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Civil Engineering and Development Department

Agreement No. CE 14/2013 (CE)

Cumulative Environmental Impact
Assessment Study for the Three
Potential Nearshore Reclamation Sites
in the Western Waters of Hong Kong –
Investigation

Final Report

March 2015

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Agreement No. CE 14/2013 (CE)

Cumulative Environmental Impact Assessment Study for the Three Potential Nearshore Reclamation Sites in the Western Waters of Hong Kong – Investigation

Final Report

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1 INTRODUCTION

1.1 Background

- 1.1.1 Civil Engineering and Development Department (CEDD) commissioned the "Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement Feasibility Study" (Land Supply Study) in June 2011 to identify potential locations for reclamation outside Victoria Harbour and rock cavern development in Hong Kong. For nearshore reclamation, five nearshore potential reclamation sites (PRS), namely Lung Kwu Tan, Siu Ho Wan, Sunny Bay, Tsing Yi Southwest and Ma Liu Shui, were identified for further consideration.
- 1.1.2 Three of these nearshore PRS, namely Lung Kwu Tan, Siu Ho Wan and Sunny Bay are located in the western waters of Hong Kong (i.e. the waters off North Lantau) and coincide with a number of current, committed and planned/proposed infrastructure and development projects which are also in the western waters, including the Tung Chung New Town Development Extension (TCNTDE), the Hong Kong - Zhuhai - Macao Bridge (HZMB) related Hong Kong projects including the Hong Kong Boundary Crossing Facilities (HZMB BCF), the Hong Kong Link Road (HZMB HKLR) and the Tuen Mun - Chek Lap Kok Link (TM-CLKL), the Contaminated Mud Pits at the South Brothers (CMPSB), the Contaminated Mud Pits at East Sha Chau (CMPESC), and the Expansion of Hong Kong International Airport into a Three-Runway System (HKIA3RS) (see Figure 1). Assessment of potential cumulative effects on the environment, in particular those more translocational impacts which likely to influence a wider area such as ecology including Chinese White Dolphins (CWD), fisheries, air quality and water quality, is considered important before carrying forward the individual proposals to further studies and assessments in the next project stages.

1.2 Study Objectives

- 1.2.1 The key objectives of this "Cumulative Environmental Impact Assessment Study for the Three Potential Nearshore Reclamation Sites in the Western Waters of Hong Kong Investigation" (CEIA Study) are as follows:
 - to assess the total environmental effects of the three identified potential reclamation sites (3 PRS) at the strategic level taking into consideration other concurrent development projects in the western waters on air quality, water quality, ecology and fisheries with a view to facilitating planning and decision-making before carrying forward the 3 PRS to future detailed assessments in planning and engineering studies and statutory environmental impact assessments (EIAs);
 - to identify and flag up potential issues on the above four environmental aspects and recommend possible strategic mitigation options in order not to exceed the overall impacts carrying capacity in the western waters based on the current project information and environmental condition;
 - to identify issues requiring for further studies and assessments, including statutory EIAs, to determine environmental acceptability of the PRS; and
 - to recommend strategic follow-up works for carrying forward the 3 PRS for further studies and assessments, including statutory EIAs.

1.3 Purpose of this Report

1.3.1 The purpose of this Final Report is to compile and consolidate the CEIA findings, proposals and recommendations of all the individual Reports and Working Papers on the 3 PRS including Sunny Bay, Siu Ho Wan and Lung Kwu Tan for the four environmental aspects of air quality, water quality, ecology and fisheries.

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1.4 Structure of this Report

- 1.4.1 The Report is organised as follows:
 - Section 2 provides a general description of the 3 PRS;
 - Section 3 describes the study approach;
 - · Section 4 identifies the concurrent projects considered in assessment;
 - Section 5 summarizes the assessment assumptions;
 - Section 6 presents the findings of air quality impact assessment;
 - Section 7 presents the findings of water quality impact assessment;
 - Section 8 presents the findings of ecological impact assessment;
 - · Section 9 presents the findings of fisheries impact assessment;
 - Section 10 summarizes the strategic environmental findings and recommended mitigation options; and
 - Section 11 gives the conclusion for this CEIA Study and way forward for reclamation projects.

2 SITE DESCRIPTION

2.1 Lung Kwu Tan

- 2.1.1 The Lung Kwu Tan PRS is located immediately west of the existing Lung Kwu Tan area, with a possible area of 200 to 300 ha. The majority of the existing shoreline at Lung Kwu Tan comprises undeveloped sandy or rocky shores. Village type residential developments are found nearby. West New Territories Landfill and Black Point Power Station are located north of the PRS but screened by the hilly terrain of the Black Point headland. Attention would however be required in land use planning with respect to a number of Not-In-My-Backyard (NIMBY) and industrial facilities south of the PRS, such as Castle Peak Power Station, Green Island Cement Plant, Shiu Wing Steel Mill, Permanent Aviation Fuel Facility, EcoPark, River Trade Terminal, etc.
- 2.1.2 Some ecological significant areas and habitats are in the vicinity of Lung Kwu Tan PRS. The Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP), one of the CWD habitats, is situated in the open water approximately 2.1 km to the west of the PRS. Terrestrial habitats including Lung Kwu Tan Valley Site of Special Scientific Interest (SSSI), Siu Lang Shui SSSI and Lung Kwu Chau, Tree Island and Sha Chau SSSI are located 0.4 km east, 1.4 km south east and 2.8 km south west to the PRS respectively.

2.2 Siu Ho Wan

- 2.2.1 The Siu Ho Wan PRS is located at approximately 5km east of the Hong Kong International Airport (HKIA) on the northern shore of Lantau Island, with a possible area of 100 to 200 ha. The majority of the existing shoreline at Siu Ho Wan is a sloping artificial seawall. The PRS is close to the North Lantau Highway and no residential development is found nearby. The PRS is in close proximity to different NIMBY and industrial facilities/uses, such as Siu Ho Wan Sewage Treatment Works (SHWSTW), North Lantau Refuse Transfer Station (NLTS), Siu Ho Wan Water Treatment Works (SHWWTW), and the future Organic Waste Treatment Facilities (OWTF). Other constraints include issues from the Potentially Hazardous Installation (PHI) at SHWWTW, the airport height restrictions and other development constraints due to the airport nearby.
- 2.2.2 Some ecological significant areas and habitats are in the vicinity of Siu Ho Wan PRS. The tidal inlet to Tai Ho Wan and Tai Ho Stream SSSI are located at about 1 km to the south of the PRS. The PRS is close to the proposed Brothers Marine Park (BMP) thus its potential impacts on the proposed BMP and CWD habitats would need to be carefully considered.

2.3 Sunny Bay

- 2.3.1 The Sunny Bay PRS is located immediately adjacent to MTR Sunny Bay Station on the northeastern coast of Lantau Island, with a possible area of 60 to 100 ha. The majority of the existing shoreline at Sunny Bay is a sloping artificial seawall. The PRS is close to the North Lantau Highway and no residential development is found nearby. Airport height restrictions and specific conditions in Deed of Restrictive Covenant Memorial No. 278911 would restrict the maximum building heights to 30 mPD for the area near the MTR Sunny Bay Station, and there would also be other development constraints due to the airport nearby.
- 2.3.2 Some ecological and fisheries significant areas and habitats are in the vicinity of Sunny Bay PRS. Yam O Wan and Ma Wan Fish Culture Zone are located at about 0.8 km and 1 km from the PRS respectively.

3 STUDY APPROACH

- 3.1.1 The CEIA Study was conducted at a strategic level with reference to the best available information regarding other ongoing, committed, planned and proposed projects at the time of the assessment. At this very preliminary stage of the project cycle, the assessment could only be done based on various assumptions such as reclamation extent, possible land uses in different development themes and their respective associated residing and working populations, traffic generation, and construction methods and programmes. These were established based on the latest project information at the time of the assessment to facilitate the assessment under conservative and possible worst-case scenario and do not represent the final proposals. The actual proposals and the details will be developed in further detailed studies in future, including the subsequent planning and engineering studies and statutory EIAs with the involvement of the public.
- 3.1.2 The baseline environmental conditions of the 3 PRS were established with reference to previously approved EIA reports, other published study reports, monitoring data and ecological field surveys. Assessments were undertaken for conservative and possible worst-case scenario, adopting the reclamation layouts derived from the Broad Technical Assessment in the Land Supply Study and other assumptions (see **Section 5** below), for the four environmental aspects of air quality, water quality, ecology and fisheries to assess environmental performance and to identify potential issues in these aspects. The assessment scenarios were developed based on the best available information at the time of the assessment and strategic mitigation options were recommended where appropriate. They do not represent the final proposals of the PRS. The assumptions made should be thoroughly reviewed and the reclamation proposals, including the reclamation extents and final land use proposals, of the PRS will be determined and assessed in the subsequent further studies and assessments.

4 CONCURRENT PROJECTS

A review of available information was conducted to identify a number of concurrent projects that may contribute to cumulative environmental effect, both in the construction and operational phases. Potential interfaces with other concurrent projects with the PRS in the western waters were considered with reference to the latest programme available. The indicative implementation programmes of the 3 PRS and the concurrent projects are shown in **Appendix A**. The concurrent projects considered for cumulative impact assessment with respect to air quality, water quality, ecology and fisheries during the construction and operational phases of the 3 PRS were also presented in **Appendix B**.

5 ASSESSMENT ASSUMPTIONS

5.1 Land Uses Assumptions

5.1.1 Three development themes A, B and C with different combinations of land uses were developed based on the development opportunities and constraints at each PRS considering the existing surrounding communities, as shown in **Table 5.1**. The three themes were adopted as the development assumptions of the 3 PRS to identify possible worst-case scenarios for cumulative impact assessments of the four environmental aspects. Theme A is mainly residential use while Theme B is mainly commercial/logistics/industrial use. Theme C is mixed uses. These themes were established only for the purpose of impact assessment in this CEIA Study and do not represent the final proposals. The actual proposals and the details will be further developed in detailed studies in future, including the planning and engineering studies and statutory EIAs.

Table 5.1 Proposed Development Themes and Major Land Uses for the Three Potential Reclamation Sites

Proposed Development	Proposed Major Land Uses			
Theme	Lung Kwu Tan	Siu Ho Wan	Sunny Bay ⁽¹⁾	
Theme A – Synergetic Nodal Communities (Residential Focus)	 Residential⁽²⁾; Institution or business park 	- Residential ⁽²⁾	 Business park with convention facilities; Entertainment and retail facilities⁽³⁾; Hotels 	
Theme B – Economic Hub (Commercial / Logistics / Industrial Uses)	 Logistics park; Green industry or R&D park; Clean industry⁽⁴⁾ 	Logistics park;Business park	 Entertainment and retail facilities⁽³⁾; Hotels 	
Theme C – Sustainable Communities (Mixed Uses)	 Residential⁽²⁾; Clean industry⁽⁴⁾ 	 Residential⁽²⁾; Logistics park 	Business park with convention facilities;Hotel	

Notes:

- (1) Residential uses have not been assigned to Sunny Bay PRS as it is considered as a regional tourism hub with development constrained by the Airport Height Restriction and the Deed of Restrictive Covenant Memorial No. 278911 as discussed in **Section 3.5**.
- (2) Residential uses shall include local commercial and Government, Institution or Community (G/IC) uses
- (3) Entertainment and retail facilities may include indoor theme park and shopping malls
- Given the high background air pollutant levels in Lung Kwu Tan due to the nearby industrial sources, industrial uses, if any, should be confined to clean industry such as packaging industry, technology industry, etc., which does not involve air emission / fuel combustion to minimize additional air pollutant loadings.
- 5.1.2 The Land Use Concept Proposal is provided in **Appendix C** for more detailed information. It should be noted that the land use themes assumed are not the final proposal for the 3 PRS. They are only indicative and set out solely for the purpose of this cumulative environmental impact assessment study. Planning and Engineering studies will be carried out in future during the next stage of this Project to determine the final land use for the PRS.

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5.1.3 Three land use development themes for the PRS are discussed below:

Theme A – Western Waters Synergetic Nodal Communities

Lung Kwu Tan PRS

- Low-rise residential neighbourhoods are proposed at waterfront location and the area near Sha Po Kong is planned for the residential development. These neighbourhoods would be supported by commercial or G/IC nodes to serve the local communities and visitors.
- An Institution/ Business Park which planned to integrate educational and R&D development is proposed at the northeastern end of the Lung Kwu Tan PRS. It is anticipated to become an incubator of the creative industries and creating high level job opportunities for Tuen Mun area.
- Two ample open spaces are proposed at the northern and southern tips of the PRS for leisure and recreation activities, and act as buffer areas between the proposed developments and existing NIMBY facilities.

Siu Ho Wan PRS

- A waterfront residential neighbourhood is proposed with public open space bisecting the various clusters of development. These open spaces would act as green corridors linking the inland area to the waterfront promenade.
- A large scale open space is proposed at the eastern part of the site for public recreation use and act as a buffer area to North Lantau Highway and public utilities to mitigate against the possible negative environmental impact from SHWSTW and OWTF and Consultation Zone (CZ) of SHWWTW.
- Only non-domestic uses are proposed for land falling within the CZ of SHW WTW.

Sunny Bay PRS

- The western portion of the Sunny Bay PRS is proposed for Business Park development with convention facilities and land reserved for regional office uses and provides job opportunities. This would create high level job opportunities for residents in Tung Chung, North Lantau and Tuen Mun.
- Hotels are proposed along the eastern waterfront area with major commercial and entertainment facilities (e.g. outlet shopping mall and indoor theme park) to create a leisure and entertainment node for local residents and visitors from aboard.
- Apart from open space along the waterfront, an open space is planned to the west of the potential helipad to serve as a noise buffer.

Theme B - Western Waters Economic Hub

Lung Kwu Tan PRS

- A Logistics Park is proposed at the centre part of the site, it will create a major employment hub at New Territories West, creating local employment opportunities for Tuen Mun area.
- Eco/green-industrial and R&D developments are proposed to form a larger hub of special industries with existing industrial activities at the northern portion.
- Industrial Park is proposed at the southern portion of the site and it can be utilized as reprovisioning sites for existing industries in Tuen Mun Town Centre, or other urban areas of Hong Kong, thus releasing areas for other more beneficial uses and provide more job opportunities. The waterfront locations for the above uses also provide direct marine access to support the transportation of goods and materials, reducing the reliance for road transport.

Siu Ho Wan PRS

- A Logistics Park development is proposed at the eastern portion and the waterfront location provides direct marine access to support the further development of shipping, freight, cargo and logistics industries.
- Business Park development is proposed at the western part of the site. High-end business and regional office development is anticipated due to its excellent accessibility and prime waterfront location. The Park would be enclosed by ample provision of parks and green spaces, and supported by local commercial uses.
- Only non-domestic uses are proposed for land falling within the CZ of SHWWTW.

Sunny Bay PRS

- Commercial and entertainment facilities (possibly indoor theme park and outlet shopping malls) are proposed at the southern and western portions of the site.
- Hotels will occupy the waterfront area and a long strip of open space is planned along the waterfront area for public and the eastern open space will also serve as a noise buffer for the potential helipad.

Theme C - Western Waters Sustainable Communities

Lung Kwu Tan PRS

- Low-rise residential developments are proposed at the northern portion of the site. Two clusters are located along the waterfront while another two clusters are situated east to the proposed road. Serving the local residents as well as visitors, commercial or G/IC nodes will be located next to these residential developments.
- An Industrial Park development is proposed at the southern tip of the site to further support industrial development in Hong Kong and to provide local employment opportunities for Tuen Mun area. The Park can also be utilized as reprovisioning sites for existing industries in Tuen Mun Town Centre, or other urban areas of Hong Kong, thus releasing areas for other more beneficial uses.
- The waterfront location of Industrial Park provides direct marine access to support the transportation of goods and materials, reducing the reliance for road transport.
- Ample open spaces are proposed throughout the site for leisure and recreation activities while acting as buffer areas between the proposed developments and existing NIMBY facilities/ proposed Industrial Park. Besides, a strip of green space is proposed along a section of Lung Kwu Tan Road as environmental buffer for nearby residential development.

Siu Ho Wan PRS

- A waterfront residential neighbourhood is proposed at the western portion of the site. Between residential area and the proposed Logistics Park at the eastern part of the site, public open space is proposed to act as a buffer between the two uses. The open space will also act as green corridor linking the inland area to the waterfront promenade. The residential neighbourhood will be served by local commercial or G/IC facilities nodes to cater to the daily need of residents.
- A Logistics Park development is proposed at the eastern portion. The waterfront location provides direct marine access to support the further development of shipping, freight, cargo and logistics industries.
- Only non-domestic uses are proposed for land falling within the CZ of Siu Ho Wan WTW.

Sunny Bay PRS

- The western portion of the site is proposed for Business Park development with MICE Convention facilities. It is anticipated for high-end business, regional office development as well as MICE and exhibition.
- Hotels are proposed to locate at the east of the proposed Business Park and a golf course build nearby to strengthen Sunny Bay's role as an integrated business and tourism hub.

5.2 Tentative Implementation Programme

5.2.1 A fast-track programme was assumed for the construction of the 3 PRS as the worst case scenario for assessments. It was assumed that reclamation would commence in early 2019 the earliest for Sunny Bay PRS and the marine works of the 3 PRS would coincide, with each of them expected to take about 3.5 years. The infrastructure works and other land-based works were assumed to take about seven years, with the first population intake anticipated in mid 2029 for Sunny Bay PRS and mid 2030 for Siu Ho Wan PRS and Lung Kwu Tan PRS.

Table 5.2 Tentative Implementation Programme

Potential Reclamation Site	Reclamation Works	Infrastructure Works and Sites Developments [1]	Population In-take
Lung Kwu Tan	End 2019 to Mid 2023	Mid 2023 to mid 2030	Mid 2030
Siu Ho Wan	End 2019 to Mid 2023	Mid 2023 to mid 2030	Mid 2030
Sunny Bay	Early 2019 to Mid 2022	Mid 2022 to mid 2029	Mid 2029

Note [1]: Infrastructure works and sites development works typically take about 7 years, based on previous project experiences.

5.3 Construction Methods

Non-dredged methods similar to those adopted for HZMB BCF were assumed for forming the seawall foundation to minimise disturbance and disposal of marine sediments. The seawall was assumed to be constructed by installation of cellular steel caissons for Sunny Bay PRS and Siu Ho Wan PRS, and by simple placement of rock fill at Lung Kwu Tan PRS. Underwater filling works were assumed to be conducted in parallel with the seawall construction to meet the construction programme. Ground treatment for the reclamation would be achieved through prefabricated vertical drains with surcharge. Although some recommendations have been made below based on the observations of the current site characteristics and preliminary assessment on environmental aspects under this Assignment, the future project proponent should further study the practicability of the seawall construction of individual PRS during the future planning and design stage of the PRS, with detailed technical and engineering details and assessments and latest and updated information of future developments.

Marine Works for Potential Reclamation Site at Siu Ho Wan

Existing Seabed Profile

5.3.2 The seabed near the existing shore of Siu Ho Wan is relatively shallow at about –2.3 to -3.5mCD. The depth of the seabed gradually increase to about -3.5 to -10 mCD at the future seawall to the north. There are two depressed areas within the reclamation area with seabed at -10 to -13mCD.

Ground Treatment for Seawall

5.3.3 It is proposed to adopt non-dredged foundation for the seawall to minimize the dredging, disposal of sediments and filling earthwork quantity that could adversely affect the water

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quality and marine environment. The use of compaction pile and deep cement mixing would not be considered due to the ground heaving at shallow water depth and high construction cost respectively. The use of stone column foundation similar to that adopted for the HZMB BCF project is proposed. During the foundation work, stone column will be installed with vibratory probe by displacing seabed materials laterally during probe insertion and then filling the void with rockfill during probe extraction. The key source of potential water quality impacts during the construction of the foundation would be the disturbance / displacement of seabed sediments during the stone column installation work and the associated loss of fines into the marine water.

5.3.4 To minimize the potential water quality impact during the stone column installation, silt curtain will be installed near the active stone column installation point. A layer of geotextile with aggregate blanket at the top will be placed on the existing seabed prior to stone column installation works as indicated in the figure below to minimize the release of fines into the marine water.

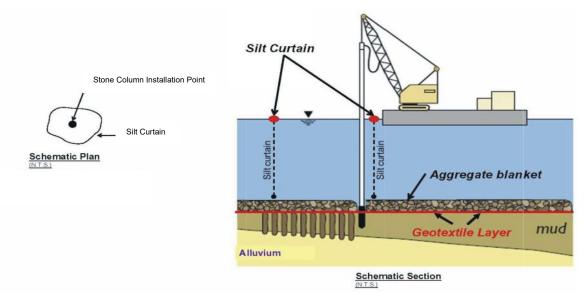


Diagram 1 Typical Arrangement of Stone Column Installation (Image extracted from Environmental Protection Department (EPD) website: Environmental Permit No. EP-354/2009/A)

5.3.5 The stone column method has been successfully applied for construction of seawall foundation without dredging for the HZMB BCF project. As the seabed mud would only be laterally displaced during the probe penetration process, the degree of seabed disturbance caused by such installation work would be minor as compared to the conventional dredging method. With installation of silt curtain around the stone column installation point, any potential release of marine mud is expected to be localized and minor, as proven from the water quality monitoring results for the HZMB BCF reclamation, which has a similar site setting and adopted the same ground treatment method.

Seawall Construction Method

5.3.6 Vertical seawall is recommended for the PRS at Siu Ho Wan under Ecological Impact Assessment to minimize the footprint of seawall and potential impacts upon the ecology (including the CWD habitat). To fulfill the fast track programme assumed, the seawall needs to be constructed as quickly as possible for early commencement of the bulk filling works. The use of cellular steel caisson to form a vertical seawall structure as proposed under the HZMB BCF project is considered a faster process (as compared to the conventional sloping seawall method) and thus can be considered for the PRS to meet the construction programme and to minimize the seawall footprint. However, installation of a sloping seawall revetment in front of the cellular steel caisson (as shown in **Diagram 2** below) may be

required to improve the overall stability of the reclamation. Construction of the sloping seawall revetment in front of the cellular steel caisson can be conducted in parallel with the bulk filling work to meet the construction programme.

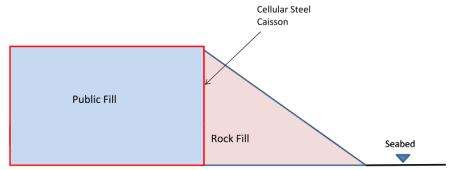


Diagram 2 Indicative Arrangement of Cellular Steel Caisson with Sloping Seawall Revetment

5.3.7 Each circular caisson is formed by steel piles and is filled with appropriate fill materials. All the filling work for construction of the cellular seawall will be fully enclosed by the steel caisson. Silt curtain will be applied around the circular caisson during the filling of cell. No significant water quality impact is expected from this operation except transient localized disturbance of bottom sediment during the installation of steel caisson. Installation work would simply involve pilling of steel caisson, which would not create significant seabed disturbance. To confine any potential loss of fines, silt curtain will be used to surround the installation work. Construction of any sloping seawall, if required, will involve placing of rock fill and seawall blocks only, which would not create significant suspended solids impact. Fines content in the rock fill for construction of the sloping seawall would be negligible.

Reclamation Method

5.3.8 Prefabricated vertical drains with surcharge is the most common method and is proven to be the most reliable ground treatment measure for non-dredged reclamation and is therefore assumed as the reclamation ground treatment for the PRS. The key underwater operations for the proposed reclamation would include placing of geotextile and sand blanket, installation of vertical drains and placing of sand fill / public fill. Potential water quality impact would mainly arise during the underwater bulk filling works resulted from the potential release of fines from the sand / public fill materials, which has been quantitatively assessed under water quality impact assessment by mathematical modelling. Band drains would be required to remove excessive water from the reclaimed area. Any surcharge discharge from the band drains could be diverted to appropriate treatment facilities (e.g. silt removal facilities) before proper disposal.

Consideration of Other Potential Marine Works

- 5.3.9 The shallow seabed at the PRS may induce safety problem for large construction vessels manoeuvring at or near the marine works area due to the limited water depth. From the experience of the HZMB BCF project which has similar site setting, this issue can be overcome by breaking down the precast steel caisson into smaller segments so that small vessels can be used to for transporting and handling the segments on-site. By adopting the same approach, no dredging for navigation would be required for this PRS.
- 5.3.10 Existing utilities such as the submarine outfall from SHWSTW would need to be re-provisioned before reclamation can be carried out. Re-provision of the submarine outfall may require minor dredging work and the associated water quality impact has been considered in this water quality modelling exercise.

Reclamation Sequence

- 5.3.11 Only single phase of reclamation works is proposed for this PRS. A tentative programme with breakdown of key construction works items and their estimated production rates is given in **Appendix D1**.
- 5.3.12 The emphasis in construction planning usually is to surround the reclamation site with seawalls as much as possible before the bulk filling work so as to confine the sediment plume generated from the filling operation. However, given the reclamation size, bulk filling would need to be carried out concurrently with the seawall construction to meet the tight construction programme. To minimize the water quality impact, it is recommended that the underwater filling work for reclamation shall not proceed until at least 200m of leading seawall at the reclamation is formed above the high water mark. All underwater filling shall be carried out behind the leading seawall to minimize the release of fines to the open water.
- 5.3.13 As all the well known ecological resources (such as Tai Ho Stream SSSI) near the PRS are located to the west of this PRS, it is recommended that the western seawall of the PRS (which contributes about one-third of the total seawall length) be constructed (above high water mark) before commencement of any underwater filling operation so that most of the identified ecological resources would be shielded from the impacts of filling. This approach would also minimize the release of filling materials into the embayed areas (such as Tai Ho Estuary, Tung Chung Wan and Airport Channel), which have relatively low flushing rate and poor tidal cleansing capacity.

Marine Works for Potential Reclamation Site at Sunny Bay

Existing Seabed Profile

5.3.14 The existing seabed within this PRS is relatively deep and the depth increases from about –5mCD near the existing shore to about -20 to -30mCD near the future seawall at the west. The seabed level of the majority of the reclamation area is around -10 to -15mCD.

Ground Treatment for Seawall

- 5.3.15 Non-dredged seawall foundation is recommended to minimize the disturbance of seabed sediments and the associated sediment release. In view of the deep seabed and strength of the seawall foundation, it is proposed to adopt sand compaction pile as the ground treatment method. Stone column and deep cement mixing would not be considered due to the significant depth of seawall and high construction cost respectively. The use of sand compaction pile foundation similar to the HZMB artificial island project is proposed.
- 5.3.16 Sand compaction pile (SCP) is constructed by feeding sand into a ground through a casing pipe and is compacted by either vibration, dynamic impact or static excitation to construct a compacted sand pile in a soft soil ground. To minimize the potential water quality impact during the process, silt curtain will be installed around the active SPC work. A layer of geotextile with aggregate blanket at the top will be placed on the existing seabed prior to the SCP work to minimize the release of fines into the marine water. The typical arrangement of the SCP installation works are shown in **Diagram 3**.
- 5.3.17 The key source of sediment disturbance during the SCP process would be during the insertion of the casing pipe, which is used for feeding sand into the ground. Simple vibratory pilling action will be used to drive the casing into the ground. Sediment disturbance due to such process would be minimal as compared to the conventional dredging method.

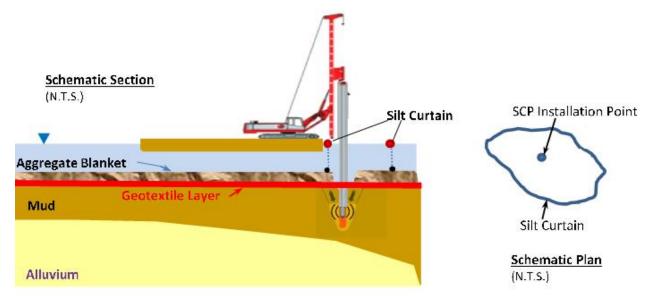


Diagram 3 Typical Arrangement of Sand Compaction Pile Installation

Seawall Construction Method

5.3.18 To fulfill the fast track programme assumed, the seawall needs to be constructed as quickly as possible. Similar to the PRS at Siu Ho Wan, the use of cellular steel caisson as adopted in the HZMB BCF project is a faster process for seawall construction and can be considered for this PRS to meet the tight construction programme (refer to **Section 5.3.6**). The potential loss of fines during the seawall construction process is expected to be minimal as described in **Section 5.3.7**.

Reclamation Method

5.3.19 Prefabricated vertical drains with surcharge were assumed as the reclamation ground treatment for this PRS as discussed in **Section 5.3.8**.

Reclamation Sequence

5.3.20 Due to the large reclamation scale as a result of the deep seabed level at the PRS, it is tentatively suggested to divide the reclamation into two phases as shown in **Diagram 4** below.



Diagram 4 Tentative Reclamation Phasing for PRS at Sunny Bay

- 5.3.21 Due to the significant fill volume for this PRS, Phase 1 and Phase 2 of the reclamation works are assumed to proceed concurrently to meet the tight construction programme. A tentative programme with breakdown of key construction works items and their estimated production rates is given in **Appendix D2**.
- 5.3.22 The construction sequence for the PRS at Sunny Bay would be similar to that recommended for the PRS at Siu Ho Wan as discussed in **Section 5.3.12** to **Section 5.3.13**. Underwater filling for reclamation will not proceed until at least 200m of leading seawall at the reclamation is formed above the high water mark to minimize the potential water quality impacts. All underwater filling will be carried out behind the leading seawall to minimize the release of fines to the open water. The reclamation works for this PRS are assumed to proceed from both ends of the PRS boundary simultaneously to meet the construction programme.

Marine Works for Potential Reclamation Site at Lung Kwu Tan

Existing Seabed Profile

5.3.23 The seabed of this PRS is very shallow, ranging from 0 mCD near the shore to about -5mCD near the future seawall at the northwest. The seabed along the southwest near the future seawall is also very shallow at about -2mCD. The seabed level of the majority of the reclamation area is around -1 to 2mCD.

Ground Treatment for Seawall and Seawall Construction Method

- 5.3.24 The use of the stone column foundation similar to that adopted for the HZMB BCF project as described in **Section 5.3.3** is proposed for this PRS to avoid dredging. Due to the shallow water depth at this PRS, it is proposed to have sloping seawall found on the stone column foundation.
- 5.3.25 As the seabed of this PRS is very shallow with potential marine access difficulties, the use of construction vessel for ground treatment may not be feasible. Instead, construction of temporary rockfill platform with leading edge to carry out the ground treatment works and sloping seawall construction as adopted in the HZMB HKLR project is proposed.

Reclamation Method

5.3.26 Prefabricated vertical drains with surcharge were assumed as the reclamation ground treatment for this Project as discussed in **Section 5.3.8**.

Confined Disposal Facility

- 5.3.27 A confined disposal facility (CDF) is proposed under the Land Supply Study at Lung Kwu Tan site to receive marine sediments generated from the dredging activities proposed under the reclamation projects or other concurrent projects. It is therefore allowed in the CEIA study that the CDF will be constructed within the PRS boundary as Phase 1 of the reclamation work to receive marine mud. However, the need of CDF and its implementation is subject to confirmation and further investigation in future studies.
- 5.3.28 The construction of the CDF would involve installation of sheet pile wall, placing of geotextile and toe protection rockfill and placing of seawall rockfill revetment, which would not create any significant suspended solids impacts. Disposal of marine mud at the CDF will be fully contained within the sheet pile wall and start after completing placing rockfill revetment. Same reclamation and ground treatment process presented in **Appendix D3** are adopted. As a result, loss of fines / contaminants would not be expected during construction and operation of the CDF.

Reclamation Sequence

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5.3.29 Three phases of reclamation are proposed as shown in **Diagram 5** below. Phase 1 reclamation in the north will be started first to receive marine mud if required, followed by Phases 2 and 3. A tentative programme with breakdown of key construction works items and their estimated production rates is given in **Appendix D3**.

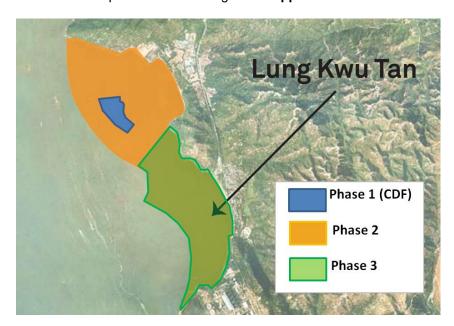


Diagram 5 Tentative Reclamation Phasing for PRS at Lung Kwu Tan

5.3.30 For CDF operation under Phase 1 reclamation, a seawall system as described in Section 5.3.28 will be constructed along the entire site boundary of Phase 1 reclamation before any filling or mud disposal activities to be carried out within the site area. Subsequently, all filling or mud disposal works will be fully contained within the completed seawall system. Construction sequence for Phase 2 and Phase 3 of the PRS would be similar to that recommended for the Siu Ho Wan and Sunny Bay sites. Underwater filling for both Phase 2 and Phase 3 of the PRS will not proceed until at least 200m of leading seawall at the reclamation is formed above the high water mark. All underwater filling for Phase 2 and Phase 3 of the PRS will be carried out behind the leading seawall to minimize the release of fines to the open water. For worst case assessment, it is assumed that the bulk filling works for Phase 2 and Phase 3 reclamations would proceed concurrently starting from the existing land boundary at the north and south respectively.

Other Potential Marine Works

5.3.31 Existing utilities such as the North West New Territories (NWNT) submarine sewage outfall (which receive treated effluent from San Wai STW) would need to be re-provisioned before reclamation can be carried out. Re-provision of the submarine outfall may require minor dredging work and the associated water quality impact has been considered in this water quality modelling exercise.

5.4 Reclamation Layouts

5.4.1 The reclamation layouts for the 3 PRS as shown in **Figure 1** represent the preliminary layout of the 3 PRS derived from the broad technical assessments under the Land Supply Study and adopted for assessments under this Assignment. The final or proposed reclamation layouts for the 3 PRS are subject to the actual land use requirements and reclamation scheme to be determined under the future detailed studies including planning and engineering studies and statutory EIAs. The proposed configuration for the PRS is however expected to be similar to the reclamation limits defined in **Figure 1** and the assessments based on the preliminary layouts should be able to estimate strategically the cumulative environmental effects of the 3 PRS.

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6 AIR QUALITY IMPACT ASSESSMENT

6.1 Assessment Criteria

- 6.1.1 The criteria for evaluating air quality impacts and the guidelines for air quality impact assessment are set out in Annex 4 and Annex 12 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM) under the Environmental Impact Assessment Ordinance (EIAO).
- 6.1.2 The Air Pollution Control Ordinance (APCO) provides the statutory framework for controlling air pollutants from a variety of sources. The Hong Kong Air Quality Objectives (AQOs), which must be satisfied, stipulate the maximum allowable concentrations over specific periods for a number of criteria air pollutants. The relevant AQOs are listed in **Table 6.1**.

Table 6.1	Hong Kong	Air Quality	Objectives
I UDIC U.I	riong rong	All Quality	ODJCCHICS

Pollutants	Averaging Time	Concentration Limit (µg/m³) (1)	No. of Exceedances to be Allowed per Calendar Year
Sulphur Dioxide	10-min	500	3
(SO_2)	24-hour	125	3
Respirable Suspended	24-hour	100	9
Particulates (PM ₁₀ / RSP) (2)	1-year	50	Not applicable
Fine Suspended Particulates	24-hour	75	9
(PM _{2.5} / FSP) (3)	1-year	35	Not applicable
Nitragan Diavida (NO.)	1-hour	200	18
Nitrogen Dioxide (NO ₂)	1-year	40	Not applicable
Ozone (O ₃)	8-hour	160	9
Carbon Manayida (CO)	1-hour	30000	0
Carbon Monoxide (CO)	8-hour	10000	0
Lead (Pb)	1-year	0.5	Not applicable

Notes:

- (1) All measurements of the concentration of gaseous air pollutants, i.e., sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide, are to be adjusted to a reference temperature of 293 Kelvin (K) and a reference pressure of 101.325 kilopascal (kPa).
- (2) Respirable suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 10 μm or less.
- (3) Fine suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less.
- 6.1.3 Chapter 9 of "Environment" of the Hong Kong Planning Standards and Guidelines (HKPSG) suggests the buffer distance requirements for roads and highways.
- 6.1.4 The EIAO-TM also stipulates that the hourly Total Suspended Particulates (TSP) level at sensitive receivers should not exceed 500 $\mu g/m^3$ (measured at 25°C and one atmosphere) for construction dust impact assessment.
- Notifiable and regulatory works are under the control of Air Pollution Control (Construction Dust) Regulation. Notifiable works are site formation, reclamation, demolition, foundation and superstructure construction for buildings and road construction. Regulatory works are building renovation, road opening and resurfacing, slope stabilisation, and other activities including stockpiling, dusty material handling, excavation, concrete production, etc. This Project is expected to involve both notifiable works (reclamation, etc) and regulatory works (dusty material handling, etc). Contractors and site agents are required to inform EPD and adopt dust control measures to minimize dust emission, while carrying out construction works, to the acceptable level.
- 6.1.6 In accordance with the EIAO-TM, odour at an air sensitive receiver should not exceed 5 odour units based on an averaging time of 5 seconds for odour prediction assessment.

6.2 Air Sensitive Receivers

- 6.2.1 The study areas for the air quality impact assessments are divided into two groups, namely Lung Kwu Tan study area (covers 3 km from the Lung Kwu Tan PRS as shown in **Figure 2ai**) and Lantau Island study area (covers 3 km from both Siu Ho Wan and Sunny Bay PRS as shown in **Figure 2aii**). Due to the vast distance between Lung Kwu Tan study area and Lantau Island study area (over 9.5 km), potential cumulative impact from these two areas is not expected.
- 6.2.2 Existing, committed and planned air sensitive receivers (ASRs) were identified in the study areas (as shown in **Figure 2ai** and **Figure 2aii**), which mainly include domestic premises, school, educational institution, office, and any other premises or places with which in terms of duration or number of people affected have similar sensitivity to the air pollutants.
- 6.2.3 Representative ASRs on 3 PRS are also identified, with reference to different land use development themes. Hong Kong Planning Standards and Guidelines (HKPSG) has stipulated the requirement of 20m buffer distance from the proposed primary distributor roads. It is assumed that the planning of the 3 PRS should follow the requirement strictly. Therefore, the identification of the planned ASRs inside the 3 PRS has already taken into account the 20m setback from the proposed primary distributor roads. The areas within 20m from the primary distributor roads are assumed to be non-air-sensitive-use areas in this assessment. In other words, no ASRs should be identified within 20m from the proposed primary distributor roads on the 3 PRS.
- 6.2.4 The ASRs were identified based on the best available information at the time of conducting this assessment, which should be subject to future review and update as necessary during future statutory EIA studies with reference to updated project information of the PRS and concurrent projects in the vicinity.

6.3 Assessment Methodology and Assumptions

Construction Phase

Air Pollution Sources

- 6.3.1 The key construction works of the 3 PRS would be reclamation, site formation, and construction of the open roads and the buildings. The major fugitive dust emission sources would be from infrastructure works, including excavation and material handling, filing activities, haul roads; and wind erosion of open sites and stockpiling areas. The marine-based reclamation works would unlikely be a major source of fugitive dust emissions.
- 6.3.2 Since the detailed construction method and programme of the 3 PRS were not available at the time of conducting this study, a realistic size of active works area with some dust control practices were assumed for the assessment.
- Apart from the 3 PRS, the major ongoing, committed, planned and proposed projects in the vicinity of the study areas are considered and listed in **Appendix B**. The implementation programmes of these projects are presented in **Appendix A** and locations of these projects are shown in **Figure 1**. Those concurrent projects which might generate cumulative construction phase air quality impacts to the environment have been identified and summarized in **Appendix B**. Potential fugitive dust emission impacts during the construction phase of the Project are assessed with the potential pollution sources. The background concentrations arising from the operation of existing developments as listed below:

Background pollutant concentrations in Lung Kwu Tan Study Area:

- Background pollutant concentrations on a territory-wide basis;
- Vehicular emissions from the roads in the 3 km assessment area; and

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 Emissions from the operation of Black Point Power Station, Castle Peak Power Station, EcoPark, Green Island Cement Plant, IWMF, STF, Shiu Wing Steel Mill, and Existing WENT Landfill and Proposed WENT Landfill Extension.

Background pollutant concentrations in Lantau Island Study Area:

- Background pollutant concentrations on a territory-wide basis;
- Vehicular emissions from the roads in the 3 km assessment area;
- Marine Traffic Emission from North Lantau Refuse Transfer Station; and
- Emissions from the operation of OWTF.

Background Concentrations

- The RSP concentrations from PATH model were used to quantify the background TSP/RSP concentrations during construction phase of the Project. As presented in **Section 6.3.1**, the major fugitive dust emissions would be from infrastructure works on reclamation sites (i.e. Year 2022 to 2030). The predicted RSP concentrations from PATH model (PATH 2020), which was released by EPD in June 2012, are adopted. The background TSP has been assumed to be the same as the RSP concentration output from PATH 2020. For the emission sources contributing to background concentrations as listed in **Section 6.3.3**, the predicted hourly RSP concentrations from CALINE4 and ISCST models were adopted for estimating the cumulative hourly TSP, daily RSP and annual RSP concentrations. For the vehicular emissions, the combination of projected traffic data for Year 2030 with the vehicular emission factors at Year 2022 is considered as the highest emission within the period of the infrastructure works.
- 6.3.5 With reference to the EPD's *Guidelines on the Estimation of PM*_{2.5} *for Air Quality Assessment in Hong Kong*, the following conservative formulae were adopted to calculate background FSP concentration from the RSP concentration extracted from PATH model:

Annual (
$$\mu$$
g/m³): PM_{2.5} = 0.71 × PM₁₀
Daily (μ g/m³): PM_{2.5} = 0.75 × PM₁₀

Modelling Tools

Apart from the models used in determining the background concentrations as discussed in **Section 6.3.4**, Fugitive Dust Model (FDM) was used to assess the potential dust impact from the construction works of the 3 PRS. As mentioned in **Section 6.2.1**, air quality assessment was carried out for Lung Kwu Tan study area and Lantau Island study area separately. Hourly TSP, daily and annual RSP and FSP levels were assessed to compare with relevant criteria as presented in **Section 6.1**. Dust emission was predicted based on emission factors from USEPA *Compilation of Air Pollution Emission Factors (AP-42)*, 5th *Edition*. The major construction activities for the Project, which would be potential sources of construction dust in the Study Area, include heavy construction activities at work site and wind erosion of open site during infrastructure works.

Operational Phase

Air Pollution Sources – Criteria Air Pollutants

6.3.7 With reference to the Land Use Concept Proposal (**Appendix C**), the proposed land use types of the 3 PRS will be different combinations of mainly residential, commercial, entertainment, business, and industrial uses. The proposed industrial uses will be confined to the types without air emission / fuel combustion, such as packaging industry, sorting and technology park (except for Siu Ho Wan PRS under Themes B & C, which will include berthing facilities associated with the logistics use). On this basis, vehicular emissions from the open roads within the PRS would be the major emission source within these 3 PRS.

For Siu Ho Wan PRS under Themes B & C, marine emissions from the operation of the berthing facilities associated with the logistics use would also be another emission source.

- 6.3.8 The major ongoing, committed, planned and proposed projects in the vicinity of the study areas are listed in **Appendix B**. The implementation programmes of these projects are presented in **Appendix A** and locations of these projects are shown in **Figure 1**. Those concurrent projects which might cause cumulative operational phase air quality impacts to the environment were included in the cumulative assessment.
- 6.3.9 In Lung Kwu Tan study area, potential air quality impacts during the operational phase of the Project are associated with the following potential pollution sources and the method of assessment applied in this study are shown in **Table 6.2**.

Table 6.2 Potential Operational Phase Air Pollution Sources in Lung Kwu Tan Study Area and Assessment Method

Pollution Sources	Assessment Method
Background pollutant concentrations	PATH Model.
Marine Traffic Emission	PATH Model.
Hong Kong International Airport (HKIA) and the	PATH Model.
associated expansion into a Three-Runway	TATTI MODEL.
System (HKIA3RS)	
Aviation Fuel Tank	PATH Model.
River Trade Terminal	PATH Model.
Vehicle emissions from open roads, arising from	CALINE4 Model.
existing developments and planned/committed	o, lente i model.
projects in the vicinity, such as the 3 PRS, STF,	
IWMF, WENT Landfill Extensions, etc, and	
proposed roads to support the reclamation sites,	
if applicable	
Vehicle emissions from open roads, arising from	The potential development in Tuen Mun Areas 40
the potential development in Tuen Mun Areas	& 46 is currently being studied, and the
40 & 46	development parameters and assumptions are
	not available at the time of study. Therefore,
	Tuen Mun Areas 40 & 46 project is not
	considered in the cumulative assessment.
Vehicle emissions from portals and ventilation	ISCST3 Model.
buildings of proposed tunnels to support the	
reclamation sites, if applicable	100070 M
Sludge Treatment Facilities (STF)	ISCST3 Model.
Integrated Waste Management Facilities Phase 1 (IWMF)	ISCST3 Model.
Green Island Cement Plant	ISCST3 Model.
Existing WENT Landfill and Proposed WENT	ISCST3 Model.
Landfill Extension	
EcoPark	ISCST3 Model.
Shiu Wing Steel Mill	ISCST3 Model.
Black Point Power Station	ISCST3 Model.
Castle Peak Power Station	ISCST3 Model.
Flare at Pillar Point Valley Landfill (PPVL)	ISCST3 Model.
Contaminated Mud Pit at East Sha Chau	Given the contaminated mud contains high water
(CMPESC)	content, it is not anticipated to generate
	significant impact related to air quality.
	Therefore, the CMPESC is not considered in the
December of March 19 Co. 50 ACC	cumulative assessment.
Decommissioning of West Portion of the Middle	Decommissioning of West Portion of the Middle
Ash Lagoon at Tsang Tsui	Ash Lagoon at Tsang Tsui will be completed in 2016. Since there will be no programme
	overlap, it is not considered in the cumulative
	assessment.
The Proposed Columbarium at Tsang Tsui	The major emissions from the proposed
The Froposed Columbandin at Isang Isan	columbarium would arise from the operations of
	joss paper burners. Given the joss paper
	burners will be incorporated with exhaust air
	22 So morporated with exhaust an

Pollution Sources	Assessment Method
1 onution cources	treatment facilities such as water scrubber and electrostatic precipitators to alleviate the dust emission, the emission from the proposed columbarium is considered as insignificant and localized. Therefore, the Proposed Columbarium is not considered in the cumulative impact assessment.
Industrial Estate at Tuen Mun Area 38	The potential development of Industrial Estate at Tuen Mun Area 38 is currently being studied, and the development details and assumptions are not available at the time of study. Therefore, this industrial estate at Tuen Mun Area 38 project is not considered in the cumulative assessment.
Expansion and Extension of Fill Bank at Tuen Mun Area 38	Expansion and Extension of Fill Bank at Tuen Mun Area 38 will be decommissioned by 31 December 2018. Since there will be no programme overlap, it is not considered in the cumulative assessment.

6.3.10 In Lantau Island study area, potential air quality impacts during the operational phase of the Project are associated with the following potential pollution sources and the method of assessment applied in this study are shown in **Table 6.3**.

Table 6.3 Potential Operational Phase Air Pollution Sources in Lantau Island Study Area and Assessment Method

otady Area and Assessment Method			
Pollution Sources	Assessment Method		
Background pollutant concentrations	PATH Model.		
Marine Traffic Emission, including berthing facilities at Siu Ho Wan PRS if applicable	PATH Model.		
Hong Kong International Airport (HKIA) and the associated expansion into a Three-Runway System (HKIA3RS)	PATH Model.		
Penny's Bay Power Station	PATH Model.		
Vehicle emissions from open roads, arising from existing developments and planned/committed projects in the vicinity, such as the 3 PRS, TCNTDE, HZMB, HKIA3RS, etc, and proposed roads to support the reclamation sites, if applicable	CALINE4 Model.		
Vehicle emissions from open roads, arising from Siu Ho Wan Depot Housing Development	Siu Ho Wan Depot Housing Development is currently being studied, and the development parameters and assumptions are not available at the time of study. Therefore, it is not considered in the cumulative assessment.		
Vehicle emissions from portals and ventilation buildings of proposed tunnels to support the reclamation sites, if applicable	ISCST3 Model.		
Portal and ventilation building emissions from Tuen Mun - Chek Lap Kok Link (TMCLKL) southbound	ISCST3 Model.		
Idling vehicle emission from HKBCF	ISCST3 Model.		
Organic Waste Treatment Facilities (OWTF)	ISCST3 Model.		
Marine Traffic Emission from North Lantau Refuse Transfer Station	ISCST3 Model.		
Fireworks in Hong Kong Disneyland Resort	With reference to the approved Theme Park and Associated Developments EIA report, the prediction and literature reviews indicated that the impacts from the fireworks displays to the vicinity are low and insignificant. Therefore, they are not considered in the cumulative impact assessment.		
Siu Ho Wan Bus Depot	The major emissions from the bus depot would be Nitrogen oxides (NOx) and RSP during engine		

D. II. d	
Pollution Sources	Assessment Method
	warm up at early morning. Since the scale of the bus depot is small and also in the view of its operation characterises, the emission from Siu Ho Wan Bus Depot is insignificant and localized, therefore it is not considered in the cumulative impact assessment.
Siu Ho Wan Vehicle Pound Vehicle Examination	Since the emission from Siu Ho Wan Vehicle
Centre and Weigh Station	Pound Vehicle Examination Centre and Weigh Station is insignificant and localized, it is not considered in the cumulative impact assessment.
Siu Ho Wan Government Maintenance Depot	Since the emission from Siu Ho Wan Government Maintenance Depot is insignificant and localized, it is not considered in the cumulative impact assessment.
The Proposed Columbarium at Siu Ho Wan	The major emissions from the proposed columbarium would arise from the operations of joss paper burners. Given the joss paper burners will be incorporated with exhaust air treatment facilities such as water scrubber and electrostatic precipitators to alleviate the dust emission, the emission from the proposed columbarium is considered as insignificant and localized. Therefore, the Proposed Columbarium is not considered in the cumulative impact assessment.
Container Terminal 10 Development (CT10) / Potential Reclamation Site at Southwest Tsing Yi	Container Terminal 10 Development (CT10) / Potential Reclamation Site at Southwest Tsing Yi are currently being studied, and the development parameters and assumptions are not available at the time of study. Therefore, these projects are not considered in the cumulative assessment.
Contaminated Mud Pit at the South Brothers (CMPSB)	The operation of Contaminate Mud Pit at the South Brothers (CMPSB) will be ceased in 2016. Since there will be no program overlap, CMPSB is not included in the cumulative assessment
Contaminated Mud Pit at East Sha Chau (CMPESC)	Given the contaminated mud contains high water content, it is not anticipated to generate significant impact related to air quality. Therefore, the CMPESC is not considered in the cumulative assessment.

