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8 Ecology

8.1 Introduction

8.1.1.1 This section presents the ecological baseline resources within the assessment area, and the results of assessment of potential ecological impacts resulting from the construction and operation of the Project, which has been conducted in accordance with the criteria and guidelines as stated in Annexes 8 and 16 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) as well as the requirements given in Clause 3.4.9 and Appendix G of the EIA Study Brief (No. ESB-329/2020).

8.2 Legislation, Standards and Guidelines

8.2.1 Local Legislation, Standards and Guidelines

8.2.1.1 The relevant legislation and associated guidelines applicable to this Ecological Impact Assessment (EcoIA) include:

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations;
- Wild Animals Protection Ordinance (Cap. 170);
- Country Parks Ordinance (Cap. 208) and its subsidiary legislation;
- The Marine Parks Ordinance (Cap. 476);
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) Annexes 8 and 16;
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation;
- Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10, "Conservation";
- Planning, Environment and Lands Bureau 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. 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 Survey;
- EIAO Guidance Note No. 11/2010 – Methodologies for Marine Ecological Baseline Surveys;
- 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(第一批).

8.2.2 International Conventions and Guidelines

8.2.2.1 International conventions and guidelines potentially relevant to this EcoIA include:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES"). This Convention regulates international trade in certain animal and plant species. 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);
- International Union for Conservation of Nature (IUCN) - The World Conservation Union maintains, through its Species Survival Commission, a "Red List" of globally threatened species of wild plants and animals (see <https://www.iucnredlist.org/>); and
- 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 Convention was extended to Hong Kong on 9 May 2011.

8.2.3 Criteria of Evaluating Species of Conservation Importance

8.2.3.1 Species of flora and fauna with conservation importance were given special attention. In accordance with Table 3, Annex 8 of the EIAO-TM, the ecological value of species was assessed in terms of protection status, distribution, and rarity. For faunal species, the protection status (e.g. fauna protected under Cap. 170 (except birds as all wild birds are protected under the ordinance but their conservation importance is not equal), Cap. 586, and/or regional/global laws/conventions), the species distribution (e.g. endemic), and the rarity (e.g. rare or restricted, or level of concern highlighted in Fellowes *et al.* (2002)) was considered. Similarly, floral species of conservation importance was considered from protection status (e.g. listed under Forestry Regulations and Cap.586 in Hong Kong, listed by IUCN or CITES, or listed as Category I or II protected species in mainland China); species distribution (e.g. endemic); and rarity (e.g. considered rare or very rare by Corlett *et al.* (2000) and regarded as rare by Yip *et al.* (2010)). However, exotic invasive species, escaped cultivars or captive species, vagrants and introduced species was excluded.

8.2.3.2 The following laws/regulations and conventions for conservation are relevant with evaluation of the conservation importance of flora and fauna species:

- Forestry Regulations (Cap. 96A) which are subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96);

- Category I/II/III in List of Wild Plants under State Protection;
- Considered ‘Rare’ or ‘Very Rare’ plant species listed by Corlett *et al.* (2000) and regarded as ‘Rare’ plant species by Yip *et al.* (2010);
- China Plant Red Data Book;
- Threatened Species List of China’s Higher Plants (Qin *et al.*, 2017);
- Wild Animals Protection Ordinance (Cap 170);
- Protection of Endangered Species of Animals and Plants Ordinance (Cap 586);
- Category I or II State Protected Wild Animals;
- PRC Wild Animal Protection Law;
- China Red Data Book of Endangered Animals;
- China Species Red List;
- Red List of China’s Vertebrates;
- The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (*Species which are classified by IUCN as Near Threatened (NT), 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*);
- 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).

8.2.3.3 The species identified from both literature review and the ecological surveys as having conservation importance was further categorized in accordance with their relevance to potential impacts, which was assessed in accordance with the EIAO-TM criteria.

8.3 Methodology

8.3.1 Assessment Area

8.3.1.1 According to the EIA Study Brief, the assessment area for the purpose of the terrestrial ecological impact assessment included areas within 500m distance from the boundary of the Project and any other areas likely to be impacted by the Project. For marine ecology, the assessment area was the same as the water quality impact assessment i.e. included areas within 500m from the boundary of the Project and covered the North Western Water Control Zone as designated under the Water Pollution Control Ordinance (Cap. 358) and water sensitive receivers in the vicinity of the Project, including the Tung Chung bay area, Estuary of Tung Chung River, Wong Lung Hang Stream, Ma Wan Chung bay area, the Brothers Marine Park and Tai Ho Wan Inlet.

8.3.2 Literature Review

8.3.2.1

A review of literature was conducted to determine the existing ecological baseline conditions within the assessment area, to identify habitat resources and species of potential conservation importance, and to identify potential information gaps in the baseline conditions of the habitats. A summary of the identified literature on the public domain and the relevant Outline Zoning Plans (OZPs) is listed below.

- Tung Chung New Town Extension EIA (AEIAR-196/2016);
- Proposed Comprehensive Residential and Commercial Development atop Siu Ho Wan Depot (AEIAR-213/2017)
- Expansion of Hong Kong International Airport into a Three-Runway System (AEIAR-185/2014);
- Tung Chung Road Improvement (AEIAR-061/2002);
- Ngong Ping Cable Car (AEIAR-074/2003);
- Approved Outline Zoning Plan (OZP) No. S/I-TCV/2 (Tung Chung Valley); No. S/I-TCTC/24 (Tung Chung Town Centre Area); S/I-TCE/2 (Tung Chung Extension Area); and S/I-TH/1 (Tai Ho)
- Ecological and Conservation Importance of Tung Chung, Lantau (1st Edition) (KFBG 2013);
- Annual Reports of Monitoring of Marine Mammals in Hong Kong;
- Hong Kong Biodiversity – Newsletter of Agriculture, Fisheries and Conservation Department (AFCD);
- Publications of AFCD (e.g. Hong Kong Biodiversity – AFCD Newsletter and Hong Kong Biodiversity Database);
- Annual Reports and Other Publications of The Hong Kong Bird Watching Society;
- Memoirs of Hong Kong Natural History Society; and
- Porcupine! Newsletter of Ecology and Biodiversity, The School of Biological Sciences, The University of Hong Kong.

8.3.3 Ecological Survey

8.3.3.1

The purpose of the ecological surveys was to collect up-to-date ecological baseline information together with the reviewed literature for subsequent assessment of the ecological value of the habitats and species, evaluation of the potential ecological impact resulting from the proposed development, and provision of appropriate mitigation measures.

8.3.3.2

According to the latest design (see **Section 2**), the proposed Study only involves land-based construction and no marine works will take place. To establish the ecological baseline information covering the key ecological resources mentioned in the EIA SB, ecological surveys focused on terrestrial habitats. Marine ecological surveys including benthic survey, intertidal survey and coastal fish survey were also conducted as supplementary survey.

8.3.3.3 The survey methodology made reference to technical guidelines of ecological assessment in Annex 16 of EIAO-TM and the relevant EIAO Guidance Notes (No. 6/2010, 7/2010, No. 10/2010 and No. 11/2010). As the assessment area for present study largely overlapped with the assessment area of EIA Study Tung Chung New Town Extension (TCNTE) (AEIAR-196/2016), the survey transects and sampling locations made reference to the sampling efforts of that EIA. In addition to the survey efforts refer to that EIA, focus was put on the Project Site of present Study.

8.3.3.4 Since no marine works would be involved for the proposed works, marine ecological surveys for coral communities and marine mammals were considered not necessary. Though marine ecological impact assessment would be covered, and the marine ecological baseline was established by desktop review, besides the supplementary marine ecological surveys (i.e. benthic survey, intertidal survey, and coastal fish survey).

8.3.4 Ecological Survey Methodology

Habitat and Vegetation Survey

8.3.4.1 Habitats within the assessment area were identified, sized and mapped based on government latest aerial photos and field ground-truthing. Representative areas of each habitat type were surveyed on foot. A habitat map of suitable scale (1:1000 to 1:5000) showing types and locations of habitats within the assessment area was prepared.

8.3.4.2 Plant species of each habitat type and their relative abundance were recorded with special attention to rare or protected species. Nomenclature and conservation status of plant species followed Hong Kong Herbarium and Corlett *et al.* (2000).

Terrestrial Mammal Survey

8.3.4.3 All sightings, tracks, and signs of mammals (including droppings) along sampling transects (**Figure 8.1**) were actively searched. The location(s) of any mammal species of conservation importance encountered was recorded, along with notable behaviour. Night surveys were conducted to survey nocturnal mammal species (e.g. bats). Hand torch was used to search for the nocturnal mammals, bat detector was adopted to locate bats, if necessary. Nomenclature for mammals followed Shek (2006).

Avifauna Survey

8.3.4.4 The avifauna of each habitat types within the assessment area was surveyed using transect count method (**Figure 8.1**). The presence and abundance of avifauna species at various habitats observed from transects were recorded visually and aurally. Bird species encountered outside sampling transects but within the assessment area were also recorded. The survey covered both high-tide and low-tide period of Tung Chung Bay. Night surveys were conducted to record nocturnal avifauna (e.g., owls). The location(s) of any avifauna species of conservation importance encountered was recorded, along with notable behaviour.

Ornithological nomenclature in this study followed the latest Hong Kong Bird Watching Society List of Hong Kong Birds.

Odonate and Butterfly Surveys

8.3.4.5 Odonate and butterfly surveys were conducted by transect count method (**Figure 8.1**). All the odonates and butterflies encountered were recorded and had their abundance recorded. Odonate and butterfly species encountered outside transects but within the assessment area were also recorded. The location(s) of any odonate and butterfly species of conservation importance encountered was recorded, along with notable behaviour. The nomenclature and conservation status for butterflies and odonates followed Chan *et al.* (2011) and Tam *et al.* (2011) respectively.

Herpetofauna Survey

8.3.4.6 Herpetofauna surveys were conducted through direct observation and active searching in all potential hiding places such as among leaf litter, inside holes, under stones and logs along the survey transects within the assessment area. During the surveys, all reptiles and amphibians sighted and heard were recorded. Auditory detection of species-specific calls was used to survey frogs and toads during night surveys. The location(s) of any herpetofauna species of conservation importance encountered was recorded, along with notable behaviour. The nomenclature and conservation status followed Karsen *et al.* (1998) and Chan *et al.* (2005).

Aquatic Survey

8.3.4.7 Aquatic fauna, including freshwater macro-invertebrates (e.g. freshwater crabs, shrimps, freshwater molluscs and aquatic insect larvae) and fishes, in the watercourses were surveyed by direct observation and, active searching, within relevant habitats of the assessment area, particular Tung Chung River and Wong Lung Hang as well as the estuary (**Figure 8.1**). Organisms were recorded and identified to the lowest possible taxon, and their relative abundance were reported. The location(s) of any species of conservation importance encountered was recorded, along with notable behaviour. Nomenclature for fish followed Lee *et al.* (2004), while those for the macro-invertebrates followed Dudgeon (2003).

Intertidal Survey

8.3.4.8 The supplementary intertidal surveys consisted of qualitative walk-through surveys along the accessible coastlines (both natural and artificial), and quantitative transect surveys at selected survey location (**Figure 8.1**), so as to produce a comprehensive species lists of the survey areas. The conservation status (including local, regional and international such as China Redlist and IUCN Redlist) of the recorded biota was provided.

8.3.4.9 For qualitative walk-through surveys, organisms encountered were recorded and their relative abundance were noted. Attention was paid on horseshoe crab and mudskipper during qualitative walk-through surveys, if horseshoe crab and mudskipper are encountered, their numbers were recorded.

8.3.4.10 For quantitative transect surveys, at each survey location, one 50 m horizontal transect along the coastline was surveyed at each of the three tidal levels: high, middle and low. On each transect, three quadrats (50 cm × 50 cm) were placed randomly to assess the abundance and diversity of flora and fauna. All organisms found in each quadrat were identified and recorded to the lowest possible taxonomic level to allow density to be calculated. Sessile species, such as algae (encrusting, foliose and filamentous), barnacles and oysters, in each quadrat were identified to the lowest possible taxonomic level and estimated as percentage cover on the rock surface. In addition, should the transect locations prove to be soft shore, all organisms found in the top 50 cm × 50 cm × 5 cm layer (length x width x depth) of the substrate were identified to the lowest possible taxonomic level and recorded.

Coastal Fish Survey

8.3.4.11 Besides the fish recorded in the watercourse and the estuary, active search fish survey by scuba diving and direct observation targeting for estuarine areas and the connecting intertidal zone were performed at Tung Chung Bay. Particular attention was paid on seahorse and pipefish. A species list was compiled, and relative abundance was provided. Relative abundance was assessed based on the number of individuals of a single species with reference to the total number of fishes observed.

Benthic Survey

8.3.4.12 Benthic survey was conducted at 5 sampling locations in the subtidal soft-bottom habitats in Tung Chung Bay and the proposed barging point. The sampling locations are shown in **Figure 8.1**.

8.3.4.13 At each sampling location, three grab samples were collected. Benthic sediment was sampled using a grab sampler to collect representative amount of sediment. Sediment from the grab samples was sieved on board of the survey vessel, washed onto a sieve stack (comprising 1 mm and 500 µm meshes) and gently rinsed with seawater to remove all fine material. Following rinsing any materials remaining on the two screens were combined and carefully rinsed using a minimal volume of seawater into pre-labelled thick triple-bagged Ziploc plastic bags. A 5% solution of formalin containing Rose Bengal in seawater was then be added to the bag to ensure tissue preservation. Care was given to ensure the concentration of solution was not adversely diluted through rinsing into the bags. Samples were sealed in plastic containers for transferring to the laboratory for sorting and identification.

8.3.4.14 Taxonomic identifications were performed using stereo dissecting and high-power compound microscopes. Taxa were identified to the lowest practicable level. Careful sampling procedure was employed to minimize fragmentation of organisms. If breakage of soft-bodied organisms occurs, only anterior portions of fragments were counted, although all fragments were retained and weighed for biomass determinations (wet weight).

8.3.5 Ecological Survey Programme

8.3.5.1 According to the Clause 2(iii) in Appendix G of the EIA Study Brief, at least 4 months ecological surveys covering the wet season are required. The ecological surveys were undertaken in the period between August 2020 and July 2021 (**Table 8.1**) covering wet seasons to collect ecological baseline information within and near the Project as well as the 500m assessment area. The survey programme as shown in **Table 8.1** has also made reference to the EIAO Guidance Note No. 7/2010 Ecological Baseline Survey for Ecological Assessment.

Table 8.1 Programme of ecological baseline survey covering wet season

| Survey Type | 2020 | | | 2021 | | | |
|--|------|-----|-----|------|-----|-----|-----|
| | Aug | Sep | Oct | Apr | May | Jun | Jul |
| Habitat mapping & vegetation | D | | | D | | | |
| Avifauna | D | D&N | D | D&N | D | D | D |
| Terrestrial mammal | D&N | | | D&N | | | |
| Herpetofauna | | D&N | | D&N | D&N | D&N | D&N |
| Odonate & butterfly | D | D | D | D | | D | |
| Freshwater communities | | D&N | | | D&N | | |
| Intertidal community including horseshoe crab and mudskipper | D | D | | | | D | D |
| Coastal fish survey in particular seahorse and pipefish | | D | | D | | | |
| Benthic survey | | | D | | | | |

Note:

The survey from May to Jul 2021 was conducted to address the comments from the green groups during the EIA Study.

D = daytime survey; N = night-time survey

8.4 Ecological Baseline Conditions

8.4.1 General Description of the Project Site and Assessment Area based on Literature Review

The Project Site

8.4.1.1 As discussed in **Section 2**, the Project consists of east and west sections, associated works areas and a barging point. The east section is the proposed realignment of the existing Tung Chung Line (TCL) and the provision of a new at-grade Tung Chung East (TCE) Station which are located along the TCNTE new reclamation area of TCE. The west section is the proposed underground tunnel connecting the existing Tung Chung Station (TUC) with the new TCW Station to the west of Yat Tung Estate.

8.4.1.2 While the east section is located on existing developed area, the west section will go underneath a hill and the coast of Ma Wan Chung before reaching the proposed new Tung Chung West (TCW) Station west of Yat Tung Estate. The entire extension alignment would be underground with aboveground works sites/works areas at the tunnel boring machine (TBM) launching and retrieval shaft, the cut and cover works site for the proposed TCW Station box, Emergency Access Point/Emergency Egress Point (EAP/EEP), footbridge demolition, new road construction, material storage and site offices.

The Assessment Area

8.4.1.3 The assessment area includes area 500m from the boundaries of the Project Site. The east section mainly consists of four parts i.e. (1) part of Tai Ho Wan near Pak Mong Village at the eastern end, (2) the hillside of Por Kai Shan along the North Lantau Highway, (3) the developed area of TCE and the reclamation area, and (4) the coastal water.

8.4.1.4 The west section consists of the valley of Tung Chung River and Wong Lung Hang, Yat Tung Estate, Mun Tung Estate, Tung Chung Bay, Ma Wan Chung and the hill behind and the developed area around the existing TUC.

8.4.2 Recognised Sites of Conservation Importance

Tung Chung River cum Bay System

8.4.2.1 Tung Chung River is located to the southwest of Tung Chung New Town and is one of the major stream courses in North Lantau. Its catchment covers the eastern slope of Nei Lak Shan, the northern slope of Lantau Peak, and the western slope of Sunset Peak. There are two main branches of this stream, one eastern and one western. The eastern branch originates from the western slope of Sunset Peak. It flows northward from Pak Kung Au down to the bottom of the valley, and then passes Shek Mun Kap, Fong Yuen, and Shek Lau Po. The western branch originates from Tei Tong Tsai of Nei Lak Shan, and passes Chap Mun Tau, Mok Ka, Nim Yuen, and Ngau Au. The two tributaries join near Ngau Au and then flow into Tung Chung Bay.

