

**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**

Executive Summary

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1 BACKGROUND

- 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.
- 1.2 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.

2 STUDY OBJECTIVES

- 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.

3 SITE DESCRIPTION

Lung Kwu Tan PRS

- 3.1 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.
- 3.2 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.

Siu Ho Wan PRS

- 3.3 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.
- 3.4 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.

Sunny Bay PRS

- 3.5 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.
- 3.6 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.

4 STUDY APPROACH

- 4.1 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.
- 4.2 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 6 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.

5 CONCURRENT PROJECTS

5.1 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**.

6 ASSESSMENT ASSUMPTIONS

Land Uses Assumptions

6.1 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 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 1 Proposed Development Themes and Major Land Uses for the Three Potential Reclamation Sites

Proposed Development Theme	Proposed Major Land Uses		
	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

⁽⁴⁾ 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.

Tentative Implementation Programme and Construction Method

6.2 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. 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. 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.

Reclamation Layout

6.3 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.

7 AIR QUALITY IMPACT ASSESSMENT

Air Sensitive Receivers

7.1 The study areas for the air quality assessment, namely Lung Kwu Tan study area and Lantau Island study area, are defined by a distance of 3 km from the boundary of the 3 PRS.

7.2 Existing, committed and planned air sensitive receivers (ASRs) were identified in the study areas (see **Figure 2**), which mainly include domestic premises, school, educational institution, office, and any other premises or places which have sensitivity to air pollutants in term of duration or number of people affected.

7.3 Representative ASRs within the 3 PRS were also identified based on the different land use development themes in Section 6.1. In this process, the requirement in the Hong Kong Planning Standards and Guidelines to locate air-sensitive uses at a minimum buffer distance of 20m from the proposed primary distributor roads was assumed to be strictly observed. In other words, ASRs were not assigned within 20m from the primary distributor roads on the 3 PRS.

7.4 For construction phase, potential dust impacts from the construction works were assessed. Under operational phase, Nitrogen Dioxide (NO₂), Sulphur Dioxide (SO₂) and Respirable Suspended Particulates (RSP), Fine Suspended Particulates (FSP) were considered as key air pollutants. The cumulative air pollutant concentrations associated with the vehicular emissions from open road network of existing and proposed roads, portal and ventilation building emissions and emissions from other sources within study areas were assessed. Cumulative odour impacts on PRS were also assessed.

Construction Phase

Assessment Findings and Mitigation Options

7.5 The key construction works of the 3 PRS would be reclamation, site formation, and construction of the open roads and the buildings. Potential air quality impacts from the construction works of the 3 PRS would mainly be related to construction dust generated from excavation, materials handling, spoil removal and wind erosion. The marine-based reclamation works would unlikely be a major source of fugitive dust emissions.

7.6 A realistic size of active works area was assumed for the assessment. With proper implementation of construction planning and mitigation measures, including the dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulation, rigorous watering of active works areas and exposed surfaces as well as good site practices, no adverse dust impacts at ASRs would be anticipated during

construction phase.

Operational Phase

Land Use Options for the Possible Worst Case Scenario

7.7 The proposed industrial uses under the land use assumptions have been confined to uses without air emission or fuel combustion, and therefore vehicular emissions from roads within the PRS were considered the major emission sources. Land use theme (see Section 6.1) resulting in the highest emission burden from road traffic (represented by NO_x emissions) within the 3 PRS was considered as the possible worst case scenario and was adopted for the air quality impact assessment during the operational phase. On this basis, Development Theme B (i.e. logistic and industrial use focus) was adopted for the operational phase assessment of the Lung Kwu Tan study area. For the Lantau Island study area, Themes B and A (i.e. Logistics and residential uses focus respectively), which represent the respective worst case scenario for the Siu Ho Wan PRS and Sunny Bay PRS, were adopted.

Assessment Findings and Mitigation Options – Air Pollutants

Lung Kwu Tan Study Area

7.8 For the Lung Kwu Tan study area, no adverse air quality impacts due to air pollutants would be anticipated at all existing ASRs in Lung Kwu Tan study area except for the existing village next to Lung Kwu Tan Road near Pak Long. Exceedance of the annual average NO₂ criterion was predicted which was attributable to the increased vehicular emissions at Lung Kwu Tan Road associated with the development of the PRS. Exceedances of RSP and FSP criteria were predicted in the small portion in southern part in Lung Kwu Tan PRS, which was mainly due to the emissions from the Castle Peak Power Station located to the south of Lung Kwu Tan PRS.

7.9 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.

Lantau Island Study Area

7.10 For the Lantau Island study area, no adverse impacts due to air pollutants would be anticipated at all existing ASRs. However, exceedance of the annual average NO₂ criterion would be anticipated near the eastern boundary of the Siu Ho Wan PRS just next to the North Lantau Highway, which were attributable to vehicular emissions from the North Lantau Highway, and hence non air-sensitive uses is recommended for the area near the North Lantau Highway.

Assessment Findings and Mitigation Options – Odour

7.11 No adverse odour impact would be anticipated within the Lung Kwu Tan PRS. For the Lantau Island study area, odour impacts were anticipated within Siu Ho Wan PRS at various heights due to the nearby odour emission facilities including SHWSTW, NLTS and OWTF. Odour impacts at heights below 40m above ground were mainly attributable to the odour emissions from the SHWSTW and NLTS, and those at assessment heights of 40m above ground and above were mainly attributable to the OWTF.

7.12 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.

8 WATER QUALITY IMPACT ASSESSMENT

Water Sensitive Receivers

8.1 Existing, committed and planned water sensitive receivers (WSRs) were identified in the study area (see

Figure 3), which mainly include cooling and flushing water intakes, bathing beaches, typhoon shelters, estuary and ecological resources including marine parks, SSSI fish culture zone (FCZ), fish spawning ground and areas of artificial reefs (AR), corals, horseshoe crabs, mangroves and seagrass.

Construction Phase

Water Quality Modelling Scenarios, Assumptions and Mitigation Options Incorporated

8.2 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 marine construction works.

8.3 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.

8.4 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 the marine works of the 3 PRS reclamation, HKIA3RS reclamation and TCNTDE reclamation, mud disposal operation at CMPESC, as well as dredging for re-provision of the SHWSTW and North West New Territories submarine outfalls would take place concurrently (see **Appendix B** for the details of the concurrent projects).

8.5 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 at peak rate concurrently with the construction of the PRS under both Scenario A and Scenario B.

8.6 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 3 PRS Together with HKIA3RS Reclamation, TCNTDE Reclamation and CMP Operation (Scenario A and Scenario B)

8.7 With the adoption of the more realistic and reasonable operation rate for the CMP operations under Scenario B, all the non-compliances at ecological and fisheries resources predicted in Scenario A would not occur with only exception of the BMP, where the maximum Suspended Solids (SS) elevation only marginally higher than the criterion value, and the coral habitat at the Brothers, where transient high level exceeding the maximum daily sedimentation rate was predicted.

8.8 The existing background SS levels at various flushing water intakes already breached the Water Supplies Department (WSD) target objective and the increase in SS levels induced by the concurrent marine construction activities were predicted to be small or negligible under both Scenario A and Scenario B. Full compliance would be achieved with deployment of silt screens at the intakes, thus it could be a possible mitigation option for consideration in the future statutory EIAs to protect the intakes. Similarly, with adoption of double-layer silt curtains and silt screens as proposed under the HKIA3RS project, the cumulative SS elevations at the cooling water intakes at Airport North and future HZMB BCF could be reduced to an acceptable level under both Scenario A and Scenario B.

Cumulative Impacts with Construction of 3 PRS Together with TCNTDE Reclamation and CMP Operation Only (Scenario C)

8.9 Scenario C assumed that all the marine works for HKIA3RS would have then been completed prior to the construction phase of the PRS. The non-compliance at the proposed BMP and its coral habitat for SS elevation and sedimentation rate was found no longer exist under Scenario C. With deployment of silt screens at flushing water intakes and cooling water intake at Airport North, full compliance with the assessment criteria for SS elevations and sedimentations rates would be achieved at all WSRs under Scenario C.

