



B1 **PHYSICAL DESCRIPTION AND MARINE ECOLOGICAL SETTING**

B1.1 **INTRODUCTION**

This *Annex* provides a high-level description of the physical and marine ecological characteristics of western Hong Kong waters, in particular north and west Lantau waters. This review provides the basis for identifying key habitats, species or ecological resources that may warrant focused effort in conservation, enhancement and restoration under the MECP. A description on the current planning of the 3RS Project is also presented.

B1.2 **PHYSICAL SETTING**

The 3RS project area mainly comprises approximately 650 ha of land formation in marine open waters and seawall development of approximately 5.9 km immediately north of the HKIA existing platform in the northern Lantau waters. The resulting loss of seabed comprises marine sediment and debris formed from natural sedimentation with the influence of flows from the PRE. The existing seawall is largely constructed of sloping armour rock with the berthing point being constructed of vertical concrete.

The hydrodynamic regime in the western Hong Kong waters is complex and varies with a number of factors including the lunar cycle (spring and neap tides), the season and the rate of flow of the Pearl River. In general, the main ebb tide currents flow south along the Urmston Road, with a subsidiary flow bifurcating northwest of Chek Lap Kok to flow south down the west coast of Lantau, and southeast around the east of Chek Lap Kok Island. Flood tides show the reverse pattern.

The Pearl River, situated in a sub-tropical climate, brings along with heavy loads of suspended sediment and nitrates during wet season and as a consequence concentrations of these parameters within western waters are variable but generally far higher than in the more oceanic influenced waters to the south and east of Hong Kong. As a result of the influence of the Pearl River, water quality of the western waters is characterized by a relatively higher background level of nitrogenous nutrients (in particular Total Inorganic Nitrogen); the water quality is otherwise acceptable with a fair rate of compliance with the Water Quality Objectives.

During the winter (dry) season the influence of the Pearl River is at its least because of reduced flows, resulting in typically well-mixed coastal waters. In contrast during the summer (wet) season, the flow of the Pearl River increases and the coastal waters become highly stratified as the large influx of brackish water overlies the denser, more saline oceanic waters near the seabed.

There are two main channels in the area. One channel extends from the Ma Wan Channel to the Urmston Road with a deepest depth of 22 m near Tap Shek Kok. The





other one which stays south of The Brothers is generally of water depth of 10 m. Other areas in the North Lantau waters are quite shallow and the average water depth is 5 to 6 m. The water depths of west Lantau range from 0 to 22 m

A number of infrastructure developments are planned or underway in western Hong Kong waters with multiple marine users operating. These include the HKIA, Hong Kong Boundary Crossing Facilities (HKBCF), Tuen Mun – Chek Lap Kok Link (TM-CLKL), Hong Kong Link Road (HKLR), contaminated sediment disposal facilities, shipping fairways and vessel traffic routes, anchorage areas, and submarine utilities such as cables, pipelines, seawater intake and effluent outfalls. Marine traffic level is high with high speed ferries, licensed ferry, tankers, bulk carriers, cargo vessels, container vessels, passenger ships, construction vessels (e.g. pilot, tug and tow, barges), government fast launches, fishing vessels and other small craft commonly seen in these waters.

B1.3 *MARINE ECOLOGICAL COMMUNITIES*

In order to better understand how the 3RS Project may have interactions with the marine ecological communities, a series of field studies were conducted between 2012 and 2014 as part of the EIA study. This included focused CWD surveys undertaken over a 12-14 month period, covering the proposed land formation footprint and particularly within the existing Hong Kong International Airport Approach Areas (HKIAAA). The CWD surveys included vessel based line transect surveys, land-based theodolite tracking surveys and underwater noise assessment in the form of passive acoustic monitoring (PAM). In addition to CWD surveys, comprehensive baseline marine ecological surveys specific to the proposed land formation footprint, especially within the existing HKIAAA, were conducted, covering intertidal habitats, sub-tidal habitats, and marine waters. Updated verification surveys were also conducted along the North Lantau coast (from Yam O to the east and Tai O to the west), SCLKCMP and The Brothers. Where appropriate, reference sites with similar ecological attributes to the habitats within the land formation footprint were also surveyed to facilitate ecological evaluation.

