

Agreement No. CE 80/2021 (CE)
Expansion of Aberdeen Typhoon Shelter – Investigation, Design and Construction

Environmental Impact Assessment – Executive Summary

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TABLE OF CONTENTS

	<u>Page</u>
1 INTRODUCTION	1
1.1 Project Background.....	1
1.2 EIA Study Brief	1
1.3 Designated Projects under EIAO	1
1.4 Environmental Impact Assessment Study	2
1.5 Purpose of this Executive Summary	2
2 PROJECT DESCRIPTION.....	3
2.1 Purpose and Scope of the Project	3
2.2 Need and Benefits of the Project	4
2.3 Environmental Benefits of the Project.....	4
2.4 Scenarios “With” and “Without” the Project.....	5
2.5 Consideration of Different Development Options	6
2.6 Construction Methods and Sequence of Works.....	9
2.7 Construction Programme	10
2.8 Operational Activities	11
2.9 Key Public Concerns	11
3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT.....	13
3.1 Air Quality Impact	13
3.2 Noise Impact	13
3.3 Water Quality Impact.....	14
3.4 Waste Management Implications.....	15
3.5 Marine Ecological Impact.....	16
3.6 Fisheries Impact.....	17
3.7 Landscape and Visual Impact	18
3.8 Cultural Heritage Impact	18
4 ENVIRONMENTAL MONITORING AND AUDIT	20
5 CONCLUSION.....	21

LIST OF TABLES

Table 2.1 Summary of Key Components of Construction Works	9
Table 2.2 Summary of Key Construction Works for the Project.....	10
Table 2.3 Summary of Key Public Concerns and Follow-up Actions.....	11

LIST OF FIGURES

- Figure 1.1** Key Changes in Project Scope from the EIA Study Brief and Project Profile
- Figure 2.1** Project Boundary and Layout Plan

LIST OF APPENDICES

- Appendix A Summary of Environmental Impacts

1 INTRODUCTION

1.1 Project Background

1.1.1 The Government of the Hong Kong Special Administrative Region (the Government) is taking forward the Invigorating Island South (IIS) initiative announced in the 2020 Policy Address to develop the Southern District into a place full of vibrancy, vigour, and velocity for people to work, live, explore new ideas and have fun. One of the key projects under the IIS initiative is to explore the feasibility of expanding the Aberdeen Typhoon Shelter (ATS) and enhancing the vessel berthing area.

1.1.2 In the 2021 Policy Address, the Government announced to commence an investigation and design study for the expansion of the ATS to create additional vessel berthing area. To this end, the Civil Engineering and Development Department (CEDD) engaged AECOM as the Consultant in April 2022 to undertake the Assignment "CE 80/2021 – Expansion of Aberdeen Typhoon Shelter – Investigation, Design and Construction" (hereinafter referred to as "the Project"). The Project aims to address the strong regional demand for sheltered vessel space in Hong Kong Island South. Beyond providing essential berthing, the expansion of the ATS also aims to foster tourism, leisure, and recreation opportunities in the Southern District and explore the possibilities for future marina development.

1.2 EIA Study Brief

1.2.1 A Project Profile (No. PP-648/2022) was submitted to the Environmental Protection Department (EPD) on 11 August 2022 for application for an Environmental Impact Assessment (EIA) Study Brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO). The EIA Study Brief (No. ESB-357/2022) for the Project was issued on 19 September 2022 under the EIAO.

1.2.2 Following the issuance of the EIA Study Brief, there have been changes in the scope of the Project as outlined in the Project Profile and the EIA Study Brief. These changes are shown in **Figure 1.1**. In accordance with Section 6.2 of the EIA Study Brief, confirmation was sought from the Director of Environmental Protection (DEP) regarding these changes. The DEP confirmed that the proposed changes to the Project did not fundamentally alter the key scope of the EIA Study Brief and thus, a fresh EIA study brief is not required. Detailed descriptions of the Project are discussed in **Section 2**.

1.3 Designated Projects under EIAO

1.3.1 The Project comprises the Designated Project (DP) items under Part I, Schedule 2 of the EIAO¹:

- Item C.1 - Reclamation works (including associated dredging works) more than 5 hectares (ha) in size.

¹ The initial project scope of works includes reclamation works which constitute DPs by virtue of Item C.1, C2 (1)(a), Item C.2 (1)(b) and Item C.3 (a) of Part 1 of Sch.2 of the EIAO. The reclamation works pertains to the construction of new breakwaters and associated land access, as detailed in the Project Profile and the EIA Study Brief (No. ESB-357/2022).

- Item C.2(1)(a) - Reclamation works (including associated dredging works) that are of more than 1 ha in size, and a boundary of which is less than 500 metre (m) from the nearest boundary of an existing or planned specified area (coastal protection area) that is wholly or partly situated on or over any foreshore and sea-bed.
- Item C.2(1)(b) - Reclamation works (including associated dredging works) that are of more than 1 ha in size, and a boundary of which is less than 200 m from the nearest boundary of an existing or planned specified area (coastal protection area) that is not wholly or partly situated on or over any foreshore and sea-bed;
- Item C.3(a) - Reclamation works resulting in more than 5% decrease in cross sectional area calculated on the basis of 0.0 mPD in a sea channel;
- Item C.4 - A breakwater more than 1 km in length or a breakwater extending into a tidal flushing channel by more than 30% of channel width;
- Item C.5 - A typhoon shelter designed to provide moorings for more than 30 vessels;
- Item C.12 (1)(b) - A dredging operation that is less than 500 m from the nearest boundary of an existing or planned specified area (coastal protection area) that is wholly or partly situated on or over any foreshore and sea-bed; and
- Item C.12 (1)(c) - A dredging operation that is less than 200 m from the nearest boundary of an existing specified area (coastal protection area) that is not wholly or partly situated on or over any foreshore and sea-bed.

1.4 Environmental Impact Assessment Study

1.4.1 The EIA was conducted for the Project in accordance with the requirements of the EIA Study Brief (No. ESB-357/2022) and the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM). The purpose of the EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project. The information obtained in the EIA Study will contribute to decisions by DEP on:

- (i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project and associated works;
- (ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
- (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

1.5 Purpose of this Executive Summary

1.5.1 This Executive Summary (ES) summarises the findings, recommendations and conclusions of the EIA Study for the Project.

2 PROJECT DESCRIPTION

2.1 Purpose and Scope of the Project

- 2.1.1 The 2024 Policy Address announced the initiative to promote yacht tourism by inviting the private sector to explore the construction and operation of marinas in the expansion area of ATS among others. The purpose of the Project is to address the strong regional demand for sheltered space in Hong Kong Island South, particularly for pleasure vessels, and support tourism, leisure and recreation development in the Southern District. Specifically, the planned additional sheltered space under the Project is essential to accommodate the anticipated demand from pleasure vessels in Hong Kong by 2030. The Project is a construction and operation project.
- 2.1.2 The Project site is located at Aberdeen Channel and sandwiched by Ap Lei Pai and Ap Lei Chau in the west and Tai Shue Wan in the east. The Project includes expansion of ATS from its southern part to provide extra sheltered space of about 24 ha (including passageways) for local vessels, as indicated on the Project boundary and layout plan in **Figure 2.1**. The Project boundary encompasses about 46 ha, including all the scope of the Project with the associated works area and the expansion area of ATS.
- 2.1.3 The detailed design of the proposed breakwaters, wave-wall in the form of floating breakwater, land access, modifications of the existing breakwaters, and other design elements are subject to further refinements during the design and construction stage. The major works items for the Project includes the following:
- (i) Proposed eastern breakwater, approximately 340 m in length, pointing to southwest with about 50 m tip bending southward, with open space and proposed marine access in form of public landing facilities (i.e. landing steps / ramp) and associated seabed stabilisation works;
 - (ii) Proposed western breakwater, approximately 300 m in length, pointing to northeast with about 85 m tip bending northward, with landing facilities for maintenance purpose and associated seabed stabilisation works;
 - (iii) Proposed land access, approximately 240 m in length, connecting the proposed eastern breakwater to Tai Shue Wan waterfront along the rocky shoreline within the Project boundary;
 - (iv) Proposed wave wall in the form of floating breakwater of about 110 m in length in the sea area within the ATS expansion area at a location approximately 70 m eastward of the tombolo between Yuk Kwai Shan and Ap Lei Pai;
 - (v) Modification of the crest of existing eastern breakwater to form a new open space with pedestrian access to Shum Wan Road; and
 - (vi) Modification of the existing western breakwater, which includes shortening of the breakwater by approximately 70 m with a view to straightening the navigation channel.