6.3.11 The locations of these emission sources (except open road vehicle emissions, marine traffic emission and projects currently without development parameters) are shown in **Figure 2b**.

Identification of Key/Representative Air Pollutants

- 6.3.12 Since vehicular emission comprises mainly Nitrogen oxides (NO_X), RSP and FSP, and emissions from major industrial sources as listed in **Sections 6.3.9** to **6.3.11**, such as power stations, comprise mainly NO_X , RSP, FSP and SO_2 , it is anticipated that emissions from these identified sources will contribute to the future cumulative impacts of NO_2 , RSP, FSP and SO_2 in the assessment area and these four criteria pollutants are therefore selected to be assessed in this study. For other pollutants, including CO and lead, due to the low concentration in ambient, they are not considered as key pollutants for the purpose of this study.
- 6.3.13 Ozone is not directly generated by the Project. The formation of ozone involves a complex interaction between a large number of chemical substances such as NOx and VOC when meteorological conditions (e.g. sunlight, temperature) "favour" such interaction. Therefore, the PRS project itself will not generate ozone. The ozone formation by photochemical reaction would take several hours and anticipated that ozone recorded in one place would be attributed to VOC and NOx emissions generated from place afar. Concentration of ozone is governed by both precursors and atmospheric transport from other areas. When precursors transport along under favorable meteorological conditions and sunlight, ozone will

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be produced. This explains why higher ozone levels are generally not produced in the urban core or industrial area but rather at some distance downwind after photochemical reactions have taken place. The NOx generated from this Project would quickly react with the ozone in the background to form NO₂ and thus results in ozone removal. No further increase on-top of background ozone level is expected. Ozone is therefore not considered as a key air pollutant of concern, and thus is not included in this assessment.

Air Pollution Sources – Odour Impacts

- 6.3.14 In Lung Kwu Tan study area, potential odour impacts during the operational phase of the Project will be associated with the following potential odour emission sources.
 - Sludge Treatment Facilities (STF);
 - Existing WENT Landfill and Proposed WENT Landfill Extension;
 - Pillar Point Sewage Treatment Works (PPSTW); and
 - Integrated Waste Management Facilities Phase 1 (IWMF).
- 6.3.15 In Lantau Island study area, potential odour impacts during the operational phase of the Project will be associated with the following potential odour emission sources.
 - Organic Waste Treatment Facilities (OWTF);
 - Siu Ho Wan Sewage Treatment Works (SHWSTW); and
 - North Lantau Refuse Transfer Station (NLTS).
- 6.3.16 The locations of these odour emission sources are also shown in Figure 2b. Since the emission from the worshipping activities from the Proposed Columbarium at Tsang Tsui and at Siu Ho Wan is very limited and insignificant, the proposed columbarium is not considered in the cumulative assessment of odour impact.

Emission Inventory

Determination of Assessment Theme with the Highest Emission Strength for the 3 PRS

- 6.3.17 The proposed industrial uses under the land use assumptions have been confined to uses without air emission or fuel combustion, and therefore vehicular emissions for roads were considered the major emission sources. The design population and planning parameters as presented in the Land Use Concept Proposal in Appendix C were assumptions adopted in the prediction of future traffic forecast for operational phase air quality impact assessment.
- 6.3.18 With regards to the vehicular emission factors, taking into account solely the natural retirement of aged vehicles and the replacement with newer vehicles with better exhaust technologies, the vehicular emission factors would be under a decreasing trend. Thus, as a conservative approach, the first year of population intake of each PRS is selected in the EMFAC-HK model to determine the emission strength of each theme, i.e. Year 2030 for Lung Kwu Tan PRS and Siu Ho Wan PRS, and Year 2029 for Sunny Bay PRS.
- 6.3.19 EMFAC-HK model was used to assess the vehicular emission strengths from Lung Kwu Tan PRS, Siu Ho Wan PRS and Sunny Bay PRS under each of the three themes. As determined by the highest emission burden from roads in the 3 PRS, Theme B is the theme with the highest NOx emission for Lung Kwu Tan PRS and Siu Ho Wan PRS, and Theme A is the theme with the highest NOx emission for Sunny Bay PRS. As such, Theme B would represent the worst case scenario to be assessed for the Lung Kwu Tan study area, and since Themes B and A would represent worst case scenarios for Siu Ho Wan PRS and Sunny Bay PRS respectively, both Themes B and A are adopted for the air quality assessment of Lantau Island study area. As a hypothetic assumption for the air quality impact assessment in the study, there is no mixed mode of themes for the respective PRS in

Lantau Island study area.

- 6.3.20 In summary, the following themes are adopted in the operational phase cumulative assessment:
 - Lung Kwu Tan study area (Lung Kwu Tan PRS) Theme B;
 - Lantau Island study area (Siu Ho Wan PRS and Sunny Bay PRS) Theme B; and
 - Lantau Island study area (Siu Ho Wan PRS and Sunny Bay PRS) Theme A.

Determination of Worst Assessment Year

- 6.3.21 With reference to the Study Brief, the air pollution impacts of future road traffic shall be calculated based on the highest emission strength from the road within the next 15 years upon commencement of operation of the Project. The selected assessment year should therefore represent the highest emission scenario for the roads within the 3 km study boundary under the themes selected for the cumulative assessment. Sensitivity tests were carried out for the two study areas separately. As NO₂ is the pollutant of primary concern for vehicular emission, the assessment year was determined based on the highest total NOx emission burden from the roads in each of the two study areas using the EMFAC-HK model.
- It was assumed the population-in-take for Lung Kwu Tan Site would be in 2030. Therefore, 2030, 2037 and 2045 were selected to conduct the sensitivity test for the study area of Lung Kwu Tan Site. For the Siu Ho Wan and Sunny Bay sites, the population-in-take was assumed to be in 2030/2029. As a conservative approach, 2029, 2030, 2037 and 2045 were selected to conduct the sensitivity test for the study area at Lantau Island. The road traffic forecast data was estimated according to the land use conceptual proposal developed for this study, which has been agreed by Traffic Department. The total vehicular emissions of NOx from the roads in each of the two air quality study areas (i.e. PRS and area within 3 km from PRS boundary) of the selected modelling years were calculated. The highest vehicle emission year for both study areas and under all determined assessment themes was identified to occur at Year 2030. Therefore, Year 2030 is selected as the assessment year for the cumulative air quality impact assessment.

Emission Inventory of Proximity Pollution Sources

- 6.3.23 An inventory of major emissions in close proximity of less than 3 km from the project boundary was prepared based on information presented in relevant approved EIA reports and Specified Processes (SP) licences. These include mainly vehicular emissions from major roads and industrial emissions.
- 6.3.24 Vehicular emissions from all open roads, portals and ventilation buildings in the two study areas were calculated by the EMFAC-HK model. Idling vehicle emission from HKBCF was extracted from the approved HZMB-BCF and TMCLKL EIA reports. The increase in traffic due to the potential reclamations is the main cause of the increased air quality impact in the study areas.
- 6.3.25 The emission inventories of the existing emission sources such as Castle Peak Power Station, and planned and committed emission sources such as Integrated Waste Management Facilities Phase 1 and Organic Waste Treatment Facilities have been derived from either the relevant approved EIA Studies, Variation of Environment Permit (VEP) application or the SP licences. The emission inventory for existing and planned / committed industrial and marine sources is summarized in **Table 6.4**.

Table 6.4 Emission Inventory for Existing and Planned / Committed Industrial and Marine Sources

Emission Source	Reference	Data required and assumption
Lung Kwu Tan Study Area		
Sludge Treatment Facilities	STF VEP application	Extracted directly from the information for STF VEP application. All RSP emission would be FSP
The Integrated Waste Management Facilities	IWMF EIA Report	Extracted directly from the EIA. All RSP emission would be FSP
Green Island Cement Plant	HKIA3RS EIA report	Extracted directly from the EIA.
Existing WENT Landfill	WENT Landfill Extensions EIA Report	Extracted directly from the EIA. All RSP emission would be FSP
WENT Landfill Extension	WENT Landfill Extensions EIA Report	Extracted directly from the EIA. All RSP emission would be FSP
EcoPark in Tuen Mun Area 38	HKIA3RS EIA report	Extracted directly from the EIA.
Shiu Wing Steel Mill (SWSM)	HKIA3RS EIA report	Extracted directly from the EIA.
Black Point Power Station	EPD's Third Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences (3rd TM) and SP licence	Emission of Combined Cycle Gas Turbine Units calculated from 3rd TM Other emission extracted directly from the SP licence All RSP emission would be FSP
Castle Peak Power Station	EPD's Third Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences (3rd TM) and SP licence	Emission of Steam Boilers calculated from 3rd TM Other emission extracted directly from the SP licence All RSP emission would be FSP
Flare at Pillar Point Valley Landfill	HKIA3RS EIA report	•Extracted directly from the EIA.
Lantau Island Study Area		
Organic Waste Treatment Facilities	OWTF VEP application	•Extracted directly from the EIA.
Marine Traffic Emission from North Lantau Refuse Transfer Station	OWTF VEP application	Extracted directly from the information from the OWTF VEP application. According to Schedule 1 of the Air Pollution Control (Marine Light Diesel) Regulation (dated 1/4/2014), the sulphur content of any marine light diesel must not exceed 0.05% by weight. All RSP emission would be FSP
Marine Traffic Emission from the Proposed Berth for the Logistics Park in Siu Ho Wan PRS (Theme B)	Study on Marine Vessels Emissions Inventory, EPD	Calculated based on Study on Marine Vessels Emissions Inventory According to Schedule 1 of the Air Pollution Control (Marine Light Diesel) Regulation (dated 1/4/2014), the sulphur content of any marine light diesel must not exceed 0.05% by weight. All RSP emission would be FSP

Emission Inventory for Ambient Background

- 6.3.26 PATH model was used to quantify the background air quality during the operational phase of the project. An emission inventory for PATH has been projected for Year 2030, which has been agreed with EPD.
- 6.3.27 The PATH emission inventory for Pearl River Delta Economic Zone (PRDEZ) (including emission inventory for Macau) has been recently updated by EPD for Years 2015 and 2020, with consideration of all committed and planned control measures in PRDEZ. Given that reduction plans beyond Year 2020 for Guangdong Province and PRDEZ are not available, but in view of the continued efforts on reducing emission loadings, further tightening on the emission targets in future years beyond Year 2020 are anticipated. Hence, it is reasonable to assume that the emissions will be capped at Year 2020 for a conservative assessment of Year 2030.
- 6.3.28 For the assessment year at 2030, the Hong Kong emission is estimated based on the best available information regarding the emission and its control policy or projected with respect to the historical growth trend of the respective activity data for the particular source sector.

Modelling Tools

- 6.3.29 CALINE4 model was used to simulate line sources including open road emissions within study areas. ISCST3 model was used to simulate point, area and volume sources emissions within study areas. The future background concentrations for air pollutants were predicted by the PATH model. The PATH model output was added to the sum of the CALINE4 and ISCST3 model results sequentially on an hour-to-hour basis to derive the short-term and long-term cumulative impacts at the ASRs.
- 6.3.30 ISCST3 model with meteorological data extracted from the PATH model was employed for prediction of cumulative odour levels at the representative ASRs for quantitative odour impacts assessment.

6.4 Construction Phase – Potential Impacts and Strategic Mitigation Options

Potential Air Quality Impacts

- 6.4.1 Potential air quality impacts from the construction works of the 3 PRS would mainly be related to construction dust from excavation, materials handling, spoil removal and wind erosion.
- Non-compliance was found under unmitigated scenario. Based on the results shown in **Appendix E**, the predicted cumulative maximum hourly average TSP concentrations at all representative ASRs would exceed the criteria stipulated in EIAO-TM. The predicted cumulative 10th highest daily and annual RSP concentrations at some representative ASRs would also exceed the criteria stipulated in AQO. For FSP concentration, only the predicted cumulative 10th highest daily FSP concentrations at A107, did not comply with the criteria stipulated in AQO while the predicted cumulative annual FSP concentrations at all of the ASRs would comply with the criteria stipulated in AQO.
- 6.4.3 In order to minimize the construction dust impact, the following dust mitigation measures shall be implemented. Watering eight times a day on active works areas, exposed areas and paved haul roads reducing dust emission by 87.5% was considered in the assessment. Any potential dust impact and watering mitigation would be subject to the actual site condition.
- 6.4.4 A hypothetical Tier 1 screening test assuming 100% active area of construction site of the Project with mitigation options (watering eight times a day to reduce dust emission by 87.5%) in place has been undertaken for predicting hourly average TSP, daily and annual average RSP and FSP levels. Hot spot locations have been determined by the Tier 1 test where

non-compliance is predicted as presented in **Appendix E**.

- 6.4.5 Based on the results of the Tier 1 screening test, compliance with EIAO-TM criteria/AQO were found at A104, A201, A203, A204, A208 and all ASRs located closest to Sunny Bay PRS (A212 to A219), while non-compliance were found at ASRs A105, A106, A107, A108, A206, A207, A209, A210 and A211. Therefore, these ASRs close to Lung Kwu Tan PRS and Siu Ho Wan PRS with non-compliance of EIAO-TM criteria/AQO are selected for Tier 2 mitigated assessment of TSP and RSP impacts. It is noted that the setback distance of ASRs A207 and A208 from Siu Ho Wan work site is similar. As a conservative approach, ASR A208 is also selected for Tier 2 mitigated assessment of TSP though the predicted TSP result at A208 shows compliance with EIAO-TM for Tier 1 mitigated assessment.
- A focused Tier 2 assessment has been undertaken whereby the daily maximum active works areas at the site boundaries, which are assumed to be 10 and 5 hectares at Lung Kwu Tan PRS and Siu Ho Wan PRS respectively, are positioned closest to the potentially worst affected ASRs. In addition, watering twelve times a day on active works areas and exposed areas reducing dust emission by 91.7% was considered in the Tier 2 assessment. The predicted mitigated cumulative maximum hourly average TSP and the 10th maximum daily RSP concentrations at these representative ASRs are summarized in **Appendix E**. The predicted short-term fugitive dust impact at all ASRs would comply with the criteria stipulated in the EIAO-TM and AQOs by Tier 2 assessment.
- 6.4.7 The assessment of long-term fugitive dust emission impact has assumed 20, 10 and 10 hectares of annual averaged active works areas at Lung Kwu Tan PRS, Siu Ho Wan PRS and Sunny Bay PRS respectively, having considered the active works areas adopted for Tier 2 assessment (i.e. 10 and 5 hectares at Lung Kwu Tan PRS and Siu Ho Wan PRS respectively), and the separation of any two works area should not be less than 1 km to avoid cumulative impact from two works areas. The predicted long-term fugitive dust impact at all ASRs would comply with the criteria of AQOs regarding the mitigated cumulative maximum hourly average mitigated TSP concentrations, 10th highest daily and annual RSP concentrations, 10th highest daily and annual FSP concentrations.

Strategic Mitigation Options

- 6.4.8 The strategic mitigation options such as those stipulated in the Air Pollution Control (Construction Dust) Regulation together with the dust control measures and good site practices are recommended. With proper implementation of the recommended strategic mitigation options in place, adverse residual air quality impact in construction phase is not anticipated.
- 6.4.9 Implementation schedule of the proposed construction phase mitigation options is provided in **Appendix G** for proper follow up and consideration under future studies.
- 6.5 Operational Phase Potential Impacts and Strategic Mitigation Options

Potential Air Quality Impacts - Criteria Air Pollutants

6.5.1 The cumulative NO₂, RSP, FSP and SO₂ concentrations at the representative ASRs in Lung Kwu Tan study area for Theme B and Lantau Island study area for both Theme B and Theme A have been assessed and the results are presented in **Appendix E**.

Lung Kwu Tan Study Area

6.5.2 Assuming Theme B in Lung Kwu Tan study area (i.e. logistics and industrial use focus), except for the areas within 20m from the planned primary distributor roads, which should be used for non-air-sensitive-use to fulfill HKPSG's requirement, the predicted cumulative NO₂ and SO₂ concentrations at the planned ASRs within the Lung Kwu Tan PRS would comply with the AQOs. In the southern part of Lung Kwu Tan PRS (see **Appendix F1** for the exceedance area), exceedances in RSP and FSP concentrations are found at various

heights from 1.5 mAG to 50 mAG, which is mainly due to the emissions from the Castle Peak Power Station located to the south of Lung Kwu Tan PRS.

- 6.5.3 Compliance was shown in the predicted concentrations of RSP, FSP and SO₂ criteria at the existing ASRs in Lung Kwu Tan area, as presented in **Appendix E**. Exceedance of annual average NO₂ concentration was spotted at A106 Dragon Cove in Pak Long. The annual average NO₂ concentration at A106 complies with AQO under without Project scenario, indicating that the major contribution of exceedance would be vehicular emission induced by the development at PRS.
- No existing and planned ASRs were found within the areas with localized exceedance of NO₂ and SO₂ predicted at 1.5m above ground in Lung Kwu Tan study area. Exceedances of the RSP and FSP are predicted within Castle Peak Power Station, Green Island Cement and Shiu Wing Steel Mill at 1.5m above ground. The major contribution to the exceedances would be the emissions from their own operation. These industrial plants are Specified Processes (SP) and their operation / emissions are controlled under their respective APCO SP licences.

Lantau Island Study Area

6.5.5 For Lantau Island study area, cumulative impact assessment results indicated that there would be no exceedance of AQOs at the representative ASRs under both Theme B and Theme A, as presented in **Appendix E**. No representative ASRs are identified within the areas with localized exceedance of NO₂ which are predicted in the vicinity of Siu Ho Wan and Sunny Bay PRS at 1.5m above ground. Exceedance was only predicted near the eastern boundary of Siu Ho Wan PRS adjacent to North Lantau Highway with respect to annual average NO₂ concentration at 1.5mAG (see **Appendix F2** for the exceedance area). The major contribution of the exceedance would be vehicular emission from North Lantau Highway.

Strategic Mitigation Options - Criteria Air Pollutants

- 6.5.6 For Lung Kwu Tan study area, given Lung Kwu Tan Road would exceed its design capacity with the reclamation development, widening Lung Kwu Tan Road would be required. It could be therefore considered to realign the future Lung Kwu Tan Road away from existing villages to alleviate the air quality impact. For the planned ASRs within PRS, the southern part of Lung Kwu Tan PRS should avoid land uses that are air-sensitive. With proper recommended strategic mitigation options, the adverse air quality impact in Lung Kwu Tan study area in operational phase should be effectively mitigated.
- 6.5.7 For Lantau Island study area, non-air-sensitive uses are recommended for the area at the eastern site boundary of Siu Ho Wan PRS adjacent to North Lantau Highway. With proper recommended strategic mitigation options in place, the adverse air quality impact in Lantau Island study area in operational phase should be effectively mitigated. Implementation schedule of the proposed operational phase air pollutant mitigation options is provided in **Appendix G** for proper follow up and consideration under future studies.

Potential Air Quality Impacts - Odour Impacts

- 6.5.8 For Lung Kwu Tan Study area, a number of the approved EIA reports have been reviewed. There are no exceedances of criteria of 5 odour units in Lung Kwu Tan Study Area. Furthermore, the development at PRS itself would not generate odour emission. Therefore, adverse odour impact would not be anticipated in Lung Kwu Tan PRS.
- 6.5.9 Cumulative odour levels at the representative ASRs for odour impact within Siu Ho Wan PRS in Lantau Island study area are predicted quantitatively with reference to the approved EIA studies of the existing odour generating facilities, while the development at PRS itself would not generate odour emission. Assuming that all the existing and committed mitigation measures suggested in the EIA reports are in place, the assessment results (in **Appendix E**)

showed exceedance at ASRs for odour within Siu Ho Wan PRS at various heights. The exceedances at assessment heights below 40mAG were mainly due to the odour emissions from the SHWSTW and NLTS, and the exceedances at assessment heights of 40mAG and above were mainly due to the odour emissions from OWTF.

Strategic Mitigation Options - Odour Impacts

- 6.5.10 To minimise the potential odour impacts on Siu Ho Wan PRS, it is recommended to enhance odour control measures at the odour sources (i.e. SHWSTW, NLTS and OWTF), such as enclosing the sewage/waste treatment facilities and installing/upgrading the deodorizing units, and to implement proper land use planning on Siu Ho Wan PRS.
- 6.5.11 Implementation schedule of the proposed operational phase odour mitigation options is provided in **Appendix G** for proper follow up and consideration under future studies.

7 WATER QUALITY IMPACT ASSESSMENT

7.1 Assessment Criteria

Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)

7.1.1 The criteria and guidelines relevant to the water quality impact assessment are set out in Annex 6 and Annex 14 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) under the Environmental Impact Assessment Ordinance (EIAO).

Water Quality Objectives

7.1.2 The Water Pollution Control Ordinance (WPCO) provides the major statutory framework for the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten Water Control Zones (WCZs). Corresponding statements of Water Quality Objectives (WQOs) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in the WCZs based on their beneficial uses. The WQOs for the North Western WCZ, North Western Supplementary WCZ, Western Buffer WCZ and Deep Bay WCZ are listed in **Table 7.1** to **Table 7.4**. These WQOs were used as the water quality assessment criteria for the Project.

Table 7.1 Summary of Water Quality Objectives for North Western WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/L for 90% of samples	Marine waters
Depth-averaged DO	Not less than 4.0 mg/L Not less than 4.0 mg/L for 90 % sample	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones, Water Gathering Ground Subzones and other inland waters Marine waters
pH	To be in the range of 6.5 - 8.5, change	Marine waters excepting
pri	due to human activity not to exceed 0.2	Bathing Beach Subzones
	To be in the range of 6.5 – 8.5	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	To be in the range of 6.0 –9.0	Other inland waters
	To be in the range of 6.0 –9.0 for 95% samples	Bathing Beach Subzones
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2 °C	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by human activity	Marine waters
	Not to cause the annual median to exceed 20 mg/L	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C) Subzones and Water Gathering Ground Subzones
	Not to cause the annual median to exceed 25 mg/L	Inland waters
Unionized Ammonia (UIA)	Annual mean not to exceed 0.021 mg/L as unionized form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters

Parameters	Objectives	Sub-Zone
Total Inorganic Nitrogen	Annual mean depth-averaged inorganic	
(TIN)	nitrogen not to exceed 0.3 mg/L	Castle Peak Bay Subzone
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.5 mg/L	Marine waters excepting Castle Peak Bay Subzone
Bacteria	Not exceed 610 per 100ml, calculated	Secondary Contact
24010114	as the geometric mean of all samples	Recreation Subzones
	collected in one calendar year	
	Should be less than 1 per 100 ml,	Tuen Mun (A) and Tuen
	calculated as the running median of the	Mun (B) Subzones and
	most recent 5 consecutive samples	Water Gathering Ground
	taken between 7 and 21 days.	Subzones
	Not exceed 1000 per 100 ml, calculated	Tuen Mun (C) Subzone
	as the running median of the most	and other inland waters
	recent 5 consecutive samples taken between 7 and 21 days	
	Not exceed 180 per 100 ml, calculated	Bathing Beach Subzones
	as the geometric mean of all samples	Datiling Deach Subzones
	collected from March to October	
	inclusive. Samples should be taken at	
	least 3 times in one calendar month at	
	intervals of between 3 and 14 days.	
Colour	Not to exceed 30 Hazen units	Tuen Mun (A) and Tuen
		Mun (B) Subzones and
		Water Gathering Ground
		Subzones
	Not to exceed 50 Hazen units	Tuen Mun (C) Subzone
F Day Biashamiaal Owygan	Not to avoid 2 mg/l	and other inland waters
5-Day Biochemical Oxygen Demand (BOD ₅)	Not to exceed 3 mg/L	Tuen Mun (A), Tuen Mun (B) and Tuen Mun (C)
Demand (BOD5)		Subzones and Water
		Gathering Ground
		Subzones
	Not to exceed 5 mg/L	Inland waters
Chemical Oxygen Demand	Not to exceed 15 mg/L	Tuen Mun (A), Tuen Mun
(COD)		(B) and Tuen Mun (C)
		Subzones and Water
		Gathering Ground
	Not to avec ad 20 may/	Subzones
Toxins	Not to exceed 30 mg/L Should not cause a risk to any	Inland waters Whole zone
IOXIIIS	beneficial uses of the aquatic	vvriole zorie
	environment	
	Waste discharge shall not cause the	Whole zone
	toxins in water significant to produce	11.1515 25115
	toxic carcinogenic, mutagenic or	
	teratogenic effects in humans, fish or	
	any other aquatic organisms.	
Phenol	Quantities shall not sufficient to produce	Bathing Beach Subzones
	a specific odour or more than 0.05 mg/L	
	a specific odour or more than 0.05 mg/L as $C_6 H_5 OH$	
Turbidity	a specific odour or more than 0.05 mg/L	Bathing Beach Subzones

Source: Statement of Water Quality Objectives (North Western Water Control Zone)

Table 7.2 Summary of Water Quality Objectives for North Western Supplementary WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved Oxygen (DO)	Not less than 2.0 mg/L for 90% of	Whole zone
within 2 m of the seabed	samples	
Depth-averaged DO	Not less than 4.0 mg/L for 90% of	Whole zone

Parameters	Objectives	Sub-Zone
	samples	
pН	To be in the range of 6.5 - 8.5, change due to human activity not to exceed 0.2	Whole zone
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2 °C	Whole zone
Suspended solids	Not to raise the ambient level by 30% caused by human activity	Whole zone
Unionized Ammonia (UIA)	Annual mean not to exceed 0.021 mg/L as unionized form	Whole zone
Nutrients	Shall not cause excessive algal growth	Whole zone
Total Inorganic Nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.5 mg/L	Whole zone
Bacteria	Not exceed 610 per 100ml, calculated as the geometric mean of all samples collected in one calendar year	Secondary Contact Recreation Subzones
Toxins	Should not cause a risk to any beneficial uses of the aquatic environment	Whole zone
	Waste discharge shall not cause the toxins in water significant to produce toxic carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone

Source: Statement of Water Quality Objectives (North Western Supplementary Water Control Zone)

Table 7.3 Summary of Water Quality Objectives for Western Buffer WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/L for 90% of samples	Marine waters excepting fish culture subzones
	Not less than 2.0 mg/L for 90% of samples	Fish culture subzones
Depth-averaged DO	Not less than 4.0 mg/L for 90% of samples	Marine waters excepting fish culture subzones
	Not less than 5.0 mg/L for 90% of samples	Fish Culture Subzones
	Not less than 4.0 mg/L	Water Gathering Ground Subzone and other Inland waters
5-Day Biochemical Oxygen Demand (BOD₅)	Not to exceed 3 mg/L	Water Gathering Ground Subzones
	Not to exceed 5 mg/L	Inland waters
Chemical Oxygen Demand (COD)	Not to exceed 15 mg/L	Water Gathering Ground Subzones
	Not to exceed 30 mg/L	Inland waters
pН	To be in the range of 6.5 – 8.5, change due to waste discharges not to exceed 0.2	Marine waters
	To be in the range of 6.5 – 8.5	Water Gathering Ground Subzones
	To be in the range of 6.0 – 9.0	Inland waters
Salinity	Change due to waste discharges not to exceed 10% of ambient	Whole zone
Temperature	Change due to waste discharges not to exceed 2 °C	Whole zone

Parameters	Objectives	Sub-Zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by waste discharges and shall not affect aquatic communities	Marine waters
	Not to cause the annual median to exceed 20 mg/L	Water Gathering Ground Subzones
	Not to cause the annual median to exceed 25 mg/L	Inland waters
Unionized Ammonia (UIA)	Annual mean not to exceed 0.021 mg/L as unionised form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
Total Inorganic Nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg/L	Marine waters
Toxic substances	Should not attain such levels as to produce significant toxic effects in humans, fish or any other aquatic organisms	Whole zone
	Waste discharges should not cause a risk to any beneficial use of the aquatic environment	Whole zone
Bacteria	Not exceed 610 per 100ml, calculated as the geometric mean of all samples collected in one calendar year	Secondary Contact Recreation Subzones and Fish Culture Subzones
	Not exceed 180 per 100 mL, calculated as the geometric mean of all samples collected from March to October inclusive in 1 calendar year. Samples should be taken at least 3 times in 1 calendar month at intervals of between 3 and 14 days.	Bathing Beach Subzones
	Less than 1 per 100ml, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Water Gathering Ground Subzones
	Not exceed 1000 per 100ml, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Inland waters
Colour	Not to exceed 30 Hazen units	Water Gathering Ground
	Not to exceed 50 Hazen units	Inland waters
Turbidity	Shall not reduce light transmission substantially from the normal level	Bathing Beach Subzones

Source: Statement of Water Quality Objectives (Western Buffer Water Control Zone)

Table 7.4 Summary of Water Quality Objectives for Deep Bay WCZ

Parameters	Objectives	Sub-Zone
Offensive Odour, Tints	Not to be present	Whole zone
Visible foam, oil scum, litter	Not to be present	Whole zone
Dissolved Oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/L for 90% of samples	Outer Marine Subzone excepting Mariculture Subzone
Dissolved Oxygen (DO) within 1 m below surface	Not less than 4.0 mg/L for 90% of samples	Inner Marine Subzone excepting Mariculture Subzone
	Not less than 5.0 mg/L for 90% of samples	Mariculture Subzone
Depth-averaged DO	Not less than 4.0 mg/L for 90% of samples	Outer Marine Subzone excepting Mariculture Subzone

Parameters	Objectives	Sub-Zone
. si diliototo	Not less than 4.0 mg/L	Yuen Long & Kam Tin
	That lees than no mg/ =	(Upper and Lower) Subzones, Beas Subzone, Indus Subzone, Ganges Subzone, Water Gathering Ground Subzones and other inland waters of the Zone
5-Day Biochemical Oxygen Demand (BOD ₅)	Not to exceed 3 mg/L	Yuen Long & Kam Tin (Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	Not to exceed 5 mg/L	Yuen Long & Kam Tin (Lower) Subzone and other inland waters
Chemical Oxygen Demand (COD)	Not to exceed 15 mg/L	Yuen Long & Kam Tin (Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground
	Not to exceed 30 mg/L	Yuen Long & Kam Tin (Lower) Subzone and other inland waters
pH	To be in the range of 6.5 - 8.5, change due to waste discharges not to exceed 0.2	Marine waters excepting Yung Long Bathing Beach Subzone
	To be in the range of 6.5 – 8.5	Yuen Long & Kam Tin (Upper and Lower) Subzones, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	To be in the range of 6.0 –9.0	Other inland waters
	To be in the range of 6.0 – 9.0 for 95% samples, change due to waste discharges not to exceed 0.5	Yung Long Bathing Beach Subzone
Salinity	Change due to waste discharges not to exceed 10% of ambient	Whole zone
Temperature	Change due to waste discharges not to exceed 2 °C	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by waste discharges and shall not affect aquatic communities	Marine waters
	Not to cause the annual median to exceed 20 mg/L	Yuen Long & Kam Tin (Upper and Lower) Subzones, Beas Subzone, Ganges Subzone, Indus Subzone, Water Gathering Ground Subzones and other inland waters
Unionized Ammonia (UIA)	Annual mean not to exceed 0.021 mg/L as unionized form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
Total Inorganic Nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.7 mg/L	Inner Marine Subzone
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.5 mg/L	Outer Marine Subzone

Parameters	Objectives	Sub-Zone
Bacteria	Not exceed 610 per 100ml, calculated as the geometric mean of all samples collected in one calendar year Should be zero per 100 ml, calculated	Secondary Contact Recreation Subzones and Mariculture Subzones Yuen Long & Kam Tin
	as the running median of the most recent 5 consecutive samples taken between 7 and 21 days.	(Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	Not exceed 180 per 100ml, calculated as the geometric mean of the collected from March to October inclusive in one calendar year. Samples should be taken at least 3 times in a calendar month at intervals of between 3 and 14 days.	Yung Long Bathing Beach Subzone
	Not exceed 1000 per 100ml, calculated as the running median of the most recent 5 consecutive samples taken at intervals of between 7 and 21 days	Yuen Long & Kam Tin (Lower) Subzone and other inland waters
Colour	Not to exceed 30 Hazen units	Yuen Long & Kam Tin (Upper) Subzone, Beas Subzone, Indus Subzone, Ganges Subzone and Water Gathering Ground Subzones
	Not to exceed 50 Hazen units	Yuen Long & Kam Tin (Lower) Subzone and other inland waters
Turbidity	Shall not reduce light transmission substantially from the normal level	Yuen Long Bathing Beach Subzone
Phenol	Quantities shall not sufficient to produce a specific odour or more than 0.05 mg/L as $C_6 H_5 OH$	Yuen Long Bathing Beach Subzone
Toxins	Should not cause a risk to any beneficial uses of the aquatic environment	Whole Zone
	Should not attain such levels as to produce toxic carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole Zone

Source: Statement of Water Quality Objectives (Deep Bay Water Control Zone).

Technical Memorandum on Effluents Discharge Standards

7.1.3 Discharges of effluents are subject to control under the WPCO. The Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS), issued under Section 21 of the WPCO, gives guidance on permissible effluent discharges based on the type of receiving waters (foul sewers, storm water drains, inland and coastal waters). The limits control the physical, chemical and microbial quality of effluent.

Water Supplies Department (WSD) Water Quality Criteria

7.1.4 Besides the WQO set under the WPCO, the WSD has also specified a set of seawater quality objectives for water quality at their flushing water intakes. The list is shown in Table **Table 7.5**.

Table 7.5 WSD Standards at Flushing Water Intakes

Parameter (in mg/L unless otherwise stated)	WSD Target Limit
Colour (Hazen Unit)	< 20
Turbidity (NTU)	< 10
Threshold Odour Number (odour unit)	< 100
Ammoniacal Nitrogen (NH₃-N)	< 1
Suspended Solids (SS)	< 10
Dissolved Oxygen (DO)	> 2
Biochemical Oxygen Demand (BOD)	< 10
Synthetic Detergents	< 5
E. coli (no. / 100 ml)	< 20,000

Reference Suspended Solids (SS) Criterion for Cooling Water Intake

7.1.5 No statutory water quality guideline is available for cooling water intakes. With reference to the approved EIA for Shatin to Central Link (SCL), a SS limit of 40 mg/L was defined as a reference objective for seawater abstraction for cooling purpose. The limit of 40 mg/L provided in the EIA for SCL is used in this assessment as a reference criterion for protection of the cooling water intakes during the Project construction. The SS criterion for cooling water intakes is different from that for the WSD's intakes as their beneficial uses are different (the former is used for cooling water system and the latter for flushing purpose).

Practice Note

7.1.6 A practice note for professional persons has been issued by the EPD to provide guidelines for handling and disposal of construction site discharges. The ProPECC PN 1/94 "Construction Site Drainage" provides good practice guidelines for dealing with ten types of discharge from a construction site. These include surface runoff, groundwater, boring and drilling water, bentonite slurry, water for testing and sterilisation of water retaining structures and water pipes, wastewater from building construction, acid cleaning, etching and pickling wastewater, and wastewater from site facilities. Guidelines given in the ProPECC PN 1/94 should be followed as far as possible during construction to minimize the water quality impact due to construction site drainage.

Assessment Criterion for Sediment Deposition (Applicable to Ecological Subtidal Habitats Only)

7.1.7 There is no existing legislative standard on sedimentation rate available. Soft corals typical of the north western coastal waters where the sediment regime is more dynamic than in other parts of Hong Kong's coastal waters are expected to be more tolerant of deposition. The daily sediment deposition rate of 200 g/m²/day is generally considered as tolerable in the western waters. The sediment deposition rate of 200 g/m²/day has been adopted as the reference criterion for this Study following the approach adopted under other approved EIA studies (1), (2), (3). The sedimentation criterion was derived for protection of subtidal coral habitats only and hence it is not applicable to other water sensitive receivers such as bathing beach users and seawater intakes where the main concern would be on the surface / mid-depth water quality. No sedimentation criterion specific to bathing beach users and

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⁽¹⁾ Ove Arup & Partners Hong Kong Ltd., Agreement No. CE14/2008 (HY) Hong Kong – Zhuhai – Macao Bridge Hong Kong Boundary Crossing Facilities, Environmental Impact Assessment Report prepared for Highways Department.

⁽²⁾ ERM, Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities, Environmental Impact Assessment Report prepared for CLP.

⁽³⁾ Mouchel. Permanent Aviation Fuel Facility (PAFF) – Environmental Impact Assessment Report prepared for Airport Authority- Hong Kong.

seawater intakes is available and therefore the sedimentation rates are not presented for these sensitive receivers under this Assessment.

7.2 Water Sensitive Receivers

- 7.2.1 The key water sensitive receivers (WSRs) considered in this assessment are shown in **Figure 3**. The identified WSRs include:
 - Cooling Water Intakes;
 - Flushing Water Intakes;
 - Bathing Beaches;
 - Typhoon Shelter:
 - Marine Park;
 - Corals;
 - Artificial Reefs;
 - Horseshoe Crab;
 - Seagrass;
 - Fish Culture Zone (FCZ);
 - Fish Spawning Ground;
 - Site of Special Scientific Interest (SSSI);
 - Estuary:
 - Mangrove Communities; and
 - Committed / Potential Marine Park.
- 7.2.2 The WSRs identified were based on the best available information obtained at the time of conducting this assessment, which should subject to future review and update as necessary during future statutory EIA studies with reference to updated project information of the PRS and concurrent projects in the vicinity. For instance, a marina development was recently proposed under the TCNTDE project after completion of this water quality impact Assessment. It should be added in the list of WSRs in the future statutory EIA studies based on the latest and updated planning information.

7.3 Assessment Methodology and Assumptions

- 7.3.1 Computer modelling was used to assess the potential hydrodynamics and water quality impacts due to the construction and operation of the PRS. The Delft3D suite of models, developed by Delft Hydraulics, was used as the modelling platforms. The Delft3D Western Harbour (WH) Model, developed under the approved EIA for TM-CLKL, was used as the basis for hydrodynamic, water quality and sediment plume modelling. The grid mesh of the WH Model has been refined further at the PRS to give better representation of the local hydrodynamics and water quality conditions.
- 7.3.2 Assumptions and alternative Project options have been considered for deriving a reasonable worst case scenario for modelling assessment as summarized in **Table 7.6**.

Table 7.6 Consideration of Different Project Options

Project Options	PRS at Siu Ho Wan	PRS at Sunny Bay	PRS at Lung Kwu Tan
Land Use Options: (see Appendix C):	Theme A, which would amount of sewage efflu (with the highest pote marine environment), w assessments under oper	ent from these 2 PRS ntial impact upon the ras adopted for impact	Theme B, which would generate the greatest amount of sewage effluent from this PRS (with the highest potential impact upon the marine environment), was adopted for impact assessments under

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Project Options	PRS at Siu Ho Wan	PRS at Sunny Bay	PRS at Lung Kwu Tan				
		l	operational phase.				
Alternative Reclamation Layouts:	technical assessments u this Study. The scenario with all the	Use of the preliminary layout for the Project derived from the broad technical assessments under the Land Supply Study for assessment under this Study. The scenario with all the 3 PRS completed would represent the worst case in terms of impact upon the tidal flushing in western waters. The scenario					
Alternative reclamation methods (Dredged or non-dredged):	3 PRS. Use of non-dredged me highly ecological sensit	ethod to avoid insurmou	ntable impact due to the ern waters following the ne same area (e.g. HZMB				
Alternative seawall foundation method (Deep Cement Mixing or Stone Column or Sand Compaction Pile):	Use of Stone Column is more suitable due to the relatively shallow seabed at this PRS (The selected option is based on engineering / technical considerations)	Use of Sand Compaction Pile is more suitable due to the deep seabed at this PRS and the required strength of seawall foundation (The selected option is based engineering / technical considerations)	Use of Stone Column is more suitable due to the relatively shallow seabed at this PRS (The selected option is based on engineering / technical considerations)				
Seawall Construction (Cellular Steel Caisson or Sloping Seawall):	Selected option is cellular steel caisson - a faster process for seawall construction to meet the tight programme and a smaller seawall footprint to minimize potential ecological impacts	Selected option is cellular steel caisson - a faster process for seawall construction to meet the tight programme and a smaller seawall footprint to minimize potential ecological impacts	Selected option is sloping seawall – which would not have significant implication on reclamation footprint due to the very shallow water depth at this PRS; Seawall construction will proceed from both sides of the PRS simultaneously to meet the tight programme				
Options for Reclamation Sequence / Phasing (all the PRS are elongated in shape): (1) Proceeding from one end of the PRS to the other end in one direction or (2) Proceeding from both ends of the PRS boundary simultaneously):	Proceeding from the west in a single direction is preferred so that the western seawall can be established at an early stage to shield the key sensitive receivers (which are mainly on the western side of the PRS) from the remaining reclamation activities	Proceeding the reclamation from both ends of the PRS boundary simultaneously is preferred to meet the tight construction programme in view of the large reclamation scale at Sunny Bay. Both the western and eastern seawalls will be established at an early stage to shield the surrounding sensitive receivers from the remaining reclamation activities	Most of this PRS area is located in embayed area with no key sensitive receivers at the immediate downstream; Proceeding the reclamation from both ends of the PRS simultaneously is recommended to meet the tight construction programme.				

7.4 Construction Phase – Potential Impacts and Strategic Mitigation Options

Water Quality Modelling Scenarios, Assumptions and Mitigation Options Incorporated

7.4.1 The major sources of water quality impacts during the construction phase of the PRS would include loss of fines and contaminants into the marine water column during the proposed

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marine construction works.

- 7.4.2 Use of non-dredged method is recommended for all the 3 PRS to minimize water quality impacts. With impacts from dredging eliminated, underwater filling work (using sand fill / public fill) would be the most critical activity contributing to water quality impacts during the construction of the PRS. Different construction design measures, such as double silt curtain systems, using filling materials of less than 25% fines contents, close cage-type grab dredger for reprovisioning of existing submarine sewage outfalls, etc., were also assumed in the modelling scenarios.
- 7.4.3 The major ongoing, committed, planned and proposed projects in the vicinity of the study areas are listed in **Appendix B**. The implementation programmes of these projects are presented in **Appendix A** and locations of these projects are shown in **Figure 1**. Those concurrent projects which might cause cumulative construction phase water quality impacts to the environment were included in the cumulative assessment.
- 7.4.4 Sediment plume modelling was carried out to assess three construction phase scenarios, namely, Scenarios A, B and C. For Scenario A and Scenario B, it was assumed that following the marine works will take place concurrently:
 - Construction of the PRS at Sunny Bay
 - Construction of the PRS at Siu Ho Wan
 - Construction of the PRS at Lung Kwu Tan
 - Construction of the HKIA3RS reclamation
 - Construction of the TCNTDE reclamation
 - Mud disposal operation at CMPESC
 - Dredging for re-provision of the NWNT submarine outfall
 - Dredging for re-provision of the existing submarine outfall of SHWSTW
- 7.4.5 Scenario A assumed the maximum allowable contaminated mud disposal rate of 26,700 m³/day specified in the Environmental Permit of the CMPESC as the total production rate for the whole mud disposal operation. Scenario B assumed the CMPESC operation at a lower production rate of 5,850 m³/day which is considered more realistic and reasonable with reference to the historic disposal record and projected mud disposal demand during construction phase of the 3 PRS. All the concurrent projects and their sediment loss rates assumed under Scenario B are same as those assumed under Scenario A except the sediment loss rate of CMPESC which is lower in Scenario B. For conservative assessment, the ground treatment and underwater filling for HKIA3RS reclamation were assumed to be conducted concurrently with the construction of the PRS and at their peak rate under both Scenario A and Scenario B.
- 7.4.6 Scenario C covered the marine works of the 3 PRS reclamation and TCNTDE reclamation, together with the CMPESC operation at a reduced reasonable production rate (5,850 m³/day) but not that for HKIA3RS. Based on the latest information at the time of the assessment, major marine works for the HKIA3RS reclamation would be completed before construction of the 3 PRS (i.e. before 2019). On this basis, it is not expected that the HKIA3RS would cause cumulative water quality impact with the 3 PRS.

Cumulative Impacts with Construction of Three PRS Together with HKIA3RS Reclamation, TCNTDE Reclamation and CMP Operation (Scenario A and Scenario B)

7.4.7 The model predicted that non-compliance with the assessment criterion for SS elevation would occur at the coral habitat at The Brothers (E4), Sha Chau and Lung Kwu Chau Marine Park (SCLKC MP) (E10 and E11), The Brothers Marine Park (BMP) (E17) and the artificial reefs (E19) under Scenario A, whilst under Scenario B, with the adoption of a reasonable case for CMP operation, all the non-compliances for SS elevations were eliminated except only at the BMP (E17) where the maximum SS elevation would still marginally exceeded the criteria value.

- 7.4.8 The maximum daily sedimentation rates predicted at the coral habitat at The Brothers (E4), the potential BMP (E17) and the artificial reef (E19) exceeded the assessment criterion under Scenario A, whilst under Scenario B, with adoption of a reasonable case for CMP operation, non-compliance was only predicted at the coral habitat at The Brothers (E4).
- 7.4.9 The cumulative SS levels predicted at flushing water intakes at Hong Kong Garden (C16) and Butterfly Beach (C19) also exceeded the target objective specified by WSD. However, the existing background SS levels have also breached the WSD target objective and the additional SS levels induced by the concurrent marine construction activities were predicted to be small or negligible. Nevertheless, deployment of silt screens at the intakes could be a possible mitigation option for consideration in the future statutory EIA studies to protect the intakes (if considered necessary). With implementation of silt screen at the intake, full compliance with the WSD target SS objective would be achieved at the flushing water intake points.
- 7.4.10 The cumulative SS elevations at the cooling water intakes at Airport North (C8) and future HZMB BCF (C10) caused by various concurrent activities would exceed the SS criterion for cooling water intake. However, with reference to the information provided in the EIA for HKIA3RS, double layer silt curtains and silt screens would be installed at the cooling water intakes at Airport North (C8) and HZMB BCF (C10) under the HKIA3RS project. Thus, the maximum SS levels predicted for these 2 cooling water intake points would be reduced to an acceptable level with adoption of the measures recommended in the EIA for HKIA3RS.

Cumulative Impacts with Construction of Three PRS Together with TCNTDE Reclamation and CMP Operation Only (Scenario C)

- 7.4.11 Based on the latest information at the time of writing, the marine works (including ground treatment works, sand blanket laying, seawall construction and marine filling) for the HKIA3RS reclamation would be completed before 2019 (i.e. before construction of this Project). Hence, it is not expected that the HKIA3RS would cause any cumulative water quality impact with the 3 PRS according to the latest construction programme. Scenario C was thus simulated to assess the cumulative impact from the construction of the 3 PRS together with the CMP operation at East Sha Chau and construction of the TCNTDE reclamation only. It was also assumed under this scenario that the CMP will be operated at a reduced reasonable disposal rate of 5,850 m³/day as in Scenario B. Based on the results of this additional sensitivity testing, full compliance with the assessment criteria for SS elevations and sedimentation rates would be achieved at all the identified WSRs.
- 7.4.12 However, the cumulative SS levels predicted at flushing water intakes at Hong Kong Garden (C16) and Butterfly Beach (C19) still exceeded the target objective specified by WSD. However, the existing background SS levels have also breached the WSD target objective and the additional SS levels induced by the concurrent marine works were predicted to be small or negligible. Nevertheless, deployment of silt screens at the intakes could be a possible mitigation option for consideration in the future statutory EIA studies to protect the intakes (if considered necessary). With implementation of silt screen at the intake, full compliance with the WSD target SS objective would be achieved at the flushing water intake points.
- 7.4.13 The cumulative SS elevations at the cooling water intakes at Airport North (C8) (induced by the concurrent marine works) were predicted to be high under this scenario (even without consideration of the HKIA3RS project). Installation of silts screen at this cooling water intake is therefore recommended to minimize the potential impacts. With adoption of this mitigation measure, the maximum SS levels predicted for this cooling water intake point would be reduced to an acceptable level.

Impacts from the Three PRS Alone

7.4.14 The mixing zones of SS elevations and sedimentation caused by the construction of the 3 PRS alone are predicted to be highly localized. Full compliance with the WQO for SS

elevations and sedimentation rates would be achieved at all the identified sensitive receivers under the case with the 3 PRS alone after implementation of the mitigation options, such as use of non-dredged method, different construction design measures including double silt curtain systems, use of filling materials of less than 25% fines contents, close cage-type grab dredger for reprovisioning of existing submarine sewage outfalls, etc. as suggested in **Section 7.4.2** above. Non-compliances with the target objectives at flushing water intakes at Hong Kong Garden (C16) and Butterfly Beach (C19) were still predicted under the case with the 3 PRS alone but the non-compliances were mainly caused by other background discharges and the contribution of the overall SS levels at these intake points were predicted to be small. Nevertheless, deployment of silt screens at the intakes could be a possible mitigation option for consideration in the future statutory EIA studies to protect the intakes if necessary. With implementation of silt screen at the intake, full compliance with the WSD target SS objective would be achieved at the flushing water intake points. No exceedance was predicted at any cooling water intake with the 3 PRS alone. No unacceptable water quality impact would be anticipated due to the construction of the 3 PRS alone.

7.4.15 Potential issues identified under Scenario A and Scenario B, the finding of sensitivity-testing Scenario C and mitigation options incorporated in the modelling scenarios are summarized in **Appendix G**.

