

## Contents

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	Page
<b>9 Ecology</b>	<b>1</b>
9.1 Introduction	1
9.2 Legislation, Standards and Guidelines	2
9.3 Methodology for Baseline Establishment	5
9.4 Ecological Baseline Condition	10
9.5 Evaluation of Habitats and Species of Conservation Importance	32
9.6 Impact Identification and Prediction	44
9.7 Impact Evaluation for Terrestrial Ecology	45
9.8 Impact Evaluation for Marine Ecology	52
9.9 Mitigation Measures	63
9.10 Cumulative Impacts	65
9.11 Residual Impacts	73
9.12 Conclusions	73
9.13 References	75

### Appendices

<b><u>Appendix 9.1</u></b>	Plant Species Recorded within the Subject Site and Assessment Area
<b><u>Appendix 9.2</u></b>	Bird Recorded within the Subject Site and Assessment Area
<b><u>Appendix 9.3</u></b>	Amphibian Recorded within the Subject Site and Assessment Area
<b><u>Appendix 9.4</u></b>	Butterfly Recorded within the Subject Site and Assessment Area
<b><u>Appendix 9.5</u></b>	Dragonfly Recorded within the Subject Site and Assessment Area
<b><u>Appendix 9.6a</u></b>	Freshwater Fauna Recorded within the Assessment Area during Dry Season
<b><u>Appendix 9.6b</u></b>	Freshwater Fauna Recorded within the Assessment Area during Wet Season

### Figures

<b><u>Figure 9.1</u></b>	Ecological Survey Transects and Aquatic Sampling Points
<b><u>Figure 9.2</u></b>	Recognised Sites of Conservation Importance within or in the Vicinity of the Assessment Area
<b><u>Figure 9.3</u></b>	Terrestrial Species of Conservation Importance Recorded in the Reviewed Literature
<b><u>Figure 9.4a</u></b>	Marine/ Estuarine Species (Except CWD) of Conservation Importance Recorded within the Assessment Area and in the Vicinity in the Reviewed Literature

- Figure 9.4b** Sighting Density and Density of Chinese White Dolphins (CWD) with Corrected Survey Effort per km<sup>2</sup> in Waters around Lantau Island in 2015 (Hung 2016)
- Figure 9.4c** Comparison of Dolphin Densities with Corrected Survey Effort per km<sup>2</sup> in North Lantau Waters in 2011-2015 (Hung 2016)
- Figure 9.5** Habitat Map and Locations of Species of Conservation Importance Identified in Field Surveys
- Figure 9.6** Photos of Habitats and Plant Species of Conservation Importance

## 9 Ecology

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### 9.1 Introduction

#### 9.1.1 Requirements of EIA Study Brief

**9.1.1.1** The EIA Study Brief (EIA Study Brief No.: ESB-294/216) was formally issued by EPD in September 2016, and technical requirements for ecological impact assessment (EcoIA) are stipulated in the EIA Study Brief, including Section 3.4.11 and Appendix I. The aim of the EcoIA shall be to protect, maintain or rehabilitate the natural environment, in particular, to avoid or minimize impacts on recognized sites of conservation importance.

**9.1.1.1** In Section 1.2 of the EIA Study Brief No.: ESB-294/2016, the major elements covered by the EIA SB are stipulated, which include both the SHD Topside Development atop the SHD (i.e. SHD Topside Development) as well as the works related to the SHO and SHD Replanning Works (i.e. Railway Development).

**9.1.1.2** The SHD Topside Development will include the following elements of works:

- podium deck, residential towers, schools, transport, utility and other supporting facilities atop the future upgraded depot;
- a new sewage pumping station serving the SHD Topside Development and sewerage connection to SHWSTW;
- Eastern connection access on Sham Shui Kok Drive during interim period; and
- Western Access connection access via Tai Ho Interchange.

**9.1.1.3** The Railway Development will include the following elements of works:

- SHD Replanning Works within the existing SHD boundary;
- Construction of concrete slab which would also provide support for construction of SHD Topside Development podium decking, as well as property enabling works for SHD Topside Development;
- New SHO station and associated trackworks at existing AEL/TCL, as well as western access and local accesses; and
- Sewerage network provision outside of the existing SHD boundary to cater for sewage generated by the Project for treatment at the Siu Ho Wan Sewage Treatment Works.

## 9.1.2 Subject Site and Assessment Area

9.1.2.1 The location of the Project is shown in **Figure 1.1**.

9.1.2.2 The Assessment Area for terrestrial ecology covers all the project elements stated in **Section 9.1** and all terrestrial habitats within 500m distance from the boundary of these project elements.

9.1.2.3 For marine ecological impact assessment, as required in the EIA SB the assessment area shall be the same as the assessment area for water quality assessment. As in this Project, there will be neither dredging nor reclamation works, and all the works will be land-based, a 500m Assessment Area is considered adequate for water quality assessment (see **Section 5**), and the same assessment area is adopted for marine ecological impact assessment for this Project. Even though, the important habitats or recognised sites of conservation importance beyond this 500m distance but mentioned in the EIA Study Brief are also assessed as required.

## 9.2 Legislation, Standards and Guidelines

### 9.2.1 General

9.2.1.1 Ordinances and regulations that are relevant to this Ecological Impact Assessment (EcoIA) include the followings:

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations (Cap. 96A);
- Wild Animals Protection Ordinance (Cap. 170);
- Country Parks Ordinance (Cap. 208) and its subsidiary legislation;
- Marine Parks Ordinance (Cap. 476);
- Environmental Impact Assessment Ordinance (Cap. 499) and the associated TM; and
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation.

9.2.1.2 This EcoIA also makes reference to the following guidelines and standards:

- Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10, "Conservation";
- PELB Technical Circular 1/97 / Works Branch Technical Circular 4/97, "Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures";
- EIAO Guidance Note No. 3/2010 – Flexibility and Enforceability of Mitigation Measures Proposed in an EIA Report;

- EIAO Guidance Note No. 6/2010 - Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective;
- EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment;
- EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys; and
- EIAO Guidance Note No. 11/2010 – Methodologies for Marine Ecological Baseline Surveys.

**9.2.1.3** This EcoIA also makes reference to the following Mainland legislation:

- List of State Protected Wild Animals, promulgated by the State Council 國家重點保護野生動物名錄; and
- List of Wild Plants under State Protection 國家重點保護野生植物名錄.

**9.2.1.4** Other international conventions and guidelines that are relevant to this EcoIA include the following:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES"). This Convention regulates international trade in animal and plant species considered to be at risk from such trade. Depending on the degree of threat posed by international trade, CITES classifies endangered species of animals and plants into three Appendices. Appendix I includes highly endangered species threatened with extinction. Commercial trade in specimens of these species is prohibited. Appendix II includes species which are not presently threatened with extinction but may become so unless trade is controlled. Their trade is allowed but subject to licensing controls. Appendix III species are species identified by any Party to CITES as requiring cooperation in controlling their trade. Their trade is subject to permits or certificates of origin. Hong Kong's obligations under this Convention are enforced via the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).
- IUCN. The World Conservation Union maintains, through its Species Survival Commission, a "Red List" of globally threatened species of wild plants and animals (see <http://www.iucnredlist.org>). The Red List is considered the authoritative publication to classify species into nine groups as Extinct (EX) - No individuals remaining; Extinct in the Wild (EW) - Known only to survive in captivity, or as a naturalized population outside its historic range; Critically Endangered (CR) - Extremely high risk of extinction in the wild; Endangered (EN) - Very high risk of extinction in the wild; Vulnerable (VU) - High risk of extinction in the wild; Near Threatened (NT) - Likely to become endangered in the near future; Least Concern (LC) -

Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category; Data Deficient (DD) - Not enough data to make an assessment of its risk of extinction; Not Evaluated (NE) - Has not yet been evaluated against the criteria.

- United Nations Convention on Biological Diversity. This convention requires parties to regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use. It also requires parties to promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings. The People's Republic of China (PRC) ratified the Convention on Biological Diversity on 5th January 1993. The HKSAR Government has stated that it is "committed to meeting the environmental objectives" of the Convention (PELB 1996).
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the "Ramsar Convention"), which requires parties to conserve and make wise use of wetlands, particularly those supporting waterfowl populations. The PRC ratified the Ramsar Convention on 31st July 1992, and various wetlands have since been listed as wetlands of international importance (i.e. Ramsar sites). One of these, Mai Po Marshes and Inner Deep Bay Ramsar site in Hong Kong SAR, was listed on 4 September 1995.
- Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention), which requires parties to protect listed threatened or endangered migratory species occurring within their boundaries.

## 9.2.2 Criteria of Evaluating Species of Conservation Importance

9.2.2.1 Species listed under local legislation and international conventions for conservation of flora and fauna were given special attention. In accordance with Table 3, Annex 8 of the TM-EIAO, the ecological value of species should be assessed in terms of protection status, species distribution, and rarity. For fauna species, criteria relating to these three aspects were considerations, such as being protected under Cap. 170 (except birds), Cap. 586, and/or regional/global legislations/conventions (i.e. the protection status), whether or not they are an endemic species (i.e. species distribution and being considered rare or restricted, and highlighted in publications such as Fellowes *et al.* (2002) (i.e. rarity). References were also made to those protected by law in China. Flora species are considered of conservation importance when it is protected/listed under the regional/global legislations/conventions (e.g. listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586); Forestry Regulations; Category I or II protected species in mainland China; listed by IUCN (2016) or CITES),

and concerned due to species distribution and rarity (e.g. considered rare by Agriculture, Fisheries and Conservation Department (AFCD) (2003, 2007); Xing *et al.* (2000); Wu and Lee (2000); or Siu (2000). Specifically speaking, flora or fauna species protected by the following laws/regulations or listed under the following conventions were considered to be species of conservation importance. However this excludes exotic weeds, escaped cultivars or captive species, vagrants and introduced species which have lower ecological value. Species which are classified by IUCN as Least Concern (LC), Data Deficient (DD), or Not Evaluated (NE), and not covered by any other laws/regulations/conventions are not considered of conservation importance in the present EcoIA.

- Forestry Regulations (Cap. 96A) which are subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96);
- Considered 'Rare' or 'Very Rare' plant species listed in AFCD (2003, 2007), Xing *et al.* (2000), Wu and Lee (2000), or Siu (2000);
- Category I or II protected species in mainland China;
- Wild Animals Protection Ordinance (Cap. 170);
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
- PRC Wild Animal Protection Law;
- China Red Data Book of Endangered Animals;
- China Plant Red Data Book;
- China Species Red List;
- The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species;
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and
- Fauna species considered of concern in Fellowes *et al.* (2002).

**9.2.2.2** The species identified as having conservation importance are further categorised in accordance with their relevancy with the identified impacts, and the potential impacts on them were assessed in accordance with the TM-EIAO criteria.

## **9.3 Methodology for Baseline Establishment**

### **9.3.1 Literature Review Methodology**

**9.3.1.1** A baseline review for ecology was conducted. Relevant literature was reviewed and information was extracted to establish a preliminary ecological baseline of the Assessment Area.

- 9.3.1.2** Ecological conditions of different parts of the Assessment Area were variously covered by previous EIA studies. The latest approved EIA reports in the area are Tung Chung New Town Extension (AEIAR-196/2016) and the Expansion of Hong Kong International Airport into a Three-Runway System (3RS, AEIAR-185/2014), which covered most of the North Lantau waters and a considerable portion of the coastal area of North Lantau Island.
- 9.3.1.3** A government study commissioned by Civil Engineering and Development Department (CEDD) investigated the cumulative impacts from three potential nearshore reclamations in the Western Hong Kong waters recommended by the Land Supply Study (Agreement No. CE 14/2013 (CE)). This study reviewed all available information, performed site surveys, and also incorporated the results from site specific Chinese White Dolphin (CWD) surveys for the shallow waters of the three potential reclamation sites (*ibid*).
- 9.3.1.4** EIAs related to Hong Kong-Zhuhai-Macao Bridge (HZMB), including Hong Kong Boundary Crossing Facilities (HKBCF, AEIAR-145-2009), Hong Kong Link Road (HKLRL, AEIAR-144-2009) and Tuen Mun-Chek Lap Kok Link (TM-CLK Link, AEIAR-146/2009), covered the terrestrial and marine habitats of North Lantau. The ecological surveys for HKLRL, which covered a vast area from Tai Ho to Sham Wat as well as the Airport Island, were firstly conducted between 2003 and 2004 (EBS), with verification survey and supplementary survey between 2008 and 2009 (EVS and ESS). The EIA study of HKBCF also had its own ecological surveys conducted in 2008 to 2009. The southern portion of the Assessment Area for the EIA study of TM-CLK Link (AEIAR-146/2009) covered the north Lantau coastline and was conducted in 2008.
- 9.3.1.5** The Project also made reference to the Ecological Monitoring and Audit of HKBCF, HKLRL and TM-CLK Link conducted from 2012 to 2016. Other relevant publications of government departments and non-government organisation were also reviewed.
- 9.3.1.6** A list of the EIAs, investigation studies and surveys considered during establishing the ecological baseline condition is given below:
- Tung Chung New Town Extension (AEIAR-196/2016);
  - Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014);
  - 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;
  - Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement – Feasibility Study;
  - Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road EM&A (2012 – 2016);



- Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities EM&A (2012 – 2016);
- Tuen Mun – Chek Lap Kok Link EM&A (2013 – 2016);
- Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities (AEIAR-145/2009);
- Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road (AEIAR-144/2009);
- Tuen Mun - Chek Lap Kok Link (AEIAR-174//2009);
- Lantau – Hong Kong’s Jewel: A Biodiversity Study of Lantau
- Monitoring of Marine Mammals in Hong Kong (annual reports from 2009 to 2016);
- The Biology and Ecology of Juvenile Horseshoe Crabs along the Northwestern Coastline of the New Territories, Hong Kong: Prospects and Recommendations for Conservation (2003); and
- The Detailed Study of the Marine Park in the Brothers Islands – Design and Construction; and
- The Fish Resources Study for the Proposed Marine Park in the Brothers Islands.

**9.3.1.7** Species of conservation importance/interest/concerns recorded in these previous studies were screened under the criteria mentioned in the previous sections, e.g. excluding non-native or cultivated plant species.

## **9.3.2 Ecological Field Survey Methodology**

**9.3.2.1** The methodology of the ecological surveys made reference to the technical guidelines of ecological assessment in Annex 16 of TM-EIAO and the relevant EIAO Guidance Notes (GN 7/2010 and GN 10/2010).

**9.3.2.2** Terrestrial ecological surveys were carried out to verify the preliminary ecological baseline established from reviewed literature, update the baseline information, and fill the identified information gaps to facilitate the establishment of a complete ecological baseline of the Assessment Area and to facilitate the ecological assessment.

**9.3.2.3** The ecological survey programme covered terrestrial habitats within the Assessment Area during wet and dry seasons. The ecological surveys covered habitats and vegetation, terrestrial mammals, birds, herpetofauna, dragonflies and butterflies and freshwater fauna. Details of the survey methodology are discussed in the following sections.

**9.3.2.4** Baseline of marine ecology is based on information from literature review. There has been sufficient information from recent marine ecological surveys and studies in North Lantau area, including the waters near Tai Ho Wan and Siu Ho Wan, and therefore no information gap is identified. Although the site is adjacent to marine environment,

the proposed development is completely land-based, it is considered that additional marine ecological surveys are not necessary.

**9.3.2.5** The objectives of the terrestrial ecological surveys are as follows:

- to update the distribution of flora/fauna of conservation importance identified from reviewed literature;
- to establish an update ecological baseline of the Assessment Area in particular areas likely to be affected by the Project and describe the characteristics of each habitat and assemblage found;
- to identify sensitive receivers (i.e. important ecological resources) present within the Assessment Area; and
- to provide baseline ecological conditions for assessment of potential environmental impacts caused by the proposed Project activities and recommendation of mitigation measures to mitigate such impacts.

### **9.3.3 Survey Period**

**9.3.3.1** According to the Clause 2(iii) in Appendix I of the EIA Study Brief, ecological field surveys should be carried out for a duration of at least 4 months covering the wet season. In the present study, a nine -month ecological field surveys programme was conducted from February to October 2016, covering both wet and dry seasons. Verification surveys were also conducted in February 2017.

**9.3.3.2** The surveys appropriately covered wet and dry seasons to ensure that the field data obtained are representative, and the survey frequency was also properly planned, and therefore the requirements set out in the EIA Study Brief are fulfilled.

### **9.3.4 Terrestrial Surveys**

#### **Habitat and Vegetation Survey**

**9.3.4.1** Habitat mapping was based on basemap and latest aerial photos, and verified by field ground-truthing. For minor watercourses on basemap, if found during ground-truthing that they were shallow and small in size, and only had at most transient flow, or were concrete urban drains or u-channels, their ecological function as watercourse habitat would be limited and thus might be incorporated into the surrounding habitats during mapping. Plant species within each habitat type were identified and their relative abundances were recorded with special attention to rare or protected species. Nomenclature and protection of the plant species followed those documented in the AFCD's biodiversity database. Similar to the criteria used in literature review, plant species recorded during the survey are considered of conservation importance when it is 1) listed under Forestry Regulations (Cap. 96A) in Hong Kong, 2) listed under Protection of Endangered Species of Animals and Plants Ordinance (Cap.586) in Hong Kong or CITES, 3) considered rare

by AFCD (2003, 2007), Xing *et al.* (2000), Wu and Lee (2000), or Siu (2000), 4) Category I or II protected species in mainland China, or 5) listed as “vulnerable, threatened, endangered, or critically endangered” by IUCN (2016), excluding non-native species or cultivated species.

**9.3.4.2** Habitat maps of the Assessment Area were produced at the suitable scale using Geographic Information Software (GIS) software. Colour photographs were taken of all habitat types encountered on site and of ecological features of special importance.

#### **Terrestrial Mammal**

**9.3.4.3** Mammals within the Assessment Area were surveyed qualitatively. All sightings, tracks, and signs of mammals found were recorded. Nomenclature of mammal follows Shek (2006). As some mammal species (e.g. bats) are nocturnal, night surveys during wet and dry seasons were also conducted.

**9.3.4.4** A survey was conducted to update the status of the bat cave on the eastern coastline of Tai Ho Wan reported by previous studies. The bat survey was conducted by direct counting in the cave during daytime.

#### **Avifauna**

**9.3.4.5** Bird surveys were conducted monthly between February and July 2016. Birds within the Assessment Area were surveyed quantitatively using transect count method. Survey transects are shown in **Figure 9.1**. All birds seen or heard were identified and their abundance recorded. Signs of breeding (e.g. nests, recently fledged juveniles) were also recorded. As some birds (e.g., owls, nightjars) are nocturnal, night surveys were conducted during wet and dry seasons. Nocturnal birds were identified by active searching using spot-light and by their calls. Nomenclature of the bird species followed the latest version of List of Hong Kong Birds by Hong Kong Bird Watching Society (HKBWS).