8.4.2.2 This stream is considered of high conservation value. Chong and Dudgeon (1992) reported that the Tung Chung River is the second-most species-rich stream in the Territory (after Tai Ho Stream, also on north Lantau). In the early 2000's, both major branches were found dominated by native fish species and of high fish abundance, and the western branch was considered of higher ecological value. From the EIA study of Tung Chung New Town Extension (2015), a total of 68 fish species and 16 aquatic invertebrates were recorded in Tung Chung River and its estuary. 11 fish species are of conservation importance including Japanese Eel *Anguilla japonica*, Giant Mottled Eel *Anguilla marmorata*, Beijing Thick-lipped Barb *Acrossocheilus bejiangensis*, Predaceous Chub *Parazacco spilurus*, Rice Fish *Orizias curvinotus*, Seaweed Pipefish *Syngnathus schlegeli*, Common Seahorse *Hippocampus kuda*, Crimson-tipped Flathead Gudgeon *Butis melanostigma*, Mangrove Goby *Hemigobius hoevenii*, Spotty Band Goby *Glossogobius olivaceus*, and Archpatch Puffer *Takifugu ocellatus*.

8.4.2.3 Tung Chung River together with other 32 natural streams including Wong Lung Hang and Tai Ho Stream were identified by the government as Ecologically Important Streams (EIS) in 2005. EIS are natural streams and rivers with important ecological functions such as providing habitats for diverse or rare animal or plant communities. Except a section of the eastern branch near Shek Lau Po, Tung Chung River is basically in natural conditions from the headwater to the outlet. Part of the areas of its headwater and upstream section was included by the Lantau

North Country Park and Lantau South Country Park designated in 1978. The northern slope below the summit of Lantau Peak was also designated in 1980 as a SSSI owing to the floral interest there. In 2008, more lands of the Tung Chung upstream section was covered by the latest Lantau North (Extension) Country Park. This stream is one of the few larger watercourses in Hong Kong that has not been subjected to significant pollution (Dudgeon and Corlett 2011).

8.4.2.4 The findings for estuarine macroinvertebrates from 3RS EIA study indicated that Tung Chung River has Shannon diversity 2.59 and evenness index 0.64.

8.4.2.5 Tung Chung Bay is the largest embayment on North Lantau and has extensive mudflats with both mangroves and seagrass beds. The seagrass beds are also an important nursery and feeding ground of horseshoe crabs. A large variety of microhabitat types in Tung Chung Bay may contribute to a diverse intertidal fauna. For example, the high species richness of crabs in Mai Po, was also attributed to the large variety of microhabitats there (Lee & Leung 1999).

8.4.2.6 Intertidal soft shore communities of Tung Chung Bay were studied in the EM&A of HKLR. Mollusks were the significantly abundant phylum in the baseline environmental monitoring (relative abundance of 96.6%), followed by arthropod (relative abundance of 3.1%) at the sampling zones. Sand Snail *Batillaria multiformis*, Mud Creeper *Cerithidea djadjariensis*, *Cerithidea cingulata*, Lipped Top Shell *Monodonta labio*, Mud Whelk *Nassarius festivus*, and Rock Oyster *Saccostrea cucullata* were the dominant species in Tung Chung Bay. From the study, over 80 intertidal species were recorded in Tung Chung Bay. No species of conservation importance was recorded except Horseshoe Crabs. No significant temporal change of any biological parameters was observed at the sampling locations during the subsequent monitoring surveys.

8.4.2.7 Apart from intertidal communities, the coastal mudflat and mangrove habitats of Tung Chung Bay support quite a diverse range of birds, with Little Egret *Egretta garzetta* and Night Heron *Nycticorax nycticorax* were recorded in 2002.

8.4.2.8 Sedimentation rate of Tung Chung Bay was monitored under the HKLR construction phase monitoring programme using a high precision Global Navigation Satellite System (GNSS) real time location fixing system, and the baseline sedimentation rate monitoring was conducted in September 2012. In the December 2014 monitoring, it was found that the mean surface levels at the four monitoring stations increased 0.1 mPD, which indicated an increase of the mudflat level.

Wong Lung Hang EIS

8.4.2.9 Wong Lung Hang is another major stream course on North Lantau. This stream lost its original lowland section and outlet due to the Tung Chung New Town development and replaced by vertical concrete drainage channel, but the midstream and upstream sections still remain natural. Previously the nearby Tung Chung River was considered the only site in Hong Kong for the rare Beijiang Thick-lipped Barb *Acrossocheilus beijiangensis* (Wu & Lin, 1977). However, this fish was later

recorded in Wong Lung Hang Stream (Chan, 1998). This finding demonstrated that Wong Lung Hang Stream, like the nearby Tung Chung River, also contains diverse aquatic fauna and freshwater fish, and attributed to its status of Ecologically Important Stream (EISs).

Breeding and Nursery Ground of Horseshoe Crab

8.4.2.10 Juvenile Horseshoe Crabs were previously recorded in San Tau, Tung Chung Bay and Tai Ho. Sau Tau is considered as one of the three most important horseshoe crab nursery sites in Hong Kong, other than Shui Hau and Pak Nai.

Tai Ho Wan

8.4.2.11 It is covered by a number of recognised sites of conservation importance including Tai Ho Stream SSSI and Tai Ho Priority Site.

8.4.2.12 Tai Ho Stream SSSI is about 5 ha in area and comprises the lower reach of Tai Ho Stream and the inner part of Tai Ho Wan. "Tai Ho Stream" includes several tributaries that lie to the south and east of Tai Ho Wan, passing Tin Liu, Tai Ho San Tsuen, and merging just below Ngau Kwu Long, and entering Tai Ho Wan at its southern end. The importance of Tai Ho Stream to Hong Kong's freshwater fish fauna, and the linkages to other ecologically important intertidal habitats in Tai Ho Wan, qualify Tai Ho Stream as a habitat of high ecological value. Conservation and prevention of damage to the stream channel and riparian zone is essential. Part of the Tai Ho Stream and its estuary was designated as an SSSI in 1999 in recognition of the ecological importance of the stream and its fish fauna.

8.4.2.13 From the EIA study of Tung Chung New Town Extension (2015), a total of 53 fish species and 3 species of crustacean were recorded from both the stream courses and the estuaries area. 8 species of fish were considered of conservation importance namely Ayu *Plecoglossus altivelis*, Japanese Eel *Anguilla japonica*, Giant Mottled Eel *Anguilla marmorata*, Predaceous Chub *Parazacco spilurus*, Crimson-tipped Flathead Gudgeon *Butis melanostigma*, Mangrove Goby *Hemigobius hoevenii*, Spotty Band Goby *Glossogobius olivaceus*, and Archpatch Puffer *Takifugu ocellatus*.

8.4.2.14 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 woodland. It is a medium-sized natural stream running from upland to estuary without any fragmentation. The stream is difficult to be recreated. Moderate diversity of freshwater fish (53 species) and amphibians (10 species) including the endemic Romer's Tree Frog were recorded (CEDD, 2015).

Pok To Yan and Por Kai Shan SSSI

8.4.2.15 Pok To Yan and Por Kai Shan SSSI was designated in 1994 for protecting plant species of conservation importance (e.g., orchids, pitcher plants) (**Figure 8.2** refers). This SSSI is located outside of the 500m assessment area.

San Tau Beach SSSI

8.4.2.16 San Tau Beach SSSI was designated in 1994 and is a shallow sheltering beach of about 2.7 ha with fine sand and silt at the west coast of Tung Chung Bay. The SSSI is located outside of the 500m from the project elements.

Sha Chau and Lung Kwu Chau Marine Park

8.4.2.17 Sha Chau and Lung Kwu Chau Marine Park was designated for conservation of Chinese White Dolphin. It is located in the western part of North Lantau waters and is about 6.5 km from the project elements and is sheltered by the Airport Island.

The Brothers Marine Park

8.4.2.18 The Brothers Marine Park (BMP) is situated in the northern Lantau waters. It was designated as a marine park in December 2016 as a mitigation measure for the HKZMB HKBCF project for the protection and enhancement of CWD habitats within the areas. Waters within the BMP are important feeding grounds for CWDs.

8.4.3 Important Habitats

Woodlands

8.4.3.1 Woodlands could be found on the hillsides between Ngau Au and San Tau in Tung Chung, hill along Tung Chung Road North and lower slopes of Por Kai Shan. Rare and protected flora species were found in these woodlands.

Fung Shui Wood

8.4.3.2 Fung Shui Wood could be found in Sheung Ling Pei, Pak Mong and near Ngau Au within the assessment area. In North Lantau area there are also fung shui woods in Shek Mun Kap, Mok Ka and San Tau, which are outside the 500m assessment area. Fung shui woods are woodland composed of a mixture of native (mostly low-elevation broad-leaved trees) and exotic (mostly fruit trees) plant species preserved during village development and are often characterised by old age and high flora diversity.

Coastal Waters

8.4.3.3 Coastal 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 Chinese White Dolphin, though the coastal waters near Tung Chung are rarely used by Chinese White Dolphin.

Mangroves

8.4.3.4 Mangroves are found in Tung Chung Bay and Tai Ho Wan. This habitat is dominated by the mangroves *Aegiceras corniculatum*, *Kandelia obovata* and *Bruguiera gymnorhiza*. Other mangroves *Avicennia marina* and *Acanthus ilicifolius* are also well represented.

Mudflats

8.4.3.5 Mudflats are found in Tung Chung Bay and 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 the 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 stabilisation, and habitat for wildlife such as coastal birds and horseshoe crabs.

8.4.3.6 Tung Chung Bay is the largest embayment on North Lantau, and has extensive mudflats with both mangroves and seagrass beds. The seagrass beds are also an important nursery and feeding ground of horseshoe crabs. A large variety of microhabitat types in Tung Chung Bay may contribute to a diverse intertidal fauna. For example, the high species richness of crabs in Mai Po, was also attributed to the large variety of microhabitats there (Lee & Leung 1999).

Seagrass bed

8.4.3.7 Seagrass beds were reported in San Tau and Tai Ho Wan. This habitat type occurs mostly in shallow, shelter soft-bottom marine coastlines and estuaries. It is an uncommon habitat type in Hong Kong.

8.4.4 Species of Conservation Importance from Reviewed Literature

8.4.4.1 A number of flora and fauna species of conservation importance were reported in the literature (mainly previous EIA studies) in Tung Chung and Tai Ho areas. The key ecological survey findings of TCNTE EIA (AEIAR-196/2016) are presented below.

8.4.4.2 Nine plant species considered of conservation importance were recorded, including *Aquilaria sinensis*, *Pavetta hongkongensis*, *Cibotium barometz*, *Gmelina chinensis*, *Diospyros vaccinioides*, *Ligustrum punctifolium*, *Uvaria calamistrata*, *Zostera japonica* and *Halophila ovalis*.

8.4.4.3 Two mammal species of conservation importance, i.e. Japanese Pipistrelle *Pipistrellus abramus* and Short-nosed Fruit Bat *Cynopterus sphinx* were recorded.

8.4.4.4 Thirty-eight bird species of conservation importance were recorded. Most bird species of conservation importance were recorded from mangroves, mudflat, and older woodland along the footpath to San Tau and near Shek Mun Kap.

8.4.4.5 Nine herpetofauna species of conservation importance were recorded, including Tokay Gecko *Gekko gecko*, Copperhead Racer *Coelognathus radiatus*, Common Rat Snake *Ptyas mucosus*, Chinese Cobra *Naja atra*, Mountain Water Snake *Sinonatrix percarinata*, Chinese Bullfrog *Hoplobatrachus chinensis*, Lesser Spiny Frog *Paa exilispinosa*, Hong Kong Newt *Paramesotriton hongkongensis* and Romer's Tree Frog *Liuixalus romeri* within the Assessment Area. However, none of them were recorded within the current Project Site.

- 8.4.4.6** Fourteen butterfly species of conservation importance were recorded, including Grey Scrub Hopper (*Aeromachus jhora*).
- 8.4.4.7** Two odonate species of conservation importance were recorded. They were Blue-spotted Dusk-hawker (*Gynacantha japonica*) and Emerald Cascader (*Zygonyx iris insignis*).
- 8.4.4.8** Eleven fish species are of conservation importance, including Beijiang Thick-lipped Barb (*Acrossocheilus beijiangensis*), Rice Fish (*Oryzias curvinotus*), Seaweed Pipefish (*Syngnathus schlegeli*), and Common Seahorse (*Hippocampus kuda*).
- 8.4.4.9** 16 and 11 species/taxa of aquatic invertebrates were also recorded in Tung Chung River and Wong Lung Hang respectively. Species of conservation importance includes Freshwater crab *Cryptopotamon anacoluthon*, which was found in Tung Chung River.
- 8.4.4.10** Horseshoe Crab juveniles of *Tachypleus tridentatus* and medium size individuals of *Carcinoscorpius rotundicauda*, is the only intertidal fauna considered as species of conservation importance in Tung Chung Bay.
- 8.4.4.11** For dive survey, only < 1% of common gorgonian *Guaiaogorgia* sp. and one common ahermatypic cup coral *Balanophyllia* sp. were recorded on the seawalls of Tung Chung New Town up to Siu Ho.

8.4.5 Terrestrial Ecological Survey Results

Habitats

- 8.4.5.1** There were fourteen types of habitat identified within the assessment area, namely agricultural land, coastal waters, fung shui wood, mangrove, mudflat, orchard, plantation, rocky shore, disturbed/wasteland, sandy shore, shrubland/grassland, developed area, watercourse and woodland (**Figure 8.3a-c** and **Figure 8.4**). These habitats within the assessment area are shown in **Table 8.2**. Among these habitats, eight habitats including mangrove, orchard, plantation, disturbed/wasteland, shrubland/grassland, developed area and watercourse were found within the aboveground works sites/works areas of the Project Site and nine habitats including coastal waters, mangrove, mudflat, orchard, plantation, shrubland/grassland, developed area, watercourse and woodland were found within the underground works sites/works areas of the Project Site. The Project Site was predominated by developed area and disturbed/wasteland.

Table 8.2 Habitats within the assessment area

| Habitat | Within the Project Site (aboveground) | | Within the Project Site (underground) | | Within the Assessment Area | | Percentage of habitats within the Assessment Area by size (%) |
|-------------------|---------------------------------------|-------------|---------------------------------------|-------------|----------------------------|-------------|---|
| | Size (ha) | Length (km) | Size (ha) | Length (km) | Size (ha) | Length (km) | |
| Agricultural Land | - | N/A | - | N/A | 9.69 | N/A | 1 |
| Coastal Waters | - | N/A | 0.2 | N/A | 146.76 | N/A | 20 |
| Fung Shui Wood | - | N/A | - | N/A | 1.38 | N/A | 0.2 |
| Mangrove | 0.08 | N/A | 0.05 | N/A | 6.07 | N/A | 0.7 |

| Habitat | Within the Project Site (aboveground) | | Within the Project Site (underground) | | Within the Assessment Area | | Percentage of habitats within the Assessment Area by size (%) |
|---------------------|---------------------------------------|-------------|---------------------------------------|-------------|----------------------------|-------------|---|
| | Size (ha) | Length (km) | Size (ha) | Length (km) | Size (ha) | Length (km) | |
| Mudflat | - | N/A | 0.54 | N/A | 7.76 | N/A | 1 |
| Orchard | 2.02 | N/A | 0.07 | N/A | 22.33 | N/A | 3 |
| Plantation | 1.54 | N/A | 0.03 | N/A | 22.86 | N/A | 3 |
| Rocky Shore | - | N/A | - | N/A | 0.03 | N/A | <0.1 |
| Disturbed/wasteland | 0.09 | N/A | - | N/A | 1.97 | N/A | 0.3 |
| Sandy Shore | - | N/A | - | N/A | 0.003 | N/A | <0.1 |
| Shrubland/Grassland | 0.31 | N/A | 0.85 | N/A | 129.15 | N/A | 17 |
| Developed area | 22.86 | N/A | 0.14 | N/A | 334.99 | N/A | 45 |
| Watercourse | 0.04 | 0.03 | 0.43 | 0.21 | 7.4 | 4.43 | 1 |
| Woodland | - | N/A | 0.51 | N/A | 49.30 | N/A | 7 |
| Total | 26.94 | 0.03 | 2.85 | 0.21 | 739.7 | 4.43 | 100* |

*Difference is due to rounding off.

8.4.5.2 Agricultural land was mainly found associating with village areas to the west of the Project Site within the assessment area, a patch of agricultural land from the Pak Mong Village was also included in the assessment area locating in the eastern portion of the assessment area (**Figure 8.3a-c**). Crop and fruit tree species were cultivated, for instance, sugar cane *Saccharum officinarum*, arrowroot *Maranta arundinacea*, lychee *Litchi chinensis* and lettuce *Lactuca sativa*.

8.4.5.3 Developed area within the assessment area comprised roads, residential areas, buildings, villages and other man-made structures (**Figure 8.3a-c**). This habitat was the major habitat in the western and middle portions of the assessment area. It was generally concrete-paved with limited growing species for plants. Landscape species such as *Calliandra haematocephala*, *Lagerstroemia speciosa* and *Schefflera arboricola* and weedy species such as *Bidens alba*, *Leucaena leucocephala* and *Rhynchelytrum repens* dominated the habitat.

8.4.5.4 Three fung shui woods were located within the assessment area, namely Sheung Ling Pei Fung Shui Wood, Pak Mong Fung Shui Wood and Fung Shui Wood near Ngau Au (**Figure 8.3a-c**). In general, the canopy of this habitat reached 12 to 20 meters and was dominated by common lowland forest species such as *Endospermum chinense*, *Sterculia lanceolata*, *Aporosa dioica* *Syzygium jambos* and *Cinnamomum camphora*. The understorey was dominated by shade tolerant shrubs (such as *Ardisia quinquegona*, *Maesa perularius* and *Psychotria asiatica*) and herb (such as *Sarcandra glabra*, *Pteris ensiformis* and *Tectaria subtriphylla*). Climbers were also commonly encountered, they included *Psychotria serpens*, *Rubus reflexus* and *Celastrus hindsii*. The dominant species varied among different fung shui woods.

8.4.5.5 The entire Sheung Ling Pei Fung Shui Wood was located to the southwest of the Project Site. This Fung Shui Wood was relatively intact with complex structure, tall canopy (about 16 to 20 m) and dominance of native species. The canopy was largely dominated by *Endospermum chinense* and the understorey was also dense.