Further Strategic Mitigation Options

- 7.4.16 Besides the environmental friendly construction design measures (that have been incorporated in the modelling) as mentioned in **Section 7.4.2**, further mitigation options as described below are also suggested for consideration under future studies to minimize the potential water quality impacts.
 - Use of geotextile bag seawall would be a faster process and therefore should be considered under future engineering studies to speed up the seawall construction process of the PRS for protecting the marine water quality from the underwater filling operations.
 - Installation of silt screens at the seawater intake points that would be potentially
 affected by the concurrent construction activities should be considered as a mitigation
 option under the future studies to protect the intake points.
 - All vessels should be sized so that adequate clearance is maintained between vessels
 and the seabed in all tide conditions, to ensure that undue turbidity is not generated by
 turbulence from vessel movement or propeller wash.
 - All hopper barges and dredgers should be fitted with tight fitting seals to their bottom openings to prevent leakage of material.
 - Construction activities should not cause foam, oil, grease, scum, litter or other objectionable matter to be present on the water within the site or dumping grounds.
 - Loading of barges and hoppers should be controlled to prevent splashing of dredged material into the surrounding water. Barges or hoppers should not be filled to a level that will cause the overflow of materials or polluted water during loading or transportation.
 - Before commencement of the reclamation works, the project proponent should complete planning of the phased construction of the reclamation, design and operation scheme of the silt curtain.
 - The site practices outlined in ProPECC PN 1/94 "Construction Site Drainage" should be followed as far as practicable in order to minimise surface runoff and the chance of erosion.

7.5 Operational Phase – Potential Impacts and Strategic Mitigation Options

Hydrodynamic and Water Quality Modelling Scenarios

7.5.1 Hydrodynamic and water quality modelling was carried out to address the permanent change in the water quality due to the 3 PRS together with different ongoing, committed, planned and

proposed projects, including:

- TCNTDE
- HKIA3RS
- TM-CLKL
- HZMB BCF
- HZMB HKLR
- CT10
- IWMF
- PRS at Southwest Tsing Yi
- CMP at South Brothers
- CMP at East Sha Chau
- 7.5.2 Year 2036 was adopted as the operational phase assessment year with reference to the latest available population forecast at the time of the assessment for background loading estimation. Land use themes with the greatest amount of sewage effluent generation were selected for the assessment of the highest potential impact on the marine environment. Theme A was adopted for the operational phase assessment of Siu Ho Wan and Sunny Bay PRS, and Theme B was adopted for the operational phase assessment of Lung Kwu Tan PRS. Since there is no spare treatment capacity in the existing Sewage Treatment Works (STW) near the PRS to treat sewage arising from the 3 PRS (Project sewage) as advised by the Authority, it was assumed in this study that new STWs would be implemented to treat the wastewater arising from the PRS development. Secondary and tertiary treatment options were tested for their efficacy as part of the water quality modelling under this CEIA Study. The options of sewage treatment/disposal would be reviewed and associated details would be investigated under the technical and engineering assessments to be carried out in the next project stage (including planning and engineering studies, detailed SIAs and statutory EIAs) based on more concrete development parameters by that time.
- 7.5.3 Three hydrodynamic and water quality modelling scenarios as listed below were simulated:
 - Scenario 1 Baseline "Without Project" Scenario (with the above mentioned projects but without the 3 PRS)
 - Scenario 2 Operational Scenario (with the above mentioned projects and the 3 PRS) – Employing secondary treatment and disinfection in new STW for treatment of Project sewage
 - Scenario 3 Operational Scenario (with the above mentioned projects and the 3 PRS) – Employing tertiary treatment and nitrogen removal in new STW for treatment of Project sewage

Cumulative Impacts with Consideration of Other Concurrent Projects

Hydrodynamic Impact

7.5.4 The two operational scenarios (namely Scenario 2 and Scenario 3) adopted the same coastline configurations and thus would have the same effect on the hydrodynamic conditions. The model predicted that the operation of the 3 PRS (under both Scenario 2 and Scenario 3) would change the discharge of Urmston Road, Ma Wan, Victoria Harbour, East Lamma and Western Lamma channels by less than 1%. The predicted change in the flow discharge through Airport Channel and Rambler Channel was relatively higher of 2.7% and 1.6% respectively, which are believed to be caused by the combined effects of the PRS at Sunny Bay and PRS at Siu Ho Wan. Although the predicted changes of discharge through Airport and Rambler Channels were relatively larger, these two channels are amongst the smallest channels with lowest base flow / discharge rates and as such, the predicted changes in these two channels would unlikely have a significant effect on the overall flow pattern in the western waters.

Water Quality Impact

7.5.5 In terms of the water quality impact, under all the modelling scenarios simulated, namely Scenario 1 (without the PRS) and Scenarios 2 and 3 (with the 3 PRS), non-compliance with the WQO for total inorganic nitrogen (TIN) was predicted at 11 beaches (namely B1 – B11), Tuen Mun Typhoon Shelter (T1), Ma Wan fish culture zone (E1) and various ecological resources (E2 - E4 and E6 - E20). Locations of these WSRs are shown in Figure 3. The number of WSRs with WQO non-compliances for TIN was predicted to be the same with and without the 3 PRS. Implementation of the 3 PRS would further increase the TIN levels by 1.6% to 6.5% depending on the location of WSRs under Scenario 2 (with adoption of secondary processes for treating the Project sewage), but the increase would be minimized to 0.1% to 2.3% under Scenario 3 (with adoption of tertiary processes for treating the Project sewage). In terms of the absolute values, the TIN increase was 0.04 mg/L and 0.01 mg/L maximum under Scenarios 2 and 3 respectively. Details of the changes in TIN level predicted at the WSRs are presented in Table 7.7. The increases in TIN levels from the baseline conditions predicted at the above WSRs under Scenario 2 and Scenario 3 (with different sewage treatment level assumed) are considered small and minor and within the range of natural fluctuation. For comparison, the annual mean TIN level recorded at selected EPD Stations WM4, DM5, NM1, NM2 and NM5 (close to these WSRs) are 0.37-0.43 mg/L, 0.76-1.14 mg/L, 0.39-0.50 mg/L, 0.51-0.70 mg/L and 0.62-0.86 mg/L respectively between year 2011 and year 2013.

Table 7.7 Summary of Potential Water Quality Impacts with Mitigation Options during the Operational Phase (Total Inorganic Nitrogen)

Scenario	Mitigation Options Incorporated in Water Quality Modelling	WSRs with Non-compliances (Ref: Figure 3)	% Changes from Baseline Levels (Details refer to Appendix H and Appendix I; Please also see Note 1 below)					
Scenario 1 - Year 2036 Baseline "Without 3 PRS"	Not Applicable to Baseline without 3	Non-compliance with the WQO at beaches (B1 – B11)	Not Applicable					
Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR +	PRS Scenario	Non-compliance with the WQO at Tuen Mun Typhoon Shelter (T1)	Not Applicable					
TCNTDE + HKIA3RS + CT10 + IWMF + PRS at Southwest		Non-compliance with the WQO at Ma Wan fish culture zone (E1)	Not Applicable					
Tsing Yi + CMP at East Sha Chau + CMP at South Brothers but without the 3 PRS)		Non-compliance with the WQO at ecological resources (E 2-E4 and E6 –E20)	Not Applicable					
Scenario 2 - Year 2036 Operational Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE +	 Adoption of secondary treatment and disinfection 	Non-compliance with the WQO at beaches (B1 – B11)	Increase the baseline level of about 0.48 to 0.58 mg/L (predicted under Scenario 1) by about 0.01 to 0.02 mg/L or about 1.8 to 3%					
HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers + the 3 PRS)	processes for treating the Project sewage	treating the Project	treating the Project	treating the Project	treating the Project	treating the Project	Non-compliance with the WQO at Tuen Mun Typhoon Shelter (T1)	Increase the baseline level of about 0.53 mg/L (predicted under Scenario 1) by about 0.02 mg/L or about 3.0%(See Note 1)
Employing secondary treatment and disinfection in new STW for treatment of		Non-compliance with the WQO at Ma Wan fish culture zone (E1)	Increase the baseline level of about 0.50 mg/L (predicted under Scenario 1) by about 0.01 mg/L or about 2.2%					
Project sewage		Non-compliance with the WQO at ecological resources (E2-E4 and E6 –E20)	Increase the baseline level of about 0.51 – 1.12 mg/L (predicted under Scenario 1) by about 0.01 – 0.04 mg/L or about 1.6 to 6.5%					
Scenario 3 - Year 2036 Operational Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE +	 Adoption of tertiary treatment with disinfection and nitrogen removal for 	Non-compliance with the WQO at beaches (B1 – B11)	Increase the baseline level of about 0.48 – 0.58 mg/L (predicted under Scenario 1) by ≤0.01 or about 0.5% to 0.8%					
HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers + the 3 PRS)	treating the Project sewage	Non-compliance with the WQO at Tuen Mun Typhoon Shelter (T1)	Increase the baseline level of about 0.53 mg/L (predicted under Scenario 1) by <0.01 mg/L or about 0.6%					
Employing tertiary treatment and nitrogen removal in new		Non-compliance with the WQO at Ma Wan fish culture zone (E1)	Increase the baseline level of about 0.50 mg/L (predicted under Scenario 1) by <0.01 mg/L or 0.4%					

Scenario	Mitigation Options Incorporated in Water Quality Modelling	WSRs with Non-compliances (Ref: Figure 3)	% Changes from Baseline Levels (Details refer to Appendix H and Appendix I; Please also see Note 1 below)
STW for treatment of Project sewage		Non-compliance with the WQO at ecological resources (E2-E4, E6 –E20)	Increase the baseline level of about 0.51 – 1.12 mg/L (predicted under Scenario 1) by ≤0.01 mg/L or 0.1 to 2.3%

Note 1: All the TIN concentrations in absolute figures presented in this table are round up to 2 decimal places. For example, The TIN elevation at Tuen Mun Typhoon Shelter (T1) under Scenario 2 = Predicted TIN level under Scenario 2 of 0.54225 mg/L (round up to 0.54 mg/L in Appendix H) - Predicted TIN level under Scenario 1 of 0.52651 mg/L (round up to 0.53 mg/L in Appendix H) = 0.01574 mg/L (round up to about 0.02 mg/L as shown in this table). The TIN increase at Tuen Mun Typhoon Shelter under Scenario 2 = TIN elevation of 0.01574 mg/L (round up to about 0.02 mg/L in this table) ÷ TIN baseline level of 0.52651 (round up to 0.53 mg/L) x 100% = 2.9895% (round up to about

7.5.6 Moreover, the depth-averaged dissolved oxygen (DO) level predicted at Ma Wan fish culture zone (FCZ) (E1) breached the WQO. The depth-averaged DO level was predicted to be 4.51 mg/L under Scenario 2 (with the 3 PRS and adoption of secondary processes for treating the Project sewage), which was about 0.4% or 0.02 mg/L lower than the baseline level of 4.53 mg/L predicted under Scenario 1 (without the 3 PRS). With the adoption of more advance (or tertiary) treatment for the Project sewage under Scenario 3, the depth-averaged DO was improved to 4.52 mg/L, which was about 0.01 mg/L or about 0.2% lower than the predicted baseline "without 3 PRS" level of 4.53 mg/L. The 10th percentile depth-averaged DO levels predicted at the Ma Wan FCZ under all scenarios 1, 2 and 3 were similar to the existing DO level recorded at the EPD station closest to the FCZ (namely WM4) where the measured 10th percentile depth-averaged level was 4.08 mg/L, 4.06 mg/L and 3.96 mg/L in 2011, 2012 and 2013 respectively (also below 5 mg/L). Thus, the decrease in DO level from the baseline condition predicted at this FCZ under Scenario 2 and Scenario 3 (with different sewage treatment level assumed) is small and minor and within the range of natural fluctuation. It is also predicted that the DO levels would only be lower than the WQO value in three months in the wet season (June to August) under with and without PRS scenarios. The monthly averaged DO levels predicted at Ma Wan FCZ is presented in Appendix J, which indicates that the DO levels would be above 5 mg/L at the FCZ for most of the months in the assessment year. The depth-averaged DO levels predicted at all the remaining WSRs fully met the WQO. The bottom DO levels predicted at all the identified WSRs also fully met the WQO under all scenarios 1, 2 and 3. Details of change in depth-averaged DO level predicted at Ma Wan fish culture zone are summarized in Table 7.8.

Summary of Potential Water Quality Impacts with Mitigation Options Table 7.8 during the Operational Phase (Dissolved Oxygen)

Scenario (or Concurrent Projects Considered)	Mitigation Options Incorporated in Water Quality Modelling	WSR with Non-compliances (Ref: Figure 3)	% Changes from Baseline Levels (Details refer to Appendix H and Appendix I)
Scenario 1 - Year 2036 Baseline "Without 3 PRS" Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE + HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers but without the 3 PRS)	Baseline without 3 PRS Scenario	Non-compliance with the WQO for depth-average DO at Ma Wan fish culture zone (E1)	Not Applicable
Scenario 2 - Year 2036 Operational Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE + HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers + the 3 PRS) • Employing secondary treatment and	disinfection processes for treating the Project	Non-compliance with the WQO for depth-average DO at Ma Wan fish culture zone (E1)	Decrease the baseline level of about 4.53 mg/L (predicted under Scenario 1) by about 0.02 mg/L or 0.4%
disinfection in new STW for treatment of Project sewage			
Scenario 3 - Year 2036 Operational Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE + HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers + the 3 PRS)	treatment with disinfection and nitrogen removal for	Non-compliance with the WQO for depth-average DO at Ma Wan fish culture zone (E1)	Decrease the baseline level of about 4.53 mg/L (predicted under Scenario 1) by about 0.01 mg/L or about 0.2%
 Employing tertiary treatment and nitrogen 	-		

Scenario (or Concurrent Projects Considered)	Mitigation Options Incorporated in Water Quality Modelling	WSR with Non-compliances (Ref: Figure 3)	% Changes from Baseline Levels (Details refer to Appendix H and Appendix I)
removal in new STW for treatment of Project sewage			

7.5.7 Based on the model results, full compliance with the WQO for SS elevations would be achieved at all identified WSRs. However, one flushing water intake at future Tung Chung East (C12) would marginally exceed the WSD's target SS objective. However, the 3 PRS (under Scenarios 2 and 3) will increase the SS level at this intake point by around 0.1 mg/L or about 1 % only (as compared to the background SS level of 11.35 mg/L and the target objective of 10 mg/L). The SS increase from the baseline condition predicted at this intake point under Scenario 2 and Scenario 3 (with different sewage treatment level assumed) is considered small and minor and within the range of natural fluctuation. For comparison, the maximum SS level recorded at EPD Station NM3 (closest to this intake point) is 9.9 - 16.7 mg/L between year 2011 and year 2013. Considering that the SS level at the intake point would be increased by only about 0.1 mg/L and water treatment will be provided to treat the seawater to the required standard before distributing to the users, no significant environmental impacts would be anticipated due to this isolated SS non-compliance. Details of change in SS level predicted at this flushing water intake are summarized in Table 7.9.

Table 7.9 Summary of Potential Water Quality Impacts with Mitigation Options during the Operational Phase (Suspended Solids)

Scenario (or Concurrent Projects Considered)	Mitigation Options Incorporated in Water Quality Modelling	WSR with Non-compliances (Ref: Figure 3)	% Changes from Baseline Levels (Details refer to Appendix H and Appendix I; Please also see Note 1 below)
Scenario 1 - Year 2036 Baseline "Without 3 PRS" Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE + HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers but without the 3 PRS)	Not Applicable to Baseline without 3 PRS Scenario	Non-compliance with the target SS objective at flushing water intake at future Tung Chung East (C12)	Not Applicable
Scenario 2 - Year 2036 Operational Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE + HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers + the 3 PRS) Employing secondary treatment and disinfection in new STW for treatment of Project sewage	secondary treatment and disinfection	Non-compliance with the target SS objective at flushing water intake at future Tung Chung East (C12)	Increase the baseline level of 11.35 mg/L (predicted under Scenario 1) by about 0.1 mg/L or about 1%
Scenario 3 - Year 2036 Operational Scenario (with TM-CLKL + HZMB BCF + HZMB HKLR + TCNTDE + HKIA3RS + CT10 + IWMF + PRS at Southwest Tsing Yi + CMP at East Sha Chau + CMP at South Brothers + the 3 PRS)	treatment with disinfection and nitrogen removal for	Non-compliance with the target SS objective at flushing water intake at future Tung Chung East (C12)	Increase the baseline level of 11.35 mg/L (predicted under Scenario 1) by about 0.1 mg/L or about 1%
Employing tertiary treatment and nitrogen removal in new STW for treatment of Project sewage	ŭ		

- 7.5.8 Full compliances with the WQO for unionized ammonia (UIA) and *E. coli* were predicted at all identified WSRs under all the modeling scenarios.
- 7.5.9 Although non-compliances were predicted under the "without 3 PRS" and "with 3 PRS" scenarios, It is considered that the water body in the North Western, North Western Supplementary and Western Buffer WCZs would unlikely be under stress due to the following:
 - These three WCZs are open water body with good flushing / dispersion capacity and therefore the level of WQO compliance for the key parameters of concern to marine life (e.g. DO and UIA) was relatively good under the existing / baseline condition.

- The level of WQO compliance was low for TIN. TIN is however a nutrient which is not toxic to marine life and as such, the non-compliance would not impair the integrity of the water body and the ecosystem as a whole nor endanger sensitive uses e.g. beaches, breeding grounds, nor diminish beneficial uses.
- Moreover, red tide is a natural phenomenon in marine water induced by different environmental factors. TIN was not a critical factor for triggering red tide in these three WCZs as the existing red tide occurrence in these WCZs was very rare (despite the high rates of TIN non-compliances recorded in all the three WCZs).
- 7.5.10 In contrast, Deep Bay WCZ is a stressed water body and there is "No net increase in pollution loading policy" in this water body. Deep Bay WCZ is a shallow semi-enclosed water body with low water exchange rate and poor tidal flushing and therefore, pollution loading to the Deep Bay WCZ would tend to accumulate inside the bay and cannot be easily flushed out. The inner subzone of Deep Bay WCZ was most affected by the pollution discharges from both the Hong Kong and Shenzhen sides, and therefore the WQO non-compliances were frequently recorded in the inner subzone of Deep Bay WCZ for all the key WQO parameters including DO, UIA and TIN. The water quality in the outer subzone of Deep Bay WCZ (which is within the Study Area and influence zone of the 3 PRS) is however considered better due to the following:
 - The level of WQO compliances in the outer subzone of Deep Bay WCZ for the key parameters of concern to marine life (e.g. DO and UIA) was relatively good under the existing / baseline condition.
 - The level of WQO compliance was low for TIN. TIN is however a nutrient which is not toxic to marine life and as such, the non-compliance would not impair the integrity of the water body and the ecosystem as a whole nor endanger sensitive uses e.g. beaches, breeding grounds, nor diminish beneficial uses.
 - Moreover, red tide is a natural phenomenon in marine water induced by different environmental factors. TIN was not a critical factor for triggering red tide in the Deep Bay WCZ as the existing red tide occurrence in this WCZ was very rare (despite the high rates of TIN non-compliances recorded in this WCZ).
- 7.5.11 Two "with 3 PRS" scenarios, namely Scenario 2 and Scenario 3 respectively, were simulated. Scenario 2 adopted secondary treatment and disinfection facilities for handling of the Project sewage, which would represent a worse case as compared to Scenario 3, which adopted a more advance treatment (namely tertiary treatment plus nitrogen removal and disinfection) for the Project sewage. The PRS would unlikely to cause any significant adverse cumulative impacts to the water quality due to the following:
 - Under Scenario 2, the maximum increase in the annual mean TIN level (caused by the 3 PRS) was predicted at three ecological receivers (namely E3, E12 and E13 respectively) and the TIN increase predicted at these three receivers ranged from 0.03 to 0.04 mg/L or about 3 to 5% as compared to the predicted baseline level of 0.58 to 0.85 mg/L. The TIN increases predicted at the rest of the WSRs were smaller. The increases in TIN levels from the baseline conditions predicted at all the WSRs under Scenario 2 are small and minor and within the range of natural fluctuation. For comparison, the annual mean TIN level recorded at EPD Stations DM5, NM1, NM2 and NM5 (closest to the 3 PRS) are 0.76-1.14 mg/L, 0.39-0.50 mg/L, 0.51-0.70 mg/L and 0.62-0.86 mg/L respectively between year 2011 and year 2013. The increases in TIN levels from the baseline conditions predicted at all the WSRs under Scenario 3 are even smaller and thus also minor and within the range of natural fluctuation.
 - The maximum decrease in the 10th percentile DO level (caused by the PRS) predicted under Scenario 2 at the Ma Wan (FCZ) is about 0.02 mg/L or only 0.4% lower than the predicted baseline level of 4.53 mg/L. The decrease in DO level from the baseline condition predicted at this FCZ under Scenario 2 is small and minor and within the range of natural fluctuation. For comparison, the 10th percentile DO level recorded at EPD Station WM4 (closest to the Ma Wan FCZ) is 4.08–3.96 mg/L, between year 2011 and year 2013. The predicted decrease in DO level from the baseline condition at this FCZ under Scenario 3 is even smaller and thus also minor and within the range

- of natural fluctuation._It is predicted that the DO levels at Ma Wan fish culture zone would be lower than the WQO value in three months in the wet season (June to August) under both with and without 3 PRS scenarios.
- The maximum increase in the maximum SS level (caused by the PRS) predicted under Scenario 2 and Scenario 3 at the seawater intake at future Tung Chung East is about 0.1 mg/L or about 1% higher than the predicted baseline level of 11.35 mg/L. The predicted increase in SS level from the baseline condition at this intake point under Scenario 2 and Scenario 3 are small and minor and within the range of natural fluctuation. For comparison, the maximum SS level recorded at EPD Station NM3 (closest to this intake point) is 9.9 16.7 mg/L between year 2011 and year 2013.
- 7.5.12 In view of the above, beneficial uses of the water body would not be adversely impaired by the predicted changes in TIN and other parameters.
- 7.5.13 Having said that, Deep Bay WCZ is a stressed water body and there is "No net increase in pollution loading policy" in this water body. Mitigation options should be carried out to achieve "No net increase in pollution loading policy" in Deep Bay WCZ. Due to the low assimilative capacity of Deep Bay WCZ and high level of background pollution loading to the Deep Bay WCZ from both the Hong Kong and Shenzhen sides as well as the high background of TIN levels recorded in the Study Area, any further pollution discharge from the 3 PRS (in particular the PRS at Lung Kwu Tan which is close to the sensitive Deep Bay WCZ) should be reduced as far as practicable to minimize eutrophication, the associated effect on aquatic ecosystem and other adverse impacts on the marine waters of the Study Area. Future project proponents of the PRS should minimize the potential water quality impacts as far as practicable to protect the western waters from being non-compliance with TIN level and other parameters.

Strategic Mitigation Options

- 7.5.14 Deep Bay WCZ is a stressed water body and there is "No net increase in pollution loading policy" in this water body. To achieve the "No net increase in pollution loading policy" in the Deep Bay WCZ and to minimize the potential water quality impacts in other relevant WCZs within the Study Area, strategic mitigation options are recommended for the 3 PRS for consideration in future studies as follows.
- 7.5.15 There should be provision of new sewage treatment facilities to handle the sewage arising from the 3 PRS. Since there is no spare treatment capacity in the existing STWs near the PRS to treat the sewage arising from the PRS as advised by the Authority on completion of the concurrent projects in the area, it was assumed in this water quality impact assessment that new STWs would be implemented within the PRS at Lung Kwu Tan and PRS at Siu Ho Wan to accommodate the sewage flow generated from development on the 3 PRS. Two alternative sewage treatment options have been considered in the assessment including:
 - Option 1 Employing secondary treatment and disinfection in new STW for treatment of Project sewage (assumed in water quality modelling under Scenario 2).
 - Option 2 Employing tertiary treatment and nitrogen removal in new STW for treatment of Project sewage (assumed in water quality modelling under Scenario 3)
- 7.5.16 The above two sewage treatment options were simulated under this water quality modelling exercise for water quality sensitivity testing purpose. The details of these sewage treatment and disposal options, including the locations of new STWs as assumed will be subject to the findings of detailed technical and engineering assessments to be carried out during the next Project stage (including detailed SIA and statutory EIAs) with reference to the latest and updated information of future developments if the potential reclamations are carried forward.
- 7.5.17 Other than the above sewage treatment options that were incorporated in the modelling assessment, other mitigation options should also be explored and investigated in future detailed studies and assessments with more detailed technical and engineering details and

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latest/updated information of future developments. Proper reuse or recycling of the treated effluent from the new STWs for other beneficial uses (e.g. toilet flushing) is recommended to minimize the pollution loading to the marine water. Reduction of pollution from other sources (e.g. diversion of sewage to new STWs with higher treatment level, etc.) could be considered to minimize the pollution loading to the marine water. Implementation of green measures and infrastructures and best storm water management practices are also proposed to minimize storm pollution discharges induced by the PRS. In the water quality modeling, the effluent discharge point of the Project-based STW at the PRS of Lung Kwu Tan was assumed near the northern boundary of the PRS (relatively closer to the sensitive Deep Bay WCZ) for the worst case impact assessment on the water body of Deep Bay WCZ. Future project proponents of the PRS are recommended to locate the STW effluent discharge point near the southern boundary of Lung Kwu Tan PRS away from the Deep Bay WCZ as far as practicable to minimize the impact on Deep Bay WCZ water body. Future project proponents should also consider other possible mitigation measures to avoid and/or minimize the potential water quality impacts on the water bodies of the Study Area.

7.5.18 Implementation schedule of the proposed mitigation options under construction and operational phases is provided in **Appendix G** for proper follow up and consideration under the future studies.

8 ECOLOGICAL IMPACT ASSESSMENT

8.1 Assessment Criteria

- 8.1.1 Key guidelines, standards, documents and ordinances/regulations underpinning the conservation of habitats and species for assessment are provided below:
 - The Country Parks Ordinance (Cap. 208) provides for the designation and management of country parks and special areas. Country Parks are designated for the purpose of nature conservation, countryside recreation and outdoor education. Special areas are created mainly for the purpose of nature conservation.
 - The Forests and Countryside Ordinance (Cap. 96) prohibits felling, cutting, burning or destroying of trees and growing plants in forests and plantations on government land. Related subsidiary regulations prohibit the selling or possession of listed, restricted and protected plant species.
 - Under the *Wild Animals Protection Ordinance (Cap. 170)*, designated wild animals are protected from being hunted, whilst their nests and eggs are protected from injury, destruction and removal. All birds and most mammals, including marine cetaceans, are protected under this Ordinance.
 - Under the *Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586)*, the trade is threatened and endangered species and local possession of these species is controlled. *Cap. 586* replaces the "Animals and Plants (Protection of Endangered Species) Ordinance (*Cap. 187*)" on 1 December 2006. The Ordinance is the local legislation that implement CITES.
 - The Marine Parks Ordinance (Cap. 476) and Subsidiary Legislation allows for designation, control and management of marine parks and marine reserves through regulation of activities therein to protect, conserve and enhance the marine environment for the purposes of nature conservation, education, scientific research and recreation. The Ordinance came into effect on 1 June 1995.
 - The amended *Town Planning Ordinance (Cap. 131)* provides for the designation of coastal protection areas, Sites of Special Scientific Interest (SSSIs), Conservation Area, Country Park, "Green Belt" or other specified uses that promote conservation or protection of the environment.
 - Chapter 10 of the Hong Kong Planning Standard and Guidelines (HKPSG) covers
 planning considerations relevant to conservation. This chapter details the principles of
 conservation, the conservation of natural landscape and habitats, historic buildings,
 archaeological sites and other antiquities. It also describes enforcement issues. The
 appendices list the legislation and administrative controls for conservation, other
 conservation related measures in Hong Kong and government departments involved
 in conservation.
 - The Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), and its subsidiary legislation, which provides guidelines on the environmental impact assessment process.
 - Annex 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts. Annex 8 recommends the criteria that can be used for evaluating habitat and ecological impact.
 - EIAO Guidance Note No. 6/2010 clarifies the requirements of ecological assessments under the EIAO.
 - EIAO Guidance Note No. 7/2010 provides general guidelines for conducting ecological baseline surveys in order to fulfil requirements stipulated in the EIAO-TM.

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- EIAO Guidance Note No. 10/2010 introduces some methodologies in conducting terrestrial and freshwater ecological baseline surveys in order to fulfil requirements stipulated in the EIAO-TM.
- EIAO Guidance Note No. 11/2010 introduces general methodologies for conducting marine ecological baseline surveys.
- The Water Pollution Control Ordinance (Cap. 358) provides the main statutory framework for the declaration of water control zones to cover the whole of Hong Kong and the establishment of water quality objectives.
- ETWB TCW No. 29/2004 Registration of Old and Valuable Trees, and Guidelines for their Preservation sets out the procedures for registration of old and valuable trees on unleased Government land within built-up areas and tourist attraction spots in village areas. Guidelines are also given for preservation and maintenance of the registered trees.
- ETWB TCW No. 5/2005 Protection of Natural Streams/Rivers from Adverse Impacts
 arising from Construction Works provides an administrative framework to better
 protect all natural streams/rivers from the impacts of construction works. The
 procedures promulgated under this Circular aim to clarify and strengthen existing
 measures for protection of natural streams/rivers from government projects and
 private developments.
- DEVB TC(W) No. 10/2013 Tree Preservation sets out the policy on tree preservation, and the procedures for control of tree felling, transplanting and pruning in Government projects.
- DSD Technical Circular No. 2/2004 Protection of Natural Rivers and Streams from Adverse Impacts Arising from Construction Works provides guidelines for the planning and execution of construction works and for the vetting of public and private development proposals that affect natural rivers and streams, i.e. including those not classified as environmentally sensitive.
- The IUCN (International Union for Conservation of Nature) Red List of Threatened Species provides taxonomic, conservation status and distribution information on taxa that have been evaluated using the IUCN Red List Categories and Criteria. This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those taxa that are facing a higher risk of global extinction. The IUCN Red List also includes information on taxa that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme.
- The Key Protected Wildlife Species List details Category I and Category II protected animal species under the PRC's Law on the Protection of Wildlife.
- United Nations Convention on Biodiversity (1992) requires signatories to make active
 efforts to protect and manage their biodiversity resources. Hong Kong Government has
 stated it will be "committed to meeting the environmental objectives" of the Convention
 (PELB, 1996). The convention includes the Indo-Pacific Humpback Dolphin (Sousa
 chinensis), locally known as Chinese White Dolphin (CWD), as a protected species.
- Convention on the International Trade in Endangered Species of Flora and Fauna (CITES) lists Sousa chinensis in Appendix I. Certain types of corals are also listed in CITES, including blue coral (Heliopora coerulea), organ pipe corals (family Tubioporidae), black corals (order Antipatharia), stony coral (order Scleractinia), fire corals (family Milleporidae) and lace corals (family Stylasteridae). The import, export and possession of the listed species are locally regulated via Cap. 586.
- The Convention of Migratory Species of Wild Animals (Bonn Convention) aims to develop international cooperation with a view to the conservation of migratory species of wild animals. Terrestrial, marine and avian migratory species were included, while the species threatened with extinction are listed as Appendix I of the Convention.

8.2 Assessment Methodology and Assumptions

Study Area

- 8.2.1 The study area for the purpose of the terrestrial ecological assessment included areas within a distance of 500 m from the PRS boundaries and the areas likely to be impacted by the 3 PRS. This included the Tai Ho Stream Site of Special Scientific Interest (SSSI), Lung Kwu Tan Valley SSSI, Siu Lang Shui SSSI, Lung Kwu Chau, Tree Island and Sha Chau SSSI, and other areas likely to be impacted by the 3 PRS.
- 8.2.2 The marine ecological impact assessment is based on the conclusions of the water quality modeling, which covered four Water Control Zones (WCZ): North Western, North Western Supplementary, Western Buffer and Deep Bay WCZ. The key ecological receivers were located in the Northwestern WCZ, Deep Bay WCZ and the northwestern portion of the Western Buffer WCZ. Ecological receivers located outside these areas are unlikely to be affected. The terrestrial and marine ecological resources and sites of conservation importance in the study area (see **Figure 4**) were identified.

Literature Review and Ecological Survey

- 8.2.3 The assessment was undertaken based on information and data published in previously approved statutory EIA reports and other relevant studies available, with the support of site surveys to fill information gaps identified during the literature review. Terrestrial habitat/vegetation surveys were undertaken within the 500 m PRS study area, between November and December 2013, and covered areas where information gaps have been identified from previous studies. The methodologies for ecological surveys and impact assessment were prepared in accordance with the criteria and guidelines in Annexes 8 and 16 of the EIAO-TM and EIAO Guidance Note No. 10/2010.
- 8.2.4 For the marine ecological resources (e.g. corals, seagrass beds, mangroves, other intertidal, subtidal, and benthic habitats) which may be impacted by the proposed reclamations, their baseline conditions were established through desktop study/literature review of available existing documents. For CWD, a site-specific field monitoring surveys were conducted at the 3 PRS under Land Supply Study of CEDD from August 2013 to February 2014. The surveys aimed to study CWD usage in nearshore waters to better understand their occurrence and behaviour in shallow waters of the 3 PRS. These surveys consisted of land-based surveys and theodolite tracking at LKT and SHW, and Passive Acoustic Monitoring (PAM) at all 3 PRS. These surveys findings are summarized in **Table 8.1** below, which were inputted to the ecological impact assessment to identify and evaluate the potential impact to CWD resulting from the development of the 3 PRS.

Table 8.1 Summary of Key Findings from Report on Study of CWD Behaviour in Shallow Waters

Aspects	Lung Kwu Tan	Siu Ho Wan	Sunny Bay
Land-based Theod	olite		
Detections recorded (# of 10 min segments)	63	122	N/A (No land-based
Location of CWD tracks	CWDs regularly used the area about 700m from the shore, just outside the proposed reclamation footprint	CWDs regularly used areas within proposed reclamation footprint in water deeper than 4-5m, with closest sighting at about 160m from shoreline.	survey)

Aspects	Lung Kwu Tan	Siu Ho Wan	Sunny Bay
Activity based on observations from land	Directional (resting/travelling) 26%	Directional (resting/travelling) 51%	
	Foraging 23%	Foraging 16%	
	Milling 51%	Milling 27%	
	Socialising 0%	Socialising 6%	
Change in activity	Not obvious	Not obvious	
in response to			
vessel presence			
PAM			
Usage of the area	Presence of CWDs was highest during the late winter/early spring period, lowest during the late summer/fall period	Presence of CWDs was highest during the late summer/fall period and lowest during the late winter/early spring period	Low and probably only occasional CWD use
Diel and seasonal pattern	Diurnality: Clear trend with more detections during night-time Seasonality: Highest # of detections in late winter/ early spring period	Diurnality: Strong diel trend with more detections during night-time Seasonality: Highest # of detections in late summer/ fall period	No clear pattern of diurnality or seasonality

Limitations and Assumptions

- 8.2.5 The ecological impact assessment was carried out with a number of assumptions, as given in following sections.
- 8.2.6 Assessments were made based on the preliminary proposed reclamation layouts, which are subject to the actual land use requirements and reclamation scheme to be determined under the future detailed studies including planning and engineering studies and statutory EIAs.
- 8.2.7 Construction schemes referred to in this Assignment are not the final proposal for this Project. They are only preliminary proposal based on current normal practice and set out solely for the purpose of this ecological impact assessment. Detailed reclamation construction design will be carried out under the future planning and engineering studies to determine the final reclamation or construction schemes for the Project.
- 8.2.8 Ecological impact assessment was carried out with reference to the assessment of hydrodynamic and water quality changes due to the 3 PRS during both construction and operational phases with a number of assumptions as presented in **Section 7** above.

8.3 Ecological Resources

8.3.1 Ecological resources were identified from literature review and ecological surveys. Habitats identified to be lost from the 3 PRS are summarized in **Table 8.2** below.

Table 8.2 Area of Habitat Loss within Study Area for each PRS

	Lu	Lung Kwu Tan PRS		Siu Ho Wan PRS			Sunny Bay PRS		
Habitat Type	Total Habitat Area within Study Area (ha)	Area of Permanent Habitat Loss (ha)	Ecological Value of the Habitat	Total Habitat Area within Study Area (ha)	Area of Permanent Habitat Loss (ha)	Ecological Value of the Habitat	Total Habitat Area within Study Area (ha)	Area of Permanent Habitat Loss (ha)	Ecological Value of the Habitat
Developed Area/Wasteland	115.7	0	Low	107.9	0	Low	53.7	0	Low
Agricultural Area	2	0	Low	0	0	-	0	0	-
Natural Watercourse	0.2 km	0	Low to Moderate	0	0	-	0.9 km	0	Low to Moderate
Modified Watercourse	3 km	0	Low	2.5 km	0	Low	0.6 km	0	Low
Plantation	10.3	0	Low	5	0	Low	16.7	0	Low
Grassland	0	0	-	0.2	0	Low	0.1	0	Low
Shrubland	146.7	0	Low to High	51	0	Low to High	78.7	0	Low to Moderate
Woodland	2.1	0	Moderate to High	1.7	0	Moderate	0	0	-
Marsh	0.03	0	Low to Moderate	0	0	-	0	0	-
Rocky Shore	3.7 km	3 km	Low	0.6 km	0	Low	2.1 km	0.4 km	Low
Sandy Shore	2.4 km	2.4 km	Low	0	0	-	0.3 km	0	Low
Artificial Shore	2.4 km	0.9 km	Low	4.3 km	2.8 km	Low	3.0 km	2.5 km	Low
Hard / Soft Substrata Subtidal Habitat	492.2	240	Low to Moderate	343.1	140	Low to Moderate	289.6	100	Low to Moderate
Sea Area (Pelagic Habitat)	492.2	240	Low to Moderate	343.1	140	High	289.6	100	Low

Remark: Habitat loss along shoreline is shown in length.

8.4 Impacts from each of the Three PRS

Chinese White Dolphins

- 8.4.1 Impacts to CWD were identified as the major issues to the 3 PRS. Various construction and operational phase impacts to CWD resulting from development of the 3 PRS were identified and evaluated. The major findings at each PRS comprise:
 - Lung Kwu Tan PRS: CWD use the water area at about 700m from the shore and beyond as important foraging and milling habitat (see Figure 5). The findings suggested that development of this site will not result in direct CWD habitat loss. The main identified impact resulting from development at Lung Kwu Tan would be disturbance from construction phase activities.
 - **Siu Ho Wan PRS**: CWD detections were higher overall at Siu Ho Wan than at Lung Kwu Tan which suggested more intensive use of the Siu Ho Wan area by CWD. CWD use the area within the proposed reclamation footprint in Siu Ho Wan where a relatively deep channel exists frequently. The minimum distance from shore of any sighting was about 160m (see **Figure 5**). On this basis, Siu Ho Wan would appear to constitute an important habitat for CWD. The main identified impacts resulting from development of Siu Ho Wan PRS would be habitat loss and carrying capacity loss resulting from reclamation works during construction/operational phase, disturbance from construction phase activities, potential CWD vessel collision injury and disturbance from High Speed Ferries (HSF) (if Siu Ho Wan PRS is to be serviced by new HSF route) and potential indirect impacts to the proposed BMP.
 - **Sunny Bay PRS**: Sunny Bay is either not used by dolphins or is used only on an occasional basis. In any event, this location is at the eastern periphery of the CWD's current range in Hong Kong, and therefore is unlikely to be a CWD hotspot. No moderate or high level impacts to CWD were identified relating to development of the Sunny Bay PRS. Historically, CWD were recorded in low densities around northeastern Lantau, and they are now rarely recorded from this area.

Other Ecological Resources

- 8.4.2 Other than CWD, assessment revealed that no habitat loss or fragmentation of terrestrial habitats would be expected within the study areas of the 3 PRS. However, potential impacts on common coral communities and Little Egret would be anticipated due to the loss of intertidal habitats at existing seawalls of the PRS. Potential impacts on adult horseshoe crabs using the seabed habitats for transit would also be anticipated due to the loss of seabed habitats within the 3 PRS.
- 8.4.3 No potential significant impacts would be anticipated in sites of conservation importance including Siu Lang Shui SSSI, Lung Kwu Chau, Tree Island and Sha Chau SSSI, AR inside the SCLKCMP, or Lantau North (Extension) Country Park, Tai Ho Stream SSSI. However, potential impacts to the proposed BMP (important for CWD) and Lung Kwu Tan Valley SSSI (important for butterflies) would be anticipated

8.5 Cumulative Impacts with Consideration of Other Concurrent Projects

- 8.5.1 Cumulative impacts are the combined effects of a single project or multiple projects. The individual impacts from a single development may not be significant on their own but when combined with other impacts, those impacts could become significant (Cooper, 2004).
- 8.5.2 Based on the key impacts arising from the 3 PRS, cumulative impact assessment on ecological resources taking into consideration the impacts from other relevant concurrent projects was undertaken. To assess such cumulative effects, it is necessary to understand:
 - what concurrent projects are likely to take place
 - what potential impacts associated with the concurrent projects are likely to affect

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identified sensitive receivers

8.5.3 All possible concurrent projects as identified in **Appendix B** have been reviewed and only projects with potential to cause cumulative ecological impacts are considered in this evaluation. Concurrent projects included in this evaluation are summarized in **Table 8.3** below.

Table 8.3 Summary of Current and Planned Projects in Western Hong Kong Waters Considered in Cumulative Ecological and Fisheries Impact Assessment

Project	Nature of the Project	Permanent Area of Reclamation	Indicative Construction Programme	Status	
PRS at Lung Kwu Tan PRS at Siu		240 ha ⁽¹⁾	End 2019 – Mid 2030, with majority of marine works completed by Mid 2023 End 2019 – Mid 2030, with	Under feasibility /	
Ho Wan	Reclamation for land supply	/4)	majority of marine works completed by Mid 2023	strategic environmental	
PRS at Sunny Bay		100 ha ⁽¹⁾	Early 2019 – Mid 2022, with majority of marine works completed by Mid 2022	studies	
TM-CLKL	Dual 2-lane carriageway between Northwest New Territories and HZMB HKBCF	48 ha	To be completed by 2018	Under Construction	
HZMB HKBCF	Reclaimed Island with boundary crossing facilities and serves as transfer point for road traffic between HZMB HKLR and TM-CLKL.	138 ha	To be completed by 2016	Under Construction	
HZMB HKLR	Dual 3-lane carriageway connecting the HZMB HKBCF.	30 ha	To be completed by 2016	Under Construction	
TCNTDE	New town development extension for accommodate 220,000 population to meet housing and other development needs.	134 ha	2018 – 2024	Under engineering and environmental impact assessment study	
HKIA3RS	Land reclamation for construction of third runway north of existing airport.	672 ha ⁽²⁾	Mid 2015 – Mid 2023, with majority of marine filling works completed by late 2018	Environmental Permit issued on 7 November 2014	
CT10 / PRS at Southwest Tsing Yi	Land Reclamation for Container Terminal 10 / PRS at Southwest Tsing Yi (Remark: This PRS may be used for CT10 or other uses subject to further review)	180 ha ⁽³⁾⁽⁴⁾	Not available	Under planning / feasibility study - Implementatio n programme not yet available	
CMPESC	Disposal of marine mud	-	Construction completed	The CMP is currently	

Project	Nature of the Project	Permanent Area of Reclamation	Indicative Construction Programme	Status
				closed and will be re-opened for mud disposal in 2016 for completion in 2023.

Remarks:

- (1) The preliminary layouts derived from broad technical assessments under Land Supply Study were adopted in the assessment, which showed approximate reclamation area of 240 ha, 140 ha and 100 ha for PRS at Lung Kwu Tan, Siu Ho Wan and Sunny Bay respectively whilst their possible extent are 200-300 ha, 100-150 ha and 60-100 ha respectively. The final or proposed reclamation layouts are to be determined under future detailed studies.
- (2) The total habitat affected is 672 ha (**650 ha reclamation** + 22 ha (seawall toe) plus 10 ha (sour apron area) less 10 ha (i.e. excluding the existing seawall toe area).
- (3) The extent was estimated based the proposed reclamation size of the EIA Study Brief for "Container Terminal 10 (CT10) Development at Tsing Yi" (Study Brief No.: ESB-194/2008) which would be greater than the proposed reclamation site at Southwest Tsing Yi (i.e. 80-120 ha) in order for a conservation assessment.
- (4) Reclamation at CT10 falls outside the normal current/historic range of CWD.
- 8.5.4 Sensitive ecological receivers that may be impacted by the PRS and/or other projects were identified from the cumulative impact assessment. The scale of impacts resulting from individual projects as well as the cumulative impacts has been assessed, using a seven point scale, based on:
 - Likely impacts identified for the 3PRS (PRS at Lung Kwu Tan, Siu Ho Wan, Sunny Bay)
 - Results presented in approved EIA Reports (TM-CLKL, HZMB HKBCF, HZMB HKLR,HKIA3RS)
 - Likely impacts identified in Project Profile, Study Brief and Draft Technical Paper on Preliminary Environmental Assessment (TCNTDE)
 - Information from water quality modelling for the PRS project (CMPSE; PRS at Southwest Tsing Yi, CT10)
- 8.5.5 The seven point scale corresponds to the following impact assessment categories:
 - XXXXXX Very High
 - XXXXX High
 - XXXX Moderate-High
 - XXX Moderate
 - XX Minor-Moderate
 - X Minor
 - Insignificant/Negligible/No Impact

Chinese White Dolphins

- 8.5.6 Cumulative impact assessment identified six moderate to high level impacts that would affect CWD as listed below. Impact from individual project before considering the mitigations measures / options committed by the relevant concurrent projects and the resulting cumulative impacts to CWD were evaluated in **Table 8.4**.
 - **Habitat Loss:** The projects included in the cumulative impact assessment would result in a total of about 1,500 ha of permanent CWD habitat loss.
 - **Habitat Fragmentation:** The only project identified to cause significant habitat fragmentation impacts is the HKIA3RS. The area to the north of the existing airport island is a preferred travel corridor for CWD, connecting core habitats near The Brothers to the East, and West Lantau/SCLKC MP to the West. Part of this area will be lost as a result of land formation for the new runway. The PRS were planned within existing bays, and were not predicted to contribute to fragmentation impacts.
 - Carrying Capacity: The HKIA3RS EIA and the current 3 PRS assessment both identified moderate impacts to carrying capacity with reference to the size and quality of available CWD habitat. The HKIA3RS EIA notes that although the size of habitat impacted by the third runway project is relatively small, its loss would have an unknown impact on the carrying capacity for the Hong Kong CWD habitat as a whole. Based upon a precautionary approach, this impact was therefore considered moderate. Given the known importance of the SHW PRS and adjacent areas to CWD, carrying capacity impacts resulting from reclamation works in this area are also considered moderate.
 - Injury from Vessel Collision and Disturbance from HSF: The HKIA3RS EIA identified vessel collision and HSF disturbance as significant impacts because vessel movements from the Sky Pier and other ferry berths in western Hong Kong waters would be restricted to a narrower corridor due to the expanded airport land platform. If new HSF routes are established for the 3 PRS, particularly for the Siu Ho Wan PRS, this would result in potential significant impacts to CWD populations.
 - There would also be a potential interaction between the HKIA3RS and Lung Kwu Tan PRS relating to vessel collision and disturbance. One of the HKIA3RS mitigation measures requires route and speed restrictions on HSFs from the Sky Pier, with some marine traffic likely re-routed north through Urmston Road. The Lung Kwu Tan PRS would likely result in a narrowing of habitat between SCLKC MP and Lung Kwu Tan, depending on actual seawall design and reclamation configuration. This combination of increased traffic moving through a narrower habitat would increase the potential for vessel strike from HSF.
 - Construction Disturbance: Disturbance during the construction phase is considered
 a minor-moderate/moderate impact in most of the relevant project EIA that could be
 minimized with standard good construction practices. It was noted however, that Hung
 (2014) observed that noticeable drops in dolphin encounter rates between 2011-2013
 around north-east Lantau coincided with the commencement of reclamation works for
 the HKBCF, HKLR and HZMB. These observations suggest that greater caution
 should be exercised in assessing potential impacts resulting from reclamation
 construction activities.
 - Impacts to Marine Parks: The HKIA3RS and the Siu Ho Wan PRS would have potential impacts on the proposed BMP. The HKIA3RS EIA noted that there are potential impacts to the proposed BMP resulting from the HKIA3RS as a consequence of indirect construction phase disturbance, and indirect impacts during the operational phase relating to HSF operations, fragmentation impacts and hydrodynamic changes. Together with Siu Ho Wan PRS, these two projects could cause cumulative impacts that would significantly degrade the value of the proposed BMP to CWD, particularly if there are concurrent construction phase activities for the projects close to the proposed BMP. These impacts would need to be minimized through a review of works

schedules to avoid cumulative potentially high disturbance activities close to the proposed BMP.

Other Ecological Resources

- 8.5.7 The cumulative loss of coral communities, which include species of conservation importance, is the predominant impact to coral communities and is likely to result in moderate impact before mitigation. However, some of the concurrent projects with the potential to impact gorgonians and ahermatypic corals (e.g. TMCLKL) have/will translocate corals to new sites to minimise these impacts. In addition, the artificial shores constructed for these reclamation projects have the potential to provide some new habitat which should help compensate for the loss. To further reduce the cumulative impacts mitigation measures to minimize the direct loss of uncommon hard corals are recommended for the PRS.
- 8.5.8 The assessment also identified minor moderate cumulative water quality impacts on Tai Ho Wan due to the potential change in water quality, moderate cumulative impacts to horseshoe crab and, minor-moderate cumulative impacts to avifauna species of conservation importance due to the loss of artificial and rocky shores by reclamations.