B1.3.1 *Chinese White Dolphins (CWD)*

The field surveys yielded important data based on which a full evaluation of the importance of the proposed works area to the CWDs was conducted, with reference to information from previous studies and the results of the current field work directed at assessing impacts within the land formation area and specifically within the current HKIAAA. While the abundance of CWDs within the two surveyed areas (airport north and airport west) was considered to be at the low end of moderate, the densities of dolphins in those areas, based on 12-14 months of data collected, appeared to be similar to those in the known historically important CWD habitats, such as The Brothers area and Southwest Lantau. These densities were much lower than those in the most critical habitat areas of Northwest Lantau and West Lantau; however the Northeast Lantau (covering the proposed land formation footprint) and Southwest Lantau areas were still considered important habitats particularly in the





light of the declining abundance of CWDs in Hong Kong waters. The PAM survey data collected between December 2012 and December 2013 suggested that CWDs may use the areas directly north of the airport more at night than during the day, although the significance of this compared with CWD use in other CWD habitat areas during night-time is not known.

Some CWDs use the airport north and airport west survey areas as part of their general habitat and as a portion of a much larger home range. A variety of activities occur in these areas, although they did not seem to represent prime feeding areas for the CWDs. The data collected appeared to point to those areas being used as important travelling areas between feeding habitats to the east at The Brothers and Sham Shui Kok, and to the west at the SCLKCMP and West Lantau area. Although the value of these focused survey areas was not readily apparent from historical studies of CWDs in Hong Kong, recent changes in habitats (such as the operation of SkyPier resulting in new vessel traffic just north of the airport, on-going intensive construction of the HKBCF directly northeast of the existing airport island and the construction of the HKLR to the west and south of the airport) have potentially resulted in variations in how the CWDs are using the available space. Northwest Lantau and West Lantau remain the major habitats for CWDs in Hong Kong waters where individuals are consistently sighted. An increase of CWDs sighted in coastal water between Fan Lau and Kau Ling Chung in Southwest Lantau was noted in 2013. The Pearl River Estuary Chinese White Dolphin National Nature Reserve (PRECWDNNR) adjoins the HKSAR boundary.

B1.3.2 Intertidal & Subtidal Assemblages

Data from literature review and field surveys were obtained to evaluate the ecological value for the intertidal, subtidal and marine water habitats within the proposed land formation footprint and in the vicinity area. Along the surveyed artificial seawall of the existing airport island, species diversity and evenness were found to be moderate-low, and no intertidal species of conservation importance were recorded. Polychaetes represented the highest species richness and abundance recorded at subtidal soft bottom habitats within the land formation footprint. For subtidal hard bottom habitats, isolated colonies of Gorgonian *Guaiagorgia* sp., which is common in western Hong Kong waters, were recorded with a low coverage along the existing artificial seawall at the north of Chek Lap Kok within the proposed land formation footprint. A cup coral species of conservation importance, *Balanophyllia* sp., was recorded with low coverage at the northeast seawall along the existing airport island outside the land formation footprint. Within the open waters of the land formation footprint, six marine fish species of conservation importance were recorded, all of which were also found outside the footprint, except for the longheaded eagle ray (recorded within the footprint only by trawl survey at a relatively low density). The ecological value of the artificial seawalls along the existing airport island, the subtidal soft bottom and hard bottom habitats, as well as marine waters within the land formation footprint were thus considered in a range from low to moderate-high.