- 8.4.5.6** The Fung Shui Wood near Ngau Au was less intact and prone to more human disturbance. More exotic tree species such as *Dimocarpus longan* and *Syzygium jambos* and pioneer species such as *Macaranga tanarius* var. *tomentosa* were found.
- 8.4.5.7** There is only a very small edge of the Pak Mong Fung Shui Wood falling within the assessment area.
- 8.4.5.8** Patches of orchards were identified to the east of the Project Site (**Figure 8.3a-b**). Most of the orchards were planted with lychee *Litchi chinensis*. Other fruit trees such as wampi *Clausena lansium*, loquat *Eriobotrya japonica* and banana *Musa acuminata* var. *cavendish* were also occasionally found in this habitat.
- 8.4.5.9** Isolated patches of plantation were found at roadside, engineering slopes and hillside within the assessment area (**Figure 8.3a-c**). Exotic plantation species and landscape species such as *Acacia* spp., *Delonix regia*, *Eucalyptus* spp. were commonly encountered.
- 8.4.5.10** Shrubland/Grassland dominated the hillsides and hilltops habitat (**Figure 8.3a-c**). This habitat is undergoing secondary succession and its species composition is highly typical of other shrubland/grassland in Hong Kong. This habitat was dominated by shrubs (such as *Litsea rotundifolia* var. *oblongifolia*, *Rhodomyrtus tomentosa* and *Melastoma sanguineum*) and grass species (such as *Dicranopteris pedate*, *Miscanthus sinensis* and *Arundinella setosa*), among, *Dicranopteris pedata*, a pioneer fern species, formed dense cover over part of the shrubland/grassland. Young individuals of light demanding tree species such as *Daphniphyllum calycinum* and *Microcos nervosa* were also occasionally found in this habitat. Besides, plantation tree species such as *Acacia auriculiformis* and *Acacia confusa* were sparsely planted in part of the shrubland/grassland.
- 8.4.5.11** Several watercourses were found within the assessment area (**Figure 8.3a-c**) including Tung Chung River, Wong Lung Hang Stream and two unnamed channels located to the north and west of Yat Tung Estate respectively.
- 8.4.5.12** The lower course of the Tung Chung River was located within the assessment area. The two main streams, the east and west tributaries, merged at a location near Ngau Au within the assessment area. The west tributary flows from Pak Tin Mun, Tei Tong Tsai, Chap Mun Tau and Mok Ka, at the section within the assessment area, the east tributary flowed through village areas with a semi-natural bed and bank consisting of gravel and sand, sign of human modification such as footbridge structure and gabion wall was noted. The east tributary originates at the west of Sunset Peak, the section within the assessment area was channelized. After merging of the two tributaries, the river flows towards Tung Chung Bay and becomes an estuary.
- 8.4.5.13** The lower course of Wong Lung Hang Stream was located within the assessment area. The section next to Chek Lap Kok New Village was semi-natural in nature, consisting of gravel bed and vertical concrete bank. Vegetation cover consisting of hydrophilic and weedy species could be found on the riverbed. While the section

near Construction Industry Council Wong Lung Hang Training Ground and next to Yu Tung Road was largely channelized, leaving a largely bare bed and bank.

- 8.4.5.14** The two unnamed channels locating to the north and the west of Yat Tung Estate were largely channelized. The one at the north of Yat Tung Estate was with indefinite water source while the one at the west was abandoned. Influencing by saline water from Tung Chung Bay, mangrove and mangrove associate such as *Acrostichum aureum*, *Kandelia obovata* and *Acanthus ilicifolius* can be occasionally found at the downstream of these channels.
- 8.4.5.15** Disturbed/wasteland was identified associating with orchard and developed area habitat located to the west of the Project Site within the assessment area (**Figure 8.3a-c**). This habitat was highly disturbed and has been subjected to clearance and was colonized by weedy species including *Bidens alba*, *Ipomoea cairica* and *Mikania micrantha*.
- 8.4.5.16** Woodland stands were interspersed with shrubland/grassland within the assessment area (**Figure 8.3a-c**). Trees within this habitat generally reaching as tall as 8m to 12m. The canopy of the woodland was dominated by common lowland secondary forest tree species, such as *Aporosa dioica*, *Mallotus paniculatus*, *Microcos nervosa*, *Schefflera heptaphylla* and *Sterculia lanceolata*. In the understorey, native shrub species *Psychotria asiatica*, *Rhaphiolepis indica* and climber species *Desmos chinensis* and *Lygodium scandens* were frequently encountered.
- 8.4.5.17** Patches of mangroves were identified in the landward side of the intertidal shore to the west of the assessment area, receiving freshwater from Tung Chung River and Wong Lung Hang Stream (**Figure 8.3a-b**). The seaward mangroves were mainly composed of true mangrove species including *Bruguiera gymnorhiza*, *Kandelia obovata* and *Lumnitzera racemosa*. The backshore was, however, dominated by mangrove associated species in the likes of *Cerbera manghas*, *Hibiscus tiliaceus*, *Derris trifoliata* and *Thespesia populnea*. The mangrove species generally range from 1m to 4m tall.
- 8.4.5.18** A narrow belt of sandy shore was identified next to Tung Chung Ma Wan Chung Pier (**Figure 8.3a-b**). With the continuous exposure to intertidal waves, no plant was found.
- 8.4.5.19** A narrow belt of rocky shore ran along the coastline next the Tung Chung Ma Wan Chung Pier and the adjacent woodland (**Figure 8.3a-b**). With the continuous exposure to intertidal waves, no plant was found.
- 8.4.5.20** Mudflat, associating with mangrove, was identified along the coastline to the west of the Project Site (**Figure 8.3a-c**). This habitat was sparsely vegetated, individuals of mangrove species, such as *Bruguiera gymnorhiza* and *Kandelia obovata*, were found.
- 8.4.5.21** Coastal waters (including water column and sub-tidal soft bottom seabed) occupy a portion within the 500m assessment area. The coastal waters formed part of the

North Lantau waters characterized by the estuarine nature under Pearl River influences.

Vegetation

- 8.4.5.22** A total of 460 flora species was recorded within the assessment area (**Appendix 8.1**). Among the 460 flora species, there are 285 native species, 166 exotic species and 9 species of unknown origin (i.e., uncertain whether the species is native or introduced). Ten species of conservation importance were recorded, including *Aquilaria sinensis*, *Brainea insignis*, *Canthium dicoccum*, *Berchemia lineata*, *Ligustrum punctifolium*, *Dalbergia assamica*, *Diospyros vaccinioides*, *Gmelina chinensis*, *Pavetta hongkongensis* and *Wahlenbergia marginata*. Only *Aquilaria sinensis* and *Canthium dicoccum* were recorded within the aboveground Works Site.
- 8.4.5.23** *Lagerstroemia indica*, *Lagerstroemia speciosa*, *Michelia x alba* and *Rhododendron sp.* are protected by Cap. 96A. However, all the recorded individuals were cultivated. In addition, these species are exotic to Hong Kong. Thus, they are not considered as species of conservation importance.
- 8.4.5.24** *Araucaria heterophylla*, *Casuarina equisetifolia*, *Dimocarpus longan*, *Lagerstroemia indica*, *Lagerstroemia speciosa*, *Litchi chinensis* and *Michelia x alba* are exotic to Hong Kong and not considered of conservation importance, despite being considered rare/very rare by Corlett *et al.* (2000), listed as Vulnerable by IUCN (2019), listed as endangered or vulnerable in Threatened Species List of China's Higher Plants, listed as vulnerable in China Plant Red Data Book, listed under Category II in the List of Wild Plants under State Protection (Part 1), and/ or listed under Cap. 96 Forests and Countryside Ordinance.
- 8.4.5.25** Recorded individuals of *Araucaria heterophylla*, *Casuarina equisetifolia*, *Ficus altissima* and *Ocimum basilicum* are cultivated, in addition, all species except *Ficus altissima* are exotic. Thus, they are not considered as species of conservation importance despite being considered Vulnerable by IUCN (2021) or considered as rare/very rare by Corlett *et al.* (2000).
- 8.4.5.26** *Dimocarpus longan* and *Litchi chinensis* are listed as Endangered/Vulnerable in Threatened Species List of China's Higher Plants, listed as Vulnerable in China Plant Red Data Book and listed under Category II in the List of Wild Plants under State Protection (Part 1). Both wild and cultivated individuals were encountered during survey. However, they are both exotic to Hong Kong and not listed as protected species in local ordinances. Thus, they are not considered as species of conservation importance.
- 8.4.5.27** *Dalbergia spp.* are listed under Appendix II of CITES and protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance in Hong Kong as species in this genus is facing threat due to the overexploitation for its valuable wood (known as rosewood). In the current study, *Dalbergia assamica*, *Dalbergia benthamii* and *Dalbergia hancei* were recorded. *Dalbergia benthamii* and *Dalbergia hancei* are climber which is not relevant to the timber exploitation.

In addition, these two species are very common in Hong Kong and considered as “common” by Corlett *et al.* (2000). Thus, they are not considered as species of conservation importance in the current Study. While *Dalbergia assamica* is tree and it is also considered as Endangered in Threatened Species List of China's Higher Plants (Qin *et al.* 2017), thus it is considered as a flora species of conservation importance. Individuals of *Dalbergia assamica* were recorded in the shrubland/grassland within the Project Site above the underground work site.

8.4.5.28 *Gymnanthera oblonga* is a very rare species according to Corlett *et al.* (2000), due to the association with mangroves and coastal habitats locally. However, this species was also recorded in other localities according to Hong Kong Herbarium database and Flora of Hong Kong e.g. Tai Tam Tuk, Sha Tin, Sai Kung and Lantau Island etc. Hence, it is not considered species of conservation importance in this study.

8.4.5.29 Eight individuals of *Ailanthus fordii* were recorded within the Works Site and EAP/EEP, and two individuals were recorded in developed area outside the Project Site but within the assessment area. *Ailanthus fordii* is considered as “Near Threatened” by the Threatened Species List of China's Higher Plants (Qin *et al.* 2017) and “Rare” by Corlett *et al.* (2000). Besides, it is protected under Forestry Regulations (Cap. 96). As all the recorded individuals were found in man-made habitats, i.e. plantation and developed area, and large amount of plantation species such as *Eucalyptus* spp. and *Acacia* spp. were found next to these individuals of *Ailanthus fordii*. Thus, all the recorded individuals of *Ailanthus fordii* are considered as cultivated individuals, and thus, this species is not considered as species of conservation importance in this Study.

8.4.5.30 Individuals of *Aquilaria sinensis* were recorded in Fung Shui Wood, plantation, shrubland/grassland and woodland within the Assessment Area. Among these individuals, an individual of *Aquilaria sinensis* was also recorded in the plantation within the Works Site. *Aquilaria sinensis* is common in the lowland forests and fung shui woods of Hong Kong (Corlett *et al.* 2000) and was included in the book “Rare and Precious Plants of Hong Kong” (Hu *et al.* 2003). In south China, particularly Hong Kong, it is threatened by illegal felling and over-exploitation and is listed in Appendix II of CITES and protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance in Hong Kong. Moreover, it is included in China Plant Red Data Book (Fu and Chin 1992) and Illustration of Rare & Endangered plant in Guangdong Province (Wu and Hu 1988), and wild individuals are listed in Category II of the List of Wild Plants under State Protection (State Forestry Administration & Ministry of Agriculture 1999). It is also categorized as “Vulnerable” in China Red Data Book (Fu and Chin 1992), the Threatened Species List of China's Higher Plants (Qin *et al.* 2017) and the IUCN Red List (IUCN 2021).

8.4.5.31 *Pavetta hongkongensis* was recorded in woodland above the underground works site and in Fung Shui Wood outside the Project Site but within the assessment area. *Pavetta hongkongensis* is a common shrub or small tree species found in the fung

shui woods and lowland forests of Hong Kong and scheduled under Forestry Regulations (Cap. 96).

- 8.4.5.32** *Berchemia lineata* and *Wahlenbergia marginata* were recorded in shrubland/grassland above the underground works site and in developed area outside the Project Site but within the assessment area respectively. They are considered as “Rare” and “Very rare” respectively by Corlett *et al.* (2000).
- 8.4.5.33** Both *Brainea insignis* and *Ligustrum punctifolium* are listed in Rare and Precious Plants of Hong Kong (Hu *et al.* 2003). In addition, *Ligustrum punctifolium* is considered as very rare by Corlett *et al.* (2000). They were recorded in plantation above the underground works site and in mangrove outside the Project Site but within the assessment area respectively in the current Study.
- 8.4.5.34** *Canthium dicoccum* was recorded in plantation within Works Site and in plantation, developed area and woodland outside the Project Site but within the assessment area. This species is a native tree species common in the lowland forests of Hong Kong. It is regarded as vulnerable by the IUCN Red List (IUCN 2021) owing to habitat loss and declination in habitat quality but it is not known to be subject to any conservation threat in Hong Kong.
- 8.4.5.35** *Diospyros vaccinioides* recorded during the surveys was located in woodland outside the Project Site but within the assessment area. *Diospyros vaccinioides* is a shrub that is very common in the shrublands of Hong Kong. Overexploitation of wild individuals of *Diospyros vaccinioides* for ornamental uses, especially in Taiwan, leads to its critically endangered status in the IUCN Red List (IUCN 2021).
- 8.4.5.36** *Gmelina chinensis* was recorded in shrubland/grassland, developed area and woodland outside the Project Site but within the assessment area. It is a common native tree in Lantau Island (Corlett *et al.* 2000). It is listed in the Rare and Precious Plants of Hong Kong (vulnerable in China) (Hu *et al.* 2003) and Illustration of Rare & Endangered plant in Guangdong Province (Wu and Hu 1988).

Terrestrial Mammals

- 8.4.5.37** Five mammal species were recorded within the assessment area (**Appendix 8.2**) during the survey period. Japanese Pipistrelle and an unknown bat species were the only mammal species of conservation importance recorded in the disturbed/wasteland and watercourse respectively outside the Project Site but within the assessment area.

Avifauna

- 8.4.5.38** A total of 54 avifauna species were recorded within the assessment area (**Appendix 8.3**) during the survey period, and 16 of them were of conservation importance.
- 8.4.5.39** These include ardeids i.e. Great Egret, Chinese Pond Heron, Little Egret, Intermediate Egret, Pacific Reef Heron, Black-crowned Night Heron and Eastern Cattle Egret; raptors i.e. Black Kite, Crested Goshawk, Crested Serpent Eagle, and Eurasian Eagle Owl; waterbirds other than ardeids i.e. Slaty-legged Crake, White-throated Kingfisher; and forest birds i.e. Collared Crow, Greater Coucal and

Chinese Hwamei. Single individual of Great Egret was recorded within aboveground Project Site.

Butterflies

8.4.5.40 A total of 77 butterfly species was recorded within the assessment area (**Appendix 8.4**) during the survey period, and 13 of them were of conservation importance.

8.4.5.41 These include Swallowtail (*Papilio xuthus xuthus*), Banded Awl (*Hasora chromus chromus*), Common Awl (*Hasora badra badra*), Common Dart (*Potanthus pseudomaesa clio*), Common Cerulean (*Jamides celeno celeno*), Rounded 6-line Blue (*Nacaduba berenice*), Tiny Grass Blue (*Zizula hylax*), Forget-me-not (*Catochrysops strabo strabo*), Grass Jewel (*Freyeria putli*), Malayan (*Megisba malaya sikkima*), Danaid Eggfly (*Megisba malaya sikkima*), Hainan Palm Dart (*Telicota besta besta*), and Plain Palm Dart (*Cephrenes acalle*). Most of which were recorded outside of aboveground Project Site except for Rounded 6-line Blue and Tiny Grass Blue.

8.4.5.42 Rounded 6-line Blue was recorded in urbanised habitat within the aboveground works site of the proposed station box to the west of Yat Tung Estate.

8.4.5.43 Tiny Grass Blue was recorded in developed area and disturbed/wasteland within the aboveground works site of the proposed station box to the west of Yat Tung Estate and also in developed area, wasteland, watercourse and woodland habitats outside the Project Site.

Odonata

8.4.5.44 A total of 25 odonate species were recorded within the assessment area (**Appendix 8.5**) during the survey period. Four species of conservation importance i.e. Emerald Cascader (*Zygonyx iris insignis*), Mangrove Skimmer (*Orthetrum poecilops poecilops*), Orange-backed Threadtail (*Prodasineura croconota*) and Ruby Darter (*Rhodothemis rufa*) were recorded. None of which was recorded within aboveground works sites/works areas.

Herpetofauna

8.4.5.45 A total of 24 herpetofauna species were recorded within the assessment area (**Appendices 8.6 and 8.7**) during the survey period, including 15 reptile species and 9 amphibians. Burmese Python, Common Rat Snake, Tokay Gecko, Romer's Tree Frog and Chinese Bullfrog were the species of conservation importance recorded, which were all located outside the Project Site but within the 500m assessment area.

Aquatic Communities

8.4.5.46 A total of 30 aquatic species, including 23 fishes and 7 invertebrates, were recorded within the assessment area (**Appendix 8.8**) during the survey period. Three freshwater fish of conservation importance were recorded. These include *Acrossocheilus beijiangensis*, Hainan Medaka (*Oryzias curvinotus*) and *Parazacco spilurus*. *Acrossocheilus beijiangensis* was recorded at downstream of Wong Lung

Hang. Hainan Medaka was recorded at the downstream of Tung Chung River. *Parazacco spilurus* was recorded at the downstream of Wong Lung Hang and in Tai Ho.