Table 8.4 Cumulative Impacts to Chinese White Dolphin (Without Mitigation)

Project	Direct Impacts		Indirect Impacts			Secondary Impacts		Impact		
	Habitat Loss	Habitat Fragmentation	Carrying Capacity ⁶	Injury from Underwater Shockwaves	Injury from Vessel Collision and Disturbance from HSF	Construction Disturbance	Water Quality	Prey Resources	Impacts to Marine Parks	Interactions
Project Phase	C+O	C+O	C+O	С	0	С	C+O	C+O	C+O	
PRS at LKT	Х	Х	Х	-	_3	XXX	Х	Х	Х	XXX
PRS at SHW	XXXXX	Х	XXX	-	XXXXX ³	XXXX	Х	Х	XXXX	XXXXX
PRS at SB	-	Х	Х	-	X ³	Х	Х	Х	-	Х
Sub-Total / Summary ¹	XXXXX	х	XXX	-	XXXXX ³	XXXX	XX	х	xxxxx	XXXXX
TM-CLKL	XX	Х	-	-	XX	XX	Х	n/a	-	XX
HZMB HKBCF	XXX	-	-	-	XX	XXX	XX	-	-	XXX
HZMB HKLR	XX	Х	-	-	XX	XXX	XX	-	-	XX
TCNTDE ²	Х	Х	-	-	Х	Х	Х	Х	Х	Х
HKIA3RS	XXXXX	XXX	XXX	-	XXXXX	X - XXX	Х	Х	X - XXX	XXXXX
CT10 / PRS at Southwest Tsing Yi	-	-	-	-	-	-	-	-	-	-
CMPESC	-	-	-	-	-	-	-	-	-	-
Sub-Total / Summary ⁴	XXXXX	XXX	XXX	-	XXXXX	XXX	XX	XX	XXX	XXXXX
Cumulative Impact for Projects ⁵	xxxxxx	xxx	xxxx	-	xxxxxx	XXXX	xx	xx	xxxxx	XXXXXX

Remarks:

- 1. This sub-total is for the cumulative impacts of the three PRSs only (not including other concurrent projects),
- 2. Assessment based on Project Profile.
- 3. Impact resulting from High Speed Ferries. It is assumed that no new HSF routes would service the Lung Kwu Tan PRS due to the difficulty in berthing in the area subject to strong ocean current, but additional routes have not been ruled out for the Siu Ho Wan and Sunny Bay PRS in this cumulative impact assessment.
- 4. This sub-total is for the cumulative impacts of other concurrent projects (not including the three PRS).
- 5. This sub-total is for the cumulative impacts of the three PRSs as well as other concurrent projects.
- 6. Impact on carrying capacity refers to human activities with potential to reduce the maximum population size of CWD occurring in Hong Kong waters, including a reduction in the availability of habitat for prey species, as well as reduction of area available for CWD feeding, socializing and other activities.

n/a - Not Assessed

8.6 Strategic Mitigation and Enhancement Options

8.6.1 In order to mitigate the predicted overall cumulative impact, strategic mitigation and enhancement options are recommended for the 3 PRS as listed in the following sections and presented in **Appendix G**. Mitigations for the other concurrent projects (see **Table 8.3** and **Appendix B**) contributing to the overall cumulative impact as presented in the relevant approved EIA Reports, Project Profile, Study Brief and Draft Technical Paper, were also taken into account for mitigating the overall cumulative impact.

Avoidance

- 8.6.2 Review and reduce reclamation extent, in particular for Siu Ho Wan PRS, to avoid direct impacts to CWD habitat and restrict reclamation to shallower waters, i.e. seabed level above -5mCD. Siu Ho Wan PRS should also avoid direct impacts to the proposed BMP taking into consideration the latest proposed BMP site boundary.
- 8.6.3 For construction activities, underwater percussive piling and blasting works should not be adopted to avoid impacts on CWD. The construction programme should be formulated to ensure that noisy construction phase activities for the PRS at Lung Kwu Tan and Siu Ho Wan do not coincide with the key CWD calving season (May-June).

Minimization

- 8.6.4 All available construction methods and programming that help reduce impacts from dredging, filling, construction phase marine traffic and minimize underwater noise should be adopted for the 3 PRS. Any other water quality mitigation measures should be taken into account in order to fully address potential marine-ecological cumulative impacts.
- 8.6.5 Key measures proposed to minimize impacts to CWD included:
 - Dolphin exclusion zones should be established and monitored to minimize potential impacts to CWD from construction activities.
 - Speed restrictions of 10 knots or less should be set for construction vessels moving within the areas where CWDs are likely to occur to minimize disturbance from underwater noise and reduce risk of ship strikes.
 - The use of marine construction vessels should be controlled or limited (e.g. by setting up temporary fill areas and transporting fill to the reclamation site via pipes; using land-based construction vehicles instead of vessels, etc) to minimize noise disturbance underwater as well as the risk of harming the CWDs by ship strikes.
 - Explore all available construction methods and good site practice that help to minimize underwater noise and water quality impact.
- 8.6.6 High Speed Ferries are recognized threat to CWDs, and if new routes are established to service the PRS, substantial direct and indirect impacts are likely to occur. If possible, the 3 PRS should not be serviced by HSF with alternative transportation links adopted.
- 8.6.7 Coral translocation should be conducted with a detailed translocation plan to minimize cumulative impacts resulting from the direct loss of coral colonies and avoid disturbance to the coral colonies.
- 8.6.8 Impacts on horseshoe crabs should be minimized by proper seawall design to reduce the PRS footprint and by minimizing water quality impacts through the implementation of eco-friendly construction methods and good site practices.
- 8.6.9 Controlling lighting during night-time, acoustic decoupling of construction equipment and good site practices should be adopted to reduce indirect disturbance impacts to terrestrial habitats in particular the Lung Kwu Tan Valley SSSI and associated wildlife including butterfly arising from the land-based activities during the construction and operational

phases.

Compensation

8.6.10 For the concurrent projects, two new marine parks would be established under the HKIA3RS and HZMB projects for mitigation of CWD habitat loss under their projects. The implementation of the avoidance and minimization measures recommended above, in particular the reduction in the reclamation extent of Siu Ho Wan PRS, was anticipated to address most of the identified impacts on CWD by the 3 PRS. It was likely that the BMP proposed by HZMB project would be enlarged to cover the CWD habitat identified within Siu Ho Wan PRS. No compensation measures for the 3 PRS was considered necessary at this stage. Compensatory measures would however still be considered if found to be necessary during the subsequent EIA.

Enhancement Options

8.6.11 Enhancement measures were proposed for consideration in addition to the recommended mitigation measures, for example, eco-enhancement seawall designs and reduction in marine traffic.

Eco-enhanced Seawall Designs

- 8.6.12 Some of the features that could be considered for the seawalls include:
 - Increased Diversity of Seawall Morphology: Changing the shape (e.g. decreased slope and linearity) of the seawall can provide a greater range of micro-habitats for intertidal species.
 - *Increased Material Heterogeneity*: Seawalls constructed of boulders of various sizes can create a greater range of micro-habitats for intertidal species.
 - **Use of Vegetation**: Providing opportunities for vegetation establishment along the seawall (e.g., backshore vegetation) can increase habitat diversity.
 - Offshore Reefs: Providing small off-shore reefs close to the toe of the seawall can provide a habitat for fish and other marine wildlife. These reefs can also help protect the seawall from wave action and erosion.
- 8.6.13 The PRS and other concurrent projects would result in the loss of intertidal habitats (artificial and rocky shores) and seabed. The loss of these habitats could be compensated through the provision of eco-friendly designed seawalls. In the western waters hard bottom substrate is limiting as most substrates are large open expanses of soft mud or muddy sands. This limits hard substrate available for colonising sessile organisms. The provision of eco-friendly designed seawalls would provide opportunities for sessile organisms to colonise and increase the diversity and heterogeneity of the seawalls thereby increasing habitat quality for other species such as juvenile fish and shrimp.
- 8.6.14 These measures may also provide some enhancement to CWD populations. In particular, the increased diversity of inter-tidal microhabitats at seawall and the provision of offshore reefs would provide enhancement to the general marine environment locally. This would provide a better habitat for fish species including potential prey items of CWD, thus creating areas of probably higher value for foraging. Measures on deployment of artificial reefs and fish stocking to enhance CWD prey resources could also be explored.

Reduction in Marine Traffic

8.6.15 High speed ferries are thought to cause significant impacts to CWD through vessel collisions, acoustic disturbance and habitat fragmentation. Reducing the volume of marine traffic, especially those to and from the Sky Pier, imposing speed limits, and realigning marine traffic routes (e.g. move the high-speed ferry route south of Lantau Island further south) may therefore reduce impacts to CWD and enhance the quality of degraded CWD habitats. The following sections present a preliminary assessment of implementing such measures.

- Reduce Marine Traffic Volume: The number of HSF in Hong Kong waters has increased dramatically since 1999, with most of this increase resulting from rising traffic between Hong Kong and Macau (Hung, 2012, 2013). The opening of the HZMB will offer alternative transit links between Hong Kong and Macau, and will likely result in reduced marine traffic (HyD, 2009). To realize the benefits of this reduction, new projects should be carefully considered to ensure they do not result in additional HSF traffic.
- **Speed Limits:** The operation of the Hong Kong Airport Sky Pier has been associated with a decrease in CWD abundance to the NE of the airport. Imposing a speed limit on ferries operating in this area would help mitigate potential impacts resulting from Sky Pier operation. Speed and route limits on vessel traffic using the Sky Pier have been proposed as part of mitigation measures outlined in the HKIA3RS EIA report, and supported by the ACE EIA Sub Comm. Although international studies have indicated that the ideal speed limit for marine mammal conservation would be 10 knots, any significant reduction in speed below the 30-40 knots currently attained by some ferries would be preferable. More widespread implementation of speed limits for HSF in HK waters would need discussion with various stakeholders including ferry operators, Marine Department and local residents.
- Re-routing of Marine Traffic South of Lantau: High Speed Ferries operating along the southern Lantau coast appear to have caused fragmentation impacts to CWD in this area, and may have led to a reduction in CWD usage of the Soko Islands (Hung, 2012, 2013). Relocation of ferry routes further south could reduce these impacts. However, there are safety issues to consider with this approach: alternative routes south of the Soko Islands are likely to be much less sheltered, potentially exposing HSFs to larger waves and rougher seas. Furthermore, shifting these routes further south would potentially lead to secondary impacts to the Indo-Pacific Finless Porpoise (Neophocaena phocaenoides), which is widely distributed in areas south of Lantau. Taking these factors into consideration, it does not appear that this is a preferred enhancement option.
- Re-routing of Marine Traffic in Urmston Road: There are limited opportunities to re-route traffic currently using Urmston Road. There are no alternative routes nearby, as Urmston Road is bordered by the New Territories coastline to the north, and the existing SCLKC MP and planned BMP and HKIA3RS MP to the south.
- 8.6.16 Other general measures that could be considered for implementation to promote CWD conservation in Hong Kong waters have been reviewed, including water quality improvements, acoustic modelling and monitoring, and increased collaboration between Hong Kong and PRC. The feasibility of implementing these enhancement measures and other possible mitigation measures should be explored and investigated in future studies and assessments when more concrete development details are available.

8.7 Potential Issues

Lung Kwu Tan PRS

- 8.7.1 Site-specific monitoring data of the Study of CWD Behaviour in Shallow Waters indicated that the Lung Kwu Tan PRS is of low-moderate value to CWD, with adjacent areas being of high value. The main identified impact resulting from development of the PRS would be construction phase disturbance, considered moderate in scale. Disturbance from construction activities can be mitigated through various construction methodologies such as establishment of land-based construction, traffic control, general good site practice and establishment of dolphin exclusion zones. Assuming these measures can be effectively implemented, it is anticipated that there would be limited potential issues for PRS at Lung Kwu Tan.
- 8.7.2 Implementation of a translocation strategy for coral colonies affected by the PRS will also help to minimise the contribution of this project to cumulative impacts on corals in the North

Western Waters.

- 8.7.3 The implementation of good site practices relating to air quality and noise in addition to buffer planting will help to minimise indirect impacts to habitats and associated species near the PRS. This is particularly relevant to the butterfly populations at the nearby Lung Kwu Tan Valley SSSI. Significant impacts resulting from disturbance therefore are not anticipated.
- 8.7.4 With the implementation of recommended mitigation measures, it is considered that potential issues resulting from Lung Kwu Tan PRS would be minor and acceptable, subject to the findings of statutory EIA.

Sunny Bay PRS

- 8.7.5 Historically, CWDs were recorded in low densities around northeastern Lantau, and they are now rarely recorded from this area. Site-specific monitoring data of the Study of CWD Behaviour in Shallow Waters indicated that the Sunny Bay PRS is of low value to CWD, with surveys indicating that the location is either not used by CWD or is used on a very occasional basis. With the implementation of mitigation measures, it can be suggested that potential issues at Sunny Bay can be reduced to acceptable levels. This would need further review and confirmation during the detailed EIA for this Project.
- 8.7.6 Implementation of a translocation strategy for coral colonies affected by the PRS will also minimise the contribution of this project to cumulative impacts on corals in the North Western Waters.
- 8.7.7 The implementation of good site practices and construction methodologies relating to minimising water quality impacts will minimise the potential impact not only from the PRS but cumulative impacts from concurrent projects as well. This is particularly relevant to water quality in Yam O Wan which supports a number of ecologically-sensitive habitats and species. Water quality impacts to Yam O Wan are anticipated to be minor.
- 8.7.8 With the implementation of recommended mitigation measures, it is considered that potential issues resulting from Sunny Bay PRS would be minor and acceptable, subject to the findings of statutory EIA.

Siu Ho Wan PRS

- 8.7.9 Site-specific monitoring data of the Study of CWD Behaviour in Shallow Waters indicate that the SHW PRS is of high value to CWD, and the main identified impacts resulting from development of the PRS would be habitat loss, carrying capacity loss, injury from vessel collisions and disturbance from HSF, construction disturbance and impacts to marine parks. Measures recommended to mitigate these impacts include:
 - Habitat and carrying capacity loss impacts can be minimized through reducing the area of proposed reclamation and reconfiguration to avoid area highly utilised by CWD
 - Vessel collision and HSF disturbance impacts can be mitigated by not adopting new HSF routes to service the PRS.
 - Construction disturbance can be mitigated through various construction methodologies, establishment of land-based construction, traffic control, general good site practice and establishment of dolphin exclusion zones.
- 8.7.10 Assuming the above measures can be successfully implemented, there is still scope for significant potential issues on CWD resulting from development of this PRS. These would include:
 - Habitat Loss/Carrying Capacity: CWD appear to utilize a deep channel as close as approximately 160m from the existing shoreline at Siu Ho Wan, as well as shallower areas inside the proposed PRS boundary though infrequently. Development of a plan

that avoids and minimizes impacts to these areas while can still meet the goals of providing a large enough area for development purposes would be extremely difficult.

- Indirect Impacts to BMP: The function of the BMP to protect CWD would be affected if the CWD are displaced away from the Brothers area due to considerable construction disturbance and potential permanent impacts as a result of developing the Siu Ho Wan PRS.
- 8.7.11 Implementation of the avoidance and minimisation measures recommended above, in particular the reduction in the reclamation extent of SHW PRS, should have addressed the identified impacts on CWD. Moreover, it is likely that the BMP proposed by HZMB project will be enlarged to cover the CWD habitat identified within Siu Ho Wan PRS. It is however necessary to further investigate the acceptability of these issues to CWD resulting from the proposed Siu Ho Wan PRS after implementing mitigation measures. Compensatory measures should be considered if found to be necessary during the subsequent EIA studies.
- 8.7.12 Implementation of a translocation strategy for coral colonies affected by the PRS will also minimise the contribution of this project to cumulative impacts on corals in the North Western Waters.
- 8.7.13 The implementation of good site practices and construction methodologies relating to water quality impacts will minimise the potential impact not only from the PRS but cumulative impacts from concurrent projects as well. This is particularly relevant to water quality in Tai Ho Wan which supports a number of ecologically-sensitive habitats and species. Water quality impacts to Tai Ho Wan are anticipated to be minor.

Future Monitoring and Investigations

8.7.14 At the time of writing, there are several issues that need to be resolved (as well as a number of recommended further investigations) in order to provide a comprehensive cumulative impact assessment. These are described in the following sections.

Baseline Data

- 8.7.15 The Report on Study of CWD Behaviour in Shallow Waters presents an unprecedented amount of fine-scale data set for an impact assessment in Hong Kong, providing a detailed picture of CWD distribution and behaviour within and adjacent to the 3 PRS. Nevertheless, there are still some gaps in this data set that reduces the accuracy and certainty of this Study. These gaps result from:
 - Lack of Seasonal Surveys: The Report on Study of CWD Behaviour in Shallow Waters covers monitoring data collected over a period of 6-months only. The distribution and behaviour of CWD in Hong Kong waters is known to exhibit seasonal changes, and it is possible that different patterns of distribution and abundance would be recorded from the 3 PRS at other times of the year. The Report on Study of CWD Behaviour in Shallow Waters recommends at least one full year (12 months) of data from the 3 PRS should to be collected, analysed and interpreted to provide a comprehensive baseline for this project.
 - Impacts from On-going Projects: As well as seasonality, other factors could potentially have affected the results of site specific field monitoring surveys conducted to date. Hung (2014) reported noticeable drops in dolphin encounter rates between 2011-2013 around north-east Lantau, coinciding with the commencement of reclamation works for the HKBCF, HKLR and HZMB. As a consequence, surveys of the 3 PRS (conducted during this period of declining encounter rates) could potentially underestimate CWD usage when compared to conditions in the absence of recent construction activities. CWD numbers in Hong Kong have been declining for most of the past 10 years, and this means that recent studies may not be representative of dolphin movements and behaviour when the population was more stable.

Results of Other Studies and Assessments

- 8.7.16 The feasibility of developing the PRS (especially the Siu Ho Wan PRS where the most significant impacts to CWD are expected), is to some extent contingent on the results of other on-going assessment and investigations. These include:
 - Designation of Brothers Marine Park: At the time of writing the BMP boundary has
 not been officially confirmed. However, by reduction in the reclamation extent of Siu
 Ho Wan PRS, the Siu Ho Wan PRS would not overlap with the latest proposed
 boundary of BMP. The nature and scale of impacts to the BMP will be determined by
 the final delineation of the BMP boundary and Siu Ho Wan PRS reclamation extent.
 - **TCNTDE EIA:** There is some potential for cumulative construction phase impacts resulting from the TCNTDE and SHW PRS Projects. At the time of writing no detailed impact assessment results for the TCNTDE project are available. While availability of these studies are not expected to change the overall recommendations of this Study, they are required for details of construction phasing to be refined to minimize potential cumulative impacts together with the Siu Ho Wan PRS.

Future Investigations Recommended

- 8.7.17 Strategic mitigation measures would require further investigation and study prior to implementation, in particular the reclamation configuration.
- 8.7.18 Reducing the boundary of proposed reclamation at Siu Ho Wan would reduce impacts to CWD. However, due to lack of full set of seasonal data as well as the uncertainties of other projects including the programmes, the possibility to reduce impacts from reclamation to acceptable level and the actual reclamation extent is subject to further detailed studies.
- 8.7.19 Further Planning and Engineering Studies will be conducted for each of the PRS to confirm various details on construction methodologies and programme and the routing of marine construction traffic, as well as any proposed additional HSF routes associated with the PRS. Any increase in HSF as a result of the PRS Project would result in potentially significant impacts to CWD populations. The need for HSF needs to be reviewed early in the planning process and potential alternatives fully explored to determine the scale and nature of this potential impact.
- 8.7.20 Items recommended under the ecological enhancement would require further investigation to assess feasibility and develop an implementation programme. In particular, the adoption of acoustic modelling and monitoring is considered a key measure that would significantly improve cumulative impact assessment for CWD in Hong Kong waters, as well as enable more effective mitigation of disturbance impacts and overall conservation efforts. The development of acoustic modelling and monitoring measures would be relatively straightforward and cost effective, and likely to receive broad support from government, green groups and other stakeholders.

9 FISHERIES IMPACT ASSESSMENT

9.1 Assessment Criteria

- 9.1.1 This fisheries impact assessment is conducted according to the criteria and guidelines set out in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) Annex 9 and Annex 17, in order to provide objective identification, prediction and evaluation of potential fisheries impacts arising from the Project. EIAO-TM Annex 17 sets out the methodology for assessment of fisheries impacts; and Annex 9 provides the evaluation criteria.
- 9.1.2 Other local legislations that are relevant to this fisheries impact assessment include:
 - The Fisheries Protection Ordinance (Cap. 171), which protects resources and regulates fishing practices for the purpose of conserving fishes and aquatic life forms within the Hong Kong water. This ordinance was revised in June 2012.
 - The Marine Fish Culture Ordinance (Cap. 353), which regulates and protects marine
 fish culture and related activities by designating areas of fish culture zone. It prohibits
 unauthorized vessels and deposition of chemicals that are harmful to the fish in a fish
 culture zone. The list of designated fish culture zones was last revised in January of
 2000.
 - The Water Pollution Control Ordinance (Cap. 358), which sets limits to water quality parameters for each Water Control Zone (WCZ). In order to promote the conservation and control pollution levels in these waters, each WCZ is designated with individual water quality objectives. Water quality objectives were last revised in June of 1997.

9.2 Fisheries Resources

- 9.2.1 The study area for the PRS at Lung Kwu Tan, Siu Ho Wan and Sunny Bay includes the North Western WCZ, North Western Supplementary WCZ, Western Buffer WCZ, and Deep Bay WCZ. The important spawning or nursery grounds, aquaculture sites or artificial reefs (ARs) within the study area for fisheries impact assessment from the development of the 3 PRS were identified (see **Figure 6**).
- 9.2.2 Part of the North Western WCZ was identified as an important spawning ground for commercial fisheries resources (AFCD, 1998). The main commercial fish species reported in this spawning ground included *Leiognathus brevirostris* (ponyfish), *Lateolabrax japonicus* (sea bass / perch), and *Clupanodon punctatus* (gizzard shad). The spawning ground is located adjacent to the southern tip of the proposed Lung Kwu Tan PRS. In addition, the spawning ground is located approximately 1.5 km and 4.2 km away from the PRS at Siu Ho Wan and Sunny Bay, respectively.

9.3 Assessment Methodology and Assumptions

- 9.3.1 The assessment was undertaken based on literature review on information and data published in previously approved statutory EIA reports and other relevant studies available. Reference of fisheries resources / activities was mostly based on AFCD Port Survey 2006, the Consultancy Study on Fisheries Resources and Fishing Operations in Hong Kong Waters 1998 and Departmental Annual Reports of AFCD.
- 9.3.2 The fisheries impact assessment was carried out with many assumptions made. Most of the key assumptions made for fisheries impact assessment are related to those adopted in assessment of hydrodynamic and water quality changes due to the 3 PRS during both construction and operational phases as presented in **Section 7** above.

9.4 Impacts from the Three PRS

9.4.1 There would be no direct loss of important spawning or nursery grounds, aguaculture sites or

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artificial reefs from the development of the 3 PRS.

- 9.4.2 The potential fisheries impact associated with the 3 PRS would be the direct loss of about 480 ha of fishing grounds with only low to moderate fisheries production. The preliminary reclamation area constitutes an insignificant portion of the total fishing areas in Hong Kong (approximately 0.3% of the 165,100 ha of marine waters in Hong Kong). In addition, the predicted resulting loss of fisheries production would be insignificant in comparison to the total fisheries production in Hong Kong. Although no fishing grounds of high fisheries production would be lost, the impacts resulting from permanent loss of fishing ground would be considered minor to moderate given the total area of the fishing ground loss.
- 9.4.3 Fishing activities and operation in the vicinity of the 3 PRS may be restricted / disturbed by the increased marine traffic and multiple uses of waters by construction barges and working vessels for the 3 PRS. However, the disturbance impact would be temporary only during the construction phase. The 3 PRS only supported low to moderate number of fishing vessels. The majority of fishing vessels operating in the vicinity are small-sized vessels (not exceeding 15 m). These small vessels would have higher flexibility in their operations and less sensitive to disturbance from the increased marine traffic. Therefore the potential impact of disturbance of fishing activities due to the 3 PRS would be minor.
- 9.4.4 Changes in water quality during reclamation and other concurrent marine works would cause minor indirect impact to fisheries resources. The water quality modelling for construction phase indicated that the mixing zones of SS elevations near the PRS would be minimized and become localized after implementation of assumed construction design measures outlined in **Section 7**. Compliance with WQO for SS was predicted for all important fisheries resources, including the Ma Wan FCZ, the ARs at SCLKC MP, the important spawning ground for commercial fisheries resources in the North Lantau waters and the oyster production area during the construction phase with implementation of the assumed construction design measures. The water quality modelling indicated that the changes in hydrodynamic conditions would be insignificant and therefore no major change in the water quality pattern was expected from the PRS upon completion.
- 9.4.5 During the operational phase, although low levels of DO were predicted at Ma Wan FCZ, the predicted decrease in DO level from the without-PRS condition was small and minor and within the range of natural fluctuation under the two with-PRS scenarios with different sewage treatment level assumed (i.e. secondary treatment and tertiary treatment respectively). It was also predicted that the DO levels would be lower than the WQO criterion in three months in the wet season (June to August) under both with and without PRS scenarios. The levels would be above the criterion complying with WQO for most times of the year. Thus, it was expected that there would be no diminishing of the beneficial uses of the FCZ resulted from the PRS and other concurrent project. Furthermore, high levels of TIN were predicted during operational phase in the western waters in general. However, the predicted increase in TIN levels from the without-PRS condition resulted from the PRS and other concurrent projects were small and minor and within the range of natural fluctuation under the two with-PRS scenarios with different sewage treatment level assumed. It was expected that the PRS would unlikely have any significant implication on red tide occurrence in the western waters.

9.5 Cumulative Impacts with Consideration of Other Concurrent Projects

- 9.5.1 To assess cumulative effects on fisheries resources, it is necessary to understand:
 - what concurrent projects are likely to take place
 - what potential impacts associated with the concurrent projects are likely to affect identified sensitive receivers
- 9.5.2 All possible concurrent projects as identified in **Appendix B** have been reviewed and only projects with potential to cause cumulative fisheries impacts are considered in this evaluation. Concurrent projects included in this evaluation are same as those considered in the

ecological assessment (see Table 8.3).

- 9.5.3 The scale of impacts resulting from individual projects as well as the cumulative impacts has been assessed, using a six point scale, based on:
 - Likely impacts identified for the 3 PRS (PRS at Lung Kwu Tan, Siu Ho Wan and Sunny Bay)
 - Results presented in approved EIA Reports (TM-CLKL, HZMB HKBCF, HZMB HKLR, CMPESC, HKIA3RS)
 - Likely impacts identified in Project Profile, Study Brief and Draft Technical Paper on Preliminary Environmental Assessment (TCNTDE)
 - Information presented in the Land Supply Study (PRS at Southwest Tsing Yi)
 - Information presented in Project Profile and EIA Study Brief (CT10)
- 9.5.4 The six-point scale corresponds to the following impact assessment categories:
 - XXXXX Very Severe
 XXXX Severe
 XXX Moderate
 XX Minor-Moderate
 - X Minor
 - Insignificant/Negligible/No Impact
- 9.5.5 For the purposes of cumulative impact assessment, the assessment has considered impacts from concurrent projects without mitigation measures in place. The rationale behind this approach is to help identify the most significant potential impacts, which can then be considered in more detail together with an assessment of proposed mitigation measures in addressing individual and cumulative impacts. Those impacts considered to have a moderate or severe impact are then discussed in more detail.
- 9.5.6 The impact significance of the 3 PRS has been discussed in **Section 9.4** and that for the other concurrent projects are summarized in the following sections, based on the impact assessment conclusion taken from the respective studies.

Direct Impacts

Loss of Fishing Ground and Fisheries Habitat

9.5.7 Taking into account the 3 PRS projects and other relevant concurrent projects, the cumulative permanent loss of fishing ground of about 1,600 ha is considered as of moderate impact significance. The permanent fishing ground loss due to the 3 PRS accounts for 30% of the cumulative loss while the loss due to HKIA3RS accounts for 42%.

Indirect Impacts

Water Quality

9.5.8 Based on the latest construction programme for HKIA3RS, the major underwater construction works would be completed before commencement of 3 PRS. Hence, it is not expected that the HKIA3RS would cause any cumulative impact with the 3 PRS according to the latest construction programme. Marine construction of the current Project would mainly overlap with two concurrent projects (TCNTDE and CMPESC). According to the water quality impact assessment, with a reduced production rate of 5,850 m³ per day assumed for the CMP operation based on the historical data and marine mud disposal demand forecast and implementation of the recommended mitigation measures outlined in **Section 7**, there would be no adverse cumulative impacts resulting from deterioration of water quality during construction stage. Compliance with WQO for SS is predicted for all important fisheries

resources, including the Ma Wan FCZ, the ARs at SCLKC MP, the important spawning ground for commercial fisheries resources in the North Lantau waters and the oyster production area during the construction phase with implementation of the recommended mitigation measures.

- 9.5.9 Low level for DO was predicted at Ma Wan FCZ during the operational phase of the 3 PRS, but the predicted DO level was similar to the baseline level (under without the 3 PRS scenario) as well as the existing background level. The 10th percentile depth-averaged DO level predicted at Ma Wan FCZ was 4.51 mg/L under Scenario 2 (with the 3 PRS and adoption of secondary processes for treating the Project sewage), which is about 0.4% or 0.02 mg/L lower than the baseline level of 4.53 mg/L predicted under Scenario 1 (without the 3 PRS), which also marginally exceeded the WQO of 5 mg/L. With the adoption of more advance (tertiary) processes for treating the Project sewage under Scenario 3, the 10th percentile depth-averaged DO level predicted at the FCZ was improved to 4.52 mg/L, which is about 0.2% or 0.01 mg/L lower than the baseline level of 4.53 mg/L. The 10th percentile depth-averaged DO levels predicted at the Ma Wan FCZ under the assessment scenarios were similar to the existing DO level recorded at the EPD station closest to the FCZ where the measured 10th percentile depth-averaged level was 4.08 mg/L, 4.06 mg/L and 3.96 mg/L in 2011, 2012 and 2013 respectively (also below 5 mg/L). Thus, the decrease in DO level from the without-PRS condition predicted at this FCZ under both Scenario 2 and Scenario 3 with different treatment level assumed was small and minor and within the range of natural fluctuation. It was also predicted that the DO levels would only be lower than the WQO value in three months in the wet season (i.e. June to August) under with and without PRS scenarios. No diminishing of the beneficial uses of the FCZ would be expected from the PRS.
- Furthermore, high levels for TIN were predicted during the operational phase in the western 9.5.10 waters in general. According to the water quality modelling, the number of water sensitive receivers (WSRs) with WQO non-compliances for TIN was predicted to be the same with and without the 3 PRS. Implementation of the 3 PRS would further increase the TIN levels by a maximum of 6.5% under Scenario 2 (with adoption of secondary processes for treating the Project sewage). The maximum TIN increase would be minimized to 2.3% under Scenario 3 (with adoption of tertiary processes for treating the Project sewage). Only the maximum TIN increase is presented in this section and details of the changes in TIN levels predicted at different WSRs are presented in Section 7 above. In terms of the absolute values, the maximum TIN increase was about 0.04 mg/L under Scenario 2 (with adoption of secondary processes for treating the Project sewage). The maximum TIN increase was further minimized to ≤0.01 mg/L under Scenario 3 (with the adoption of tertiary processes for treating the Project sewage). The increases in TIN levels from the without-PRS condition predicted at all the WSRs, under both Scenario 2 and Scenario 3 with different treatment level assumed are considered small and minor and within the range of natural fluctuation. For example, the annual mean TIN level recorded at selected EPD Stations WM4. DM5. NM1. NM2 and NM5 (close to these WSRs) are 0.37-0.43 mg/L, 0.76-1.14 mg/L, 0.39-0.50 mg/L, 0.51-0.70 mg/L and 0.62-0.86 mg/L respectively between year 2011 and year 2013. The non-compliance of WQO for TIN would unlikely have any significant implication on red tides occurrence in the western waters.
- 9.5.11 Taking into account the 3 PRS projects and other relevant concurrent projects, the cumulative water quality impacts are considered minor.

Disturbance of Fishing Activities

9.5.12 Fishing activities and operation in the vicinity of the 3 PRS and works areas of other concurrent projects may be restricted / disturbed by the increased marine traffic and multiple uses of waters by construction barges and working vessels for the Project. However, the disturbance impact would be temporary only during the construction phase. The majority of fishing vessels operating in the vicinity are small-sized vessels (not exceeding 15 m). These small vessels would have higher flexibility in their operations and less sensitive to disturbance from the increased marine traffic. Therefore, the impacts on the disturbance of fishing

activities would be minor.

Secondary Impacts

9.5.13 Secondary impacts would arise if a mitigation measure causes one or more impacts in addition to those that would be caused by the proposed project. There are no potential secondary impacts arising from the proposed fisheries mitigation options presented in **Section 9.6** below.

Overall Cumulative Impact Significance

9.5.14 Taking into account the 3 PRS projects and other relevant concurrent projects, permanent loss of fishing ground would be the key impact resulting from the concurrent projects in the western waters. The cumulative impacts resulting from the loss of fishing ground are considered moderate. Given the minor indirect water quality impacts and the higher flexibility of the small vessels operating in the vicinity of the project areas, the cumulative impacts from water quality and disturbance of fishing activities are considered minor. Therefore, the overall cumulative impact significance is considered moderate. To mitigate the cumulative impact, mitigation measures suggested by projects should be considered holistically as discussed below.

9.6 Strategic Mitigation and Enhancement Options

9.6.1 In order to mitigate the predicted overall cumulative impact, strategic mitigation and enhancement options are recommended for the 3 PRS as listed as follows and presented in **Appendix G**. Mitigations for the concurrent projects which would likely contribute to the overall cumulative impact (see **Table 8.3** and **Appendix B**) as presented in the relevant approved EIA Reports, Project Profile, Study Brief and Draft Technical Paper, were also taken into account in deriving strategic mitigation options for mitigating the overall cumulative impact. With consideration of the mitigation options for the 3 PRS as well as the other concurrent projects, the mitigated cumulative impacts to fisheries resources were evaluated to be minor.

Avoidance

9.6.2 Based on the assessment on ecological impact (presented in **Section 8** above), the extent of reclamation of Siu Ho Wan PRS should be reduced to avoid habitat of CWD. As the reclamation area is reduced, the direct loss of fishing ground would be reduced. Also, as it is expected the construction duration would be shortened after the reduction in reclamation extent, indirect impact of deterioration of water quality by reclamation and the disturbance to fishing activities would be reduced.

Minimization

9.6.3 Various construction methods that could reduce impacts from dredging, fill and construction phase marine traffic (e.g. use of non-dredged reclamation techniques), and water quality control measures and good site practice (e.g. use of well-maintained double-silt curtains) should be adopted for the 3 PRS. For operation phase, proper sewage treatment and disposal schemes together with other pollution reduction measures (e.g. reuse of recycling of effluent, green measures and infrastructures and best storm water management practices to minimize storm pollution discharges) are recommended for consideration.

Compensation

9.6.4 Two new marine parks of approximately 3,250 ha would be established under the HKIA3RS and HZMB projects to mitigate the CWD habitat loss under their projects and the cumulative impacts arising from the loss of fishing ground and fisheries resources. As presented in **Section 8** above, the extent of reclamation of Siu Ho Wan PRS should be reduced to avoid habitat of CWD identified within the PRS. It is likely that the BMP proposed by HZMB projects

will be enlarged (i.e. of area larger than 850 ha as originally proposed) to cover the CWD habitat identified within Siu Ho Wan PRS. It is known that fisheries management and enhancement measures would be implemented inside the proposed BMP to help conserve and enhance the prey resources of CWD as well as other fish stocks. It is expected the implementation of the proposed measures would enhance the overall fisheries resources in the western Hong Kong waters.

Enhancement Options

- 9.6.5 Fisheries enhancement measures were proposed for consideration in addition to the recommended mitigation options to further improve the fisheries resources in the north Lantau waters and support the fishing operation.
- 9.6.6 **Eco-enhanced Seawall Designs** Eco-enhanced seawall designs were proposed for the 3 PRS. As mentioned in **Section 8.6.11**, some of the options being considered for the seawalls include:
 - Increased Diversity of Seawall Morphology
 - Increased Material Heterogeneity
 - Use of Vegetation
 - Offshore Reefs
- 9.6.7 **Deployment of Artificial Reefs** It is commonly used an enhancement measure for the marine habitats. ARs are effective devices for attracting and supporting large populations of fish by providing complex and hard surface habitat in areas where only soft bottoms occur. The ARs may provide shelters and promote the recruitment of fish larvae and juveniles and eventually enhance the fisheries resources of the local region. The creation of hard surfaces increases the complexity of marine habitats by offering various micro-habitats, and provides opportunities for marine organisms to develop within the ARs.
- 9.6.8 **Fish Stocking** stocking programmes have been commonly adopted to improve the quantity or quality of fish stocks for restoration, enhancement and conservation reasons.

9.7 Potential Issues

- 9.7.1 With the implementation of the proposed mitigation measures, no unresolved key issues are identified. Nonetheless, as this assessment is taking place early in the project cycle, many details (including reclamation extent, implementation programme and the final development options) are not yet decided and available. On the next stage of engineering feasibility and detailed EIA studies, the assumptions made for this fisheries impact assessment and its findings should be reviewed based on more update information of the 3 PRS and other projects. Potential issues associated with the construction and operational phases have been assessed in the following sections, taking into account the background and environmental conditions and the impacts from other concurrent projects.
- 9.7.2 The permanent loss of about 480 ha of fishing ground due to the 3 PRS projects is considered as of minor to moderate impact significance. The loss of fishing ground is approximately 0.3% of the Hong Kong marine waters available for fishing. The contribution to the cumulative loss of fishing grounds is minor to moderate (30% of the 1,600 ha). Although the reclamation extent is subject to change, the waters to be affected should be similar to that under preliminary layouts and the impact should be similar. Therefore, mitigation measures for the direct loss of fishing grounds due to the 3 PRS projects are considered not necessary.
- 9.7.3 The implementation of good site practices and eco-friendly construction methodologies will minimize the potential impact from the construction of PRS. During operational phase, the potential water quality impacts to the fisheries resources are anticipated to be minor with

appropriate treatment to the sewage and other pollution reduction measures to be considered. Nonetheless, in future detailed studies, attention should be given to the TIN level of various WSRs including the fisheries resources which have already attained a high background level. Attention is also drawn to DO level at Ma Wan FCZ which is found fluctuated around the required WQO level.

9.7.4 Two new marine parks of approximately 3,250 ha would be established under the HKIA3RS and HZMB projects, to mitigate the CWD habitat loss under their projects and the cumulative impacts arising from the loss of fishing ground and fisheries resources. As presented in **Section 8** above, the extent of reclamation of Siu Ho Wan PRS should be reduced to avoid habitat of CWD identified within the PRS. It is likely that the BMP proposed by HZMB projects will be enlarged (i.e. of area larger than 850 ha as originally proposed) to cover the CWD habitat identified within Siu Ho Wan PRS. It is expected the designation of Marine Parks and implementation of the proposed fisheries management and enhancement measures would enhance the overall fisheries resources in the western Hong Kong waters.

10 OVERALL STRATEGIC ENVIRONMENTAL FINDINGS AND RECOMMENDED STRATEGIC ENVIRONMENTAL MITIGATION OPTIONS

- 10.1.1 The assessments with respect to air quality, water quality, ecology and fisheries under this CEIA Study were undertaken with the adoption of a number of assumptions under some conservative assessment scenarios and strategic mitigation options recommended to be implemented by relevant departments / parties if the PRS are taken forward. Based on the assumptions and the knowledge of the recommended strategic mitigation options, the assessments with reference to the best available information did not identify major issues on the four environmental aspects that would prevent the PRS proposals from being carried forward to the next stage for further studies and assessments.
- 10.1.2 There should be further studies, including planning and engineering studies and statutory EIAs, to determine environmental acceptability of the PRS and proper follow-up of different recommendations in future. Future project proponents of statutory EIAs, planning and engineering studies, etc., of the 3 PRS should review and reassess the suitability, feasibility and practicability of the strategic mitigation options. Future project proponents should also liaise with the relevant authorities for the implementation of the relevant mitigation options in the next stage. Proposed implementation schedule of recommended strategic environmental mitigation options is summarized in **Appendix G**. The following sections highlight the key issues and recommended strategic mitigation options in four environmental aspects:

10.2 Air Quality

10.2.1 With proper implementation of construction planning and mitigation options, no adverse dust impacts would be anticipated during construction phase of the 3 PRS. For Lung Kwu Tan PRS, the existing residential areas adjacent to Lung Kwu Tan Road would be vulnerable to the increased vehicular emissions at Lung Kwu Tan Road during operational phase. Future Lung Kwu Tan Road should be realigned away from existing residential areas at Lung Kwu Tan to alleviate the air quality impacts if the reclamation development is in place. A small portion of future reclamation area in the south in Lung Kwu Tan PRS close to the power station and cluster of industrial facilities should avoid uses sensitive to air quality. For Siu Ho Wan PRS, areas adjacent to the North Lantau Highway would be vulnerable to vehicular emissions, thus the development density and land uses should be carefully considered and air sensitive uses should not be proposed right next to the North Lantau Highway. Eastern part of Siu Ho Wan PRS would be vulnerable to odour nuisance from existing sewage treatment and waste handling facilities and odour control measures at sources would be required.

10.3 Water Quality

10.3.1 With proper programming on the marine works of reclamation projects and implementation of eco-friendly construction design measures, no potential adverse water quality impacts would be anticipated during construction phase. During the operational phase, the predicted hydrodynamic impact due to the reclamations would unlikely have significant effect on the overall flow pattern in the western waters. Regarding the water quality, under both with and without PRS scenarios, the predicted TIN and SS levels at various WSRs would be high due to the already high levels in baseline conditions, whereas the predicted DO levels at Ma Wan FCZ would be lower than the criterion in three months of the year. There were only small changes in the predicted levels of all these parameters with PRS in place. To address the potential water quality impacts, provision of new sewage treatment facilities of adequate treatment level, effluent reuse, measures to reduce pollution from other sources, green infrastructures, best storm water management practices and other appropriate mitigation options should be explored and investigated.

10.4 Ecology

10.4.1 Impacts to CWD were identified as the major issues to the 3 PRS. Recommended strategic mitigation options include review and reduce reclamation extent, in particular for Siu Ho Wan

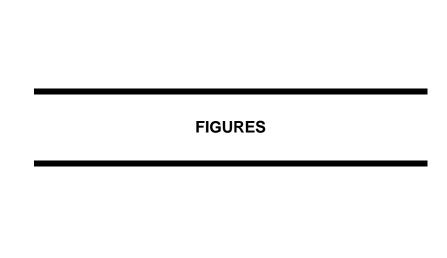
PRS, to minimize encroachment into CWD habitat. Siu Ho Wan PRS should also avoid direct impacts to the proposed BMP taking into consideration the latest proposed BMP site boundary. Speed restrictions and control of use should be adopted for construction vessels and dolphin exclusion zones should be established to minimize the disturbance to CWD. No potential significant impacts would be anticipated in most of the sites of conservation importance. Potential impacts on the proposed BMP, Lung Kwu Tan Valley SSSI, Tai Ho Wan, coral communities and horseshoe crabs would be anticipated. Coral translocation, eco-friendly water quality mitigation options, control of lighting at night-time, use of acoustic decoupling equipment and good site practices should be implemented to minimize the potential ecological impacts.

10.5 Fisheries

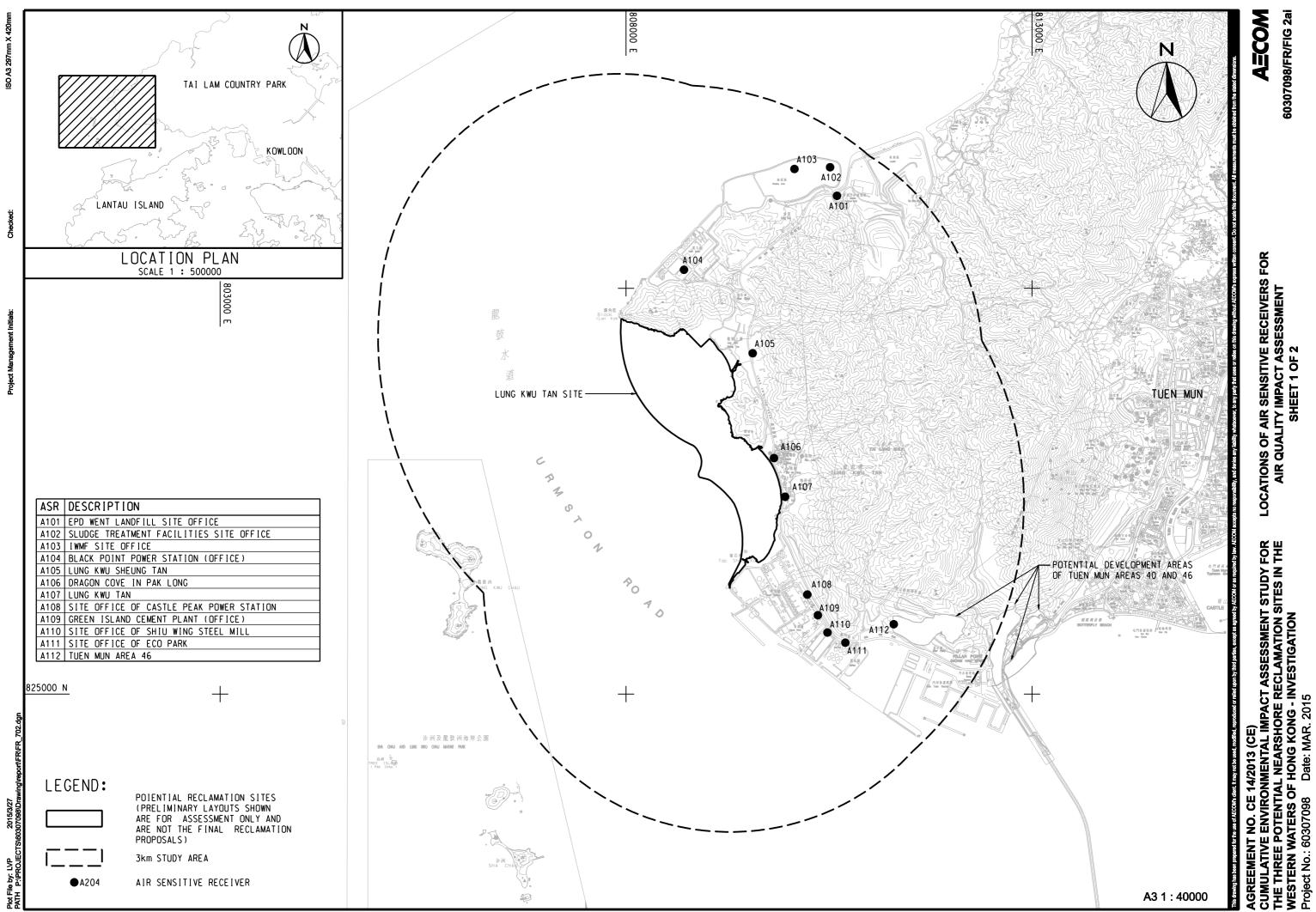
10.5.1 No direct loss of important spawning or nursery grounds, aquaculture sites or AR would be anticipated from the 3 PRS. Permanent loss of fishing grounds would be anticipated but only fishing grounds of low to moderate fisheries production would be affected. Low DO levels were predicted at Ma Wan FCZ during operational phase under both with and without PRS scenarios, but the predicted changes in DO levels from the baseline condition would be small and would only occur in three months of the year. The FCZ was therefore not anticipated to be affected by the 3 PRS and other concurrent projects.

11 CONCLUSION AND WAY FORWARD

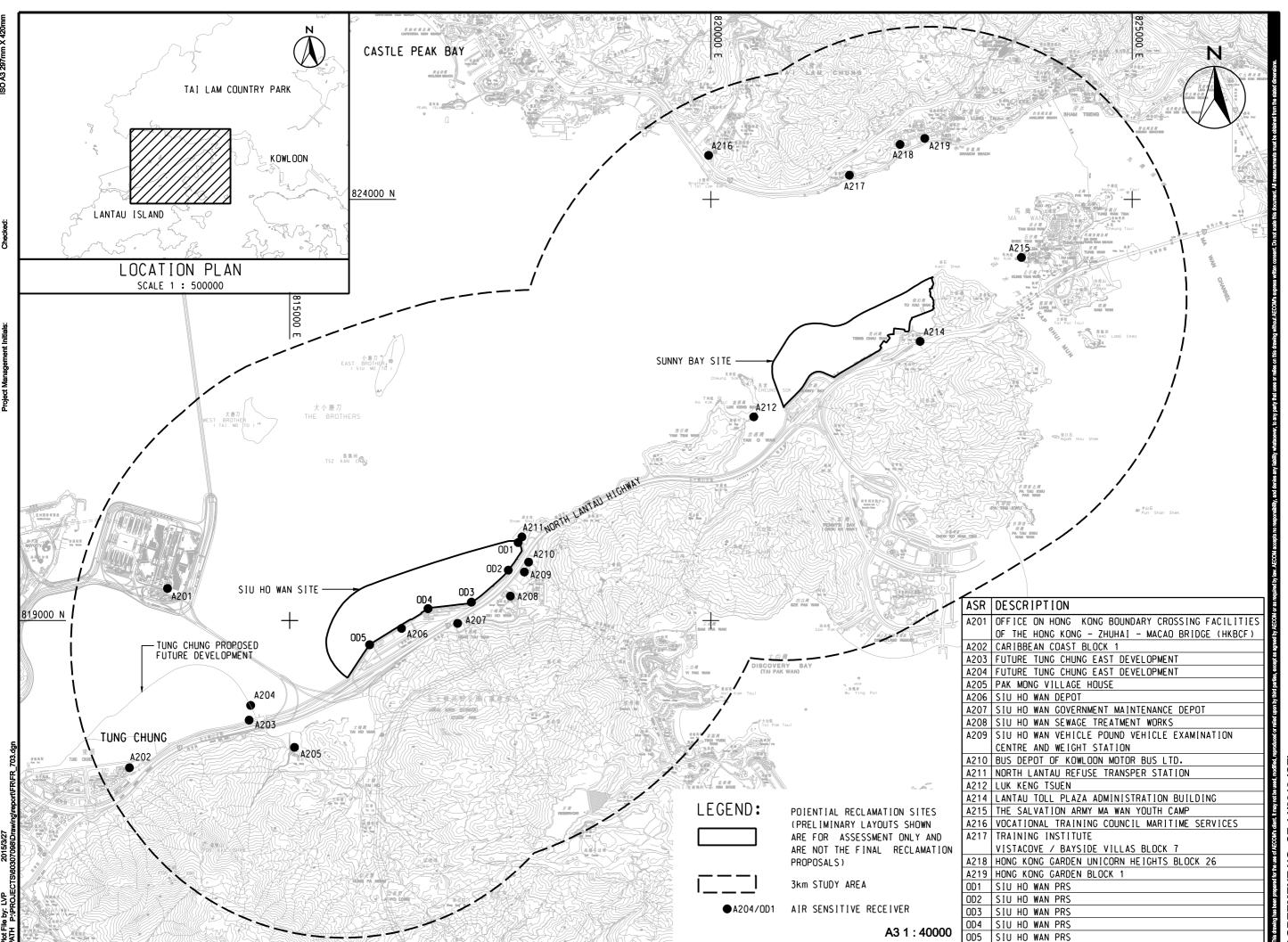
- 11.1.1 This CEIA Study assessed the potential cumulative impacts on the four environmental aspects, including air quality, water quality, ecology and fisheries, from the concurrent implementation of the PRS and other concurrent development projects in the western waters at a strategic level based on the best available information at the time of the assessments. With implementation of appropriate mitigation options, the study assessments identified that there would be no major issues on the four environmental aspects that would prevent the PRS proposals from being carried forward to the next stage for further studies and assessments, including planning and engineering studies and statutory EIAs.
- 11.1.2 It is worth highlighting that the four assessments were based on the best available information at the time of the assessment and a number of assumptions under some conservative assessment scenarios. The assessment assumptions, potential environmental issues, and recommended mitigation options will be further investigated and followed up in subsequent detailed studies and assessments for the PRS. Assessment assumptions should be reviewed when more detailed information on the development proposals becomes available during these future studies. Future project proponents should also review the potential environmental issues, and also explore and investigate any other possible mitigation options to avoid and minimize the potential cumulative impacts on the environment. Liaison with relevant authorities and parties on the required mitigation options should be carried out, whenever necessary, to obtain their agreements to ascertain the recommendations in the detailed studies and assessments.