#### **Herpetofauna**

**9.3.4.6** Herpetofauna within the Assessment Area were surveyed qualitatively. All reptiles and amphibians sighted were recorded. Nomenclature of amphibian follows Chan *et al.* (2005) and reptile follows Karsen *et al.* (1998). As herpetofauna are mostly nocturnal and more active during wet season, night surveys were carried out in wet seasons. Potential microhabitats of herpetofauna such as wall, fallen logs, litter, channel/nullah, underneath of stones or other materials, artificial container (e.g. pots) were searched during surveys to locate cryptic or secretive herpetofauna species. Amphibians were also identified by their calls during night surveys. Special attention was paid on Romer’s Tree Frog, a species of conservation importance stated in the EIA Study Brief, during the survey.

### **Dragonflies and Butterflies**

**9.3.4.7** Dragonflies and butterflies within the Assessment Area were surveyed quantitatively using the transect count method. Survey transects are shown in **Figure 9.1**. Dragonflies and butterflies observed were identified and recorded. Nomenclature of dragonfly follows Tam *et al.* (2011) and nomenclature of butterfly follows Chan *et al.* (2011).

### **Freshwater Community Survey**

**9.3.4.8** Aquatic fauna, including freshwater macro-invertebrates (e.g. freshwater crabs, shrimps, molluscs and aquatic insect larvae) and fishes in the sampling points (**Figure 9.1**) of the watercourses identified within the Assessment Area were studied by direct observation and active searching, in wet and dry seasons. Organisms were recorded and identified to the lowest possible taxon, and their relative abundances were reported. Nomenclature for fish followed Lee *et al.* (2004), while those for the macro-invertebrates followed Dudgeon and Corlett (1994).

## **9.4 Ecological Baseline Condition**

### **9.4.1 General Descriptions of the Subject Site**

**9.4.1.1** The proposed SHD Topside Development and Railway Development are mostly within the Subject Site. The Subject Site consists of the existing Siu Ho Wan Depot (SHD), which is mainly urbanized/disturbed. Other works outside the site boundary include utilities alignment connecting the topside development via North Lantau Highway to Siu Ho Wan Sewage Treatment Works, eastern connection access on Sham Shui Kok Drive and western access via Tai Ho Interchange, which are also mainly urbanized/disturbed.

### **9.4.2 Recognised Sites of Conservation Importance**

**9.4.2.1** Recognised sites of conservation importance within the 500m Assessment Area included Lantau North (Extension) Country Park, Tai Ho Priority Site for Enhanced Conservation, Coastal Protection Area within Tai Ho Wan, and The Brothers Marine Park. Besides, Tai Ho Stream Site of Special Scientific Interest (SSSI) and Tai Ho Ecologically Important Stream (EIS) and its estuary are located in the vicinity of the 500m Assessment Area, while, the proposed marine park under the Expansion of HKIA into 3RS project is located in the northwest part of North Lantau waters and far away from the Subject Site (**Figure 9.2**). They are all located outside the Subject Site boundary.

**9.4.2.2** **Lantau North (Extension) Country Park** covers the hill slopes to the south of North Lantau Highway between Sunny Bay and Sham Wat, and partially falls within the Assessment Area of the present study. In addition to the existing 7,800ha of designated Lantau North and South Country Parks, the Lantau North (Extension) Country Park was

proposed in the 1999 Policy Address as a positive means to conserve the natural environment of Lantau, and was designated in 2008.

**9.4.2.3 Tai Ho Priority Site** is one of 12 sites for enhanced conservation under New Nature Conservation Policy. It consists of a natural stream with several tributaries running from upland to lowland estuary. The site comprises four major habitat types, namely natural stream, mangrove stand / mudflat, agricultural land and woodland. The part of natural stream is a medium-sized natural stream running from upland to estuary without any fragmentation. The stream is impossible to be recreated. Moderate diversity of freshwater fish (53 species as of 2004) and amphibians (10 species as of 2004) including the endemic Romer's Tree Frog were recorded.

**9.4.2.4 Tai Ho Stream SSSI and Tai Ho EIS** is located to the south of the Assessment Area is Tai Ho Stream, which is hydrologically linked with Tai Ho Wan, part of which is within the Assessment Area. Tai Ho Stream is an Ecologically Important Stream (EIS). Tai Ho Stream is one of the most ecologically valuable fresh water streams in Hong Kong. The stream and riparian habitat is excellent, and the stream and its extensive tributaries run from upland to the lowland estuary without fragmentation. In extensive surveys from 1980-1991, this stream was the richest in freshwater fish species of the 31 field sites studied (Chong and Dudgeon 1992). A total of 46 fish species were recorded in Tai Ho Stream in that study (at least 53 fish species have been recorded so far). Based on this published study of stream fish fauna in the HKSAR, the Tai Ho Stream is ranked as the richest in freshwater fish species in the HKSAR. Chong and Dudgeon (1992) also recorded the salmonid fish Ayu ("sweetfish") *Plecoglossus altivelis* at Tai Ho Stream, the first record of this species for Hong Kong or Guangdong (Dudgeon 1993). It is the only known breeding site for the globally threatened Ayu in Hong Kong. This species requires unobstructed passage between salt and fresh water to breed. The high water quality and natural state of Tai Ho Stream are likely very important to this species. Other freshwater fish species recorded include Giant Mottled Eel *Anguilla marmorata* (a Class II protected species in China), Japanese Eel *A. japonica*, Largesnout Goby *Awaous melanocephalus* and Rice-paddy Eel *Pisodonophis boro*. Owing to its great diversity of freshwater and brackish water fish, Tai Ho Stream was designated as an SSSI in 1999 and identified by the government as Ecologically Important Streams (EIS) in 2005. The findings for estuarine macroinvertebrates from the approved EIA report for 3RS (AEIAR-185/2014) indicated that estuarine fish of conservation importance included Red Stingray *Dasyatis akajei*, Banded mulletgoby *Hemigobius hoevenii*, Spotted Seahorse *Hippocampus kuda* and Seaweed pipefish *Syngnathus schlegeli* recorded in Tai Ho.

**9.4.2.5** According to the approved EIA for Tung Chung New Town Extension (AEIAR-196/2016), a total of 53 species of fish and 3 species of crustacean were recorded from both the stream courses and the estuarine area of Tai Ho. Eight species of fish were considered of

conservation importance. They are Japanese Eel *Anguilla japonica*, Giant Marbled Eel *Anguilla marmorata*, Predaceous Chub *Parazacco spilurus*, Crimson-tipped Flathead Gudgeon *Butis melanostigmas*, Mangrove Goby *Hemigobius hoevenii*, Spotty Band Goby *Glossogobius olivaceus*, and Archpatch Puffer *Takifugu ocellatus*, Ayu *Plecoglossus altivelis* was also recorded. Among the crustaceans, a Freshwater Crab *Cryptopotamon anacoluthon* was the species of conservation importance.

**9.4.2.6 Coastal Protection Area and Conservation Area** - Draft Tai Ho Outline Zoning Plan No. S/I-TH/1 was gazetted on 24 March 2017. Besides a SSSI covering Tai Ho Stream, the plan also includes Coastal Protection Area (CPA) along the coastline of Tai Ho Wan and Conservation Area (CA) covering the riparian zone of Tai Ho Stream as well as woodland area. While both the SSSI (for conserving and protecting the features of special scientific interest such as rare or particular species of fauna and flora and their habitats) and CA (for protecting and retaining the existing natural landscape, ecological or topographical features of the area for conservation, educational and research purposes and separating sensitive natural environment such as SSSI or Country Park from the adverse effects of development) zones are located outside the Assessment Area, a portion of Coastal Protection Area falls within the Assessment Area. The CPA zone is intended to conserve, protect and retain the natural coastlines and the sensitive coastal natural environment.

**9.4.2.7 The Brothers Marine Park** is a mitigation measure for the HKBCF reclamation. The authority made a firm commitment to seek the designation of a Marine Park in the waters around the Brothers Islands, as the mitigation measure to mitigate the habitat loss of Chinese White Dolphin caused by HKBCF under HZMB. The draft map of the boundary has been gazetted in early 2016 and the marine park has been designated in December 2016. The southern end of the marine park falls within the present Assessment Area.

**9.4.2.8** “Detailed Study of the Marine Park in the Brothers – Design and Construction” was conducted during the proposal stage of the Brothers Marine Park. The three key elements, including the extent and boundary of Marine Park, the ecological and fisheries enhancement measures, and the management plan of the marine park were considered in the design stage of The Brothers Marine Park.

**9.4.2.9** Furthermore, “Fish Resources Study for the Proposed Marine Parks in the Brothers Islands” was conducted to obtain the baseline fish resources information in the preliminary areas of The Brothers Marine Park before it was designated. Five fishing methods (i.e. gill-netting, hand-lining, long-lining, shrimp trawling and hang trawling) were used to sample pelagic and benthic fish resources within and in the vicinity of The Brothers Marine Park. Juvenile fish survey was also conducted to investigate spatial and seasonal variation of juvenile fish populations. The study concluded that the areas near Sham Shui Kok and Siu Mo To are sites of fisheries importance.

**9.4.2.10** **The proposed marine park under the Expansion of HKIA into 3RS project** was recommended in the approved EIA report for 3RS (AEIAR-185/2014), the Airport Authority Hong Kong (AAHK) proposed to establish a new marine park which would comprise an area of approximately 2,400 ha as compensation for the seabed habitat and open waters habitat loss associated with the land formation for the 3RS Project. The new marine park is proposed to provide critical linkages between the current Sha Chau and Lung Kwu Chau Marine Park (SCLKCMP) and The Brothers Marine Park (BMP). It is anticipated that the establishment of the new marine park would protect and conserve the marine environment around the HKIA from various anthropogenic threats such as seabed dredging, dumping, coastal reclamation and destructive fishing. In addition, it is expected to improve the conservation of CWDs by mitigating the impacts of habitat loss, habitat fragmentation, changes in patterns of habitat use, as well as minimising the noise and disturbance from marine traffic, specifically high speed vessels traffic. The proposed marine park will be located at the northern and western part of the airport.

### 9.4.3 Important Habitats

**9.4.3.1** The EIA Study Brief has identified some habitats in consideration of ecological importance including wetland (i.e. mudflats and mangroves at Tai Ho Wan), estuary of Tai Ho Stream, bat roost in Tai Ho Wan, and breeding and nursery grounds for horseshoe crabs. Some further habitats considered of conservation importance were identified during the course of literature review.

**9.4.3.2** **Bat roost** was a bat roost in Tai Ho Wan in a cave just above the intertidal zone along the east shore of Tai Ho Wan. This cave which was probably excavated for mineral exploration and subsequently abandoned, has been colonised by bats (Mott Connell 1999). The cave was used as a day-time roost by at least three species of insectivorous bats.

**9.4.3.3** **Coastal/Marine waters** are the marine waters of North Lantau provide habitats for a number of marine organisms, including some species of conservation importance such as subtidal hard and soft bottom assemblages, marine fishes and CWD, though the coastal waters near Siu Ho Wan are rarely used by CWD in recently years. The western Hong Kong waters including North Lantau waters are characterized by the influences from Pearl River discharge, and are of estuarine environment. The estuarine environment do not favour some oceanic fauna groups such as the hard coral communities, but low coral coverage was occasionally found.

**9.4.3.4** According to the benthic survey from the approved EIA report for Tung Chung New Town Extension (AEIAR-196/2016), sampling locations AB-4, AB5 and AB-6 were just at the offshore just outside the SHD, within the 500m Assessment Area. Shannon diversity at those sampling

locations was regarded as moderate. Species of conservation importance found in those sampling locations at the offshore just outside the SHD included *Metapenaeus ensis*. Shrimps belong to the genus *Metapenaeus* are commercially important and were extensively cultured in the Gei Wai of Mai Po. They are common in mangrove and estuarine areas in Hong Kong (Leung 1999, Vance 1999). Due to over-exploitation, all four *Metapenaeus* species found in Hong Kong are considered to be Vulnerable in China (CSIS 2008). However, shallow estuarine areas in Hong Kong have the potential to provide nursery habitats for these species. Therefore, *Metapenaeus* spp. are not regarded as a relevant species of conservation importance in this study.

**9.4.3.5 Intertidal shores / subtidal shores** – The intertidal and subtidal zones along coastlines, with the suitable substrates, facilitated the formation of intertidal habitats such as mangroves and mudflats and/or colonization of faunal communities such as coral communities. Descriptions of these habitats and fauna communities are provided in below sections.

**9.4.3.6** There were intertidal surveys conducted in Tai Ho Wan within the current Assessment Area, according to the approved EIA report for Tung Chung New Town Extension (AEIAR-196/2016). Shannon diversity of the quantitative survey on the natural rocky shore was regarded as moderate. However, no species of conservation importance was recorded. Intertidal surveys were also conducted on the artificial seawall outside SHD within the current Assessment Area, species diversity was regarded as low and no species of conservation importance was recorded.

**9.4.3.7 Mangroves** are found in Tai Ho Wan with a size of 1.86ha and are the third largest mangrove on Lantau. The Tai Ho Wan mangroves harboured all of Hong Kong's native mangrove species except *Excoecaria agallocha* and the extremely restricted *Heritiera littoralis* (From the approved EIA report for TM-CLK Link, AEIAR-146/2009).

**9.4.3.8 Mudflats** are found in the inner embayment of Tai Ho Wan. Mudflats are important not only because they provide habitats to infauna which are in turn the prey items of many waterfowl, but also it is a suitable substrate for the colonization of mangroves and seagrasses, both are important habitat types in Hong Kong. The structures of the mudflat habitat would be diversified by the colonizing vegetation. Ecological functions provided by these communities include energy cycling, coastal stabilization, and habitat for wildlife such as coastal birds and horseshoe crabs.

**9.4.3.9 Seagrass** were reported in Tai Ho Wan. Patches of the seagrass *Halophila beccarii* were recorded in Tai Ho Wan at the stream mouth within Tai Ho Stream SSSI, which are outside the 500m Assessment Area. During the April 2004 survey of EBS (Ecological Baseline Survey) of HZMB EIA, the seagrass *Halophila beccarii* habitat was found during low tide at Tai Ho Wan and supported more than 20



colonies each approximately 30cm x 30cm in area (From the approved EIA for HZMB-HKBCF, AEIAR-145/2009). The Tai Ho seagrass beds are of importance due to the presence of a locally restricted seagrass species and that it is a nursery site for horseshoe crabs which are threatened by habitat loss in Hong Kong. However, during the field survey for TM-CLK Link EIA (AEIAR-146/2009), no seagrass beds were found on the mudflat in Tai Ho Wan. Later on, during the survey for the 3RS EIA (AEIAR-185/2014), *Halophila beccarii* was recorded in Tai Ho Wan.

**9.4.3.10 Breeding and nursery grounds for horseshoe crabs** – Juvenile horseshoe crabs were previously in Tai Ho Wan. It was mainly recorded in the mudflat according to the approved EIA report for Tung Chung New Town Extension (AEIAR-196/2016).

**9.4.3.11 Woodland** – according to the approved EIA report for Tung Chung New Town Extension (AEIAR-196/2016), in the southern part of the 500m Assessment Area, some areas of young secondary woodlands were reported on the hillslopes within the Lantau North (Extension) Country Park.

## 9.4.4 Species of Conservation Importance from Reviewed Literature

**9.4.4.1 Plants** – Two plant species of conservation importance were recorded previously from the approved EIA for 3RS (AEIAR-185/2014) within the Assessment Area of the present EcoIA. They are *Nepenthes mirabilis* and *Arundina graminifolia*, both at ravines in Shrubland/Grassland at Tai Ho.

**9.4.4.2 Terrestrial Mammals** – The bat roost in Tai Ho Wan recorded 3 species of bats. These were the Pomona Leaf-nosed Bat *Hipposideros pomona* (approx. 100 individuals), Least Horseshoe Bat *Rhinolophus pusillus* (1 male) and Chinese Horseshoe Bat *Rhinolophus sinicus* (1 individual). The mine was a nursery site for Pomona Leaf-nosed Bat. The 20 females were each carrying a single young (approx. 2-3 week old). This species is very common in Hong Kong. The cave was probably also used as a winter hibernaculum. A Least Horseshoe Bat *Rhinolophus pusillus* roost was also found near Pak Mong (Ades 1999). Two species of non-cave dwelling bats were also recorded in Tai Ho and nearby areas by AFCD (Shek and Chan 2006). These were Japanese Pipistrelle *Pipistrellus abramus* and Brown Noctule *Nyctalus noctula*. Japanese Pipistrelle is very common and Brown Noctule is common in Hong Kong (*ibid.*). Japanese Pipistrelle was also recorded in Tai Ho during the baseline survey of investigation study for Lantau Logistics Park (Agreement No. CE 23/2004). This species can be found in many types of habitats (Shek 2006).

**9.4.4.3 Birds** – Bird species of conservation importance recorded within the Assessment Area in previous studies included Black-crowned Night Heron *Nycticorax nycticorax*, Black Kite *Milvus migrans*, Eurasian

Woodcock *Scolopax rusticola* and Grey Treepie *Dendrocitta formosae* (Figure 9.2c of the approved EIA for Tung Chung New Town Extension, AEIAR-196/2016).

- 9.4.4.4** Black-crowned Night Heron was recorded in coastal areas east of Tai Ho Wan. This species occurs in many types of wetland habitats in Hong Kong (Carey *et al.* 2001). Breeding/roosting sites of Black-crowned Night Heron is considered as “local concern” (Fellowes *et al.* 2002).
- 9.4.4.5** Black Kite was recorded in coastal areas and shrubland/grassland near Tai Ho Wan. This species is Class 2 Protected Animal of China and listed in Appendix 2 of CITES (Gao 2002). Breeding/roosting sites of Black Kite is considered as “regional concern” (Fellowes *et al.* 2002).
- 9.4.4.6** Eurasian Woodcock was recorded in the hillside to the east of Tai Ho Wan. This species is a scarce winter visitor, and found in scattered localities including Cloudy Hill, Tai Po Kau, Shek Kong.
- 9.4.4.7** Grey Treepie was recorded in the hillside to the east of Tai Ho Wan. This species is considered of “local concern” (Fellowes *et al.* 2002). This species a scarce winter visitor and resident, and found in scattered localities including Sai Kung, Luk Keng, Tai Po Kau, Tai Tam Reservoir, Ho Chung, Hong Kong University, Lam Tsuen, Hok Tau.
- 9.4.4.8** No active ardeid nesting colony was reported in Lantau in 2015 (Anon. 2015). In fact, only two egrettries had been reported in Lantau since 1998: Tai O egrettry and To Kau Wan egrettry. The Tai O egrettry and To Kau Wan egrettry were about 12.7km and 5.7km from the Assessment Area, respectively. Tai O egrettry was abandoned in 2008 while the To Kau Wan egrettry was abandoned in 2003. No record of high abundance of waterbirds in Tai Ho Wan was found from reviewed literature.
- 9.4.4.9** **Herpetofauna** - Species of conservation importance recorded within the Assessment Area in previous studies included Common Rat Snake *Ptyas mucosus* and Lesser Spiny Frog *Quasipaa exilispinosa* (Figure 9.2c of the approved EIA for Tung Chung New Town Extension (AEIAR-196/2016).
- 9.4.4.10** Lesser Spiny Frog was recorded in streams on the hillside to the east of Tai Ho Wan. This species is classified as “vulnerable” in IUCN Red List, and considered of “potential global concern” by Fellowes *et al.* (2002). Lesser Spiny Frog is mainly found in and near hill streams (Chan *et al.* 2005).
- 9.4.4.11** Common Rat Snake was recorded in the hillside to the east of Tai Ho Wan. This species is listed in Appendix 2 of CITES, considered “endangered” in China Red Data Book, and ranked as “potential regional concern” by Fellowes *et al.* (2002). In Hong Kong, Common Rat Snake occurs in a variety of habitats, including agricultural land, shrubland, grassland, around ponds and reservoirs (Karsen *et al.* 1998).