2.2 Need and Benefits of the Project

- 2.2.1 The 2024 Policy Address announced the initiative to promote yacht tourism by inviting the private sector to explore the construction and operation of marinas in the expansion area of ATS among the three locations. According to MD², the demand for sheltered space for pleasure vessels is projected to increase from 240.3 ha in 2021 to 311.1 ha in 2035. The matching of demand and supply of sheltered space for pleasure vessels indicates that there will be a shortfall of sheltered space for pleasure vessels in the territory up to 2035.
- 2.2.2 Pleasure cruising is gaining popularity in Hong Kong, with Hong Kong Island South emerging as one of the favoured yachting and boating destination for pleasure vessels. The major sources of sheltered space in the Southern District are the Aberdeen South Typhoon Shelter and Aberdeen West Typhoon Shelter (collectively referred to as “ATS”), along with three sheltered anchorages (viz. Middle Island, St. Stephen’s Bay and Tai Tam Harbour).
- 2.2.3 The proposed addition of 24 ha of sheltered space in the Project is anticipated to significantly ease the pressure on the limited berthing capacity in the Southern District. This expansion will allow for the accommodation of more vessels and enhance marine access to Tai Shue Wan for visitors. Furthermore, when integrated with local attractions, the Project has the potential to generate substantial economic benefits, driving increased economic activity and boosting tourism revenue.
- 2.2.4 Creating additional open spaces at breakwaters crest will also provide the public with opportunities to relish the scenic views, enhancing their overall experience and fostering social benefits. Sustainable technologies and facilities, such as solar/wind-powered lighting, weather monitoring, information boards, and a microalgae green wall, will be integrated to reduce electricity consumption and the Project’s carbon footprint. This showcases innovative renewable energy applications for urban development and environmental management.

2.3 Environmental Benefits of the Project

2.3.1 Provision of Eco-shoreline

- 2.3.1.1 The design for the Project will thoughtfully incorporate eco-shoreline features, including eco-tiles, tidal pools and seabird perch, of spanning about 570 m along the proposed breakwaters, land access and its associated vessel impact protection system (VIPS). These elements aim to enhance biodiversity, improve ecological performance, and strengthen coastal protection, ensuring that the development aligns with principles of environmental sustainability and educational enrichment.
- 2.3.1.2 The subtidal portion of the proposed and modified breakwaters will create approximately 4.55 ha of artificial hard substrates, which could facilitate the colonisation of corals and other epibenthos. Additionally, the construction of the proposed land access connecting to the proposed eastern breakwater will create approximately 0.2 ha of artificial subtidal hard bottom habitat. Approximately

² Marine Department (2022) Assessment of Typhoon Shelter Space Requirements 2022-2035

1,380 m of artificial intertidal habitat will be created through the construction of the proposed breakwaters as well as the proposed land access connecting to the proposed eastern breakwater.

2.3.2 Preservation and Promotion of Sea Caves at Coastal Protection Area

2.3.2.1 There are sea caves along the Coastal Protection Area (CPA) at Tai Shue Wan and Ap Lei Pai, which serve as geological archives that provide valuable insights into coastal erosion and weathering processes. Thus, the alignment of the proposed land access has been designed to follow the rocky shoreline outside the CPA, allowing visitors to appreciate the area's natural geological features. Currently, access to these sea caves is limited to marine transportation or kayaking, which restricts public accessibility. The Project will provide convenient access to the sea caves via the proposed land access, enabling the public to enjoy a closer view of the natural landscape and geological features such as sea caves for both leisure and educational purposes.

2.3.3 Beneficial Use of Unwanted Materials Generated By Other Projects

2.3.3.1 The construction and demolition (C&D) materials generated from the Project, including those arising from the demolition of part of the existing breakwaters, will be reused on-site whenever feasible. These materials will primarily serve as rock fill for the proposed structures, such as the foundation for the VIPS and landfall of proposed breakwaters. Moreover, substantial infill material is still needed for the breakwaters. To address this need, C&D materials generated by other local projects and accumulated in CEDD's Public Fill Reception Facilities would also be used for the Project as infill materials. This approach will not only facilitate the beneficial use of a significant quantity of unwanted materials but also minimise the dependence of importing raw material.

2.4 Scenarios “With” and “Without” the Project

Scenario with the Project

2.4.1 Hong Kong Island South, being a popular boating region for pleasure vessels, will face increasing demand from pleasure vessels for sheltered space due to the surge in their territorial demand. The Project will provide additional 24 ha of sheltered space, in meeting the strong demand in the region particularly for pleasure vessels.

2.4.2 The Project will promote marine tourism along the waterfronts and cultivate water-friendly culture to bring vibrancy of the district. Additionally, potential access to the breakwater crests in form of the proposed landing facility on the eastern side of the ATS is expected to create new and green tourist attractions in the ATS expansion area.

2.4.3 The Project will feature eco-shoreline designs, including eco-tiles and tidal pools, to enhance biodiversity, support marine ecosystems, and improve coastal protection. These features will create habitats for a variety of organisms while strengthening resilience against erosion and storm surges. This approach enhances environmental sustainability.

Scenario without the Project

- 2.4.4 It is expected that the number of vessels in existing Aberdeen Typhoon Shelter will be further increased. Without extra sheltered space to be provided by 2030 under the Project, the risk of vessel collisions and conflicts will be increased. This poses safety concerns to both pleasure vessels and fishing boats operating in the congested waters especially during peak times and typhoon seasons.
- 2.4.5 The persistent challenge of insufficient berthing spaces may discourage visiting pleasure vessels from choosing Hong Kong as a destination, thereby negatively impacting the promotion of yacht and waterborne tourism in the Hong Kong Island South area. This situation would hinder marine tourism industry and its economic benefits.
- 2.4.6 In the absence of the Project, the future environmental conditions in the ATS are expected to remain relatively stable since no significant fluctuations in marine activities are anticipated. The marine habitats within the Project area, including subtidal hard substrate and soft bottom habitats, and intertidal habitats, are considered to remain very low to low ecological value.

2.5 Consideration of Different Development Options

2.5.1 Considering the environmental constraints, engineering/operational requirements, and considerations during the EIA study, the Project layout and structural forms have been modified from the initial plans outlined in the Project Profile and the EIA Study Brief. The key elements of these considerations and modifications are listed below:-

2.5.2 Consideration of Site Location and Size

2.5.2.1 Given the regional shortfall of sheltered space in Hong Kong Island South, expanding ATS from its southern part can satisfy the potential economic benefits of meeting the development of marinas, which is the preferred option.

2.5.2.2 The Project's size and the breakwater layout were carefully considered for technical feasibility and cost-effectiveness, with a strong emphasis on minimising environmental impact. The proposed typhoon shelter size allows for an efficient breakwater design that reduces the foundation footprint, thereby minimising disturbance to the seabed and its marine ecology.

2.5.3 Consideration of Proposed Breakwater and Land Access Alternative Layout and Location

Proposed Eastern and Western Breakwaters

2.5.3.1 The breakwaters are proposed to be in a Northeast-Southwest direction. This design incorporates an adequate navigation channel width, overlapping breakwater tips and strategic bend at the tip of each breakwater. This arrangement is able to meet the functional requirements, including acceptable wave performance, maintaining marine traffic and unobstructed sea view at the crest of proposed eastern breakwater for future use of the open space.

Proposed Wave Wall in the Form of Floating Breakwater

- 2.5.3.2 To preserve the natural scenery, tombolo, which formed by natural process in between Yuk Kwai Shan and Ap Lei Pai, creating an eye-catching geomorphic feature, the wave wall in the form of floating breakwater is proposed to be relocated offshore by approximately 70 m eastward within the Project site.

Proposed Land Access

- 2.5.3.3 To minimise the impact to the existing shoreline of Tai Shue Wan, particularly the existing sea caves, which falls within the Coastal Protection Area, the proposed land access connecting to the proposed eastern breakwater and Tai Shue Wan promenade is to be constructed offshore with shallow foundation.

2.5.4 Consideration of Modifications of Existing Breakwaters

- 2.5.4.1 By adequately modifying the existing eastern breakwater, it is possible to provide direct pedestrian access from Sham Wan Road to the existing eastern breakwater. Therefore revitalisation of the existing eastern breakwater to provide public space is recommended.

- 2.5.4.2 To enhance the safety of the navigation channel and at the same time minimising the potential seabed disturbance and water quality impact, it is proposed to maintain the major part of the existing western breakwater insitu by shortening of part of the breakwater of approximately 70 m and removing the breakwater structure down to -5 mPD without dredging works at seabed.

2.5.5 Consideration of Alternative Structural Form for Breakwaters and Land Access

Proposed Eastern and Western Breakwaters

- 2.5.5.1 With the consideration of deep water situation, construction time and navigation requirement, it is recommended to adopt vertical type caisson breakwaters as the main structural form while sloping rubble mound is adopted at the breakwater landfalls.

Adoption of Floating Breakwater for the Proposed Wave Wall

- 2.5.5.2 A floating breakwater design was chosen to optimise wave dynamics and cost-effectiveness while prioritising environmental protection. This approach protects environment and offers significant advantages, including preserving the natural tombolo between Yuk Kwai Shan and Ap Lei Pai, avoiding disturbance to the seabed and its marine ecology, minimising potential impacts on water quality and flow, and reducing visual intrusion with a lower profile and smaller footprint.

Adoption of Shallow Foundation for the Proposed Land Access

- 2.5.5.3 To minimise environmental disturbance, a shallow foundation is proposed for the land access. This is feasible due to the presence of shallow rockhead along the proposed alignment and the reduced wave loading in the sheltered area. This approach avoids extensive piling, thereby protecting the marine ecosystem.

2.5.6 Consideration of Alternatives for Construction Methodologies

Foundation Option Adopted in this Project

- 2.5.6.1 Deep Cement Mixing (DCM) was selected as the construction method to minimise environmental impacts. Unlike dredging, DCM avoids water quality problems and the dispersion of contaminants. Moreover, DCM enhances the stability and durability of the structure, reducing the need for frequent maintenance and reconstruction, and further minimising the Project's overall environmental footprint.

Low-carbon Design for Construction

- 2.5.6.2 Green construction technologies including low-carbon concrete and Glass Fibre Reinforced Polymer reinforcement, will be adopted as far as possible to lower the overall carbon emission from the production of conventional concrete and steel reinforcement.