Supplementary Marine Ecological Survey Results

Intertidal Communities

- 8.4.5.47** Intertidal Community (Qualitative Walk-through): Within the 500m assessment area, qualitative walk-through survey was conducted along the accessible shorelines of the survey locations, to record organisms including highly mobile fauna such as crab encountered with their relative abundance.
- 8.4.5.48** The results of this qualitative survey showed that the shorelines along the survey locations mainly comprised vertical wall, sandy shore, rocky shore, mudflat and mangrove.
- 8.4.5.49** A total of 63 intertidal organisms were found in all the sampling locations during the qualitative survey (**Appendix 8.9**). *Saccostrea cucullata*, *Batillaria multiformis*, *Pirenella incisa* and *Uca lactea* were the dominant species recorded in Tung Chung Bay west and Tai Ho, while *Saccostrea cucullata* and *Ligia exotica* were the dominant species recorded in the proposed barging point at TCE. All species recorded except Mangrove Horseshoe Crab (*Carcinoscorpius rotundicauda*) and Blue Mudhopper (*Scartelaos histophorus*) were considered to be common and widespread as in other intertidal shores in Hong Kong. Other than Mangrove Horseshoe Crab and Blue Mudhopper, no species of conservation importance were recorded.
- 8.4.5.50** For quantitative intertidal community survey, transects were deployed at three locations in Tung Chung Bay and one in Tai Ho. As the proposed barging point at TCE consists of artificial vertical wall, no quantitative survey was conducted. The transects covered high-shore, mid-shore and low-shore. Dominant species among the transects were found to be quite similar as in the qualitative survey described above except for the mobile species.
- 8.4.5.51** A total of 34 intertidal organisms were recorded during the quantitative survey (**Appendix 8.10**). Dominant species found were typical species in that particular site as described in the qualitative survey.
- 8.4.5.52** **Table 8.3** shows the number of species (S), density (D, i.e. individual/m²), evenness (J) and Shannon Diversity (H') of intertidal organisms recorded in the survey locations (both qualitative and quantitative surveys are present). The number of species in Tung Chung Bay and Tai Ho was similar but the density was the highest in TC river west, while Ma Wan Chung had the highest Shannon Diversity among the sampling locations.

Table 8.3 Number of species (S), density (D individual/m²), evenness (J) and shannon diversity (H') of intertidal organisms recorded from qualitative and quantitative surveys at the survey locations within the 500m assessment area

| Sampling Location/Parameter | Qualitative survey | Quantitative survey | | | |
|-------------------------------|--------------------|---------------------|-----|------|------|
| | S | S | D | J | H' |
| TC river west | 27 | 19 | 301 | 0.42 | 1.22 |
| Hau Wong Temple | 22 | 9 | 258 | 0.39 | 0.85 |
| Ma Wan Chung | 22 | 19 | 119 | 0.75 | 2.2 |
| Proposed barging point at TCE | 3 | N/A | N/A | N/A | N/A |
| Tai Ho | 44 | 18 | 147 | 0.54 | 1.56 |

N/A: not applicable

Coastal Fishes

8.4.5.53 The coastal fish survey was conducted within Tung Chung Bay by SCUBA diving and direct observation from the coastlines. A total of 15 coastal fish species was recorded (**Appendix 8.11**). Shuttles Hoppfish (*Periophthalmus modestus*) was the dominant species found in the coastal water. Blue Mudhopper (*Scartelaos histophorus*) was the only species of conservation importance recorded during the coastal fish survey.

Benthic Communities

8.4.5.54 Subtidal benthic surveys at 5 sampling locations in the 500m assessment area showed that 177 individuals of organisms in 8 phyla, 32 families, and 39 species in 15 grab samples, respectively. Polychaetes were the dominant species among the samples and no species of conservation importance were recorded. Full lists of benthic data for abundance and biomass are shown in **Appendix 8.12** to **Appendix 8.13**. All of the species recorded are common and widespread in Hong Kong.

8.4.5.55 In terms of infaunal abundance, the majority of the organisms recorded in the subtidal soft bottom habitat were from the phylum Annelida (~65%) (**Appendix 8.12** refers). Nemertinea *Cerebratulina* sp. was the dominant species recorded, while *Paraprionospio pinnata* was the dominant species among the Annelida.

8.4.5.56 In terms of infaunal biomass, organisms from the phylum Mollusca contributed to about 44% of the total biomass recorded (**Appendix 8.13** refers).

8.4.5.57 Benthic Shannon Diversity Index (H') ranged from 1.04 – 2.60 (Error! Reference source not found.). Pielou's Evenness Index (J) was relatively high for all sampling locations, which implies that the organisms were quite evenly distributed. Sampling locations B1 and B2 are within Tung Chung Bay and were of higher Shannon Diversity among the sampling locations.

8.4.5.58 The benthic assemblages within the 500m assessment area are similar to that in Hong Kong waters. Previous studies of benthic surveys showed that value of H' varied from 2.21 – 3.50 in the eastern waters, which is higher than Victoria Harbour

(1.10 to 2.49), Tolo Harbour and Channel (1.51 – 1.85), western waters at outer Deep Bay (2.14 – 2.86) and southern waters (2.53 – 2.98) (CityU Professional Services Limited 2002).

Table 8.4 Benthic fauna compositions in grab samples

| Phylum | No. of families | No. of species | No. of individuals | % of abundance | Biomass (g) | % of biomass |
|---------------|-----------------|----------------|--------------------|----------------|-------------|--------------|
| Annelida | 19 | 24 | 115 | 64.97 | 0.285 | 32.68 |
| Arthropoda | 3 | 3 | 8 | 4.52 | 0.079 | 9.06 |
| Chordata | 1 | 1 | 1 | 0.56 | 0.005 | 0.57 |
| Coelentera | 1 | 1 | 1 | 0.56 | 0.058 | 6.65 |
| Echinodermata | 1 | 1 | 1 | 0.56 | 0.02 | 2.29 |
| Mollusca | 5 | 7 | 20 | 11.30 | 0.384 | 44.04 |
| Nemertinea | 1 | 1 | 29 | 16.38 | 0.04 | 4.59 |
| Sipuncula | 1 | 1 | 2 | 1.13 | 0.001 | 0.11 |
| Total | 32 | 39 | 177 | 100 | 0.872 | 100 |

Table 8.5 Summary results of subtidal benthic survey

| Location | No. of species | Abundance | Wet weight (g) | Evenness (<i>J</i>) | Shannon diversity (<i>H'</i>) |
|----------|----------------|-----------|----------------|-----------------------|---------------------------------|
| B1 | 11 | 20 | 0.097 | 0.92 | 2.21 |
| B2 | 18 | 54 | 0.173 | 0.9 | 2.60 |
| B3 | 20 | 59 | 0.183 | 0.79 | 2.14 |
| B4 | 17 | 38 | 0.344 | 0.89 | 2.20 |
| B5 | 5 | 6 | 0.075 | 0.95 | 1.04 |

8.5 Evaluation of Habitats and Species

8.5.1.1 The Project Site encompasses coastal waters, mangrove, mudflat, orchard, plantation, disturbed/wasteland, shrubland/grassland, developed area, watercourse and woodland. The ecological importance of the Project Site and each type of habitat in the assessment area were evaluated in accordance with the criteria stipulated in Annex 8 of EIAO-TM (Table 8.6 to Table 8.19).

Table 8.6 Evaluation of agricultural land within the assessment area

| Criterion | Agricultural Land |
|-------------------------|--|
| Naturalness | Man-made origin |
| Size | 9.69 ha |
| Diversity | Low for flora and fauna |
| Rarity | Four fauna species of conservation importance: Greater Coucal, Hainan Palm Dart, Romer's Tree Frog, and Chinese Bullfrog |
| Re-creatability | Easy to recreate |
| Fragmentation | Small stands scattered in assessment area |
| Ecological linkage | Not functionally linked to habitats of conservation importance |
| Potential value | Low |
| Nursery/breeding ground | No significant observation |

| Criterion | Agricultural Land |
|--------------------------------|-------------------|
| Age | Young |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Low |

Table 8.7 Evaluation of coastal waters within the assessment area

| Criterion | Coastal Waters |
|--------------------------------|---|
| Naturalness | Natural habitat. The surrounding coastlines are largely natural except near Ma Wan Chung Village, while the coastlines are all artificial in TCE |
| Size | 146.76 ha |
| Diversity | Low fauna diversity |
| Rarity | Six fauna species of conservation importance: Black-crowned Night Heron, Great Egret, Little Egret, Pacific Reef Heron, Black Kite, and White-throated Kingfisher |
| Re-creatability | Difficult to recreate |
| Fragmentation | Not fragmented |
| Ecological linkage | Connected to other habitats including Tung Chung River and the outer waters |
| Potential value | High for the Tung Chung Bay as it is natural and has been preserved |
| Nursery/breeding ground | Nursery grounds for horseshoe crab, spawning and nursery grounds for many fish and invertebrates |
| Age | N/A |
| Abundance/richness of wildlife | Medium to high abundance of intertidal and subtidal fauna in Tung Chung Bay |
| Overall ecological value | High for Tung Chung Bay, Low for the coastal waters in TCE |

Table 8.8 Evaluation of Fung Shui Woods within the Assessment Area

| Criterion | Fung Shui Woods |
|--------------------------------|--|
| Naturalness | Semi-natural habitat, consisting of a mixture of native tree species, exotic and orchard species |
| Size | 1.38 ha |
| Diversity | Medium for flora and low for fauna |
| Rarity | Two flora species of conservation importance: <i>Aquilaria sinensis</i> and <i>Pavetta hongkongensis</i> Three fauna species of conservation importance: Crested Goshawk, Greater Coucal, and Tokay Gecko |
| Re-creatability | The time required for compensation/regeneration is even longer than woodland |
| Fragmentation | Fairly intact at Sheung Ling Pei and Ngau Au |
| Ecological linkage | Linked to woodland |
| Potential value | High |
| Nursery/breeding ground | No significant observation. Could provide breeding habitats for birds, reptiles and butterflies. |
| Age | Old (mostly since 1945) |
| Abundance/richness of wildlife | Low |
| Overall ecological value | High (Sheung Ling Pei), Medium (others) |

Table 8.9 Evaluation of Mangroves within the Assessment Area

| Criterion | Mangroves |
|-------------|---|
| Naturalness | Fairly natural |
| Size | 6.07 ha |
| Diversity | Medium for flora, low for fauna |
| Rarity | One flora species of conservation importance: <i>Ligustrum punctifolium</i> Six fauna species of conservation importance: Black-crowned Night Heron, Eastern Cattle Egret, Little Egret, Greater Coucal, Collared Crow, and Mangrove Skimmer |

| Criterion | Mangroves |
|--------------------------------|--|
| Re-creatability | Easy to recreate but may takes time to mature and restore species |
| Fragmentation | Fairly intact, formed soft shore along west side of Tung Chung Bay |
| Ecological linkage | Linked to seagrass bed, mudflats and San Tau Beach SSSI |
| Potential value | High |
| Nursery/breeding ground | Breeding and nursery grounds for intertidal organisms |
| Age | More than a decade |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Medium to High |

Table 8.10 Evaluation of Mudflats within the Assessment Area

| Criterion | Mudflats |
|--------------------------------|--|
| Naturalness | Natural |
| Size | 7.76 ha |
| Diversity | Low for flora and fauna |
| Rarity | Eight fauna species of conservation importance: Great Egret, Intermediate Egret, Little Egret, Pacific Reef Heron, Black-crowned Night Heron, Banded Awl, Blue Mudhopper and <i>Carcinoscorpius rotundicauda</i> |
| Re-creatability | Difficult to recreate |
| Fragmentation | Continuous stand along Tung Chung Bay |
| Ecological linkage | Linked to other habitats including mangroves, estuary, and coastal waters |
| Potential value | Medium |
| Nursery/breeding ground | Breeding and nursery grounds for horseshoe crab |
| Age | N/A |
| Abundance/richness of wildlife | Medium to high for intertidal organisms |
| Overall ecological value | High |

Table 8.11 Evaluation of Orchard within the Assessment Area

| Criterion | Orchard |
|--------------------------------|---|
| Naturalness | Man-made habitat |
| Size | 22.33 ha |
| Diversity | Low for flora and fauna |
| Rarity | Nine fauna species of conservation importance: Little Egret, Crested Serpent Eagle, Greater Coucal, Black Kite, Eurasian Eagle Owl, Emerald Cascader, Mangrove Skimmer, Chinese Bullfrog, and Romer's Tree Frog |
| Re-creatability | Easy to recreate |
| Fragmentation | Dominated lowland area of Tung Chung Valley |
| Ecological linkage | Not functionally linked to habitats of conservation importance |
| Potential value | Low |
| Nursery/breeding ground | No significant observation. Could provide breeding habitats for birds, butterflies and reptiles |
| Age | Young |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Low |

Table 8.12 Evaluation of Plantation within the Assessment Area

| Criterion | Plantation |
|-------------|---|
| Naturalness | Man-made habitat mainly on engineering slope |
| Size | 22.86 ha |
| Diversity | Low flora and fauna diversity |
| Rarity | Three flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Canthium dicoccum</i> and <i>Brainea insignis</i> Three fauna species of importance: Greater Coucal, Plain Palm Dart, and |

| Criterion | Plantation |
|--------------------------------|--|
| | Banded Awl |
| Re-creatability | Easy to recreate |
| 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 |
| Nursery/breeding ground | No significant observation. Limited due to simple habitat structure and subjected to disturbance from road traffic |
| Age | Young |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Low |

Table 8.13 Evaluation of Rocky Shore within the Assessment Area

| Criterion | Rocky Shore |
|--------------------------------|--|
| Naturalness | Natural |
| Size | 0.03 ha |
| Diversity | Low for flora and fauna |
| Rarity | None |
| Re-creatability | Difficult to recreate |
| Fragmentation | Fragmented, only small section remained |
| Ecological linkage | Connected to Tung Chung Bay and coastal waters |
| Potential value | Low |
| Nursery/breeding ground | Breeding and nursery ground for limited intertidal and/or subtidal organisms |
| Age | N/A |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Low for both intertidal and subtidal parts |

Table 8.14 Evaluation of Disturbed/wasteland within the Assessment Area

| Criterion | Disturbed/wasteland |
|--------------------------------|--|
| Naturalness | Man-made habitat |
| Size | 1.97 ha |
| Diversity | Low flora and fauna diversity |
| Rarity | Seven fauna species of conservation importance: Eastern Cattle Egret, Greater Coucal, Japanese Pipistrelle, Common Dart, Forget-me-not, Grass Jewel, Tiny Grass Blue |
| Re-creatability | Easy to recreate |
| Fragmentation | Fragmented |
| Ecological linkage | Not functionally linked to habitats of conservation importance |
| Potential value | Low |
| Nursery/breeding ground | No significant observation |
| Age | N/A |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Low |

Table 8.15 Evaluation of Sandy Shore within the Assessment Area

| Criterion | Sandy Shore |
|-----------------|--|
| Naturalness | Natural |
| Size | 0.003 ha |
| Diversity | Low flora and fauna diversity |
| Rarity | None |
| Re-creatability | Difficult to recreate |
| Fragmentation | Fragmented, only minute section remained |

| Criterion | Sandy Shore |
|--------------------------------|--|
| Ecological linkage | Connected to Tung Chung Bay and 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 8.16 Evaluation of Shrubland/Grassland within the Assessment Area

| Criterion | Shrubland/Grassland |
|--------------------------------|---|
| Naturalness | Semi-natural, frequently disturbed by hill fire |
| Size | 129.15 ha |
| Diversity | Low to medium flora diversity, low fauna diversity |
| Rarity | Four flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Berchemia lineata</i> , <i>Dalbergia assamica</i> and <i>Gmelina chinensis</i> One fauna species of conservation importance: Swallowtail |
| Re-creatability | Easy to recreate |
| Fragmentation | Continuous stands on upper hillside |
| Ecological linkage | Not functionally linked to habitats of conservation importance |
| Potential value | Limited due to frequent hill fire 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 | Low |
| Overall ecological value | Low |

Table 8.17 Evaluation of Developed area within the Assessment Area

| Criterion | Developed area |
|--------------------------------|--|
| Naturalness | Man-made habitat |
| Size | 334.99 ha |
| Diversity | Low to medium diversity of flora, low diversity of fauna |
| Rarity | Three flora species of conservation importance: <i>Canthium dicoccum</i> , <i>Gmelina chinensis</i> and <i>Wahlenbergia marginata</i> Ten fauna species of conservation importance: Black-crowned Night Heron, Black Kite, Burmese Python, Common Rat Snake, Tokay Gecko, Plain Palm Dart, Common Awl, Tiny Grass Blue, Forget-me-not and Malayan |
| Re-creatability | Easy to recreate |
| Fragmentation | N/A |
| Ecological linkage | Not functionally linked to habitats of conservation importance |
| Potential value | Low |
| Nursery/breeding ground | No significant observation |
| Age | N/A |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Low |

Table 8.18 Evaluation of Watercourse within the Assessment Area

| Criterion | Watercourse |
|-------------|---|
| Naturalness | Lower section of eastern branch of Tung Chung River and Wong Lung Hang channelized, upper sections fairly natural |
| Size | 7.40 ha (4.43 km) |
| Diversity | Low for flora; low to medium for aquatic fauna |
| Rarity | Fourteen fauna species of conservation importance: Unknown bat species, |

| Criterion | Watercourse |
|--------------------------------|--|
| | Chinese Pond Heron, Little Egret, Black-crowned Night Heron, Great Egret, Black Kite, Chinese Bullfrog, Tiny Grass Blue, Danaid Eggfly, Orange-backed Threadtail, Ruby Darter, <i>Acrossocheilus beijiangensis</i> , Hainan Medaka and <i>Parazacco spilurus</i> |
| Re-creatability | Natural section difficult to recreate, channelized sections easy to recreate |
| Fragmentation | Stream habitat fragmented by channelized section, but the stream flow is still maintained |
| Ecological linkage | Connected to Tung Chung Bay and Tai Ho Wan |
| Potential value | Moderate if the channelized section is restored |
| Nursery/breeding ground | No significant observation |
| Age | N/A |
| Abundance/richness of wildlife | Medium for aquatic fauna |
| Overall ecological value | High for the natural section, low to medium for channelized section |

Table 8.19 Evaluation of woodland within the assessment area

| Criterion | Woodland |
|--------------------------------|---|
| Naturalness | Semi-natural habitat, consisting of a mixture of native tree species, exotic and/or orchard species |
| Size | 49.30 ha |
| Diversity | Medium for flora; low for fauna |
| Rarity | Five flora species of conservation importance: <i>Aquilaria sinensis</i> , <i>Canthium dicoccum</i> , <i>Diospyros vacciniodes</i> , <i>Gmelina chinensis</i> and <i>Pavetta hongkongensis</i> Nine fauna species of conservation importance: Chinese Pond Heron, Black Kite, Slaty-legged Crake, Greater Coucal, Chinese Hwamei, Common Awl, Common Cerulean, Tiny Grass Blue and Romer's Tree Frog |
| Re-creatability | Feasible, but the more mature the woodland, the longer time required for recreation |
| Fragmentation | Small linear and/or isolated stands along ravine, foothills |
| Ecological linkage | Isolated, or linked to nearby shrubland/grassland |
| Potential value | Moderate to high under natural succession to develop into mature woodland if protected from anthropogenic disturbance or destruction |
| Nursery/breeding ground | No significant observation |
| Age | Young |
| Abundance/richness of wildlife | Low |
| Overall ecological value | Medium |

8.5.1.2 In accordance with Table 3, Annex 8 of the EIAO-TM, the ecological value of species was assessed in terms of protection status (e.g. fauna protected under WAPO (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare). The list and evaluation of floral and faunal species of conservation importance recorded within the assessment area, according to the EIAO-TM, are given in **Tables 8.20 & 8.21**. Representative photos of species of conservation importance are shown in **Figure 8.5**.