Further Strategic Mitigation Options

8.10 Besides the eco-friendly construction design measures assumed in the assessment, further additional mitigation measures could be considered in future studies to minimize the potential water quality impacts, such as phasing of reclamation works and use of geotextile bag seawall, etc. Good site practices outlined in *ProPECC PN 1/94* "Construction Site Drainage" should be followed to minimise surface runoff and erosion.

Operational Phase

Hydrodynamic and Water Quality Modelling Scenarios

8.11 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 HKIA3RS, TCNTDE, HZMB BCF, HZMB HKLR, TM-CLKL, CT10/ PRS at Southwest Tsing Yi, IWMF, CMPSB and CMPESC (see **Appendix B** for the details of the concurrent projects). Year 2036 was adopted as the operational phase assessment year as a conservative population assumption 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 generated by 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.

8.12 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

8.13 The two operational scenarios, Scenario 2 and Scenario 3, adopted the same coastline configurations, and therefore would have the same effect on the hydrodynamic conditions. The model predicted that under both Scenario 2 and Scenario 3, the predicted changes in the flow discharge due to the operation of the 3 PRS, through western water channels including Urmston Road, Ma Wan, Victoria Harbour, East Lamma, Western Lamma channels, Airport Channel and Rambler Channel, would be minimal and unlikely have significant effect on the overall flow pattern in the western waters.

8.14 Under all with and without PRS scenarios, i.e. the three scenarios, the water quality assessment on the operational phase predicted full compliance of the Water Quality Objectives (WQOs) for Dissolved Oxygen (DO) and Unionized Ammonia (UIA), which are key parameters for supporting marine life, within the marine water bodies of the North Western, North Western Supplementary, Western Buffer and outer Deep Bay WCZs at the EPD monitoring stations. Compliance was also found for *E. coli* levels at the secondary contact recreation zones, Ma Wan FCZ and bathing beaches in the western waters. Changes in salinity would also comply with the relevant WQO. Due to high background discharges, particularly from Pearl River, Total Inorganic Nitrogen (TIN) levels were high and would not comply with WQO in these WCZs under both with and without PRS scenarios. Findings under Scenarios 2 and 3 of different treatment levels were very similar.

8.15 In Scenario 1 (without PRS scenario), high TIN levels were predicted at various WSRs within the North Western, North Western Supplementary, Western Buffer and the Outer Subzone of Deep Bay WCZs. TIN levels were persistently high due to high background sources, particularly from Pearl River discharges. The assessment for Scenarios 2 and 3 (with PRS scenarios) revealed that the predicted increases in the TIN levels as a result of the 3 PRS from the baseline condition were small and within the range of natural fluctuation. Though nitrogen is one of the primary nutrients supporting plant growth and abundance of such nutrients (or eutrophication) in marine waters may be one of the factors leading to excessive algal growth (in certain cases harmful algal bloom or red tide), TIN was considered not a critical factor triggering red tide in these WCZs given that there was low frequency of red tide outbreak in the abovementioned WCZs despite records of high TIN levels. Hence, high TIN levels would unlikely bring direct harmful effects on marine life.

8.16 The baseline depth-averaged DO level at Ma Wan FCZ already breached the WQO (lower than the WQO criterion). The predicted DO levels with the 3 PRS at this WSR would only decrease by small degree and have minor changes from the baseline condition without PRS. Under both with and without PRS scenarios, the predicted DO levels at this WSR would be lower than the WQO criterion only in three months of the year in the wet season (June to August) and would be above the criterion complying with WQO for most times of the year. The predicted SS level breached the WSD target objective at the future flushing water intake at Tung Chung East of TCNTDE even under without PRS scenario. There would be only small increases in the predicted levels of SS with the three PRS from the baseline condition at this WSR. In view of the above, no potential adverse water quality impacts were anticipated due to the operation of the 3 PRS.

Strategic Mitigation Options

8.17 Notwithstanding the above, further pollution discharge from the 3 PRS (in particular the PRS at Lung Kwu Tan, which is closest to the sensitive Deep Bay WCZ) should still be reduced as far as practicable to minimize eutrophication and its associated effects on the aquatic ecosystem and other adverse impacts on the marine waters, taking into consideration the low assimilative capacity of Deep Bay WCZ, the high level of background pollution loading input to the Deep Bay WCZ from Hong Kong and Shenzhen, and the high rate of TIN non-compliance recorded in the study area. Future project proponents of the PRS should minimize the potential water quality impacts by different possible mitigation measures to reduce pollution loading to the study area and take into account "No net increase in pollution loading" of Deep Bay WCZ.

8.18 Apart from provision of new treatment facilities with at least secondary treatment level, which are the essential elements in deriving the water quality modelling results, other possible mitigation measures should be explored and investigated in future studies and assessments when more concrete development details are available. Effluent reuse for other beneficial uses (e.g. toilet flushing) could be adopted to minimize pollution load to the marine water. Diversion of sewage to the new STWs with higher treatment level to reduce the pollution from other sources could also be explored. Green infrastructures and best stormwater management practices could be implemented to minimize storm water pollution.

9 ECOLOGICAL IMPACT ASSESSMENT

Impacts from the 3 PRS

9.1 Potential impacts from the 3 PRS on ecological resources and sites of conservation importance in the study area (see **Figure 4**) were considered. 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. For CWD, findings from the site-specific CWD monitoring survey conducted from August 2013 to February 2014 at the 3 PRS under a separated study of CEDD were also taken into account.

CWD

9.2 Impacts to CWD were identified as the major issues to the 3 PRS. A site-specific CWD monitoring survey in shallow waters of Lung Kwu Tan, Siu Ho Wan and Sunny Bay was conducted under a separated study of CEDD from August 2013 to February 2014. The aim of these surveys was to study CWD usage in nearshore waters to better understand their occurrence and behavior in shallow waters of the 3 PRS. Land-based theodolite tracking was performed at Lung Kwu Tan and Siu Ho Wan while passive acoustic monitoring was performed at Lung Kwu Tan, Siu Ho Wan and Sunny Bay. Based on the results of these surveys, various potential construction and operational phase impacts to CWD resulting from development of the 3 PRS were identified and evaluated. Findings are listed below:

- **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

9.3 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.

9.4 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.

Cumulative Impacts with Consideration of Other Concurrent Projects

9.5 Based on the key impacts arising from the 3 PRS, cumulative impact assessment taking into consideration the impacts from other relevant concurrent projects was undertaken.

CWD

9.6 With respect to CWD, the assessment identified impacts in the following aspects:

- **Habitat Loss:** The projects included in the cumulative impact assessment would result in a total of 1,500ha 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/SCLKCMP to the West. Part of this area would 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, as well as the current PRS assessment, 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 Siu Ho Wan 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 were established for the 3 PRS, particularly for 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 required 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 SCLKCMP 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 EIAs 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 suggested that greater caution should be exercised in assessing potential impacts resulting from reclamation construction activities.
- **Impacts to Marine Parks:** The HKIA3RS and Siu Ho Wan PRS would have potential impacts on the proposed BMP. The HKIA3RS EIA noted that there were 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 concurrent potentially high disturbance activities close to the proposed BMP.

Other Ecological Resources

9.7 For other ecological resources, assessment revealed that Tai Ho Wan, coral communities and horseshoe crabs would be vulnerable to water quality impacts, and there would be potential impacts on avifauna species due to the loss of artificial and rocky shores by the 3 PRS.

Strategic Mitigation and Enhancement Options

Avoidance

9.8 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.