Construction Method for Main Structures

- 2.5.6.3 The Project will utilise prefabricated units for the proposed breakwaters and floating breakwaters whenever practical, which will reduce construction time and thereby minimise potential on-site environmental impacts on air, noise and water quality.

2.5.7 Consideration of Construction Sequence

- 2.5.7.1 To shorten the construction period for the breakwaters, multiple work-fronts will be considered to allow different work activities to proceed in parallel. It is assumed that two work-fronts comprising sand blanket and geo-textile laying plants along with DCM plants will be deployed at the same time across various locations. Concurrent stabilisation of multiple seabed sections accelerates the overall construction and shortens the duration of potential environmental impacts, thereby enhancing the Project's environmental performance.

2.5.8 Consideration of Integration of Tai Shue Wan Public Pier to Proposed Eastern Breakwater

- 2.5.8.1 This integration proposed Tai Shue Wan pier into the proposed eastern breakwater will not only enhance efficient utilisation of marine space for mooring and navigation purposes but also averted the necessity for an extra concurrent project, thereby alleviating the additional environmental impacts, such as seabed disturbance and noise generation.

2.5.9 Consideration of Adoption of Eco-shoreline

- 2.5.9.1 While the existing marine habitats within the Project are considered as very low to low ecological value, eco-shoreline features such as eco-tiles, tidal pools and seabird perch, are proposed to be integrated along the proposed breakwaters, land access and VIPS to encourage the colonisation of marine organisms, promote a balanced aquatic ecosystem in the area and create a habitat that enriches local biodiversity.

2.6 Construction Methods and Sequence of Works

2.6.1 The construction of the key components comprises the following works:-

Table 2.1 Summary of Key Components of Construction Works

Construction Works	Detailed Sequence
(i) Proposed breakwaters and public marine accesses	<p>(a) Localised removal of any hard obstructions may be required from the top about 3 m of the seabed surface prior to DCM works commencing.</p> <p>(b) Placement of geotextile and sand blanket</p> <p>(c) Seabed stabilisation in form of DCM and dredging at shallow water locations</p> <ul style="list-style-type: none"> • In shallow water locations, such as near to the landfall of the proposed breakwaters, minimal dredging is suggested where DCM is not applicable. <p>(d) Rubble mound filling for breakwater foundation and landfall</p> <ul style="list-style-type: none"> • Rubble mound filling for the caisson foundation, will be proceeded after the completion of DCM construction. <p>(e) Installation of precast concrete elements</p> <ul style="list-style-type: none"> • The precast concrete elements, (e.g. caissons or concrete armour units), can be progressed in parallel with DCM works. Those precast concrete elements can be delivered by units upon progressive completion of DCM works to reduce occupation of site spaces and simplify construction sequence <p>(f) Filling the caisson compartment</p> <ul style="list-style-type: none"> • Filling of the caisson compartment will be carried out in parallel with the adjacent caisson installation. <p>(g) Placement of scour protection at the two sides of caissons</p> <p>(h) Construction of caisson topside and marine access</p> <ul style="list-style-type: none"> • Construct the public landing facilities within the footprint of proposed eastern breakwater • Construct the landing facilities for the purpose of maintenance access within the footprint of proposed western breakwater
(ii) Proposed land access connecting proposed eastern breakwater	<p>(a) Placement of levelling stone on the seabed to provide a levelled ground</p> <p>(b) Construction of approximately 240 m long elevated footpath by installing prefabricated/in-situ land access segments, supported by precast/in-situ columns and pad footings</p> <p>(c) Placement of VIPS in form of precast concrete segments in front of the elevated footpath structure</p>

Construction Works	Detailed Sequence
(iii) Proposed wave wall in the form of floating breakwater	(a) Placement of concrete sinkers on the seabed (b) Installation of prefabricated floating breakwater units with anchoring by chains to concrete sinkers (c) Installation of breakwater crest elements (i.e. navigation lights)
(iv) Modification of existing eastern breakwater	(a) Construction of pedestrian access road to breakwater crest by modification of the crest (b) Installation of breakwater crest elements (i.e. safety railing, information board, etc.)
(v) Shortening and modification of existing western breakwater	(a) Removal of rock armour and fill material at the breakwater head up to approximately -5 mPD (approximately 70 m in length) (b) Placement of rock armour and fill material to make good the shortened tip (c) Re-construction of maintenance access and navigation light

2.7 Construction Programme

2.7.1 Subject to the detailed design of the Project, necessary statutory procedures and funding approval, the construction works are anticipated to be carried out between 2026 and 2030. The tentative programme for major construction works is outlined in **Table 2.2**.

Table 2.2 Summary of Key Construction Works for the Project

Proposed Works	Tentative Construction Programme [^]
Proposed Eastern Breakwater	Q2 2026 to Q2 2030
Proposed Western Breakwater	Q2 2026 to Q2 2030
Shortening of Existing Western Breakwater	Q2 2026 to Q2 2029*
Modification of Existing Eastern Breakwater	Q2 2026 to Q2 2029*
Proposed Wave Wall in the Form of Floating Breakwater	Q2 2026 to Q2 2030*
Proposed Land Access	Q2 2026 to Q2 2030*

Notes:

[^] The works could be conducted with concurrent work fronts, as assessed in the relevant **Sections 3 – 10** under the worst case scenario.

* The duration of the construction works is about 1 year. The commencement of these works will depend on the future detailed design of the Project, the Marine Department's agreement on the temporary navigation arrangement, the contractor's resource allocation and the programme of interfacing projects (i.e. the proposed marina development), etc..

2.8 Operational Activities

2.8.1 During the operational phase of the Project, there will be vessels navigation and mooring activities in the ATS expansion area. Scheduled inspection and maintenance will be carried out for the breakwaters, land access, landing facilities and the facilities installed on the breakwater crest (i.e. navigation lights, public lighting, etc).

2.9 Key Public Concerns

2.9.1 During the public inspection of the Project Profile (No. PP-648/2022) held from 12 August to 25 August 2022, several environmental concerns were received.

2.9.2 Consultation with the Development Planning Committee (DPC) of the Southern District Council (SDC) was carried out at its meeting held on 23 May 2024, and the Project was well received by the committee members.

2.9.3 The project design has taken into consideration the received environmental concerns and appropriate mitigation measures were recommended as appropriate in the EIA study to minimise the environmental impacts. The key environmental concerns and the follow up actions taken are summarised in **Table 2.3**.

Table 2.3 Summary of Key Public Concerns and Follow-up Actions

Item No.	Concerns	Follow-up Actions to be Taken
<i>Concerns / Issues Received from Public Inspection of Project Profile</i>		
1.	Need of the Project	The needs of Project (i.e. increasing demand for sheltered space) and the benefits of the Project (refer to Section 2.2) are presented in this EIA Report and have also been highlighted in the DPC meeting of SDC.
2.	<p>Potential impacts on the tombolo between Yuk Kwai Shan and Ap Lei Pai due to the proposed wave wall on top of the tombolo.</p> <p><i>Relevant Environmental Aspects:</i></p> <ul style="list-style-type: none"> - Water Quality (Section 5 of EIA) - Marine Ecology (Section 7 of EIA) - Landscape and Visual (Section 9 of EIA) 	<p>Considering public concerns raised during the earlier stage of the Project and to preserve the tombolo, the wave wall is now proposed as a form of floating breakwater located at approximately 70 m east of the tombolo. No construction works will be carried out on the tombolo or adjacent land areas under the Project. Furthermore, the adoption of floating breakwater eliminates the need for non-dredged seabed stabilisation works (i.e. DCM), filling works or dredging works for its installation. This design approach minimises adverse impacts on water flow, water quality, seabed conditions and sediment deposition on the tombolo during construction and operation phases.</p> <p>The design also was presented at the DPC meeting of SDC where it received positive feedback.</p> <p>Assessments on water quality impact (refer to Section 5.6 of EIA), marine ecological impact (refer to Section 7.7 of EIA) and landscape and visual impact (refer to Section 9.6 - 9.7 of EIA) were conducted under the EIA study to assess</p>

		the potential impacts of the Project (including the proposed wave wall in the form of floating breakwater) to nearby environment. With the proper implementation of the mitigation/enhancement measures, no adverse water quality impacts and visual impact are anticipated, and the ecological impact are considered acceptable.
3.	Potential terrestrial ecological impacts on wild boars habitats which may lead to nuisance to the public.	The majority of the project works will be marine-based, thus terrestrial ecological impacts are not anticipated. Referring to Environmental Impact Assessment for Tai Shue Wan Development at Ocean Park (Register No.: AEIAR-184/2014) in 2014, the wild boar population and foraging locations are land-based and far away from proposed breakwater's location which is mainly on the sea.
<i>Concerns/Issues received in District Council Meeting</i>		
4.	Potential increase in general refuse and associated potential impacts on water quality may arise from vessel activities within the expanded typhoon shelter area. <i>Relevant Environmental Aspects:</i> - Waste Management Implications (Section 6 of EIA)	According to current practice, floating marine refuse within the Aberdeen Typhoon Shelter is regularly collected by the Marine Department (MD)'s contractor as a part of their daily operation. Domestic refuse collection services are provided to local vessels in Aberdeen Typhoon Shelter twice per day by MD's contractor. For large-scale domestic refuse collection from local vessels within the typhoon shelter, the MD has established a 24-hour hotline to facilitate timely collection service inside the typhoon shelter. With the implementation of waste management control practices, unacceptable environmental impacts (e.g. air and odour emission, noise and wastewater discharge) are not anticipated. Details are discussed in the waste management implications assessment (refer to Section 6.5 of EIA).

