

8 ECOLOGICAL IMPACT

8.1 INTRODUCTION

- 8.1.1 This chapter presents an assessment of potential impacts on ecological resources within the assessment area, and the results of assessment of the potential ecological impacts from the construction and operation of the proposed Traffic Improvement Scheme in Tuen Mun.
- 8.1.2 According to the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), the baseline conditions for the ecological components of the terrestrial and aquatic environment were evaluated based on information from available literature and field surveys conducted for the purposes of this EIA. The potential impacts on any ecologically sensitive receivers within the assessment area were assessed. Measures required to mitigate any identified adverse impacts were recommended, where appropriate, and residual impacts were assessed.
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8.2 ENVIRONMENTAL LEGISLATION, STANDARDS AND GUIDELINES

Ordinances and Regulations

- 8.2.1 The relevant legislation and associated guidelines related to this study include:
- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations;
 - Wild Animals Protection Ordinance (Cap. 170);
 - Environmental Impact Assessment Ordinance (EIAO) (Cap. 499);
 - EIAO-TM Annexes 8 and 16; and
 - Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation.
- 8.2.2 This study assessment makes reference to the following guidelines and standards:
- Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10, "Conservation";
 - PELB Technical Circular 1/97 / Works Branch Technical Circular 4/97, "Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures";
 - EIAO Guidance Note No. 3/2010 - Flexibility and Enforceability of Mitigation Measures Proposed in an Environmental Impact Assessment Report;
 - EIAO Guidance Note No. 6/2010 - Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective;
 - EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment; and,
 - EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys

The preliminary ecological impact assessment also makes reference to the following international conventions and national legislation:

- List of Wild Animals under State Protection, promulgated by the State Council 國家重點保護野生動物名錄;
- List of Wild Plants under State Protection, promulgated by the State Council 國家重點保護野生植物名錄;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES"). This Convention regulates international trade in animal and plant species considered to be at risk from such trade. The main categories of species relevant to Hong Kong are listed in Appendices I and II. Species listed in Appendix I are species threatened with extinction that are or may be affected by trade; species listed in Appendix II are those that, while not necessarily under current threat of extinction, may become threatened unless trade is subject to strict regulation. Hong Kong's obligations under this Convention are enforced via the Protection of Endangered Species of Animals and Plants Ordinance; and
- 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 <http://www.redlist.org>). The Red List is considered the authoritative publication to classify species as critically endangered, endangered, vulnerable, or lower-risk.

Criteria of Evaluating Species of Conservation Importance

8.2.3 Species of flora and fauna with conservation importance are given special attention. In accordance with Table 8.4, Annex 8 of the TM-EIAO, the ecological value of species is assessed in terms of protection status, distribution, and rarity. Flora or fauna species protected by the following laws/regulations, listed under the following conventions and/or endemic to Hong Kong, are considered to be species of conservation importance. However, this excludes exotic species, cultivated individuals, escaped cultivars or captive species, vagrants and introduced species which have lower ecological value. 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 current Project.

- 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);
- China Plant Red Data Book;
- China Species Red List;
- China Red Data Book of Endangered Animals;
- Category I or II protected species in mainland China;
- Threatened Species List of China's Higher Plants (Qin et al. 2017);
- Red List of China's Vertebrates;
- Rare and Precious Plants of Hong Kong (2003);
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- Forestry Regulations (Cap. 96A) which are subsidiary legislation of the Forests and Countryside Ordinance (Cap. 96);

- Wild Animals Protection Ordinance (Cap. 170) (except birds as all wild birds are protected under the ordinance but their conservation importance is not equal);
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
- PRC Wild Animal Protection Law;
- Plant species considered 'Rare' or 'Very Rare' listed by Corlett *et al.* (2000) where applicable; and
- Fauna species considered of concern in Fellowes *et al.* (2002).