- 9.4.4.12 Dragonfly** – One dragonfly species of conservation importance Elegant Clubtail *Leptogomphus elegans*, which was identified by Fellowes *et al.* (2002) as local concern, was previously recorded in the woodland within the Assessment Area. This species is common and widely distributed in small wooded streams throughout Hong Kong.
- 9.4.4.13 Freshwater and estuarine fauna** – The species of conservation importance recorded in Tai Ho Bay in previous studies included Red Stingray *Dasyatis akajei*, Ayu (Sweetfish) *Plecoglossus altivelis*, Giant Mottled Eel *Anguilla marmorata*, Japanese Eel *A. japonica*, Largesnout Goby *Awaous melanocephalus*, Rice-paddy Eel *Pisodonophis boro*, Banded Mulletgoby *Hemigobius hoevenii*, Crimson-tipped Flathead Gudgeon *Butis melanostigmas*, Spotty Band Goby *Glossogobius olivaceus*, Archpatch Puffer *Takifugu ocellatus*, Predaceous Chub *Parazacco spilurus* and a Freshwater Crab *Cryptopotamon anacoluthon*. Ayu is a salmonid fish, first recorded for Hong Kong at Tai Ho Stream (Chong and Dudgeon 1992), also the only known breeding site for the globally threatened Ayu in Hong Kong. Locations of these species of the conservation importance are shown in **Figure 9.4a**, except those the exact locations were not reported in the literature. For example, Largesnout Goby, Rice-paddy Eel and Predaceous Chub were only reported to be recorded in Tai Ho Wan or Tai Ho Stream but without exact locations. For the species recorded within Tai Ho Wan (with exact locations), most of them were recorded outside the 500m Assessment Area. Due to the land-based nature of the Study, aquatic species outside the 500m Assessment Area and/or without exact locations are not considered relevant and not further evaluated.
- 9.4.4.14 Seahorse and pipefish** – The findings for estuarine macroinvertebrates from the approved EIA for 3RS (AEIAR-185/2014) indicated that Spotted Seahorse (*Hippocampus kuda*) and Seaweed pipefish (*Syngnathus schlegeli*) were recorded in Tai Ho Wan. Seahorses face the threat of overfishing for their qualities for traditional medicine and aquarium purposes. The Spotted Seahorse *Hippocampus kuda* was listed as “Vulnerable” under the IUCN Red List and “Endangered” under China Species Red List. It has been evaluated as uncommon in Hong Kong (To *et al.* 2013). Seaweed Pipefish *Syngnathus schlegeli* has been evaluated as rare in Hong Kong. Only one individual of Seaweed Pipefish *Syngnathus schlegeli* was recorded in the dry season at Tai Ho Wan. However, it was recorded in almost all survey locations in 3RS EIA (AEIAR-185/2014) except San Tau during the wet season and the highest number of *Syngnathus schlegeli* was recorded in Tung Chung with eight individuals.
- 9.4.4.15 Horseshoe crabs** – They have been identified as a species of conservation importance in Hong Kong. Though three species have been reported in HKSAR waters: (i.e. *Tachypleus tridentatus*, *T. gigas* and *Carcinoscorpius rotundicauda*), usually the individuals encountered in the field are *T. tridentatus* and *C. rotundicauda*. Horseshoe crabs appear to be undergoing rapid population declines and

are thought to be under severe pressure in the South China Sea, including Hong Kong waters, due to habitat loss, pollution and over exploitation. During the EBS study of the Hong Kong-Zhuhai-Macau Bridge (HZMB) between 2003 and 2004 (HZMB-HKLR), juvenile horseshoe crab were recorded in Tai Ho Wan and Pak Mong (fourteen live and three molts of *Carcinoscorpius rotundicauda*).

**9.4.4.16** Two horseshoe crab species, *Tachypleus tridentatus* and *Carcinoscorpius rotundicauda* were recorded in Tai Ho Wan during the 3RS EIA study (AEIAR-185/2014). In the approved EIA report for Tung Chung New Town Extension (AEIAR-196/2016), juvenile individuals of Horseshoe Crab *Tachypleus tridentatus* were also recorded in Tai Ho Wan.

**9.4.4.17** **Corals** –The North Lantau waters are within the estuarine western waters. In contrast to the oceanic eastern waters, the abundance and diversity of corals are low in western Hong Kong waters (in particular North-western waters which are closer to Pearl River Estuary). North Lantau waters are thus characterized by domination of gorgonian and soft corals. Soft corals, sea pens and gorgonian corals (sea fans) were reported to be present throughout the North-western waters (Mouchel 2002). A dive survey targeting on corals was conducted along the coastline from Sham Wat to Kei Tau Kok (to the east of Tung Chung near Tai Ho) during the HZMB-HKLR EBS survey. No hermatypic hard coral was found at any of the 27 dive sites. Although ahermatypic corals were recorded, but they were concentrated in sites to the west of the airport island. The only widespread and common octocoral recorded in the survey was one species of gorgonians *Echinomuricea* sp. which was found both to the east and to the west of the airport island. In TM-CLK Link EIA report (AEIAR-146/2009), dive survey was also conducted at the Brothers, and low coverage (<5%) of gorgonian and ahermatypic corals were recorded.

**9.4.4.18** A dive survey was conducted at the artificial seawalls near SHD during the baseline survey of investigation study for Lantau Logistics Park (Agreement No. CE 23/2004). The survey site is basically facing to the Brothers in North Lantau waters. It is to the east of the outlet of Tai Ho Wan. Freshwater input from Tai Ho Stream is discharged into the nearby waters through this only outlet of Tai Ho Wan with the open sea. Though no alive or dead hard corals, colonies of gorgonian were found on the boulders of the artificial seawalls. They were all of small sizes (less than 10 cm in length) and scattered on the boulders, resulting in a low coverage (<1%). Partially mortality was also observed in many colonies, which indicated that these gorgonians were under stress.

**9.4.4.19** In the EIA of Tung Chung New Town Extension, a dive survey was conducted along the coastline from Tung Chung Bay to Siu Ho, with one of the survey location AD-1 located on the artificial seawall adjacent to SHD. Only one common gorgonian *Guaiagorgia* sp. of less than 1% coverage, was recorded in AD-1. This species was also recorded in all other seawall dive survey locations under the EIA.

Another common ahermatypic cup coral *Balanophyllia* sp. reported by the EIA was however only recorded outside the 500m Assessment Area for the present EcoIA.

**9.4.4.20 Chinese White Dolphin** - *Sousa chinensis* (CWD in short form, also commonly known as Indo-Pacific humpback dolphin) is one of the only two resident marine mammal species in Hong Kong. Recently, this species is separated from the species in Australia (*Sousa sahulensis*), and the distribution of *Sousa chinensis* is now changed to waters from central China (near the mouth of the Yangtze River), south throughout the waters of Southeast Asia as far southeast at least as Borneo, and as far west as the Orissa coast of India (Sutaria and Jefferson 2004; Jefferson and Rosenbaum 2014). Off the coast of South China, at least seven separate populations were identified from Guangxi up to the mouth of the Yangtze River, and all coincide with the presence of river mouths (Jefferson and Hung 2004). One of these CWD populations lives in the Pearl River Estuary, where they inhabit waters of the HKSAR, Macau SAR and Guangdong Province. Located at the eastern side of the Pearl River Estuary, the waters in Hong Kong form part of the habitat for this CWD population, but CWD in Hong Kong only concentrates in the more estuarine- influenced waters, i.e. all the waters of western Hong Kong. They are present commonly year-round in the waters north and west of Lantau, and also occur seasonally or in small numbers to the south and east of Lantau Island, as well as in southern Deep Bay and to the west of Lamma Island (Jefferson 2000, Jefferson & Hung 2004). They are not present in the waters to the east of Lamma Island, except for occasional wanderings. The dolphins appear to shift their grounds seasonally with the extent of river influence, moving farther south and east from the Pearl River in the wet season, and farther into the estuary proper in the dry season. Western and Northern Lantau waters are the most important range of the CWD in HKSAR waters. This has been concluded from systematic boat surveys for CWD in Hong Kong waters since 1996.

**9.4.4.21** From the latest annual Monitoring of Marine Mammals in Hong Kong Waters (2015-16), CWDs were sighted regularly in west and south of Lantau Island (Hung 2016) (**Figure 9.4b**). Habitat use patterns of dolphins 2011-2015 revealed that their high density areas included the west coast of Lantau (particularly around Tai O Peninsula, Kai Kung Shan, Peaked Hill, Fan Lau and Kau Ling Chung), around Lung Kwu Chau, and these areas should be recognised as the most important dolphin habitats in recent years (**Figure 9.4c**).

**9.4.4.22** The coastal waters immediately adjacent to the present Assessment Area are of very low use by CWD. **Figure 9.4b** shows that during the survey in 2015 both the CWD sighting density (SPSE) and the density of CWD (DPSE) in the waters to the south of the Brothers Islands as well as the present Assessment Area had no ranking and were left blank, indicating a very low CWD use. In the entire eastern part of North Lantau waters, there was only one grid cell in the offshore waters to the east of the Brothers Island with ranking of SPSE and DPSE of CWD, but both of the lowest ranking, in 2015 survey. This might be related to the fact that

since 2012 the waters adjacent to the east side of the airport platform were blocked off by the HKBCF reclamation works and no longer available for dolphins. The SPSE and DPSE results of 2015 in north Lantau waters revealed that the Assessment Area and in its vicinity were of very low use by CWD.

- 9.4.4.23** CWD surveys were performed for EIA studies in North Lantau area. 18 systematic line-transect dolphin vessel surveys were conducted from July 2008 to March 2009 under the TM-CLK Link project for the HZMB EIA Study (including HKLR, HKBCF and TM-CLK Link EIAs). The survey area covered the central portion of North Lantau waters between Pillar Point and the Brothers Islands. 30 groups of CWD numbering 100 individuals were sighted, with most sightings (22 sightings) made in the western section of Northeast Lantau survey area (the transect covering the Brothers Islands), while another eight sightings were made in the eastern section of Northwest Lantau survey area. Given the high dolphin use in the Brothers Islands as shown by this survey and the AFCD long term monitoring, the government designated a marine park in the Brothers Islands as a mitigation measure for HZMB project.
- 9.4.4.24** The HZMB (comprising HKBCF and HKLR contracts, both have individual monitoring survey covering the waters between Ma Wan and Airport Island) construction phase ecological monitoring surveys since 2012, which follow the same survey transects as those adopted for AFCD annual survey and are performed twice a month, did not report so far dolphin sighting at the coastal waters adjacent to the present Assessment Area neither.
- 9.4.4.25** The 3RS EIA (AEIAR-185/2014) included a 14-month dolphin survey programme between October 2012 and November 2013 in North Lantau waters, in particular to the north of the airport island and to the west of the airport island which were not previously surveyed due to the restrictions of HKIA Exclusion Zone. The programme comprised three major types of field survey, i.e. vessel line transect surveys, land-based theodolite surveys, and Autonomous passive acoustic monitoring (PAM). A total of 77 groups of CWDs numbering 277 individuals were sighted from 56 vessel surveys. The majority of these sightings (75%) were to the north of the airport island (considerably larger surveyed area) while the remaining (25%) were to the west of the airport island. CWD sightings were shown to be distributed throughout the entire survey areas, demonstrating that the CWDs do use the entire survey area to some extent. Land-based theodolite surveys were conducted to track dolphin movements. Based on data collected from the four land-based stations, it can be concluded that the CWDs use the waters to the north, northeast and west of Chek Lap Kok and off Sha Chau. The highest percentage of dolphins per survey effort was observed off Chek Lap Kok and more CWDs per survey effort were observed during the winter season.
- 9.4.4.26** The recent Land Supply Study (i.e. Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement

– Feasibility Study) aims at exploring different approaches to increase the local land supply. One of the approaches is to identify suitable location for reclamation outside Victoria Harbour. Among the 5 potential reclamation site identified, three of them are located in the western waters of Hong Kong. There are concerns on the potential impacts to CWD, and a survey was commissioned to investigate the three potential reclamation sites in North Lantau waters (Lung Kwu Tan, Siu Ho Wan and Sunny Bay) in terms of CWD habitat use. The surveys included both 6-month Land-based theodolite surveys and passive acoustic monitoring (PAM) by Ecological Acoustic Recorder (EAR). The proposed Siu Ho Wan reclamation site is located near the SHD and closest to the Subject Site. Theodolite survey results revealed that CWD regularly utilised the areas offshore Lung Kwu Tan and Siu Ho Wan, usually in water deeper than 4-5m, but occasionally within 0.5 km of shore at Siu Ho Wan. Siu Ho Wan has a higher dolphin use than Lung Kwu Tan and Sunny Bay. From the EAR results, CWD detections in Siu Ho Wan were most common in the central part of its Study Area. This more or less coincides with the results from the theodolite surveys in which sightings were plotted and they distributed from off the coastline to the Brothers Islands. For the sightings within the Siu Ho Wan study area boundary, more sightings were at the central part, with the closest sighting at about 160m from the coastline.

**9.4.4.27 Daytime and night time activities** – It has been aware that there might be differences on the daytime and night time activities of CWD. Recently, some surveys have been performed to collect the night time activity information to supplement vessel and theodolite surveys. As mentioned above, PAM surveys were performed at North Lantau waters under 3RS EIA and the Land Supply Study. In the 3RS EIA, a general tendency for more sounds detected by PAM than during the daytime was found at night time to the north of airport, or in the evening at southeast of Sha Chau. The 3RS EIA opined that this indicated the abundance of CWD at night in the area north of the airport was higher, when compared with that indicated by the daytime visual data alone. It is considered that CWDs often travel through the area during the daytime rather than the night-time, and the increase in vocalisations at night may indicate an increase in habitat use at night. In the surveys for Land Supply study, more CWD sound event detections were made during night time hours than during the day at Lung Kwu Tan and Siu Ho Wan. For Sunny Bay, which was not considered important to CWD based on the results from vessel surveys under AFCD marine mammal monitoring and thus theodolite survey was not covered this site, the PAM survey results recorded a very low CWD sound event detections and suggested low use of the area, with low and probably only occasional CWD use. Based upon the results from the Land Supply study which covered three study areas, areas with considerable CWD daytime visual records, i.e. Lung Kwu Tan (where CWD were recorded offshore to the study area boundary) and Siu Ho Wan, the records by PAM could be higher in night time.

**9.4.4.28** Locations of the flora and fauna species of conservation importance reported by the above literature and within the 500m Assessment Area are shown in **Figures 9.3 and 9.4**. For the marine species of conservation importance, as the 500m Assessment Area covers a portion of outer Tai Ho Wan, those recorded in inner part of Tai Ho Wan (but outside the 500m distance boundary) are also presented in **Figure 9.4a**. Indeed most of these marine species of conservation importance shown in **Figure 9.4a** were located outside the 500m Assessment Area (e.g. *Anguilla japonica*, *A. marmorata*, *Butis melanostigma*). Due to the land-based nature of the Study, marine/estuarine species outside the 500m Assessment Area and/or without exact locations are not considered relevant and thus will not be further evaluated, but Tai Ho Wan itself as an important habitat will still be assessed. The flora and fauna species of conservation importance reported by the above literature and inside the present Assessment Area for Terrestrial Ecology and Marine Ecology are listed in **Tables 9.1 to 9.2** below.