3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

3.1 Air Quality Impact

3.1.1 Potential air quality impacts associated with the construction and operational phases of the Project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.3 and Appendix B of the EIA Study Brief, as well as Annexes 4 and 12 of the EIAO-TM. The assessment area for air quality impact assessment is within 500 m from the boundary of the Project site.

Construction Phase

3.1.2 The potential air quality impacts may arise from the construction works of the Project including filling for the proposed breakwater, construction of the proposed wave wall in the form of floating breakwater, as well as the modification of existing eastern and western breakwaters, and material handling. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation together with the recommended air quality mitigation measures, good site practices, and environmental monitoring and audit (EM&A) programme, no adverse air quality impact at air sensitive receivers (ASRs) is anticipated due to the construction activities of the Project.

Operation Phase

3.1.3 Cumulative air quality impact arising from vehicular emission from open roads, parking site/termini, industrial and marine emissions within the 500-m assessment area, as well as background concentrations, has been assessed for the operation phase of the Project. The results concluded that the predicted cumulative air pollutant concentrations on the identified ASRs comply with both the prevailing and the proposed Air Quality Objectives (AQOs) during the operation phase and no air sensitive use shall be located within the exceedance zones identified in the contour plots. As such, adverse air quality impact due to the operation of the Project is not anticipated.

3.2 Noise Impact

3.2.1 Potential noise impacts associated with the construction and operational phases of the Project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.4 and Appendix C of the EIA Study Brief, as well as Annexes 5 and 13 of the EIAO-TM. The assessment area for noise impact assessment is defined by a distance of 300 m from the site boundary of the Project.

Construction Phase

3.2.2 Assessment on potential construction noise impact arising from the proposed Project has been conducted qualitatively. With implementation of appropriate mitigation measures including quieter construction methods, good site practices, no adverse construction noise impact would be anticipated. A Construction Noise Management Plan (CNMP) would be prepared and checked before the invitation of tender and commencement of construction works by a Certified Noise Modelling Professional as recognised by the Hong Kong Institute of Qualified Environmental Professionals Limited (HKIQEP), or equivalent as agreed by the DEP. Regular site environmental

audit during construction phase is recommended to ensure proper implementation of mitigation measures and good site practices.

Operation Phase

- 3.2.3 Based on the findings of the marine traffic noise assessment, adverse noise impact due to the Project is not anticipated.

3.3 Water Quality Impact

- 3.3.1 The water quality impact assessment was conducted in accordance with the requirements in Annexes 6 and 14 of the EIAO-TM and the requirements in Section 3.4.5 and Appendix D of the EIA Study Brief. The assessment area for water quality impact assessment covered the Western Buffer Water Control Zone (WCZ) and Southern WCZ as designated under Water Pollution Control Ordinance (WPCO) and water sensitive receivers (WSRs) in the vicinity of the Project site.

Construction Phase

- 3.3.2 The water quality impacts during the marine construction works have been quantitatively assessed by the Hong Kong Delft3D Flexible Mesh (HK-DFM) Model using the Delft3D Flexible Mesh Model Suite (Delft3D-FM). Suspended sediment is identified as the most significant water quality parameter during marine construction. The scenarios for dredging, sand blanket filling and DCM installation have been assessed and it is predicted that potential water quality impacts would be localised within the Project site. With implementation of the proposed mitigation measures, potential water quality impacts upon the water sensitive receivers could be effectively minimised. An EM&A programme is required to ensure the effectiveness of the proposed water quality mitigation measures. No adverse water quality impact due to marine-based construction of the Project is therefore anticipated.
- 3.3.3 For land-based construction activities, the key water quality issues would be the potential release of sediment-laden water from surface work areas and discharge of construction site effluent. Minimisation of water quality deterioration could be achieved through implementing adequate mitigation measures. Regular site inspections should be undertaken routinely to inspect the construction activities and work areas in order to ensure the recommended mitigation measures are properly implemented. With implementation of the proposed mitigation measures, no adverse water quality impact due to land-based construction of the Project is anticipated.

Operation Phase

- 3.3.4 During operation phase, no significant change in hydrodynamic regime was predicted according to the modelling results. No significant change in water quality regime, which associated with the hydrodynamic impact, is anticipated. Other water quality impact associated with the operation of the Project was identified as surface runoff from paved areas. It is expected that the impacts of surface runoff can be prevented by adopting recommended mitigation measures. No adverse water quality impact due to the operation of the Project is therefore anticipated.

3.4 Waste Management Implications

3.4.1 Waste management implications associated with the construction and operation of the Project were identified and assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.6 and Appendix E of the EIA Study Brief, as well as Annexes 7 and 15 of the EIAO-TM.

Construction Phase

3.4.2 Waste types generated by the construction activities of the Project would include C&D materials from general construction works and shortening of existing breakwater, dredged sediments from dredging works, general refuse from workforce and chemical waste from maintenance of construction plant and equipment. Floating refuse may also be trapped and accumulated along the shoreline and breakwaters. Provided that these wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, adverse environmental impacts during the construction phase would not be anticipated.

3.4.3 Reduction measures have been recommended to minimise the amount of C&D materials generated from the Project. Approximately 24,000 m³ of inert C&D materials and 1,000 m³ of non-inert C&D materials would be generated during the construction phase of the Project. Approximately 22,400 m³ of inert C&D material would be reused on-site as backfilling materials while the remaining 1,600 m³ of surplus inert C&D material would be delivered to Public Fill Reception Facility (PFRF) for beneficial reuse in other projects. Non-inert C&D material would be reused and recycled before disposal at landfill. Opportunities in minimisation of generation and maximisation of reuse would be continually investigated during the detailed design and construction phases. The other materials that cannot be reused or recycled would be disposed to designated outlets.

3.4.4 The total volume of dredged sediment generated from the Project is estimated to be approximately 241,263 m³. Based on the results of the chemical and biological screening, approximately 198,855 m³ of sediment is suitable for Type 1 – Open Sea Disposal and 42,408 m³ of sediment is suitable for Type 1 – Open Sea Disposal (Dedicated Sites) in accordance with *ETWB TCW No. 34/2002*. With the implementation of the recommended mitigation measures and in accordance with the requirements of prevailing guidelines/circulars, no adverse environment impacts would be expected from dredging, transportation and disposal of marine sediment.

Operation Phase

3.4.5 During the operation phase, the key waste types generated will include general refuse from vessel users in the ATS. There would also be accumulation of floating refuse on the newly constructed wave wall in the form of floating breakwater and breakwaters of the Project. Provided that all these wastes are handled, transported and disposed of in strict accordance with the relevant legislative requirements and the recommended mitigation measures are properly implemented, no adverse environmental impact is expected during the operation phase.

3.5 Marine Ecological Impact

- 3.5.1 The ecological impact assessment was conducted in accordance with the relevant requirements as specified in Section 3.4.7 and Appendix F of the EIA Study Brief, as well as Annexes 8 and 16 of the EIAO-TM.
- 3.5.2 A total of four habitat types were identified within and adjacent to the Project site, mainly consisting of marine habitats including subtidal habitats, intertidal habitats of rocky shore, sandy shore and artificial seawall, which all are considered to be of very low to low ecological value.
- 3.5.3 32 coral species of conservation importance were recorded within the assessment area in previous and recent surveys, dominated by common and abundant coral species in Hong Kong such as *Favites abdita* and *Oulastrea crispata* with low coverage (<5%).
- 3.5.4 For benthic and intertidal communities, only one benthic species of conservation importance, Amphioxus species *Branchiostoma belcheri* was recorded close to Middle Island located within the Southern WCZ (about 2 km distant from the Project site) in previous surveys. Whereas no species of conservation importance was recorded within the assessment area during recent survey for both communities.

Construction Phase

- 3.5.5 During construction phase, proposed marine-based works under the Project would cause permanent and temporary loss of subtidal soft substrate habitats (about 5.3 ha and 2.0 ha respectively), permanent loss of subtidal hard substrate habitats (about 1.4 ha), intertidal rocky shore (about 120 m) and artificial seawall (about 200 m). Given the small size and very low to low ecological value of the affected habitats, the direct impact of habitat loss is expected to be low for all these habitats.
- 3.5.6 Under the Project footprint, 13 coral species of conservation importance would be directly impacted by proposed works. Given all impacted coral species are commonly widespread in Hong Kong waters, recorded in low coverage on site and all are subjected to existing disturbance from the typhoon shelter, the potential impact on these species is considered to be low.
- 3.5.7 Given that proposed works would be mainly at the middle of the Aberdeen Channel, which is subjected to existing high level of disturbance from the typhoon shelter and less preferable to be utilised by wildlife, and unnecessary encroachment into natural habitats would be avoided, the impact on other wildlife is considered low.

Operation Phase

- 3.5.8 During operation phase, direct and indirect impacts such as boat mooring and anchoring, underwater noises and pollution generated would be resulted from increased marine traffic within the ATS expansion area. Given that the disturbance impacts are localised within the Project footprint with no additional area of habitat loss, and these habitats are of very low to low ecological value which are already subjected to the existing disturbances from typhoon shelter, the impacts are considered to be insignificant and low.