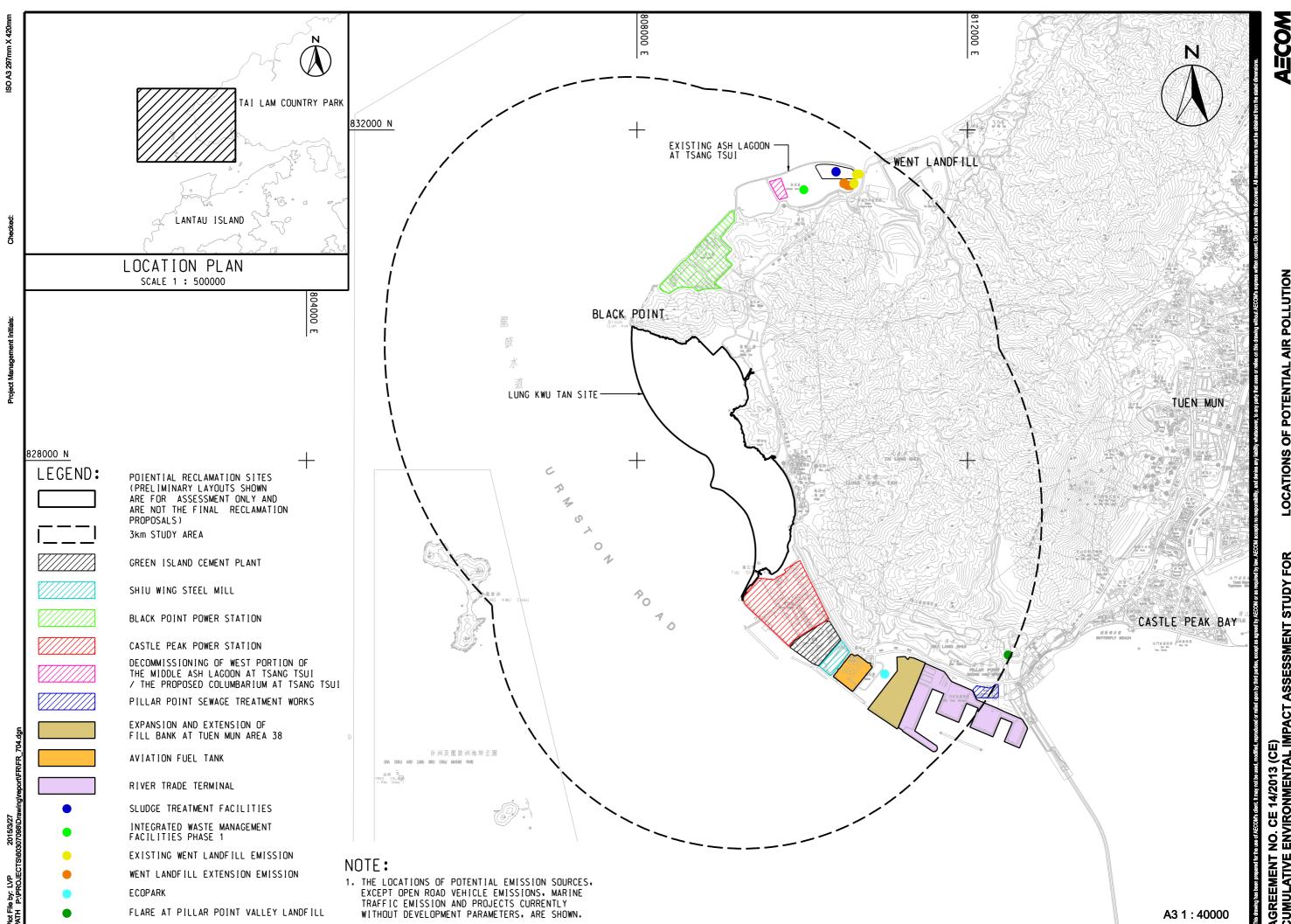
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AGREEMENT NO. CE 14/2013 (CE)
CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR
THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE
WESTERN WATERS OF HONG KONG - INVESTIGATION
Project No.: 60307098 Date: MAR. 2015

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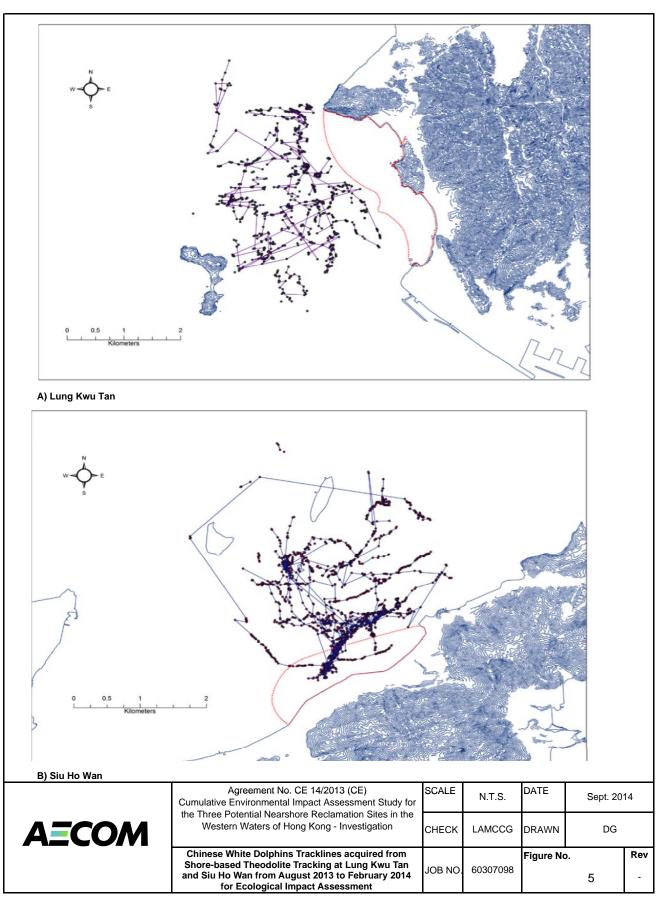
LOCATIONS OF POTENTIAL AIR POLLUTION AND ODOUR EMISSION SOURCES SHEET 1 OF 2

AGREEMENT NO. CE 14/2013 (CE)
CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR
THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE
WESTERN WATERS OF HONG KONG - INVESTIGATION
Project No.: 60307098 Date: MAR. 2015

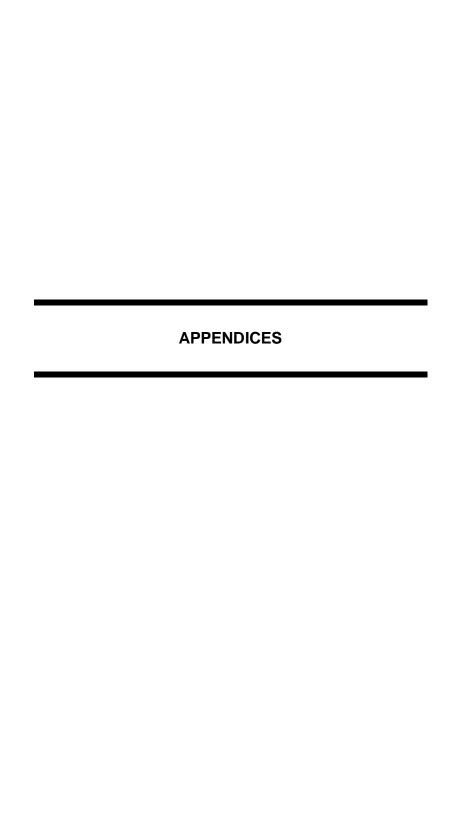












APPENDIX A

Indicative Implementation Programme of Major Concurrent Projects in the Western Waters

Appendix A Indicative Implementation Programme of Major Concurrent Projects in the Western Waters

No.	Major Interfacing Projects	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
1	PRS at Lung Kwu Tan								Marine-ba	sed reclai	mation wo	rks Lar	d-based	construction	on of infra	structure	works	*		
2	PRS at Siu Ho Wan							Marine-based reclamation works Land-based construction of infrastructure works												
3	PRS at Sunny Bay							Marine-b	ased recla	amation w	orks Land	d-based	constructi	on of infra	structure	works				
4	Tung Chung New Town Development Extension (TCNTDE)																			
5	Hong Kong International Airport and the associated expansion into a Three-Runway System (HKIA3RS)			(incluand	uding seav	rine works wall const ing) would ore 2019	ruction	Mainly la	ind-based	works										
6	Tuen Mun - Chek Lap Kok Link (TM-CLKL)																			
7	Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HZMB BCF)																			
8	Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road (HZMB HKLR)																			
9	Contaminated Mud Pit at the South Brothers (CMPSB)																			
10	Contaminated Mud Pit at East Sha Chau (CMPESC)																			
11	Integrated Waste Management Facilities Phase 1 (IWMF)	Constru	ıction pr	ogramn	ne is not	availab	le at the	time of	f assess	ment.										
12	Container Terminal 10 Development (CT10) / Potential Reclamation Site at Southwest Tsing Yi	Constru	ıction pr	ogramn	ne is not	availab	le at the	time of	assess	ment.										
13	Sludge Treatment Facilities (STF)																			
14	Organic Waste Treatment Facilities (OWTF)																			
15	Tuen Mun Areas 40 and 46	Constru	iction pr	ogramn	ne is not	availab	le at the	time of	assess	ment.										
16	Siu Ho Wan Depot Housing Development								assess											
17	West New Territories (WENT) Landfill Extensions																			
18	Decommissioning of West Portion of the Middle Ash Lagoon at Tsang Tsui																			
19	Proposed Columbarium at Tsang Tsui	Constru	iction pr	ogramn	ne is not	availab	le at the	time of	assess	ment.									-	
20	Proposed Columbarium at Siu Ho Wan	Constru	ıction pr	ogramn	ne is not	availab	le at the	time of	assess	ment.										
21	Industrial Estate at Tuen Mun Area 38																			
22	Expansion and Extension of Fill Bank at Tuen Mun Area 38																			

Construction Phase

Operational Phase
Partial Construction and Partial Operation of the Landfill Extension (Construction of Phases 5-6 and Operation of Phases 1-4)

APPENDIX B

List of Concurrent Projects Considered in Air, Water, Ecology and Fisheries Impact Assessments

APPENDIX B - LIST OF CONCURRENT PROJECTS CONSIDERED IN AIR, WATER, ECOLOGY AND FISHERIES IMPACT ASSESSMENTS

Construction Phase

No.	Projects	Construction Schedule	Air	Water	Ecology	Fisheries		
1.	PRS at Lung Kwu Tan	End 2019 – Mid 2030	✓	✓	✓	✓		
2.	PRS at Siu Ho Wan	End 2019 – Mid 2030	✓	✓	✓	✓		
3.	PRS at Sunny Bay	Early 2019 - Mid 2029	✓	✓	✓	✓		
4.	Tung Chung New Town Development Extension (TCNTDE)	2018 – 2024	✓	✓	✓	✓		
5.	Hong Kong International Airport and the associated expansion into a Three-Runway System (HKIA3RS)	Mid 2015 – mid 2023	Not considered in the quantitative cumulative assessment – HKIA3RS is over 4km from the Project boundary; no overlapping of major construction dust activities. Therefore, HKIA3RS is not expected to contribute significant cumulative impact			✓		
6.	Tuen Mun – Chek Lap Kok Link (TM-CLKL)							
7.	Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HZMB BCF)	Currently under construction; to be completed by 2016 (except for TM-CLKL to	X – No programme overlap	 X – No programme overlap (new land boundary incorporated in the coastline configurations for construction phase sediment plume modelling) 				
8.	Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road (HZMB HKLR)	be completed by 2018)						
9.	Contaminated Mud Pit at the South Brothers (CMPSB)	The CMP at the South Brothers is currently in operation and will be closed and capped in late 2015 and 2016 respectively	X – No programme overlap; operation to be ceased in 2015/2016					
10.	Contaminated Mud Pit at East Sha Chau (CMPESC)	The CMP is currently closed and will be reopened for mud disposal in 2016 for completion in 2023	Not considered in the quantitative cumulative assessment – Operation involves disposal of marine mud with high water content; no significant air quality impact expected	(Construction phase eco	diment loss incorporated in se logy and fisheries impacts we e to the sediment modelling r	ere assessed by making		

No.	Proj	ects	Construction Schedule	Air	Water	Ecology	Fisheries
11.	Integrated Waste Management Facilities Phase 1 (IWMF) IWMF at Shek Kwu Chau Not available		Not available	Not considered in the quantitative cumulative assessment – IWMF at Tsang Tsui is over 2 km away from the Project boundary; no significant dust generating activities would be required for the construction works of IWMF as reported in the approved EIA for IWMF	no cumulative marine water	work is proposed for the IWM r quality, marine ecology and pected from the Tsang Tsui sit	fisheries impact would be
			Not considered in the quantitative cumulative assessment – IWMF at Shek Kwu Chau is over 10km from the Project boundary; no significant dust generating activities would be required for the construction works of IWMF as reported in the approved EIA for IWMF	X – Influence zone of the marine construction works of the Shek Kwu Chau site would be confined in close proximity to Shek Kwu Chau within the Southern water (as indicated from the modelling results available in the approved EIA Report for IWMF) and hence no cumulative marine water quality, marine ecology and fisheries impact would be expected from the construction of the IWMF at Shek Kwu Chau			
12.	Container Termina Development (CT Potential Reclama Southwest Tsing \	10) / ation Site at	Not available	X – Implementation programme and information for the construction phase not yet available; CT10 construction is over 3km from the Project boundary; no cumulative dust impact expected	X – Implementation prograr	nme and information for the o available	construction phase not yet
13.	Sludge Treatment	t Facilities (STF)	Completed by 2013	·	X – No programi	me overlap	
14.	Organic Waste Tr (OWTF)	eatment Facilities	2015 – 2017		X – No programn	me overlap	
15.	Tuen Mun Areas 40 and 46		Not available	X – Implementation programme and information for the construction phase not yet available	X – Land-based construction with no major marine water quality issue expected	X – Implementation programme and information for the construction phase not yet available	X – Land-based construction with no major fisheries issue expected
16.	Siu Ho Wan Depot Housing Development		Not available	X – Implementation programme and information for the construction phase not yet available	X – Land-based construction with no major marine water quality issue expected	X – Implementation programme and information for the construction phase not yet available	X – Land-based construction with no major fisheries issue expected

No.	Projects	Construction Schedule	Air	Water	Ecology	Fisheries
17.	West New Territories (WENT) Landfill Extensions	andfill Extensions 2016 – 2024 Decommissioning of West Portion		X – Land-based construction with no major marine water quality issue expected	X – Land-based construction (over 1km away) with no significant cumulative terrestrial ecology impact expected; no major marine ecology concern expected	X – Land-based construction with no major fisheries impact expected
18.	Decommissioning of West Portion of the Middle Ash Lagoon at Tsang Tsui	2015 – 2016		X – No program	me overlap	
19.	Proposed Columbarium at Tsang Tsui	Not available	Not considered in the quantitative cumulative assessment – not expected to contribute significant cumulative impact	X – Land-based construction with no major marine water quality issue expected	X – Land-based construction (over 2 km away) with no significant cumulative terrestrial ecology impact expected; no major marine ecology concern expected	X – Land-based construction with no major fisheries issue expected
20.	Proposed Columbarium at Siu Ho Wan	Not available	Not considered in the quantitative cumulative assessment – not expected to contribute significant cumulative impact	X – Land-based construction with no major marine water quality issue expected	X – Implementation programme and information for the construction phase not yet available	X – Land-based construction with no major fisheries issue expected
21.	Industrial Estate at Tuen Mun Area 38	2019 – 2023	X – Implementation information for the construction phase not yet available	X – Mainly land-based construction with no major marine water quality issue expected	X – Implementation information for the construction phase not yet available	X – Mainly land-based construction with no major fisheries issue expected

No	. Projects	Construction Schedule	Air	Water	Ecology	Fisheries
22	Expansion and Extension of Fill Bank at Tuen Mun Area 38	Decommissioned by end 2018		X – No programi	me overlap	

Notes:

- ✓ Included in the construction phase impact assessment
 X Not included in the construction phase impact assessment
- Cumulative Impacts from the concurrent projects not included in the assessments of the study will be assessed at later stages or during future statutory EIA studies when the relevant programme information is available or the projects are found applicable.

Operational Phase

No.	Projects	Operation Schedule	Air	Water	Ecology	Fisheries	
1.	PRS at Lung Kwu Tan	Mid 2030 onwards	✓	✓	✓	✓	
2.	PRS at Siu Ho Wan	Mid 2030 onwards	✓	✓	✓	✓	
3.	PRS at Sunny Bay	Mid 2029 onwards	✓	✓	✓	✓	
4.	Tung Chung New Town Development Extension (TCNTDE)	First population intake at Tung Chung East from 2023/2024 onwards	✓	✓	✓	✓	
5.	Hong Kong International Airport and the associated expansion into a Three-Runway System (HKIA3RS)	2023 onwards	✓	✓	✓	✓	
6.	Tuen Mun – Chek Lap Kok Link (TM-CLKL)	2019 onwards	✓	✓	√	√	
7.	Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (HZMB BCF)	2017 onwards	✓	✓	√	√	
8.	Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road (HZMB HKLR)	2017 onwards	✓	✓	✓	✓	
9.	Contaminated Mud Pit at the South Brothers (CMPSB)	The CMP at the South Brothers is currently in operation and will be closed and capped in late 2015 and 2016 respectively			X – Operation ceased in 2016 before operation of this Project		
10.	10. Contaminated Mud Pit at East Sha Chau (CMPESC) The CMP is currently closed and will be reopened for mud disposal in 2016 for completion in 2023 Not considered in the quantitative cumulative assessment – Operation involves disposal of marine mud with high water content; no significant air quality impact expected						

No.	Proj	ects	Operation Schedule	Air	Water	Ecology	Fisheries
	IWMF at Tsang Tsui Not available ✓ Integrated Waste Management		√	X –The Tsang Tsui site is land-based and will not change the coastline configuration and thus will not affect the tidal current and marine water quality; Zero discharge of process and sanitary wastewater is adopted in the IWMF operation at Tsang Tsui	X – Tsang Tsui site is land- based development (over 2 km away) with no major cumulative terrestrial ecology impact expected; no major marine ecology concern expected	X – Tsang Tsui site is land- based development with no major fisheries concern expected	
11.	Management Facilities Phase 1 (IWMF)	IWMF at Shek Kwu Chau	Not available	✓	✓ – Reclamation at Shek Kwu Chau (which would potentially change the hydrodynamic condition of marine water) is incorporated in the hydrodynamic modelling of this assessment / zero discharge of process and sanitary wastewater is adopted in IWMF operation at Shek Kwu Chau	X – Shek Kwu Chau site is over 10km from the Project boundary; no significant cumulative ecology impact expected	X – Shek Kwu Chau site is over 10km from the Project boundary; no significant cumulative fisheries impact expected
12.	Container Termina Development (CT Potential Reclama Southwest Tsing V	10) / ation Site at	Not available	X – Implementation programme and information for the operational phase not yet available	√	 ✓ – based on water quality assessment (new land boundary at Tsing Yi incorporated in hydrodynamic model) 	✓ – based on water quality assessment (new land boundary at Tsing Yi incorporated in hydrodynamic model)
13.	Sludge Treatment Facilities (STF) 2014 onwards		2014 onwards	√	X – Land-based development with no marine water quality impact / zero discharge of process and sanitary wastewater is adopted in STF operation	X – Land-based development (over 2 km away) with no significant cumulative terrestrial ecology impact expected; no major marine ecology concern expected	X – Land-based development with no major fisheries concern expected

No.	Projects	Operation Schedule	Air	Water	Ecology	Fisheries		
14.	Organic Waste Treatment Facilities (OWTF)	2018 onwards	✓	X – Land-based development with no direct marine water quality impact / wastewater discharge to Siu Ho Wan Sewage Treatment Works incorporated in water quality model	X – No ecological sensitive receivers identified in the OWTF EIA, therefore no ecological impacts anticipated	X – Land-based development with no major fisheries concern expected		
15.	Tuen Mun Areas 40 and 46	Not available	X – Implement	ation programme and informat	ion for the operational phase n	ot yet available		
16.	Siu Ho Wan Depot Housing Development	Not available	X – Implementation programme and information for the operational phase not yet available					
17.	West New Territories (WENT) Landfill Extensions	2018 – 2028	✓	X – Land-based development with no major marine water quality issue expected; Leachate / wastewater discharge to Pillar Point Sewage Treatment Works incorporated in water quality model	X – Land-based development (over 1 km away) with no significant cumulative terrestrial ecology impact expected; no major marine ecology concern expected	X – Land-based development with no major fisheries concern expected		
18.	Decommissioning of West Portion of the Middle Ash Lagoon at Tsang Tsui	Not applicable	Not applicable					

7

No.	Projects	Operation Schedule	Air	Water	Ecology	Fisheries
19.	Proposed Columbarium at Tsang Tsui	Not available	Not considered in the quantitative cumulative assessment – The major emissions from the proposed columbarium would arise from the operations of joss paper burners. Given the joss paper burners will be incorporated with exhaust air treatment facilities such as water scrubber and electrostatic precipitators to alleviate the dust emission, the emission from the proposed columbarium would be considered as insignificant and localized. Therefore, the Proposed Columbarium will not be considered in the cumulative impact assessment. (Implementation programme and information for the operational phase not yet available)	X – Land-based development with no major marine water quality issue expected (Implementation programme and information for the operational phase not yet available)	X – Land-based development (over 2 km away) with no significant cumulative terrestrial ecology impact expected; no major marine ecology concern expected from this land-based project (Implementation programme and information for the operational phase not yet available)	X – Land-based development with no major fisheries concern expected (Implementation programme and information for the operational phase not yet available)

No.	Projects	Operation Schedule	Air	Water	Ecology	Fisheries			
20.	Proposed Columbarium at Siu Ho Wan	Not available	Not considered in the quantitative cumulative assessment – The major emissions from the proposed columbarium would arise from the operations of joss paper burners. Given the joss paper burners will be incorporated with exhaust air treatment facilities such as water scrubber and electrostatic precipitators to alleviate the dust emission, the emission from the proposed columbarium would be considered as insignificant and localized. Therefore, the Proposed Columbarium will not be considered in the cumulative impact assessment. (Implementation programme and information for the operational phase not yet available)	X – Land-based development with no major marine water quality issue expected (Implementation programme and information for the operational phase not yet available)	X –Implementation programme and information for the operational phase not yet available	X – Land-based development with no major fisheries concern expected (Implementation programme and information for the operational phase not yet available)			
21.	Industrial Estate at Tuen Mun Area 38	2018 onwards	X – Im	plementation information for th	e operational phase not yet a	/ailable			
22.	Expansion and Extension of Fill Bank at Tuen Mun Area 38	Decommissioned by end 2018	X – Decommissioned before operation of this Project						

Notes:

- ✓ Included in the operational phase impact assessment
 X Not considered in the operational phase impact assessment
- Cumulative Impacts from the concurrent projects not included in the assessments of the study will be assessed at later stages or during future statutory EIA studies when the relevant programme information is available or the projects are found applicable.

APPENDIX C

Land Use Concept Proposal



(Shenzhen Wan SHEKOU To Shenzhen Hung Shui Kiu New Development Area Deep Bay Yuen Long und Kwii Tan Sha Chau and So Kwiin Wat Lung Kwu Chau Marine Park Tsing Yi Proposed The Brothers Marine Park Planned Third Runway HKIA LEGEND Potential Reclamation Sites ANTAU ISLANI **Existing Development Areas** LANTAU ISLAND Planned Development Areas Existing Industrial Uses/ Utilities **Existing Tourism Attraction** Existing Ecologically Sensitive Areas/ SSSIs Existing Road Transport Links Planned Road Transport Links Existing Rail Links Potential Rail Links - → General Flight Path (indicative) ---> Possible Helicopter Flight Path (indicative) Possible Integration with Surrounding Developments

Major Development Opportunities

1 Synergizing with Emerging Gateway and Bridgehead Economy in Northwest New Territories (NWNT)

Several new 'gateways' would be emerging in the western part of Hong Kong following the successive commissioning of cross-boundary and strategic transport links. The most notable one would be the Hong Kong International Airport (HKIA)' Tung Chung and its extension area as being situated in close proximity to the Boundary Control Point (HKBCF), planned Third Runway, Airport North Commercial District, Asia-World Expo, Siu Ho Wan Depot development and Disneyland Resort. With the commissioning of the Hong Kong-Zhuhai-Macao Bridge (HZMB) together with HKIA, Hong Kong's premier multi-modal regional transport hub will be on Lantau Island. HZMB will help establish the "One-hour Intercity Traffic Circle" covering Pearl River Delta (PRD) region.

As part of the regional transportation network in the eastern side of PRD Region, the Tuen Mun-Chek Lap Kok Link (TM-CLKL) would transform the Study Area from a peripheral location in the Western waters into another gateway from the HZMB/HKBCF/ HKIA to the NWNT (including Hung Shui Kiu New Development Area (HSK NDA) and Tuen Mun Area 40 and 46), and Hong Kong-Shenzhen Western Corricor (HK-SWC)/ Tuen Mun Western Bypass (TMWB) to the HKIA. The potential reclamation sites are suitable locations in the SAR to capturing and capitalizing on the spill-over of visitors from both eastern and western parts of PRD region. Sensible consideration however should be made to differentiate from and hence complement with the HKIA/Tung Chung and other potential gateways in the western part of Hong Kong in terms of broad use mix, development program, visitors/ patronage to be served and implementation timeframe.

Addressing Growing and Changing Demand for Logistics Sites

The logistics industry is one of the pillar industries of Hong Kong making significant contributions towards promoting the economic development and employment over the years. It is understood from the stakeholders of the logistics industry that there is a lack of logistics sites for many years, and the industry has gradually shifted to the handling of high-value goods and provision of high value-added services. This brings to an increasing demand for modern logistic facilities.

The Government has been considering Tuen Mun West as a key district for the further development of logistics industry with the commissioning of the TM-CLKL, and is reviewing the feasibility of designating some of the land in Tuen Mun West Area 38 for logistics development. Taking into account previous planning intention for the Siu Ho Wan site, it is very much worthwhile to continue consider the potential to accommodate appropriate logistics facilities to enhance the synergies with the existing and other possible logistics operation in the Study Area.

3 Connectivity to and Integration with Potential Rail Links

Besides the planned and committed strategic transport links, there are also strategic rail links currently under study, some of them have potential interface with the Study Sites. These include the West Rail Line Tuen Mun South Extension (TMS Extension) which is one of the five local enhancement schemes now under Stage 2 public consultation of the Review and Update of the Railway Development Strategy 2000 (RDS-2). Subject to its final recommendation, the possible Tuen Mun South station proposed in the vicinity of Tuen Mun Ferry Pier would be the nearest rail station to the potential Lung Kwu Tan site. Another possible strategic rail link is the Domestic Spur Line of the Hong Kong-Shenzhen Western Express Line which is one of the three regional railway corridors proposed in the Stage 1 public consultation of the RDS-2. The indicative alignment of the Domestic Spur Line would link up Tung Chung, HKBCF and through the Study Area to the Tuen Mun south area.

The future planning of the potential reclamation sites should take full consideration the consultation findings and final recommendations of the RDS-2 in a timely and comprehensive manner so as to facilitate any beneficial land use-transit integration and/or physical connection to mass transit critical to the site planning and development potential optimization, and to serve potential residential and working population at the Study Sites.

4 Waterfront Location

Located at the waterfront areas of the Western Waters, the potential reclamation sites are benefited from direct marine access to support the transportation of goods and materials, minimizing the reliance on road transportation.

Sizable Development Sites

The reclamation sites are sizable and provide much flexibility in site planning and design for comprehensive and coordinated developments and more provision of open and green spaces, which help create a quality, sustainable living environment. These sites may also provide opportunities for strategic economic uses which generate employment. According to the Outline Zoning Plan (OZP), the reclamation area in Sunny Bay can be planned for the uses compatible with tourism and recreation. For Siu Ho Wan reclamation, the site is proposed for a logistics park use under the 2007 Revised Concept Plan for Lantau.

Major Development Constraints

1 Noise and Emission Impact arising from Nearby Road / Air Traffic

The Potential Reclamation Sites are located in close proximity to the aircraft and helicopter flight paths, and will be susceptible to potential noise impact from surrounding air traffic. Other than the existing North Lantau Highway (NLH), Lung Mun Road and Lung Kwu Tan Road, the planned Tuen Mun-Chek Lap Kok Link (TM-CLKL), TM-CLKL Toll Plaza and the possible primary distributor would further add to the traffic volume of the area and induce additional traffic noise and air quality concerns due to the increase road traffic.

2 Potential Ecological/ Fisheries/ Water Quality Impacts

The Potential Reclamation Sites may cause potential impacts upon ecological/fisheries significant species/habitats in the areas, such as Chinese White Dolphin, marine parks, Sites of Special Scientific Interest (SSSIs), etc., as well as water quality and water sensitive receivers in the vicinity. In particular, given the short distance between the proposed Siu Ho Wan reclamation site and the proposed The Brothers Marine Park (BMP) the construction and operation of the proposed reclamation may adversely affect the function of the BMP.

3 Interface Issue with Nearby Land Uses

The Potential Reclamation Sites are basically neighboring a range of special industries/ utilities, hence to different extent subject to environmental impacts in terms of not-in-my-back-yard (NIMBY) facilities (Siu Ho Wan Water Treatment Works (WTW) which is a Potentially Hazardous Installation (PHI), Sewage Treatment Works (STW), and Organic Waste Treatment Facilities (OWTF)), and industrial uses (industrial operations to the south of Lung Mun Road including a river trade terminal, a power station, a cement plant, a steel mill and a resource recovery park) that generates noise and air, flood light and visual impacts. Should residential and other environmentally-sensitive uses be proposed, sensible disposition of such uses and probably mitigation measures are required.

4 Carrying Capacity of Access Roads to Reclamation Sites

The carrying capacity of Lantau Link (including NLH) may pose constraints on the future development of the two reclamation sites in North Lantau. Lung Mun Road and Lung Kwu Tan Road are of limited capacity and may limit development potentials of Lung Kwu Tan site.

5 Height Restrictions as Constraints to Future Development

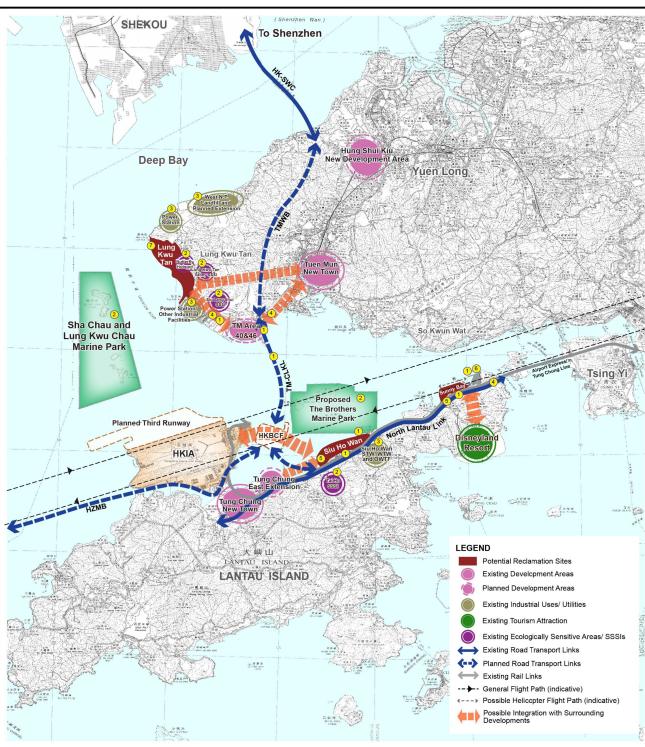
The Siu Ho Wan and Sunny Bay sites both fall within the Airport Height Restriction zone. In particular, Siu Ho Wan is subject to the height restriction of 80-120 mPD. Sunny Bay site is subject to Deed of Restrictive Covenant Memorial No. 278911, in which the height restriction of the area near the MTR Sunny Bay Station is 30 mPD. Future development on both sites will be constrained by the height restrictions.

6 Proposed Development at Sunny Bay Site

A potential helipad is being proposed at Sunny Bay site under a separate study. Potential noise impact is yet to be investigated. Future land use proposal would have to take into account compatibility and interface issues with the potential helipad development. The layout of helipad development as presented in this submission is only an indicative option solely for the purpose carrying out the cumulative environmental impact assessment (CEIA) under this Assignment and will be subject to change under separate investigation/ design study.

7 Proposed Development at Lung Kwu Tan Site

A Confined Disposal Facility (CDF) was identified as a potential facility under the seperate land supply study. It is proposed to be located underground near the new waterfront of Lung Kwu Tan site for the disposal of marine sediment. The use above the CDF is restricted as open space which limits possible land use options.



60307098/FIG 3

Theme A: Western Waters Synergetic Nodal Communities "To integrate with nearby development to create synergetic nodal neighbourhood districts"

Taking forward findings from the on-going Enhancing Land Supply Study, Theme A aims to create distinct neighbourhood districts through capturing the opportunities for integrated development with their nearby existing/planned development, including Tung Chung New Town, Sunny Bay Recreation Node and Tuen Mun Area 40 and 46 plus Tuen Mun New Town, cross-supporting while strengthening their own growth. Taking advantage of the existing and emerging local and regional transportation network, the potential reclamation sites will be well-connected to other parts of Hong Kong as well as cross-boundary destinations via a range of public transport facilities. The planned and proposed transport infrastructure, including road and rail connection would further enhance the accessibility to support larger scale comprehensive development.

Siu Ho Wan and Lung Kwu Tan sites target to enhance Hong Kong's overall land supply for both public and private residential developments. On the other hand, taking advantage of the close connection to Disneyland Resort, Sunny Bay has the potential to be developed as tourism, business and entertainment hub, creating economic synergy in North Lantau.

Taking into account the sizeable areas of the potential reclamation sites, this Theme also responses to latest policy directives to provide long-term solution spaces of more quality and affordable housing as well as to create better living environment in Hong Kong. Furthermore, to support the continual growth of one of Hong Kong's pillar industries, leisure and entertainment development is also considered to further enhance existing tourism development within the North Lantau district.

Siu Ho Wan

The Siu Ho Wan site is planned to create a waterfront residential community which will complement and integrate with existing and planned development in Tung Chung and North Lantau.







Sunny Bay

The Sunny Bay site is envisioned to be a business and tourism hub in the region. Business Park and Meetings, Incentives, Conferences, and Exhibitions (MICE) Facilities are proposed at the site to create synergy effect with the proposed tourism facilities and hotel development as well as nearby theme park development, and to further strengthen North Lantau and Hong Kong's position as a business and tourism centre.







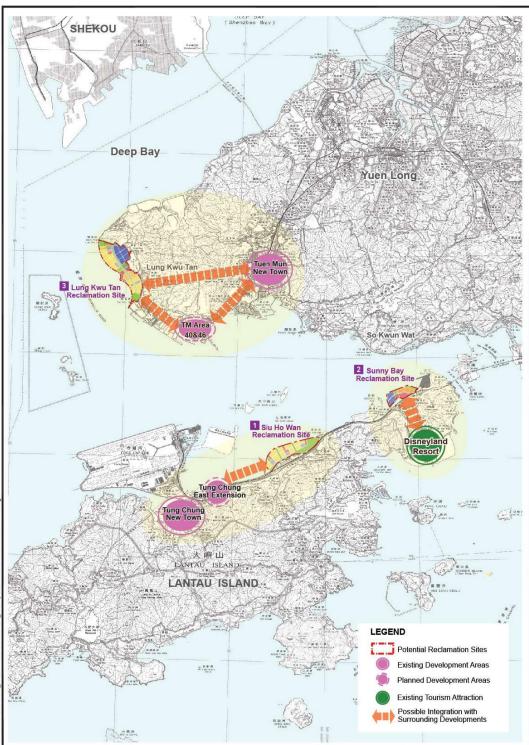
3 Lung Kwu Tan

Taking into account the sizable area of Lung Kwu Tan site and local views on Tuen Mun future development, the Lung Kwu Tan site is proposed for residential and institution/ business park development in order to support the provision of housing and employment opportunities. Future development can be considered as a future extension of Tuen Mun New Town together with future development at Tuen Mun Area 40 and 46.









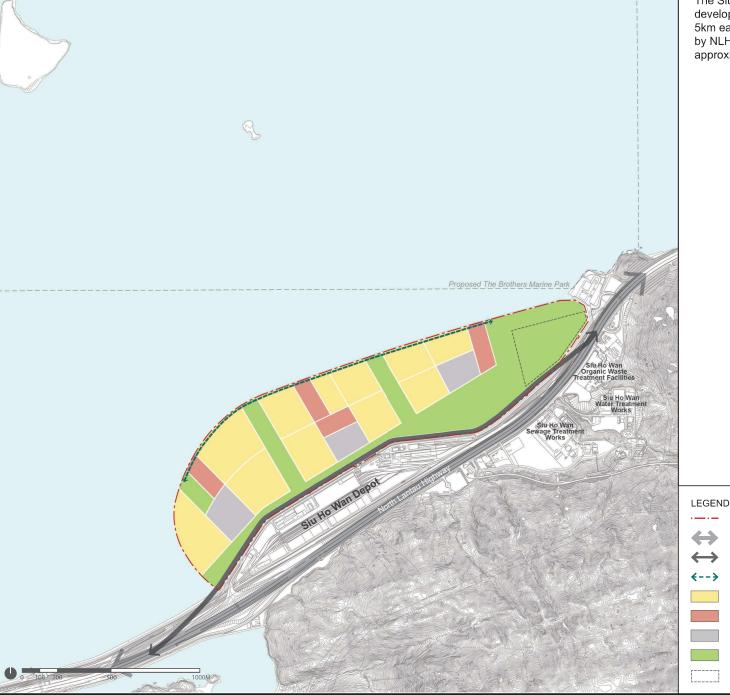


Site Boundary

Existing Major Road Connection Proposed Primary Distributor Waterfront Connection Residential Local Commercial GIC Facilities Open Space

Potential Underground Sewage Treatment Works Facilities

The Siu Ho Wan reclamation site is proposed to be developed at the north of Lantau Island, approximately 5km east of the HKIA. It is currently connected by NLH. The proposed extent of the site is to be approximately 135.3ha.



LAND USE CONCEPT - SIU HO WAN

THEME A - WESTERN WATERS SYNERGETIC NODAL COMMUNITIES

LAND USE CONCEPT - SIU HO WAN THEME A - WESTERN WATERS SYNERGETIC NODAL COMMUNITIES

Land Use Concept

- A waterfront residential neighbourhood will be created with public open space bisecting the various clusters of development. These open spaces will also act as green corridors linking the inland area to the waterfront promenade, both physically and visually.
- Each residential development cluster will be served by a local commercial or G/IC facilities node to cater to the daily need of residents. G/IC facilities will be provided according to the requirements as stipulated in the Hong Kong Planning Standards and Guidelines (HKPSG).
- A large scale open space is proposed at the eastern part of the site for public recreation use, and will act as a buffer area to NLH and public utilities to mitigate against the possible negative environmmental impact (e.g. Siu Ho Wan STW, OWTF and Consultation Zone (CZ) of WTW).
- Only non-domestic uses are proposed for land falling within the CZ of Siu Ho Wan WTW. Detailed hazard assessment will be required during the future planning and engineering studies to confirm the compliance with the societal risk criteria under the HKPSG.
- The Airport height restriction was taken into considerations in proposing the maximum building heights of residential developments in order to maximize the development potential.
- Based on the estimated residential and employment population under this concept, the existing sewage treatment works may not be able to accommodate the extra sewage flow. In order to serve future population, an Underground Sewage Treatment Works is therefore proposed at the eastern tip of the open space, where no structure is allowed above the future STW. Besides, a buffer zone has been reserved between the future STW and residential uses.
- Road connections are proposed to link up with NLH for access to Tung Chung for mass transit and bus transportation, as well as to other areas of Hong Kong.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Residential	59.3	44	3.0	1,780,000	30
Local Commercial	9.6	7	3.0	289,100	-
G/IC Facilities	11.1	8	-	-	-
Open Space	49.9	37	-	-	-
Roads	5.4	4	-	-	-

Design Population						
Residential Population	79,400					
Number of Households	27,400					
Employment Population	14,500					

Housing Mix	ousing Mix						
Housing Types	Plot Ratio	Average Flat Size (sqm)	GFA (sqm)	Households			
Type 1	3.0	65	1,780,000	27,400			
Total	-	-	1,780,000	27,400			

Previous Studies / Policies Reference

- · As recommended in the recent Tung Chung New Town Extension Study, 70-75 ha of reclaimed land in Tung Chung East will be allocated to residential developments which accommodate a population of 95,000-110,000. The Siu Ho Wan site can be developed as a further expansion of residential areas of Tung Chung East Extension.
- Prior to this Study, the Northshore Lantau Development Feasibility Study (2001) recommended residential use in the urban extension area in Siu Ho Wan in order to complement the tourism and recreation attractions of North Lantau, while South West New Territories Development Strategy Review (2001) identified Siu Ho Wan as a potential area for high-density residential development.

- 1. Note that all vehicles to/from the site need to use two interchanges (i.e. Siu Ho Wan Interchange and Tai Ho Interchange) and one planned primary distributor travelling between NLH and the site. There are implications on the NLH, Lantau Link and TM-CLKL. The degree of implications on each road link depends on the planning parameters. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CEIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Open Space Provisio	n					
HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks				
166.100	499.400	Sufficient				

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

30307098/FIG 5 AECON

CONCEPT - SIU HO WAN RN WATERS SYNERGETIC NODAI COMMUNITIES

LAND USE CONCEPT - SUNNY BAY

THEME A - WESTERN WATERS SYNERGETIC NODAL COMMUNITIES

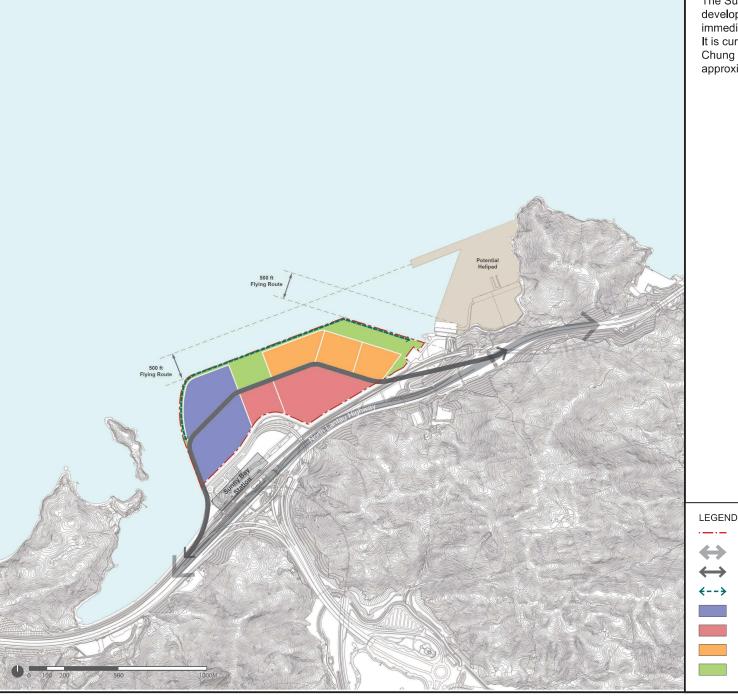
Proposed Site

Site Boundary

Open Space

Existing Major Road Connection
Proposed Primary Distributor
Waterfront Connection
Business Park and MICE
Convention Facilities
Commercial and Entertainment

The Sunny Bay reclamation site is proposed to be developed at the northeast coast of Lantau Island, immediately adjacent to Sunny Bay MTR Station. It is currently connected by NLH and MTR Tung Chung Line. The proposed extent of the site is to be approximately 55.6ha.



LAND USE CONCEPT - SUNNY BAY THEME A - WESTERN WATERS SYNERGETIC NODAL COMMUNITIES

Land Use Concept

- Taking advantage of its strategic location with direct access to rail connection, and close proximity to the HKIA and future BCF, the western portion of the site is proposed for Business Park development with convention facilities and land reserved for regional office uses. This would create high level job opportunities for residents in Tung Chung, North Lantau and Tuen Mun.
- To further strengthen Sunny Bay as a regional tourism hub, hotels are proposed along the eastern waterfront area with major commercial and entertainment facilities (e.g. outlet shopping mall and indoor theme park) to create a leisure and entertainment node for local as well as visitors from aboard.
- The site is subject to the Airport height restriction and Deed of Restrictive Covenant Memorial No. 278911, in which the height restriction of the area near the MTR Sunny Bay Station is 30 mPD. These restrictions were taken into considerations in proposing the maximum building heights in order to maximize the development potential.
- Apart from open space along the waterfront, an open space is planned to the west of the potential helipad to serve as a noise buffer. Taking into account the potential helipad and its flying routes, noise sensitive uses will be avoided along the waterfront areas.
- · The extra sewage flow arising from the site is assumed to be diverted to the Underground Sewage Treatment Works proposed at the eastern tip of the Potential Reclamation Site at Siu Ho Wan for proper treatment and disposal.
- · The site is highly accessible with Sunny Bay MTR Station public transport interchange and parking facilities nearby. New road links will be incorporated to connect with NLH and further with other strategic road links within and across the region.

Previous Studies / Policies Reference

- The position of the Sunny Bay site as an international tourist and recreation node had been confirmed in South West New Territories Development Strategy Review (2001) and Northshore Lantau Development Feasibility Study (2001).
- The Concept Plan for Lantau (2004, revised in 2007) positioned North Lantau Strip under the theme of "Economic Infrastructure and Tourism/Recreation Development" and encouraged the use of synergy effect with Hong Kong Disneyland and other tourism developments in North Lantau. The planning intention was to provide in the area a cluster of entertainment, leisure and tourist facilities.
- According to the Explanatory Statement of North-East Lantau OZP, the site adjacent to the Sunny Bay MTR Station can be considered for compatible tourism and recreational uses subject to further study.

- 1. Note that all vehicles to/from the site need to use the planned primary distributor travelling between NLH and the site. One more traffic lane for each direction needs to be provided to accompdate the traffic volume generated from the site. There are implications on the NLH and Lantau Link. The degree of implications on each road link depends on the planning parameters. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CFIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Commercial and Entertainment	13.7	25	1.0	137,200	5
Hotel	12.3	22	1.5	184,300	12
Business Park and MICE Convention Facilities	15.4	28	2.5	384,200	7
Open Space	11.0	20	-	-	-
Roads	3.2	5	-	-	-

Design Population		
Employment Population	23,100	example.

Open Space Provision				
HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks		
11,500	109,700	Sufficient		

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

50307098/FIG 7

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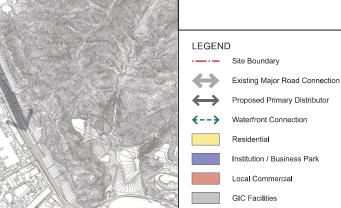
ONCEPT - SUNNY BAY WATERS SYNERGETIC NODAL

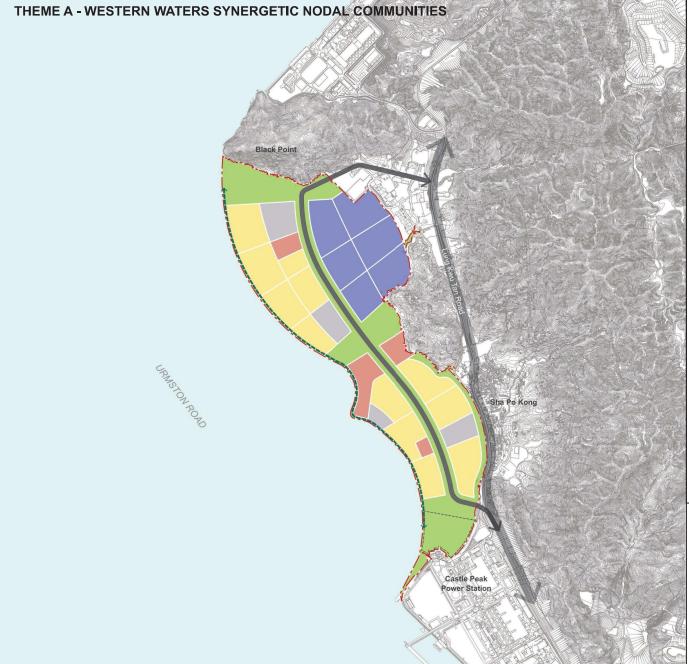
LAND USE CONCEPT - LUNG KWU TAN

Proposed Site

The Lung Kwu Tan reclamation site is proposed to be developed immediately west of the existing Lung Kwu Tan area. The waterfront area of Lung Kwu Sheung Tan is proposed to be resumed for redevelopment in conjunction with the proposed reclamation. It is currently connected by Lung Mun Road and Lung Kwu Tan Road. The proposed extent of the site is to be approximately 237ha.