- 9.9 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

- 9.10 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. Details of the construction measures to reduce water quality impact are presented in Section 8 above. Any other water quality mitigation measures should be taken into account in order to fully address potential marine-ecological cumulative impacts.
- 9.11 Dolphin exclusion zones should be established and monitored to minimize potential impacts to CWD from construction activities.
- 9.12 Speed restrictions should be set for construction vessels moving within the areas where CWD are likely to occur to minimize disturbance from underwater noise and reduce risk of ship strikes.
- 9.13 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 CWD by ship strikes.
- 9.14 Since HSF is a recognized threat to CWD, new HSF routes as transportation links to serve the 3 PRS should be avoided to minimize the direct and indirect impacts on CWD.
- 9.15 Coral translocation should be conducted to minimize cumulative impacts resulting from the direct loss of coral colonies, with a detailed translocation plan to avoid disturbance to the coral colonies.
- 9.16 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.
- 9.17 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

- 9.18 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

- 9.19 Enhancement measures were proposed for consideration in addition to the recommended mitigation measures, including eco-enhanced seawall designs:
- **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 offshore 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.

- 9.20 The PRS and other concurrent projects would result in the loss of intertidal habitats (artificial and rocky shores) and seabed. The habitats could be re-established and enhanced through the provision of eco-friendly designed seawalls, providing opportunities for sessile organisms colonize and increasing the diversity and heterogeneity of the seawalls thereby increasing habitat quality for other species such as juvenile fish and shrimp.

- 9.21 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.

- 9.22 General measures that could be considered for implementation to promote CWD conservation in Hong Kong waters have been reviewed, including reduction in marine traffic, water quality improvements, acoustic modelling and monitoring, seawall eco-enhancement 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.

10 FISHERIES IMPACT ASSESSMENT

Impacts from the 3 PRS

- 10.1 There would be no direct loss of important spawning or nursery grounds, aquaculture sites or AR within the study area for fisheries impact assessment (see **Figure 6**) from the development of the 3 PRS.
- 10.2 The potential fisheries impact associated with the 3 PRS would be the direct loss of about 480 ha of fishing grounds with low to moderate fisheries production. The predicted resulting loss of fisheries production would be insignificant in comparison to the total fisheries production in Hong Kong. The 3 PRS only supported low to moderate number of fishing vessels. 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.
- 10.3 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.
- 10.4 Changes in water quality during reclamation and other concurrent marine works would cause minor indirect impact to fisheries resources. The water quality modelling for the construction phase indicated that the mixing zones of SS elevations near the PRS would be minimized and become localized after implementation of the assumed construction design measures as mentioned in Section 8.3. Compliance with WQO for SS elevation was predicted for all important fisheries resources, including the Ma Wan FCZ, the ARs at SCLKCMP, 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 as mentioned in Section 8.3. 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.

- 10.5 During the operational phase, although low levels of DO were predicted at Ma Wan FCZ, the predicted decreases in DO levels from the baseline condition were small and minor and within the range of natural fluctuation with the adoption of the mitigation options. Under both with and without PRS scenarios, the predicted DO levels at the FCZ would be lower than the WQO criterion only in three months of the year in the wet season (June to August) and 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 projects. Furthermore, high levels of TIN were predicted during operational phase in the western waters in general. However, the predicted increases in TIN levels from the baseline condition resulted from the PRS and other concurrent projects were small and minor and within the range of natural fluctuation with the adoption of the mitigation options. It was expected that the PRS would unlikely have significant implication on red tide occurrence in the western waters.

Cumulative Impacts with Consideration of Other Concurrent Projects

- 10.6 The ongoing, committed, planned and proposed projects in western Hong Kong waters that would have the potential to cause cumulative fisheries impacts have been included in the assessment. Permanent loss of fishing ground would be the key impact resulting from the concurrent projects in western Hong Kong waters. Although there would be no loss of fishing grounds of high fisheries production, the cumulative loss of about 1,600 ha of fishing ground was 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 would be minor.

Strategic Mitigation and Enhancement Options

Avoidance

- 10.7 Based on assessment on ecological impact in Section 9, the extent of Siu Ho Wan PRS would be reduced to avoid direct impacts to habitat of CWD. The direct loss of fishing ground would therefore be reduced.

Minimization

- 10.8 Construction methods and programming that could reduce impacts from dredging, filling and construction phase marine traffic (e.g. use of non-dredged reclamation techniques), and water quality control measures and good site practices (e.g. use of well-maintained double-silt curtains) should be adopted for the 3 PRS. Any other water quality mitigation measures in Section 8 should be taken into account in order to fully address potential fisheries cumulative impacts.

Compensation

- 10.9 Two new marine parks would be established under the HKIA3RS and HZMB projects for mitigation of CWD habitat loss under their projects. As stated in Section 9, the extent of Siu Ho Wan PRS extent would be reduced to avoid direct impacts to CWD habitat and it was likely that the BMP proposed by HZMB project would be enlarged to cover the CWD habitat identified within Siu Ho Wan PRS. It was expected that the implementation of the proposed fisheries management and enhancement measures associated with the Marine Parks would enhance the overall fisheries resources in the western Hong Kong waters.

Enhancement Options

- 10.10 Fisheries enhancement measures were proposed for consideration in addition to the mitigation options to further improve the fisheries resources in the north Lantau waters and support the fishing operation.
- **Eco-enhanced Seawall Designs:** Eco-enhanced seawall designs were proposed for the 3 PRS which were mentioned in Section 9.19.
 - **Deployment of AR:** AR 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 and are commonly used as enhancement measures for marine habitats. The AR 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 AR.

- **Fish Stocking:** Stocking programmes have been commonly adopted to improve the quantity or quality of fish stocks for restoration, enhancement and conservation reasons.

11 OVERALL STRATEGIC ENVIRONMENTAL FINDINGS AND RECOMMENDED STRATEGIC ENVIRONMENTAL MITIGATION OPTIONS

- 11.1 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.

- 11.2 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. The following sections highlight the key issues and recommended strategic mitigation options in four environmental aspects:

Air Quality

- 11.3 With proper implementation of construction planning and mitigation measures, 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.

Water Quality

- 11.4 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 measures should be explored and investigated.

Ecology

- 11.5 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 measures, control of lighting at night-time, use of acoustic decoupling equipment and good site practices should be implemented to minimize the potential ecological impacts.

Fisheries

- 11.6 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.

12 CONCLUSION AND WAY FORWARD

- 12.1 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.
- 12.2 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 measures should be carried out, whenever necessary, to obtain their agreements to ascertain the recommendations in the detailed studies and assessments.