- 3.5.9 Potential change in hydrodynamic and hydrology properties would also be expected with installation of new breakwaters. However, due to low diversity and abundance of subtidal organism, the impact would be considered low.
- 3.5.10 Enhancement measures such as installation of eco-shoreline features on the proposed and modified breakwaters as well as eco-features on VIPS would be implemented for the Project, which could create about 4.75 ha and 1380 m of artificial habitats for facilitating colonisation of intertidal and subtidal epifauna. With proper water mitigation measures in place during both construction and operation phases, it is anticipated that ecological impacts from the Project on the marine environment would be acceptable, no adverse ecological impact would be anticipated.

3.6 Fisheries Impact

- 3.6.1 The fisheries impact assessment was conducted in accordance with the relevant requirements as specified in Section 3.4.8 and Appendix G of the EIA Study Brief, as well as Annex 9 and 17 of the EIAO-TM.
- 3.6.2 No sites of fisheries importance such as spawning ground and nursery area for commercial fisheries resources, Fish Culture Zones (FCZs), Artificial Reefs (ARs), were identified within the Project site. The nearest spawning ground and nursery area for commercial fisheries resources is located at South Lamma and Lamma Island respectively (approximately 5.8 km and 2.3 km from the Project site). Five FCZs were identified within the assessment area, of which including Sok Kwu Wan (SKW) FCZ, Lo Tik Wan (LTW) FCZ (and ARs), Ma Wan (MW) FCZ, Cheung Sha Wan (CSW) FCZ and Po Toi (PT) FCZ. Additionally, the overall fisheries production with moderate levels (>200-300 kg/ha) were recorded, with moderate to high numbers of fishing vessels (>400-600).
- 3.6.3 There would be a permanent loss of about 25.3 ha of access to fishing ground and permanent loss of fishing ground and fisheries habitats of about 8.7 ha due to the occupation of marine area between existing and proposed breakwaters and construction works elements respectively, of which are considered to be a very small proportion. By comparing with the total marine waters of Hong Kong (approximately 170,000 ha), the loss of access to fishing ground and loss of fishing ground and fisheries habitats caused by the Project is considered minor. A temporary loss of 42 ha of access to fishing grounds resulted from temporary works would only cause minor impact on fisheries. Only minor deterioration of water quality impacts during construction phase and no significant changes in hydrodynamics and deterioration of water quality during operation phase are expected. With the implementation of mitigation measures for controlling water quality impact, the Project would not cause any unacceptable water quality impact to water space in the vicinity of the Project site during construction and operation phases. Given that high traffic at the vicinity of the Project site were contributed by the operation of existing ATS, most of the fishing operations near the Project site are predominantly small-scale and conducted using highly flexible and mobile sampans, impact on fisheries due to the increase in work vessels and increase marine traffic on fisheries during construction and operation phases are therefore considered to be minor.

- 3.6.4 With the implementation of water quality mitigation measures during construction and operation phases, potential impacts on fisheries will be further minimised. No unacceptable residual fisheries impacts during construction and operation phases of the Project will be resulted.

3.7 Landscape and Visual Impact

- 3.7.1 The landscape and visual impact assessment has been conducted in accordance with Section 3.4.9 and Appendix H of the EIA Study Brief, Annexes 10 and 18 of the EIAO-TM, and EIAO Guidance Note No. 8/2010.

Landscape Impact

- 3.7.2 Majority of the proposed permanent works occur within LR7 and LCA7 which represents the open waters. As a result in discussions under former sections, the resulting impact at Year 10 for LR7 and LCA7 will be Slight and Moderate to Substantial respectively. For LR5 and LCA1, they will undergo Slight and Insubstantial to Slight impact significance at Year 10 with the implementation of the aforementioned designs treatments and various provisions during construction and on-going maintenance upon operation. No trees are affected under the proposed works.

Visual impact

- 3.7.3 Under the above visual impact assessment, it is envisioned with the full implementation of proposed mitigation measures, the majority of the VSRs will experience a reduce impact of Slight while a few of them shall not be affected at Year 10 (Insubstantial).

Overall Acceptability

- 3.7.4 Though the waterbody's character and coastline profile shall be changed, there is a need for the Project to provide for the enhancement of protection of marine assets and waterfront property in the face of extreme climate conditions, it is concluded that both residual landscape and visual impact are assessed to be acceptable with mitigation measures.

3.8 Cultural Heritage Impact

- 3.8.1 The cultural heritage impact assessment was conducted in accordance with the relevant requirements as specified in in Section 3.4.10 and Appendix I and I-1 of the EIA Study Brief, as well as section 2 of Annex 10 and section 2 of Annex 19 of the EIAO-TM.
- 3.8.2 No heritage site falls within the Project area and therefore there is no direct impact on any heritage site. Hence, no mitigation measure is required for the conservation and preservation of heritage site and the requirements in Annexes 10 and 19 of the EIAO-TM have been met. In addition, no direct impact is anticipated on any declared monument, proposed monument, graded historic building and Government historic site.

Construction Phase

- 3.8.3 One other identified item with no status, namely the existing breakwaters, is located within the Project boundary. The existing western breakwater is to be shortened. Thorough cartographic and photographic record, and other documentation means such as 3D scanning or photogrammetry of the existing western breakwater should be conducted prior to the proposed construction works, they will be act as the record for future conservation/interpretation. In addition, condition and structural survey of the existing western breakwater should also be carried out before and after all construction works to inspect its physical condition and structural integrity. Furthermore, conservation of the existing western breakwater should be incorporated into the design of the development. The shape of the end of the shortened western arm should be constructed to preserve a similar shape and materials of the tetrapod in its current layout.
- 3.8.4 Meanwhile, one other identified item with no status, namely No. 198 light beacon and associated landing facilities, is located within 300m assessment area. No impact is anticipated, and thus no mitigation measure is required.
- 3.8.5 Based on the findings of the Marine Archaeological Investigation (MAI), the survey result was sufficient to conclude that the findings within the assessment area are of low archaeological interest. As the identified object within the assessment area is of low archaeological interest and the works are about 100 m away, there will be no negative impact from the construction works and is therefore no need for any mitigation or further action.
- 3.8.6 For precautionary measures, AMO should be informed immediately if marine archaeological materials having certain to significant values are found during the course of construction works of the Project.

Operation Phase

- 3.8.7 No impact is anticipated by the Project during operation phase.

4 ENVIRONMENTAL MONITORING AND AUDIT

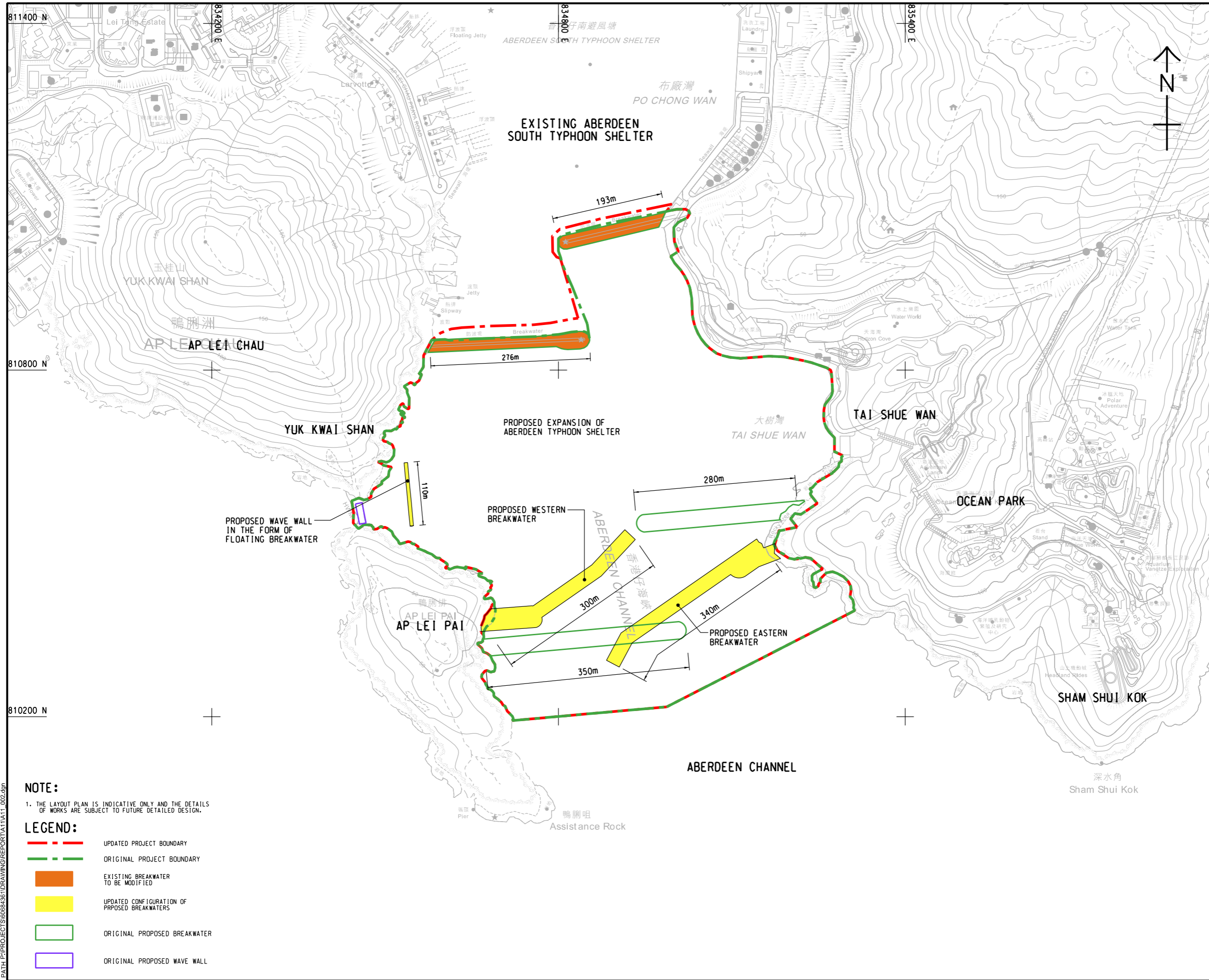
- 4.1.1 The EM&A requirements for air quality, noise, water quality, waste management, marine ecology, fisheries, landscape and visual as well as cultural heritage have been recommended, with regular site inspection and audits during construction phase to ensure that the recommended mitigation measures are properly implemented. Post-construction water quality monitoring is also recommended upon completion of all construction activities. The EM&A requirements are specified and detailed in the EM&A Manual.