Mangrove and intertidal mudflat habitats along the North Lantau coast at Tai Ho Wan, Tung Chung Bay, San Tau and Sham Wat Wan were identified as important intertidal habitats. The presence of seagrass beds at San Tau and Tai Ho Wan was verified with three seagrass species recorded, and a new locality of *Halophila beccarii* was identified at Sham Wat Wan. A significant number of horseshoe crab juveniles and sub-adults were recorded at Sham Wat Wan, San Tau, Tung Chung Bay and Tai Ho Wan, suggesting that these areas may be part of the nursery grounds of horseshoe crabs in Hong Kong. Eight fish species and one crab species of conservation importance were recorded from intertidal streams along the North Lantau coast, including the spotted seahorse *Hippocampus kuda* and the pipefishes *Syngnathoides biaculeatus* and *Syngnathus schlegeli*.

For the sub-tidal soft bottom habitat, one individual of amphioxus, *Branchiostoma belcheri*, was found at North Lantau outside the land formation footprint, and low coverage of cup coral *Balanophyllia* sp. and ahermatypic coral *Paracyathus rotundatus* were observed within SCLKCMP. For the sub-tidal hard bottom habitat, a low abundance of benthic fauna and low coverage of cup coral *Balanophyllia* sp. were commonly recorded throughout the study area outside of the land formation footprint.

For the open marine water habitats, a moderate abundance of marine fauna was recorded at North of airport island outside the land formation footprint, SCLKCMP and The Brothers, and a total of 20 species of conservation importance (including 17 fish species, one sea snail and two horseshoe crabs) were reported.

B1.3.3 Recognised Sites of Conservation Importance

Four recognised sites of marine conservation importance are found in western Hong Kong waters. These sites included the San Tau Beach SSSI, SCLKCMP, the planned BMP and potential Southwest Lantau Marine Park (SWLMP), which are all outside the land formation footprint of the 3RS Project. The San Tau Beach SSSI is recognised as ecologically importance for the presence of seagrass bed, mangroves and mudflat in the site, whereas the SCLKCMP, BMP and SWLMP are important habitats for the CWDs. These sites of marine conservation importance were considered overall to be of high ecological value.

B1.4 3RS DEVELOPMENT

The 3RS Project will be located on a new land formation immediately north of HKIA in North Lantau. The key project components include:

- Land formation comprising ground improvement, seawall construction and modification (including sea rescue boat points), filling and surcharge activities;
- Construction of new airfield facilities including the third runway, taxiways, aprons, aviation fuel supply network and other airfield infrastructure, aircraft navigational aids, approach lighting system and new HKIAAA marker beacons;





- Modification of existing airfield facilities, including the existing North Runway, taxiways and aprons in the Midfield area;
- Construction of new passenger facilities including the Third Runway Concourse (TRC) and expansion of T2, the automated people mover system and associated depot and maintenance / stabling areas, and the baggage handling system;
- Construction of new ancillary facilities to support the operational needs of the expanded airport, including utility buildings, airport support developments, air cargo staging, catering, aircraft maintenance, aircraft engine run-up (engine testing) facilities, ground service equipment area, early bag storage facility, fire station, fire training facility, petrol fuelling station, new air traffic control towers, Hong Kong Observatory facility, mobile phone system antenna towers, stores, security gate houses, etc.;
- Construction of new and expanded infrastructure and utilities, including road networks, seawater cooling and flushing system, stormwater drainage system, greywater system, sewerage network and potable water supply, Towngas supply, 132 kV / 11 kV and other power supply networks, communication networks, etc.; and
- Diversion of existing submarine infrastructure, including the submarine aviation fuel pipelines and submarine 11 kV cables.

Land formation work is planned to commence in 2016. The tentative programme for the Project is for the 3RS to be operational in 2023. Given the scale and complexity of the project, the construction and concurrent runway operational configuration will be implemented in phases. Some components, such as the TRC, may be constructed in phases based on the level of demand. Due to such phasing arrangements, the three-runway airfield system will be in operation before the full completion of all infrastructure associated with the project.