**Table 9.1** Evaluation of terrestrial species of conservation importance within the 500m Assessment Area reported by literature

No.	Scientific Name	Common Name	Protection / conservation status	Locations / Habitats recorded	Rarity	Sources
Plant						
1	<i>Arundina graminifolia</i>	Bamboo Orchid	Cap. 96A; Cap. 586.	Ravine in Shrubland/Grassland at Tai Ho	Common (Xing <i>et al.</i> 2000)	(3)
2	<i>Nepenthes mirabilis</i>	Pitcher Plant	Cap. 96A; Cap. 586; Vulnerable in the China Plant Red Data Book (AFCD 2015); Listed in Rare and Precious Plants in Hong Kong (AFCD 2015).	Hillside between Tung Chung and Tai Ho, ravine, Tung Chung Stream	Restricted (Xing <i>et al.</i> 2000)	(1), (2)
Terrestrial Mammal						
3	<i>Hipposideros pomona</i>	Pomona Leaf-nosed Bat	Cap. 170; Fellowes <i>et al.</i> (2002): (LC).	Tai Ho Wan Bat Roost	Very common	(1)
4	<i>Rhinolophus pusillus</i>	Least Horseshoe Bat	Cap. 170; Fellowes <i>et al.</i> (2002): PRC, (RC).	Tai Ho Wan Bat Roost	Uncommon	(1)
5	<i>Rhinolophus sinicus</i>	Chinese Horseshoe Bat	Cap. 170	Tai Ho Wan Bat Roost	Very common	(1)
Bird						
6	<i>Dendrocitta formosae</i>	Grey Treepie	Cap. 170; Fellowes <i>et al.</i> (2002): LC.	Hillside covered by shrubland/grassland in Tai Ho	Scarce winter visitor and resident. Found in Sai Kung, Luk Keng, Tai Po	(5)

No.	Scientific Name	Common Name	Protection / conservation status	Locations / Habitats recorded	Rarity	Sources
					Kau, Tai Tam Reservoir, Ho Chung, Hong Kong University, Lam Tsuen, Hok Tau.	
7	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Cap. 170; Fellowes <i>et al.</i> (2002): (LC).	Intertidal; Streams	Common to abundant resident	(5), (6)
8	<i>Milvus migrans</i>	Black Kite	Cap. 170; Cap. 586; Class 2 Protected Animal of PRC; CITES: Appendix II; Fellowes <i>et al.</i> (2002): (RC).	Soaring above many types of habitats (e.g., seawall, shrubland/grassland)	Abundant winter visitor and resident	(1), (3) (5), (6)
9	<i>Scolopax rusticola</i>	Eurasian Woodcock	Cap. 170	Hillside covered by shrubland/grassland in Tai Ho	Scarce winter visitor.	(5)
Herpetofauna						
10	<i>Ptyas mucosus</i>	Common Rat Snake	CITES: Appendix II; China Red Data Book Status: Endangered; Fellowes <i>et al.</i> (2002): PRC.	Tai Ho	Common	(5)
11	<i>Paa exilispinosa</i>	Lesser Spiny Frog	IUCN (2016): vulnerable; Fellowes <i>et al.</i> (2002): PGC.	Upper reach of Tung Chung Stream, Stream on hill slope of Por Kat Shan	Common, found in and near hill streams in a wide range of altitude	(4), (5), (6)

No.	Scientific Name	Common Name	Protection / conservation status	Locations / Habitats recorded	Rarity	Sources
Dragonfly						
12	<i>Leptogomphus elegans</i>	Elegant Clubtail	Fellowes <i>et al.</i> (2002): LC	Widely distribute in small wooded streams throughout Hong Kong	Common	(3)

## Notes:

Level of concern: LC = local concern, PRC = potential regional concern, RC = regional concern, GC = global concern; Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence (Fellowes *et al.*, 2002)

- (1) Remaining Development in Tung Chung and Tai Ho Comprehensive Feasibility Study (1999)
- (2) KFBG 2013. Ecological and Conservation Importance of Tung Chung, Lantau. March 2013, first edition. Publication Series No. 11
- (3) Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014)
- (4) Tung Chung Road Improvement (AEIAR-061/2002)
- (5) HZMB Hong Kong Link Road (AEIAR-144/2009)
- (6) HZMB – TMCLK Link (AEIAR-146/2009)

**Table 9.2** Evaluation of marine species of conservation importance within the Assessment Area reported by literature

No.	Scientific Name	Common Name	Protection / conservation status	Locations / Habitats recorded	Rarity	Sources
1	<i>Sousa chinensis</i>	Chinese White Dolphin	Cap. 170; Cap. 586; CITES: Appendix I; Class I Protected Animal of PRC; China Species Red List: Endangered; IUCN (2016): Near Threatened.	Mostly in waters north and west of Lantau, this species was also recorded in the coastal/marine waters near Tai Ho area.	Common in the Western Hong Kong waters	(2)
2	<i>Glossogobius olivaceus</i>	Goby	Nil	Coastal waters of Tai Ho Wan, on the boundary of the 500m assessment area.	Uncommon	(1)
3	<i>Tachypleus tridentatus</i>	Horseshoe crab	China Species Red List: Endangered	Intertidal zone of Tai Ho Wan, on the boundary of the 500m assessment area.	Uncommon	(1)
4	<i>Carcinoscorpius rotundicauda</i>	Horseshoe Crab	China Species Red List: Vulnerable	Mangroves and coastal waters of Tai Ho Wan, on the boundary of the 500m assessment area.	Uncommon	(1)
5	<i>Guaiaogorgia</i> sp.	Nil	Nil	Artificial seawall outside Siu Ho Wan Depot	Common	(1)

Notes:

- (1) Tung Chung New Town Extension (AEIAR – 196/2016)  
(2) Monitoring of Marine Mammals in Hong Kong Waters

## 9.4.5 Ecological Survey Results

### Habitat and Vegetation Survey

- 9.4.5.1** The Subject Site (including the utility and access roads) covered only developed area. No natural terrestrial habitat, aquatic or marine habitats were included or would be affected. Habitat types identified within the Assessment Area included woodland, plantation, shrubland/grassland, urbanized/disturbed, watercourse (natural and channelized), rocky shore, sandy shore, mangrove, mudflat, seawall, and coastal waters (including water column and sub-tidal soft bottom seabed) (refers to **Figure 9.5** and **Figure 9.6** and **Table 9.3**). Photos of habitats and plant species of conservation importance are presented in **Figures 9.6a - d**.
- 9.4.5.2** A total of 314 plant species were recorded, 198 of which are native species (refers to **Appendix 9.1**). Four plant species considered of conservation importance were recorded outside the Subject Site during the ecological field surveys: *Arundina graminifolia*, *Cibotium barometz*, *Diospyros vaccinioides*, and *Nepenthes mirabilis*, (refers to **Figure 9.6d**).
- 9.4.5.3** *Cibotium barometz* is a large tree-like fern native to China including Hong Kong. It is widely distributed and commonly found in Hong Kong, mainly along shrubby and forested valleys and forest margins. Its rhizomes can be used in herbal medicine. It is listed in Appendix 2 of CITES, which is devoted to species that are not necessarily currently threatened with extinction but that may become so unless trade is closely controlled. It is also protected under Cap. 586. A colony of *Cibotium barometz* were recorded at ravine under plantation behind Siu Ho Water Treatment Works.
- 9.4.5.4** *Diospyros vaccinioides* is a shrub common in Hong Kong but listed as Critically Endangered (CR) in IUCN (2016). An individual is recorded in shrubland/grassland habitat.
- 9.4.5.5** The herb *Arundina graminifolia* and *Nepenthes mirabilis* are protected under both Forestry Regulations Cap. 96A and Protection of Endangered Species of Animals and Plants Ordinance Cap. 586. *Nepenthes mirabilis* is also listed as Vulnerable in the China Plant Red Data Book (AFCD 2015) and listed in Rare and Precious Plants in Hong Kong (AFCD 2015). They were recorded at a ravine near Tai Ho Wan.

**Table 9.3** Habitat recorded within the Assessment Area

Habitat	Size (ha/km)	Percentage (%)	Size (ha)
	Assessment Area		Subject Site*
Coastal Waters	180.57 ha	41.07	-
Plantation	13.14 ha	3.00	-
Rocky Shore	0.63 ha (1.57 km)	0.14	-

Habitat	Size (ha/km)	Percentage (%)	Size (ha)
	Assessment Area		Subject Site*
Sandy Shore	0.12 ha (0.34 km)	0.03	
Seawall	5.44 ha (3.78km)	1.24	-
Woodland	22.91 ha	5.21	-
Shrubland/Grassland	105.58ha	24.01	-
Urbanised/Disturbed	108.15 ha	24.60	30.07
Mangrove	0.87 ha	0.20	-
Intertidal Mudflat	0.04 ha	< 0.01	-
Watercourse	2.20 ha (Natural = 2.64km , Channelized = 3.35km)	0.50	-

\*Project elements also included utilities (linear nature) from topside development to Siu Ho Wan Sewage Treatment Works, eastern connection access on Sham Shui Kok Drive and western access via Tai Ho Interchange.

**9.4.5.6** Patches of woodland were found mainly in ravines and hillside formed during succession from shrubland/grassland and survived from hillfire. They were young with open canopy and formed of common pioneer tree and shrub species including *Litsea glutinosa*, *Bridelia tomentosa*, and *Celtis sinensis*. No species of conservation importance was recorded in this habitat.

**9.4.5.7** Plantation was mainly found on engineered slopes at Siu Ho Wan Sewage Treatment Works and Siu Ho Wan Water Treatment Works and along roads. Exotic species commonly found in the canopy included *Acacia confusa*, *Acacia mangium*, *Eucalyptus* spp. and *Lophostemon conferta*, which grew up to 10-12m in height. The understorey was composed of various tree, shrub and herb species including *Aporosa dioica*, *Sterculia lanceolata*, *Daphniphyllum calycinum*, *Psychotria asiatica*, and *Blechnum orientale*. An individual of plant of conservation importance, *Cibotium barometz*, was recorded at the ravine under the plantation habitat.

**9.4.5.8** Shrubland-grassland was the dominant habitat on hillsides of the Assessment Area. It was mainly composed of common species including *Rhodomyrtus tomentosa*, *Baeckea frutescens*, *Miscanthus* spp., and *Dicranopteris pedata*. Three plant species of conservation importance, *Arundina graminifolia*, *Nepenthes mirabilis* and *Diospyros vaccinioides*, were recorded in this habitat. An individual of *Arundina graminifolia* and a small colony of *Nepenthes mirabilis* were recorded at the ravine near Tai Ho Wan, while an individual of *Diospyros vaccinioides* was recorded on the hillside. They are all fairly common in Hong Kong.

**9.4.5.9** The SHD, roads, highways, Siu Ho Wan Sewage Treatment Works and Siu Ho Wan Water Treatment Works, and construction sites constituted urbanised/disturbed habitat. Plant species recorded were mainly composed of landscape species and roadside plantation. A moderate diversity of plants, though mainly exotic, cultivated and ruderals, was

recorded at the SHD. They were recorded at the landscape area and vacant lots for storage. The proposed utilities, eastern connection access on Sham Shui Kok Drive and western access via Tai Ho Interchange also mainly cut across urbanised/disturbed habitat with common species only. No species of conservation importance was recorded in this habitat.

- 9.4.5.10** According to **Section 11.4.2**, a broad brush tree survey was conducted and recorded approximately 510 nos. of trees within the existing Siu Ho Wan Depot. Trees recorded included native, landscape trees and fruit trees. All trees recorded are common in Hong Kong, while no tree species of conservation importance were found. Besides, an additional broad brush tree survey within the extent of proposed utilities, western access via Tai Ho Interchange, SPS and eastern access on Sham Shui Kok Drive has been conducted. There are approximately 91 nos. of trees located within the boundary of these works and none is species of conservation importance.
- 9.4.5.11** Short sections of small watercourses were recorded on the hillside to the south of North Lantau Highway. The uphill sections were fairly natural but stream water was collected by an artificial concrete channel or underground culvert at the foothill before reaching the coastal waters. Species recorded along the natural sections are similar to those recorded at shrubland/grassland habitat, including *Dicranopteris pedata*, *Sterculia lanceolata*, *Baeckea frutescens*, and *Rhodomyrtus tomentosa*. No species of conservation importance was recorded in this habitat.
- 9.4.5.12** Both natural (rocky and sandy) and artificial (seawall) coastlines occurred within the Assessment Area. A short section of rocky shore was recorded on the east side of Tai Ho Wan. Plant species including some mangrove and backshore vegetation colonised in the rock crevices and along the shore. Example included *Aegiceras corniculatum*, *Clerodendrum inerme*, *Scaevola taccada*, and *Pandanus tectorius*. While the sandy shore on the eastern edge of the Assessment Area was void of vegetation. The coastline between North Lantau Highway and coastal water is lined with seawall. Most of the seawall surfaces are void of vegetation; some isolated trees, shrub and weeds were occasionally recorded in the crevices or on the flat surfaces. Example included *Ficus subpisocarpa*, *Lantana camara*, *Bidens alba* and *Neyraudia reynaudiana*. No species of conservation importance was recorded in this habitat.
- 9.4.5.13** Coastal waters (including water column and sub-tidal soft bottom seabed) occupy the largest area sizes within the 500m assessment area among all the habitat types.
- 9.4.5.14** A small patch of intertidal mudflat is located at the southwest edge of the 500m study area boundary of the Railway Development between woodland and a small strip of rocky shore on the opposite side Tai Ho Wan from the proposed development.

**9.4.5.15** Two strips of mangroves have been found along the coastal areas of Tai Ho Wan within the 500m study area boundary of the Railway Development. This habitat is dominated by the mangroves *Aegiceras corniculatum*, *Kandelia obovata* and *Bruguiera gymnorhiza*. Horseshoe crab, *Carcinoscorpius rotundicauda*, and goby, *Glossogobius olivaceus*, have been recorded along the edges of these mangroves.

#### **Terrestrial Mammal**

**9.4.5.16** No terrestrial mammal (e.g., Eurasian Wild Boar *Sus scrofa*) was recorded within the Subject Site or other parts of the Assessment Area during the surveys.

**9.4.5.17** Two bat species, including Pomona Leaf-nosed Bat *Hipposideros pomona* and Least Horseshoe Bat *Rhinolophus pusillus*, were recorded in the cave located on the eastern coastline of Tai Ho Wan, immediately at the boundary of the Assessment Area, during the survey. Around 180-200 individuals of bat were recorded within the bat cave. All bat species are protected under Cap. 170 and are considered of conservation importance.

#### **Bird**

**9.4.5.18** Eight species of bird were recorded within the Subject Site during the surveys (**Appendix 9.2**). All recorded species are common and widely distributed in Hong Kong. None of the bird species recorded in the Subject Site was considered of conservation importance. Both species richness and abundance of bird in the Subject Site were considered very low.

**9.4.5.19** Thirty-two species of bird were recorded within the Assessment Area during the surveys (**Appendix 9.2**). Seven species of bird were considered of conservation importance. These included Striated Heron *Butorides striata*, Chinese Pond Heron *Ardeola bacchus*, Little Egret *Egretta garzetta*, Crested Goshawk *Accipiter trivirgatus*, Greater Coucal *Centropus sinensis*, Collared Scops Owl *Otus lettia* and Red-billed Starling *Spodiopsar sericeus*. All these species were recorded in locations outside the Subject Site (see **Figure 9.5**), and the cumulative abundance of these species was low (**Appendix 9.2**). Details of observations and conservation status of these species are described in **Table 9.17**.

**9.4.5.20** Both species richness and abundance of bird were considered very low in watercourse, plantation and woodland, low in shrubland/grassland, and low to moderate in urbanised/disturbed in the Assessment Area (excluding the Subject Site). No birds were found in coastal habitats.



### **Herpetofauna**

- 9.4.5.21** No reptile was recorded within the Subject Site or other parts of the Assessment Area during the surveys.
- 9.4.5.22** Only two species of amphibian were recorded within the Subject Site (**Appendix 9.3**). Both species are common in Hong Kong, and are not considered of conservation importance.
- 9.4.5.23** A total of five species of amphibian were recorded within the Assessment Area. Only Romer's Tree Frog *Liuixalus romeri* was considered of conservation importance. This species was found in a channelized watercourse outside and separated from the Subject Site by urbanised/disturbed habitat (see **Figure 9.5c**).

### **Butterfly and Dragonfly**

- 9.4.5.24** Fourteen species of butterfly were recorded within the Subject Site during the surveys (**Appendix 9.4**). All are either common or very common in Hong Kong. None of the butterfly species recorded in the Subject Site was considered of conservation importance. Both species richness and abundance of butterfly in the Subject Site were considered low.
- 9.4.5.25** Twenty-six species of butterfly were recorded within the Assessment Area during the surveys (**Appendix 9.4**). All are either common or very common in Hong Kong. None of the recorded species was considered of conservation importance. Both species richness and abundance of butterfly were considered low in woodland, plantation and shrubland/grassland, and low to moderate in urbanised/disturbed (excluding the Subject Site) in the Assessment Area.
- 9.4.5.26** No dragonfly was recorded within the Subject Site during the surveys (**Appendix 9.5**). This was related to the absence of aquatic habitat within the Subject Site.
- 9.4.5.27** Ten species of dragonfly were recorded within the Assessment Area during the surveys (**Appendix 9.5**). All the recorded species are abundant and widely distributed in Hong Kong. None of the recorded species was considered of conservation importance. Species richness was low in all types of habitats within the Assessment Area. Abundance of dragonfly was low in woodland, plantation, shrubland/grassland and watercourse, and low to moderate in urbanised/disturbed (excluding the Subject Site) in the Assessment Area.

### **Freshwater Community Survey**

- 9.4.5.28** A total of 5 and 8 freshwater fauna were recorded in the 4 sampling locations within the Assessment Area during dry season and wet season, respectively (**Appendices 9.6a and 9.6b**). They included crustaceans and insects. As most parts of the stream are transient, narrow and

shallow water, no fish was recorded. No obvious seasonal patterns were observed from the dry season and wet season survey results.

**9.4.5.29** Diversity of freshwater fauna was low among the sampling stations. Most species recorded in the surveys are common and widespread in Hong Kong. Two species of conservation importance including one individual of *Cryptopotamon anacoluthon* and another individual of *Pseudosesarma patshuni* were found in wet season.

**9.4.5.30** *Cryptopotamon anacoluthon* is an endemic crab species of Hong Kong. This species is considered as “Potential Global Concern” due to its endemism (Fellowes *et al.* 2002). This species appears to be most numerous in shaded shallow streams with clear, fast-flowing water, rocky substratum and accumulations of leaf-litter, which serve as shelter and food (IUCN 2015). It is also listed as Vulnerable in IUCN (2015). *Cryptopotamon anacoluthon* was found in sampling point C.

**9.4.5.31** *Pseudosesarma patshuni* is an endemic sesarminae crab species to Hong Kong. It was previously considered having very limited distribution as the habitat type in which it was first found (i.e. supralittoral freshwater paddy fields) was “becoming very rare in Hong Kong (Lee 1995). However, during the surveys of AFCD, this species was found in more locations (including Tai Tan, Siu Tan, Sham Chung and To Kwa Peng). The results showed that the species might have a wider distribution than previously thought (AFCD 2005). *P. patshuni* was found in sampling point A in the present study.

## 9.5 Evaluation of Habitats and Species of Conservation Importance

### 9.5.1 Evaluation of Habitats

**9.5.1.1** The ecological values of the habitats within the Assessment Area and the important habitats in the vicinity were evaluated in accordance with the criteria stipulated in Annex 8 of TM-EIAO (Table 9.4 to 9.15). While evaluation of marine habitats based on reviewed literature, evaluation of terrestrial habitats based on information from both reviewed literature and the terrestrial ecological surveys under the present EcoIA.