Table 8.20 Evaluation of Floral Species of Conservation Importance within the Assessment Area Recorded from Present Surveys

| Scientific Name | Locations | Protection Status | Distribution ¹ | Rarity ¹ |
|-------------------------------|--|--|--|---------------------|
| <i>Aquilaria sinensis</i> | In plantation within Works Site In Fung Shui Wood, plantation, shrubland/grassland and woodland outside the Project Site but within the assessment area | IUCN Red List of Threatened Species (2020): Vulnerable ² Appendix II of CITES ³ Threatened Species List of China's Higher Plants: Vulnerable ⁴ China Plant Red Data Book: Vulnerable ⁵ Included in Illustrations of Rare & Endangered Plant in Guangdong Province ⁶ Listed in Rare and Precious Plants of Hong Kong ⁷ Cap. 586 ⁸ State Protection (Category II) ⁹ | Lowland forests and fung shui woods | Common |
| <i>Berchemia lineata</i> | In shrubland/grassland above the underground works site | N/A | Shrubland and seaside. Sai Wan, Ping Chau (Mirs Bay), Penny's Bay and Lung Kwu Chau | Rare |
| <i>Brainea insignis</i> | In plantation above the underground works site | Listed in Rare and Precious Plants of Hong Kong ⁷ | Grassland and shrubland | Restricted |
| <i>Canthium dicoccum</i> | In plantation within Works Site In plantation, developed area and woodland outside the Project Site but within the assessment area | IUCN Red List of Threatened Species (2021): Vulnerable ² | Lowland forest | Common |
| <i>Dalbergia assamica</i> | In shrubland/grassland above the underground works site | Threatened Species List of China's Higher Plants: Endangered ⁴ Cap. 586 ⁸ Appendix II of CITES ³ | Forest. Pak Kong (Sai Kung) and Tai Mo Shan. | Rare |
| <i>Diospyros vaccinioides</i> | In woodland outside the Project Site but within the assessment area | IUCN Red List of Threatened Species (2021): Critically Endangered ² | Shrubland | Very common |

| Scientific Name | Locations | Protection Status | Distribution ¹ | Rarity ¹ |
|-------------------------------|---|--|--|---------------------------|
| <i>Gmelina chinensis</i> | In shrubland/grassland, developed area and woodland outside the Project Site but within the assessment area | Rare and Precious Plants of Hong Kong (vulnerable in China) ⁷ Illustration of Rare & endangered plant in Guangdong Province ⁶ | Forest and shrubland | Common (in Lantau Island) |
| <i>Ligustrum punctifolium</i> | In mangrove outside the Project Site but within the assessment area | Listed in Rare and Precious Plants of Hong Kong ⁷ | Coastal habitats. Sham Chung and Sam A Chung | Very rare |
| <i>Pavetta hongkongensis</i> | In woodland above the underground works site In Fung Shui Wood outside the Project Site but within the assessment area | Cap. 96A ¹⁰ | Fung shui woods and lowland forest | Common |
| <i>Wahlenbergia marginata</i> | In developed area outside the Project Site but within the assessment area | N/A | Lantau Island | Very rare |

Notes:

1. Corlett *et al.* (2000). Hong Kong Vascular Plants: Distribution and Status.
2. IUCN (2021). IUCN Red List Version 2021-1.
3. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2020). Appendices I, II and III.
4. Qin *et al.* (2017). Threatened Species List of China's Higher Plants.
5. Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants.
6. Wu & Hu (1988). Illustration of Rare & endangered plant in Guangdong Province.
7. Hu *et al.* (2003). Rare and Precious Plants of Hong Kong.
8. Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance
9. State Forestry Administration & Ministry of Agriculture (1999). List of Wild Plants under State Protection (Part 1).
10. Cap. 96A Forestry Regulations under Cap. 96 Forests and Countryside Ordinance

Table 8.21 Evaluation of Fauna Species of Conservation Importance within the Assessment Area Recorded from Present Surveys

| Common name /Scientific name | Location | Protection/ Conservation status | Distribution | Rarity |
|---|--|--|---|-------------------------------------|
| Mammal | | | | |
| Japanese Pipistrelle | Disturbed/wasteland and watercourse outside Project Site | Cap. 170 | Widely distributed throughout Hong Kong. | Very Common |
| Unknown bat species | Watercourse outside Project Site | Cap. 170 | - | - |
| Birds (All wild birds are protected under Cap 170, and not individually indicated in the column of Protection/Conservation Status) | | | | |
| Black-crowned Night Heron | Coastal water, urbanised, mangrove, mudflat, and watercourse outside Project Site | Fellowes <i>et al.</i> (2002): (LC) | Widely distributed in Hong Kong. | Common resident and winter visitor |
| Chinese Pond Heron | Watercourse and woodland outside Project Site | Fellowes <i>et al.</i> (2002): PRC, (RC) | Common resident. Widely distributed in Hong Kong. | Common resident |
| Eastern Cattle Egret | Mangrove, and disturbed/wasteland outside Project Site | Fellowes <i>et al.</i> (2002): (LC) | Widely distributed in Hong Kong. | Resident and common passage migrant |
| Great Egret | Developed area within Project Site Mudflat, coastal water, and watercourse outside Project Site | Fellowes <i>et al.</i> (2002): PRC, (RC) | Widely distributed in Hong Kong. | Common resident and winter visitor |
| Intermediate Egret | Mudflat outside Project Site | Fellowes <i>et al.</i> (2002): RC | Found in Deep Bay area, Tai Long Wan, Starling Inlet, Tai O, Cape D'Aguiar. | Common passage migrant |
| Little Egret | Coastal waters, mangrove, mudflat, orchard, coastal water, and watercourse outside Project Site | Fellowes <i>et al.</i> (2002): PRC, (RC) | Widely distributed in coastal area throughout Hong Kong. | Common resident |
| Pacific Reef Heron | Mudflat, and coastal water outside Project Site | Class 2 Protected Animal of China; China Red Data Book Status: (Rare); Fellowes <i>et al.</i> (2002): (LC) | Widely distributed in coastal area throughout Hong Kong | Uncommon resident |
| Crested Serpent Eagle | Orchard outside Project Site | China Red Data Book Status: (Vulnerable); Fellowes <i>et al.</i> (2002): (LC); Appendix 2 of CITES | Widely distributed in shrublands on hillsides throughout Hong Kong. | Uncommon resident |

| Common name /Scientific name | Location | Protection/ Conservation status | Distribution | Rarity |
|------------------------------|--|--|--|------------------------------------|
| Crested Goshawk | Fung Shui Wood outside Project Site | Class 2 Protected Animal of China; China Red Data Book Status: (Rare); Appendix 2 of CITES | Widely distributed in woodlands and shrublands throughout Hong Kong. | Uncommon resident |
| Black Kite | Coastal water, developed area, orchard, watercourse, and woodland outside Project Site | Fellowes <i>et al.</i> (2002): (RC); Appendix 2 of CITES | Widely distributed in Hong Kong. | Common resident and winter visitor |
| Slaty-legged Crake | Woodland outside Project Site | China Red Data Book Status: (Indeterminate); | Shing Mun Country Park, Hok Tau and Tai Tam Country Park | Common summer visitor |
| Eurasian Eagle Owl | Orchard outside Project Site | Class 2 Protected Animal of China; China Red Data Book Status: (Rare);Fellowes <i>et al.</i> (2002): RC; Appendix 2 of CITES | Widely distributed in Hong Kong. | Scarce resident |
| White-throated Kingfisher | Coastal waters outside Project Site | Fellowes <i>et al.</i> (2002): (LC) | Widely distributed in coastal areas throughout Hong Kong | Common resident |
| Collared Crow | Mangrove outside Project Site | Fellowes <i>et al.</i> (2002): LC; IUCN Red List Status: Vulnerable | Found in Inner Deep Bay area, Nam Chung, Kei Ling Ha, Tai Mei Tuk, Pok Fu Lam, Chek lap Kok, Shuen Wan, Lam Tsuen. | Uncommon resident |
| Greater Coucal | Agricultural land, Fung Shui Wood, mangrove, orchard, plantation, disturbed/wasteland, and woodland outside Project Site | Class 2 Protected Animal of China; China Red Data Book Status: (Vulnerable) | Widely distributed in Hong Kong. | Common resident |
| Chinese Hwamei | Woodland outside Project Site | Appendix 2 of CITES | Widely distributed in hillside shrubland throughout Hong Kong. | Common resident |
| Butterflies | | | | |
| Plain Palm Dart | Developed area, and plantation outside Project Site | N/A | Ngong Ping | Very Rare |
| Banded Awl | Mudflat, and plantation outside Project Site | N/A | Sham Wat, Lai Chi Wo, Po Toi | Rare |

| Common name /Scientific name | Location | Protection/ Conservation status | Distribution | Rarity |
|------------------------------|---|-----------------------------------|--|-----------|
| Common Awl | Developed area, and woodland outside Project Site | Fellowes <i>et al.</i> (2002): LC | Wu Kau Tan, Lai Chi Wo, Hong Kong Wetland Park | Very Rare |
| Common Cerulean | Woodland outside Project Site | N/A | Shek Pik, High Junk Peak, Shek Mun Kap, Fung Yuen, Pui O, Ma On Shan | Rare |
| Common Dart | Disturbed/wasteland outside Project Site | Fellowes <i>et al.</i> (2002): LC | Hok Tau | Rare |
| Danaid Eggfly | Watercourse outside Project Site | Fellowes <i>et al.</i> (2002): LC | Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang | Uncommon |
| Forget-me-not | Developed area, and disturbed/wasteland outside Project Site | N/A | Pui O, Tai Po Kau, Fung Yuen, Shing Mun, Sha Lo Wan | Very Rare |
| Grass Jewel | Disturbed/wasteland outside Project Site | Fellowes <i>et al.</i> (2002): LC | Sha Lo Wan, Sam A Tsuen | Very Rare |
| Hainan Palm Dart | Agricultural land outside Project Site | Fellowes <i>et al.</i> (2002): LC | Shing Mun, Pak Tam Chung, Tung Lung Chau | Very Rare |
| Malayan | Developed area outside Project Site | Fellowes <i>et al.</i> (2002): LC | North Lantau Island | Very Rare |
| Rounded 6-line Blue | Developed area within Project Site | N/A | Tai Po, Sha Lo Wan | Very Rare |
| Tiny Grass Blue | Developed area and disturbed/wasteland within Project Site Developed area, disturbed/wasteland, watercourse, and woodland outside Project Site | N/A | Lung Kwu Tan, Fung Yuen and Sha Lo Wan | Very rare |

| Common name /Scientific name | Location | Protection/ Conservation status | Distribution | Rarity |
|------------------------------|---|--|--|----------|
| Swallowtail | Shrubland/grassland outside Project Site | N/A | Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang, Lung Kwu Chau | Rare |
| Odonates | | | | |
| Emerald Cascader | Orchard outside Project Site | Fellowes <i>et al.</i> (2002): PGC | Widely distribute in moderately clean, rapidly flowing forested streams throughout Hong Kong | Abundant |
| Mangrove Skimmer | Mangrove, and orchard outside Project Site | Fellowes <i>et al.</i> (2002): GC; IUCN Red List Status: VU | Double Island, Lai Chi Wo, Nam Chung, So Lo Pun, Yim Tso Ha (Starling Inlet), Yung Shue au and Yung Shue O. | Uncommon |
| Orange-backed Threadtail | Watercourse outside Project Site | Fellowes <i>et al.</i> (2002): LC | Occurs in well wooded streams | Common |
| Ruby Darter | Watercourse outside Project Site | Fellowes <i>et al.</i> (2002): LC | Widely distribute in ponds and marshes throughout Hong Kong | Common |
| Herpetofauna | | | | |
| Burmese Python | Developed area outside Project Site | Class 1 Protected Animal of China; China Red Data Book Status: (Critically Endangered); Fellowes <i>et al.</i> (2002): PRC; IUCN Red List Status: Vulnerable; Appendix 2 of CITES;(Cap. 170) | Widely distributed throughout Hong Kong. | N/A |
| Common Rat Snake | Developed area outside Project Site | China Red Data Book Status: (Endangered); Fellowes <i>et al.</i> (2002): PRC; Appendix 2 of CITES | Widely distributed throughout Hong Kong. | N/A |
| Tokay Gecko | Fung Shui Wood, and developed area outside Project Site | Class 2 Protected Animal of China; China Red Data Book Status: (Endangered); Fellowes <i>et al.</i> (2002): RC | Distributed in rocky areas in Tung Chung and Sham Wat on Lantau Island, Lion Rock Country Park. Population on Hong Kong Island are considered as escaped from snake shops. | Common |

| Common name /Scientific name | Location | Protection/ Conservation status | Distribution | Rarity |
|--|---|--|---|---------------------------------------|
| Chinese Bullfrog | Agricultural land, orchard and watercourse outside Project Site | Class 2 Protected Animal of China; Fellowes <i>et al.</i> (2002): Potential Global Concern | Lowland species found in cultivated lands, ponds, streams and marshes | Common |
| Romer's Tree Frog | Agricultural land, orchard and woodland outside Project Site | Fellowes <i>et al.</i> (2002): PGC; IUCN Red List Status: EN; (Cap. 170) Cap. 170, IUCN (2015): endangered. Fellowes <i>et al.</i> (2002): Potential Global Concern | Distributed in woodlands on Lantau Island, Po Toi Island, Lamma Island, Hong Kong Island and New Territories. Endemic to Hong Kong; formerly found in Lamma, Lantau, Po Toi and Chek Lap Kok. Relocated to various sites in the New Territories; Breeds in shaded, still or slow-flowing waters that are fish free and are low in nutrient content. The breeding sites are usually associated with forest or shrubland, while non-breeding individuals are found in forest, plantation and clearings within them | Locally common in scattered locations |
| Aquatic Species | | | | |
| Beijiang Thick-lipped Barb (<i>Acrossocheilus beijiangensis</i>) | Watercourse outside Project Site | AFCD Assessment: Species of Conservation Concern; Fellowes <i>et al.</i> (2002): Global Concern | Records from reservoir catchments on Hong Kong Island and a few streams on Lantau Island | Rare |
| Rice Fish (<i>Oryzias curvinotus</i>) | Watercourse outside Project Site | AFCD Assessment: Species of Conservation Concern; Fellowes <i>et al.</i> (2002): Global Concern | Records from a few streams in North District, Sai Kung and on Lantau Island as well as some reservoirs in North District and Tuen Mun | Uncommon |
| Predaceous chub (<i>Parazacco spilurus</i>) | Watercourse outside Project Site | China Red Data Book: Vulnerable | widespread species occurring in most unpolluted hill streams in both upper and lower courses | Common |
| Intertidal Communities | | | | |

| Common name /Scientific name | Location | Protection/ Conservation status | Distribution | Rarity |
|--|------------------------------|---------------------------------------|---|----------|
| <i>Carcinoscorpius rotundicauda</i> | Mudflat outside Project Site | China Species Red List: Vulnerable | Declining in range due to water pollution/ loss of nursery grounds (Morton & Lee 2003); locally found in Tsim Bei Tsui, Pak Nai, Sham Wat, Yi O, Shui Hau Wan | Uncommon |
| Blue Mudhopper (<i>Scartelaos histophorus</i>) | Mudflat outside Project Site | Nil | Tung Chung | Uncommon |
| Benthic communities | | | | |
| No benthic species of conservation importance were recorded. | | | | |

8.5.2 Summary of Survey

8.5.2.1 The ecological baseline surveys were conducted between August to October 2020 and April to July 2021. There were fourteen types of habitats within the assessment area, namely agricultural land, coastal waters, fung shui wood, mangrove, mudflat, orchard, plantation, rocky shore, disturbed/wasteland, sandy shore, shrubland/grassland, developed area, watercourse and woodland. A total of 55 species of conservation importance of flora and fauna were recorded during the survey. Recorded species of conservation importance within the aboveground works areas/works sites included *Aquilaria sinensis*, *Canthium dicoccum*, Tiny Grass Blue, Rounded 6-line Blue and Great Egret.

8.6 Impact Identification and Prediction

8.6.1 Proposed Layout Plan

8.6.1.1 As discussed in **Section 2**, the latest design of the Project has avoided all marine works (e.g. modification of seawall, marine dredging works, construction of barges). A summary of the key elements for the Project is given below:

- At-grade station and associated at-grade track works at TCE
- Underground station at TCW (by excavation; and potentially drill and blast for a small section);
- Tunnel construction (by TBM) from existing TUC to the new underground station;
- Overrun tunnel at south of TCW station;
- EAP/EEP at Shun Tung Road;
- Works areas and works sites; and
- Minor works such as utilities diversions, Temporary Traffic Management (TTM), footbridges demolition / reprovision etc.