8.3 ASSESSMENT METHODOLOGY

Assessment Area

8.3.1 The assessment area for the purpose of the terrestrial ecological impact assessment includes areas within 500m distance from the boundaries of the Project Sites shown in **Figure 8.1.1, 8.1.2, 8.1.3.**

8.3.2 There are two Project Sites shown in **Figure 8.1.1**, they are:

- Proposed Lung Fu Road Slip Road (Northbound and Southbound) (LFRSR NB&SB)
- Proposed Tuen Mun Road / Hoi Wing Road Slip Road (HWRSR)

Literature Review

8.3.3 The ecological characteristics, especially recognized sites of conservation importance and species of conservation importance, of the 500m assessment area are reviewed through standard literature review procedures. Assessment/Study Areas of publicly available studies overlapping the assessment area of this study are reviewed. Recognized site(s) of conservation importance and species of conservation importance present in the overlapping range are taken note and indicated accordingly. The reviewed literature is summarized as **Table 8.1**, and the result of literature review is presented in **Section 8.4.**

Table 8.1. Reviewed literature

Relevant literature	Terrestrial and aquatic ecology					
	Habitat and Vegetation	Terrestrial Mammal	Avifauna	Herpetofauna	Butterfly and Odonate	Aquatic Fauna
Territory-wide Study on Roosting Sites of Ardeids in Winter 2019/20 (So and Yuen, 2020)	-	-	✓	-	-	-
EIA study of Traffic Improvements to Tuen Mun Road Town Centre Section (AEIAR-128/2009)	✓	✓	✓	✓	✓	✓
EIA study of Tuen Mun South Extension (AEIAR-236/2022)	✓	✓	✓	✓	✓	✓
EIA study of Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat) (EIA-280/2022)	✓	✓	✓	✓	✓	✓
Agreement No. CE 57/2017 (CE) Site Formation and Infrastructure Works Public Housing Developments	✓	✓	✓	✓	✓	✓

Relevant literature	Terrestrial and aquatic ecology					
	Habitat and Vegetation	Terrestrial Mammal	Avifauna	Herpetofauna	Butterfly and Odonate	Aquatic Fauna
at Tuen Mun Central – Investigation, Design and Construction						

Ecological Survey Methodology

- 8.3.4 The methodology of the ecological surveys makes reference to the technical guidelines of ecological assessment in Annexes 8 and 16 of Technical Memorandum under Environmental Impact Assessment Ordinance and the relevant Guidance Notes (GN 7/2010 and GN 10/2010).
- 8.3.5 In accordance with the EIA Study Brief (No. ESB-339/2021), a rapid site survey should be carried out in wet season that covers the potentially affected terrestrial habitats, and investigations to verify the information collected, fill in the information gaps as identified from literature review, if any, and to fulfil the objectives of the EIA study. Surveys on habitat and vegetation, terrestrial mammals, avifauna, herpetofauna, butterfly and odonate, and aquatic fauna were conducted. The rapid site survey also covered flora, fauna and any other sites/habitats/species of conservation importance, such as Tai Lam Country Park (TLCP).
- 8.3.6 The period of the rapid site surveys was undertaken in wet season from April 2022 to May 2022 (Table 8.2).

Table 8.2. Ecological Survey Programme

Survey	2022			
	Apr		May	
	DT	NT	DT	NT
Habitat and Vegetation	✓	-	-	-
Terrestrial Mammal	✓	✓	✓	✓
Avifauna	✓	✓	✓	✓
Ardeid Roost	-	✓#	-	✓#
Herpetofauna	✓	✓	✓	✓
Butterfly and Odonate	✓	-	✓	-
Aquatic Fauna	-	-	✓	-

*Abbreviations: DT = Day Time; NT = Night Time

The ardeid roost survey was conducted in the evening

- 8.3.7 As the Project involves small scale of works inside and surrounded by developed areas with very low ecological value, significant ecological impact is not anticipated. Hence, a rapid site survey was to focus on the areas that are likely affected by the Project, i.e. within the boundary of the Project and the vicinity and important habitats and the recognized sites of conservation importance such as TLCP and ardeid roosting site at Tuen Mun Park (for avifauna survey). The survey transect for avifauna, and butterflies and odonates surveys is, thus, designed following the above principles. The survey transect, ardeid roost surveying point and aquatic sampling points are shown in **Figure 8.1.1, 8.1.2, 8.1.3** and they will be discussed below.
- 8.3.8 **Habitat and Vegetation:** Walk-over surveys were conducted at representative areas of each habitat type within the Assessment Area. Areas that are likely affected by the Project, i.e. within the boundary of the Project and the vicinity and important habitats and the recognized sites of conservation importance such as TLCP were focused. Vascular plant species in each habitat type was identified (with the aid of binoculars when necessary) and their relative abundance was recorded, with special attention to rare and protected species. Color photographs were

taken of all habitats encountered and of ecological features of special importance. Habitat maps of the assessment area were produced at a suitable scale using Geographical Information System (GIS) software. Nomenclature of vascular plant species follows Hong Kong Herbarium (2022), whilst their rarity in Hong Kong follows Corlett *et al.* (2000) and Yip *et al.* (2010) where applicable. The locality of each recorded species of conservation importance within the 500m Assessment Area is presented in **Figure 8.4.1, 8.4.2 and 8.4.3.**