833400 N

823400 N

813400 N

804300 E

814300 E

824300 E

834300 E

WEST NEW TERRITORIES (WENT)
LANDFILL EXTENSIONS

DEEP BAY WCZ
NORTH WESTERN WCZ

LUNG KWU TAN

FILL BANK AT
TUEN MUN AREA 38

INDUSTRIAL ESTATE
AT TUEN MUN AREA 38

CONTAMINATED MUD PIT AT
EAST SHA CHAU

NORTH WESTERN SUPPLEMENTARY WCZ

THIRD AIRPORT RUNWAY

HONG KONG - ZHUHAI - MACAO BRIDGE
HONG KONG LINK ROAD

SLUDGE TREATMENT
FACILITIES

INTEGRATED WASTE
MANAGEMENT FACILITIES
PHASE I AT TSANG TSUI

DECOMMISSIONING OF WEST
PORTION OF THE MIDDLE ASH
LAGOON AT TSANG TSUI/
PROPOSED COLUMBARIUM
AT TSANG TSUI

TUEN MUN AREAS 40 AND 46

HONG KONG - ZHUHAI - MACAO BRIDGE
HONG KONG BOUNDARY CROSSING FACILITIES

TUEN MUN -
CHEK LAP KOK LINK

CONTAMINATED MUD PIT
AT THE SOUTH BROTHERS

PROPOSED COLUMBARIUM
AT SIU HO WAN

ORGANIC WASTE
TREATMENT FACILITIES

SIU HO WAN
DEPOT
HOUSING DEVELOPMENT

TUNG CHUNG NEW TOWN
DEVELOPMENT EXTENSION

INTEGRATED WASTE MANAGEMENT
FACILITIES PHASE I
AT SHEK KWU CHAU

WESTERN BUFFER WCZ

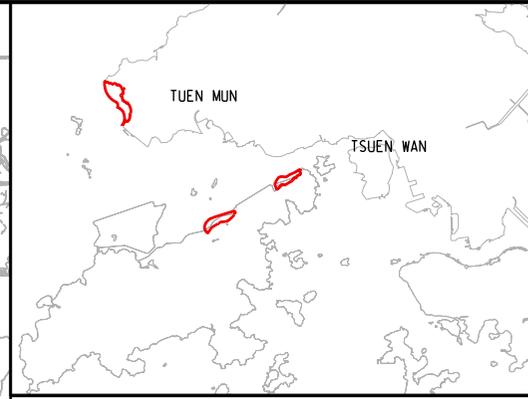
WESTERN BUFFER WCZ

SUNNY BAY

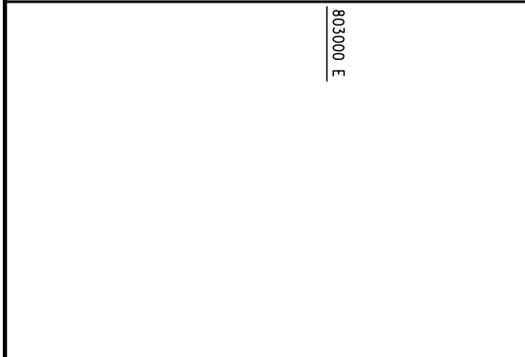
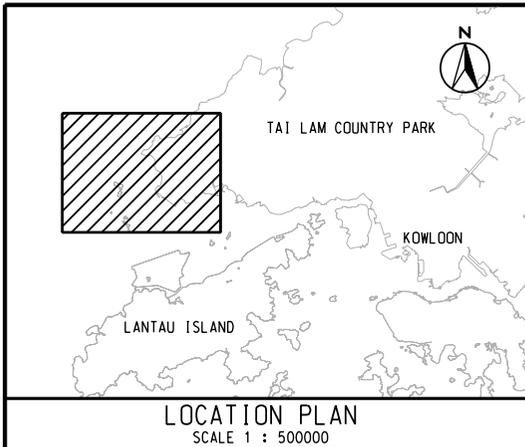
CONTAINER TERMINAL 10
DEVELOPMENT/POTENTIAL
RECLAMATION SITE AT
SOUTHWEST TSING YI

LEGEND:

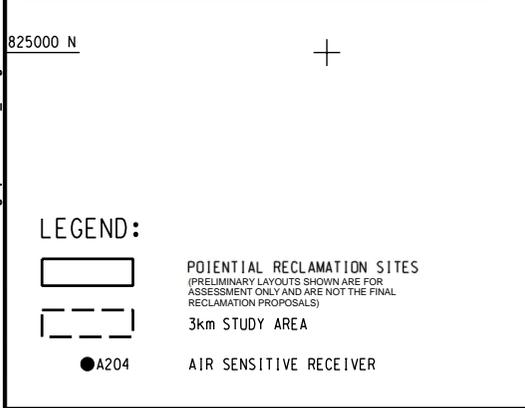
-  POTENTIAL RECLAMATION SITES
(PRELIMINARY LAYOUTS SHOWN ARE FOR
ASSESSMENT ONLY AND ARE NOT THE FINAL
RECLAMATION PROPOSALS)
-  WATER CONTROL ZONE (WCZ)
-  STUDY AREA
-  DEVELOPMENT UNDER PLANNING
OR UNDER CONSTRUCTION

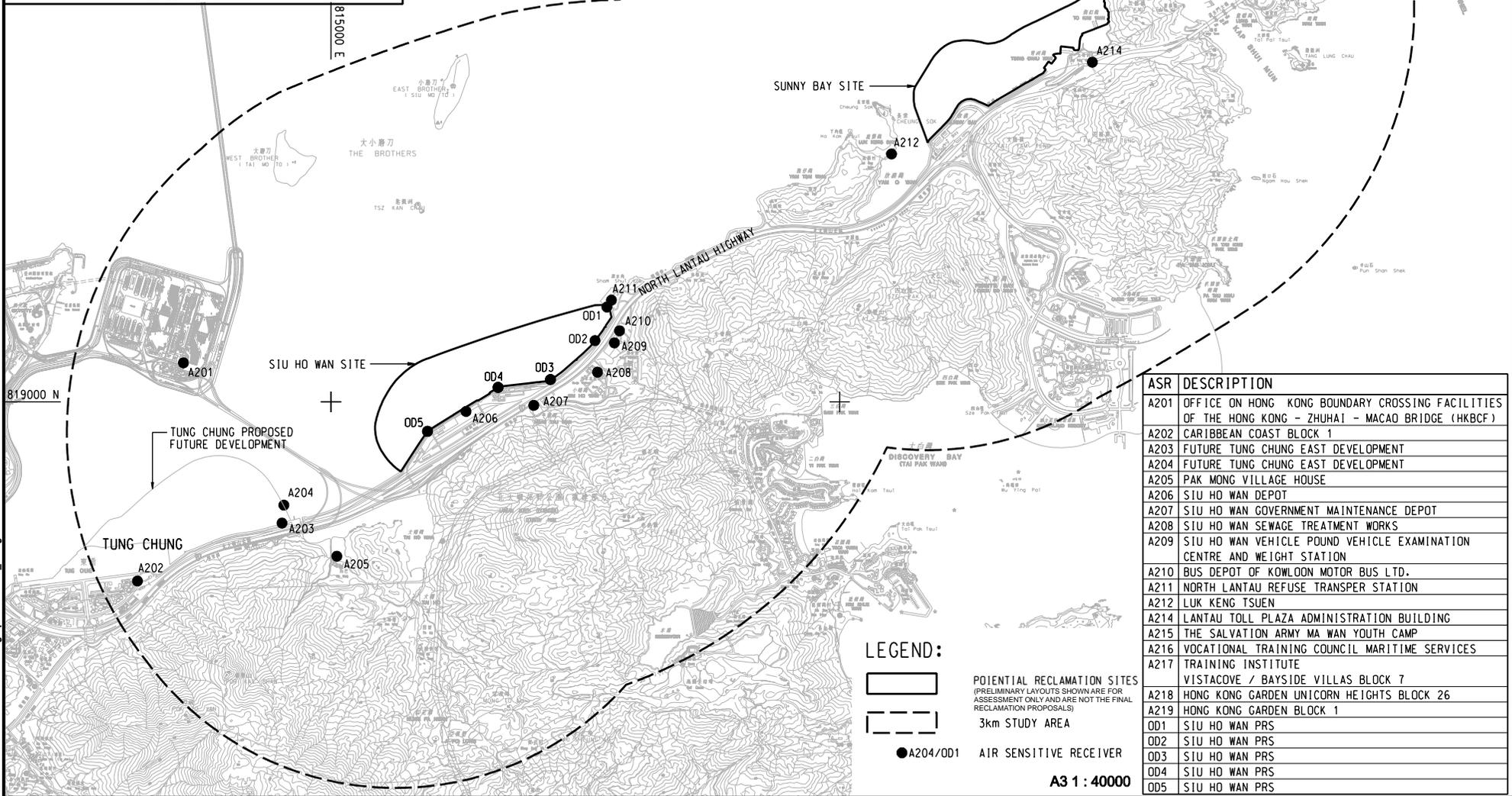
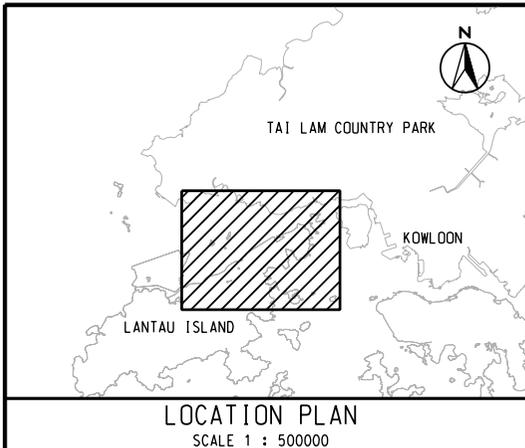