8.6.1.2 The works for the east section would mainly consist of the following: cable and signalling diversion works, temporary power building and temporary plant for down tract diversion, trackside auxiliaries, site offices and material storage, site formation and associated works, track works and track diversion works, TTM, hoarding and station construction.

8.6.1.3 The works for the west section would mainly consist of the following: footbridge demolition and reprovisioning, cut-and-cover station and tunnel construction, utilities diversion, civil construction, E&M material storage, site office, construction materials delivery, TBM launching and retrieval, EEP/EAP construction, barge loading and unloading, stockpile and material storage.

8.6.2 Identification of Ecological Impacts

8.6.2.1 As discussed in **Section 2**, due consideration has been given in formulating the design of TUE to overcome environmental challenges faced by the Project. The hierarchy of "Avoid, Minimise and Mitigate" has been adopted during the process to protect the environment in particular ecology as much as practicable. The key principles adopted to ecological challenges are summarised below and further discussed in **Section 8.8**.

- Avoidance of any marine works (eg dredging for barging point and tunnel);
- Avoidance of works within / direct impact upon Tung Chung River and its estuary, and Tai Ho Wan;
- Avoidance of works within the intertidal zone;
- Avoidance of works within Country Parks, mudflats, Conservation Area and CPA;
- Avoidance of works within secondary woodland;
- Avoidance of re-diversion of Wong Lung Hang nullah; and
- Minimisation of surface runoff and provision of necessary treatment facilities

8.6.2.2 With the above principles of avoidance and minimisation implemented, the Project should still inevitably cause some impacts during both construction and operational phases. The following sections identify and discuss the impacts.

Ecological Impacts During Construction Phase

8.6.2.3 Direct impacts during the construction phase include the following:

- Any permanent loss of habitats and vegetation;
- Any temporary loss of habitats and vegetation; and
- Any direct mortality of wildlife.

8.6.2.4 Indirect Impacts during the construction phase include the following:

- Noise and vibration;
- Dust emission;
- Human and general construction activities;
- Water quality deterioration;
- Habitat fragmentation;
- Potential ground water infiltration due to tunnel formation.

Ecological Impacts During Operational Phase

8.6.2.5 Direct impacts during the operational phase include the permanent loss of habitats and vegetation.

8.6.2.6 Indirect impacts during the operational phase include the following:

- Disturbance from human activities and normal operation; and
- Habitat fragmentation.

8.7 Impact Evaluation

8.7.1.1 Potential ecological impacts during the construction and operational phases of the Project are based on the criteria stated in Table 1 of Annex 8 in EIAO-TM and are presented below.

8.7.2 Construction Phase Direct Impacts

Permanent Loss of Habitats and Vegetation

8.7.2.1 Permanent habitat and/or vegetation loss are anticipated at the below areas:

- The re-aligned Tung Chung Line in Tung Chung East
- The proposed EAP/EEP building
- The proposed TCW Station Box
- Aboveground works sites and works areas

8.7.2.2 These areas would be occupied by permanent at-grade structures which could not be fully reinstated back to the condition before the construction works would be considered as permanent loss. The vegetation within such areas is also considered as permanent loss. The level of impact would be greater if the permanently loss area is of conservation importance, and/or utilised by species of conservation importance.

8.7.2.3 The permanent habitat loss would affect about 14.8ha of habitats dominated by urbanised area and disturbed/wasteland, totalling about 12.7ha, and small to minor areas of low-valued orchard (~2.0 ha), plantation (~0.10 ha) and abandoned channel (~0.03 ha).

Tung Chung East

8.7.2.4 The project areas in TCE are on reclaimed area and the reclamation would have been completed prior to the commencement of the construction of TUE. Hence, the works in TCE would only affect developed area. The associated ecological impacts are considered as **insignificant**.

EAP/EEP

8.7.2.5 As discussed in **Section 2**, the EAP / EEP has been relocated from Ma Wan Chung to the artificial slope at Shun Tung Road. This has avoided the secondary woodland at Ma Wan Chung. The ecological habitat at the artificial slope at Shun Tung Road is plantation with low ecological value. The construction of EAP / EEP would cause a direct impact of about 0.10 ha of plantation at the artificial slope. The associated ecological impacts are considered as **minor**.

TCW Station Box

8.7.2.6 Orchard: The orchard to the west of Yat Tung Estate is where the proposed TCW station box would be located. This orchard is dominated by lychee, a common fruit tree species. No flora species of conservation importance is identified. The permanent loss of orchard is considered to be **of minor impact**.

8.7.2.7 Small stand of mangrove: this mangrove stand identified within an abandoned drainage channel to the west of Yat Tung Estate would be avoided by set-back of construction works during construction of the TCW station box. Direct impact is **not anticipated**.

Aboveground Works Sites and Works Areas

8.7.2.8 For the other developed area within above ground works site/works areas, since the ecological value is considered to be minor / negligible, the ecological impact of permanent loss is considered to be **insignificant**. Some works sites would encroach upon plantation habitat which is of low ecological value, the loss is considered to be **of minor impact**.

Temporary Loss of Habitats and Vegetation

Aboveground Works Sites and Works Areas

8.7.2.9 Temporary above ground works sites and works areas include those which are not within the footprint of permanent structures but within the Project Site. Temporary habitat loss would affect about 11.7ha of low valued habitats dominated by 9.9 ha developed area and minor areas of orchard (~0.03 ha), plantation (~1.5 ha) and shrubland/grassland (~0.28 ha) which are also of low ecological value.

8.7.2.10 These temporary works areas which could be reinstated to the original conditions are considered to be temporary loss. Most of these areas are existing urbanised habitat in nature. For the TBM launching shaft in Tung Chung Crescent, it consists of developed area. The works site along Shun Tung Road is for temporary traffic arrangement, mobilisation of materials and holding machines and equipment. The adjacent hill slope along Shun Tung Road within the works site would be largely left undisturbed except for necessary works area for construction of the proposed EAP/EEP which is discussed in subsequent section. As all the affected habitat by the TBM launching shaft is developed area, the associated direct ecological impacts are considered as **insignificant**.

8.7.2.11 Except for part of the works site on the hillslope along Shun Tung Road which consisted of plantation and small area of shrubland/grassland habitat. Still, all these habitats are of low ecological value. Most vegetated part of the hillslope along Shun Tung Road would be left undisturbed during the construction phase except for necessary works area required for constructing the EAP/EEP (**Section 8.7.2.5** refers). There is nearly no or sparse vegetation cover within developed area habitat. Such vegetation could either gradually re-colonise through natural succession process or be planted back upon the completion of works. The temporary works areas affect mainly developed area of low ecological value and some minor areas

of plantation habitat; the potential ecological impact is considered to be **insignificant**.

Barging Point

- 8.7.2.12** The barging point is on an existing reclaimed land. Temporary loss of urbanised area is anticipated at the barging point, the ecological impact is considered to be **insignificant**.

Potential Impact to Fauna Species of Conservation Importance

- 8.7.2.13** During site clearance, non-volant animals would be susceptible to direct injury and/or mortality. The level of ecological impact would be larger if the abundance of the affected animal group(s) inhabiting that area is large, or the affected species is of conservation importance. In general, a low abundance of locally common herpetofauna species were recorded within the aboveground works sites i.e. developed area, orchard and plantation. Significant direct mortality impact to herpetofauna species is **not anticipated**.

Tung Chung East

- 8.7.2.14** The TCE section is located at existing developed area including existing railway and near highways where wildlife density is very low. The potential impact of causing direct mortality of wildlife is considered to be **minor**.

Tung Chung West

- 8.7.2.15** The TCW section is located at a relatively more suburb area as compared with the TCE section. Some vegetated areas i.e. the lychee orchard where the proposed station box would be located, some roadside plantation and shrubland/grassland areas where the works site along Shun Tung Road would be located should be more suitable for wildlife to inhabit compared with a pure developed area/wasteland.
- 8.7.2.16** Two very rare¹ species of conservation importance i.e. Rounded 6-line Blue and Tiny Grass Blue were identified within the aboveground works site of TCW station box to the west of Yat Tung Estate. Given that Tiny Grass Blue was also commonly recorded in other habitat types within the Assessment Area i.e., agricultural land, disturbed/wasteland and watercourses etc. during the current survey, direct mortality due to site clearance to this species is of **minor** level of impact.
- 8.7.2.17** Rounded 6-line Blue was recorded in low number within the urbanised habitat within the works site. With reference to the larval feeding habit of this species i.e. lychee, which is well available in elsewhere outside the Project Site within the orchard habitats in the Assessment Area, and the low number of this species recorded, the direct mortality impact is considered to be **minor**.
- 8.7.2.18** The larval food plant of Tiny Grass Blue is the common exotic species *Lantana camara* which is very common. For Rounded 6-line Blue, as also discussed in the last section, the orchard habitats within the Assessment Area are in general

¹ AFCD (2020) Hong Kong Biodiversity Database (last review date 2020/06/18, access in Aug 2020)
<https://www.afcd.gov.hk/english/conservation/hkbiodiversity/hkbiodiversity.html>

dominated by lychee plantation. Given the fact that similar habitats i.e. disturbed/wasteland and urbanised habitats and/or larval food plants are well available within the Assessment Area (i.e. 500m from the project boundary), and the low number of this species recorded, the impact due to loss of larval food plants at this area is considered **minor** for these two butterfly species.

8.7.2.19 A single individual of Great Egret was recorded within aboveground Project Site near the channelised watercourse. Given that the abundance was low, the record was transient and that the construction phase disturbance would only be temporary, the potential impact to Great Egret is considered as **minor**.

8.7.2.20 A single individual of Romer's Tree Frog was recorded near the Project Site to the north of Yu Tung Road in orchard habitat. Other records of this species were relatively far from Project Site. No direct impact to this species is anticipated. Construction phase indirect impact to this species is considered to be **minor** as the works would be confined in the works boundaries and would be temporary.

Potential Impact to Flora Species of Conservation Importance

Tung Chung East

8.7.2.21 No flora of conservation importance was recorded within nor in the vicinity of TCE section. No potential impact to flora species of conservation importance is anticipated.

Tung Chung West

8.7.2.22 1 no. of *Canthium dicoccum* and 1 no. of *Aquilaria sinensis* were recorded on the slope along Shun Tung Road which is within the works site. These flora species of conservation importance within the works site could be avoided by works thus no direct impact is anticipated.

8.7.2.23 Other identified flora species of conservation importance i.e., *Brainea insignis*, *Aquilaria sinensis*, *Pavetta hongkongensis*, *Dalbergia assamica* and *Ligustrum punctifolium* etc. are located outside of the aboveground works areas, no direct impact to these species is anticipated.

8.7.3 Construction Phase - Indirect Impacts

Noise and Vibration

8.7.3.1 Noise and vibration generated by construction related heavy machineries during site formation would temporarily drive wildlife which inhabit the nearby areas away. A potential consequence would be a drop of wildlife abundance and density in the areas adjacent to the construction sites. The effect of this form of indirect impact would be temporary during the construction phase.

Tung Chung East

8.7.3.2 The existing location of TCL realignment section is already subject to frequency noise and vibration disturbance from road traffic and railway. Therefore, the construction noise and vibration are of **insignificant** impact.

Tung Chung West

8.7.3.3 Most of the recorded bird species in the immediate vicinity of the works sites and works areas are typical urban birds such as Spotted Dove, bulbuls, Japanese White-eye, Eurasian Tree Sparrow, Oriental Magpie Robin etc., but there are also some ardeid species inhabiting the less disturbed Tung Chung Bay which is just next to Tung Chung Town and Ma Wan Chung village. Considering the proximity between the above ground works site at the proposed station box to the west of Yat Tung Estate and the Tung Chung Bay i.e., where some egrets inhabit, without mitigation measure, the level of impact is considered to be **minor to moderate**. For other recorded species of conservation importance, they are either recorded in low numbers (Horseshoe Crab and Mangrove Skimmer) or also relatively more adapted to the urban disturbance (Japanese Pipistrelle), potential noise and vibration impact to these species are **minor**.

Dust Emission

8.7.3.4 Unpaved construction site would generate more fugitive dust. Dust covering plant leaves would affect the rate of gases exchange and photosynthesis depending on the degree of dustiness. Prolong exposure to dust may pose sub-lethal effects on vegetation and hinder the normal growth. In general, the health of the vegetation, the habitat quality and the carrying capacity could be affected in a highly dusty environment.

Tung Chung East

8.7.3.5 TCE section is located near Tai Ho Wan. Considered that the realignment works would not involve large scale excavation works and the realignment works area is located at developed area where the highway is already constantly subject to dust from road traffic and reclamation works nearby, the construction phase dust impact due to the realignment works is considered to be **insignificant**.

Tung Chung West

8.7.3.6 Two areas within the Assessment Area are relatively more susceptible to potential dust emission impact than the others. These include (1) the small, retained mangrove stand at the abandoned drainage channel to the west of Yat Tung Estate within the works site; and (2) the plantation slope along Shun Tung Road around the EAP/EEP works site. The other works sites and works areas are either located within developed area i.e., sparse vegetation coverage already or have low abundance of wildlife recorded. Therefore, dust impact is low significance for these areas. For the small, retained mangrove stand which is located at the abandoned drainage channel, due to the close proximity, without mitigation measure, the level of impact is considered to be **minor to moderate**. For the plantation slope along Shun Tung Road, two flora species of conservation

importance including *C. dicoccum* and *A. sinensis*, were recorded near the proposed EAP/EEP or within the works site along Shun Tung Road, without mitigation measure, the level of impact is also considered to be **minor to moderate**.

Human and General Construction Activities

8.7.3.7 Human activities and other construction activities would be another source of disturbance which also have similar effect to cause a temporary drop of wildlife density and diversity around the Project related works areas and construction sites.

Tung Chung East

8.7.3.8 TCE is located at highly disturbed developed area near existing highway and railway. Wildlife density is low and only very disturbance tolerant species could be found. Construction phase disturbance due to the realignment works and TUE station construction is of **insignificant impact**.

Tung Chung West

8.7.3.9 Some ardeids including Little Egret, Great Egret, Black-crowned Night Heron and Pacific Reef Heron were recorded on the mudflat off the coast of Ma Wan Chung. Since the coast of Ma Wan Chung is subject to human disturbance at a certain degree, these birds either roost at a relatively far distance from Ma Wan Chung coast or that a minority of more disturbance-tolerant individuals occasionally got closer to the landward side. Due to the proximity between the above ground works site and Tung Chung Bay where more disturbance sensitive wildlife was recorded, without mitigation measure, the level of impact is considered to be **minor to moderate**.

Water Quality Deterioration

8.7.3.10 Construction site runoff would be the main source of water pollutant during the construction phase. It may contain muddy runoff from uncovered earth surfaces, grout polluted water and other possible pollutants such as oil and grease, solid waste etc. The potential impact is more prominent during heavy rainfall.

Tung Chung East

8.7.3.11 Watercourses near the works area would be potentially impacted by surface runoff from works site. Although location-wise close to the ecologically sensitive Tai Ho Wan, the surface runoff from works site is separated by North Lantau Highway. The standard construction site drainage management is able to confine surface runoff from entering into the estuarine of Tai Ho. Water quality deterioration impact is not anticipated.

Tung Chung West

8.7.3.12 Habitats prone to water quality deterioration impact would be the coastal area of Ma Wan Chung, estuary of Wong Lung Hang and Tung Chung River which forms the Tung Chung River cum Bay System. Recorded species of conservation importance/concerned species include a low abundance of Horseshoe Crab, Blue

Mudhopper (*Scartelaos histophorus*). Although no freshwater species of conservation importance were recorded in the vicinity of the works sites and works areas in TCW, untreated site runoff discharging into the Bay directly and/or nearby watercourses which would eventually drain into Tung Chung Bay, would affect the habitat quality. Without mitigation measure and depending on the quantity, water quality deterioration impact is considered to be **minor to moderate**.

Habitat Fragmentation

8.7.3.13 Fragmented habitats are more prone to disturbance due to edge effect since they have more interfaces with the sources of disturbance i.e., nearby disturbed areas. The disconnection between two fragmented areas is also a barrier discouraging/hindering wildlife to pass through. No important habitat identified by Annex 8 of the EIAO-TM would be fragmented.

Tung Chung East

8.7.3.14 With reference to the current proposed alignment, no habitat would be fragmented by the proposed permanent structures. The TUE realignment is located solely on developed area. Fragmentation impact is **not anticipated**.

Tung Chung West

8.7.3.15 While the TCW section, the habitat type which would be subject to potential fragmentation is the orchard around the open cut works site of the TCW station box, near Ma Wan Chung village. Due to the construction of the new station box, a few remaining orchard areas would become fragmented. Given the limited ecological value of the orchard and no record of species of conservation importance around this portion of orchard so far, fragmentation impact is considered to be **minor**.

Potential Ground Water Infiltration and Impact to Marine Sediment due to Tunnelling

Tung Chung East

8.7.3.16 As all the works in TCE are at-grade, potential ground water infiltration due to tunnelling is not anticipated.

Tung Chung West

8.7.3.17 The activities of TBM and other potential underground works may influence the groundwater levels. However, as the works area is close to the estuary area, the groundwater level would be quickly balanced by the surrounding marine environment and watercourses. Also, the TBM excavation works would take place at the rock layer (10 – 20 m below sea level) underneath a thick alluvium layer, the disturbance to the sediment of Ma Wan Chung mudflat should be minor. Therefore, any change of groundwater level caused by the project would be insignificant and hence significant change in underground hydrology, flow regime, sediment erosion, and deposition patterns are **not anticipated**.

8.7.4 Operational Phase - Direct Impact

Permanent Loss of Habitats and Vegetation

8.7.4.1 As discussed in **Section 8.7.2.4**, the loss of habitats and vegetation due to areas occupied by above-ground permanent structures and/or areas which could not be fully re-instated is considered to be permanent loss. The permanent habitat loss would affect about 14.8ha of habitats dominated by developed area and disturbed/wasteland, totalling about 12.7ha, and small to minor areas of low-valued orchard, plantation and abandoned channel. The permanent loss is considered to be of **minor** ecological impact.