**Table 9.4** Evaluation of Subject Site (Urbanised/disturbed)

Criterion	Description
Naturalness	Man-made habitat, all of urbanized/disturbed habitat with limited landscape planting
Size	30.07ha
Diversity	A moderate diversity of flora (but mainly exotic, cultivated and ruderals species) and low diversity of fauna
Rarity	No flora or fauna species of conservation importance recorded.
Re-creatability	Easy to re-create

Criterion	Description
Fragmentation	N/A
Ecological linkage	Not functionally linked to habitats of conservation importance.
Potential value	Low
Nursery/breeding ground	No significant observation. Low value as a breeding habitat for fauna due to high level of disturbance.
Age	N/A
Abundance/richness of wildlife	Low
Overall ecological value	Very Low

**Table 9.5** Evaluation of Woodland within the Assessment Area

Criterion	Description
Naturalness	Fairly natural habitat, consisting of a mixture of native tree species and exotic species.
Size	22.91ha
Diversity	Low flora diversity; low diversity of bird, butterfly and dragonfly.
Rarity	No flora or fauna species of conservation importance recorded during ecological surveys.  From reviewed literature: Elegant Clubtail
Re-creatability	Feasible, but the more mature the woodland, the longer time required for compensation/re-creation.
Fragmentation	Small linear and/or isolated stands along ravines and foothills.
Ecological linkage	Isolated, or linked to nearby shrubland/grassland.
Potential value	Moderate under natural succession to develop into mature woodland if protected from anthropogenic disturbance or destruction.
Nursery/breeding ground	No significant observation, but could potentially provide breeding habitats for birds, reptiles and butterflies.
Age	~30 years
Abundance/richness of wildlife	Low bird, butterfly and dragonfly abundance.
Overall ecological value	Low to moderate

**Table 9.6** Evaluation of Plantation within the Assessment Area

Criterion	Description
Naturalness	Man-made habitat mainly on engineering slope
Size	13.14 ha
Diversity	Low to moderate flora diversity; very low fauna diversity.
Rarity	Flora species of conservation importance include <i>Cibotium barometz</i> . No fauna species of conservation importance recorded.
Re-creatability	Easy to re-create
Fragmentation	Formed thin belts on engineered slopes.
Ecological linkage	Not functionally linked to habitats of conservation importance.
Potential value	Moderate with protection from fire and active management including thinning and interplanting with native species.

Criterion	Description
Nursery/breeding ground	No significant observation. Low value as a breeding habitat for fauna due to high level of disturbance.
Age	~20 years
Abundance/richness of wildlife	Abundance of bird, dragonfly and butterfly are very low or low.
Overall ecological value	Low

**Table 9.7** Evaluation of Shrubland/Grassland within the Assessment Area

Criterion	Description
Naturalness	Fairly natural. Fire and other disturbance no apparent.
Size	105.58 ha
Diversity	Low to moderate flora diversity; low diversity of bird, butterfly and dragonfly.
Rarity	Flora species of conservation importance include <i>Nepenthes mirabilis</i> , <i>Arundina graminifolia</i> , <i>Diospyros vaccinioides</i> . Fauna species of conservation importance recorded during ecological surveys included Pomona Leaf-nosed Bat (bat cave), Least Horseshoe Bat (bat cave), Chinese Pond Heron, Crested Goshawk and Greater Coucal. From reviewed literature: Chinese Horseshoe Bat (bat cave), Black Kite, Eurasian Woodcock, Grey Treepie and Common Rat Snake.
Re-creatability	Easy to recreate
Fragmentation	Continuous stands on upper hillside
Ecological linkage	Ecologically linked to woodland
Potential value	Limited due to frequent hillfire in the presence of grave site and burial ground
Nursery/breeding ground	No significant observation. Could provide breeding habitats for birds, butterflies and reptiles
Age	N/A
Abundance/richness of wildlife	Abundance of bird, dragonfly and butterfly are low
Overall ecological value	Low to moderate

**Table 9.8** Evaluation of Urbanised/Disturbed within the Assessment Area

Criterion	Description
Naturalness	Man-made habitat
Size	108.15 ha
Diversity	Low flora diversity, mainly composed of landscape and ornamental species; low to moderate diversity of bird and butterfly, low diversity of dragonfly.
Rarity	Fauna species of conservation importance included Little Egret, Collared Scops Owl, Red-billed Starling.
Re-creatability	Easy to re-create
Fragmentation	N/A
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low

Criterion	Description
Nursery/breeding ground	No significant observation. Low value as a breeding habitat for fauna due to high level of disturbance.
Age	N/A
Abundance/richness of wildlife	Low to moderate abundance of bird and butterfly and dragonfly
Overall ecological value	Very Low

**Table 9.9** Evaluation of Watercourse within the Assessment Area

Criterion	Description	
	Natural section	Channelized section
Naturalness	Natural sections on hill	Man-made channel
Size	2.64 km	3.35 km
Diversity	Low for flora, very low diversity of fauna.	Very low for flora and fauna
Rarity	Fauna species of conservation importance included <i>Cryptopotamon anacoluthon</i> and <i>Pseudosesarma patshuni</i> .	Fauna species of conservation importance included Striated Heron, Little Egret and Romer's Tree Frog (but artificial channel is not the important habitat of these species).
Re-creatability	Natural stream section difficult to re-create	Channelized sections easy to recreate
Fragmentation	Stream habitat fragmented by the channelised section, but the stream flow is still maintained	N/A
Ecological linkage	Water flow connected to coastal waters	Water flow connected to coastal waters
Potential value	Low	Low
Nursery/breeding ground	No significant observation. Natural sections of watercourses could provide breeding habitats for amphibians and dragonflies as well as aquatic fauna.	No significant observation. Limited due to simple structure.
Age	N/A	N/A
Abundance/richness of wildlife	Very low abundance of fauna.	Very low abundance of fauna.
Overall ecological value	Low to moderate	Low

**Table 9.10** Evaluation of Coastal Waters within the Assessment Area

Criterion	Description
Naturalness	Natural habitat. The coastlines are all artificial seawalls.
Size	180.57 ha
Diversity	According to reviewed literature, high diversity of estuarine species in Tai Ho Wan.

Criterion	Description
Rarity	From reviewed literature: Marine fauna included Chinese White Dolphin, <i>Tachypleus tridentatus</i> and <i>Glossogobius olivaceus</i> From reviewed literature: Terrestrial fauna included Black-crowned Night Heron and Black Kite
Re-creatability	Difficult to re-create
Fragmentation	Not fragmented
Ecological linkage	Connected the outer waters
Potential value	Next to The Brothers Marine Park, may act as buffer to CWD.
Nursery/breeding ground	Breeding habitats for fishes and invertebrates
Age	N/A
Abundance/richness of wildlife	Low abundance of CWD
Overall ecological value	Moderate

**Table 9.11** Evaluation of Sub-tidal Hard and Soft Bottom Habitats within the Assessment Area

Criterion	Description
Naturalness	Sub-tidal soft bottom is natural, while sub-tidal hard bottom is formed by artificial seawalls.
Size	180.57 ha
Diversity	According to reviewed literature, moderate community.
Rarity	From reviewed literature: Benthic species included gorgonian <i>Guaiagorgia</i> sp. was found.
Re-creatability	Difficult to re-create
Fragmentation	Not fragmented
Ecological linkage	Connected the outer waters
Potential value	Low
Nursery/breeding ground	Breeding habitats for fishes and invertebrates
Age	N/A
Abundance/richness of wildlife	Low abundance of subtidal and benthic organisms
Overall ecological value	Low to moderate

**Table 9.12** Evaluation of Rocky and Sandy Shores within the Assessment Area

Criterion	Description	
	Rocky Shore	Sandy Shore
Naturalness	Natural habitat.	Natural habitat.
Size	1.57 km	0.34 km
Diversity	According to reviewed literature, moderate diversity for intertidal fauna	According to reviewed literature, low diversity of intertidal fauna
Rarity	From reviewed literature: Black-crowned Night Heron	Common habitat in Hong Kong, no species of conservation importance recorded.

Criterion	Description	
	Rocky Shore	Sandy Shore
Re-creatability	Difficult to re-create	Difficult to re-create
Fragmentation	Not fragmented	Not fragmented
Ecological linkage	Connected the Tai Ho Wan	Connected to marine waters
Potential value	Low	Low
Nursery/breeding ground	Breeding and nursery ground for limited intertidal organisms	Breeding and nursery ground for limited intertidal organisms
Age	N/A	N/A
Abundance/richness of wildlife	Low for bird and moderate for intertidal organisms.	Low for intertidal organisms
Overall ecological value	Low	Low

**Table 9.13** Evaluation of Seawall within the Assessment Area

Criterion	Description
Naturalness	Man-made habitat.
Size	3.78 km
Diversity	According to reviewed literature, low diversity for intertidal organisms and birds
Rarity	Common habitat in Hong Kong, no species of conservation importance recorded.
Re-creatability	Easy to re-create
Fragmentation	N/A
Ecological linkage	Connected the coastal waters
Potential value	Low
Nursery/breeding ground	Breeding and nursery ground for limited intertidal organisms
Age	N/A
Abundance/richness of wildlife	Low
Overall ecological value	Low

**Table 9.14** Evaluation of Mudflat within the Assessment Area

Criterion	Description
Naturalness	Natural habitat.
Size	0.04 ha
Diversity	High diversity of intertidal organisms
Rarity	No species of conservation importance recorded
Re-creatability	Low
Fragmentation	Not fragmented
Ecological linkage	Linked to other habitats including mangroves, estuary and coastal waters.
Potential value	High
Nursery/breeding ground	Breeding and nursery ground for intertidal organisms
Age	N/A

Criterion	Description
Abundance/richness of wildlife	High
Overall ecological value	Moderate to high

**Table 9.15** Evaluation of Mangrove within the Assessment Area

Criterion	Description
Naturalness	Natural habitat.
Size	0.87 ha
Diversity	High diversity of mangrove
Rarity	<i>Tachypleus tridentatus</i>
Re-creatability	Easy to re-create but may takes time to mature and restore species diversity
Fragmentation	Not fragmented
Ecological linkage	Linked to other habitats including mudflat, estuary and coastal waters
Potential value	Moderate
Nursery/breeding ground	Breeding and nursery ground for intertidal organisms
Age	N/A
Abundance/richness of wildlife	Moderate
Overall ecological value	Moderate to high

## 9.5.2 Evaluation of Species of Conservation Importance

**9.5.2.1** In accordance with Table 3, Annex 8 of the TM-EIAO, the ecological value of species recorded was assessed in terms of protection status (e.g. fauna protected under Cap. 170 (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare or restricted).

**9.5.2.2** The lists and evaluation of species of conservation importance recorded within the Assessment Area, according to the TM-EIAO, are given in **Tables 9.16 to 9.18**. And the locations of those recorded from reviewed literature and during the terrestrial ecological survey are shown in **Figures 9.3 and 9.5**, while the marine species of conservation importance identified in reviewed literature are shown in **Figures 9.4a – c**.



**Table 9.16** Evaluation of floral species of conservation importance within the Assessment Area (from ecological survey and literature review)

No	Scientific Name	Common Name	Protection status	Locations / Habitats recorded	Rarity
1	<i>Arundina graminifolia</i> <sup>#</sup>	Bamboo Orchid	Cap. 96A; Cap. 586.	Ravine in Shrubland/Grassland at Tai Ho	Common (Xing <i>et. al.</i> 2000)
2	<i>Cibotium barometz</i>	Lam of Tartary	Cap. 586; Category II nationally protected species in the PRC; Vulnerable in China (AFCD 2015).	Ravine in Plantation Habitat	Locally very common (Wu and Lee 2000)
3	<i>Diospyros vaccinioides</i>	Small persimmon	Critically Endangered in IUCN (2016).	Shrubland/Grassland	Locally very common (Xing <i>et. al.</i> 2000)
4	<i>Nepenthes mirabilis</i> <sup>#</sup>	Pitcher Plant	Cap. 96A; Cap. 586; Vulnerable in the China Plant Red Data Book (AFCD 2015); Listed in Rare and Precious Plants in Hong Kong (AFCD 2015).	Ravine in Shrubland/Grassland at Tai Ho	Restricted (Xing <i>et al.</i> 2000)

#: Species also recorded in reviewed literature

**Table 9.17** Evaluation of terrestrial fauna species of conservation importance within the Assessment Area (from ecological survey and literature review)

No	Species	Locations / Habitats recorded	Protection status / Conservation Status / Level of Concern	Distribution	Rarity
1	Pomona Leaf-nosed Bat	A cave on the eastern coastline of Tai Ho Wan	Cap. 170; Fellowes <i>et al.</i> (2002): (LC)	Widely distributed in countryside areas throughout Hong Kong	Very Common

No	Species	Locations / Habitats recorded	Protection status / Conservation Status / Level of Concern	Distribution	Rarity
2	Least Horseshoe Bat	A cave on the eastern coastline of Tai Ho Wan	Cap. 170; Fellowes <i>et al.</i> (2002): PRC, (RC).	Widely distributed in countryside areas throughout Hong Kong	Uncommon
3	Chinese Horseshoe Bat*	A cave on the eastern coastline of Tai Ho Wan	Cap. 170	Widely distributed in countryside areas throughout Hong Kong	Very Common
4	Striated Heron	Found in watercourse outside the Subject Site	Cap. 170; Fellowes <i>et al.</i> (2002): (LC).	Widely distributed in Hong Kong.	Locally uncommon in summer and scarce in winter
5	Chinese Pond Heron	Recorded in shrubland/grassland outside the Subject Site	Cap. 170; Fellowes <i>et al.</i> (2002): PRC, (RC).	Widely distributed in Hong Kong.	Common resident.
6	Little Egret	Recorded in urbanized/disturbed and watercourse outside the Subject Site	Cap. 170; Fellowes <i>et al.</i> (2002): RC.	Widely distributed in coastal area throughout Hong Kong.	Common resident.
7	Crested Goshawk	Recorded in shrubland/grassland outside the Subject Site	Cap. 170; Cap.586; Class 2 Protected Animal of China; Appendix 2 of CITES.	Widely distributed in woodlands and shrublands throughout Hong Kong.	Uncommon resident.
8	Greater Coucal	Recorded in shrubland/grassland outside the Subject Site	Cap. 170; Class 2 Protected Animal of China; China Red Data Book Status: (Vulnerable).	Widely distributed in Hong Kong.	Common resident.

No	Species	Locations / Habitats recorded	Protection status / Conservation Status / Level of Concern	Distribution	Rarity
9	Collared Scops Owl	Recorded in urbanized/disturbed outside the Subject Site	Cap. 170; Cap.586; Class 2 Protected Animal of China; Appendix 2 of CITES.	Widely distributed in shrubland throughout Hong Kong.	Common resident.
10	Red-billed Starling	Recorded in urbanized/disturbed outside the Subject Site	Cap. 170; Fellowes <i>et al.</i> (2002): GC.	Widely distributed in Hong Kong	Common winter visitor.
11	Black-crowned Night Heron*	Recorded in coastal areas east of Tai Ho Wan	Cap. 170; Fellowes <i>et al.</i> (2002): (LC).	Mainly found in low lying wetlands and coastal areas with mangroves	Common to abundant resident
12	Black Kite*	Recorded in coastal areas and shrubland/grassland near Tai Ho Wan	Cap. 170; Cap. 586; Class 2 Protected Animal of PRC; CITES: Appendix II; Fellowes <i>et al.</i> (2002): (RC).	Widely distributed in Hong Kong and occurs in many types of habitats	Abundant winter visitor and resident
13	Eurasian Woodcock*	Recorded in the hillside to the east of Tai Ho Wan	Cap. 170	Found in Cloudy Hill, Tai Po Kau, Shek Kong	Scarce winter visitor.
14	Grey Treepie*	Recorded in the hillside to the east of Tai Ho Wan	Cap. 170; Fellowes <i>et al.</i> (2002): LC	Found in Sai Kung, Luk Keng, Tai Po Kau, Tai Tam Reservoir, Ho Chung, Hong Kong University, Lam Tsuen, Hok Tau	Scarce winter visitor and resident.
15	Common Rat Snake*	Recorded in the hillside to the east of Tai Ho Wan	CITES: Appendix II; China Red Data Book Status: Endangered; Fellowes <i>et al.</i> (2002): PRC.	Widely distributed in Hong Kong	Common

No	Species	Locations / Habitats recorded	Protection status / Conservation Status / Level of Concern	Distribution	Rarity
16	Romer's Tree Frog	Found in channelized watercourse outside the Subject Site.	Cap. 170; IUCN Red List Status: Endangered; Fellowes <i>et al.</i> (2002): PGC	Distributed in woodlands on Lantau Island, Po Toi Island, Lamma Island, Hong Kong Island and New Territories.	Locally common at various localities
17	Lesser Spiny Frog*	Recorded in streams on the hillside to the east of Tai Ho Wan	IUCN (2016): vulnerable; Fellowes <i>et al.</i> (2002): PGC	Found in and near hill streams in a wide range of altitudes	Common
18	Elegant Clubtail*	Recorded in the woodland	Fellowes <i>et al.</i> (2002): LC	Widely distributed in small wooded streams throughout Hong Kong	Common
19	<i>Cryptopotamon anacoluthon</i>	Recorded in a natural watercourse outside the Subject Site	Listed as Vulnerable by IUCN (2016); "Potential Global Concern" species (Fellowes <i>et al.</i> 2002)	Numerous in shaded shallow streams with clear, fast-flowing water, rocky substratum, and accumulations of leaf-litter.	Endemic to Hong Kong
20	<i>Pseudosesarma patshuni</i>	Recorded in a natural watercourse outside the Subject Site	Nil	Tai Tan, Siu Tan, Sham Chung and To Kwa Peng	Endemic to Hong Kong

Level of concern: LC = local concern, PRC = potential regional concern, RC = regional concern, GC = global concern; Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence (Fellowes *et al.*, 2002).

\* From reviewed literature

**Table 9.18** Evaluation of marine fauna species of conservation importance within the Assessment Area (from reviewed literature)

No	Species	Locations / Habitats recorded	Protection status / Conservation Status / Level of Concern	Distribution	Rarity
1	<i>Sousa chinensis</i> (Chinese White Dolphin)	Siu Ho Wan	Cap. 170; Cap. 586; CITES: Appendix I; Class I Protected Animal of PRC; China Species Red List: Endangered; IUCN (2016): Near Threatened	Mostly in waters north and west of Lantau, this species was also recorded in the coastal/marine waters near Tai Ho area.	Common in the Western Hong Kong waters
2	<i>Glossogobius olivaceus</i>	Coastal waters of Tai Ho Wan	Nil	Restricted distribution in Hong Kong, only recorded in a few reservoirs and estuaries	Uncommon
3	<i>Tachypleus tridentatus</i>	Rocky shore of Tai Ho Wan, on the boundary of the 500m assessment area.	China Species Red List: Endangered	Locally found in Tsim Bei Tsui, Pak Nai, Sham Wat, Yi O, Shui Hau Wan	Uncommon
4	<i>Carcinoscorpius rotundicauda</i>	Mangrove and coastal waters of Tai Ho Wan	China Species Red List: Vulnerable	Declining in range due to water pollution/ loss of nursery grounds; locally found in Tsim Bei Tsui, Pak Nai, Sham Wat, Yi O, Shui Hau Wan	Uncommon
5	<i>Guaiagorgia</i> sp.	Artificial seawall outside Siu Ho Wan Depot	Nil	Western waters	Common

## 9.6 Impact Identification and Prediction

### 9.6.1 Proposed Development Plan and Assessment Methodology

**9.6.1.1** The major elements involved in the Topside Development as well as in the Railway Development have been described in **Section 9.1**. The assessment below identified and quantified as far as possible the potential terrestrial, aquatic, and marine ecological impacts associated with the Project, both directly (e.g. by habitat loss) and indirectly (e.g. by dust, noise and traffic), including construction phase and operational phase, to recognised sites of conservation importance, important habitats, and the associated wildlife groups/species. Predicted impacts would be quantified as far as possible and evaluated with reference to the criteria in Annexes 8 and 16 of the TM-EIAO. Impacts are generally ranked as "insignificant", "minor", "moderate" or "severe". Where significant negative impacts are predicted, the strategy followed the priority of "avoid, minimize, and compensate". The acceptability of residual impacts following mitigation was assessed. Finally, the assessment evaluated the need for ecological monitoring and audit, and prescribed in detail any required EM&A programme in accordance with the Study Brief. A summary of the potential impacts that may arise as a result of the construction and operation of the Project are presented below.