Potential Underground Sewage Treatment Works Facilities





LAND USE CONCEPT - LUNG KWU TAN THEME A - WESTERN WATERS SYNERGETIC NODAL COMMUNITIES

Land Use Concept

- Residential neighbourhoods are proposed at waterfront location to take advantage of the magnificent view of Urmston Road/ Sha Chau and Lung Kwu Chau Marine Park. The area near Sha Po Kong is also dedicated to the residential development, maintaining the residential nature along this section of Lung Kwu Tan Road. These neighbourhoods will be supported by commercial or G/IC nodes so as to serve the local communities as well as visitors. G/IC facilities will be provided according to the requirements as stipulated in the HKPSG.
- Low-rise residential developments are proposed at the site after taking into account the possible environmental impacts (air quality) which pose constraints on the development density and building height. Besides, future planning should take into account potential development constraints due to the power station and NIMBY facilities nearby when residential developments are proposed.
- Situated at the northeastern end of the site, the proposed Institution/ Business Park use is planned to integrate educational and R&D developments. It is also anticipated to become an incubator of the creative industries, thus creating high level job opportunities for Tuen Mun area,
- Two ample open spaces are proposed at the northern and southern tips of the site for leisure and recreation activities while acting as buffer areas between the proposed developments and existing NIMBY facilities. The open space will be linked up via the waterfront promenade and green link along the road transversing the site. At least 100m buffer distance has been reserved between residential developments and NIMBY or industrial use as required under Chapter 9 (Environment) of the HKPSG.
- There is no existing sewage treatment works within the site. In order to accomodate the extra sewage flow generated by the future residential and employment population, an Underground Sewage Treatment Works is therefore proposed at the southern tip of the open space, where no structure is allowed above the future STW. Besides, a buffer zone has been reserved between the future STW and residential uses.
- The proposed road links in the site will connect the site to the urban area by Lung Mun Road and Lung Kwu Tan Road.

Planning Parameters

Drangood Land Ha

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Residential	79.3	33	2.0 - 3.0	1,797,100	15
Institution / Business Park	47.1	20	2.5	1,177,400	10
Local Commercial	14.1	6	3.0	421,700	-
G/IC Facilities	17.6	7	-	-	-
Open Space	70.0	30	-	-	-
Roads	8.9	4	-	ı	-

Design Population		
Residential Population	93,700	
Number of Households	32,300	
Employment Population	80,000	

Housing Mix				
Housing Types	Plot Ratio	Average Flat Size (sqm)	GFA (sqm)	Households
Type 1	2.0	65	784,200	12,100
Type 2	2.0 - 3.0	50	1,012,900	20,200
Total	-	-	1,797,100	32,300

Open Space Provision HKPSG Planned Provision (sqm) Remarks Requirements (sam) 227,400 699.900 Sufficient

Previous Studies / Policies Reference

· In addressing the needs for local employment, the Tuen Mun Aspiration Study (2007) identified four industries to suit Tuen Mun's future development, namely logistics, green industries, tourism and creative industries.

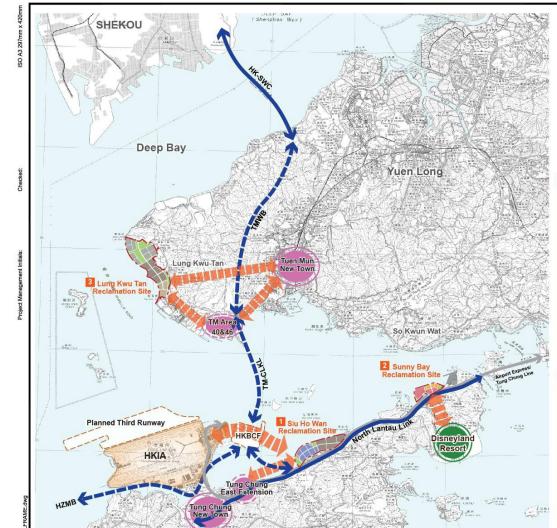
Disclaimer

- 1. Note that all vehicles to/from the site need to use Lung Mun Road travelling between Tuen Mun Town Centre and the site. Currently, Lung Mun Road is a dual-two traffic lane. Under the currently road network, it might not have sufficient lane capacity to accomodate the addition traffic volume generated from the site. In addition, other potential developments surrounding Lung Kwu Tan might cause the combine impact on the road network. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a separate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- 2. The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CEIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

GREEMENT NO. CE 14/2013 (CE). CUMULATIVE ENVIRONMENTAL IMPACT. SSESSIMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION. ITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION.

50307098/FIG 9

CONCEPT - LUNG KWU TAN FRN WATERS SYNERGETIC NODAL COMMUNITIES



LANTAU ISLAND

LANTAU ISLAND

LEGEND

Potential Reclamation Sites **Existing Development Areas** Planned Development Areas **Existing Tourism Attraction** Existing Road Transport Links Planned Road Transport Links Existing Rail Links Possible Integration with Surrounding Developments

Theme B: Western Waters Economic Hub "To create business and employment opportunities in support of Hong Kong's Pillar

Taking into account existing major infrastructure as well as those being planned and underway in close proximity to the three potential reclamation sites, several new 'Economic Gateways' could be emerging in this western part of Hong Kong. Theme B therefore targets to create various business and employment hubs at the three reclamation sites so as to support further development of the pillar industries as well as to capture and capitalize on the spill-over of visitors and business opportunities from both eastern and western parts of the Pearl River Delta region.

Moreover, this Theme also aims to provide a significant amount of job opportunities that are easily accessible to the residents of the Tung Chung and Tuen Mun areas, creating local employment for development of self-sustaining communities.

1 Siu Ho Wan: Logistics and Business

The Siu Ho Wan site is envisioned to create a high-technology regional logistics and business hub taking into account nearby transportation infrastructure (including HKIA and upcoming HZMB) for connections to the Pearl River Delta region as well as to other parts of the world. The future hub could serve as a further extension of existing logistics services at the HKIA taking into consideration the increase demand from Third Runway development.







Sunny Bay: Tourism and Entertainment

The Sunny Bay site is positioned as a tourism and recreational hub in the region. To complement the commercial and entertainment development (possibly with indoor theme park), waterfront hotel uses are proposed to foster the city's tourism growth. It will also help to create job opportunities for North Lantau residents and encourage local







Lung Kwu Tan: Eco/Green Industry, Research and Development (R&D) and Logistics

The vision of the Lung Kwu Tan site is to create a major eco/green industrial and logistics hub at the western part of the New Territories. This helps promote R&D of clean industries as well as local employment benefiting Hong Kong and Tuen Mun New Town.







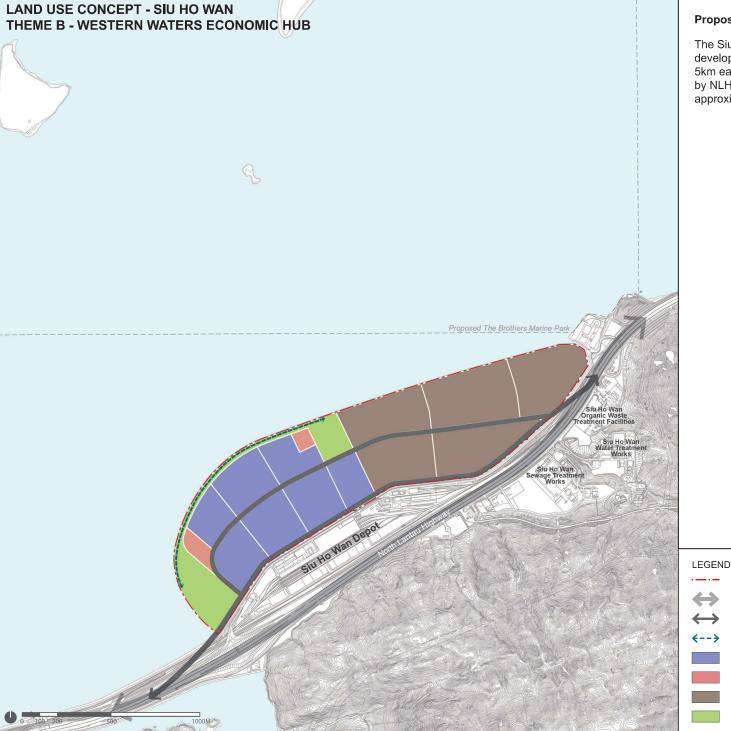
AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION



Site Boundary

Existing Major Road Connection Proposed Primary Distributor Waterfront Connection **Business Park** Local Commercial Logistics Park Open Space

The Siu Ho Wan reclamation site is proposed to be developed at the north of Lantau Island, approximately 5km east of the HKIA. It is currently connected by NLH. The proposed extent of the site is to be approximately 135.3ha.



LAND USE CONCEPT - SIU HO WAN THEME B - WESTERN WATERS ECONOMIC HUB

Land Use Concept

- A Logistics Park development is proposed at the eastern portion of the site taking advantage of the site's proximity to the HKIA, as well as the future strategic cross-boundary transport links. The waterfront location also provides direct marine access to support the further development of shipping, freight, cargo and logistics industries.
- · The western part of the site will be dedicated for Business Park development. It is anticipated for high-end business and regional office development with its excellent accessibility and prime waterfront location. The Park will be enclosed by ample provision of parks and green spaces, and supported by local commerical uses.
- Only non-domestic uses are proposed for land falling within the CZ of Siu Ho Wan WTW. Detailed hazard assessment will be required during the future planning and engineering studies to confirm the compliance with the societal risk criteria under the HKPSG.
- It is assumed that the treatment capacity of the existing Siu Ho Wan STW will be further upgraded to accommodate the extra sewage flow arising from the site.
- Road connections are proposed to link up with NLH for access to Tung Chung for mass transit and bus transportation, as well as to other areas of Hong Kong.

Previous Studies / Policies Reference

- · The Lantau Logistics Park Development Feasibility Study carried out in 2003 recommended for a logistic park development at Siu Ho Wan and was and strongly supported by the Hong Kong Logistics Development Council.
- In 2004, the major development proposals of the Concept Plan for Lantau (revised in 2007) have proposed logistics park development at Siu Ho Wan site.
- In response to the Lantau Development Alliance (LaDA)'s proposal in 2012, which targets to position Tung Chung as a satellite business district that balances Hong Kong's current pattern of over-centralization and eases the pressure on the CBD, the site is possible to complement Tung Chung in transforming North Lantau to become another major business area. More affordable Grade B offices could be built.
- The Policy Address 2013 mentioned Lantau Island, particularly Tung Chung, has a geographical advantage for the development of logistics, tourism and other industries, hence creating new employment opportunities for the local residents.

- 1. Note that all vehicles to/from the site need to use two interchanges (i.e. Siu Ho Wan Interchange and Tai Ho Interchange) and one planned primary distributor travelling between NLH and the site. There are implications on the NLH, Lantau Link and TM-CLKL. The degree of implications on each road link depends on the planning parameters. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- 2. The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CEIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Logistics Park	59.9	44	2.2	1,317,600	3
Business Park	45.0	33	2.5	1,125,500	10
Local Commercial	3.1	2	3.0	92,100	-
Open Space	16.2	12	ı	1	-
Roads	11.1	9	-	-	-
Total Site Area	135.3	100	-	2,535,200	-

Design Population	
Employment Population	62,800

Open Space Provision

HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks
31,400	161,700	Sufficient

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

LAND USE CONCEPT - SIU HO WAN THEME B - WESTERN WATERS ECONOMIC HUB

50307098/FIG 12

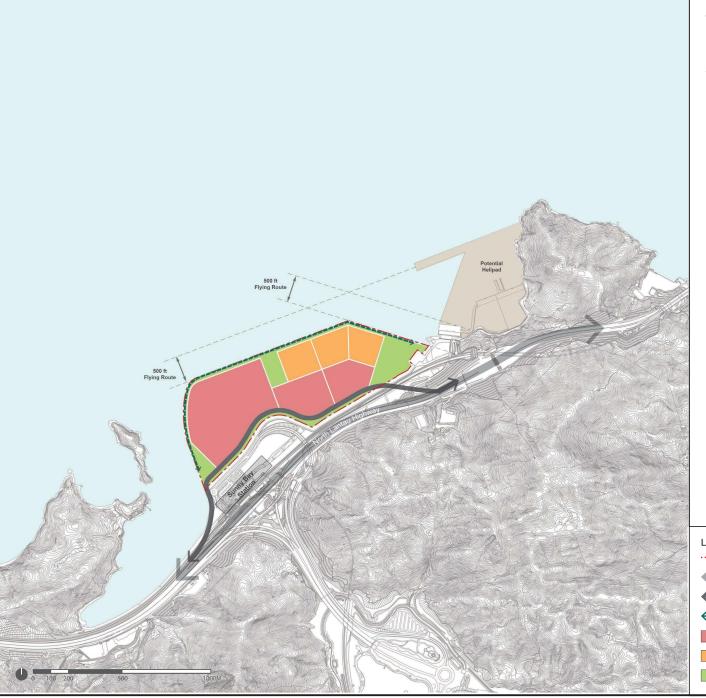
LAND USE CONCEPT - SUNNY BAY

THEME B - WESTERN WATERS ECONOMIC HUB

AECOM

Proposed Site

The Sunny Bay reclamation site is proposed to be developed at the northeast coast of Lantau Island, immediately adjacent to Sunny Bay MTR Station. It is currently connected by NLH and MTR Tung Chung Line. The proposed extent of the site is to be approximately 55.6ha.



LEGEND

Site Boundary



Existing Major Road Connection



Proposed Primary Distributor



Waterfront Connection





Commercial and Entertainment





Open Space

LAND USE CONCEPT - SUNNY BAY THEME B - WESTERN WATERS ECONOMIC HUB

Land Use Concept

- To further strengthen the tourism and recreation functions of North Lantau, commercial and entertainment facilities (possibly indoor theme park and outlet shopping malls) are proposed at the southern and western portions of the site.
- · Hotels will occupy the waterfront area, providing alternative leisure holiday experience at North
- A long strip of open space is planned along the waterfront area for public enjoyment. The waterfront open area will also serve as a continuous linkage for the other open spaces at the eastern, western and middle parts of the site. The eastern open space will also serve as a noise buffer for the potential helipad. Taking into account the potential helipad and its flying routes, noise sensitive uses will be avoided along the waterfront areas.
- The site is subject to the Airport height restriction and Deed of Restrictive Covenant Memorial No. 278911, in which the height restriction of the area near the MTR Sunny Bay Station is 30 mPD. These restrictions were taken into considerations in proposing the maximum building heights in order to maximize the development potential.
- It is assumed that the treatment capacity of the existing Siu Ho Wan STW will be further upgraded to accommodate the extra sewage flow arising from the site.
- · The site is highly accessible with Sunny Bay MTR Station public transport interchange and parking facilities nearby. New road links will be incorporated to connect with NLH and further with other strategic road links within and across the region.

Previous Studies / Policies Reference

- The position of the Sunny Bay site as an international tourist and recreation node had been confirmed in South West New Territories Development Strategy Review (2001) and Northshore Lantau Development Feasibility Study (2001).
- The Concept Plan for Lantau (2004, revised in 2007) positioned North Lantau Strip under the theme of "Economic Infrastructure and Tourism/Recreation Development" and encouraged the use of synergy effect with Hong Kong Disneyland and other tourism developments in North Lantau. The planning intention was to provide in the area a cluster of entertainment, leisure and tourist facilities.
- According to the Explanatory Statement of North-East Lantau OZP, the site adjacent to the Sunny Bay MTR Station can be considered for compatible tourism and recreational uses subject to further study.

- 1. Note that all vehicles to/from the site need to use the planned primary distributor travelling between NLH and the site. One more traffic lane for each direction needs to be provided to accompdate the traffic volume generated from the site. There are implications on the NLH and Lantau Link, The degree of implications on each road link depends on the planning parameters. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- 2. The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CFIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Commercial and Entertainment (Possible Indoor Theme Park)	28.9	52	1.0	289,000	5
Hotel	10.4	19	1.5	155,400	12
Open Space	13.6	24	-	-	1
Roads	2.7	5	-	-	-
Total Site Area	55.6	100		444,400	-

Design Population		
Employment Population	6,400	

Open Space Provision					
HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks			
3,200	135,700	Sufficient			

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

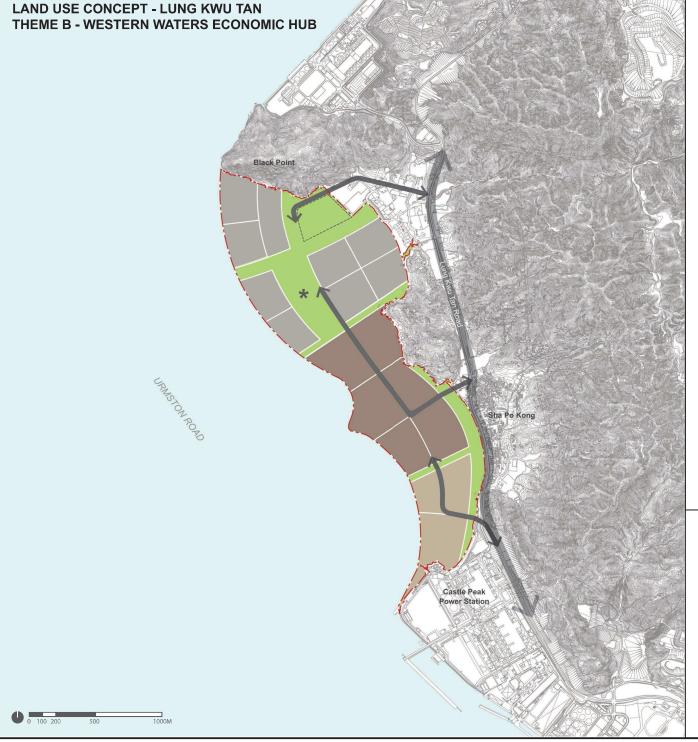
LAND USE CONCEPT - SUNNY BAY
THEME B - WESTERN WATERS ECONOMIC HUB

50307098/FIG 14

AECOM

Proposed Site

The Lung Kwu Tan reclamation site is proposed to be developed immediately west of the existing Lung Kwu Tan area. The waterfront area of Lung Kwu Sheung Tan is proposed to be resumed for redevelopment in conjunction with the proposed reclamation. It is currently connected by Lung Mun Road and Lung Kwu Tan Road. The proposed extent of the site is to be approximately 237ha.



LEGEND

Site Boundary

Existing Major Road Connection



Proposed Primary Distributor



Waterfront Connection





Eco / Green Industry / R&D Park



Logistics Park



Open Space



Potential Underground Sewage Treatment Works Facilities



Proposed Underground Confined Disposal Facility (CDF) for Marine Sediment

LAND USE CONCEPT - LUNG KWU TAN THEME B - WESTERN WATERS ECONOMIC HUB

Land Use Concept

- · Located at the northern portion of the site, the eco/green-industrial and R&D developments would form a larger hub of special industries together with existing industrial activities in the area. Together with the proposed Logistics Park at the centre part of the site, it will create a major employment hub at New Territories West, creating local employment opportunities for Tuen Mun area and wider.
- The proposed Industrial Park at the southern portion of the site can be utilized as reprovisioning sites for existing industries in Tuen Mun Town Centre, or other urban areas of Hong Kong, thus releasing areas for other more beneficial uses. Given the high background air pollutant levels in the surrounding area and the need to strike for compliance with the more stringent new Air Quality Objectives, the Project scheme shall be designed to minimize additional air pollution associated with the new developments as far as practicable. The proposed industrial uses will be confined to the types without air emission / fuel combustion such as packaging industry, sorting and technology park.
- The waterfront locations for the above uses also provide direct marine access to support the transportation of goods and materials, reducing the reliance for road transport.
- A confined disposal facility (CDF) for marine sediment is proposed within the site above which an open space has been proposed as no development is to be allowed on such facility. As advised by CEDD, the potential CDF is included as one of the land use option for the purpose of CEIA only.
- There is no existing sewage treatment works within the site. In order to accomodate the extra sewage flow generated by the future employment population, an Underground Sewage Treatment Works is therefore proposed at the northeastern tip of the open space, where no structure is allowed above the future STW. Besides, a buffer zone has been reserved between the future STW and industrial uses.
- A strip of green space is proposed along a section of Lung Kwu Tan Road as environmental buffer for nearby residential development.
- The proposed road links in the site will connect the site to the urban area by Lung Mun Road and Lung Kwu Tan Road,

Previous Studies / Policies Reference

- · As mentioned in the Policy Address 2009-10, environmental industries (including green/ecoindustries) will be one of the six industries where Hong Kong enjoys clear advantages.
- The Tuen Mun Aspiration Study (2007) mentioned green industries such as recycling centers have potential to be developed in Tuen Mun. Moreover, the idea of creating a major logistics hub had also been recommended under the Study.
- The 2013-14 Budget mentioned the plan to designate about 10 ha of land at Tuen Mun West for the development of logistics facilities to facilitate clustering of companies involved in various operations and services for the industry,

Disclaimer

- 1. Note that all vehicles to/from the site need to use Lung Mun Road travelling between Tuen Mun Town Centre and the site. Currently, Lung Mun Road is a dual-two traffic lane. Under the currently road network, it might not have sufficient lane capacity to accomodate the addition traffic volume generated from the site. In addition, other potential developments surrounding Lung Kwu Tan might cause the combine impact on the road network. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- 2. The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CEIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Eco / Green Industry / R&D Park	76.0	32	2.5	1,899,300	10
Logistics Park	66.4	28	2.5	1,459,700	3
Industrial Park	27.7	12	2.5	693,300	10
Open Space	59.0	25	-	-	-
Roads	7.9	3	ı	-	-
Total Site Area	237.0	100	-	4,052,300	-

Design Population	
Employment Population	64,700

Open Space Provision					
HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks			
32,300	589,800	Sufficient			

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

LAND USE CONCEPT - LUNG KWU TAN THEME B - WESTERN WATERS ECONOMIC HUB

50307098/FIG 16 AECON

Theme C: Western Waters Sustainable Communities "To balance residential and economic development for creation of self-sustained communities"

Under Theme C, it is envisioned future new development areas should be self-sustainable, with effective transport network, sufficient economic activities, community facilities and employment opportunities.

Under this theme, the three potential reclamation sites will provide land for development that aims to strike a balance between satisfying the social need for more quality and affordable housing, while supporting the long-term economic development of Hong Kong. Mixed development within each of the reclamation sites (except Sunny Bay site) will mean opportunities for housing, local employment and business development - creating three unique and "self-sustained" communities.

1 Siu Ho Wan

The Siu Ho Wan site is positioned to be a self-sustainable and balanced community. Waterfront residential development and supporting community facilities are proposed at the site. The site is also proposed to be a supporting base to the various air-related industries and shipping/freight services taking advantage of its close proximity to the HKIA, creating job opportunities for the residential community.







2 Sunny Bay

The Sunny Bay site is envisioned to be created as a business and convention hub in the region. With the proposed hotel development, Business Park and MICE Convention Facilities are proposed at the site, synergizing with the residential developments in Tung Chung and North Lantau as well as Third Runway development at HKIA.







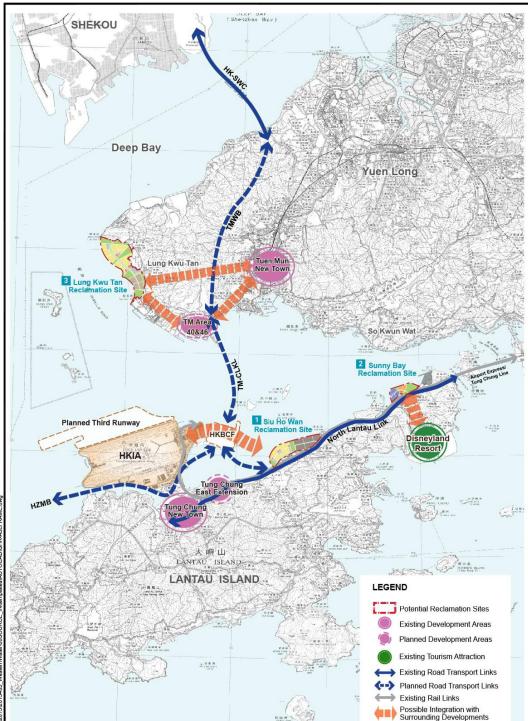
3 Lung Kwu Tan

The Lung Kwu Tan site is envisioned to be developed for green and sustainable industries such that eco-friendly industrial uses can be co-exist together with residential development. Residential community could be benefited from employment opportunities within the site and supported by local commercial, G/IC facilities to meet their daily needs.







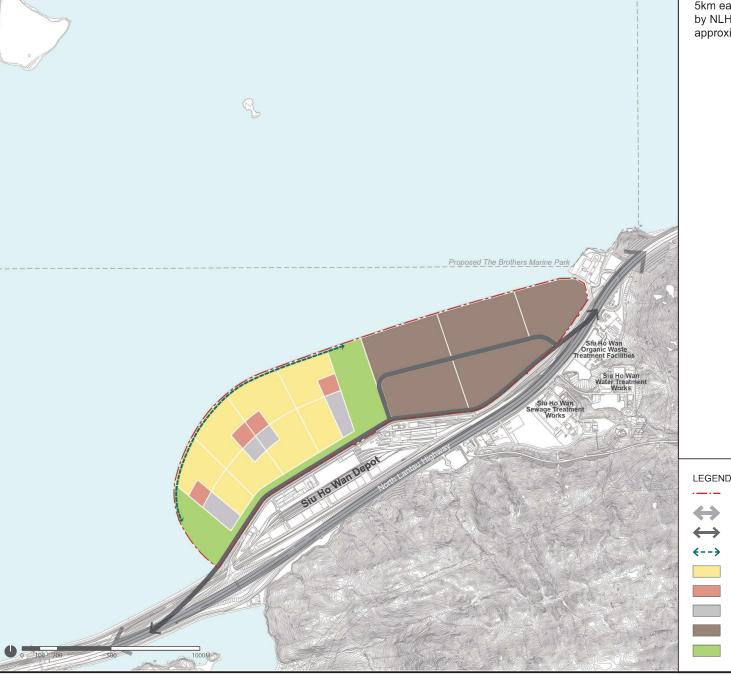


Proposed Site

Site Boundary

Existing Major Road Connection Proposed Primary Distributor Waterfront Connection Residential Local Commercial GIC Facilities Logistics Park Open Space

The Siu Ho Wan reclamation site is proposed to be developed at the north of Lantau Island, approximately 5km east of the HKIA. It is currently connected by NLH. The proposed extent of the site is to be approximately 135.3ha.



LAND USE CONCEPT - SIU HO WAN

THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

LAND USE CONCEPT - SIU HO WAN THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

50307098/FIG 19

LAND USE CONCEPT - SIU HO WAN THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

Land Use Concept

- A waterfront residential neighbourhood is proposed at the western portion of the site. Public open space is proposed between residential area and the proposed Logistics Park at the eastern part of the site as buffer between the two uses. The open space will also act as green corridor linking the inland area to the waterfront promenade, both physically and visually.
- The residential neighbourhood will be served by local commercial or G/IC facilities nodes to cater to the daily need of residents. G/IC facilities will be provided according to the requirements as stipulated in the HKPSG.
- · A Logistics Park development is proposed at the eastern portion of the site taking advantage of the site's proximity to the HKIA, as well as the future strategic cross-boundary transport links. The waterfront location also provides direct marine access to support the further development of shipping, freight, cargo and logistics industries.
- Only non-domestic uses are proposed for land falling within the CZ of Siu Ho Wan WTW. Detailed hazard assessment will be required during the future planning and engineering studies to confirm the compliance with the societal risk criteria under the HKPSG.
- The Airport height restriction was taken into considerations in proposing the maximum building heights of residential developments in order to maximize the development potential.
- It is assumed that the treatment capacity of the existing Siu Ho Wan STW will be further upgraded to accommodate the extra sewage flow arising from the site.
- Road connections are proposed to link up with NLH for access to Tung Chung for mass transit and bus transportation, as well as to other areas of Hong Kong,

Previous Studies / Policies Reference

- · As recommended in the recent Tung Chung New Town Extension Study, 70-75 ha of reclaimed land in Tung Chung East will be allocated to residential developments which accommodate a population of 95,000-110,000. The Siu Ho Wan site can be developed as a further expansion of residential areas of Tung Chung East Extension.
- The Lantau Logistics Park Development Feasibility Study carried out in 2003 recommended for a logistic park development at Siu Ho Wan and was and strongly supported by the Hong Kong Logistics Development Council.
- In 2004, the major development proposals of the Concept Plan for Lantau (revised in 2007) has proposed logistics park development at Siu Ho Wan site.
- The Policy Address 2013 mentioned Lantau Island, particularly Tung Chung, has a geographical advantage for the development of logistics, tourism and other industries, hence creating new employment opportunities for the local residents.

- 1. Note that all vehicles to/from the site need to use two interchanges (i.e. Siu Ho Wan Interchange and Tai Ho Interchange) and one planned primary distributor travelling between NLH and the site. There are implications on the NLH, Lantau Link and TM-CLKL. The degree of implications on each road link depends on the planning parameters. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- 2. The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CEIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Residential	42.4	31	3.0	1,272,100	25
Logistics Park	53.9	40	2.2	1,185,800	3
Local Commercial	4.1	3	3.0	123,100	1
G/IC Facilities	6.2	5	-	-	-
Open Space	20.7	15	-	-	-
Roads	8.0	6	-	-	-
Total Site Area	135.3	100	-	2,581,000	-

Design Population			
Residential Population	56,800		
Number of Households	19,600		
Employment Population	7,900		
_			

Housing Mix				
Housing Types	Plot Ratio	Average Flat Size (sqm)	GFA (sqm)	Households
Type 1	3.0	65	1,272,100	19,600
Total	-	-	1,272,100	19,600

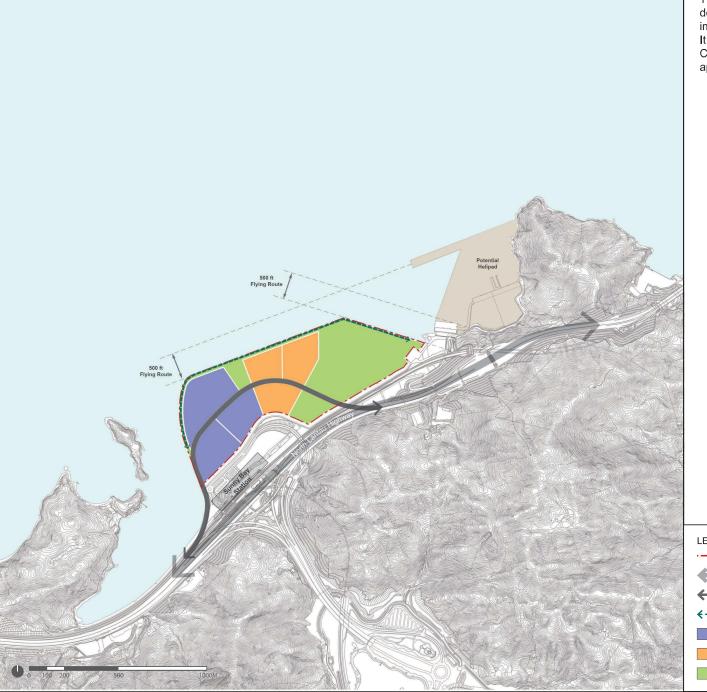
Open Space Provision					
HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks			
117,400	206,900	Sufficient			

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

AECOM



The Sunny Bay reclamation site is proposed to be developed at the northeast coast of Lantau Island, immediately adjacent to Sunny Bay MTR Station. It is currently connected by NLH and MTR Tung Chung Line. The proposed extent of the site is to be approximately 55.6ha.



PRELIMINARY LAND USE CONCEPT - SUNNY BAY

THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

LEGEND

Site Boundary

Existing Major Road Connection



Proposed Primary Distributor



Waterfront Connection



Business Park and MICE Convention Facilities





Golf Course and Open Space

LAND USE CONCEPT - SUNNY BAY THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

Land Use Concept

- Taking advantage of its strategic location with direct access to rail connection, and close
 proximity to the HKIA and future BCF, the western portion of the site is proposed for Business
 Park development with MICE Convention facilities. It is anticipated for high-end business,
 regional office development as well as MICE and exhibition.
- Hotels are proposed to the east of the proposed Business Park. Golf course use is planned next
 to the hotels in order to strengthen Sunny Bay's role as an integrated business and tourism hub.
- Taking into account the potential helipad and its flying routes, noise sensitive uses will be avoided along the waterfront areas.
- The site is subject to the Airport height restriction and Deed of Restrictive Covenant Memorial No. 278911, in which the height restriction of the area near the MTR Sunny Bay Station is 30 mPD. These restrictions were taken into considerations in proposing the maximum building heights in order to maximize the development potential.
- It is assumed that the treatment capacity of the existing Siu Ho Wan STW will be further upgraded to accommodate the extra sewage flow arising from the site.
- The site is highly accessible with Sunny Bay MTR Station public transport interchange and parking facilities nearby. New road links will be incorporated to connect with NLH and further with other strategic road links within and across the region.

Previous Studies / Policies Reference

- The South West New Territories Development Strategy Review (2001) mentioned that the
 possible uses of Sunny Bay may include integrated complex with hotel, retail and office facilities,
 tourist and convention village, and hi-tech entertainment attractions.
- The Concept Plan for Lantau (2004, revised in 2007) positioned North Lantau Strip under the
 theme of "Economic Infrastructure and Tourism/Recreation Development" and encouraged the
 use of synergy effect with Hong Kong Disneyland and other tourism developments in North
 Lantau. The planning intention was to provide in the area a cluster of entertainment, leisure and
 tourist facilities.
- According to the Explanatory Statement of North-East Lantau OZP, the site adjacent to the Sunny Bay MTR Station can be considered for compatible tourism and recreational uses subject to further study.

Disclaimer

- 1. Note that all vehicles to ffrom the site need to use the planned primary distributor travelling between NLH and the site. One more traffic lane for each direction needs to be provided to accomodate the traffic volume generated from the site. There are implications on the NLH and Lantau Link. The degree of implications on each road link depends on the planning parameters. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- 2. The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CEIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Business Park and MICE Convention Facilities	16.6	30	2.5	416,000	7
Hotel	11.3	20	1.5	169,900	12
Golf Course and Open Space	24.9	45	-	-	-
Roads	2.8	5	-	-	_

Design Population		
Employment Population	22,200	
	_	

Open Space Provision				
HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks		
11,100	249,200	Sufficient		

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

LAND USE CONCEPT - SUNNY BAY THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

50307098/FIG 21

AECOM

PRELIMINARY LAND USE CONCEPT - LUNG KWU TAN

THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

Proposed Site

The Lung Kwu Tan reclamation site is proposed to be developed immediately west of the existing Lung Kwu Tan area. The waterfront area of Lung Kwu Sheung Tan is proposed to be resumed for redevelopment in conjunction with the proposed reclamation. It is currently connected by Lung Mun Road and Lung Kwu Tan Road. The proposed extent of the site is to be approximately 237ha.



LEGEND

Site Boundary

Existing Major Road Connection



Proposed Primary Distributor



Waterfront Connection





Residential



GIC Facilities



Industrial Park





Open Space



Potential Underground Sewage Treatment Works Facilities

LAND USE CONCEPT - LUNG KWU TAN THEME C - WESTERN WATERS SUSTAINABLE COMMUNITIES

Land Use Concept

- Residential developments are proposed at the northern portion of the site. Two clusters are located along the waterfront to take advantage of the magnificent view of Urmston Road/ Sha Chau and Lung Kwu Chau Marine Park, while another two clusters are situated east to the proposed road. Serving the local residents as well as visitors, commercial or G/IC nodes will be located next to these residential developments. G/IC facilities will be provided according to the requirements as stipulated in the HKPSG.
- Low-rise residential developments are proposed at the site after taking into account the possible environmental impacts (air quality) which pose constraints on the development density and building height. Besides, future planning should take into account potential development constraints due to the power station and NIMBY facilities nearby when residential developments are proposed.
- Situated at the southern tip of the site, the Industrial Park development is planned to further support industrial development in Hong Kong providing local employment opportunities for Tuen Mun area. The Park can also be utilized as reprovisioning sites for existing industries in Tuen Mun Town Centre, or other urban areas of Hong Kong, thus releasing areas for other more beneficial uses. Given the high background air pollutant levels in the surrounding area and the need to strike for compliance with the more stringent new Air Quality Objectives, the Project scheme shall be designed to minimize additional air pollution associated with the new developments as far as practicable. The proposed industrial uses will be confined to the types without air emission / fuel combustion such as packaging industry, sorting and technology park.
- The waterfront location of Industrial Park also provide direct marine access to support the transportation of goods and materials, reducing the reliance for road transport.
- Ample open spaces are proposed throughout the site for leisure and recreation activities while acting as buffer areas between the proposed developments and existing NIMBY facilities/ proposed Industrial Park. The open space will be linked up via the waterfront promenade and green link along the road transversing the site. Besides, a strip of green space is proposed along a section of Lung Kwu Tan Road as environmental buffer for nearby residential development. At least 100m buffer distance has been reserved between residential developments and NIMBY or industrial use as required under Chapter 9 (Environment) of the HKPSG.
- There is no existing sewage treatment works within the site. In order to accommodate the extra sewage flow generated by the future residential and employment population, an Underground Sewage Treatment Works is therefore proposed at the southern tip of the open space, where no structure is allowed above the future STW. Besides, a buffer zone has been reserved between the future STW and industrial uses.
- The proposed road links in the site will connect the site to the urban area by Lung Mun Road and Lung Kwu

Previous Studies / Policies Reference

 As mentioned in the Policy Address 2009-10, environmental industries (including green/eco-industries) will be one of the six industries where Hong Kong enjoys clear advantages. The Tuen Mun Aspiration Study (2007) mentioned green industries such as recycling centers have potential to be developed in Tuen Mun.

Disclaimer

- 1. Note that all vehicles to/from the site need to use Lung Mun Road travelling between Tuen Mun Town Centre and the site. Currently, Lung Mun Road is a dual-two traffic lane. Under the currently road network, it might not have sufficient lane capacity to accomodate the addition traffic volume generated from the site. In addition, other potential developments surrounding Lung Kwu Tan might cause the combine impact on the road network. Thus, the traffic capacity of the potential reclamation site needs to be further considered and reviewed in the Traffic Impact Assessment in a seperate study. Detailed transport infrastructure scheme for the potential reclamation site will be determined under the future detailed Planning and Engineering Studies and other technical assessments should the site be selected.
- 2. The notional land use proposals are drawn up solely for selecting the worst case scenario for the purpose of carrying out the CEIA. The future land uses and infrastructure provision of the reclamation site will be reviewed under detailed Planning and Engineering Studies and other technical assessments should the site be selected.

Planning Parameters

Proposed Land Use					
Land Use	Land Area (ha)	Percentage of Land Area (%)	Indicative Average Plot Ratio	GFA (sqm)	Indicative Max. Building Height (storey)
Residential	83.0	35	2.0 - 3.0	2,088,200	15
Industrial Park	32.4	14	2.5	809,600	10
Local Commercial	6.9	3	3.0	208,300	-
G/IC Facilities	14.6	6	-	-	-
Open Space	92.8	39	-	1	-
Roads	7.3	3	-	-	-
Total Site Area	237.0	100	-	3,106,100	-

Design Population		
Residential Population	110,400	
Number of Households	38,100	
Employment Population	20,100	

Housing Mix									
Housing Types	Plot Ratio	Average Flat Size (sqm)	GFA (sqm)	Households					
Type 1	2.0	65	799,100	12,300					
Type 2	3.0	50	1,289,100	25,800					
Total	-	-	2,088,200	38,100					

Open Space Provision							
HKPSG Requirements (sqm)	Planned Provision (sqm)	Remarks					
230,900	928,200	Sufficient					

AGREEMENT NO. CE 14/2013 (CE) CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR THE THREE POTENTIAL NEARSHORE RECLAMATION SITES IN THE WESTERN WATERS OF HONG KONG – INVESTIGATION

50307098/FIG 23

LAND USE CONCEPT - LUNG KWU TAN WESTERN WATERS SUSTAINABLE COMMUNITIES

APPENDIX D

Tentative Construction Programme for the Potential Reclamation Sites

Appendix D1 Tentative Construction Programme for Potential Reclamation Site at Siu Ho Wan

ID Task Name	Quantity	Production Rate (per day)	Duration	Year of 2019 03 04	Year of 2020 Q1 Q2 Q3 Q4	Year of 2021 Q1 Q2 Q3 Q4	Year of 2022 Q1 Q2 Q3 Q4	Year of 2023 Q1 Q2 Q3 Q4	Year of 2024 Q1 Q2
				7 0 7 10 11 12		1 2 0 4 0 0 7 0 7 10 11 12		1 2 5 4 5 6 7 6 7 16 11 16	. 1 2 3 4 3 3
Reclamation Work			1380 Days						
1 Seawall Construction			510 Days						
2 ji. Placing of geotextile and stone blanket	400,000 m ³ Vol.	7,692 m ³	60 Days		Suspension of pilling	work during peak mo	nths of the dolphin ca	ving season (i.e. May a	nd June)
3 ii. Installation of stone column foundation (assuming 15% replacment ratio)	40,681 No.	163 No.	288 Days		V				
4 iii. Installation of cellular steel caisson			240 Days						
5 iv. Filling inside the caisson			300 Days						
6 v. Placing of revetment in front of the caisson			270 Days						
7 Reclamation and ground treatment	1,330,000 m ² Area	1,137 m ²	1350 Days				:=:=::		
8 j. Placing of sand blanket	2,660,000 m ³ Vol.		390 Days						
9 ii. Installation of vertical drains	443,500 No.		360 Days						
10 iii. Placing of sand fill / selected public fill by bottom dump until -2mPD	700,000 m ³ Vol.	1,795 m ³	450 Days						
11 iv. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD	6,000,000 m ³ Vol.	9,615 m ³	720 Days						
12 v. Installation of instrumentations for monitoring			390 Days						
13 vi. Placing of selected public fill by trunk and compacted by roll and compaction method			510 Days					İ	
14 vii. Placing of surcharge using selected public fill by trunk and compacted by roll and compaction method			690 Days			l————			
15 viii. Removal of surcharge by excavator and truck when settlement performance achieved.			30 Days					Ĺi	

Legend: Operation below water Operation above water

Appendix D2 Tentative Construction Programme for Potential Reclamation Site at Sunny Bay

				V	V		V	V 1 - 0000
		Maximum		Year of 2019 Q1 Q2 Q3 Q4	Year of 2020 Q1 Q2 Q3 Q4	Year of 2021 Q1 Q2 Q3 Q4	Year of 2022 Q1 Q2 Q3 Q4	Year of 2023 Q1 Q2 Q3 Q4
ID Task Name	Quantity	Production Rate (per day)	Duration	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
		()/			<u> </u>			
\sqcup								
Reclamation Work (Phase 1)			1290 Days			<u></u>		
1 Seawall Construction			510 Days					
2 i. Placing of geotextile and sand blanket	430,000 m ³ Vol.	6,615 m ³	75 Days					
3 ii. Installation of SCP foundation (assuming 50% replacment ratio)	107,500 m ² Area	459 m ²	270 Days					
4 iii. Installation of cellular steel caisson			240 Days					
5 iv. Filling inside the caisson			240 Days					
6 v. Placing of revetment in front of the caisson			360 Days					
7 Reclamation and ground treatment	720,000 m ² Area	748 m ²	1110 Days			55		
8 i. Placing of sand blanket	1,440,000 m³ Vol.	6,923 m ³	240 Days					
9 ii. Installation of vertical drains	240,000 No.	0'452 W.	240 Days					
7 In Installation of Volume and Ins		10 (25 3	,					
iii. Placing of sand fill / selected public fill	4,420,000 m ³ Vol.	10,625 m ³	480 Days					
11 iv. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD	3,240,000 m ³ Vol.	8,308 m ³	450 Days					
12 v. Installation of instrumentations for monitoring			480 Days		<u></u>	:		
13 vi. Placing of selected public fill by trunk and compacted by roll and compaction method	to formation level		510 Days		i		,	
14 vii. Install De-watering surcharge system and Kept for surcharge period			660 Days		!	 	 	
15 viii. Removal of surcharge by excavator and truck when settlement performance achieve	d.		60 Days				i=I	
Reclamation Work (Phase 2)		I	1290 Days		I :			
Reclamation work (Phase 2)			1290 Days		<u></u>	T		
H								
16 Seawall Construction			510 Days					
17 i. Placing of geotextile and sand blanket	150,000 m ³ Vol.	2,885 m ²	60 Days					
18 ii. Installation of SCP foundation (assuming 50% replacment ratio)								
	37,500 m ² Area	361 m ²	,					
19 iii. Installation of cellular steel caisson	37,500 m ² Area	361 m ²	90 Days					
	37,500 m ² Area	361 m ²		=				
19 iii. Installation of cellular steel caisson	37,500 m ² Area	361 m ²	90 Days	=_				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson	37,500 m ² Area	361 m ²	90 Days 90 Days	=_				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson	37,500 m ² Area		90 Days 90 Days 120 Days	<u>-</u>				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson			90 Days 90 Days 120 Days	1				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson 22 Reclamation and ground treatment	210,000 m ² Area	218 m ²	90 Days 90 Days 120 Days 1110 Days	3				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson 22 Reclamation and ground treatment 23 i. Placing of sand blanket 24 ii. Installation of vertical drains	210,000 m ² Area 420,000 m ³ Vol. 65,000 No.	218 m ²	90 Days 90 Days 120 Days 1110 Days 90 Days 60 Days	7				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson 22 Reclamation and ground treatment 23 i. Placing of sand blanket 24 ii. Installation of vertical drains 25 iii. Placing of sand fill / selected public fill by bottom dump until -2mPD	210,000 m ² Area 420,000 m ³ Vol. 65,000 No. 1,302,000 m ³ Vol.	218 m ² 5,385 m ³ 7,704 m ³	90 Days 90 Days 120 Days 1110 Days 90 Days 60 Days 195 Days	1	_			
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson 22 Reclamation and ground treatment 23 i. Placing of sand blanket 24 ii. Installation of vertical drains 25 iii. Placing of sand fill / selected public fill by bottom dump until -2mPD 26 iv. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD	210,000 m ² Area 420,000 m ³ Vol. 65,000 No.	218 m ² 5,385 m ³	90 Days 90 Days 120 Days 1110 Days 90 Days 60 Days 195 Days 150 Days	=======================================				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson 22 Reclamation and ground treatment 23 i. Placing of sand blanket 24 ii. Installation of vertical drains 25 iii. Placing of sand fill / selected public fill by bottom dump until -2mPD 26 iv. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD 27 v. Installation of instrumentations for monitoring	210,000 m ² Area 420,000 m ³ Vol. 65,000 No. 1,302,000 m ³ Vol. 945,000 m ³ Vol.	218 m ² 5,385 m ³ 7,704 m ³	90 Days 90 Days 120 Days 1110 Days 90 Days 60 Days 195 Days 150 Days	=======================================				
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson 22 Reclamation and ground treatment 23 i. Placing of sand blanket 24 ii. Installation of vertical drains 25 iii. Placing of sand fill / selected public fill by bottom dump until -2mPD 26 iv. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD 27 v. Installation of instrumentations for monitoring 28 vi. Placing of selected public fill by trunk and compacted by roll and compaction method	210,000 m ² Area 420,000 m ³ Vol. 65,000 No. 1,302,000 m ³ Vol. 945,000 m ³ Vol.	218 m ² 5,385 m ³ 7,704 m ³	90 Days 90 Days 120 Days 1110 Days 90 Days 60 Days 195 Days 150 Days 510 Days	===	[:::::::::::::::::::::::::::::::::::::			
19 iii. Installation of cellular steel caisson 20 iv. Filling inside the caisson 21 v. Placing of revetment in front of the caisson 22 Reclamation and ground treatment 23 i. Placing of sand blanket 24 ii. Installation of vertical drains 25 iii. Placing of sand fill / selected public fill by bottom dump until -2mPD 26 iv. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD 27 v. Installation of instrumentations for monitoring	210,000 m² Area 420,000 m³ Vol. 65,000 No. 1,302,000 m³ Vol. 945,000 m³ Vol.	218 m ² 5,385 m ³ 7,704 m ³	90 Days 90 Days 120 Days 1110 Days 90 Days 60 Days 195 Days 150 Days	==	C::3 E:::::::::		::=:::::::::::::::::::::::::::::::::::	

Operation below water

Operation above water

Appendix D3 Tentative Construction Programme for Potential Reclamation Site at Lung Kwu Tan

					Year of 2019	Year of 2020	Year of 2021	Year of 2022	Year of 2023	Year of 2024
ID	Task Name	Quantity	Production Rate (per day)	Duration	Q3 Q4 7 8 9 10 11 12	Year of 2020 Q1 Q2 Q3 Q4 1 2 3 4 5 6 7 8 9 10 11 12	Q1 Q2 Q3 Q4 1 2 3 4 5 6 7 8 9 10 11 12	Q1 Q2 Q3 Q4 1 1 2 3 4 5 6 7 8 9 10 11 12	01 02 03 04 1 2 3 4 5 6 7 8 9 10 11 12	Q1 Q2 1 2 3 4 5 6
	Phase 1 Reclamation									
1	Seawall Construction			180 Days						
2	i. Installation of sheetpile			60 Days						
3	ii. Placing of geotextile	31,800 m ² Area	1,223 m ²	30 Days						
4	iii. Placing of rockfill	31,800 m ³ Vol.	2,446 m ³	15 Days						
5	Reclamation and ground treatment	130,000 m ² Area		930 Days						
6	i. placing of sand layer using sprinker method	260,000 m ³ Vol.	5,000 m ³	60 Days						
7	ii. Installation of vertical drains	42,000 No.		30 Days						
8	iii. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD	310,000 m ³ Vol.	5,962 m ³	60 Days						
9	iv. Installation of instrumentations for monitoring			30 Days		[]				
10	v. Placing of selected public fill by trunk and compacted by roll and compaction method	130,000 m ² Area	294 m ²	510 Days					İ	
11	vi. Placing of surcharge using selected public fill by trunk and compacted by roll and compaction method			690 Days		[
12	vii. Removal of surcharge by excavator and truck when settlement performance achieved.			30 Days				<u> </u>		
	Phase 2 Reclamation									
13	Seawall Construction			240 Days						
14	i. Placing of geotextile and rockfill platform	1,404,000 m ³ Vol.	7,714 m ³	210 Days						
15	ii. Installation of Stone Column (assuming 15% replacment ratio)	22,346 No.	156 No.	165 Days						
						Suspension of pillin	g work during peak m	onths of the dolphin c	alving season (i.e. May	and June)
16	Reclamation and ground treatment	1,390,000 m ² Area	1,243 m ²	1290 Days						
17	i. placing of geotextile and sand blanket	1,390,000 m ² Area	7,637 m ²	210 Days						
18	ii. Installation of vertical drains	465,000 No.		360 Days						
19	iii. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD	5,560,000 m ³ Vol.	7,374 m ³	870 Days						
20	iv. Installation of instrumentations for monitoring			420 Days			;			
21	v. Placing of selected public fill by trunk and compacted by roll and compaction method	1,390,000 m ² Area	3,145 m ²	510 Days			i <u>—-—-</u>			
22	vi. Placing of surcharge using selected public fill by trunk and compacted by roll and compaction method			690 Days			l <u></u>			
23	vii. Removal of surcharge by excavator and truck when settlement performance achieved.			30 Days					J I.	
	Phase 3 Reclamation									
24	Seawall Construction			270 Days						
25	i. Placing of geotextile and stone blanket	1,220,000 m ³ Vol.	11,731 m ³	120 Days						
26	ii. Installation of stone column foundation (assuming 15% replacment ratio)	29,565 No.	131 No.	260 Days						
							ig work during peak m	onths of the dolphin o	alving season (i.e. May	and June)
	Reclamation and ground treatment	1,060,000 m ² Area	948 m ²	1290 Days						
28	i. placing of geotextile and sand blanket	1,060,000 m ² Area	6,795 m ²	180 Days						
29	ii. Installation of vertical drains	355,000 No.		360 Days						
30	iii. Placing of sand fill / selected public fill by grab and place from barge until +2.5mPD	2,650,000 m ³ Vol.	3,775 m ³	810 Days						
31	iv. Installation of instrumentations for monitoring			390 Days				<u> </u>		
32	v. Placing of selected public fill by trunk and compacted by roll and compaction method	1,060,000 m ² Area	2,398 m ²	510 Days			<u></u> 1 <u></u> 1		<u> </u>	
33	vi. Placing of surcharge using selected public fill by trunk and compacted by roll and compaction method			690 Days			<u></u>			
34	vii. Removal of surcharge by excavator and truck when settlement performance achieved.			30 Days				1	<u> </u>	

Legend: Operation below water

APPENDIX E

Construction and Operational Phases Air Quality at Sensitive Receivers

APPENDIX E CONSTRUCTION AND OPERATIONAL PHASES AIR QUALITY AT SENSITIVE RECEIVERS

1 CONSTRUCTION PHASE

1.1 Unmitigated Scenario

Table 1.1 Predicted Cumulative Maximum Hourly Average TSP Concentrations at Representative Air Sensitive Receivers (Unmitigated)

ASRs	Closest Project Site	Assessment Height (mAG)	Cumulative Maximum Hourly Average TSP Concentrations (μg/m³)
A104	Lung Kwu Tan	1.5	<u>1699</u>
A105	Lung Kwu Tan	1.5	<u>3936</u>
A106	Lung Kwu Tan	1.5	<u>7387</u>
A107	Lung Kwu Tan	1.5	9824
A108	Lung Kwu Tan	1.5	<u>3586</u>
A201	Siu Ho Wan	1.5	<u>1121</u>
A203	Siu Ho Wan	1.5	<u>1907</u>
A204	Siu Ho Wan	1.5	<u>1380</u>
A205	Siu Ho Wan	1.5	2836
A206	Siu Ho Wan	1.5	<u>7244</u>
A207	Siu Ho Wan	1.5	<u>3671</u>
A208	Siu Ho Wan	1.5	<u>2763</u>
A209	Siu Ho Wan	1.5	4034
A210	Siu Ho Wan	1.5	<u>3770</u>
A211	Siu Ho Wan	1.5	<u>6807</u>
A212	Sunny Bay	1.5	2323
A214	Sunny Bay	1.5	<u>2726</u>
A215	Sunny Bay	1.5	<u>1475</u>
A216	Sunny Bay	1.5	<u>718</u>
A217	Sunny Bay	1.5	<u>663</u>
A218	Sunny Bay	1.5	<u>872</u>
A219	Sunny Bay	1.5	<u>899</u>

Note:

- (1) The hourly average TSP EIAO-TM criterion is 500 μg/m³.
- (2) Bold and underlined values represent the predicted TSP concentration exceeds the respective criteria.
- (3) A203 and A204 are future air sensitive receivers and will be occupied after completion of TCNTDE Phase 1 Future Tung Chung East Development. Therefore, TCNTDE Phase 1 has not been included in cumulative assessment.
- (4) According to site visit, it is confirmed that Lantau Toll Plaza Administration Building (A214) is central-air-conditioned and the fresh air intakes of the air-conditioning systems are located at 8m and 10m above ground. The assessment height at 1.5mAG is selected for construction phase assessment as a conservative approach.