5 CONCLUSION

- 5.1.1 The EIA has identified and assessed the potential environmental impacts during the construction and operation of the Project in accordance with the criteria and guidelines of the EIAO-TM and the EIA Study Brief. The EIA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards. The summary of the environmental impacts for the Project is presented in **Appendix A**.
- 5.1.2 Overall, the EIA concluded that the Project would comply with the requirements of the EIA Study Brief and the EIAO-TM with the implementation of the proposed mitigation measures during the construction and operation phases of the Project. The schedule of implementation of the proposed mitigation measures has been provided in the EM&A Manual. An EM&A programme has also been recommended to check the effectiveness of the proposed mitigation measures.

Figures

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 Checked:
 Designer:
 Project Management Initials:



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PROJECT
 項目
EXPANSION OF ABERDEEN TYPHOON SHELTER - INVESTIGATION, DESIGN AND CONSTRUCTION

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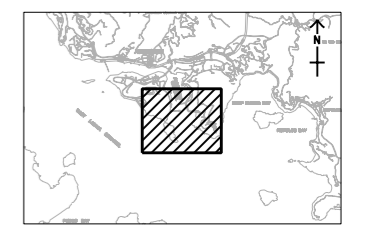
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NO.	DATE	DESCRIPTION	CHK.
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A	JUL 22	DRAWING AMENDED	AN

STATUS
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SCALE 比例
 A3 1:6000
DIMENSION UNIT 尺寸單位
 METRES

KEY PLAN 索引圖
 A3 1:20000



PROJECT NO. 項目編號
 60684361
CONTRACT NO. 合約編號
 CE 80/2021 (CE)

SHEET TITLE 圖號/名稱
 KEY CHANGES IN PROJECT SCOPE FROM THE EIA STUDY BRIEF AND PROJECT PROFILE

SHEET NUMBER 圖號/編號
 60684361/A11/FIGURE 1.1

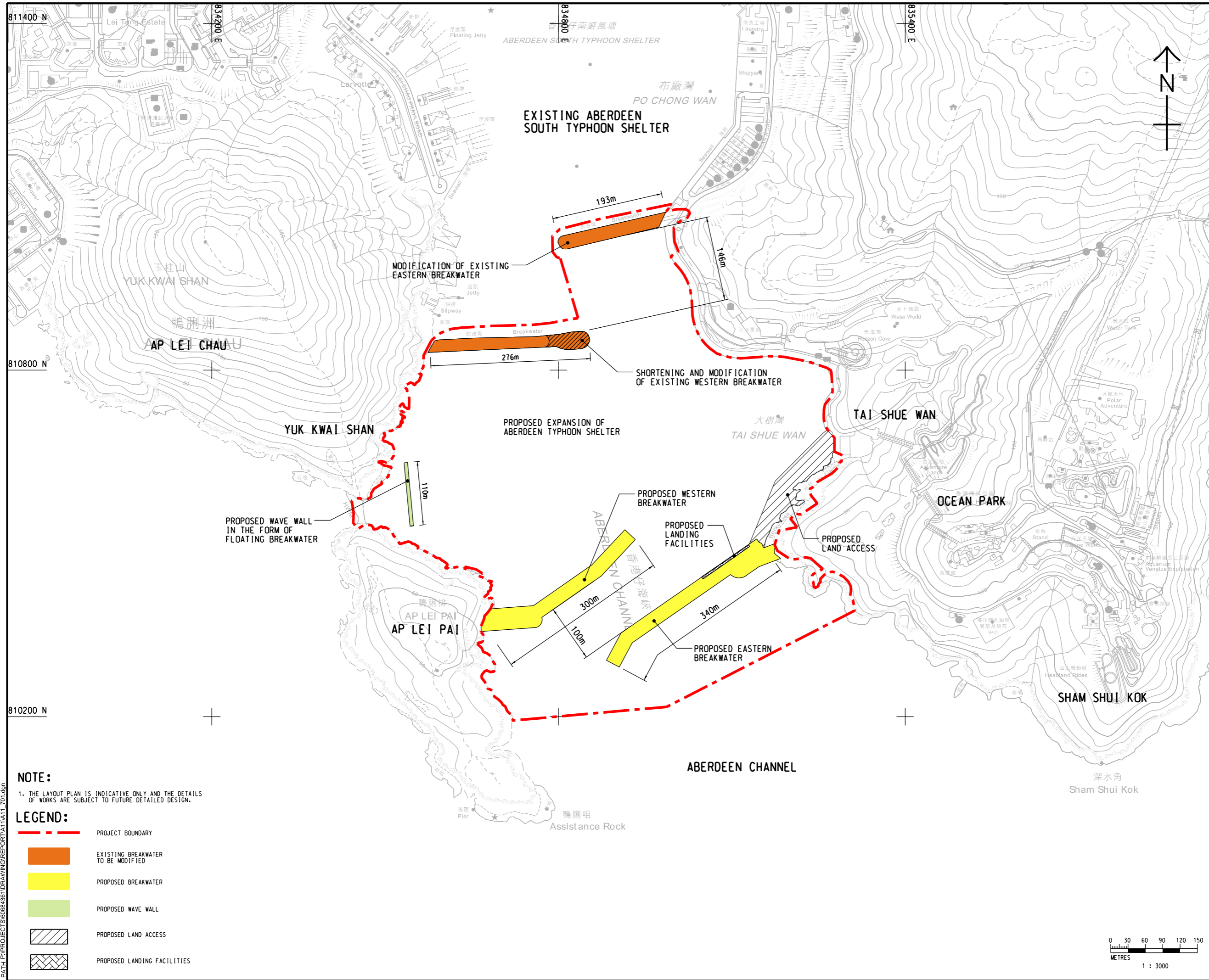
NOTE:
 1. THE LAYOUT PLAN IS INDICATIVE ONLY AND THE DETAILS OF WORKS ARE SUBJECT TO FUTURE DETAILED DESIGN.

- LEGEND:**
- - - UPDATED PROJECT BOUNDARY
 - - - ORIGINAL PROJECT BOUNDARY
 - EXISTING BREAKWATER TO BE MODIFIED
 - UPDATED CONFIGURATION OF PROPOSED BREAKWATERS
 - ORIGINAL PROPOSED BREAKWATER
 - ORIGINAL PROPOSED WAVE WALL

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LEGEND:

	PROJECT BOUNDARY
	EXISTING BREAKWATER TO BE MODIFIED
	PROPOSED BREAKWATER
	PROPOSED WAVE WALL
	PROPOSED LAND ACCESS
	PROPOSED LANDING FACILITIES



PROJECT
 項目
EXPANSION OF ABERDEEN TYPHOON SHELTER - INVESTIGATION, DESIGN AND CONSTRUCTION

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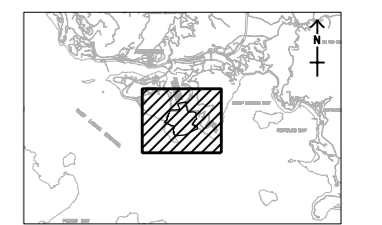
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SCALE
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 A3 1 : 6000

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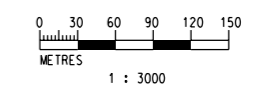


PROJECT NO.
 項目編號
 60684361

CONTRACT NO.
 合約編號
 CE 80/2021 (CE)

SHEET TITLE
 圖紙名稱
PROJECT BOUNDARY AND LAYOUT PLAN

SHEET NUMBER
 圖紙編號
 60684361/A11/FIGURE 2.1



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Appendices

Appendix A

Summary of Environmental Impacts

Appendix A Summary of Environmental Impacts

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
Air Quality Impact					
Construction Phase					
Air sensitive uses within 500 m from the boundary of the Project site	<ul style="list-style-type: none"> The potential air quality impact from the construction activities would be limited. Adverse constructional air quality impact to surrounding ASRs is not anticipated The potential odour impact from the dredging activities would be short-term. Adverse odour impact from the dredged material is not expected. Adverse air quality impact arising from the use of powered mechanical equipment (PME) and construction trucks to the surrounding ASRs is not anticipated. Adverse air quality impact from the construction vessels is not anticipated. With reference to Sections 3.7.1 – 3.7.3 of the EIA report, adverse air quality and odour impact from the 	<ul style="list-style-type: none"> Annexes 4 and 12 of the EIAO-TM 	No exceedance was predicted.	Air quality mitigation measures and good site practices: <ul style="list-style-type: none"> Use of regular watering to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather. Use of frequent watering for particularly dusty construction areas and areas close to ASRs. Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines. Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs. Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations. The engine of the PMEs during idling shall be switched off. Provision of wind shield and dust extraction units or similar dust mitigation measures at the 	<ul style="list-style-type: none"> No adverse residual impacts anticipated