### 9.6.2 Predicted Impacts – Construction Phase

#### Direct Impacts

**9.6.2.1** Loss of habitats and/or associated vegetation due to land-based site formation will constitute direct ecological impacts of the Project. Habitats anticipated to be affected included urbanized/disturbed and a minor area of plantation. Habitat loss can be divided into below two categories:

- Permanent habitat loss; and
- Temporary habitat loss.

#### Indirect Impacts

**9.6.2.2** Indirect impacts are also caused by construction activities, usually disturbance due to noise, movement of workers and equipment, the associated traffic. Water quality impacts and hydrology on aquatic habitats may occur due to surface runoff. A summary of the potential indirect construction phase impacts on the habitats and species include the following:

- Disturbance impacts from land-based construction activities;
- Runoff from construction works;
- Traffic disturbance; and
- Vibration and underwater noise.

### 9.6.3 Predicted Impacts – Operational Phase

#### **Direct Impacts**

**9.6.3.1** Permanent habitat loss – terrestrial habitats within the Subject Site will be lost permanently after implementation of the Project.

#### **Indirect Impacts**

**9.6.3.2** Noise, traffic and human activities including artificial lightings from the development areas will pose indirect impacts for ecology. Sewage generated from the proposed development will be conveyed to Siu Ho Wan Sewerage Treatment Works for treatment by pumping station. If failure of the pumping station occurs, this may pose threats to the adjacent marine ecology.

## 9.7 Impact Evaluation for Terrestrial Ecology

### 9.7.1 Construction Phase – Terrestrial Direct Impacts

#### **Habitat Loss**

**9.7.1.1** The potential direct terrestrial ecological impacts arising from the construction works, including loss of habitats, were assessed in accordance with Annexes 8 and 16 of the TM-EIAO.

*Habitat Loss from Podium Deck, Residential Towers, and other Supporting Facilities in SHD Topside Development*

**9.7.1.2** The future podium deck and residential towers will be atop the reprovisioned SHD, and thus will not affect any existing habitats even the urbanised/disturbed habitat within existing SHD.

*Habitat Loss from Proposed Sewage Pumping Station for SHD Topside Development*

**9.7.1.3** The proposed SPS for proposed SHD Topside Development will be located atop the future reprovisioned depot, and thus will not affect any existing habitats even the urbanised/disturbed habitat within existing SHD.

*Habitat Loss from Utility for SHD Topside Development*

**9.7.1.4** While for the utility, the sewage generated from the proposed development will be conveyed to Siu Ho Wan Sewerage Treatment Works for treatment. In order to achieve this, a pair of twin rising mains will be constructed with approximate 900m in length with size of

450mm in diameter. The alignment of the sewer is shown in **Figure 1.1**. The utility crosses the NLH and LAR and then along an existing access road and finally discharge to SHWSTW. The alignment only goes through urbanized/disturbed habitat.

- 9.7.1.5** The rising mains would generally be laid by open trench excavation method, except for the section across North Lantau Highway which would be constructed by trenchless construction method. Temporary works area may also be required for the open trench excavation, which should be limited to urban/ disturbed area as far as practicable.

*Habitat Loss from Eastern Connection and Western Access*

- 9.7.1.6** There is an existing service road located to the east of the SHD, which connects to the Sham Shui Kok Drive along the existing coastline. This service road would need to be widened slightly to fulfill the highway standards. The western access, on the other hand, would be in form of a short viaduct of approximately 50m long connecting the podium to the Tai Ho Interchange to be constructed as part of the Tung Chung East development (i.e. Tai Ho Interchange will be constructed under another development). Only urbanized/disturbed habitat will be affected, and will be replaced by the same habitat.

*Habitat Loss from SHD Replanning Works*

- 9.7.1.7** The existing SHD is all made of urbanized/disturbed habitat with limited landscape planting of common or exotic vegetation. Construction works would be confined within urbanized/disturbed habitat. There will be no loss of natural habitats due to SHD Replanning Works.

*Habitat Loss from Temporary Works Areas*

- 9.7.1.8** There would be some temporary works areas during the construction phase. Though the locations and extent of those temporary works areas have not been determined at this stage, it is expected that urban/disturbed areas near the Subject Site would be prioritized as temporary works area.

*Habitat Loss from Provision of Sewerage System for Reprovisioned SHD*

- 9.7.1.9** Temporary loss of a small area of 0.26ha of urban/developed area and <0.01ha of plantation would occur from a section of proposed works for the reprovisioned sewerage mains at the alignment south of the North Lantau Highway, which is located at the same location of existing sewerage system of SHD. The affected plantation habitats of low ecological value are small in size and consisted of mainly exotic species which did not support a high diversity of fauna. The urban/developed area is located next to the NLH and TCL/AEL and is highly disturbed. Reinstatement of these habitats would take place upon completion of works, the ecological impacts of temporary loss of urban/developed area and plantation are considered to be insignificant.



### 9.7.1.10 Estimated losses of each habitat type is summarised in **Table 9.19a & b** below.

**Table 9.19a** Summary of estimated habitat loss due to SHD Topside Development

Habitat	Estimated area size (ha)				
	Podium deck, residential towers, and other supporting facilities	New SPS for Topside	Utility	Eastern connection access	Western access via Tai Ho Wan Interchange
Urbanized / disturbed	atop the future reprovisioned SHD	within the future reprovisioned SHD area	0.16	0.74	0.2

**Table 9.19b** Summary of estimated habitat loss due to Railway Development

Habitat	Estimated area (ha)	
	SHO and SHD Replanning works	Provision of sewage system
Urbanized / disturbed	30	0.26
Plantation	-	<0.01

## 9.7.2 Construction Phase – Terrestrial Indirect Impacts

### Terrestrial Constructional Indirect Impacts due to SHD Topside Development

#### *Noise, Dust, Light and Human Activities inside Construction Site*

**9.7.2.1** Noise, dust, light and human activities will increase during construction phase, and might temporarily reduce the abundance and distribution of fauna in habitats adjacent to the Subject Site.

**9.7.2.2** Noise and dust will mainly affect areas adjacent to the works fronts/works areas. Construction activities involved for SHD Topside Development would be general building construction works atop the reprovisioned SHD, and minor road widening and pipeline works, which are of low disturbance level. Areas adjacent to the SHD Topside Development, utility and areas for road widening are mostly urbanized/disturbed covered by railway and highway. Utilisation of this type of habitat by fauna is very low due to the high level of disturbance. The hillside (mainly shrubland/grassland) to the south of the North Lantau Highway comprises natural habitats, which is about 100m away from the SHD, separated by highway and railway. Fauna including those species of conservation importance (e.g. Greater Coucal, Black Kite) inhabiting the habitats in this hillside are subjected to the existing noise of highway traffic and are probably habituated to the disturbance from noise, and hence are not expected to be adversely affected by the noise of construction works from a further distance. Due to the distance

from the construction sites, vegetation and fauna in these habitats are not likely to be disturbed by dust and human activities during construction phase. There are existing lightings within or near the Subject Site. Fauna species sensitive to lightings probably have avoided the Subject Site and nearby areas. Lighting in the Subject Site during construction phase will mainly aim on security purposes and no strong flood light is anticipated. Hence, no adverse impact to fauna species is expected. The potential impact due to noise, dust, and light in construction phase is ranked as **Insignificant**.

#### *Site Runoff*

**9.7.2.3** During the construction phase, any watercourses near the works area of the Subject Site, the utility alignment as well as the areas for road widening would be potentially impacted by surface runoff from works site; earth working areas and stockpiles, wash water from dust suppression sprays and wheel washing facilities; and chemicals spillage such as fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment, especially during rainstorm. Elevated suspended solids levels caused by site runoff could increase the suspended solids load in the water bodies, and could decrease dissolved oxygen levels. A lower oxygen level would affect stationary species, whilst mobile species would tend to temporarily avoid the area. The result could be a temporary reduction in aquatic life abundance and/or change in distribution. While the Subject Site and the road widening are away from any watercourses, the utility alignment follows an existing access road which is alongside a channelized watercourse (**Figure 9.5** refers), the channelized watercourse might thus have a relatively higher potential to be affected by sedimentation of surface runoff.

**9.7.2.4** The channelized watercourse is an artificial concrete-paved channel which receives the flow from the catchment and the natural watercourses on the hill slopes. The ecological value of natural section and channelized section of watercourses within the Assessment Area are ranked as low to moderate and low, respectively. Species of conservation importance found in the watercourses include *Cryptopotamon anacoluthon*, *Pseudosesarma patshuni* and Romer's Tree Frog. Both *Cryptopotamon anacoluthon* and *Pseudosesarma patshuni* would not be affected as the natural sections where they were recorded were upstream to / uphill to the channelized section as well as the proposed utility alignment. However, Romer's Tree Frog was recorded close to the lower end of the channelized watercourse where the utility alignment would go alongside its upper section. The works areas for the utility would be small and have no direct encroachment to the channelized watercourse, but open trench excavation method would be involved. If without suitable control of site runoff, there is a potential that sediments carried by site runoff from the utility works areas might enter the channelized watercourses during heavy rainfall, and might affect the location with Romer's Tree Frog record or the individuals as

they are of lower mobility. Given the low abundance of the frog species and the relatively small scale of the works, this potential impact due to site runoff is ranked as **Minor**. To take the precautionary approach, implementation of measures to control site runoff is required.

#### *Construction Traffic*

- 9.7.2.5** During construction, traffic noise would be induced from the use of construction vehicles for transporting construction materials to and from the Subject Site. Considering the traffic routes would mostly be along existing highway and slip roads to the Subject Site which would not be close to any natural habitats or recognized sites of conservation importance, and the small flow of 40 construction vehicles per hour at peak compare with the existing flow of >4,200 vehicles per hour on the NLH (Annual Average Daily Traffic of 68,930 in 2015), no significant disturbance impact from the construction traffic is anticipated.

#### **Terrestrial Construction Indirect Impacts due to Railway Development**

- 9.7.2.6** Construction activities for Railway Development may increase human activities, glare from artificial lighting, noise disturbances from traffic and construction machinery. However given that the construction works and natural habitats in the surrounding are separated by the North Lantau Highway, where high levels of disturbances from existing traffic are present, potential disturbance impacts are considered to be insignificant. In addition, foundation works would not involve percussive piling but instead would adopt bored piling method, with much lower disturbance.

#### **Recognized Sites of Conservation Importance**

- 9.7.2.7** Lantau North (Extension) Country Park, Tai Ho Priority Site, Tai Ho Stream SSSI and Tai Ho EIS, Coastal Protection Area as well as other sites/habitats of conservation importance such as bat roost in the east of Tai Ho Wan are all outside the proposed development and will not be encroached. There will be no significant potential indirect disturbance to fauna inside those recognized sites/habitats of conservation importance due to the considerable distance from the Subject Site. In view of the localised and reversible nature of impact, the potential impact to these habitats and associated fauna in the recognized sites of conservation importance is ranked as **Insignificant**. Good site practice and site precautionary measures will be implemented to avoid the potential indirect impact to important habitats from these sources.

#### **Species of Conservation Importance**

- 9.7.2.8** Twenty-four terrestrial species of conservation importance were found within the Assessment Area from the ecological surveys and reviewed literatures (**Tables 9.16 & 9.17**). This included four species of plant, three species of bats, eleven species of birds, two species of crabs, one reptile, two amphibians and one dragonfly. No species of conservation

importance were recorded within the Subject Site. There will be no direct and indirect impact to flora or fauna species of conservation importance.

### 9.7.3 Operational Phase – Terrestrial Direct Impacts

#### **Terrestrial Operational Direct Impacts due to SHD Topside Development**

**9.7.3.1** Operational phase direct impacts for terrestrial ecology would be the habitats lost permanently for construction. In this project, habitat loss in construction phase will all be urbanized/disturbed habitat. The urbanized/disturbed habitat will be replaced by the same habitat (i.e. road widening). It is therefore considered that direct impact to terrestrial ecology during operational phase is not expected.

#### **Terrestrial Operational Direct Impacts due to Railway Development**

**9.7.3.2** No direct impacts are anticipated during the operational phase. Activities of operational phase would be similar to existing condition but underneath the proposed SHD Topside Development.

### 9.7.4 Operational Phase – Terrestrial Indirect Impacts

#### **Terrestrial Operational Indirect Impacts due to SHD Topside Development**

##### *Noise, Traffic and Human Activities due to Residents*

**9.7.4.1** Noise, traffic and human activities will increase during operational phase, and might affect the abundance and distribution of fauna in habitats adjacent to the development areas.

**9.7.4.2** The operation of the eastern connection access on Sham Shui Kok Drive and western access via Tai Ho Interchange would pose certain disturbance to the wildlife. According to the preliminary traffic assessment, most of the traffic from the development would be using the interchange at Siu Ho Wan at the western side of the development. It is estimated that around 160 vehicles per hour would be using this eastern connection as an access leaving and entering the development. The western access, on the other hand, would be in form of a short viaduct of approximately 50m long connecting the podium to the Tai Ho Interchange which will be constructed as part of the Tung Chung East development.

**9.7.4.3** Areas adjacent to the Subject Site as well as the connection access are covered by railway and highway. Utilisation of these habitats by fauna is very low due to the high level of disturbance. The hillside (mainly shrubland/grassland) to the south of the North Lantau Highway is natural habitats, and is separated from the Subject Site by highway and railway. Fauna (e.g. Greater Coucal, Black Kite) currently inhabiting

the habitats in this hillside are subjected to the existing noise of traffic and are probably habituated to the disturbance from noise and dust. The bat roost will be about 500m from the buildings in the Subject Site. Moreover, most of the activities during operational phase would be indoors activities. Hence, the roosting bats are not expected to be affected by the activities during operational phase. The proposed residential and commercial development are of low disturbance level as most activities are indoor, and would cause insignificant increase noise and human activities during operational phase.

#### *Artificial Lightings of Residential Buildings*

**9.7.4.4** Artificial lighting will increase within the development site during operational phase, and potentially affect the behaviour and distribution of nocturnal animals, including bats, birds, reptiles and amphibians, especially in habitats near Tai Ho Wan.

**9.7.4.5** Habitats adjacent to the Subject Site are mostly urbanised/disturbed. Based on the disturbed existing condition, the potential impact of artificial lightings to nocturnal animals in habitats near the Subject Site is ranked as **Insignificant**. The nearest natural habitats are found on the hillsides to the south of the North Lantau Highway, separated from the Subject Site by highway and railway. These hillsides are mainly covered by Shrubland/Grassland, which only supported low diversity and abundance of fauna.

#### *Barrier Effects of Residential Buildings for Flight of Avifauna*

**9.7.4.6** Large-sized waterbirds and raptors generally have lower maneuverability. If high rising structures such as buildings are constructed along their regular flight paths, these birds might need to change their flight paths and cause a disturbance impacts to them. This concern would be higher if the regular flight paths between breeding colonies such as egreties and foraging habitats are blocked. This is because the breeding birds might need to spend additional energy to fly to and fro their feeding habitats and thus might have indirect influences on their breeding success. This impact, however, is not considered relevant for the present proposed development as no egreties or other significant avifanua breeding sites are reported on Lantau for years. In addition, no large number of waterbirds was recorded in nearby areas from ecological surveys or reviewed literature. It is thus not anticipated any influences/impact would be caused to breeding sites or regular flight paths of any avifauna by the buildings of the proposed development. The potential impact to barrier effect to flight paths of birds is ranked as **Insignificant**.

#### **Terrestrial Operational Indirect Impacts due to Railway Development**

**9.7.4.7** The reprovisioned SHD will be operating underneath the proposed SHD Topside Development. Potential indirect impacts (i.e. noise,

traffic, artificial lighting and human activities) from SHO would be insignificant.

**9.7.4.8** The impacts discussed above are summarized in **Table 9.20**.

## **9.8 Impact Evaluation for Marine Ecology**

### **9.8.1 Construction Phase – Marine Direct Impacts**

**9.8.1.1** There will be neither marine works nor marine traffic for the Project and thus there will be no loss of marine habitats within the Assessment Area.

### **9.8.2 Construction Phase – Marine Indirect Impacts**

#### **Marine Constructional Indirect Impacts due to SHD Topside Development**

##### *Site Runoff*

**9.8.2.1** During the construction phase, the marine waters would be potentially impacted by surface runoff, especially during rainstorm. The surface runoff might be polluted by:

- Boring and drilling water;
- Wheel washing water;
- Water for testing and sterilization of water retaining structures and water pipes;
- Wastewater from building construction and site facilities; and
- Acid cleaning, etching and pickling wastewater.

**9.8.2.2** Elevated suspended solids levels caused by site runoff (if without proper control) could increase the suspended solids load in the water bodies, and could decrease dissolved oxygen levels. A lower oxygen level would affect stationary species, whilst mobile species would tend to temporarily avoid the area. The result could be a temporary reduction in aquatic life abundance and/or change in distribution. The ecological value of coastal waters within the Assessment Area is ranked as moderate. Species of conservation importance found in the marine waters within the Assessment Area include *Guaiagorgia* sp., *Tachypleus tridentatus*, *Carcinoscorpius rotundicauda*, *Glossogobius olivaceus* and Chinese White Dolphin. *Guaiagorgia* sp. is commonly found in western waters of Hong Kong, and impact to *Tachypleus tridentatus* is not likely as it was recorded in Tai Ho Wan, while Chinese White Dolphin are mobile species which can avoid small scale unfavorable conditions.

**9.8.2.3** According to the latest implementation plan, all the foundation works for SHD Topside Development will be conducted under the SHD Replanning Works. Hence, construction of SHD Topside Development

would not generate any surface runoff contaminated by bentonite slurries which are only involved for piling.

- 9.8.2.4** In addition, there is an existing access road of a width about 9m between the Subject Site and the seawall. Hence, the chance of runoff released to marine habitats will be very low. Besides, as the SHD Topside Development is constructed atop the reprovisioned SHD rather than on ground level and without extensive earth works, runoff could be easily collected by the temporary construction drainage system. The potential impact due to runoff to marine waters is considered **Minor**.