LOCATION PLAN
SCALE 1 : 400000



ASR	DESCRIPTION
A101	EPD WENT LANDFILL SITE OFFICE
A102	SLUDGE TREATMENT FACILITIES SITE OFFICE
A103	IWMF SITE OFFICE
A104	BLACK POINT POWER STATION (OFFICE)
A105	LUNG KWU SHEUNG TAN
A106	DRAGON COVE IN PAK LONG
A107	LUNG KWU TAN
A108	SITE OFFICE OF CASTLE PEAK POWER STATION
A109	GREEN ISLAND CEMENT PLANT (OFFICE)
A110	SITE OFFICE OF SHIU WING STEEL MILL
A111	SITE OFFICE OF ECO PARK
A112	TUEN MUN AREA 46

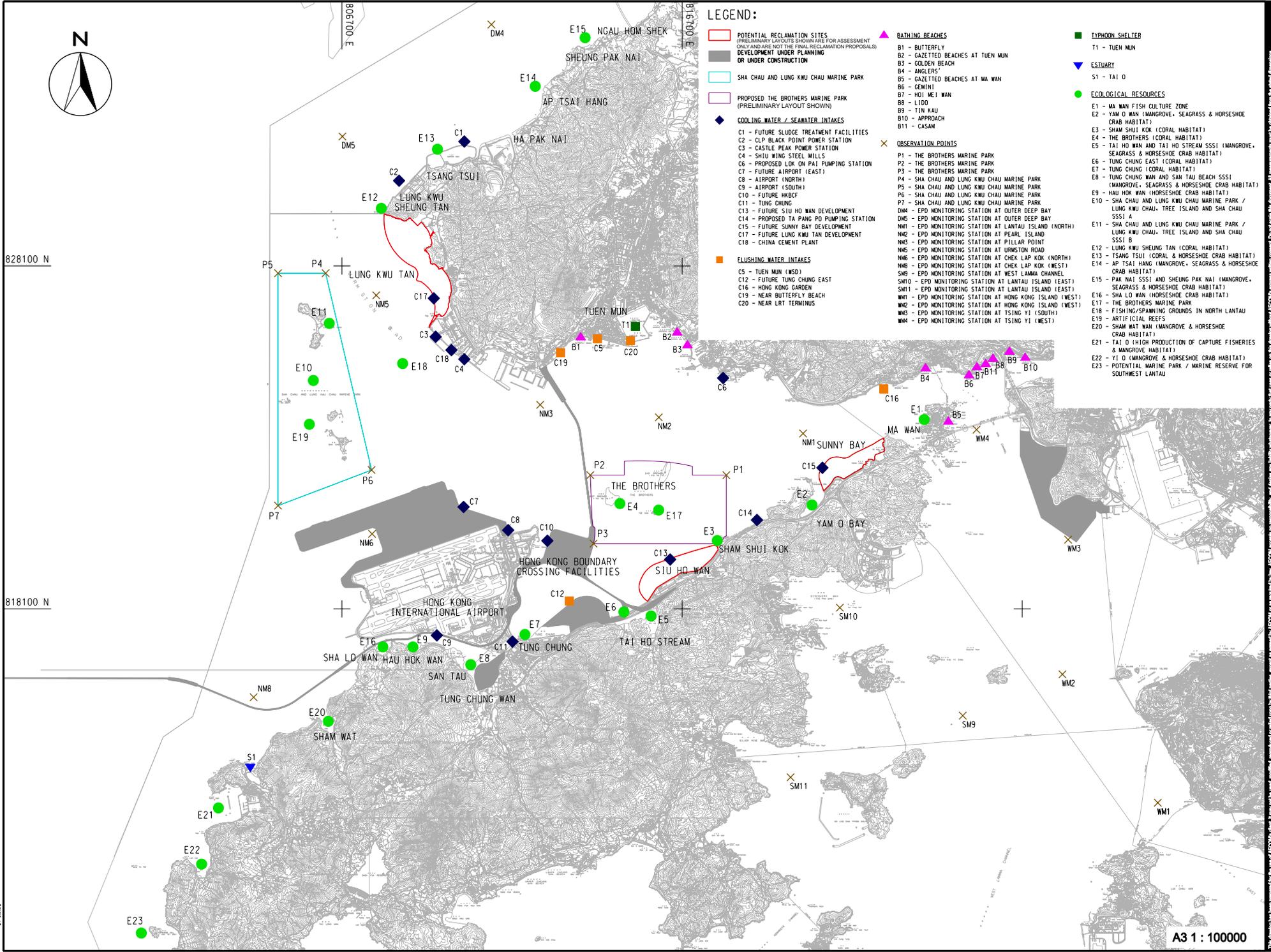




ASR	DESCRIPTION
A201	OFFICE ON HONG KONG BOUNDARY CROSSING FACILITIES OF THE HONG KONG - ZHUHAI - MACAO BRIDGE (HKBCF)
A202	CARIBBEAN COAST BLOCK 1
A203	FUTURE TUNG CHUNG EAST DEVELOPMENT
A204	FUTURE TUNG CHUNG WEST DEVELOPMENT
A205	PAK MONG VILLAGE HOUSE
A206	SIU HO WAN DEPOT
A207	SIU HO WAN GOVERNMENT MAINTENANCE DEPOT
A208	SIU HO WAN SEWAGE TREATMENT WORKS
A209	SIU HO WAN VEHICLE POUND VEHICLE EXAMINATION CENTRE AND WEIGHT STATION
A210	BUS DEPOT OF KOWLOON MOTOR BUS LTD.
A211	NORTH LANTAU REFUSE TRANSFER STATION
A212	LUK KENG TSUEN
A214	LANTAU TOLL PLAZA ADMINISTRATION BUILDING
A215	THE SALVATION ARMY MA WAN YOUTH CAMP
A216	VOCATIONAL TRAINING COUNCIL MARITIME SERVICES TRAINING INSTITUTE
A217	VISTACOVE / BAYSIDE VILLAS BLOCK 7
A218	HONG KONG GARDEN UNICORN HEIGHTS BLOCK 26
A219	HONG KONG GARDEN BLOCK 1
OD1	SIU HO WAN PRS
OD2	SIU HO WAN PRS
OD3	SIU HO WAN PRS
OD4	SIU HO WAN PRS
OD5	SIU HO WAN PRS

A3 1 : 40000

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A3 1 : 100000

LEGEND:

- POTENTIAL RECLAMATION SITES (PRELIMINARY LAYOUTS SHOWN ARE FOR ASSESSMENT ONLY AND ARE NOT THE FINAL RECLAMATION PROPOSALS) UNDER DEVELOPMENT OR UNDER CONSTRUCTION
- SHA CHAU AND LUNG KWU CHAU MARINE PARK
- PROPOSED THE BROTHERS MARINE PARK (PRELIMINARY LAYOUT SHOWN)
- ◆ COOLING WATER / SEAWATER INTAKES
 - C1 - FUTURE SLUDGE TREATMENT FACILITIES
 - C2 - C/P BLACK POINT POWER STATION
 - C3 - CASTLE PEAK POWER STATION
 - C4 - SHUI WING STEEL MILLS
 - C6 - PROPOSED LOK ON PAI PUMPING STATION
 - C7 - FUTURE AIRPORT (EAST)
 - C8 - AIRPORT (NORTH)
 - C9 - AIRPORT (SOUTH)
 - C10 - FUTURE HKBCF
 - C11 - TUNG CHUNG
 - C13 - FUTURE SIU HO WAN DEVELOPMENT
 - C14 - PROPOSED TA PANG PD PUMPING STATION
 - C15 - FUTURE SUNNY BAY DEVELOPMENT
 - C17 - FUTURE LUNG KWU TAN DEVELOPMENT
 - C18 - CHINA CEMENT PLANT
- FLUSHING WATER INTAKES
 - C5 - TUEN MUN (WSD)
 - C12 - FUTURE TUNG CHUNG EAST
 - C16 - HONG KONG GARDEN
 - C19 - NEAR BUTTERFLY BEACH
 - C20 - NEAR LRT TERMINUS
- ▲ BATHING BEACHES
 - B1 - BUTTERFLY
 - B2 - GAZETTED BEACHES AT TUEN MUN
 - B3 - GOLDEN BEACH
 - B4 - ANGLERS'
 - B5 - GAZETTED BEACHES AT MA WAN
 - B6 - GEMINI
 - B7 - HOI MEI WAN
 - B8 - LIUO
 - B9 - TIN KAU
 - B10 - APPROACH
 - B11 - CASAM
- TYPHOON SHELTER
 - T1 - TUEN MUN
- ▼ ESTUARY
 - S1 - TAI O
- ECOLOGICAL RESOURCES
 - E1 - MA WAN FISH CULTURE ZONE
 - E2 - YAM O WAN (MANGROVE, SEAGRASS & HORSESHOE CRAB HABITAT)
 - E3 - SHAM SHUI KOK (CORAL HABITAT)
 - E4 - THE BROTHERS (CORAL HABITAT)
 - E5 - TAI HO WAN AND TAI HO STREAM SSSI (MANGROVE, SEAGRASS & HORSESHOE CRAB HABITAT)
 - E6 - TUNG CHUNG EAST (CORAL HABITAT)
 - E7 - TUNG CHUNG (CORAL HABITAT)
 - E8 - TUNG CHUNG WAN AND SAN TAU BEACH SSSI (MANGROVE, SEAGRASS & HORSESHOE CRAB HABITAT)
 - E9 - HAU HOK WAN (HORSESHOE CRAB HABITAT)
 - E10 - SHA CHAU AND LUNG KWU CHAU MARINE PARK / LUNG KWU CHAU TREE ISLAND AND SHA CHAU SSSI A
 - E11 - SHA CHAU AND LUNG KWU CHAU MARINE PARK / LUNG KWU CHAU TREE ISLAND AND SHA CHAU SSSI B
 - E12 - LUNG KWU SHEUNG TAN (CORAL HABITAT)
 - E13 - TSANG TSUI (CORAL & HORSESHOE CRAB HABITAT)
 - E14 - AP TSAI HANG (MANGROVE, SEAGRASS & HORSESHOE CRAB HABITAT)
 - E15 - PAK NAI SSSI AND SHEUNG PAK NAI (MANGROVE, SEAGRASS & HORSESHOE CRAB HABITAT)
 - E16 - SHA LO WAN (HORSESHOE CRAB HABITAT)
 - E17 - THE BROTHERS MARINE PARK
 - E18 - FISHING/SPAWNING GROUNDS IN NORTH LANTAU
 - E19 - ARTIFICIAL REEFS
 - E20 - SHAM WAT WAN (MANGROVE & HORSESHOE CRAB HABITAT)
 - E21 - TAI O (HIGH PRODUCTION OF CAPTURE FISHERIES & MANGROVE HABITAT)
 - E22 - YI O (MANGROVE & HORSESHOE CRAB HABITAT)
 - E23 - POTENTIAL MARINE PARK / MARINE RESERVE FOR SOUTHWEST LANTAU
- × OBSERVATION POINTS
 - P1 - THE BROTHERS MARINE PARK
 - P2 - THE BROTHERS MARINE PARK
 - P3 - THE BROTHERS MARINE PARK
 - P4 - SHA CHAU AND LUNG KWU CHAU MARINE PARK
 - P5 - SHA CHAU AND LUNG KWU CHAU MARINE PARK
 - P6 - SHA CHAU AND LUNG KWU CHAU MARINE PARK
 - P7 - SHA CHAU AND LUNG KWU CHAU MARINE PARK
 - DM4 - EPD MONITORING STATION AT OUTER DEEP BAY
 - DM5 - EPD MONITORING STATION AT OUTER DEEP BAY
 - NM1 - EPD MONITORING STATION AT LANTAU ISLAND (NORTH)
 - NM2 - EPD MONITORING STATION AT PEARL ISLAND
 - NM3 - EPD MONITORING STATION AT PILLAR POINT
 - NM5 - EPD MONITORING STATION AT URWSTON ROAD
 - NM6 - EPD MONITORING STATION AT CHEK LAP KOK (NORTH)
 - NM8 - EPD MONITORING STATION AT CHEK LAP KOK (WEST)
 - SM9 - EPD MONITORING STATION AT WEST LAMA CHANNEL
 - SM10 - EPD MONITORING STATION AT LANTAU ISLAND (EAST)
 - SM11 - EPD MONITORING STATION AT LANTAU ISLAND (EAST)
 - WM1 - EPD MONITORING STATION AT HONG KONG ISLAND (WEST)
 - WM2 - EPD MONITORING STATION AT HONG KONG ISLAND (WEST)
 - WM3 - EPD MONITORING STATION AT TSING YI (SOUTH)
 - WM4 - EPD MONITORING STATION AT TSING YI (WEST)