Table 1.2 Predicted Cumulative Maximum Daily, 10th Highest Daily and Annual Average RSP Concentrations at Representative Air Sensitive Receivers (Unmitigated)

	Olassad	Assessment	Cumulative	RSP Concentrat	ions (μg/m³)
ASRs	Closest Project Site	Height (mAG)	Maximum Daily Average	10 th Highest Daily Average	Annual Average
A104	Lung Kwu Tan	1.5	<u>164</u>	<u>123</u>	45
A105	Lung Kwu Tan	1.5	<u>248</u>	<u>216</u>	47
A106	Lung Kwu Tan	1.5	<u>378</u>	303	<u>50</u>
A107	Lung Kwu Tan	1.5	409	<u>361</u>	<u>53</u>
A108	Lung Kwu Tan	1.5	<u>191</u>	<u>126</u>	<50
A201	Siu Ho Wan	1.5	<u>152</u>	97	41
A203	Siu Ho Wan	1.5	<u>149</u>	83	42
A204	Siu Ho Wan	1.5	<u>153</u>	87	42
A205	Siu Ho Wan	1.5	<u>210</u>	82	42
A206	Siu Ho Wan	1.5	<u>297</u>	<u>260</u>	47
A207	Siu Ho Wan	1.5	<u>170</u>	<u>155</u>	44
A208	Siu Ho Wan	1.5	<u>211</u>	<u>169</u>	43
A209	Siu Ho Wan	1.5	<u>264</u>	184	44
A210	Siu Ho Wan	1.5	<u>313</u>	184	44
A211	Siu Ho Wan	1.5	402	<u>231</u>	44
A212	Sunny Bay	1.5	<u>159</u>	104	42
A214	Sunny Bay	1.5	<u>212</u>	<u>180</u>	48
A215	Sunny Bay	1.5	143	<u>108</u>	43
A216	Sunny Bay	1.5	<u>120</u>	86	42
A217	Sunny Bay	1.5	<u>126</u>	98	41
A218	Sunny Bay	1.5	<u>128</u>	99	41
A219	Sunny Bay	1.5	<u>124</u>	97	41

- (1) The daily average RSP concentration limit under AQO is 100 g/m³, and the number of exceedances allowed is 9.
- (2) The annual average RSP concentration limit under AQO is 50 μg/m³.
- (3) Bold and underlined values represent the predicted RSP concentration exceeds the respective criteria.
- (4) A203 and A204 are future air sensitive receivers and will be occupied after completion of TCNTDE Phase 1 Future Tung Chung East Development. Therefore, TCNTDE Phase 1 has not been included in cumulative assessment.
- (5) According to site visit, it is confirmed that Lantau Toll Plaza Administration Building (A214) is central-air-conditioned and the fresh air intakes of the air-conditioning systems are located at 8m and 10m above ground. The assessment height at 1.5mAG is selected for construction phase assessment as a conservative approach.

Table 1.3 Predicted Cumulative Maximum Daily, 10th Highest Daily and Annual Average FSP Concentrations at Representative Air Sensitive Receivers (Unmitigated)

		Assessment	Cumulative	FSP Concentrati	tions (μg/m³)	
ASRs	Closest Project Site	Height (mAG)	Maximum Daily Average	10 th Highest Daily Average	Annual Average	
A104	Lung Kwu Tan	1.5	<u>93</u>	65	32	
A105	Lung Kwu Tan	1.5	<u>93</u>	71	31	
A106	Lung Kwu Tan	1.5	<u>102</u>	74	32	
A107	Lung Kwu Tan	1.5	<u>96</u>	<u>76</u>	33	
A108	Lung Kwu Tan	1.5	<u>106</u>	68	35	
A201	Siu Ho Wan	1.5	92	60	29	
A203	Siu Ho Wan	1.5	<u>91</u>	59	29	
A204	Siu Ho Wan	1.5	<u>91</u>	59	29	
A205	Siu Ho Wan	1.5	<u>89</u>	59	28	
A206	Siu Ho Wan	1.5	94	67	29	
A207	Siu Ho Wan	1.5	<u>91</u>	61	29	
A208	Siu Ho Wan	1.5	90	62	29	
A209	Siu Ho Wan	1.5	92	63	30	
A210	Siu Ho Wan	1.5	<u>92</u>	64	30	
A211	Siu Ho Wan	1.5	<u>93</u>	70	30	
A212	Sunny Bay	1.5	<u>94</u>	61	29	
A214	Sunny Bay	1.5	<u>93</u>	64	31	
A215	Sunny Bay	1.5	<u>93</u>	60	30	
A216	Sunny Bay	1.5	90	60	30	
A217	Sunny Bay	1.5	88	61	29	
A218	Sunny Bay	1.5	<u>87</u>	60	29	
A219	Sunny Bay	1.5	<u>87</u>	60	29	

- (1) The daily average FSP concentration limit under AQO is 75 $\mu g/m^3$, and the number of exceedances allowed is 9.
- (2) The annual average FSP concentration limit under AQO is 35 μg/m³.
- (3) Bold and underlined values represent the predicted FSP concentration exceeds the respective criteria.
- (4) A203 and A204 are future air sensitive receivers and will be occupied after completion of TCNTDE Phase 1 Future Tung Chung East Development. Therefore, TCNTDE Phase 1 has not been included in cumulative assessment.
- (5) According to site visit, it is confirmed that Lantau Toll Plaza Administration Building (A214) is central-air-conditioned and the fresh air intakes of the air-conditioning systems are located at 8m and 10m above ground. The assessment height at 1.5mAG is selected for construction phase assessment as a conservative approach.

1.2 Mitigated Scenario

Table 1.4 Predicted Cumulative Maximum Hourly Average TSP Concentrations at Representative Air Sensitive Receivers (Mitigated Tier 1)

ASRs	Closest Project Site	Assessment Height (mAG)	Cumulative Maximum Hourly Average TSP Concentrations (μg/m³)
A104	Lung Kwu Tan	1.5	273
A105	Lung Kwu Tan	1.5	<u>560</u>
A106	Lung Kwu Tan	1.5	<u>995</u>
A107	Lung Kwu Tan	1.5	<u>1307</u>
A108	Lung Kwu Tan	1.5	<u>517</u>
A201	Siu Ho Wan	1.5	195
A203	Siu Ho Wan	1.5	307
A204	Siu Ho Wan	1.5	260
A205	Siu Ho Wan	1.5	439
A206	Siu Ho Wan	1.5	988
A207	Siu Ho Wan	1.5	<u>543</u>
A208	Siu Ho Wan	1.5	393
A209	Siu Ho Wan	1.5	<u>587</u>
A210	Siu Ho Wan	1.5	<u>554</u>
A211	Siu Ho Wan	1.5	900
A212	Sunny Bay	1.5	375
A214	Sunny Bay	1.5	402
A215	Sunny Bay	1.5	249
A216	Sunny Bay	1.5	159
A217	Sunny Bay	1.5	157
A218	Sunny Bay	1.5	157
A219	Sunny Bay	1.5	166

Note:

- (1) The hourly average TSP EIAO-TM criterion is 500 μg/m³.
- (2) Bold and underlined values represent the predicted TSP concentration exceeds the respective criteria.
- (3) A203 and A204 are future air sensitive receivers and will be occupied after completion of TCNTDE Phase 1 Future Tung Chung East Development. Therefore, TCNTDE Phase 1 has not been included in cumulative assessment.
- (4) According to site visit, it is confirmed that Lantau Toll Plaza Administration Building (A214) is central-air-conditioned and the fresh air intakes of the air-conditioning systems are located at 8m and 10m above ground. The assessment height at 1.5mAG is selected for construction phase assessment as a conservative approach.
- (5) Active works area was assumed to be 100% of construction site with watering eight times a day.

Table 1.5 Predicted Cumulative Maximum Daily, 10th Highest Daily and Annual Average RSP Concentrations at Representative Air Sensitive Receivers (Mitigated Tier 1)

		Assessment	Cumulative	RSP Concentrati	ons (μg/m³)
ASRs	Closest Project Site	Height (mAG)	Maximum Daily Average	10 th Highest Daily Average	Annual Average
A104	Lung Kwu Tan	1.5	<u>125</u>	88	44
A105	Lung Kwu Tan	1.5	<u>125</u>	94	44
A106	Lung Kwu Tan	1.5	<u>139</u>	<100	45
A107	Lung Kwu Tan	1.5	<u>130</u>	<u>103</u>	46
A108	Lung Kwu Tan	1.5	<u>138</u>	87	48
A201	Siu Ho Wan	1.5	122	83	41
A203	Siu Ho Wan	1.5	<u>121</u>	79	41
A204	Siu Ho Wan	1.5	<u>121</u>	79	42
A205	Siu Ho Wan	1.5	<u>119</u>	79	41
A206	Siu Ho Wan	1.5	<u>128</u>	91	42
A207	Siu Ho Wan	1.5	122	82	41
A208	Siu Ho Wan	1.5	<u>120</u>	83	41
A209	Siu Ho Wan	1.5	<u>124</u>	85	42
A210	Siu Ho Wan	1.5	<u>124</u>	85	42
A211	Siu Ho Wan	1.5	<u>125</u>	93	42
A212	Sunny Bay	1.5	<u>125</u>	81	41
A214	Sunny Bay	1.5	<u>126</u>	85	44
A215	Sunny Bay	1.5	<u>124</u>	80	42
A216	Sunny Bay	1.5	<u>120</u>	80	42
A217	Sunny Bay	1.5	<u>117</u>	81	41
A218	Sunny Bay	1.5	<u>116</u>	80	40
A219	Sunny Bay	1.5	<u>116</u>	80	41

- (1) The daily average RSP concentration limit under AQO is 100 g/m³, and the number of exceedances allowed is 9.
- (2) The annual average RSP concentration limit under AQO is 50 μg/m³.
- (3) Bold and underlined values represent the predicted RSP concentration exceeds the respective criteria.
- (4) A203 and A204 are future air sensitive receivers and will be occupied after completion of TCNTDE Phase 1 Future Tung Chung East Development. Therefore, TCNTDE Phase 1 has not been included in cumulative assessment.
- (5) According to site visit, it is confirmed that Lantau Toll Plaza Administration Building (A214) is central-air-conditioned and the fresh air intakes of the air-conditioning systems are located at 8m and 10m above ground. The assessment height at 1.5mAG is selected for construction phase assessment as a conservative approach.
- (6) Active works area was assumed to be 100% of construction site with watering eight times a day.

Table 1.6 Predicted Cumulative Maximum Daily, 10th Highest Daily and Annual Average FSP Concentrations at Representative Air Sensitive Receivers (Mitigated Tier 1)

		Assessment	Cumulative	FSP Concentrati	ons (μg/m³)
ASRs	Closest Project Site	Height (mAG)	Maximum Daily Average	10 th Highest Daily Average	Annual Average
A104	Lung Kwu Tan	1.5	<u>93</u>	64	31
A105	Lung Kwu Tan	1.5	<u>93</u>	63	31
A106	Lung Kwu Tan	1.5	94	63	32
A107	Lung Kwu Tan	1.5	92	62	32
A108	Lung Kwu Tan	1.5	<u>106</u>	66	34
A201	Siu Ho Wan	1.5	90	60	29
A203	Siu Ho Wan	1.5	<u>87</u>	58	29
A204	Siu Ho Wan	1.5	<u>87</u>	58	29
A205	Siu Ho Wan	1.5	<u>87</u>	59	28
A206	Siu Ho Wan	1.5	<u>89</u>	59	29
A207	Siu Ho Wan	1.5	90	61	29
A208	Siu Ho Wan	1.5	<u>89</u>	59	29
A209	Siu Ho Wan	1.5	<u>91</u>	60	29
A210	Siu Ho Wan	1.5	92	60	29
A211	Siu Ho Wan	1.5	<u>91</u>	60	29
A212	Sunny Bay	1.5	<u>91</u>	59	29
A214	Sunny Bay	1.5	<u>93</u>	60	31
A215	Sunny Bay	1.5	<u>93</u>	60	30
A216	Sunny Bay	1.5	90	60	30
A217	Sunny Bay	1.5	88	59	29
A218	Sunny Bay	1.5	<u>87</u>	59	29
A219	Sunny Bay	1.5	<u>87</u>	59	29

- (1) The daily average FSP concentration limit under AQO is 75 $\mu g/m^3$, and the number of exceedances allowed is 9.
- (2) The annual average FSP concentration limit under AQO is 35 μg/m³.
- (3) Bold and underlined values represent the predicted FSP concentration exceeds the respective criteria.
- (4) A203 and A204 are future air sensitive receivers and will be occupied after completion of TCNTDE Phase 1 Future Tung Chung East Development. Therefore, TCNTDE Phase 1 has not been included in cumulative assessment.
- (5) According to site visit, it is confirmed that Lantau Toll Plaza Administration Building (A214) is central-air-conditioned and the fresh air intakes of the air-conditioning systems are located at 8m and 10m above ground. The assessment height at 1.5mAG is selected for construction phase assessment as a conservative approach.
- (6) Active works area was assumed to be 100% of construction site with watering eight times a day.

Table 1.7 Predicted Cumulative Maximum Hourly Average TSP Concentrations at Representative Air Sensitive Receivers (Mitigated Tier 2)

ASRs	Closest Project Site	Assessment Height (mAG)	Cumulative Maximum Hourly Average TSP Concentrations (μg/m³)
A105	Lung Kwu Tan	1.5	227
A106	Lung Kwu Tan	1.5	390
A107	Lung Kwu Tan	1.5	407
A108	Lung Kwu Tan	1.5	332
A206	Siu Ho Wan	1.5	418
A207	Siu Ho Wan	1.5	204
A208	Siu Ho Wan	1.5	155
A209	Siu Ho Wan	1.5	191
A210	Siu Ho Wan	1.5	228
A211	Siu Ho Wan	1.5	259

- (1) The hourly average TSP EIAO-TM criterion is 500 $\mu g/m^3$. (2) Most of the ASRs at Siu Ho Wan Site is predicted to have exceedance in hourly TSP concentration. Therefore, A208, which is located near Siu Ho Wan Site, is also selected in the Tier 2 Assessment for conservative purpose.
- (3) The annual averaged active works areas were assumed to be 20, 10 and 10 hectares at Lung Kwu Tan PRS, Siu Ho Wan PRS and Sunny Bay PRS respectively with watering twelve times a day.

Predicted Cumulative Maximum Daily, 10th Highest Daily and Annual Table 1.8 Average RSP Concentrations at Representative Air Sensitive Receivers (Mitigated Tier 2)

ASRs	Closest	Assessment Height	Cumulative RSP Co	ncentrations (μg/m³)
ASKS	Project Site	(mAG)	Maximum Daily Average	10 th Highest Daily Average
A105	Lung Kwu Tan	1.5	123	85
A106	Lung Kwu Tan	1.5	125	86
A107	Lung Kwu Tan	1.5	122	86

Note:

- (1) The daily average RSP concentration limit under AQO is 100 μg/m³, and the number of exceedances allowed is 9.
- (2) Boldfaced values represent the predicted RSP concentration exceeds the respective criteria.
- (3) The annual averaged active works areas were assumed to be 20, 10 and 10 hectares at Lung Kwu Tan PRS, Siu Ho Wan PRS and Sunny Bay PRS respectively with watering twelve times a day.

E-7 A=COM

OPERATIONAL PHASE - CRITERIA AIR POLLUTANTS 2

2.1 Lung Kwu Tan Study Area

Table 2.1 Predicted Cumulative Concentrations at Representative ASRs in Lung Kwu Tan Study Area - Theme B

			mulative N ntrations in			nulative Ratrations in			mulative Factorial			mulative S	
ASR	Location	Max Hourly Ave.	19 th highest 1-hr Ave.	Annual Ave.	Max 24- hour Ave.	10 th highest 24-hour Ave.	Annual Ave.	Max 24- hour Ave.	10 th highest 24-hour Ave.	Annual Ave.	Max 10- min Ave.	Max 24- hour Ave.	4 th highest 24-hour Ave.
AQO (I	Number of Exceedances allowed)	200 (18)	200	40	100 (9)	100	50	75 (9)	75	35	500	125 (3)	125
A101	EPD WENT Landfill Site Office	176 (0)	133	27	122 (2)	83	43	91 (2)	62	31	341	63 (0)	38
A102	Sludge Treatment Facilities Office	193 (0)	142	33	124 (2)	84	45	93 (2)	63	33	413	75 (0)	37
A103	IWMF Site Office	204 (1)	140	27	123 (2)	84	44	92 (2)	63	31	413	75 (0)	37
A104	Black Point Power Station (Office)	180 (0)	137	33	124 (2)	85	44	93 (2)	63	31	333	61 (0)	40
A105	Lung Kwu Sheung Tan	184 (0)	147	32	123 (1)	83	43	93 (1)	63	31	315	55 (0)	40
A106	Dragon Cove in Pak Long	229 (8)	182	<u>41</u>	126 (1)	83	45	95 (1)	63	32	338	51 (0)	40
A107	Lung Kwu Tan	188 (0)	148	34	123 (1)	81	45	92 (1)	61	32	269	52 (0)	37
A108	Site Office of Castle Peak Power Station	217 (4)	145	36	144 (3)	88	49	113 (5)	67	35	188	49 (0)	36
A109	Green Island Cement Plant (Office)	217 (3)	149	36	146 (5)	91	50	111 (5)	65	35	192	49 (0)	36
A110	Site Office of Shiu Wing Steel Mill	217 (4)	153	38	151 (9)	93	48	113 (8)	73	35	211	49 (0)	36
A111	Site Office of Eco Park	217 (3)	162	38	135 (6)	96	44	102 (6)	72	32	286	49 (0)	36
A112	Potential Development Areas of Tuen Mun Areas 40 and 46	287 (6)	170	37	133 (2)	84	43	99 (2)	63	31	406	60 (0)	34
P101-138, P145	Lung Kwu Tan PRS	181-225 (0-4)	138-161	31-37	122-126 (1-2)	81-86	43-46	91-95 (1-3)	61-65	31-33	209-344	51-63 (0)	38-44
P139	Lung Kwu Tan PRS	233 (4)	169	35	128 (3)	88	49	96 (4)	66	<u>36</u>	185	53 (0)	41
P140	Lung Kwu Tan PRS	233 (5)	170	36	153 (3)	91	49	135 (4)	72	<u>36</u>	187	52 (0)	40
P141	Lung Kwu Tan PRS	233 (5)	170	36	132 (5)	95	<u>50</u>	119 (7)	70	<u>37</u>	192	51 (0)	40
P142	Lung Kwu Tan PRS	233 (4)	170	35	128 (4)	91	<u>52</u>	98 (7)	72	<u>38</u>	186	53 (0)	41
P143	Lung Kwu Tan PRS	233 (5)	170	35	129 (8)	97	<u>53</u>	103 (<u>13</u>)	<u>81</u>	<u>40</u>	186	52 (0)	41
P144	Lung Kwu Tan PRS	233 (5)	168	35	138 (8)	97	<u>53</u>	116 (<u>13</u>)	<u>79</u>	<u>39</u>	187	53 (0)	41

- (1) Bold and underlined values represent the predicted concentration exceeds the respective criteria.
- (2) This table shows the maximum predicted cumulative concentrations among all assessment heights at each ASR.

Table 2.2 Breakdown of RSP and FSP Concentrations at Locations with Predicted Exceedances in Castle Peak Power Station, Green Island Cement and Shiu Wing Steel Mill

			Predicted	Breal	kdown of Contr	ributions to C	umulative Co	ncentrations (µ	ug/m³)	
Pollutant	AQO (µg/m³)	Location of Exceedance	Cumulative Concentration (µg/m³)	Ambient	Vehicular Emission	Castle Peak Power Station	Green Island Cement Plant	Shiu Wing Steel Mill	Other Industrial Sources	
th		Castle Peak Power Station (1)	-	-	-	-	-	-	-	
10 th Highest Daily Average RSP	100	Green Island Cement Plant	<u>101</u>	77	0.03	0	15	9	0	
/worago reor		Shiu Wing Steel Mill	<u>111</u>	90	0.26	10	3	7	0	
	50		Castle Peak Power Station	<u>51</u>	41	0.31	5	4	1	0
Annual Average RSP		Green Island Cement Plant	<u>57</u>	41	0.06	1	3	12	0	
1.0.		Shiu Wing Steel Mill	<u>62</u>	41	0.14	1	2	18	0	
th		Castle Peak Power Station (1)	-	-	-	=	-	-	-	
10 th Highest Daily Average FSP	75	Green Island Cement Plant	<u>77</u>	50	0.14	0	0	27	0	
, worago i oi		Shiu Wing Steel Mill	<u>91</u>	45	0.14	6	12	27	0	
		Castle Peak Power Station	<u>37</u>	29	0.31	5	2	1	0	
Annual Average FSP	35	Green Island Cement Plant	<u>43</u>	29	0.06	1	2	11	0	
101		Shiu Wing Steel Mill	<u>49</u>	29	0.14	1	1	17	0	

Note:

- (1) Exceedance areas of Daily RSP and FSP in Castle Peak Power Station are coal stores, fuel oil tank, DG store, LPG storage tanks and CO₂ storage tanks, which are non-air-sensitive-use.
- (2) Bold and underlined values represent the predicted concentration exceeds the respective criteria.
- (3) This table shows the maximum predicted cumulative concentrations among all assessment heights at each ASR.

2.2 **Lantau Island Study Area**

Table 2.3 Predicted Cumulative Concentrations at Representative ASRs in Lantau Island Study Area - Theme B

			mulative N ntrations in			mulative R ntrations ir			mulative F ntrations ir			mulative S ntrations ir	η μg/m³
ASR	Location	Max Hourly Ave.	19 th highest 1-hr Ave.	Annual Ave.	Max 24- hour Ave.	10 th highest 24-hour Ave.	Annual Ave.	Max 24- hour Ave.	10 th highest 24-hour Ave.	Annual Ave.	Max 10- min Ave.	Max 24- hour Ave.	4 th highest 24-hour Ave.
	Number of Exceedances allowed)	200 (18)	200	40	100 (9)	100	50	75 (9)	75	35	500	125 (3)	125
A201	Office on HKBCF	208 (4)	159	35	119 (1)	80	41	89 (1)	60	29	93	43 (0)	28
A202	Caribbean Coast Block 1	221 (2)	136	33	116 (1)	78	40	87 (1)	59	29	123	41 (0)	30
A203	Future Tung Chung East Development	219 (1)	135	33	115 (1)	77	40	87 (1)	58	29	124	41 (0)	28
A204	Future Tung Chung East Development	218 (1)	131	29	115 (1)	77	40	86 (1)	58	28	124	41 (0)	28
A205	Pak Mong Village House	220 (1)	132	27	115 (1)	77	40	86 (1)	58	28	124	41 (0)	28
A206	Siu Ho Wan Depot	193 (0)	136	31	118 (1)	79	40	88 (1)	59	29	102	40 (0)	25
A207	Siu Ho Wan Government Maintenance Depot	203 (1)	165	35	119 (1)	79	41	90 (1)	60	29	95	39 (0)	24
A208	Siu Ho Wan Sewage Treatment Works	197 (0)	151	31	118 (1)	78	40	89 (1)	59	29	95	39 (0)	24
A209	Siu Ho Wan Vehicle Examination Centre and Weight Station	214 (3)	164	37	121 (1)	80	41	91 (1)	60	29	104	37 (0)	24
A210	Bus Depot of Kowloon Motor Bus Ltd.	215 (4)	169	37	121 (1)	80	41	91 (1)	60	30	104	37 (0)	24
A211	North Lantau Refuse Tramsper Station	291 (5)	161	37	120 (1)	79	41	90 (1)	60	30	104	37 (0)	24
A212	Luk Keng Tsuen	204 (2)	134	32	119 (1)	79	41	89 (1)	59	29	128	37 (0)	21
A214	Lantau Toll Plaza Administration Building	224 (6)	159	40	121 (1)	79	42	91 (1)	60	30	118	37 (0)	22
A215	The Salvation Army Ma Wan Youth Camp	246 (7)	167	37	122 (1)	80	43	92 (1)	60	30	107	34 (0)	22
A216	Vocational Training Council Maritime Services Training Institute	226 (4)	168	39	118 (1)	79	42	89 (2)	59	30	114	41 (0)	22
A217	Vistacove / Bayside Villas Block 7	227 (4)	151	34	115 (1)	79	41	87 (1)	59	29	125	38 (0)	22
A218	Hong Kong Garden Unicorn Heights Block 26	230 (4)	151	32	115 (1)	79	41	86 (1)	59	29	125	38 (0)	22
A219	Hong Kong Garden Block 1	228 (4)	152	33	115 (1)	78	41	86 (1)	59	29	125	38 (0)	22
P260-P298	Siu Ho Wan PRS	186-309 (0-3)	129-163	28-37	117-127 (1)	78-81	40-41	88-97 (1)	58-61	29-30	95-137	37-40 (0)	24-26
P200-P232	Sunny Bay PRS	203-229 (1-7)	134-176	31-39	119-120 (1)	78-80	41-42	89-90 (1)	59-60	29-30	103-128	34-37 (0)	20-22

(1) This table shows the maximum predicted cumulative concentrations among all assessment heights at each ASR.

Table 2.4 Predicted Cumulative Concentrations at Representative ASRs in Lantau Island Study Area - Theme A

				lO₂ n μg/m³		mulative R ntrations ir			mulative F			mulative S ntrations ir	η μg/m³
ASR	Location	Max Hourly Ave.	19 th highest 1-hr Ave.	Annual Ave.	Max 24- hour Ave.	10 th highest 24-hour Ave.	Annual Ave.	Max 24- hour Ave.	10 th highest 24-hour Ave.	Annual Ave.	Max 10- min Ave.	Max 24- hour Ave.	4 th highest 24-hour Ave.
	Number of Exceedances allowed)	200 (18)	200	40	100 (9)	100	50	75 (9)	75	35	500	125 (3)	125
A201	Office on HKBCF	208 (4)	159	35	119 (1)	80	41	89 (1)	60	29	93	43 (0)	28
A202	Caribbean Coast Block 1	221 (2)	136	32	116 (1)	78	40	87 (1)	59	29	123	41 (0)	30
A203	Future Tung Chung East Development	219 (1)	134	32	115 (1)	77	40	87 (1)	58	29	124	41 (0)	28
A204	Future Tung Chung East Development	218 (1)	131	29	115 (1)	77	40	86 (1)	58	28	124	41 (0)	28
A205	Pak Mong Village House	220 (1)	131	27	115 (1)	77	40	86 (1)	58	28	124	41 (0)	28
A206	Siu Ho Wan Depot	190 (0)	133	31	118 (1)	79	40	88 (1)	59	29	102	40 (0)	25
A207	Siu Ho Wan Government Maintenance Depot	197 (0)	165	34	119 (1)	79	41	90 (1)	60	29	95	39 (0)	24
A208	Siu Ho Wan Sewage Treatment Works	196 (0)	146	30	118 (1)	78	40	89 (1)	59	29	95	39 (0)	24
A209	Siu Ho Wan Vehicle Examination Centre and Weight Station	211 (3)	158	36	121 (1)	80	41	91 (1)	60	29	104	37 (0)	24
A210	Bus Depot of Kowloon Motor Bus Ltd.	212 (3)	165	36	121 (1)	80	41	91 (1)	60	29	104	37 (0)	24
A211	North Lantau Refuse Tramsper Station	290 (3)	160	36	120 (1)	79	41	90 (1)	60	29	104	37 (0)	24
A212	Luk Keng Tsuen	203 (2)	134	31	119 (1)	79	41	89 (1)	59	29	128	37 (0)	21
A214	Lantau Toll Plaza Administration Building	224 (6)	159	40	121 (1)	79	42	91 (1)	60	30	118	37 (0)	22
A215	The Salvation Army Ma Wan Youth Camp	246 (7)	157	35	122 (1)	81	43	92 (1)	60	30	107	34 (0)	22
A216	Vocational Training Council Maritime Services Training Institute	225 (4)	165	37	118 (1)	79	42	89 (1)	59	30	114	41 (0)	22
A217	Vistacove / Bayside Villas Block 7	227 (4)	151	34	115 (1)	79	41	87 (1)	59	29	125	38 (0)	22
A218	Hong Kong Garden Unicorn Heights Block 26	229 (4)	151	32	115 (1)	79	41	86 (1)	59	29	125	38 (0)	22
A219	Hong Kong Garden Block 1	228 (4)	152	33	115 (1)	78	41	86 (1)	59	29	125	38 (0)	22
P260 -P298	Siu Ho Wan PRS	186-309 (0-2)	129-154	28-35	117-127 (1)	78-81	40-41	88-97 (1)	58-60	29-30	95-137	37-40 (0)	24-26
P301 - P323	Sunny Bay PRS	203-228 (1-7)	135-176	30-39	119-120 (1)	78-80	41-42	89-90 (1)	59-60	29-30	103-128	34-37 (0)	20-22

E-12

Note:

⁽¹⁾ This table shows the maximum predicted cumulative concentrations among all assessment heights at each ASR.

3 OPERATIONAL PHASE – ODOUR IMPACTS

3.1 Lantau Island Study Area

Table 3.1 Predicted Odour Levels at the ASRs (Base Case Scenario with Existing and Committed Mitigation Measures Incorporated)

ASRs		Odour Leve	l (5 seconds av	verage) (OU)	
ASKS	OD1	OD2	OD3	OD4	OD5
1.5 mAG	<u>65.6</u>	<u>131.3</u>	<u>120.5</u>	<u>49.0</u>	<u>19.6</u>
5 mAG	<u>60.3</u>	<u>106.4</u>	<u>99.4</u>	<u>46.1</u>	<u>19.0</u>
10 mAG	<u>45.5</u>	<u>53.3</u>	<u>53.0</u>	<u>37.7</u>	<u>17.3</u>
15 mAG	<u>37.2</u>	<u>17.0</u>	<u>18.8</u>	<u>26.9</u>	<u>14.7</u>
20 mAG	<u>38.0</u>	<u>10.5</u>	<u>13.1</u>	<u>16.9</u>	<u>11.8</u>
25 mAG	<u>33.4</u>	<u>9.1</u>	<u>10.7</u>	<u>9.5</u>	<u>8.9</u>
30 mAG	<u>24.3</u>	<u>7.6</u>	<u>9.1</u>	<u>7.1</u>	<u>6.3</u>
35 mAG	<u>14.6</u>	<u>6.2</u>	<u>7.6</u>	<u>5.1</u>	4.2
40 mAG	<u>7.3</u>	<u>5.9</u>	<u>6.1</u>	4.0	3.3
45 mAG	4.8	<u>7.8</u>	4.8	3.7	3.0
50 mAG	<u>7.2</u>	<u>17.9</u>	3.7	3.5	2.6
55 mAG	<u>8.8</u>	<u>13.9</u>	3.7	3.2	2.3
60 mAG	8.9	<u>13.5</u>	4.5	3.0	2.0
65 mAG	<u>7.4</u>	<u>13.2</u>	<u>5.0</u>	2.7	1.8
70 mAG	<u>5.8</u>	<u>13.1</u>	<u>5.2</u>	2.6	1.5
75 mAG	4.0	<u>11.1</u>	4.9	2.5	1.3
80 mAG	2.3	<u>8.0</u>	4.2	2.2	1.2
85 mAG	1.7	5.0	3.3	1.9	1.2
90 mAG	1.6	2.6	2.4	1.7	1.1
95 mAG	1.6	2.6	1.7	1.5	1.1
100 mAG	1.6	2.6	1.9	1.4	1.0

Note:

Table 3.2 Predicted Odour Levels at the ASRs (Further Mitigated Scenario)

ASRs		Odour Leve	l (5 seconds av	/erage) (OU)	
ASNS	OD1	OD2	OD3	OD4	OD5
1.5 mAG	2.3	2.0	1.7	1.7	0.9
5 mAG	2.6	2.1	1.9	1.7	0.9
10 mAG	3.2	2.1	2.3	1.7	0.9
15 mAG	3.7	2.6	2.7	1.8	0.9
20 mAG	3.8	3.1	3.4	1.9	0.9
25 mAG	3.3	3.1	3.3	2.0	0.8
30 mAG	2.4	2.4	2.8	1.9	0.8
35 mAG	1.5	1.5	1.9	1.6	0.7
40 mAG	0.7	1.5	1.4	1.2	0.5
45 mAG	1.2	2.0	0.9	0.8	0.4
50 mAG	1.8	4.5	0.7	0.5	0.4
55 mAG	2.2	3.5	0.9	0.6	0.3
60 mAG	2.2	3.4	1.1	0.6	0.3
65 mAG	1.8	3.3	1.3	0.6	0.3
70 mAG	1.5	3.3	1.3	0.7	0.3

⁽¹⁾ Predicted results exceeded criteria for odour, i.e. 5 OU/5-sec are shown as bold and underlined characters.

ASRs	Odour Level (5 seconds average) (OU)									
ASNS	OD1	OD2	OD3	OD4	OD5					
75 mAG	1.0	2.8	1.2	0.6	0.3					
80 mAG	0.6	2.0	1.1	0.6	0.3					
85 mAG	0.3	1.2	0.8	0.5	0.3					
90 mAG	0.3	0.7	0.6	0.4	0.2					
95 mAG	0.3	0.6	0.4	0.3	0.2					
100 mAG	0.3	0.6	0.5	0.2	0.2					

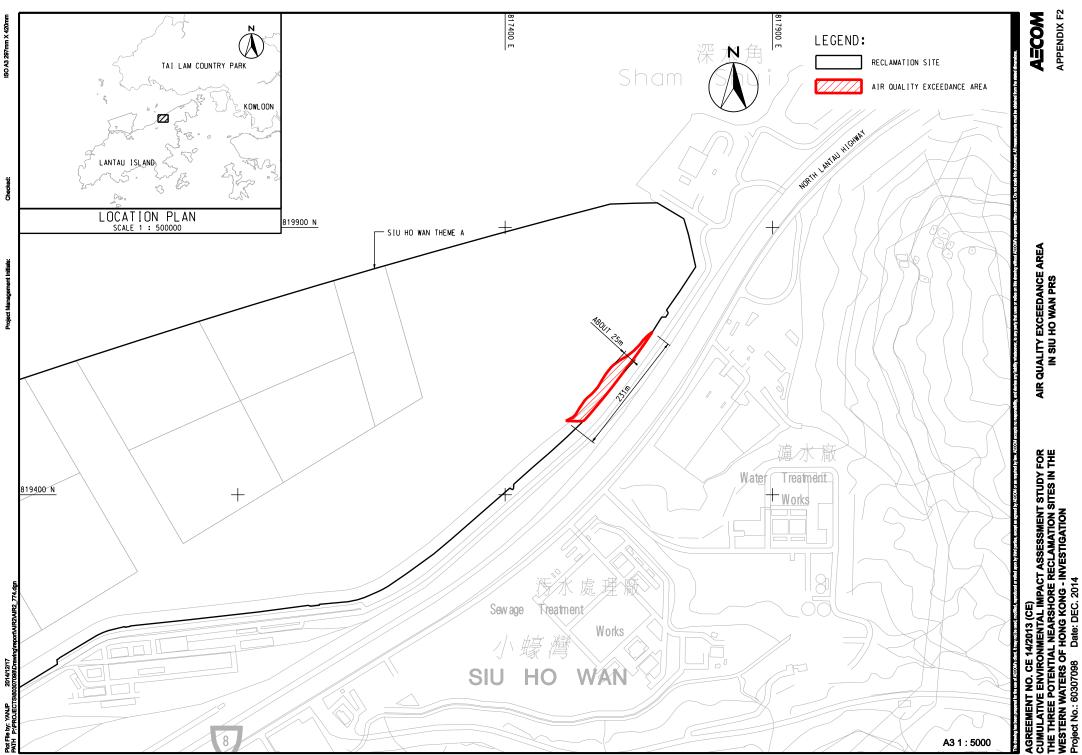
AECOM E-14

⁽¹⁾ Further mitigation include enhancement of odour control measures at sources (i.e. SHWSTW, NLTS and OWTF), such as enclosing the sewage/waste treatment facilities and installing/upgrading the deodorizing units, and implementation of proper land use planning on Siu Ho Wan PRS.

APPENDIX F

Air Quality Exceedance Area in Lung Kwu Tan PRS and Siu Ho Wan PRS





AIR QUALITY EXCEEDANCE AREA IN SIU HO WAN PRS

APPENDIX G

Implementation Schedule of Recommended Strategic Mitigation Options

Appendix G Implementation Schedule of Recommended Strategic Mitigation Options

	Potential Issues	Recommended Strategic Mitigation Options	Responsible Parties to Follow-up in Next Project Stage
Ai	r Quality Impact – Construction Phase		
•	All ASRs with TSP exceedances Black Point Power Station (Office), Lung Kwu Sheung Tan, Dragon Cove in Pak Long, Lung Kwu Tan, and Site Office of Castle Peak Power Station (A104 to A108) and Siu Ho Wan Depot, Siu Ho Wan Government Maintenance Depot, Siu Ho Wan Sewage Treatment Works, Siu Ho Wan Vehicle Pound Vehicle Examination Centre and Weight Station, Bus Depot of Kowloon Motor Bus Ltd., North Lantau Refuse Transfer Station, Luk Keng Tsuen, Lantau Toll Plaza Administration Building, and The Salvation Army Ma Wan Youth Camp (A206 to A215) with RSP exceedances Lung Kwu Tan (A107) with FSP exceedances	 Use of regular watering on all active work areas and exposed areas to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather 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 Open stockpiles and dusty vehicle loads shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs Establishment and use of vehicle wheel and body washing facilities at the exit points of the site Provision of wind shield and dust extraction units or high hoarding along site boundary Imposition of speed controls for vehicles on site haul roads and routing vehicles 	Future project proponents of statutory EIAs, planning and engineering studies, etc. of the three PRS • to review and reassess the suitability and feasibility of the required mitigation measures • to liaise with the relevant authorities and parties on the implementation of the required mitigation measures • to follow up the required mitigation measures
Ai	r Quality Impact – Operational Phase		
•	Southern part of Lung Kwu Tan PRS from 1.5 mAG to 50 mAG with RSP and FSP exceedances	 Non-air-sensitive-use area is recommended in the southern part of Lung Kwu Tan PRS. The extent of the recommended non-air-sensitive-use area is shown in Appendix F1 	Future project proponents of statutory EIAs, planning and engineering studies, etc. of the three PRS
•	Dragon Cove in Pak Long (A106) with annual NO ₂ concentration exceedance	Future Lung Kwu Tan Road should be realigned away from existing residential areas at Lung Kwu Tan if reclamation development is in place	to review and reassess the suitability and feasibility of the
•	Near eastern site boundary of Siu Ho Wan PRS at 1.5 mAG with NO ₂ concentrations exceedances	 Non-air-sensitive-use area (upto 5mAG high) is recommended near the eastern site boundary of Siu Ho Wan PRS. The extent of the recommended non-air-sensitive-use area is shown in Appendix F2 	required mitigation measures to liaise with the relevant authorities and parties on the
•	Siu Ho Wan PRS with odour level exceedances	Enhancement of odour control measures at sources (i.e. SHWSTW, NLTS and OWTF), such as enclosing the sewage/waste treatment facilities and installing/upgrading the deodorizing units, and implementation of proper land use planning on Siu Ho Wan PRS	 implementation of the required mitigation measures to follow up the required mitigation measures

		in Next Project Stage
Water Quality Impact – Construction Phase		
 Coral habitat at The Brothers (E4), Sha Chau and Lung Kwu Chau Marine Park / Lung Kwu Chau, Tree Island and Sha Chau SSSI A (E10), Sha Chau and Lung Kwu Chau Marine Park / Lung Kwu Chau, Tree Island and Sha Chau SSSI B (E11), and Artificial Reefs (E19) with Suspended Solids (SS) exceedances under Modelling Scenario A; The Brothers Marine Park (E17) with SS exceedances under Modelling Scenarios A and B The Brothers Marine Park (E17) and Artificial Reefs (E19) with sedimentation rate exceedances under Modelling Scenario A; coral habitat at The Brothers (E4) with sedimentation rate exceedances under Modelling Scenarios A and B Cooling water intake at Airport (North) (C8) with SS exceedance under Modelling Scenarios A, B and C, without installation of silt screens or silt curtains Cooling water intake at HZMB BCF (C10) with SS exceedance under Modelling Scenarios A and B, without installation of silt screens or silt curtains Flushing water intakes at Hong Kong Garden (C16) and Butterfly Beach (C19) with SS exceedances under Modelling Scenario "3 PRS Alone" and Scenarios A, B and C, without installation of silt screens or silt curtains 	 Programming the marine works of the 3 PRS should be investigated Non-dredged method should be used for reclamation to minimize seabed disturbance and associated loss of fines For each reclamation phase, no underwater filling work should be carried out until a permanent seawall of at least one-third of the entire seawall length of that reclamation phase is built above the high water mark to surround part of the reclamation site. For the PRS at Siu Ho Wan, seawall construction should proceed starting from the western end to the eastern end of the PRS boundary, whilst for both the PRS at Sunny Bay and Lung Kung Tan, the seawall construction should proceed from both ends of the PRS boundary simultaneously to protect the key sensitive receivers All underwater filling for reclamation should proceed behind at least 200m of leading seawall (above the high water mark) The fines contents of the underwater filling materials should be properly controlled to no more than 25% Cage-type closed grab dredger should be used for all the dredging activities proposed under this Project. Double silt curtain systems should be adopted to enclose all the dredging and underwater filling operations proposed under this Project (Dredging is only proposed for re-provisioning of the existing submarine sewage outfalls that would be affected by the reclamation works) Silt screens and/or silt curtains installation at two cooling water intakes at Hong Kong Garden (C16) and Butterfly Beach (C19) respectively to mitigate the SS elevations Water quality control measures and good site practices for construction phase Good site practices including careful handling of construction solid waste should be adopted Sewage effluent handling by temporary sanitary facilities, such as portable 	Future project proponents of statutory EIAs, planning and engineering studies, etc. of the three PRS • to review and reassess the suitability and feasibility of the required mitigation measures • to liaise with the relevant authorities and parties on the implementation of the required mitigation measures • to follow up the required mitigation measures

Potential Issues	Recommended Strategic Mitigation Options	Responsible Parties to Follow-up in Next Project Stage
Water Quality Impact – Operational Phase		
 Beaches (B1 to B11), Tuen Mun Typhoon Shelter (T1), Ma Wan fish culture zone (E1) and ecological resources (E2 to E4; E6 to E20) with Total Inorganic Nitrogen (TIN) exceedances under Modelling Scenarios 1, 2 and 3 Ma Wan fish culture zone (E1) with depthaveraged Dissolved Oxygen (DO) exceedance under Modelling Scenarios 1, 2 and 3 Flushing water intake at future Tung Chung East (C12) with SS exceedance under Modelling Scenarios 1, 2 and 3 Deep Bay Water Control Zone (WCZ) with TIN exceedances 	 Two alternative sewage treatment options were assessed in this study, namely: Provision of secondary treatment and disinfection processes Provision of tertiary treatment (with nitrogen removal and disinfection processes) Reuse or recycling of the treated effluent from the new STW for other beneficial uses Reduce pollution from other sources (e.g. diversion of sewage to new STWs with higher treatment level, etc.) Implementation of green measures and infrastructures and best storm water management practices to minimize the generation of storm pollution discharges Any treated sewage effluent discharge point of the PRS at Lung Kwu Tan should be located near the southern boundary (away from the Deep Bay WCZ as far as practicable) 	Future project proponents of statutory EIAs, planning and engineering studies, etc. of the three PRS • to review and reassess the suitability and feasibility of the required mitigation measures • to liaise with the relevant authorities and parties on the implementation of the required mitigation measures • to follow up the required mitigation measures
Ecological Impact – Construction and Opera	tional Phases (Terrestrial Ecology)	
Tai Ho Wan, horseshoe crab and avifauna species of conservation importance using artificial and rocky shore, as well as butterflies around the Lung Kwu Tan Valley SSSI with potential minor to moderate cumulative impacts	 Avoidance by reduction of reclamation configuration Minimisation by controlling lighting during night-time Minimisation by acoustic decoupling of construction equipment Good site practices to reduce indirect disturbance impacts to terrestrial habitats and associated wildlife arising from the land-based construction activities Enhancement measures by acoustic modelling and monitoring including baseline data collection and field trials Water quality control measures and good site practices for construction phase Relevant water quality mitigation measures during operational phase 	Future project proponents of statutory EIAs, planning and engineering studies, etc. of the three PRS • to review and reassess the suitability and feasibility of the required mitigation measures • to liaise with the relevant authorities and parties on the implementation of the required mitigation measures • to follow up the required mitigation measures

Potential Issues	Recommended Strategic Mitigation Options	Responsible Parties to Follow-up in Next Project Stage
	Enhancement of shoreline habitat by eco-enhanced seawall designs	
Ecological Impact – Construction and Opera	tional Phases (Marine Ecology)	
 Chinese White Dolphins (CWD) with potential significant direct impact due to habitat loss and habitat fragmentation and potential indirect impact due to marine traffic and disturbances from high-speed ferries and construction The proposed Brothers Marine Park (BMP) with potential significant direct impact Coral communities with potential moderate impact due to cumulative loss 	 Avoidance by reduction of reclamation configuration at Siu Ho Wan to avoid impact on CWD and BMP 3 PRS not to be serviced by HSF with alternative transportation links adopted Minimisation by non-dredged method for reclamation Minimisation by reducing the volume of construction marine traffic and high speed ferries Dolphin exclusion zones establishment Coral colonies translocation Water quality control measures and good site practices for construction phase Relevant water quality mitigation measures during operational phase Enhancement of shoreline habitat by eco-enhanced seawall designs Enhancement of prey resources by artificial reefs and fish stocking General measures including reduction in marine traffic, acoustic modelling and monitoring, increased collaboration between Hong Kong and People's Republic of China to develop species action plan, coordinated monitoring programme and water quality improvement programme 	Future project proponents of statutory EIAs, planning and engineering studies, etc. of the three PRS • to review and reassess the suitability and feasibility of the required mitigation measures • to liaise with the relevant authorities and parties on the implementation of the required mitigation measures • to follow up the required mitigation measures
Fisheries Impact – Construction and Operati	onal Phases	
 Fishing grounds and fisheries habitat with minor impact due to direct loss and potential minor indirect impact due to adverse water quality Fishing activities with potential minor indirect 	 Avoidance by reduction of reclamation configuration Minimisation by non-dredged method for reclamation Minimisation by reducing the volume of construction marine traffic Water quality control measures and good site practices for construction 	Future project proponents of statutory EIAs, planning and engineering studies, etc. of the three PRS to review and reassess the suitability and feasibility of the
impact due to disturbanceMa Wan fish culture zone with low depth-	Packet quality control measures and good site practices for construction phase Relevant water quality mitigation measures during operational phase	required mitigation measures to liaise with the relevant

Potential Issues	Recommended Strategic Mitigation Options	Responsible Parties to Follow-up in Next Project Stage
averaged DO	Enhancement options including eco-enhanced seawall designs, deployment of artificial reefs and fishing stocking	authorities and parties on the implementation of the required mitigation measures
		to follow up the required mitigation measures

Remarks:

- Some of the above recommended mitigation options have been included in the modelling/assessment with assumptions.
- Potential environmental issues and recommended strategic mitigation options in this study are subject to future detailed studies and assessments and updated/latest information of future developments during the project levels of the reclamations.