#### *Marine Traffic*

- 9.8.2.5** In the Project, it is expected that construction materials will be transported by construction vehicles via the existing highways and slip roads. No marine traffic required for construction phase is anticipated.

### **Marine Construction Indirect Impacts due to Railway Development**

#### *Underwater Noise*

- 9.8.2.6** In addition to site runoff impact as discussed in **Section 9.8.2.1** to **9.8.2.4**, piling works are required for the foundation works of the SHO and SHD Replanning Works, including that for the SHD Topside Development. There may be concern about potential disturbance to the Chinese White Dolphin as cetaceans are acoustically sensitive and rely on sound as a primary means of exploration and communication. Most marine mammals rely on echo-location method to navigate and detect prey. Percussive piling for marine-base works is one of the works activities known to be disturbing to cetaceans. Land-based percussive piling may also generate vibration which would propagate through the geological media and may reradiate as acoustic wave in the sea, though propagation through all these media would have provided significant attenuation in vibration already. Percussive piling may therefore generate ground vibration and hence underwater noise, which may cause disturbance impact to the Chinese White Dolphin. Although low occurrence of CWD has been recorded in northeast Lantau in recent years (Hung, 2016), as a precautionary measure, percussive piling will not be adopted in this Project and quiet bored piling method will be used instead. Therefore, potential noise and vibration impacts that would arise from percussive piling would be avoided. The potential impact to Chinese White Dolphin due to underwater noise is therefore expected to be insignificant.

#### *Surface Runoff*

- 9.8.2.7** Sites of conservation importance (including The Brothers Marine Park, the proposed marine park under the Expansion of Hong Kong International Airport into a Three-Runway System), species of conservation importance and other marine wildlife may be indirectly affected by potential water quality impact, if uncontrolled, such as from

construction site run-off, accidental spillage, and sewage effluent from construction workforce, as well as groundwater from contaminated areas, and contaminated site run-off (e.g. bentonite slurries, concrete washings, and grouting materials at construction site; fuel, oil and lubricants from construction vehicles and equipment). With the implementation of recommended water quality mitigation measures, as well as the adoption of guidelines and good site practices for handling and disposal of construction discharges (refer to Water Quality Impact Assessment of this EIA Report for details), potential impacts on marine ecological resources due to water quality deterioration by land-based construction works are not expected.

### 9.8.3 Operational Phase – Marine Direct Impacts

**9.8.3.1** There is no reclamation and marine mode of transportation will not be required during the operational phase for the proposed Comprehensive and Commercial Development atop Siu Ho Wan Depot, and therefore no direct impacts on marine ecology is anticipated.

### 9.8.4 Operational Phase – Marine Indirect Impacts

#### **Marine Operational Indirect Impacts due to SHD Topside Development**

##### *Hydrological Change*

**9.8.4.1** As there is no reclamation or dredging works for the Project, it is anticipated that the Project would not induce significant hydrological change in the nearby water bodies. Hence, no indirect ecological impact due to hydrological change is anticipated.

##### *Sewage and Emergency Discharge*

**9.8.4.2** During operation, all sewage generated from the proposed development will be diverted to public sewage treatment facilities, i.e. Siu Ho Wan Sewage Treatment Works. No net increase of pollution loading in aquatic habitats within the Assessment Area is anticipated, and no additional mitigation measure is required.

**9.8.4.3** New sewage pumping stations are proposed for the proposed development within the Subject Site. The sewage pumping stations will collect the sewage and convey the sewage to the Siu Ho Wan Sewage Treatment Works. Emergency discharge, if occurs, would still has insignificant impact on hydrology during operational phase.

**9.8.4.4** Taking into account the ecological sensitivity of the area including Tai Ho Wan and coastal waters in north Lantau, measures and additional provisions are proposed to enhance the sewerage network reliability and minimize the environmental impacts due to system failure or in case of emergency situations. Major emergency events include pump failure; rising main failure, and power failure.



**9.8.4.5** According to the **Section 5.5.3**, to mitigate the risks of pump and/or power failure, several mitigation measures are proposed to cater for the emergency situations including a) 100% standby pumping capacity within each Sewage Pumping Station (SPS), with spare pump up to 50% pumping capacity stockpiled in each SPS for any emergency use; b) dual-feed power supply; c) emergency storage tank providing up to 3-hours ADWF capacity; d) Monitoring and Control System (MACS) providing real-time notification of alert signal in emergency situation; and e) MTRC's term contractor to provide 24-7 emergency repair service in the case of emergency situation. Besides, it is proposed to adopt high density polyethylene (HDPE) pipe and ductile iron pipe for proposed gravity sewers and rising mains, and concrete surround for proposed rising mains, to mitigate the risk of bursting.

**9.8.4.6** With the above mitigations measures in place, it is considered that the possibility of emergency discharge of sewage to coastal waters of north Lantau would be minimised, and the impact is ranked as **Insignificant**.

#### **Marine Operational Indirect Impacts due to Railway Development**

**9.8.4.7** The key source of potential impacts during the operational phase would be related to potential marine water quality impacts from sewage and wastewater generated from the SHO and reprovisioned SHD. Site runoff would also be another minor source of impacts. With proper sewage and wastewater disposal and treatment arrangements, as well as storm water drainage control measures, potential operational impacts to marine ecology would be insignificant.

**9.8.4.8** The impacts discussed above are summarized in **Table 9.20**.

### **9.8.5 Impact on Marine Sites and Species of Conservation Importance**

**9.8.5.1** The Brothers Marine Park and five species of conservation importance (*Guaiaogorgia* sp., *Tachypleus tridentatus*, *Carcinoscorpius rotundicauda*, *Glossogobius olivaceus* and Chinese White Dolphin) were found within the Assessment Area, and a number of habitats and species of conservation importance were recorded in Tai Ho Wan such as mudflat and seagrass bed, horseshoe crabs, pipefish, and Ayu, etc. If without mitigation measures, surface runoff during construction phase and emergency discharge during operational phase may affect the water quality and hydrology near The Brothers Marine Park and the proposed Marine Park under the 3RS. However, the effect would be small in scale and transient. Mobile CWD would avoid such environment and would not be affected significantly. In addition, there will be no marine works, marine traffic, and the chance of emergency discharge to marine waters is would be minimised with water quality mitigation measures. Given the implementation of proposed water quality mitigation measures, no significant impacts to these recognized sites/habitats (i.e. The Brothers Marine Park, the proposed Marine Park under the 3RS and mudflats and

seagrass beds in Tai Ho Wan) and species of conservation importance are expected.

**Table 9.20** Summary of construction phase and operational phase impacts

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
<b>Terrestrial Ecology – Construction Phase – Direct Impacts</b>										
Habitat loss due to <b>SHD Topside Development</b>	<b>Podium deck, residential towers, and other supporting facilities and new SPS</b> - All atop the future upgraded depot, no impact on existing habitats <b>Utility</b> - 0.16ha <b>Eastern Connection:</b> 0.74ha <b>Western Access:</b> 0.2ha;	Urbanized / disturbed	Very low	Low flora and fauna diversity	1.1ha (0.16ha + 0.2ha + 0.74ha)	Replaced by new urbanized area	Reversible	Low	Insignificant	No
Habitat loss due to <b>Railway Development</b>	SHD replanning works and SHO	Urbanized / disturbed	Very low	Low flora and fauna diversity	30 ha	Replaced by new urbanized area	Reversible	low	Insignificant	No
	Provision of sewerage mains at the alignment south of the North Lantau Highway <b>Urban/developed area</b> - 0.26ha <b>Plantation</b> - <0.01ha	Urbanized / disturbed and Plantation	Very low / low	Low to moderate flora diversity, very low fauna diversity	Urban/developed area: 0.26ha Plantation: <0.01ha	Temporary	Reversible	low	Insignificant	Reinstatement after works
<b>Terrestrial Ecology – Construction Phase – Indirect Impact</b>										
<b>SHD Topside Development:</b> Noise, dust, light and human activities	General Building Construction works Construction of utility Construction of eastern and western access roads	Urbanized area, limited impact on the natural habitat (separated by NLH)	Areas adjacent to the works area are mostly urbanized, very low	Mostly common species, species of conservation importance located away	Vary with locations	Temporary	Reversible	Minor	Insignificant	No ecological mitigation measure is required, but good site practice should be conducted.

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
			ecological value	from the works area						
<b>SHD Topside Development:</b> Site runoff	General Building Construction works Construction of utility Construction of eastern and western access roads	Channelized watercourse	Low for channelized watercourse	Romer's Tree Frog	Vary with locations	Temporary	Reversible	Minor	Minor	No ecological mitigation measure is required, but good site practices and implementation of measures to control site runoff to watercourse should be conducted.
<b>SHD Topside Development:</b> Construction traffic	Induced terrestrial traffic	Urbanized area	Very low	Common terrestrial species	Small	Temporary	Reversible	Minor	Insignificant	No
<b>Railway Development:</b> Noise, dust, light and human activities	SHO, SHD replanning works and provision of sewerage system connecting to Siu Ho Wan Sewage Treatment Works	Urbanized area, limited impact on the natural habitat (separated by NLH)	Areas adjacent to the works area are mostly urbanized, very low	Mostly common species, species of conservation importance located away	Vary with locations	Permanent	Reversible	Minor	Insignificant	No ecological mitigation measure is required, but good site practice should be conducted.

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
			ecological value	from the works area						
<b>Terrestrial Ecology – Operational Phase – Direct Impact</b>										
Permanent Habitat loss due to <b>SHD Topside Development</b>	<b>Podium deck, residential towers, and other supporting facilities and new SPS -</b> Replaced by same urbanized habitat <b>Utility</b> - Replaced by same urbanized habitat <b>Eastern &amp; western accesses:</b> Replaced by same urbanized habitat	Urbanized area	Very low	Common terrestrial species	1.1ha	Permanent	Non-reversible	Moderate	Insignificant	No
Permanent Habitat loss due to <b>Railway Development</b>	(Habitat loss addressed under direct impacts of construction phase above)									
<b>Terrestrial Ecology – Operational Phase – Indirect Impact</b>										
<b>SHD Topside &amp; Railway Development:</b> Noise, traffic and human activities	Proposed development	Urbanized area, limited impact on the natural habitat (separated by NLH)	Very low	Common terrestrial species	Vary with locations	Permanent	Non-reversible	Moderate	Insignificant	No
<b>SHD Topside &amp; Railway Development:</b>	Proposed development	Nocturnal fauna adjacent to the	Vary with habitat types	Nocturnal fauna	Vary with locations	Permanent	Non-reversible	Low	Insignificant	No ecological mitigation measure is required, but

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Artificial lightings		development areas								precautionary measures, environmental-friendly design of lightings will be adopted
<b>SHD Topside &amp; Railway Development:</b> Barrier effects to bird flights	Proposed development	Waterbirds and raptors	Vary with habitat types	Mostly common species	Low	Permanent	Non-reversible	Insignificant as no major flight paths were identified	Insignificant	No
<b>Marine Ecology – Construction Phase – Direct Impact</b>										
<b>SHD Topside &amp; Railway Development:</b> Habitat loss	No marine works, no habitat loss									No
<b>Marine Ecology – Construction Phase – Indirect Impact</b>										
<b>SHD Topside &amp; Railway Development:</b> Site and surface runoff	Proposed development	Marine habitats (including The Brothers Marine Park, the proposed marine park under the Expansion of Hong Kong	Vary with habitats	Marine organisms especially <i>Guaiagorgia</i> sp., <i>Tachypleus tridentatus</i> , <i>Carcinoscorpius rotundicauda</i> ,	Low abundance of <i>Guaiagorgia</i> a sp., <i>Tachypleus tridentatus</i> , <i>Carcinoscorpius rotundicauda</i>	Temporary	Reversible	Minor	Minor	No ecological mitigation measure is required, but water mitigation measures and good site practices will be adopted.

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
		International Airport into a Three-Runway System)		<i>Glossogobius olivaceus</i> and CWD	<i>da, Glossogobius olivaceus</i> and CWD					
<b>SHD Topside Development:</b> Marine Traffic	No marine construction traffic									
<b>SHD Topside &amp; Railway Development:</b> Underwater noise	Foundation works	Marine habitats	Vary with habitats	CWD	Low abundance of CWD - No recent records in surrounding waters	Temporary	Reversible	Minor	Insignificant	No ecological mitigation measure is required, but quiet bore piling method will be adopted.
<b>Marine Ecology – Operational Phase – Direct Impact</b>										
<b>SHD Topside &amp; Railway Development</b> Permanent habitat loss	No marine works, no habitat loss									No
<b>Marine Ecology – Operational Phase – Indirect Impact</b>										
<b>SHD Topside &amp; Railway Development:</b> Hydrological change	No reclamation or marine works, no change in hydrology									

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
<b>SHD Topside &amp; Railway Development:</b> Sewage and emergency discharge	Sewage pumping station and sewer	Marine habitats	Vary with habitats	Marine organisms especially <i>Guaiagorgia</i> sp., <i>Tachypleus tridentatus</i> , <i>Carcinoscorpius rotundicauda</i> , <i>Glossogobius olivaceus</i> and CWD	Low abundance of <i>Guaiagorgia</i> sp., <i>Tachypleus tridentatus</i> , <i>Carcinoscorpius rotundicauda</i> , <i>Glossogobius olivaceus</i> and CWD	Temporary	Reversible	Minor	Insignificant	No ecological mitigation measure is required, but measures on minimising emergency discharge in proposed sewage pumping station will be adopted.



## 9.9 Mitigation Measures

### 9.9.1 Considerations for Impact Avoidance

**9.9.1.1** No ecological mitigation measures apart from general good site practices are considered necessary for this project as impacts identified during both construction and operation phases are considered either ‘minor’ or ‘insignificant’. Following the “Avoid, Minimize and Compensate” approach of dealing with impacts as stipulated in TM-EIAO, the feasibility to avoid impacts was first examined. Where impacts are anticipated, efforts were made to minimise the impacts such as by refining the extents or scopes.

#### **Avoidance of Recognised Sites of Conservation Importance**

**9.9.1.2** All the recognised sites of conservation importance, including Country Park, SSSI, EIS, and Marine Park have been avoided and will not be encroached by any developments under the Project.

#### **Avoidance of Marine Works**

**9.9.1.3** As The Brothers Marine Park is only around 200m north to the Subject Site, any induced marine traffic from the proposed development may cause adverse impact to The Brothers Marine Park and Chinese White Dolphin. Hence, marine works and marine traffic are avoided in the current preliminary design, to avoid potential impact on the marine park and Chinese White Dolphin.

#### **Avoidance of Percussive Piling for Site Formation**

**9.9.1.4** The use of percussive piling would be avoided as it would potentially generate comparatively high levels of noise and vibration impacts to nearby ecological sensitive receivers that may be present. Instead, a quieter construction method, bored piling would be adopted to minimise potential noise and vibration ecological disturbance.

### 9.9.2 Considerations for Impact Minimisation

#### **Minimization of Habitat and Vegetation Loss**

**9.9.2.1** The construction and operation of the SHD Topside and Railway development would not result in the loss of natural habitats. The existing urbanized/disturbed habitat of the works area currently supports some landscape plantings. Affected trees would be minimized as addressed in the Landscape and Visual Impact Assessment of this EIA Report.

#### **Minimizing Disturbance Impacts**

**9.9.2.2** Good site practice should be implemented to further minimise impacts from disturbance such as noise, air quality and water quality issues, as addressed in their respective assessment chapters of this EIA Report.

### **Minimise the Surface Runoff from Construction Site**

**9.9.2.3** During the construction phase, site runoff and drainage would be controlled at all work sites, and a temporary drainage system would be implemented to ensure that the surface run-off with high concentration of suspended solid (SS) would not be discharged to coastal waters or watercourses. Runoff would need to pass through sedimentation tanks to reduce the concentration of SS. In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented on site as far as practicable to control site runoff and drainage at all work sites during construction, so that the treated runoff will be discharged to public drainage system in compliance with the WPCO. Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed. Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/rivers should be identified. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines. The best practices are detailed in **Section 5** of EIA on Water Quality.

### **Minimise chances of emergency discharge in ultimate sewage pumping station**

**9.9.2.4** In order to protect ecological sensitive receivers of marine waters, the following additional provisions are proposed to enhance the sewerage network reliability and minimize the environmental impacts due to system failure or in case of emergency situations:

- Standby pumps;
- Spare pumps;
- Backup power supply;
- Monitoring and control system;
- Emergency storage facilities;
- Emergency repair;
- Twin rising mains; and
- Concrete surround protection for rising mains.

**9.9.2.5** With the abovementioned design/provisions implemented, the possibility of emergency discharge of sewage from the proposed SPS would be minimised.

## **9.9.3 Recommended Precautionary Measures**

**9.9.3.1** As an amphibian species of conservation importance, Romer's Tree Frog was recorded in the downstream end of a channelized section of watercourse, which might potentially be disturbed indirectly during

construction phase by surface runoff from a section of the utility of SHD Topside Development, which aligns along an access road parallel with that channelized watercourse. Though encroachment on watercourse has been avoided, site runoff might potentially enter the watercourse and in turn disturb the species if without control. The potential impact to Romer's Tree Frog is ranked as Minor given the low abundance of the species and the small scale of the works. To take a precautionary approach, besides usual good site practices, implementation of suitable control of site runoff is required to minimize the potential impact from construction works to the watercourse.

## 9.10 Cumulative Impacts

### 9.10.1 Concurrent Projects

**9.10.1.1** In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operational period for this Study has been conducted and a list of the concurrent projects identified at this stage is provided in **Section 1.7** of this EIA report, with **Figure 1.2** showing the locations of these concurrent projects. As neither marine works nor marine traffic is involved in the proposed Project, no direct cumulative impacts to marine ecology are anticipated. Besides, only bore piling instead of percussive piling will be adopted, cumulative impact on underwater noise will be negligible. With the adoption of the mitigation measures, indirect cumulative impacts (e.g. water quality) to marine ecology will not be anticipated. Among the concurrent projects, not all of them are relevant to terrestrial ecology. Some projects would have their works finished before the commencement of Project construction (e.g. OWTF Phase I), and thus irrelevant to cumulative impacts in construction phase disturbance impacts. Some other projects would cause little or no permanent terrestrial habitat loss (e.g. SHO and SHD Replanning Works), and thus not relevant to the cumulative impacts of permanent terrestrial habitat loss in operational phase. The potential occurrence of cumulative impacts would be mostly determined by the nature of the projects, the project scales, and the distances between the projects. The cumulative impacts were assessed based on Section 4.3.3 of the EIAO-TM.

**9.10.1.2** The table below (**Table 9.21**) summarizes the relevancy of the concurrent projects and the potential impacts involved. A total of 13 concurrent projects are included in the table. Project relevant to ecology is examined individually. For those projects identified as relevant with potential cumulative impacts, the cumulative impacts are further discussed in **Sections 9.10.2** and **9.10.3**.