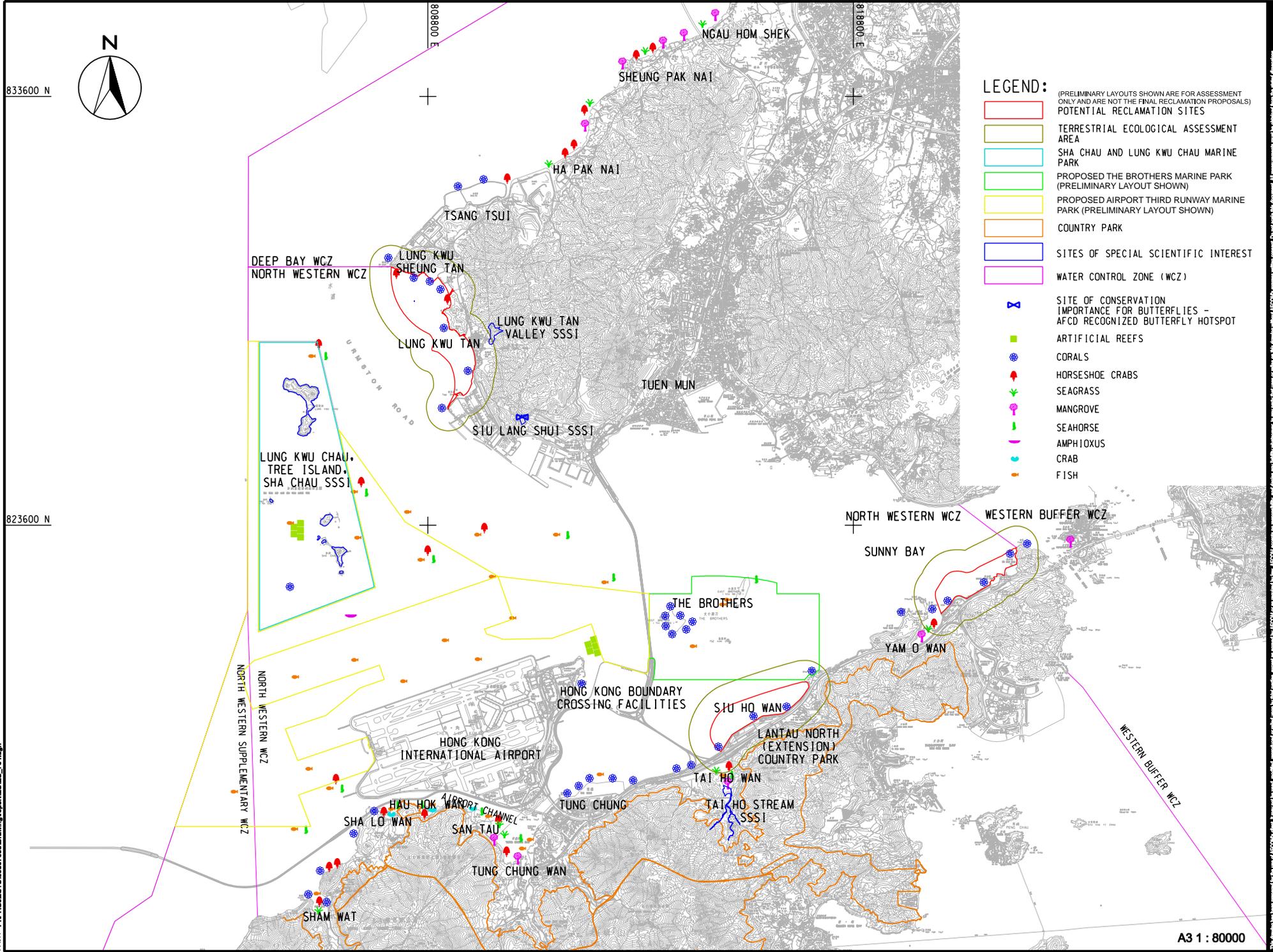


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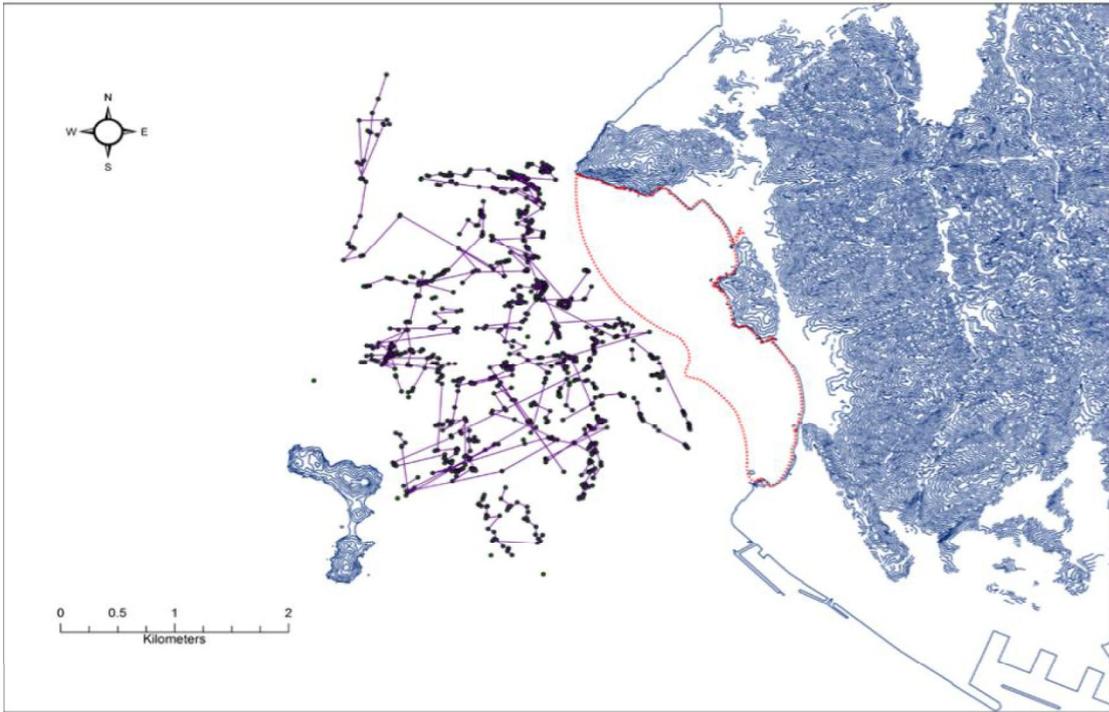
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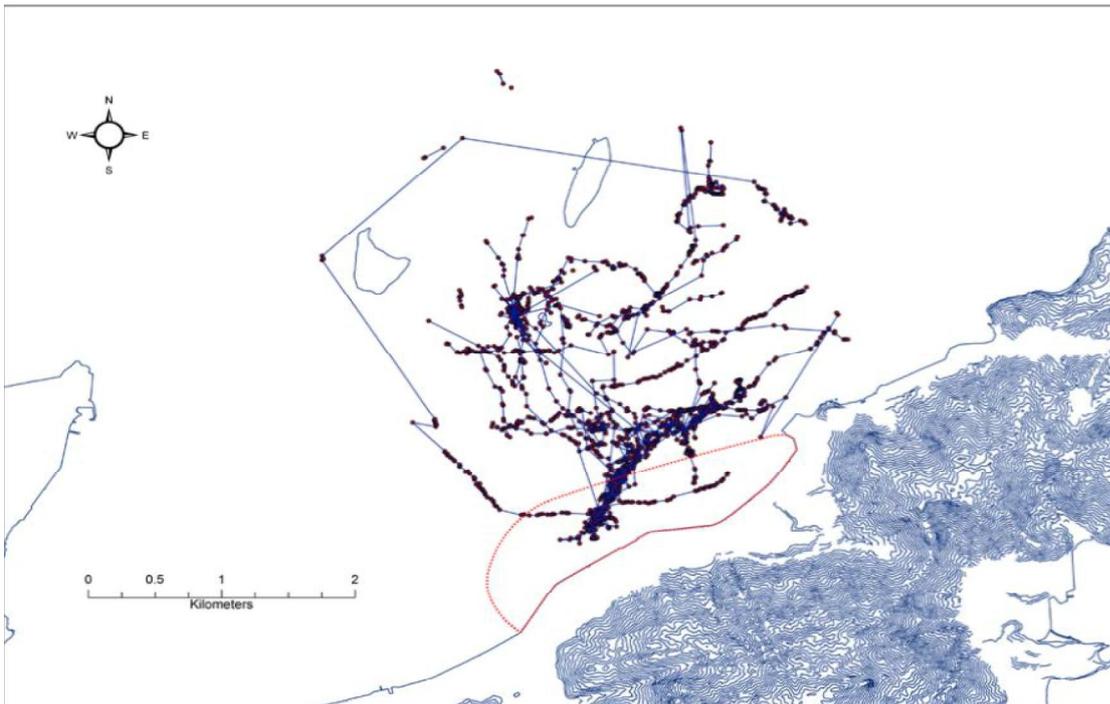


LEGEND:

- (PRELIMINARY LAYOUTS SHOWN ARE FOR ASSESSMENT ONLY AND ARE NOT THE FINAL RECLAMATION PROPOSALS) POTENTIAL RECLAMATION SITES
- TERRESTRIAL ECOLOGICAL ASSESSMENT AREA
- SHA CHAU AND LUNG KWU CHAU MARINE PARK
- PROPOSED THE BROTHERS MARINE PARK (PRELIMINARY LAYOUT SHOWN)
- PROPOSED AIRPORT THIRD RUNWAY MARINE PARK (PRELIMINARY LAYOUT SHOWN)
- COUNTRY PARK
- SITES OF SPECIAL SCIENTIFIC INTEREST
- WATER CONTROL ZONE (WCZ)
- S SITE OF CONSERVATION IMPORTANCE FOR BUTTERFLIES - AFCD RECOGNIZED BUTTERFLY HOTSPOT
- ARTIFICIAL REEFS
- CORALS
- HORSESHOE CRABS
- SEAGRASS
- MANGROVE
- SEA HORSE
- AMPHIOXUS
- CRAB
- FISH



A) Lung Kwu Tan



B) Siu Ho Wan

	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	SCALE	N.T.S.	DATE	Sept. 2014
		CHECK	LAMCCG	DRAWN	DG
	Chinese White Dolphins Tracklines acquired from Shore-based Theodolite Tracking at Lung Kwu Tan and Siu Ho Wan from August 2013 to February 2014 for Ecological Impact Assessment	JOB NO.	60307098	Figure No.	5
					-

Source: Report on Study of Chinese White Dolphin Behaviour in Shallow Waters under Land Supply Study