8.7.5 Operational Phase - Indirect Impacts

Disturbance from Human Activities and Normal Operation

8.7.5.1 The works in TCE is located at the existing highway and railway which is also subject to heavy disturbance. Additional disturbance due to the new railway is not anticipated. The ecologically sensitive bay area of Tai Ho Wan is separated from the re-aligned railway by the existing North Lantau Highway, and there are already existing operating railways, the operational phase disturbance due to the new railway is also not anticipated.

8.7.5.2 The extended railway in TCW is underground and the major source of operational phase disturbance would be due to the increased commuting population and associated traffic flow concentrated at the newly built TCW station and its vicinity. Since these areas are mostly developed and is subject to existing disturbance already, the additional operational phase disturbance is not anticipated.

8.7.5.3 The ecologically important Tung Chung Estuary would not be disturbed by railway operation. The light and noise disturbance during normal operation to the Tung Chung Bay is not significant.

Habitat Fragmentation

8.7.5.4 Habitats which would be sandwiched by permanent structures by the current Project are considered to be fragmented. The current Project footprint is **not anticipated** to cause significant fragmentation of existing habitat.

8.8 Cumulative Impacts from Concurrent Projects

8.8.1.1 This section examines the possible interactions between the environmental impacts of the Project and those of other developments whose construction or operation phases would overlap with the Project, thereby resulting in cumulative impacts whose synergistic effects would exceed in severity those of the various projects taken individually, and would likely to be wider in scope. Nearby projects that would have potential cumulative ecological impacts during the construction and operation phases of the Project are summarised in **Table 8.22** below. Major potential ecological cumulative impacts were described in the following sections.

8.8.1.2 Since marine works is not required for the current Project, cumulative direct marine ecological impact contributed by the current Project is not anticipated. For cumulative terrestrial ecological impacts, it could be divided into construction phase direct and indirect cumulative impacts, and then operational phase direct and indirect cumulative impacts.

8.8.2 Construction Phase

Cumulative Direct Habitat Loss

8.8.2.1 Tung Chung New Town Extension and its Associated Infrastructures (TCNTE) would result in terrestrial habitat loss. Apart from about 120.5 ha of reclaimed land in TCE, it covers over 200 ha area of land area. Most habitats to be loss due to TCNTE Recommended Outline Development Plan (RODP) are urbanised/disturbed (10.79 ha) and orchard (18.11 ha) which are of low ecological value. In fact, most orchard loss predicted in the TCNTE EIA referred to the currently proposed TCW station box. No woodland nor important habitat loss is anticipated for the current Project, so no cumulative loss of woodland nor important habitat is anticipated.

Cumulative Construction Disturbance

8.8.2.2 For TCE section, the realignment works, and the new TCE station would be located on existing developed area and near the reclaimed land of TCNTE. Cumulative ecological impacts due to construction disturbance should be **minor** given the negligible ecological value of habitats in the immediate vicinity. For TCW section, by taking an underground tunnel option for the extension alignment, construction phase disturbance impact has been largely reduced in the first place. For the above ground works for cut and cover TCE station, there is no concurrent project elements of TCNTE in the immediate vicinity, and given that mitigation measures would be undertaken to minimise the potential disturbance from the construction of the TCW station, the cumulative construction disturbance is considered to be **minor**.

8.8.3 Operational Phase

Cumulative Permanent Habitat Loss

8.8.3.1 As discussed in the above section, the permanent habitat loss due to the current Project does not affect any important habitat. Also, no marine works are required for the current Project. Therefore, the cumulative permanent habitat loss impact is not anticipated.

Cumulative Operational Phase Disturbance

8.8.3.2 The TCNTE would overall create an additional population of about 200,000. It is certain that the level of operational phase disturbance impact would increase comparing with the existing condition. It should be noted that while an increase in human population and disturbance is unavoidable, the current Project undertakes an underground tunnel option which has already greatly reduce the operational

phase disturbance as far as practicable. Also, the TCNTE project also involves the revitalisation of Tung Chung River channelised section and provision of a River Park to create a positive environmental outcome. Therefore, the cumulative operational phase disturbance impact is not anticipated.

Table 8.22 Concurrent Projects and Potential Cumulative Impacts

| Proposed development/on-going projects | Nature of the projects | Major potential ecological impacts | Construction phase | Operational phase |
|---|---|--|--------------------|-------------------|
| Reprovisioning, Remedial and Improvement Work (RRIW) | Demolition and reprovision of the footbridge at a section of Yu Tung Road near Mun Tung Estate. | <ul style="list-style-type: none"> - No natural habitat of flora and fauna has been identified within the RRIW - No marine works nor reclamation required | Insignificant | Insignificant |
| Tung Chung New Town Extension and its Associated Infrastructures (TCNTE) | New town development extension for accommodate 220,000 population to meet housing and other development needs. | <ul style="list-style-type: none"> - Permanent loss of seabed and marine waters, 112 ha in size respectively - Potential water quality impact during construction phase - Increase in operational phase human activities | Minor impact | Insignificant |
| Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works | Siu Ho Wan Depot (SHD) replanning in 4 major phases; podium deck and property enabling works for supporting the SHD Topside Development; and a new station and the associated trackwork, as well as local access roads and EVA. | <ul style="list-style-type: none"> - No natural habitat of flora and fauna has been identified within SHD - No marine works nor reclamation required | Insignificant | Insignificant |
| Proposed Comprehensive Residential and Commercial Development atop Siu Ho Wan Depot | Residential towers on a podium deck over the entire SHD along with associated recreational, schools, transportation facilities and open spaces etc. | <ul style="list-style-type: none"> - Loss of urbanised/disturbed habitat (about 31.1ha) of very low ecological value and plantation (<0.01ha) of low ecological value. - Insignificant indirect impacts due to construction activities. - Increase in operational phase human activities | Insignificant | Insignificant |

| Proposed development/on-going projects | Nature of the projects | Major potential ecological impacts | Construction phase | Operational phase |
|---|--|--|--------------------|-------------------|
| Additional Sewerage Rising Main and Rehabilitation of the Existing Sewage Rising Main between Tung Chung and Siu Ho Wan | Construction of an additional sewage rising main of about 6.5km with diameter of 1200mm from Tung Chung sewage pumping station to Siu Ho Wan sewage treatment works and rehabilitation of the existing sewage rising main with diameter of 1200mm. | <ul style="list-style-type: none"> - Overlap with the alignment options of the utility under the SHD Topside Development, no additional habitat loss. | Insignificant | Insignificant |
| Expansion of Hong Kong International Airport into a Three-Runway System (3RS) | New land formation immediately north of HKIA comprising associated taxiways, aprons, new passenger concourse buildings and expansion of the existing Terminal 2 building | <ul style="list-style-type: none"> - Permanent loss of intertidal and subtidal hard bottom habitats of 5.9 km long for reclamation - Permanent loss of marine waters habitat of 650 ha in size for reclamation - Permanent loss of sub-tidal soft bottom habitats of 672 ha in size for reclamation - Increase in operational phase human activities | Insignificant | Insignificant |
| Topside Development at HKBCF Island of the HZMB | The construction programme is yet to be confirmed. | <ul style="list-style-type: none"> - Habitat loss is not anticipated due to topside development. - Increase in operational phase human activities | Insignificant | Insignificant |
| SkyCity Development | Development of a new commercial district on the northeast of HKIA | <ul style="list-style-type: none"> - Marine habitat loss is not anticipated - Construction phase indirect impacts - Increase in operational phase human activities | No Impact | Insignificant |

| Proposed development/on-going projects | Nature of the projects | Major potential ecological impacts | Construction phase | Operational phase |
|--|--|---|--------------------|-------------------|
| Intermodal Transfer Terminal (ITT) – Bonded Vehicular Bridge and Associated Roads. | Development of a new building which serves intermodal transfer of passengers to and from HZMB | <ul style="list-style-type: none"> - Insignificant marine habitat loss - Construction phase indirect impacts | No Impact | Insignificant |
| Road P1 (Tai Ho – Sunny Bay Section) | A proposed new highway along the north Lantau coast | <ul style="list-style-type: none"> - Potential marine habitat loss - Increase in traffic flow | Insignificant | Insignificant |
| Improvement Works for Ma Wan Chung Pier | Pier improvement works | <ul style="list-style-type: none"> - Minor temporary loss of marine habitat | Insignificant | Insignificant |
| Tuen Mun – Chek Lap Kok Link | Submarine tunnel. It has been commenced in 2020. | <ul style="list-style-type: none"> - No significant residual ecological impact | N/A | Insignificant |
| Airport City Link | Construction and operation of a road bridge | <ul style="list-style-type: none"> - Insignificant marine habitat loss - Construction phase indirect impacts | Insignificant | Insignificant |
| Airport Tung Chung Link | Construction and operational of a road bridge and marine facilities in the waters between Airport Island and HKP Island. | <ul style="list-style-type: none"> - Potential direct and indirect impacts to Scenic Hill (any potential cumulative impact would be addressed in the EIA study for Airport Tung Chung Link) - Potential marine habitat loss | Insignificant | Insignificant |
| Commercial Development-Cum-Public Market in Tung Chung Area 6 | Commercial development and public market near the existing Tung Chung Station | <ul style="list-style-type: none"> - No significant ecological impact anticipated as the nearby area has already been developed | Insignificant | Insignificant |

8.9 Avoidance / Minimisation / Mitigation Measures

8.9.1 Avoidance of Marine Works

8.9.1.1 The ecological baseline has revealed that there are abundant marine / intertidal ecological resources in the vicinity, including mangrove, Tung Chung River and its estuary, mudflats etc. All these ecological resources are considered having High ecological value. As discussed in **Section 2**, the design development has been mindful to avoid any impacts on these important marine / intertidal ecological resources.

8.9.1.2 For the barging point at the existing seafront at TCE, the existing bathymetry would not allow barges to berth along the existing seawall unless certain dredging is conducted. However, dredging would inevitably cause certain sediment release even with good practices such as silt curtain in place. The engineering team has therefore used a flat top barge arrangement to extend the spoil loading point at approximately 70 – 80m away from the existing seawall. By adopting this design for the barging point, it is not necessary to conduct any dredging and marine works and hence avoided the disturbance of the seabed.

8.9.1.3 The latest tunnel alignment would run through the bay area of Ma Wan Chung which accommodates mudflats and mangroves that have high ecological value. In order to avoid any direct impacts on these mudflats and mangroves, the design has adopted TBM tunnelling instead of immersed tube tunnelling / open-cut, cut-and-cover tunnelling. By adopting this tunnelling approach, it would not require any marine works such as dredging and temporary reclamation for the tunnelling works in Ma Wan Chung.

8.9.2 Avoidance of works within / direct impact upon Tung Chung River and its estuary, and Tai Ho Wan

8.9.2.1 Ecological baseline conditions have also revealed the ecological importance of Tung Chung River and its estuary. In order to preserve this, the current design has totally avoided any works in the Tung Chung River and its estuary and hence avoided any direct impacts on them.

8.9.2.2 Similarly, for Tai Ho Wan which is also an ecologically important area, the current design and construction would not encroach into Tai Ho Wan and hence avoid any impacts on it.

8.9.3 Avoidance of works within the intertidal zone

8.9.3.1 As discussed in **Section 2**, the TCW Station will be located on the land area and away from the coastline of Tung Chung Bay. Given that the intertidal zone of Tung Chung Bay also has high ecological value, the current design has allowed for a

setback from the coastline. This setback will ensure that any direct impact to the intertidal zone in Tung Chung Bay is avoided.

8.9.3.2 The latest ecological survey has also revealed an abandoned drainage channel at the west of Yat Tung Estate. This abandoned drainage channel leads to the Wong Lung Hang estuary and there are mangrove stands identified at the section to the western end which is within the tidal influence zone. In order to avoid encroachment into these mangrove habitats, all the construction works would be limited to beyond the tidal influence zone and above the high-water mark. This section of the site boundary will be installed with sheet pile/ hoarding with concrete footing to avoid accidental encroachment into the mangrove habitat. By adopting this engineering approach, all the intertidal zone would be totally avoided.

8.9.4 Avoidance of works within Country Parks, SSSI, Conservation Area and CPA

8.9.4.1 According to the latest ecological survey findings, all the construction works and above-ground structures such as station structures, EAP / EEP etc. would be strategically located at areas of low ecological values including developed areas, plantation, orchard, shrubland/grassland etc. All these construction works, and above-ground structures would not encroach the Lantau North (Extension) Country Park, Tai Ho Stream SSSI, Tai Ho Priority Site, Conservation Area nor CPA and hence avoid any impacts on them.

8.9.5 Avoidance of works within secondary woodland

8.9.5.1 During the preliminary design, the EAP/EEP was located in a woodland habitat on the hillside behind Ma Wan Chung Village. Given the principle of avoidance, the design had critically reviewed the possibility of relocating the EAP / EEP to another location to avoid / minimise loss in secondary woodland. After a due review on various design requirements, the latest design has relocated the EAP / EEP to an artificial slope at Shun Tung Road at which only plantation of low ecological value is identified. Hence, this Project would avoid all secondary woodland.

8.9.6 Avoidance of Re-diversion of Wong Lung Hang nullah

8.9.6.1 The outlet of Wong Lung Hang nullah is a natural bay area accommodating mudflat and mangroves which there will not be any construction works. In order to further reduce any indirect impacts on this Wong Lung Hang estuary area, the need for re-diversion of Wong Lung Hang nullah has been duly reconsidered by the engineering team. By adjusting the design of the overrun tunnel, the latest design has avoided any re-diversion of the Wong Lung Hang nullah and hence avoided any direct impacts on the Wong Lung Hang estuary area.

8.9.7 Avoidance of Flora of Conservation Importance by Protection Zone

8.9.7.1 One individual of *Canthium dicoccum* was recorded on the plantation slope along Shun Tung Road near the proposed EAP/EEP. One individual of *Aquilaria sinensis* was recorded in the works site along Shun Tung Road. These individuals of flora species of conservation importance would be avoided by the works. It is recommended to set up protection zones for these individuals which are located close to the works area in order to avoid disturbance. Guidelines/procedures in the DEVB TC(W) No. 4/2020 – Tree Preservation should be referred to when setting up tree protection zones.

8.9.8 Minimisation of surface runoff and provision of necessary treatment facilities

8.9.8.1 The construction works in TCE would be totally on reclaimed land/developed area and away from ecological sensitive receivers. Hence, good practices such as proper construction site drainage system and sedimentation tanks as well as the further enhancement measures such as barrier along the western boundary of the construction site/works areas for TCW station as mentioned in Chapter 5 would be implemented to avoid adverse impacts caused by surface runoff.

8.9.8.2 Only land-based construction activities would be conducted, and separation distance from the coastline would be maintained, good practices such as proper construction site drainage system and sedimentation tanks shall be implemented. A summary of these special enhancement measures for containing surface run-off in TCW is given below:

- Subject to actual site circumstances and subsequent detailed design, a barrier such as sheet pile / hoarding with concrete footing could be installed along the western boundary of the construction site / works areas for TCW Station as shown in **Figure 5.2**. This barrier shall be designed to contain the surface run-off from releasing to the estuary in an uncontrolled manner during heavy rainfall. Moreover, the capacity of the sedimentation tanks shall be reviewed during the detailed design stage to cater for adverse weather conditions.
- Proper surface channels would be incorporated along the western boundary of the construction site / works areas for TCW Station to divert excess flow of site runoff into desilting facilities to minimise the chance of polluting the mangrove habitat.

8.9.9 Minimisation of Noise Disturbance During Construction

8.9.9.1 The mudflat on the estuary of Tung Chung River and Wong Lung Hang is an important feeding ground of large water birds including some migratory species. In order to minimise the impacts on these species, Quality Powered Mechanical

Equipment (QPME) and/or quieter mechanical equipment as per the recommendations in Chapter 4 would be used. Suitable mufflers, silencers and noise enclosure should also be used to reduce the noise generated by noisy machines as per the recommendations in **Chapter 4**.

8.9.10 Minimisation of Air Quality Impact During Construction

8.9.10.1 A number of standard dust suppression measures would be undertaken at the construction site. These measures include regular spray to suppress fugitive dust generation, exposed earth surface covered by tarpaulins, standard wheel washing facilities at the construction site entrances etc. These measures would help to alleviate the generation of fugitive dust during the construction period and hence minimise any impacts on the neighbouring habitats.

8.9.10.2 For controlling potential dust emission from drill and blast activities, standard measures would be implemented. Any drill and blast activities should be conducted underneath concrete slabs and/or underneath a roof cover. Impermeable blast covers at the mucking out locations will be shut during blasting. The blasting should only be carried out in a fully enclosed environment. Areas within 30m from the blasting area will be wetted with water prior to blasting. Mist spraying measures will be installed at the mucking out locations where necessary. Detail of the recommendation in dust control measures are referring to **Chapter 3**.

8.9.11 Minimisation of Human Disturbance during Construction

8.9.11.1 Site hoarding of appropriate height along site boundaries will be installed to minimise disturbance due to human activities during construction to the nearby areas as far as practicable. Construction activities and material storage should be strictly confined within the construction sites. For TCW section, due to the proximity to the Wong Lung Hang estuary and Tung Chung Bay, the nearby ecologically sensitive area will be demarcated by site hoarding from the works areas and work sites to minimize unnecessary human access and disturbance to these areas.