**Table 9.21** Potential impacts of concurrent projects and relevancy with ecology

Item	Concurrent Projects	Project Proponent	Programme		Potential cumulative impacts (Construction Phase)	Potential cumulative impacts (Operational Phase)
			Start	Complete		
1	Tung Chung New Town Extension	CEDD	2017	2030	<b>Potential cumulative disturbance impacts to terrestrial habitats near the Subject Site due to construction of Road P1.</b> Marine works NOT relevant.	<b>Relevant to cumulative terrestrial natural habitat loss on Lantau;</b> <b>Relevant to terrestrial disturbance impacts due to traffic of Road P1.</b> Marine works NOT relevant.
2	HZMB HKBCF	HyD	2011	Under Review	Not Relevant – Marine based development unlikely affects terrestrial ecology.	Not Relevant – Unlikely to cause disturbance on terrestrial ecology given the distance.
3	Topside development at the HKBCF Island	CEDD & PlanD	-	-	<b>Potential cumulative disturbance impacts to terrestrial habitats due to construction of utilities and water reservoir.</b>	Not Relevant – disturbance caused by induced traffic restricted to existing highways. No disturbance anticipated from the operation of utilities and water reservoir
4	HKIA 3RS	Airport Authority Hong Kong	2017	2023	Not Relevant – Marine based development unlikely to cause disturbance on terrestrial ecology given the distance.	Not Relevant – Loss of existing urbanised habitats on Airport Island will be replaced by similar habitat (i.e. urbanized); Disturbance caused by induced traffic restricted to existing highway.
5	NCD at the HKIA	Airport Authority Hong Kong	-	First phase of NCD is targeted for completion in 2021.	Not Relevant – Unlikely to cause disturbance on terrestrial ecology given the distance.	Not Relevant – Loss of existing urbanised habitats on Airport Island will be replaced by similar habitat (i.e. urbanized); Disturbance caused by induced traffic restricted to existing highway.

Item	Concurrent Projects	Project Proponent	Programme		Potential cumulative impacts (Construction Phase)	Potential cumulative impacts (Operational Phase)
			Start	Complete		
6	OWTF Phase I	EPD	2014	2016	Not Relevant – The construction phase would be completed before commencement of the proposed Project.	Not Relevant – Loss of existing urbanised habitats will be replaced by similar habitat (i.e. urbanized); Disturbance caused by induced traffic restricted to existing highway.
7	TM-CLK Link	HyD	2011	Northern connection: 2020 at the earliest  Southern connection: 1 <sup>st</sup> Half of 2019 at the earliest	Not Relevant – the construction phase most likely would be completed before commencement of the proposed Project.	<b>Relevant to cumulative terrestrial natural habitat loss on Lantau;</b> Not Relevant – Disturbance caused by induced traffic restricted to existing highway.
8	HZMB HKLR	HyD	2012	2017	Not Relevant – the construction phase most likely would be completed before commencement of the proposed Project.	<b>Relevant to cumulative terrestrial natural habitat loss on Lantau;</b> Not Relevant – Disturbance caused by induced traffic restricted to existing highway.
9	Construction of Additional Sewage Rising Main and Rehabilitation of the Existing Sewage Rising Main between Tung Chung and Siu Ho Wan	DSD	Mid-2023	2025	<b>Potential cumulative disturbance impacts to terrestrial habitats near the Subject Site.</b>	Not Relevant – no disturbance caused by the operation.
10*	Developments at Siu Ho Wan and the Associated Transport Infrastructures	CEDD	-	-	Reclamation not relevant; No programme for landside development.	Reclamation not relevant; No programme for landside development.
11*	Sediment Disposal Facility in South of Brothers	CEDD	2012	2023	Not Relevant – Marine based development unlikely affects terrestrial ecology.	Not Relevant – Unlikely to cause disturbance on terrestrial ecology given the distance.

Item	Concurrent Projects	Project Proponent	Programme		Potential cumulative impacts (Construction Phase)	Potential cumulative impacts (Operational Phase)
			Start	Complete		
12 *	The remaining identified Potential Near Shore Reclamation Sites in Western Waters of Hong Kong under Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement (i.e. Sunny Bay and Lung Kwu Tan)	CEDD	-	-	Not Relevant – Marine based development unlikely affects terrestrial ecology.	Not Relevant – Unlikely to cause disturbance on terrestrial ecology given the distance.

Note:

Text in bold indicates the potential cumulative impacts that are relevant to the SHD Topside Development.

\* Projects not included in Chapter 1 but considered relevant with Ecology.

**9.10.1.3** Details of the relevant concurrent projects during the construction and/or operational phases are detailed below.

*Tung Chung New Town Extension*

**9.10.1.4** The project comprised of approximately 130ha of reclaimed land and 120ha existing land for the development of Tung Chung East and Tung Chung West developments respectively. Besides the residential and commercial development, different infrastructural works would also be carried out. The Road P1 (Tung Chung - Tai Ho Section) would also be built under the Tung Chung New Town Extension project. The construction phase of the project would commence in 2017 and would be completed by 2030.

**9.10.1.5** The majority of habitat loss would occur to the west of Tung Chung New Town, with a small area of urbanized habitat adjacent the proposed reclamation near the publish pier. These habitat losses however are far from the Siu Ho Wan area, and are unlikely to be utilized by the same terrestrial fauna individuals in Siu Ho Wan, or vice versa.

**9.10.1.6** There is a large separation distance of about 1.2km between the Tung Chung New Town Extension (Tung Chung East Planning Area) and the proposed development. However, the Road P1 (Tung Chung – Tai Ho Section) is only 50m away from the western boundary of the proposed development. Cumulative environmental impacts (including fugitive dust and airborne noise) during construction phase of the Project are therefore anticipated. The vehicular emissions and road traffic noise generated would have certain cumulative impacts on the Project during operation.

### Topside Development of HKBCF

- 9.10.1.7** Besides the essential cargo and passenger clearing and vehicle inspection facilities and government offices on HZMB HKBCF, a planning, engineering and architectural is now being conducted to explore the feasibility of developing large-scale hotel, dining, shopping and entertainment facilities to develop bridgehead economy and optimize the HKBCF. There is currently no confirmed programme for the construction of the topside development of HKBCF.
- 9.10.1.8** The development also involves a new water service reservoir on the hill slope to the east of Siu Ho Wan Water Treatment Works near the eastern end of the 500m Assessment Area. The exact habitat losses would be caused by this proposed service reservoir is not sure at this stage but it is expected that the loss would be mostly shrubland/grassland habitat. The habitat losses caused by the new service reservoir however are of certain distance (from the Depot and are of different habitat types (mainly shrubland/grassland vs mainly urbanized/disturbed), and are thus unlikely to be utilized by the same batches of terrestrial fauna individuals. The water pipeline of the HKBCF topside would only cause very minor temporary habitat loss impacts and should be negligible.
- 9.10.1.9** Given the large separation distance of about 2km between HZMB HKBCF and the proposed development, cumulative environmental impacts during construction phase of the Project is not anticipated. Cumulative impact to terrestrial habitat loss is not expected as it is on a reclaimed land. While the vehicular emissions and road traffic noise would only be restricted to existing highway during operation.

### Tuen Mun – Chek Lap Kok Link (TM-CLK Link)

- 9.10.1.10** TM-CLK Link includes a 9-km long dual two-lane carriageway between Tuen Mun and North Lantau. This strategic road link is designed to meet the anticipated road traffic demand generated by HZMB and provide significant reduction in travelling distance and time across, northwest New Territories, HKIA and North Lantau.
- 9.10.1.11** The construction of TM-CLK Link has been commenced in 2013 and it is anticipated that the north connection would be completed by 2020 at the earliest, whereas the south section is anticipated to be completed by the 1<sup>st</sup> half of 2019 at the earliest. Cumulative environmental impacts during construction phase of TM-CLK Link include habitat loss and airborne noise. Since the site formation of TM-CLK Link near the southern connection was completed, significant cumulative fugitive dust is therefore not anticipated. Vehicular emission and road traffic noise impacts are also anticipated during operation phase due to the induced traffic flow. Cumulative impacts on other environmental aspects are not anticipated due to the nature of the project.

*Hong Kong-Zhuhai-Macao Bridge (HZMB) Hong Kong Link Road (HKLR)*

**9.10.1.12** The HZMB HKLR is a 12km-long road connecting the HZMB HKBCF to the HZMB Main Bridge. The HZMB HKLR comprised of a 9.4km long viaduct from Hong Kong boundary to Scenic Hill on the airport island, a 1km long tunnel section to the land formation formed along the east coast of the airport island and a 1.6km long at-grade road section on the land formation connecting to HZMB HKBCF. The construction of HZMB HKBCF has been commenced in 2011, while the construction programme is now being under review.

**9.10.1.13** Cumulative impact would be the habitat loss in the Scenic Hill. Given the large separation distance of about 3.8km between HZMB HKBCF and the proposed development, other cumulative environmental impacts during construction phase of the Project is not anticipated. The vehicular emissions and road traffic noise would be restricted to existing highway.

*Construction of Additional Sewage Rising Main and Rehabilitation of the Existing Sewage Rising Main between Tung Chung and Siu Ho Wan*

**9.10.1.14** A section of 6.5km alignment of the gravity sewer/rising main under the project of DSD “Construction of Additional Sewage Rising Main and Rehabilitation of the Existing Sewage Rising Main between Tung Chung and Siu Ho Wan”, however, overlaps with the alignment options of the utility under the SHD Topside Development. But additional habitat loss is not anticipated, as both the sewers for Tung Chung New Town and the Project are underground and the temporary loss of urbanized/disturbed habitat would be reinstated upon completion of construction works. There will be no operational impact for this concurrent project, no cumulative impact during operational phase is expected.

## **9.10.2 Cumulative Impacts during Construction Phase**

**9.10.2.1** For the contributions/influences related to marine ecology, there will be neither marine works nor marine traffic, and all the works will be land-based in nature. No cumulative impacts to marine ecology are anticipated.

**9.10.2.2** For terrestrial ecology, relevant concurrent projects that involve land-based construction works contributed to cumulative impacts, are presented in **Table 9.21** above.

### **Construction Phase Disturbance Impacts to Terrestrial Habitats**

**9.10.2.3** Some concurrent projects that involve land-based construction works would have their implementation/construction programmes overlapped with the Project and are considered relevant with construction cumulative disturbance impacts.



- 9.10.2.4** The implementation programme of topside development at the HKBCF Island is not available yet, but as the location of major works on Lantau, i.e. the service reservoir is of a certain distance to the proposed Subject Site. Significant cumulative disturbance impacts are not anticipated.
- 9.10.2.5** The section of the gravity sewer/rising main for Tung Chung New Town between Tung Chung and Siu Ho Wan overlaps with the utility. Cumulative impacts to the channel may occur. With good site practices to be implemented, cumulative impacts to the channel will be limited.
- 9.10.2.6** Tuen Mun-Chek Lap Kok Link and Road P1 in Tung Chung New Town Extension are the nearest to the Subject Site as well as the Eastern Connection to Sham Shui Kok Drive and the Western Access to Tai Ho Interchange. However, the construction works of Tuen Mun-Chek Lap Kok Link will be finished soon (exact date under review), which may not overlap with the Project. Road P1 involves reclamation within the present Assessment Area, but the land-based works would not be large as there will not be large-scaled site formation works after reclamation. The disturbance level would be low and the potential of causing cumulative disturbance impacts to terrestrial habitats would be low.
- 9.10.2.7** Disturbance to terrestrial habitats from projects in North Lantau during their construction phase, including 3RS, NCD at the HKIA, HKLR, and HKBCF is anticipated to be negligible due to the long separation distance.

### **9.10.3 Cumulative Impacts during Operational Phase**

- 9.10.3.1** As there will be no reclamation, low likelihood of emergency discharge to marine waters, or marine traffic during operational phase, no cumulative impacts to marine ecology are anticipated.

#### **Loss of Terrestrial Habitats**

- 9.10.3.2** Cumulative terrestrial habitat loss on North Lantau from the concurrent projects includes water service reservoir and its water pipelines for HKBCF topside development (size not yet available), the terrestrial portion of Tuen Mun-Chek Lap Kok Link, Hong Kong Link Road and Tung Chung New Town Extension. The known sizes of habitat loss from the concurrent projects are shown in **Table 9.22**. The present Project contributes about 35% of urbanized area, but none on any natural habitats. The habitat is of low ecological values. The present Project mainly contributes on the loss of urbanised area habitat, which will be replaced by similar habitats during the operation phase. Therefore the present Project indeed has no influence on the natural habitats on North Lantau and thus the inhabiting wildlife.

**Table 9.22** Known terrestrial habitat loss from the concurrent projects

Habitat	Proposed development (SHD Topside & Railway Development)	Tung Chung New Town Extension	TM-CLK Link	HKZMB HKLR	Total
	Size (ha)				
Urbanized	31.1 ha (1.1ha from SHD Topside Development & 30 ha from Railway Development)	27.46	27.97	-	85.73
Orchard	-	18.11	-	-	18.11
Woodland	-	5.72	0.53	-	6.25
Fung shui woodland	-	0.2	-	-	0.2
Dry abandoned agricultural land	-	4.77	-	-	4.77
Dry active agricultural land	-	1.92	-	-	1.92
Wet abandoned agricultural land	-	1.68	-	-	1.68
Plantation	<0.01	1.94	6.59	-	8.53
Shrubland/grassland	-	5.61	0.68	3	9.29
Tall shrubland	-	-	4.75	-	4.75
Wasteland	-	-	1.45	-	1.45
watercourse	-	0.16 (210m)	-	-	0

### **Operational Phase Disturbance Impacts to Terrestrial Habitats**

**9.10.3.3** Terrestrial noise and air pollution generated by traffic due to the concurrent projects during operational phase are not expected to contribute significantly to existing noise levels near the North Lantau Highway as the background noise level from the Highway is high already, and are mostly within the existing highway corridor.

**9.10.3.4** The HKBCF (topside development), 3RS and Tung Chung New Town Extension will be distant away from the Subject Site, and hence the cumulative impact of terrestrial disturbance due to noise and lighting during operational phase will be unlikely. No significant impact due to fragmentation, pollution emission, lighting and noise to terrestrial habitats of North Lantau and associated fauna was predicted during the EIA studies of TM-CLK Link and HKLR, 3RS or Tung Chung New Town Extension. With the implementation of the recommended mitigation measure and/or design approach in the respective projects, significant cumulative impact on the important habitats and sites of conservation importance in North Lantau is not anticipated.

## 9.11 Residual Impacts

### 9.11.1 Residual Impacts for Marine and Terrestrial Ecology

**9.11.1.1** Residual environmental impact refers to the net environmental impact after the implementation of all mitigation measures, with the background environmental conditions and the impact from existing, committed and planned projects in nearby areas being taken into account.

**9.11.1.2** No residual marine ecological impacts are anticipated as there will be no marine works or marine transportation.

**9.11.1.3** For terrestrial ecology, as the Project will be on an existing urbanized/disturbed habitat, which will be replaced by the same habitat type in the future development. Hence, loss of the existing urbanized/disturbed habitat will be temporary, and there will be no net loss of urbanized/disturbed habitat after construction.

**9.11.1.4** It was found in the assessments, that the identified indirect impacts (i.e. noise, dust and human activities) to the terrestrial habitats, flora and fauna species would only be minor or insignificant during both construction phase and operational phase. With the adoption of good site practices no adverse residual impact is anticipated during both construction and operational phases.

## 9.12 Conclusions

**9.12.1.1** This section of the EIA has described the potential terrestrial and marine ecological impacts associated with the construction and operation of the Project. The purpose of the assessment is to evaluate the acceptability of predicted impacts to terrestrial and marine ecological resources and sensitive receivers. Findings of literature review and dedicated baseline field surveys have provided information for the evaluation of species of conservation importance and ecological importance of various habitats within the Assessment Area.

**9.12.1.2** A total of 13 habitat types were identified within the Assessment Area. There are terrestrial habitats (i.e. woodland, shrubland/grassland, plantation, urbanized/disturbed, and natural watercourse and channelized watercourse) and coastal habitats (i.e. rocky shore, sandy shore, seawall, mangrove, mudflat, coastal waters, sub-tidal habitat (including hard bottom and soft bottom seabed habitats)). Many of the habitats are of very low to low ecological value, except for woodland, natural section of watercourses, shrubland/grassland, and subtidal habitats of low to moderate ecological value, coastal water of moderate ecological value, and mudflat and mangrove which are ranked as moderate to high value. Apart from this, Lantau North (Extension) Country Park, Tai Ho Priority Site for Enhanced Conservation, and The Brothers Marine Park are located within the Assessment Area but there

will be no adverse impact on any of these recognized sites of conservation importance.

- 9.12.1.3** Regarding the terrestrial species of conservation importance, 4 plant species, 3 mammal species, 11 bird species, 1 reptile species, 2 amphibian species, 1 dragonfly species and 2 aquatic fauna were recorded from both the ecological surveys and literature review. Marine fauna of conservation importance recorded within the Assessment Area from reviewed literature include *Guaiagorgia* sp., *Tachypleus tridentatus*, *Carcinoscorpius rotundicauda*, *Glossogobius olivaceus* and Chinese White Dolphin. However, none of them were recorded within the Subject Site, thus no direct impacts on these species of conservation importance are anticipated.
- 9.12.1.4** During the construction phase, construction activities would only have direct impacts on urbanized/disturbed area. Terrestrial ecological impact arising from both SHD Topside Development and Railway Development would be insignificant.
- 9.12.1.5** During the operational phase, indirect impacts including noise, traffic, human activities and artificial lightings might affect the wildlife in the vicinity. However, due to the existing disturbance in the urbanized /disturbed habitat and distance from the natural habitats, the potential impact due to these sources in operational phase is ranked as Insignificant. As there are no large number of waterbirds and egrettries in the vicinity, the potential impact of barrier effect to flight paths of birds is ranked as Insignificant.
- 9.12.1.6** For marine ecological impact, as there will be no marine works or marine traffic and chances of emergency discharge to marine waters would be minimised, unacceptable potential impacts to marine ecology is expected to be insignificant. As the use of percussive piling would be avoided, the potential impact of underwater noise to Chinese White Dolphin is expected to be insignificant.
- 9.12.1.7** As there will be neither marine works nor marine traffic, as well as the adoption of proposed water quality mitigation measures, no cumulative impacts to marine ecology are anticipated. With the implementation of the recommended mitigation measure and/or design approach in the respective projects, significant cumulative impact on terrestrial ecology is not anticipated.
- 9.12.1.8** With the implementation of the proposed mitigation measures, no adverse residual impact due to the land-based construction of proposed development, access road and the utility is anticipated.

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