- 8.3.9 **Terrestrial mammals:** Mammal surveys (including day and night-time surveys) were carried out by active search and cover representative habitats within the Assessment Area. Areas that are likely affected by the Project, i.e. within the boundary of the Project and the vicinity and important habitats and the recognized sites of conservation importance such as TLCP were focused. All sightings, tracks, and signs of mammals found were recorded. As some mammal species (e.g. bats) are nocturnal, night surveys were also be conducted. Nomenclature of mammal follows the biodiversity database maintained by Agriculture, Fisheries and Conservation Department (AFCD) (AFCD 2022). The locality of each recorded species of conservation importance within the 500m Assessment Area is presented in **Figure 8.4.1, 8.4.2 and 8.4.3.**
- 8.3.10 **Avifauna:** Avifauna was surveyed using transect count method, the transect is shown in **Figure 8.1.1, 8.1.2, 8.1.3.** All avifauna seen or heard was identified and their abundance recorded by habitat. Signs of breeding (e.g. nests, recently fledged juveniles) were also be recorded. As some birds (e.g., owls, nightjars) are nocturnal, night surveys were also be conducted. Nocturnal birds were identified by active searching using spot-light and by their calls. Ornithological nomenclature follows AFCD (2022). The locality of each recorded species of conservation importance within the 500m Assessment Area is presented in **Figure 8.4.1, 8.4.2 and 8.4.3.** The number of ardeids roosting at Tuen Mun Park was also be counted at the ardeid roost surveying point in the evening (approximately 30 minutes before and after sunset). The ardeid roost surveying point is a location that the ardeid night roost was clearly seen. Other relevant observations about the ardeids in Tuen Mun Park were also recorded.
- 8.3.11 **Herpetofauna:** Herpetofauna was surveyed at representative habitats within the Assessment Area. Areas that are likely affected by the Project, i.e. within the boundary of the Project and the vicinity and important habitats and the recognized sites of conservation importance such as TLCP were focused. All reptiles and amphibians sighted were recorded. As herpetofauna are mostly nocturnal, night surveys were carried out. Potential microhabitats of herpetofauna such as wall, fallen logs, litter, channel/nullah, fishpond margins, underneath of stones or other materials, artificial container (e.g. pots) were searched during surveys to locate cryptic or secretive herpetofauna species. Amphibians were also identified by their calls during night surveys. Nomenclature follows AFCD (2022). The locality of each recorded species of conservation importance within the 500m Assessment Area is presented in **Figure 8.4.1, 8.4.2 and 8.4.3.**
- 8.3.12 **Butterflies and Odonates:** Odonates and butterflies were surveyed using transect count method, the transect is shown in **Figure 8.1.1, 8.1.2, 8.1.3.** The observed butterflies and odonates were identified and their abundance was recorded. Nomenclature of butterfly and odonate follow AFCD (2022). The locality of each recorded species of conservation importance within the 500m Assessment Area is presented in **Figure 8.4.1, 8.4.2 and 8.4.3.**
- 8.3.13 **Aquatic fauna:** Surveys of freshwater communities were undertaken at the aquatic sampling points in the watercourses likely to be affected by the Project by means of active searching and direct observation. Freshwater fauna found was identified to the lowest possible taxonomic level with their abundance recorded, and the nomenclature for aquatic fauna follows AFCD (2022). The locality of each recorded species of conservation importance within the 500m Assessment Area is presented in **Figure 8.4.1, 8.4.2 and 8.4.3.**



Methodology for the Ecological Impact Assessment

8.3.14 The ecological importance of the habitats within the Project Site and 500m assessment area is evaluated and makes reference to the criteria stipulated in Annex 8 of TM-EIAO. In accordance with Table 3, Annex 8 of the TM-EIAO, the ecological value of recorded species is assessed in terms of protection status (e.g. fauna protected under Wild Animals Protection Ordinance (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare or restricted). The potential impact arising from the proposed development is evaluated and mitigation measures are recommended.