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
	<p>construction activities, dredging, Non-Road Mobile Machinery (NRMM), construction trucks and vessels are not anticipated.</p>			<p>loading area of barging point, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons/ periods.</p> <ul style="list-style-type: none"> • Provision of not less than 2.4 m high hoarding from ground level along site boundary where adjoins a road, streets or other accessible to the public except for a site entrance or exit. • Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs. • Instigation of an environmental monitoring and auditing program during the construction phase in order to enforce controls and modify method of work if dusty conditions arise and to ensure no adverse air quality impact during Construction phase. • Locate all the dusty activities away from any nearby ASRs as far as practicable. • For construction vessels, the number of trips would be monitored and minimised and vessel travelling route would be kept away from the ASRs as far 	

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
				as possible. <ul style="list-style-type: none"> • Engine of construction vessels shall be switched off while not in use. • All malodorous materials shall be placed as far as possible from any ASRs. • The stockpiled malodorous materials shall be covered entirely by plastic tarpaulin sheets. • The malodorous materials shall be removed from site as soon as possible and shall not be stockpiled overnight at the site. • Dredged materials onto the barges should be properly covered as far as practicable to minimise the exposed area and potential fugitive dust and odour emissions during its transportation. 	
Operation Phase					
Existing and planned air sensitive uses within 500 m from the boundary of the Project site	<u>Fine Suspended Particulates (FSP)</u> <ul style="list-style-type: none"> • 19th highest 24-hr average conc: 28 – 29 µg/m³ • Annual average: 11 µg/m³ 	The prevailing/proposed Hong Kong Air Quality Objectives (HKAQOs) <u>FSP</u> <ul style="list-style-type: none"> • 24-hr average conc.: <ul style="list-style-type: none"> ▪ 50 µg/m³ (Prevailing) 	No exceedance was predicted.	<ul style="list-style-type: none"> • No mitigation measure is required. 	<ul style="list-style-type: none"> • No adverse residual impacts anticipated

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
	<p><u>Respirable Suspended Particulates (RSP)</u></p> <ul style="list-style-type: none"> 10th highest 24-hr average conc.: 49 – 50 µg/m³ Annual average: 18 – 19 µg/m³ <p><u>Nitrogen Dioxide (NO₂)</u></p> <ul style="list-style-type: none"> 19th highest 1-hr average conc.: 72 – 146 µg/m³ 10th highest daily average conc.: 32 – 50 µg/m³ Annual average conc.: 13 – 24 µg/m³ <p><u>Sulphur Dioxide (SO₂)</u></p> <ul style="list-style-type: none"> 4th highest 10-minute average conc.: 23 – 28 µg/m³ 4th highest daily average conc.: 6 – 7 µg/m³ 	<ul style="list-style-type: none"> 37.5 µg/m³ (Proposed) (Number of exceedances allowed: 18) Annual average conc.: 25 µg/m³ (Prevailing) 15 µg/m³ (Proposed) <p><u>RSP</u></p> <ul style="list-style-type: none"> 24-hr average conc.: 100 µg/m³ (Prevailing) 75 µg/m³ (Proposed) (Number of exceedances allowed: 9) Annual average conc.: 50 µg/m³ (Prevailing) 30 µg/m³ (Proposed) <p><u>NO₂</u></p> <ul style="list-style-type: none"> 1-hr average conc.: 200 µg/m³ (Prevailing and Proposed) (Number of exceedances 			

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
		allowed: 18) <ul style="list-style-type: none"> • Daily average conc.: 120 $\mu\text{g}/\text{m}^3$ (Proposed) (Number of exceedances allowed: 9) • Annual average conc.: 40 $\mu\text{g}/\text{m}^3$ (Prevailing and Proposed) <u>SO₂</u> <ul style="list-style-type: none"> • 10-minute average conc.: 500 $\mu\text{g}/\text{m}^3$ (Prevailing and Proposed) (Number of exceedances allowed: 3) • Daily average conc.: <ul style="list-style-type: none"> ▪ 50 $\mu\text{g}/\text{m}^3$ (Prevailing) ▪ 40 $\mu\text{g}/\text{m}^3$ (Proposed) (Number of exceedances allowed: 3) 			

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
Noise Impact					
Construction Phase					
Existing residential uses within 300 m from the boundary of the Project site	<ul style="list-style-type: none"> The separation distance between NSR N1 to the nearest Project works is approximately 284 m to the south of NSR N1, and the majority of the Project works are located outside of the 300 m assessment area from NSR N1. With consideration of the nature of the Project works, adverse construction noise impact associated with the Project is not anticipated. 	<ul style="list-style-type: none"> Annexes 5 and 13 of the EIAO-TM Leq_(30 min) 75 dB(A) at 1 m from the façade of residential dwellings 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Use of quiet PME Use of quieter construction method Use of noise barriers/enclosures Good site practices: <ul style="list-style-type: none"> Only well-maintained plant should be operated on site and plant should be serviced regularly; Utilising silencers or mufflers on construction plant; Mobile plant should be sited as far away from noise sensitive receivers (NSRs) as possible; Plant that are in intermittent use should be shut down between works periods or throttled down to a minimum; Plant known to emit noise strongly in one direction should, where possible, be orientated so that noise is directed away from the nearby NSRs; Material stockpiles and other 	<ul style="list-style-type: none"> No adverse residual impacts anticipated

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				<p>structures such as site hoarding should be effectively utilised to screen noise from on-site construction activities; and</p> <ul style="list-style-type: none"> - Appropriate traffic routes for transportation of large volume of construction materials/spoils/excavated materials should be identified to minimise potential noise impacts. 	
Operation Phase					
Existing residential uses within 300 m from the boundary of the Project site	<p><u>Marine Traffic Noise</u></p> <ul style="list-style-type: none"> • The predicted marine traffic noise level at NSR N1 is expected to be well below the prevailing noise level and comply with the criteria established (i.e. 10 dB(A) below the prevailing noise level) and adverse noise impact is not anticipated. 	<ul style="list-style-type: none"> • 10 dB(A) below the prevailing noise level in Methodology Paper on Noise Impact Assessment agreed by EPD. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • No adverse residual impacts anticipated.
Water Quality Impact					
Construction Phase					
Representative water sensitive receivers, in the vicinity of the Project such as: <ul style="list-style-type: none"> • existing ATS and 	Potential water quality impact associated with the construction phase include:	<ul style="list-style-type: none"> • Annexes 6 and 14 of the EIAO-TM • Water Quality Objectives (WQOs) for the Western 	<ul style="list-style-type: none"> • Exceedance of the assessment criteria for SS and sediment deposition at coral communities, 	<ul style="list-style-type: none"> • Deploy double silt curtains to enclose the dredging, sand blanket filling and DCM installation process • Control the dredging rates and 	<ul style="list-style-type: none"> • It is anticipated that the potential water quality impacts arise under construction phase

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
<p>the proposed ATS expansion area;</p> <ul style="list-style-type: none"> • seawater intakes; • secondary contact recreation subzones; • fish culture zones; • cooling water intake; • WSD flushing water intake; • Coastal Protection Area (CPA); • gazetted beach; and • coral communities. 	<ul style="list-style-type: none"> • Release of fines (from sediment and fill) and contaminants into the receiving waters, causing increase in suspended solids (SS), sediment deposition, contaminants and decrease in dissolved oxygen (DO) in receiving waters; • Wastewater from general construction activities; • Construction site run-off; • Sewage from construction workforce; • Accidental spillage of chemicals; • Shortening of existing ATS breakwater; and • Floating refuse and debris. 	<ul style="list-style-type: none"> • Buffer WCZ and Southern WCZ • Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) • Professional Persons Environmental Consultative Committee Practice Notes (ProPECC PN) 2/24 • WSD Water Quality Criteria for Flushing Water Intakes • Hong Kong Planning Standards and Guidelines (HKPSG) • Assessment Criteria for Coral • Metals and Micropollutants • Sediment Quality Assessment Criteria • Guidelines for Estimating Sewage 	<p>namely CR7 (Sham Shui Kok), CR8 (South of Tai Shu Wan) and CR9 (Tai Shu Wan)</p>	<p>employ closed grab dredgers for all dredging works</p> <ul style="list-style-type: none"> • Adopt good site practices for dredging operation • Follow the guidelines outlined in ProPECC PN 2/24 “<i>Construction Site Drainage</i>” as practicable to control construction site discharges generated from surface run-off, wheel washing water, acid cleaning, etching and pickling wastewater • Comply with the effluent standards stipulated in TM-DSS for all effluent discharged from construction site • Provide sufficient interim sanitary facilities, such as portable chemical toilets in works area. Contractual desludging service should be deployed to clean the portable toilets on a regular basis. • Develop management procedures for chemicals used and prepare an emergency spillage handling procedure to deal with chemical spillage in case of accident occurs. Disposal of chemical wastes should comply with the Waste 	<p>would be temporary and localised. Therefore, no unacceptable residual water quality impacts are expected, if all of the recommended mitigation measures are implemented.</p>