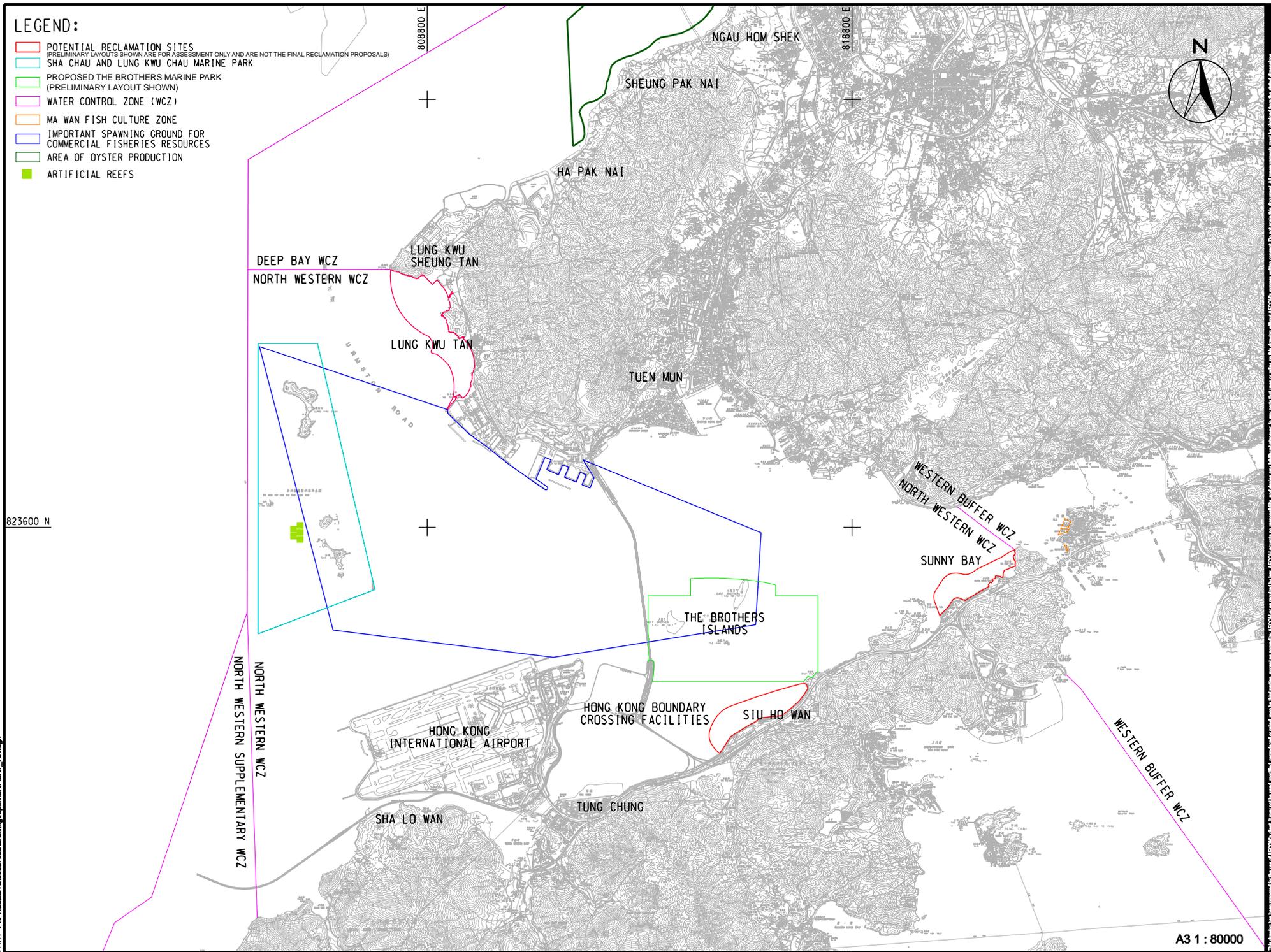
LEGEND:

- ▭ POTENTIAL RECLAMATION SITES
(PRELIMINARY LAYOUTS SHOWN ARE FOR ASSESSMENT ONLY AND ARE NOT THE FINAL RECLAMATION PROPOSALS)
- ▭ SHA CHAU AND LUNG KWU CHAU MARINE PARK
- ▭ PROPOSED THE BROTHERS MARINE PARK
(PRELIMINARY LAYOUT SHOWN)
- ▭ WATER CONTROL ZONE (WCZ)
- ▭ MA WAN FISH CULTURE ZONE
- ▭ IMPORTANT SPAWNING GROUND FOR
COMMERCIAL FISHERIES RESOURCES
- ▭ AREA OF OYSTER PRODUCTION
- ▭ ARTIFICIAL REEFS

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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: FEB. 2014

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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																				
2	PRS at Siu Ho Wan																				
3	PRS at Sunny Bay																				
4	Tung Chung New Town Development Extension (TCNTDE)																				
5	Hong Kong International Airport and the associated expansion into a Three-Runway System (HKIA3RS)																				
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)	<i>Construction programme is not available at the time of assessment.</i>																			
12	Container Terminal 10 Development (CT10) / Potential Reclamation Site at Southwest Tsing Yi	<i>Construction programme is not available at the time of assessment.</i>																			
13	Sludge Treatment Facilities (STF)																				
14	Organic Waste Treatment Facilities (OWTF)																				
15	Tuen Mun Areas 40 and 46	<i>Construction programme is not available at the time of assessment.</i>																			
16	Siu Ho Wan Depot Housing Development	<i>Construction programme is not available at the time of assessment.</i>																			
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	<i>Construction programme is not available at the time of assessment.</i>																			
20	Proposed Columbarium at Siu Ho Wan	<i>Construction programme is not available at the time of assessment.</i>																			
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)	Currently under construction; to be completed by 2016 (except for TM-CLKL to be completed by 2018)	X – No programme overlap	X – No programme overlap (new land boundary incorporated in the coastline configurations for construction phase sediment plume modelling)		
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)	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 re-opened 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	✓ – Operational phase sediment loss incorporated in sediment plume modelling (Construction phase ecology and fisheries impacts were assessed by making reference to the sediment modelling results)		

No.	Projects	Construction Schedule	Air	Water	Ecology	Fisheries	
11.	Integrated Waste Management Facilities Phase 1 (IWMF)	IWMF at Tsang Tsui	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	X – No marine construction work is proposed for the IWMF at Tsang Tsui and hence no cumulative marine water quality, marine ecology and fisheries impact would be expected from the Tsang Tsui site		
		IWMF at Shek Kwu Chau	Not available	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 Terminal 10 Development (CT10) / Potential Reclamation Site at Southwest Tsing Yi	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 programme and information for the construction phase not yet available			
13.	Sludge Treatment Facilities (STF)	Completed by 2013	X – No programme overlap				
14.	Organic Waste Treatment Facilities (OWTF)	2015 – 2017	X – No programme 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	2016 – 2024	Not considered in the quantitative cumulative assessment – With reference to the approved WENT Landfill Extensions EIA report, most the construction activities of the ponds would have been completed in early 2023 (except Phases 5 & 6). The total area of the Phases 5 & 6 is much smaller than that of other phases and the dust impact would be localized within Deep Bay airshed as WENT Landfill is topographically separated with the Lung Kwu Tan PRS by mountains. According to Hong Kong Planning Standards and Guidelines (HKPSG), air pollution dispersion is inhibited when topographically confined by hills. Therefore, WENT Landfill Extensions is not expected to contribute significant cumulative impact	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 programme 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				

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	✓ – Final seabed level after capping of the CMP incorporated in hydrodynamic model	X – Operation ceased in 2016 before operation of this Project	X – Operation ceased in 2016 before operation of this Project
10.	Contaminated Mud Pit at East Sha Chau (CMPESC)	The CMP is currently closed and will be re-opened 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	✓ – Operation ceased in 2023; no long term cumulative impact expected (final seabed level after capping of the CMP incorporated in hydrodynamic model)		

No.	Projects	Operation Schedule	Air	Water	Ecology	Fisheries	
11.	Integrated Waste Management Facilities Phase 1 (IWMF)	IWMF at Tsang Tsui	Not available	✓	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
		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 Terminal 10 Development (CT10) / Potential Reclamation Site at Southwest Tsing Yi	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	✓	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 – Implementation programme and information for the operational phase not 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			

No.	Projects	Operation Schedule	Air	Water	Ecology	Fisheries
19.	Proposed Columbarium at Tsang Tsui	Not available	<p>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)</p>	<p>X – Land-based development with no major marine water quality issue expected (Implementation programme and information for the operational phase not yet available)</p>	<p>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)</p>	<p>X – Land-based development with no major fisheries concern expected (Implementation programme and information for the operational phase not yet available)</p>

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 – Implementation information for the operational phase not yet available			
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.