8.4 ECOLOGICAL BASELINE CONDITION

Literature Review

Recognized site of conservation importance

- 8.4.1 Recognized sites of conservation importance within the 500m assessment area only include TLCP. Castle Peak Site of Special Scientific Interest (SSSI) is located outside but close to the boundary of the 500m assessment area.
- 8.4.2 TLCP is located to the east of the HWRSR Site which is within the 500m assessment area. The minimum distance between the Country Park boundary and the HWRSR Site is about 60m (**Figure 8.2**). TLCP (5412 ha) is the second largest Country Park of Hong Kong designated in 1979. A few decades ago, TLCP was a bare domain with scarce vegetation. Under serious soil erosion, it is characterized by denuded hilltops and ravines. After the completion of Tai Lam Chung Reservoir, afforestation began in 1952 to protect the catchwaters from erosion and soil loss. Most parts of TLCP are afforested with Taiwan Acacia (*Acacia confusa*), Brisbane Box (*Lophostemon confertus*), Chinese Red Pine (*Pinus massoniana*), Slash Pine (*Pinus elliottii*) and Swamp Mahogany (*Eucalyptus robusta*), in addition to a smaller portion of native species, comprising Oak and Machilus species and *Castanopsis fissa*.
- 8.4.3 The Castle Peak Site of SSSI is located to the west of the LFRSR NB&SB Site which is outside the assessment area. The minimum distance between the SSSI and the LFRSR NB&SB Site is approximately 800m (**Figure 8.2**). Inside this SSSI, the grassy summit is the most important site for *Platycodon grandifloras*, a rare plant which is protected under the Forest and Countryside Ordinance. The ravines are forested with interesting and rare plant species such as *Uvaria hamiltonii*.

Important Habitats

- 8.4.4 Tuen Mun Egretty is located at the northeast of the LFRSR NB&SB Site. However, it is outside and far away from the Project Site (~1.2 km). Tuen Mun Egretty is an egretty located in an urbanized area with a small population of Little Egret. Tuen Mun Egretty was first reported in 2003. This ardeids nesting colony is located at *Acacia auriculiformis* plantation on the embankment of the Tuen Mun River Channel, 200m south of the proposed highway alignment. Only Little Egret was recorded nesting in this egretty. Number of nests never made up more than 35 nests, or 4% of total ardeids nests, in Hong Kong, and the nesting population of this egretty is considered low in Hong Kong Context. The foraging ecology of Little Egret in the Tuen Mun Egretty has not been studied previously. Potential foraging habitats included the Tuen Mun River Channel, ponds in Tuen Mun Park and coastal areas of Castle Peak Bay. Tuen Mun Egretty was surveyed in the EIA study of Tuen Mun South Extension (AEIAR-236/2022) during Mar 2021 to Jun 2021. The number of nests recorded in Mar 2021, Apr 2021, May 2021 and Jun 2021 were 0, 18, 14 and 8 respectively.
- 8.4.5 Tuen Mun Park ardeid roost, which is located near the boundary of the 500m assessment area, is a night roost site for ardeids. It is about 950m apart from the Tuen Mun Egretty, its approximate location is shown in **Figure 8.2**. According to the survey of So and Yuen (2020) during 16th December, 2019, there were 259 individuals of night-roosting ardeids (excluding the Black-crowned Night Heron). Among which, 235 individuals were Little Egret, 16 individuals were Great Egret and 8 individuals were Chinese Pond Heron. The Tuen Mun Park ardeid roost was also surveyed in the EIA study of Tuen Mun South Extension (AEIAR-236/2022) during Jan 2021 to Jun 2021. According to their findings, higher abundance of ardeid was recorded using the roost in dry season in general, with the highest abundance recorded in Jan 2021 (300

individuals). While lower abundance of ardeid was recorded wet season, the lowest abundance of ardeid was recorded in May 2021 (39 individuals). Most of the ardeids in Tuen Mun Park ardeid roost were Little Egret (about 70-85%), followed by Great Egret (about 12-27%) and Chinese Pond Heron (about 2-5%).