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
		Flows for Sewage Infrastructure Planning” (GESF)		Disposal Regulation (WDO). • Collect and remove floating refuse at regular intervals on a daily basis within the works area.	
Operation Phase					
<p>Representative water sensitive receivers, in the vicinity of the Project such as:</p> <ul style="list-style-type: none"> • existing ATS and the proposed ATS expansion area; • seawater intakes; • secondary contact recreation subzones; • fish culture zones; • cooling water intake; • WSD flushing water intake; • CPA; • gazetted beach; and • coral communities. 	<p>Potential water quality impact associated with the operation phase include:</p> <ul style="list-style-type: none"> • Change in hydrodynamic regime; • Floating refuse accumulation; • Marine vessel discharges; and • Non-point source surface run-off from new impervious areas. 	<ul style="list-style-type: none"> • Annexes 6 and 14 of the EIAO-TM • WQOs for the Western Buffer WCZ and Southern WCZ • ProPECC PN 1/23 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Best Stormwater Management Practices and Storm Water Pollution Control Plan to reduce non-point source pollution. • Regular maintenance and refuse collection at the ATS expansion area • Good site practices for marine vessel operation 	<ul style="list-style-type: none"> • No adverse residual impacts anticipated

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Waste Management Implications					
Construction Phase					
<p>C&D materials, chemical wastes, dredged sediments, floating refuse and general refuse</p>	<ul style="list-style-type: none"> • Around 1,000 m³ of non-inert C&D materials and 24,000 m³ of inert C&D materials would be generated during the construction phase of the Project. 22,400 m³ of inert C&D material would be reused on site while the remaining 1,600 m³ of surplus inert C&D material would be transported to PFRFs for beneficial reuse in other projects. Non-inert C&D materials would be recycled before disposed to landfill. • Approximately 241,263 m³ of dredged sediment would be generated from the Project. Approximately 198,855 m³ of sediment is suitable for Type 1 – Open Sea Disposal and 42,408 m³ of sediment is suitable for Type 1 – Open Sea Disposal (Dedicated Sites) in accordance with <i>ETWB TCW No. 34/2002</i>. • Small quantity of chemical 	<ul style="list-style-type: none"> • Annexes 7 and 15 of the EIAO-TM • Waste Disposal Ordinance (Cap. 354) • Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C) • Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N) • Land (Miscellaneous Provisions) Ordinance (Cap. 28) • Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation • Dumping at Sea 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Implementation of good site practices, waste reduction measures and proper handling, storage, collection, transportation and re-use/disposal of waste 	<ul style="list-style-type: none"> • No adverse residual impact anticipated

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
	<p>wastes in the order of a few cubic metres per month will be generated from the maintenance and servicing of construction plants, equipment and machineries.</p> <ul style="list-style-type: none"> • Around 4.4 m³ of floating refuse per construction year could be collected from accumulation along the proposed breakwaters and wave wall in the form of floating breakwater. • Around 260 kg per day of general refuse would be generated from construction works and on-site staff and workers. 	<p>Ordinance (DASO) (Cap. 466)</p>			
Operation Phase					
<p>Floating refuse and general refuse</p>	<ul style="list-style-type: none"> • The estimated quantity of floating refuse and general refuse generated in the future expanded ATS would be approximately 374 kg/day. 	<ul style="list-style-type: none"> • Annexes 7 and 15 of the EIAO-TM • Waste Disposal Ordinance (Cap. 354) • Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C) • Public Health and Municipal Services 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Implementation of good site practices, waste reduction measures and proper handling, storage, collection, transportation and re-use/disposal of waste 	<ul style="list-style-type: none"> • No adverse residual impact anticipated

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
		Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation			
Marine Ecological Impact					
Construction Phase					
Intertidal habitats (e.g. Artificial Seawall, Sandy Shore, Rocky Shore)) Subtidal habitats (e.g. Subtidal soft bottom, Subtidal hard bottom) Wildlife (including coral species of conservation importance)	<ul style="list-style-type: none"> Permanent loss of about 5.3 ha subtidal soft bottom, about 1.4 ha subtidal hard bottom habitat, about 120 m intertidal rocky shoreline and about 200 m artificial seawall Direct impact on coral species of conservation importance and associated habitats Potential direct injury / mortality of wildlife species Indirect impact through underwater noise, vibration, and reduction of sunlight on associated wildlife Deterioration of marine water quality on marine habitats and associated 	<ul style="list-style-type: none"> Annexes 8 and 16 of the EIAO-TM EIAO Guidance Notes No. 6/2010, No. 7/2010 and No. 11/2010 	<ul style="list-style-type: none"> No exceedances are predicted 	<ul style="list-style-type: none"> Minimise indirect construction disturbances such as underwater noise, vibration, elevation of SS in water level, and wastewater / chemical run-off, as well as increased human activities, through recommended water quality mitigation measures such as deployment of silt curtains, use of quieter Quality PME, and adherence of good site practise, etc. 	<ul style="list-style-type: none"> No unacceptable residual impact anticipated

Sensitive Receivers / Assessment Points	Impact Prediction Results (Without Mitigation)	Key Relevant Standards/Criteria	Extents of Exceedance Predicted (Without Mitigation)	Impact Avoidance Measures / Mitigation Measures	Residual Impacts (After Implementation of Mitigation Measures)
	wildlife				
Operation Phase					
Intertidal habitats (e.g. Artificial Seawall, Sandy Shore, Rocky Shore) Subtidal habitats (e.g. Subtidal soft bottom, Subtidal hard bottom) Wildlife (including coral species of conservation importance)	<ul style="list-style-type: none"> Potential changes in hydrodynamics properties and hydrology Indirect disturbance impact from marine traffic and reduction of sunlight on marine habitats and associated wildlife (including coral species of conservation importance) 	<ul style="list-style-type: none"> Same as construction phase 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No mitigation measure is required but enhancement measures are proposed. 	<ul style="list-style-type: none"> No unacceptable residual impact anticipated
Fisheries Impact					
Construction Phase					
Fisheries sensitive receivers within Southern WCZ and Western Buffer WCZ	<ul style="list-style-type: none"> Temporary loss of access to fishing ground of approx. 42 ha Permanent loss of fishing ground and fishing habitats of approx. 8.7 ha due to construction works elements Minor disturbance impacts on fishing activities, fisheries habitats and resources 	<ul style="list-style-type: none"> Annex 9 and 17 of the EIAO-TM Fisheries Protection Ordinance (Cap. 171) – Marine Fish Culture Ordinance (Cap. 353) Water Pollution Control Ordinance (Cap. 358) 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Implementation of good site practices, double silt curtains, closed grab and restriction of dredging rates, and proper handling, storage, collection, and disposal of waste Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities 	<ul style="list-style-type: none"> No adverse residual impacts anticipated

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Operation Phase					
Fisheries sensitive receivers within Southern WCZ and Western Buffer WCZ	<ul style="list-style-type: none"> Permanent loss of access to fishing ground of approx. 25.3 ha due to the occupation of marine area between existing and proposed breakwaters Permanent loss of fishing ground and fisheries habitats of approx. 8.7 ha due to the construction works elements (same as in construction phase) Minor disturbance impacts on fishing activities, fisheries habitats and resources 	<ul style="list-style-type: none"> Same as construction phase 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No mitigation measure is required 	<ul style="list-style-type: none"> No adverse residual impacts anticipated
Landscape and Visual Impact					
Construction Phase					
Landscape and visual sensitive receivers in the vicinity of the Project	<ul style="list-style-type: none"> Slight to Substantial impact on landscape Insubstantial to Substantial Adverse visual impact 	<ul style="list-style-type: none"> Annex 10 and 18 of the EIAO-TM EIAO Guidance Note No. 8/2010 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Programming and phasing of construction works Preservation of existing trees and other vegetation Erection of decorative screen hoardings 	<ul style="list-style-type: none"> No adverse residual impacts anticipated
Operation Phase					
Landscape and visual sensitive receivers in	<ul style="list-style-type: none"> Insubstantial to Substantial impact on landscape Insubstantial to Substantial 	<ul style="list-style-type: none"> Same as construction phase 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Provision of sensitive designs for publicly accessible areas, open spaces and associated access 	<ul style="list-style-type: none"> No adverse residual impacts anticipated

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the vicinity of the Project	Adverse visual impact			<ul style="list-style-type: none"> Regular maintenance of publicly accessible areas, open spaces and associated access Provision of sensitive designs for infrastructural structures 	
Cultural Heritage Impact					
Construction Phase					
Existing western breakwater	<ul style="list-style-type: none"> Direct impact due to shortening of the existing breakwater is anticipated. Potential indirect impacts of ground borne vibration, tilting and settlement are anticipated to existing western breakwater during the construction phase. 	<ul style="list-style-type: none"> Annex 10 and 19 of the EIAO-TM 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Preserved by record (3D scanning, photographic and video) before the shortening and modification. The end of the shortened western arm should be constructed to preserve a similar shape and materials of the tetrapod in its current layout. For precautionary measures, AMO should be informed immediately if marine archaeological materials having certain to significant values are found during the course of construction works of the Project. 	<ul style="list-style-type: none"> No adverse residual impacts anticipated
Operation Phase					
N/A	<ul style="list-style-type: none"> No impact is anticipated by the Project during operation phase. 	<ul style="list-style-type: none"> Same as construction phase 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> No mitigation measure is required 	<ul style="list-style-type: none"> No adverse residual impacts anticipated

Note:
N/A: Not Applicable