Table 8.23 Summary of Construction Phase and Operational Phase Impacts

| Impact | Habitat quality | Species | Size/abundance | Duration | Reversibility | Magnitude | Impact evaluation | Mitigation measure(s) required |
|--|---|--|--|---|--|---|---|---|
| Construction Phase Direct Impacts | | | | | | | | |
| Permanent loss of habitats and vegetation | <p>Tung Chung East: low value urbanised habitat</p> <p>EAP/EEP: plantation of low ecological value</p> <p>TCW Station Box: consists of orchard, developed area, disturbed/wasteland and a section of abandoned channel of low ecological value; a small stand of mangrove (medium to high ecological value for mangrove in general); the mangrove stand would be avoided by setback of works.</p> <p>Other aboveground works sites and works areas: all low value developed area.</p> | <p>Tung Chung East: no species of conservation importance would be impacted.</p> <p>EAP/EEP: flora recorded species of conservation importance i.e. <i>Aquilaria sinensis</i> and <i>Canthium dicoccum</i> would be avoided.</p> <p>TCW Station Box: Two butterfly species of conservation importance i.e., Tiny Grass Blue and Rounded 6-line Blue were recorded within the works site of TCW Station Box.</p> <p>Other aboveground works: No species of conservation importance would be affected for other aboveground works sites and works areas.</p> | <p>About 14.8 ha of low valued habitats dominated by urbanised area and disturbed/wasteland, totalling about 12.7 ha, and small to minor areas of low-valued orchard (~2.0 ha), plantation (~0.10 ha) and abandoned channel (~0.03 ha).</p> <p>A low numbers of Tiny Grass Blue and Rounded 6-line Blue.</p> | Habitat loss would be permanent | Permanent habitat loss would be irreversible | Moderate for urbanised habitat due to the extensive area; low for orchard; very low for plantation, disturbed/wasteland; shrubland/grassland and the abandoned channel. | <p>Tung Chung East: Insignificant</p> <p>EAP/EEP: Minor</p> <p>TCW Station Box: Minor; the small mangrove stand would be avoided; direct impact is not anticipated.</p> <p>Aboveground works sites and works areas: Minor</p> | No specific mitigation measures are required. |
| Temporary loss of habitats and vegetation | Aboveground works sites and works areas including the TBM launching shaft works area, the barging point are mostly developed area with low ecological value . | <p>TBM launching shaft: it is located within Tung Chung Crescent which is existing urbanised area with no species of conservation importance recorded.</p> <p>Support low abundance and diversity of locally common flora and fauna. No species of conservation importance would be affected.</p> | 11.7ha of low valued habitats dominated by 9.9 ha developed area. | Habitat loss in works areas and part of the works sites in Yu Tung Road, Shun Tung Road, Tung Chung Crescent and north of Yat Tung Estate, the barging point and two works areas in Tung Chung East would be temporary. | Temporary habitat loss would be reversible | Low | <p>Aboveground works sites and works areas: Insignificant</p> <p>TBM launching shaft: Insignificant</p> <p>Barging Point: Insignificant</p> | No specific mitigation measures are required. |
| Potential impact to fauna species of conservation importance | <p>Extensive low valued developed area for the Tung Chung East section for the re-alignment works</p> <p>Although vegetated, the orchard habitat within the</p> | <p>Transient record of Great Egret within aboveground site and a single record of Romer's Tree Frog outside the aboveground site.</p> <p>A low abundance of a butterfly species of conservation importance i.e., Rounded 6-line Blue</p> | Low abundance of herpetofauna and low abundance/insignificant abundance of two butterfly species of conservation importance | Temporary during the construction phase only | Irreversible | Low | Minor | No specific mitigation measures are required. |

| Impact | Habitat quality | Species | Size/abundance | Duration | Reversibility | Magnitude | Impact evaluation | Mitigation measure(s) required |
|---|---|--|--|---|---------------|--|---|---|
| | Tung Chung West station open cut area, and the vegetated slope along Shun Tung Road i.e., plantation and shrubland/grassland habitats are of low ecological value . | were recorded within the TCW Station Box works area. Another butterfly species of conservation importance i.e., Tiny Grass Blue was recorded within the TCW Station Box works area in higher abundance compared with Rounded 6-line Blue, but it was also commonly recorded elsewhere outside the works areas and works sites. | | | | | | |
| Potential direct impact to flora Species of conservation importance | The vegetation slope along Shun Tung Road covered by plantation and shrubland/grassland habitat is of low ecological value | <i>Aquilaria sinensis</i> and <i>Canthium dicoccum</i> would be avoided. | The individuals of flora species of conservation importance would be avoided. | Permanent | Irreversible | Low | No direct impact is anticipated | - Setting up tree protection zone with reference to the Guidelines on Tree Preservation during Development for the avoided flora species of conservation importance near the EAP/EEP works site. |
| Construction Phase Indirect Impacts | | | | | | | | |
| Noise and vibration | Tung Chung East: low value urbanised habitat for the areas near the works site, moderate to high value for the coastal mudflat and mangrove in Tai Ho Wan. Tung Chung West: coastal waters, mudflat and mangrove habitats in Tung Chung Bay are considered to be of moderate – high or high ecological value ; downstream section of Wong Lung Hang downstream (channelised): low – moderate value . | For TCE, the most ecologically sensitive area would be Tai Ho Wan. A number of species of conservation importance were recorded including Horseshoe Crab (<i>Carcinoscorpius rotundicauda</i>), butterflies, ardeids, several frog species and Tokay Gecko etc. For TCW, disturbance sensitive species around the works site and works area consist of mainly water birds inhabiting the coast. Ardeids including Black-crowned Night Heron, Little Egret, Eastern Cattle Egret, Great Egret and Pacific Reef Heron etc. occur in the estuary of Wong Lung Hang (channelised watercourse) or the mudflat and mangrove habitats at Ma Wan Chung. | The section of Tai Ho Wan within the Assessment Area is small, the entire Tai Ho Wan is large. The coastal area of Tung Chung Bay which consists of mudflat and mangrove habitats is large and intact. Relatively low numbers of ardeids would be potentially affected. | Temporary during the construction phase | Reversible | Low for TCE due to the fact that the works site would be separated from Tai Ho Wan by the existing North Lantau Highway. This section of Tai Ho Wan is already subject to certain level of disturbance from the traffic. Low to moderate for TCW due to the scale and proximity of works and the size of the potentially affected area. | Insignificant for TCE Minor – Moderate for TCW | - Use of Quality Powered Mechanical Equipment (QPME) and/or quieter mechanical equipment. - Suitable mufflers, silencers and noise enclosure should be used to reduce the noise generated by noisy machines. |

| Impact | Habitat quality | Species | Size/abundance | Duration | Reversibility | Magnitude | Impact evaluation | Mitigation measure(s) required |
|---|--|---|---|---|---------------|---|--|--|
| Dust emission | <p>Tung Chung East: low value urbanised habitat for the areas near the works site, high value for the coastal mudflat and mangrove in Tai Ho Wan.</p> <p>Tung Chung West: the retained mangrove stand is of medium – high ecological value (general evaluation for mangrove habitat), the plantation slope along Shun Tung Road is of low ecological value.</p> | <p>For TCE, the most ecologically sensitive area would be Tai Ho Wan. In this area, species susceptible to dust impact is mainly flora, including <i>Gmelina sinensis</i>, <i>D. vaccinioides</i>, <i>C. dicoccum</i> and <i>A. sinensis</i>.</p> <p>For TCW, no species of conservation importance were recorded within the retained mangrove stand, a few locally common flora species of conservation importance were recorded within the plantation slope along Shun Tung Road including <i>B. insignis</i>, <i>C. dicoccum</i> and <i>A. sinensis</i>.</p> | <p>The section of Tai Ho Wan within the Assessment Area is small, the entire Tai Ho Wan is large.</p> <p>For TCW, the affected mangrove habitat is of small size; for the plantation slope, a low number of species of conservation importance would be potentially affected.</p> | Temporary during the construction phase | Reversible | <p>Low for TCE as the vicinity areas are already subject to dust along North Lantau Highway.</p> <p>Low to moderate for the retained mangrove stand and plantation slope in TCW.</p> | <p>Insignificant for TCE</p> <p>Minor – moderate for TCW</p> | <ul style="list-style-type: none"> - Regular spray to suppress fugitive dust in the construction sites - Cover exposed earth surfaces by tarpaulins - Wheel washing facilities at construction site entrances |
| Human and general construction activities | <p>Tung Chung East: low value urbanised habitat for the areas near the works site, high value for the coastal mudflat and mangrove in Tai Ho Wan.</p> <p>Tung Chung West: coastal waters, mudflat and mangrove habitats in Tung Chung Bay are considered to be of moderate – high or high ecological value; downstream section of Wong Lung Hang downstream (channelised): low – moderate value.</p> | <p>For TCE, the most ecologically sensitive area would be Tai Ho Wan. A number of species of conservation importance were recorded including Horseshoe Crab, butterflies, ardeids, several frog species and Tokay Gecko etc.</p> <p>For TCW, disturbance sensitive species around the works site and works area consist of mainly water birds inhabiting the coast. Ardeids including Black-crowned Night Heron, Little Egret, Eastern Cattle Egret, Great Egret and Pacific Reef Heron etc. occur in the estuary of Wong Lung Hang (channelised watercourse) or the mudflat and mangrove habitats at Ma Wan Chung.</p> | <p>The section of Tai Ho Wan within the Assessment Area is small, the entire Tai Ho Wan is large.</p> <p>The coastal area of Tung Chung Bay which consists of mudflat and mangrove habitats is large and intact. Relatively low numbers of ardeids would be potentially affected.</p> | Temporary during the construction phase | Reversible | <p>Low for TCE as the vicinity areas are already subject to traffic disturbance from North Lantau Highway which separate the proposed works from habitats near Tai Ho Bay.</p> <p>Low to moderate for TCW</p> | <p>Insignificant for TCE</p> <p>Minor – moderate for TCW</p> | <ul style="list-style-type: none"> - Site hoarding of appropriate height along site boundaries will be installed. - Construction activities and material storage should be strictly confined within the construction sites. |
| Water quality deterioration | <p>Tung Chung East: low value urbanised habitat for the areas near the works site, high value for the coastal mudflat and mangrove in Tai Ho Wan.</p> <p>Tung Chung West: low value retained mangrove stand; low value abandoned drainage channel; moderate – high value coastal waters and mangrove in Tung Chung</p> | <p>For TCE, the most ecologically sensitive area would be Tai Ho Wan. A number of species of conservation importance were recorded including Horseshoe Crab, butterflies, ardeids, several frog species and Tokay Gecko etc.</p> <p>For TCW, no freshwater aquatic species of conservation importance were recorded in the adjacent waterbodies i.e., the abandoned drainage channel, Wong Lung Hang downstream (channelised) and the retained mangrove stand. A single individual of Romer's Tree Frog was recorded</p> | <p>The section of Tai Ho Wan within the Assessment Area is small, the entire Tai Ho Wan is large.</p> <p>Wong Lung Hang downstream section is considered as a large watercourse. The coastal area of Tung Chung Bay which</p> | Temporary during the construction phase | Reversible | <p>Low for TCE as it is separated from the sensitive Tai Ho Wan</p> <p>Low to moderate or moderate for TCW depending on the quantity of potential site runoff. More amount of runoff is</p> | <p>Not anticipated for TCE.</p> <p>Minor – moderate or moderate for TCW.</p> | <p>Good site practices:</p> <ul style="list-style-type: none"> - Proper construction site drainage system - Provision of silt removal facilities within construction site where necessary. - A barrier such as sheet pile/hoarding with |

| Impact | Habitat quality | Species | Size/abundance | Duration | Reversibility | Magnitude | Impact evaluation | Mitigation measure(s) required |
|--|--|---|---|---|---------------|--|---|--|
| | Bay; high value mudflat; low – moderate value Wong Lung Hang downstream (channelised) | in orchard to the north of Yu Tung Road and Mun Tung Estate. Low abundance of Horseshoe Crab and Blue Mudhopper (<i>Scartelaos histophorus</i>) were recorded on the mudflat of Ma Wan Chung. | consists of mudflat and mangrove habitats is large and intact. A low abundance of aquatic species of conservation importance were recorded. | | | expected during rainy days. | | <p>concrete footing could be installed along the western boundary of the construction site / works areas for TCA Station (subject to actual site circumstances and subsequent detailed design).</p> <p>- Proper surface channels along the western boundary of the construction site / works areas for TCW Station.</p> <p>- Conduct water quality monitoring at the discharge locations to be agreed under the Water Discharge Licence. (see details in Section 5.7.2.3)</p> |
| Habitat fragmentation | <p>Tung Chung East: no habitat fragmentation is anticipated.</p> <p>Tung Chung West: low value orchard habitat would be fragmented.</p> | TCW: Low abundance of common wildlife would be affected. | Small sized orchard habitat is impacted. | Permanent | Irreversible | Low due to low ecological value and small size of the habitat. | <p>Not anticipated for TCE.</p> <p>Minor for TCW.</p> | No specific mitigation measures are required. |
| Potential ground water infiltration and impact to marine sediment due to tunneling | <p>Tung Chung East: no ground water infiltration impact is anticipated.</p> <p>Tung Chung West: Coastal water: high value; mudflat: high value; mangrove in Tung Chung Bay and Ma Wan Chung: moderate to high value</p> | TCW: ardeids, Horseshoe Crab, Blue Mudhopper, common intertidal communities. | Tung Chung Bay consists of large mudflat habitat. The recorded species of conservation importance/concerned species are not of significant abundance. | Temporary during the construction phase | Reversible | Low due to the fact that the tunnel works area is close to the estuary area, the ground water level would be quickly balanced by the surrounding marine environment and watercourses. Also the tunnel works will take place at the rock layer. | Not anticipated. | No specific mitigation measures are required. |

| Impact | Habitat quality | Species | Size/abundance | Duration | Reversibility | Magnitude | Impact evaluation | Mitigation measure(s) required |
|--|--|--|--|-----------|--|--|------------------------|---|
| Operational Phase Direct Impact | | | | | | | | |
| Permanent loss of habitats and vegetation | Permanently loss habitats include low-valued developed area, orchard, disturbed/wasteland, plantation and a short section of abandoned drainage channel. | A low abundance of urban species was recorded in these habitats. Two butterfly species of conservation importance i.e., Tiny Grass Blue and Rounded 6-line Blue were recorded within the TCW Station Box works site. | About 14.8 ha of low valued habitats dominated by urbanised area and disturbed/wasteland, totalling about 12.7 ha, and small to minor areas of low-valued orchard, plantation and abandoned channel. A low number of Tiny Grass Blue and Rounded 6-line Blue. | Permanent | Permanent habitat loss would be irreversible | Moderate for urbanised habitat due to the extensive area; low for orchard; very low for plantation, disturbed/wasteland; shrubland/grassland and the abandoned channel. | Minor | No specific mitigation measures are required. |
| Operational Phase Indirect Impacts | | | | | | | | |
| Disturbance from human activities and normal operation | Tung Chung East: low valued developed area with existing disturbance from railway and traffic along North Lantau Highway. The ecologically sensitive bay area in Tai Ho Wan is separated from the re-aligned railway by North Lantau Highway. Tung Chung West: increased population would be cumulated at developed areas without any ecological concern. | Mostly common urban species would be affected by operational phase disturbances. | Low abundance of wildlife would be affected. | Permanent | Irreversible | Low, given that TCE is already subject to existing disturbance from highway and railway; and that TCW around the new station box is developed area and also subject to existing disturbance. | Not anticipated | No specific mitigation measures are required. |
| Habitat fragmentation | Tung Chung East: no habitat fragmentation is anticipated. Tung Chung West: low value orchard habitat would be fragmented. | TCW: Low abundance of common wildlife would be affected. | Small sized orchard habitat is impacted. | Permanent | Irreversible | Low due to low ecological value and small size of the habitat. | Not anticipated | No specific mitigation measures are required. |

8.10 Residual Impacts

- 8.10.1.1** The TCE section locates entirely on existing developed area which is of very low ecological value. The residual impact of permanent loss of developed area is therefore considered to be negligible.
- 8.10.1.2** For TCW section, the permanently loss of mainly urbanised area and disturbed/wasteland habitats do not include any important habitat. Residual impacts of such permanent loss are considered to be minor. Permanent loss of vegetated habitats includes approximate 1.95 ha orchard habitat for the new TCW station; about 0.10 ha plantation for the EAP/EEP. For other areas which mainly affect existing developed area, the residual impact due to permanent loss of developed area due to works sites, works areas and the barging point is considered to be negligible. Residual indirect impact of noise and vibration, dust emission and human disturbances during the construction phase would be insignificant with the implementation of the respective mitigation measures.
- 8.10.1.3** Stormwater and surface runoff during the operational phase would be properly collected by the drainage system of the Project. While all untreated sewage would be properly collected into sewerage systems. Therefore, residual water quality impact is negligible.
- 8.10.1.4** Operational phase human disturbance impacts would be insignificant. For TCE, the Project is along existing railway next to highway and a reclamation area which would be a developed area. For TCW, the nearby areas are developed, which are mainly residential uses.
- 8.10.1.5** For residual habitat fragmentation impact, the affected habitat type is low-valued orchard habitat dominated by monoculture of a few fruit tree species, mainly lychee. The residual fragmentation impact would be insignificant.

8.11 Environmental Monitoring and Audit (EM&A)

- 8.11.1.1** It is recommended that regular site inspections during the construction phase should be undertaken to inspect the construction activities and works areas to ensure the recommended mitigation measures are properly implemented. Details of the audit requirements are provided in the stand-alone EM&A Manual for the Project.

8.12 Conclusion

- 8.12.1.1** The current Project consists of the proposed TCL realignment, proposed extension of TCL to TCW through an underground tunnel, proposed TCE and TCW Stations, associated barging point, TBM launching shaft, above- and underground works sites and works areas during construction phase. No marine works is required.

8.12.1.2 The ecological baseline of the 500m Assessment Area was established by literature review and ecological survey covering the wet season of 2020 and 2021 including terrestrial ecological survey and supplementary marine ecological survey. As there would be no marine works required for the current Project, direct marine ecological impact is not anticipated. A total of 14 habitat types, including coastal waters, were identified within the Assessment Area. The TCE section is located solely on existing developed area and reclaimed land with limited ecological value. The ecological sensitive habitats and species around the TCW section have been avoided by the proposed underground tunnel and careful site selection for above ground works. Indirect ecological impacts including noise, vibration, dust and potential water quality deterioration would be either insignificant or would be mitigated by appropriate mitigation measures together with environmental monitoring and audit. No significant ecological impact would be arised from the Project.

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