APPENDIX H

Operational Phase Water Quality at Sensitive Receivers

Appendix H - Operational Phase Water Quality at Seawater Intakes - Annual

Note: Shaded and Bolded - value exceeded the WSD criteria

					Mid-E	Depth		
					Maximum		202	Minimum
ID (Ref:	L. P. d. B. L.		UIA	E.coli	NH ₃ -N	SS	BOD₅	DO
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Flushing Wa								
Assessment			N/A	≤ 20,000	≤ 1	≤ 10	≤ 10	≥ 2
C5	Tuen Mun (WSD)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	459	0.301	9.83	1.84	4.04
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	455	0.313	9.78	1.83	4.00
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	455	0.304	9.78	1.83	4.01
C12	Future Tung Chung East	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.009	450	0.303	11.35	3.50	4.85
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	443	0.327	11.47	3.57	4.84
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.009	443	0.306	11.46	3.57	4.86
C16	Hong Kong Garden	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.011	113	0.333	8.69	1.59	3.89
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.011	120	0.340	8.67	1.60	3.88
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.011	120	0.337	8.66	1.60	3.88
C19	Near Butterfly Beach	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	95	0.297	9.48	1.77	4.13
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	91	0.310	9.44	1.75	4.08
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	91	0.300	9.44	1.75	4.09
C20	Near LRT Terminus	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	1,363	0.301	9.84	1.97	4.10
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.011	1,379	0.314	9.78	1.95	4.07
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	1,379	0.305	9.77	1.95	4.08
	er / Seawater Intakes							
Assessment			N/A	N/A	N/A	< 40	N/A	N/A
C1	Future Sludge Treatment Facilities	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.019	9,948	0.594	21.01	4.58	4.86
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.019	9,953	0.612	20.99	4.58	4.83
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.019	9,953	0.595	20.98	4.58	4.85
C2	CLP Black Point Power Station	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.018	1,071	0.547	19.32	3.77	4.35
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.018	1,070	0.565	19.36	3.77	4.25
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.018	1,070	0.549	19.35	3.77	4.27
C3	Castle Peak Power Station	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	128	0.339	12.77	2.11	3.71
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.011	129	0.361	12.86	2.12	3.67
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	128	0.340	12.85	2.12	3.69
C4	Shiu Wing Steel Mills	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.011	114	0.332	12.83	2.19	3.98
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.012	113	0.353	12.91	2.20	3.90
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.011	113	0.334	12.90	2.20	3.92
C6	Proposed Lok On Pai Pumping Station	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	74	0.301	9.74	1.76	3.87
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	75	0.312	9.61	1.75	3.82
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	75	0.305	9.60	1.75	3.82
C7	Future Airport (East)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.009	62	0.320	11.88	1.85	4.34
	' ' '	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	61	0.340	11.88	1.84	4.28
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	61	0.324	11.87	1.84	4.30
C8	Airport (North)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	62	0.322	11.19	1.82	4.13
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	64	0.342	11.19	1.82	4.02
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	64	0.326	11.19	1.82	4.03
C9	Airport (South)	Scenario 1 - Year 2036 Baseline Scenario (W/o Project)	0.009	1,294	0.316	12.41	3.40	4.92
	:							4.92
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	1,311	0.333	12.60	3.69	4 47



Appendix H - Operational Phase Water Quality at Seawater Intakes - Annual

Note: Shaded and Bolded - value exceeded the WSD criteria

						Depth		
					Maximum			Minimum
ID (Ref:			UIA	E.coli	NH ₃ -N	SS	BOD ₅	DO
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Cooling Wate	r / Seawater Intakes							
Assessment	Criteria		N/A	N/A	N/A	< 40	N/A	N/A
C10	Future HKBCF	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	57	0.320	10.52	1.82	4.16
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	62	0.341	10.52	1.82	4.20
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	62	0.325	10.51	1.82	4.21
C11	Tung Chung	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.009	2,523	0.304	12.03	3.65	5.63
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.010	2,544	0.322	12.17	3.83	5.59
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.009	2,544	0.306	12.15	3.82	5.60
C13	Future Siu Ho Wan Development	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	-	-	-	-	-	-
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.013	257	0.376	10.63	1.96	3.97
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.011	257	0.332	10.62	1.96	3.98
C14	Proposed Ta Pang Po Pumping Station	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.011	319	0.317	10.22	1.72	3.99
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.012	388	0.374	10.22	1.72	3.93
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.012	388	0.325	10.21	1.72	3.94
C15	Future Sunny Bay Development	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	-	-	-	-	-	-
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.011	60	0.329	9.85	1.48	3.62
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.010	60	0.313	9.85	1.48	3.62
C17	Future Lung Kwu Tan Development	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	-	-	-	-	-	-
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.018	35,594	0.516	15.08	3.40	4.49
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.013	35,593	0.408	15.05	3.39	4.50
C18	China Cement Plant	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	0.010	98	0.328	12.48	1.99	3.80
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.012	94	0.350	12.57	2.02	3.78
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.011	94	0.331	12.56	2.02	3.80



Appendix H - Operational Phase Water Quality at Bathing Beaches, Typhoon Shelter and Estuary - Annual

Note: Shaded and Bolded - value exceeded the assessment criteria

	lable			Bottom			Depth Ave	aged		
			10%ile	Max	10%ile	Geometric		Me	an	
ID (Ref:			DO	Sedimentation	DO	Mean E.coli	Salinity	TIN	UIA	SS
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(g/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Beaches	maioator i ome	Countrie	(9,=)	(g/iii /u)	(g, =/	()	(9, = /	\g/=/	\g, =/	(9, = /
Assessment	Criteria (for North Western WCZ)		≥2	N/A	≥ 4	≤ 180	N/A	≤ 0.5	≤ 0.021	N/A
B1	Butterfly	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.51	55.33	4.82	44	26.8	0.58	0.007	6.26
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.49	53.22	4.79	43	26.8	0.59	0.007	6.23
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.50	53.16	4.81	43	26.8	0.58	0.007	6.22
B2	Gazetted Beaches at Tuen Mun	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.91	42.78	5.15	45	26.4	0.57	0.007	6.12
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.88	43.90	5.11	48	26.4	0.59	0.007	6.08
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.89	43.85	5.12	48	26.4	0.58	0.007	6.08
B3	Golden Beach	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.90	47.44	5.12	38	26.4	0.57	0.007	6.11
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.85	48.33	5.09	40	26.5	0.59	0.007	6.08
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.87	48.28	5.10	40	26.5	0.58	0.007	6.07
Assessment	Criteria (for Western Buffer WCZ)		≥2	N/A	≥ 4	≤ 180	N/A	≤ 0.4	≤ 0.021	N/A
B4	Anglers'	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.33	28.45	4.48	67	29.7	0.49	0.008	5.06
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.33	28.21	4.48	65	29.7	0.50	0.008	5.05
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.33	28.18	4.48	65	29.7	0.49	0.008	5.04
B5	Gazetted Beaches at Ma Wan	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.39	26.05	4.54	8	30.1	0.45	0.007	4.64
-		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.38	25.63	4.53	8	30.1	0.46	0.007	4.62
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.39	25.61	4.54	8	30.1	0.46	0.007	4.62
B6	Gemini	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.30	36.41	4.40	34	30.1	0.48	0.008	5.01
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.29	36.07	4.40	34	30.1	0.49	0.008	4.99
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.30	36.04	4.41	34	30.1	0.48	0.008	4.99
B7	Hoi Mei Wan	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.34	30.73	4.48	43		0.48	0.008	4.88
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.34	30.96	4.48	43		0.49	0.008	4.87
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.34	30.93	4.49	43		0.49	0.008	4.86
B8	Lido	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.37	31.74	4.50	69	29.8	0.49	0.008	4.91
	2.00	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.36	32.76	4.50	70		0.50	0.008	4.89
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.37	32.73	4.51	70		0.49	0.008	4.89
B9	Ting Kau	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.39	32.68	4.53	137	29.7	0.49	0.007	4.87
50	Ting itaa	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.38	32.64	4.52	138		0.50	0.008	4.85
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.39	32.61	4.53	138		0.49	0.008	4.85
B10	Approach	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.40	34.24	4.51	109	29.7	0.49	0.007	4.92
510	Арргоасп	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.39	33.61	4.51	112		0.50	0.007	4.89
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.40	33.59	4.52	112	29.7	0.49	0.007	4.89
B11	Casam	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.34	32.21	4.47	46		0.48	0.007	4.88
511	Oddani	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.34	31.87	4.47	46		0.49	0.008	4.87
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.34	31.85	4.48	46		0.49	0.008	4.86
Typhoon She	ltor	Geenand 3 Tear 2000 Geenano (With Toject) Terriary Treatment for Toject based 61W	7.57	31.03	7.70	1	30.0	0.73	0.000	4.00
	Criteria (for North Western WCZ)		≥2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
T1	Tuen Mun	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	3.19	23.43	5.54	774	26.3	0.53	0.006	5.59
11	Tuen Mun	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	3.12	23.82	5.55	776		0.54	0.006	5.60
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	3.12	23.79	5.58	776		0.54	0.006	5.59
Tai O Estuary	<u> </u>	Toolinano o - Toai 2000 Oconiano (wiiitt Tojoog - Totilaly Healthent for Flojeof-based 3119	0.10	20.19	J.J0	170	20.3	0.33	0.000	3.39
	Criteria (for North Western WCZ)		≥2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
S1	Tai O	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.50	99.96	4.93	240		0.49	0.004	6.95
J 1	Tai O	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.47	102.27	4.90	240	24.9	0.49	0.004	6.96
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.48	102.27	4.90	240		0.30	0.004	6.96
		Too have a real 2000 occidence (with a report) a realized and the real particular and the real 2000 occidence (with a realized of the realized	7.40	102.24	7.31	240	24.0	0.43	0.004	0.90



Appendix H - Operational Phase Water Quality for Ecological Resources - Annual

Note: Shaded and Bolded - value exceeded the assessment criteria

				Bottom		1	Depth Aver	aged		
			10%ile	Max	10%ile	Geometric		Me	an	
ID (Ref:			DO	Sedimentation	DO	Mean <i>E.coli</i>	Salinity	TIN	UIA	SS
Figure 3.2)	Indicator Point	Scenario	(mg/L)	(g/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Ecological R		Scenario	(IIIg/L)	(g/m /a)	(IIIg/L)	(110.7100111L)	(IIIg/L)	(IIIg/L)	(IIIg/L)	(IIIg/L)
	t Criteria (for Fish Culture Zone in North Western WC	7)	≥ 2	N/A	≥5	≤ 610	N/A	≤ 0.4	≤ 0.021	N/A
E1	Ma Wan Fish Culture Zone	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.37	41.02	4.53	4		0.50	0.007	5.30
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.35	41.54	4.51	4	29.1	0.51	0.007	5.28
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.36	41.50	4.52	4	29.1	0.50	0.007	5.28
Assessment	t Criteria (Corals in Outer Deep Bay WCZ and North		≥2	≤ 200	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
E3	Sham Shui Kok (Coral Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.43	44.99	4.73	12	26.8	0.58	0.007	6.34
	, ,	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.41	45.56	4.72	16	26.7	0.61	0.008	6.36
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.42	45.51	4.74	15	26.7	0.59	0.007	6.35
E4	The Brothers (Coral Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.47	55.29	4.71	8	26.2	0.59	0.007	6.60
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.44	54.51	4.68	8		0.61	0.008	6.60
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.45	54.46	4.69	8	26.2	0.60	0.007	6.59
E6	Tung Chung East (Coral Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.86	48.13	5.16	3		0.61	0.006	6.63
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.91	42.94	5.40	2		0.62	0.007	6.40
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.92	42.89	5.42	2		0.61	0.006	6.39
E7	Tung Chung (Coral Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	6.17	45.65	6.22	93		0.54	0.005	7.89
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.18	43.15	6.22	93		0.56	0.005	8.03
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	6.20	43.12	6.25	93		0.55	0.005	8.03
E12	Lung Kwu Sheung Tan (Coral Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.45	100.85	4.82	45		0.75	0.008	10.62
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.37	95.73	4.75	76		0.79	0.009	10.56
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.39	95.64	4.77	75		0.76	0.008	10.55
E13	Tsang Tsui (Coral & Horseshoe Crab Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	5.22	109.50	5.41	686	19.4	0.85	0.008	12.48
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	5.17	106.31	5.37	704	19.4	0.88	0.009	12.46
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	5.20	106.20	5.39	704		0.86	0.008	12.46
	t Criteria (for North Western WCZ)		≥ 2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
E2	Yam O Wan (Mangrove, Seagrass & Horseshoe	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	5.08	21.47	5.25	1	27.7	0.51	0.006	5.58
	Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	5.19	25.11	5.41	1		0.54	0.006	5.71
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	5.21	25.08	5.43	1		0.52	0.006	5.71
E5	Tai Ho Wan and Tai Ho Stream SSSI (Mangrove,	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	5.61	21.38	6.66	1		0.43	0.004	7.67
	Seagrass & Horseshoe Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.30	16.74	6.76	1		0.44	0.004	7.82 7.82
==		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	6.32	16.73	6.78	1 700		0.42	0.004	
E8	Tung Chung Wan and San Tau Beach SSSI	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	6.04	0.85	6.05 6.05	1,709	24.7 24.5	0.62	0.008	11.41 11.57
	(Mangrove, Seagrass & Horseshoe Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.03 6.05	0.69	6.05	1,721		0.64 0.63	0.008	11.57
F0		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	5.92	0.69 37.75	6.12	1,721	24.5 24.5	0.63	0.008	8.22
E9	Hau Hok Wan (Horseshoe Crab Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)				53			0.004	
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	5.91 5.93	37.32 37.30	6.13 6.14	52 52		0.55 0.54	0.004 0.004	8.33 8.33
E40	01 01 11 17 01 14 1 17 1				4.76			0.54		9.07
E10	Sha Chau and Lung Kwu Chau Marine Park / Lung	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.55	70.53	4.76	4	21.9		0.006	9.07
	Kwu Chau, Tree Island and Sha Chau SSSI A	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.52	69.31	4.73	4		0.70 0.69	0.007	9.07
E44	Oh - Oh		4.53	69.27	4.74				0.006	9.06
E11	Sha Chau and Lung Kwu Chau Marine Park / Lung	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.34	86.29	4.56	13		0.71	0.007	
	Kwu Chau, Tree Island and Sha Chau SSSI B	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.31	87.68 87.59	4.53	13 13		0.73 0.71	0.008	9.22 9.22
<u> </u>		Josephanio 3 - Teal 2000 Scendino (with Froject) - Tettiary Treatment for Froject-based STW	4.32	67.59	4.34	13	22.0	U./ I	0.007	3.22



Appendix H - Operational Phase Water Quality for Ecological Resources - Annual

Note: Shaded and Bolded - value exceeded the assessment criteria

IN/A - INOL AVAI				Bottom			Depth Avera	aged		
			10%ile	Max	10%ile	Geometric Mean		Me	an	
ID (Ref:			DO	Sedimentation	DO	E.coli	Salinity	TIN	UIA	SS
Figure 3.2)	Indicator Point	Scenario	(mg/L)	(g/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Ecological Re	esources									
Assessment	Criteria (for North Western WCZ)		≥2	N/A	≥4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
E16	Sha Lo Wan (Horseshoe Crab Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	5.38	65.23	5.66	30	24.4	0.54	0.004	7.74
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	5.35	62.39	5.64	29		0.56	0.005	7.82
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	5.37	62.37	5.66	29		0.55	0.004	7.81
E17	The Brothers Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.44	46.20	4.68	9		0.58	0.007	6.46
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.40	52.69	4.65	9		0.60	0.008	6.48
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.41	52.65	4.66	9	26.6	0.59	0.007	6.47
E18	Fishing/Spawning Grounds in North Lantau	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.30	65.97	4.52	29		0.65	0.008	7.98
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.26	70.21	4.49	29		0.67	0.008	7.96
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.27	70.17	4.50	29	24.9	0.66	0.008	7.95
E19	Artificial Reefs	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.70	50.43	4.82	2		0.64	0.006	8.68
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.66	43.63	4.79	2		0.66	0.006	8.69
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.67	43.60	4.80	2	22.5	0.65	0.006	8.69
E20	Sham Wat Wan (Mangrove & Horseshoe Crab	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.42	123.58	5.15	1	24.4	0.51	0.004	6.57
	Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.39	126.49	5.13	1	24.4	0.52	0.004	6.57
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.40	126.45	5.14	1	24.4	0.51	0.004	6.57
Assessment	Criteria (for North Western Supplementary WCZ)		≥2	N/A	≥4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
E21	Tai O (High Production of Capture Fisheries &	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.68	52.36	5.06	3		0.43	0.003	6.29
	Mangrove Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.66	54.91	5.05	3	25.5	0.44	0.003	6.29
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.67	54.89	5.06	3		0.44	0.003	6.29
E22	Yi O (Mangrove & Horseshoe Crab Habitat)	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.69	74.29	5.07	1	25.6	0.43	0.003	5.76
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.66	74.26	5.05	1	25.5	0.44	0.003	5.77
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.67	74.24	5.06	1	25.5	0.43	0.003	5.77
E23	Potential Marine Park / Marine Reserve for Southwest	t Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.21	44.73	4.55	1	27.8	0.35	0.003	5.96
	Lantau	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.20	46.36	4.53	1	27.8	0.36	0.003	5.97
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.20	46.35	4.54	1	27.8	0.35	0.003	5.96
	Criteria (for Inner Deep Bay WCZ)		≥2	N/A	≥4	N/A	N/A	≤ 0.7	≤ 0.021	N/A
E14	Ap Tsai Hang (Mangrove, Seagrass & Horseshoe	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	6.05	3.32	6.06	11,952	18.6	0.95	0.010	18.08
	Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.02	4.04	6.03	11,952	18.6	0.97	0.010	18.11
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	6.04	4.04	6.05	11,952	18.6	0.95	0.010	18.10
E15	Pak Nai SSSI and Sheung Pak Nai (Mangrove,	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	6.09	0.00	6.10	11,189		1.12	0.013	20.80
	Seagrass & Horseshoe Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.06	0.00	6.08	11,180	18.3	1.14	0.013	20.81
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	6.08	0.00	6.09	11,180	18.3	1.13	0.013	20.80



Appendix H - Operational Phase Water Quality at Observation Points - Annual

Note: Shaded and Bolded - value exceeded the assessment criteria

N/A - Not Availa				Bottom			Depth Aver	aged		
			10%ile	Max	10%ile	Geometric Mean		Me	an	
ID (Ref:			DO	Sedimentation	DO	E.coli	Salinity	TIN	UIA	SS
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(g/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
	Points (EPD Routine Monitoring Station)									
	Criteria (for North Western WCZ)		≥2	N/A	≥4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
NM1	EPD Routine Monitoring Station - NM1	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.24	34.19	4.42	8	29.3	0.50	0.007	5.41
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.23	44.79	4.41	8	29.3	0.51	0.008	5.39
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.24	44.75	4.41	8	29.3	0.51	0.007	5.39
NM2	EPD Routine Monitoring Station - NM2	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.32	50.49	4.55	8	27.5	0.56	0.007	6.21
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.29	50.06	4.52	9	27.5	0.58	0.008	6.19
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.31	50.01	4.54	9	27.5	0.56	0.007	6.19
NM3	EPD Routine Monitoring Station - NM3	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.33	56.71	4.55	10		0.60	0.007	6.94
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.30	57.93	4.51	11	26.5	0.62	0.008	6.90
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.32	57.85	4.53	11	26.5	0.60	0.007	6.90
NM5	EPD Routine Monitoring Station - NM5	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.30	76.31	4.54	18			0.007	8.54
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.26	76.75	4.51	19	24.0	0.70	0.008	8.54
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.27	76.67	4.52	19	24.0	0.68	0.008	8.53
NM6	EPD Routine Monitoring Station - NM6	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	3.89	58.33	5.41	1	24.0		0.004	5.25
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	3.84	62.70	5.39	1	24.0	0.54	0.004	5.26
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	3.86	62.68	5.41	1	24.0	0.53	0.004	5.26
Assessment (Criteria (for North Western Supplementary WC	Z)	≥2	N/A	≥4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
NM8	EPD Routine Monitoring Station - NM8	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.23	99.37	4.64	1	25.0	0.49	0.004	7.83
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.21	98.11	4.61	1	24.9	0.50	0.004	7.84
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.22	98.07	4.62	1	24.9	0.49	0.004	7.84
	Criteria (for Western Buffer WCZ)		≥ 2	N/A	≥4	N/A	N/A	≤ 0.4	≤ 0.021	N/A
WM1	EPD Routine Monitoring Station - WM1	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.25	22.17	4.35	2	32.2	0.22	0.003	3.87
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.25	21.85	4.35	2	32.3	0.22	0.003	3.86
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.25	21.85	4.35	2		0.22	0.003	3.86
WM2	EPD Routine Monitoring Station - WM2	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.20	26.59	4.30	2			0.005	4.32
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.20	26.54	4.29	2	31.5	0.33	0.005	4.30
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.20	26.53	4.30	2		0.33	0.005	4.29
WM3	EPD Routine Monitoring Station - WM3	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.35	26.47	4.47	30		0.52	0.012	4.42
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.35	26.72	4.46	29	31.7	0.53	0.012	4.40
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.36	26.71	4.47	29	31.7	0.53	0.012	4.40
WM4	EPD Routine Monitoring Station - WM4	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.22	27.76	4.32	4	30.6	0.44	0.007	4.82
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.22	25.72	4.31	4	30.6	0.45	0.007	4.80
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.22	25.70	4.31	4	30.6	0.44	0.007	4.80
	Criteria (for Deep Bay WCZ (Outer Subzone))		≥2	N/A	≥4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
DM4	EPD Routine Monitoring Station - DM4	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	5.20	121.49	5.46	38	18.6	1.01	0.011	14.51
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	5.16	118.65	5.43	40		1.03	0.012	14.51
	<u> </u>	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	5.18	118.58	5.45	40		1.01	0.011	14.51
DM5	EPD Routine Monitoring Station - DM5	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.48	83.71	4.76	21	20.6	0.77	0.008	10.36
	_	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.44	78.70	4.72	25		0.79	0.008	10.36
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.46	78.62	4.73	25	20.6	0.77	0.008	10.35



Appendix H - Operational Phase Water Quality at Observation Points - Annual

Note: Shaded and Bolded - value exceeded the assessment criteria

N/A - Not Avail				Bottom	Depth Averaged 10%ile Geometric Mean										
			10%ile	Max	10%ile	Geometric Mean		Me	an						
ID (Ref:			DO	Sedimentation	DO	E.coli	Salinity	TIN	UIA	SS					
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(a/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)					
	Points (EPD Routine Monitoring Station)					,									
Assessment	Criteria (for Southern WCZ)		≥2	N/A	≥ 4	N/A	N/A	≤ 0.1	≤ 0.021	N/A					
SM9	EPD Routine Monitoring Station - SM9	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.43	41.05	4.65	1	30.8	0.36	0.005	4.61					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.42	41.23	4.63	1	30.8	0.37	0.005	4.58					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.43	41.21	4.64	1	30.8	0.36	0.005	4.58					
SM10	EPD Routine Monitoring Station - SM10	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.84	23.94	5.44	2	30.4	0.37	0.004	4.47					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.79	24.56	5.39	2	30.4	0.37	0.004	4.45					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.79	24.54	5.40	2	30.4	0.37	0.004	4.45					
SM11	EPD Routine Monitoring Station - SM11	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.97	20.38	5.69	1	30.8	0.33	0.004	4.48					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.95	20.44	5.66	1	30.9	0.33	0.004	4.46					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.96	20.43	5.68	1	30.9	0.32	0.004	4.45					
Observation I	Points (Marine Parks)														
	Criteria (for North Western WCZ)		≥2	N/A	≥4	N/A	N/A	≤ 0.5	≤ 0.021	N/A					
P1	The Brothers Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.34	52.57	4.58	8	28.0	0.54	0.007	5.84					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.32	51.93	4.54	8	28.0	0.55	0.008	5.84					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.33	51.89	4.56	8	28.0	0.54	0.007	5.83					
P2	The Brothers Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.41	65.01	4.68	8	25.8	0.61	0.007	7.03					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.37	62.04	4.64	8	25.8	0.63	0.008	7.01					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.38	61.99	4.65	8	25.8	0.61	0.007	7.01					
P3	The Brothers Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.69	50.42	4.98	151	26.0	0.60	0.007	6.64					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.66	51.32	4.95	113	25.9	0.62	0.008	6.68					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.68	51.25	4.98	113	25.9	0.61	0.007	6.67					
P4	Sha Chau and Lung Kwu Chau Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.27	75.95	4.50	19	22.4	0.71	0.007	9.39					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.24	82.50	4.47	19	22.5	0.73	0.008	9.36					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.25	82.42	4.48	19	22.5	0.71	0.007	9.35					
P5	Sha Chau and Lung Kwu Chau Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.34	79.67	4.54	5	20.3	0.73	0.007	10.27					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.32	80.07	4.52	5	20.4	0.75	0.007	10.23					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.33	80.02	4.53	5	20.4	0.73	0.007	10.22					
P6	Sha Chau and Lung Kwu Chau Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.55	75.76	4.79	5	22.3	0.69	0.007	8.70					
		Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.50	89.33	4.75	5	22.3	0.71	0.007	8.69					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.52	89.23	4.76	5	22.3	0.69	0.007	8.68					
P7	Sha Chau and Lung Kwu Chau Marine Park	Scenario 1 - Year 2036 Baseline Scenario (w/o Project)	4.70	43.39	4.88	2		0.60	0.005	8.29					
	-	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	4.67	43.23	4.86	2		0.62	0.005	8.29					
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	4.68	43.21	4.87	2	23.0	0.61	0.005	8.28					



APPENDIX I

Percentage Changes in Operational Phase Water Quality Caused by the PRS

Appendix I - Percentage Changes in Operational Phase Water Quality at Seawater Intakes

			Mid-Depth Maximum					Minimum
ID (Ref:			UIA	E.coli	NH ₃ -N	SS	BOD ₅	DO
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Flushing Wa		Teedinane	(mg/L)	(110.9/1001112)	(g/L/	(g/L/	(mg/L)	(111972)
Assessmen			N/A	≤ 20.000	≤ 1	≤ 10	≤ 10	≥ 2
C5	Tuen Mun (WSD)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.4%	-0.8%	4.1%	-0.5%	-0.8%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.5%	-0.8%	1.0%	-0.6%	-0.9%	
C12	Future Tung Chung East	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.5%	-1.6%	7.9%	1.1%	2.0%	
	o o	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.4%	-1.6%	1.2%	1.0%	2.0%	0.1%
C16	Hong Kong Garden	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	2.1%	5.6%	2.1%	-0.2%	0.6%	-0.3%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.1%	5.6%	1.2%	-0.3%	0.5%	-0.1%
C19	Near Butterfly Beach	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.1%	-3.5%	4.2%	-0.4%	-0.8%	-1.3%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.6%	-3.5%	1.0%	-0.4%	-0.9%	-1.0%
C20	Near LRT Terminus	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.3%	1.2%	4.3%	-0.6%	-0.9%	-0.8%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.4%	1.2%	1.1%	-0.7%	-1.1%	-0.4%
Cooling Wat	er / Seawater Intakes							
Assessmen	t Criteria		N/A	N/A	N/A	< 40	N/A	N/A
C1	Future Sludge Treatment Facilities	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	3.8%		3.2%	-0.1%	0.1%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.5%	0.1%	0.2%	-0.1%	0.1%	
C2	CLP Black Point Power Station	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	3.7%	-0.1%	3.3%	0.2%	0.1%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.6%	-0.1%	0.3%	0.2%	0.1%	
C3	Castle Peak Power Station	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	10.3%	0.3%	6.6%	0.7%	0.6%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	1.6%	0.2%	0.4%	0.6%	0.4%	
C4	Shiu Wing Steel Mills	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	11.7%	-1.0%	6.3%	0.6%	0.6%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	1.5%	-1.0%	0.8%	0.5%	0.4%	
C6	Proposed Lok On Pai Pumping Station	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.8%	0.6%	3.5%	-1.4%	-0.6%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.7%	0.6%	1.4%	-1.5%	-0.7%	
C7	Future Airport (East)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	6.6%	-0.8%	6.3%	0.0%	-0.4%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.9%	-0.9%	1.4%	0.0%	-0.5%	
C8	Airport (North)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	5.8%	3.3%	6.1%	0.0%	0.2%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	1.1%	3.2%	1.2%	0.0%	0.1%	
C9	Airport (South)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	2.6%	1.3%	5.5%	1.5%	8.5%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-1.1%	1.3%	0.9%	1.5%	8.5%	
C10	Future HKBCF	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	7.4%	7.7%	6.4%	0.0%	-0.1%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	3.2%	7.7%	1.3%	0.0%	-0.2%	
C11	Tung Chung	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	3.5%	0.8%	6.1%	1.1%	4.7%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	0.8%	0.9%	1.1%	4.5%	
C13	Future Siu Ho Wan Development	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	N/A	N/A	N/A	N/A	N/A	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	N/A	N/A	N/A	N/A	N/A	
C14	Proposed Ta Pang Po Pumping Station	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	16.1%	21.8%	18.0%	0.1%	-0.1%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	10.0%	21.8%	2.6%	0.0%	-0.2%	
C15	Future Sunny Bay Development	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	N/A	N/A	N/A	N/A	N/A	
	<u> </u>	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	N/A	N/A	N/A	N/A	N/A	
C17	Future Lung Kwu Tan Development	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	N/A	N/A	N/A	N/A	N/A	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	N/A	N/A	N/A	N/A	N/A	
C18	China Cement Plant	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	11.6%	-4.3%	6.9%	0.6%	1.5%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	1.7%	-4.3%	0.9%	0.6%	1.3%	-0.1%



Appendix I - Percentage Changes in Operational Phase Water Quality at Bathing Beaches, Typhoon Shelter and Estuary

				Bottom		Depth Averaged					
			10%ile	Max	10%ile Geometric Mean		Mean				
ID (Ref:			DO	Sedimentation	DO	E.coli	Salinity	TIN	UIA	SS	
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(a/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	
Beaches											
Assessment	Criteria (for North Western WCZ)		≥ 2	N/A	≥ 4	≤ 180	N/A	≤ 0.5	≤ 0.021	N/A	
B1	Butterfly	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.5%	-3.8%	-0.5%	-0.5%	0.1%	2.9%	6.2%	-0.5%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	-3.9%	-0.2%	-0.5%	0.1%	0.8%	1.0%	-0.6%	
B2	Gazetted Beaches at Tuen Mun	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.6%	2.6%	-0.7%	6.7%	0.1%	3.0%	6.8%	-0.6%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.3%	2.5%	-0.4%	6.6%	0.1%	0.8%	1.1%	-0.7%	
B3	Golden Beach	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.8%	1.9%	-0.7%	6.0%	0.2%	3.0%	6.8%	-0.6%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	1.8%	-0.3%	6.0%	0.2%	0.8%	1.0%	-0.7%	
	Criteria (for Western Buffer WCZ)		≥2	N/A	≥ 4	≤ 180	N/A	≤ 0.4	≤ 0.021	N/A	
B4	Anglers'	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	-0.9%		-2.6%	-0.1%	2.2%	3.3%	-0.3%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.1%	-0.9%	0.1%	-2.6%	-0.1%	0.8%	0.8%	-0.3%	
B5	Gazetted Beaches at Ma Wan	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.2%	-1.6%	-0.1%	-1.1%	0.0%	1.8%	3.0%	-0.4%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.1%	-1.7%	0.1%	-1.2%	0.0%	0.5%	0.7%	-0.5%	
B6	Gemini	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	-0.9%	-0.1%	0.3%	0.0%	2.1%	3.0%	-0.3%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	-1.0%	0.1%	0.3%	0.0%	0.7%	0.9%	-0.3%	
B7	Hoi Mei Wan	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	0.7%	0.0%	-0.1%	0.0%	2.1%	3.1%	-0.3%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	0.7%	0.2%	-0.1%	0.0%	0.8%	0.9%	-0.4%	
B8	Lido	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.2%	3.2%	-0.2%	0.8%	0.0%	2.1%	3.2%	-0.4%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.1%	3.1%	0.0%	0.8%	0.0%	0.7%	0.9%	-0.4%	
B9	Ting Kau	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.3%	-0.1%	-0.2%	0.7%	0.0%	2.0%	3.2%	-0.5%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.1%	-0.2%	0.1%	0.7%	0.0%	0.7%	0.9%	-0.5%	
B10	Approach	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.3%	-1.8%	-0.2%	2.5%	0.0%	2.0%	3.2%	-0.5%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	-1.9%	0.1%	2.5%	0.0%	0.6%	0.9%	-0.5%	
B11	Casam	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	-1.1%	-0.1%	0.1%	0.0%	2.0%	3.0%	-0.3%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	-1.1%	0.1%	0.1%	0.0%	0.7%	0.9%	-0.4%	
Typhoon She											
Assessment	Criteria (for North Western WCZ)		≥ 2	N/A	≥ 4	N/A	N/A		≤ 0.021	N/A	
T1	Tuen Mun	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-2.2%	1.7%	0.2%	0.2%	0.1%	3.0%	4.9%	0.1%	
1		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-1.3%	1.6%	0.7%	0.2%	0.1%	0.6%	0.8%	0.1%	
Tai O Estuary											
	Criteria (for North Western WCZ)		≥2	N/A	≥ 4	N/A	N/A		≤ 0.021	N/A	
S1	Tai O	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.7%	2.3%	-0.5%	-0.1%		2.1%	4.1%	0.2%	
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	2.3%	-0.3%	-0.1%	0.0%	0.6%	0.7%	0.1%	



Appendix I - Percentage Changes in Operational Phase Water Quality for Ecological Resources

ID (Ref: Figure 3.2)			I			Geometric			Depth Averaged				
Figure 3.2)			10%ile		Max 10%ile			Mean					
			DO	Sedimentation	DO	E.coli	Salinity	TIN	UIA	SS			
`!!! -	Indicator Point	Scenario	(mg/L)	(g/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)			
	esources												
Assessment	Criteria (for Fish Culture Zone in North Western WC		≥2	N/A	≥5	≤ 610	N/A	≤ 0.4	≤ 0.021	N/A			
≣1	Ma Wan Fish Culture Zone	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.4%	1.3%	-0.4%	2.3%	0.1%	2.2%	4.3%	-0.3%			
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.3%	1.2%	-0.2%	2.3%	0.1%	0.4%	0.7%	-0.4%			
	Criteria (Corals in Outer Deep Bay WCZ and North		≥2	≤ 200	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A			
≣3	Sham Shui Kok (Coral Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.6%	1.3%	-0.3%	25.0%	-0.1%	6.5%	17.0%	0.4%			
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.3%	1.1%	0.0%	23.3%	-0.1%	1.9%	2.1%	0.3%			
Ξ 4	The Brothers (Coral Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.8%	-1.4%	-0.6%	0.3%	-0.1%	3.2%	6.5%	-0.1%			
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	-1.5%	-0.3%	0.2%	-0.1%	1.0%	1.1%	-0.2%			
∃ 6	Tung Chung East (Coral Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	1.0%	-10.8%	4.7%	-29.6%	-1.2%	2.9%	1.3%	-3.5%			
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	1.4%	-10.9%	5.1%	-29.6%	-1.2%	0.1%	-5.3%	-3.6%			
≣ 7	Tung Chung (Coral Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.1%	-5.5%	0.0%	0.6%	-0.9%	3.9%	5.2%	1.8%			
-10		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.4%	-5.5%	0.5%	0.6%	-0.9%	1.0%	-0.3%	1.8%			
E12	Lung Kwu Sheung Tan (Coral Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-1.8%	-5.1%	-1.5%	66.6%	0.2%	5.6%	17.8%	-0.6%			
-10	T T (O 1011 1 O 1111 1 O	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-1.4% -0.8%	-5.2% -2.9%	-1.1% -0.7%	66.0% 2.7%	0.2%	1.3%	1.8% 8.0%	-0.7% -0.2%			
Ξ13	Tsang Tsui (Coral & Horseshoe Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.8%	-2.9% -3.0%	-0.7%	2.7%	0.1%	3.0% 0.7%	0.8%	-0.2% -0.2%			
Accoccmon	Criteria (for North Western WCZ)	Josephano 3 - Tear 2036 Scenano (with Project) - Tentary Treatment for Project-based 51 W	-0.4%	-3.0% N/A	-0.4%	N/A	N/A	0.7%	≤ 0.021	-0.2% N/A			
	Yam O Wan (Mangrove, Seagrass & Horseshoe	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	2.0%	16.9%	3.1%	5.4%	-1.2%	5.1%	6.0%	2.2%			
:2	Crab Habitat)		2.5%		3.1%		-1.2%			2.2%			
	,	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW		16.8%		5.4%		2.3%	-0.9%	2.2%			
≣5	Tai Ho Wan and Tai Ho Stream SSSI (Mangrove,	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	12.4%	-21.7%	1.6%	0.0%	-0.8%	2.6%	0.8%				
	Seagrass & Horseshoe Crab Habitat)	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	12.7%	-21.8%	1.9% -0.1%	0.0%	-0.8%	-0.9%	-3.2%	1.9% 1.4%			
≣8	Tung Chung Wan and San Tau Beach SSSI	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	-18.2%	-0.1% 0.2%	0.7%	-0.8% -0.8%	3.3%	2.6%				
	(Mangrove, Seagrass & Horseshoe Crab Habitat) Hau Hok Wan (Horseshoe Crab Habitat)	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.2%	-18.2% -1.2%	0.2%	0.7% -3.2%	-0.8%	0.9%	-0.1% 4.9%	1.3% 1.3%			
≣9	Hau Hok Wan (Horseshoe Crab Habitat)	Scenario 3 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1% 0.2%	-1.2% -1.2%	0.1%	-3.2%	-0.6%	3.9% 1.2%	0.4%	1.3%			
E10	Sha Chau and Lung Kwu Chau Marine Park / Lung	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.8%	-1.2%	-0.7%	1.9%	0.1%	2.7%	6.5%	0.0%			
:10	Kwu Chau, Tree Island and Sha Chau SSSI A	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	-1.7%	-0.7%	1.9%	0.1%	0.9%	1.4%	0.0%			
<u>=</u> 11	Sha Chau and Lung Kwu Chau Marine Park / Lung	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.7%	1.6%	-0.7%	2.2%	0.1%	2.7%	6.2%	-0.3%			
211	Kwu Chau, Tree Island and Sha Chau SSSI B	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.7 %	1.5%	-0.7%	2.1%	0.2%	0.7%	1.2%	-0.3%			
= 16	Sha Lo Wan (Horseshoe Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.5%	-4.3%	-0.3%	-4.8%	-0.5%	3.5%	4.9%	1.0%			
.10	Ona Lo Wan (noiseshee Orab Habitat)	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	-4.4%	0.0%	-4.8%	-0.5%	1.1%	0.5%	0.9%			
E 17	The Brothers Marine Park	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.9%	14.1%	-0.6%	6.2%	-0.1%	3.3%	6.5%	0.2%			
	The Brothers Manne Fank	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.6%	14.0%	-0.4%	6.1%	-0.1%	1.1%	1.3%	0.1%			
= 18	Fishing/Spawning Grounds in North Lantau	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.8%	6.4%	-0.7%	2.3%	0.2%	2.9%	6.4%	-0.3%			
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	6.4%	-0.4%	2.3%	0.2%	0.7%	1.1%	-0.3%			
= 19	Artificial Reefs	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.7%	-13.5%	-0.7%	-0.9%	0.0%	2.6%	6.0%	0.1%			
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	-13.6%	-0.4%	-0.9%	0.0%	0.8%	1.1%	0.0%			
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	2.3%	-0.2%	-0.1%	0.0%	0.7%	0.7%	0.0%			
Assessment	Criteria (for North Western Supplementary WCZ)		≥2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A			
21	Tai O (High Production of Capture Fisheries &	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.3%	4.9%	-0.3%	1.0%	-0.1%	1.9%	3.2%	0.1%			
	Mangrove Habitat)	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	4.8%	-0.1%	1.0%	-0.1%	0.6%	0.5%	0.1%			
22	Yi O (Mangrove & Horseshoe Crab Habitat)	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.6%	0.0%	-0.3%	0.0%	-0.1%	1.8%	2.9%	0.1%			
	, , , , , , , , , , , , , , , , , , , ,	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.4%	-0.1%	-0.1%	0.0%	-0.1%	0.5%	0.5%	0.0%			
= 23	Potential Marine Park / Marine Reserve for	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.4%	3.7%	-0.4%	0.0%	0.0%	1.3%	2.0%	0.1%			
	Southwest Lantau	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	3.6%	-0.2%	0.0%	0.0%	0.2%	0.3%	0.0%			
Assessment	Criteria (for Inner Deep Bay WCZ)		≥ 2	N/A	≥ 4	N/A	N/A	≤ 0.7	≤ 0.021	N/A			
<u> </u>	Ap Tsai Hang (Mangrove, Seagrass & Horseshoe	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.5%	21.8%	-0.4%	0.0%	0.0%	2.2%	3.6%	0.2%			
	Crab Habitat)	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	21.7%	-0.1%	0.0%	0.0%	0.5%	0.4%	0.1%			
E15	Pak Nai SSSI and Sheung Pak Nai (Mangrove,	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.4%	0.0%	-0.3%	-0.1%	0.0%	1.6%	2.0%	0.0%			
	Seagrass & Horseshoe Crab Habitat)	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	0.0%	-0.1%	-0.1%	0.0%		0.1%	0.0%			



Appendix I - Percentage Changes in Operational Phase Water Quality at Observation Points

N/A - Not Ava	ileabic			Bottom	Depth Averaged					
			10%ile	Max	10%ile	Geometric Mean	Mean			
ID (Ref:			DO	Sedimentation	DO	E.coli	Salinity	TIN	UIA	SS
Figure 3.1)	Indicator Point	Scenario	(mg/L)	(g/m²/d)	(mg/L)	(no./100mL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
	Points (EPD Routine Monitoring Station)									
Assessment	≥2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A		
NM1	EPD Routine Monitoring Station - NM1	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.3%	31.0%	-0.3%	1.9%	0.1%	2.2%	3.9%	-0.4%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	30.9%	-0.1%	1.9%	0.1%	0.6%		-0.4%
NM2	EPD Routine Monitoring Station - NM2	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.6%	-0.8%	-0.7%	5.6%	0.1%	2.7%		-0.4%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.3%	-0.9%	-0.4%	5.6%	0.1%	0.7%		-0.5%
NM3	EPD Routine Monitoring Station - NM3	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.7%	2.2%	-0.7%	15.3%	0.2%	3.1%		-0.5%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.3%	2.0%	-0.4%	15.2%	0.2%	0.8%		-0.6%
NM5	EPD Routine Monitoring Station - NM5	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.8%	0.6%	-0.7%	7.0%	0.1%	3.1%		0.0%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.5%	0.5%	-0.4%	6.9%	0.1%	0.9%		-0.1%
NM6	EPD Routine Monitoring Station - NM6	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-1.2%	7.5%	-0.3%	0.0%	-0.1%	2.5%		0.1%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.7%	7.5%	0.0%	0.0%	-0.1%	0.7%		0.1%
	Criteria (for North Western Supplementary WCZ		≥2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
NM8	EPD Routine Monitoring Station - NM8	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.5%	-1.3%	-0.5%	-0.8%	0.0%	2.1%		0.1%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.4%	-1.3%	-0.3%	-0.8%	0.0%	0.6%		0.1%
	Criteria (for Western Buffer WCZ)		≥2	N/A	≥ 4	N/A	N/A	≤ 0.4	≤ 0.021	N/A
WM1	EPD Routine Monitoring Station - WM1	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.0%	-1.4%	0.0%	-0.9%	0.0%	0.4%		-0.3%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	-1.5%	0.0%	-0.9%	0.0%	-0.3%	0.0%	-0.3%
WM2	EPD Routine Monitoring Station - WM2	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	-0.2%	-0.1%	-1.3%	0.1%	0.9%		-0.5%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	-0.2%	0.0%	-1.3%	0.1%	-0.1%	0.2%	-0.5%
WM3	EPD Routine Monitoring Station - WM3	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	0.0%	1.0%	-0.1%	-0.8%	0.1%	1.1%		-0.2%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.1%	0.9%	0.0%	-0.8%	0.1%	0.5%	0.8%	-0.3%
WM4	EPD Routine Monitoring Station - WM4	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	-7.3%	-0.2%	0.7%	0.1%	1.6%	2.6%	-0.4%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	-7.4%	-0.1%	0.6%	0.1%	0.4%	0.7%	-0.4%
	Criteria (for Deep Bay WCZ (Outer Subzone))		≥2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
DM4	EPD Routine Monitoring Station - DM4	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.8%	-2.3%	-0.6%	3.6%	0.0%	2.0%	3.7%	0.0%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.4%	-2.4%	-0.3%	3.5%	0.0%	0.5%	0.5%	0.0%
DM5	EPD Routine Monitoring Station - DM5	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-1.0%	-6.0%	-0.9%	19.2%	0.0%	3.1%		0.0%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.6%	-6.1%	-0.6%	19.1%	0.0%	0.8%		0.0%
	Criteria (for Southern WCZ)		≥2	N/A	≥ 4	N/A	N/A	≤ 0.1	≤ 0.021	N/A
SM9	EPD Routine Monitoring Station - SM9	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.1%	0.4%	-0.3%	0.2%	0.1%	0.8%		-0.7%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	0.0%	0.4%	-0.2%	0.2%	0.1%	-0.4%		-0.7%
SM10	EPD Routine Monitoring Station - SM10	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-1.2%	2.6%	-1.0%	0.1%	0.1%	1.1%		-0.5%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-1.0%	2.5%	-0.8%	0.1%	0.1%	-0.3%		-0.6%
SM11	EPD Routine Monitoring Station - SM11	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.3%	0.3%	-0.4%	-0.8%	0.1%	0.6%	1.4%	-0.5%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	0.2%	-0.2%	-0.8%	0.1%	-0.6%	-0.1%	-0.6%
	Points (Marine Parks)									
Assessment	Criteria (for North Western WCZ)		≥ 2	N/A	≥ 4	N/A	N/A	≤ 0.5	≤ 0.021	N/A
P1	The Brothers Marine Park	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.5%	-1.2%	-0.8%	-2.9%	0.0%	2.7%		0.0%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.7%	-4.6%	-0.5%	0.7%	0.1%	0.8%	1.3%	-0.3%
P3	The Brothers Marine Park	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.7%	1.8%	-0.5%	-25.2%	-0.2%	4.1%		0.6%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.3%	1.7%	0.0%	-25.2%	-0.2%	1.2%		0.6%
P4	Sha Chau and Lung Kwu Chau Marine Park	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.7%	8.6%	-0.7%	0.8%	0.2%	2.6%		-0.3%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.4%	8.5%	-0.5%	0.8%	0.2%	0.7%	1.1%	-0.3%
P5	Sha Chau and Lung Kwu Chau Marine Park	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.5%	0.5%	-0.5%	0.2%	0.2%	2.3%		-0.4%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.2%	0.4%	-0.3%	0.2%	0.2%	0.6%		-0.4%
P6	Sha Chau and Lung Kwu Chau Marine Park	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-1.1%	17.9%	-0.8%	0.5%	0.2%	2.9%		-0.1%
		Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.8%	17.8%	-0.5%	0.5%	0.2%	0.8%		-0.2%
P7	Sha Chau and Lung Kwu Chau Marine Park	Scenario 2 - Year 2036 Scenario (with Project) - Secondary Treatment for Project-based STW	-0.7%	-0.4%	-0.6%	-2.0%	0.0%	2.6%	5.7%	0.0%
	Ţ.	Scenario 3 - Year 2036 Scenario (with Project) - Tertiary Treatment for Project-based STW	-0.4%	-0.4%	-0.3%	-2.0%	0.0%	0.8%	1.0%	0.0%



APPENDIX J

Operational Phase Monthly DO Levels Predicted at Ma Wan Fish Culture Zone

Appendix J - Operational Phase Monthly DO Levels Predicted at Ma Wan Fish Culture Zone

	Month	Scenario 1	Scenario 2	Scenario 3
	Jan	6.50	6.50	6.50
(mg/L)	Feb	6.30	6.30	6.30
L) L)	Mar	6.18	6.18	6.18
00	Apr	5.84	5.84	5.84
J D	May	5.20	5.19	5.20
Эec	June	4.82	4.81	4.81
ra	July	4.42	4.40	4.41
}. }	Aug	4.58	4.57	4.57
/ /	Sep	5.46	5.46	5.46
nth	Oct	5.96	5.96	5.96
Monthly Averaged	Nov	5.86	5.86	5.86
_	Dec	6.34	6.34	6.34