Habitat and Species of conservation importance

- 8.4.6 In the EIA study of Traffic Improvements to Tuen Mun Road Town Centre Section (AEIAR-128/2009), part of the assessment area in that EIA overlaps with that of the current Project. The overlapping area mainly covers the eastern part of the assessment area of the current Project. In that overlapping area, six habitats were identified, they include developed area/village, town park, shrubland, sea, watercourse and plantation woodland. Developed area/village, plantation woodland and watercourse (channel) were ranked as low ecological value; town park and watercourse (natural) were ranked as low to moderate ecological value, while shrubland was ranked as moderate ecological value (**Table 8.3**). No species of conservation importance was recorded in the overlapping assessment area.
- 8.4.7 In the EIA study of Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat) (EIA-280/2022), part of the assessment area in that EIA overlaps with the eastern portion of the assessment area of the current Project. In that overlapping area, eight habitats were identified, including developed area, grassland/shrubland, marine water, mixed woodland, plantation woodland, sandy shore, seawall and watercourse. The ecological values of each of the habitats are listed in **Table 8.4**. Three flora species of conservation importance (*Aquilaria sinensis*, *Michelia odora* and *Neottopteris nidus*) and 7 terrestrial fauna species of conservation importance (Black Kite, Great Egret, Little Egret, White-Throated Kingfisher, Danaid Eggfly, Emerald Cascader and Pallas's Squirrel) were found within the overlapping area, however, all of them were located outside the Project Site of the current Project. Besides, two species of coral (*Guaigorgia* sp. and *Oulastrea crispata*) were also found at the coastline (**Table 8.7** and **Table 8.8**). The locations of these species are shown in **Figure 8.3**.
- 8.4.8 The western part of the assessment area of the current Project also overlaps with the assessment area of the EIA study of Tuen Mun South Extension (AEIAR-236/2022). The habitats in the overlapping area identified by AEIAR-236/2022 include: developed area, mixed woodland, modified watercourse, plantation and village/orchard. The ecological values of each of the habitats are listed in **Table 8.5**. Within the overlapping area, there were 8 avifauna species of conservation importance (Black-crown Night Heron, Chinese Pond Heron, Great Egret, Little Egret, Greater Council, Collared Crow, Crested Goshawk and Ashy Drongo) and 2 mammal species of conservation importance (Short Nosed Fruit Bat and Least Horseshoe Bat) recorded. However, all of these records were outside the Project Site of the current Project (**Table 8.7**). The locations of these species are shown in **Figure 8.3**.
- 8.4.9 Most of the assessment area of the current Project overlaps with that of CE 57/2017 (CE) - Site Formation and Infrastructure Works Public Housing Developments at Tuen Mun Central – Investigation, Design and Construction. The overlapping area also includes a small area within TLCP. Habitats within the overlapping area include developed area/wasteland, grassland, shrubland, mixed woodland, woodland, natural watercourse, modified watercourse, plantation and village/orchard. Shrubland, plantation, woodland and a small section of natural watercourse are also presence in the overlapping area with TLCP. The ecological values of each of the habitats are listed in **Table 8.6**. Within the overlapping area, 5 fauna species of conservation importance (Black-crowned Night Heron, Little Egret, Chinese Pond Heron, Emerald Dove and Short-nosed Fruit Bat) and 3 flora species of conservation importance (*Diospyros vaccinioides*, *Aquilaria sinensis* and *Camellia sinensis*) were recorded. However, all of these records were outside the Project Site of the current Project (**Table 8.7**). *Diospyros vaccinioides* was also recorded within the overlapping area of TLCP. The locations of these

species are shown in **Figure 8.3**. *Gnetum luofuense*, *Dalbergia benthamii* and *Dalbergia hancei* were recorded and regarded as species of conservation importance in this study. These species, however, are not considered as species of conservation importance in the current Study. *Gnetum luofuense* is a common climber in Hong Kong, it is considered as “very common” and “common” by Corlett *et al.* (2000) and AFCD (2007) respectively. It is not facing any known specific threat in Hong Kong, too. The only conservation status of this species is “Near Threatened” in IUCN Red List of Threatened Species (IUCN 2022), which does not meet the criteria of species of conservation importance stated in **Section 8.2.3**. *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). However, as *Dalbergia benthamii* and *Dalbergia hancei* are climber which is not relevant to the timber exploitation. In addition, these species are common in Hong Kong, they are not considered as species of conservation importance under the current Study.

Table 8.3 Habitats and their ecological value in AEIAR-128/2009

Habitat	Ecological value
Plantation woodland	Low
Developed area/village	Low
Watercourse (channel)	Low
Town park	Low to moderate
Watercourse (natural)	Low to moderate
Shrubland	Moderate
Sea	Not evaluated

Table 8.4 Habitats and their ecological value in EIA-280/2022

Habitat	Ecological value
Developed area	Very low
Grassland/shrubland	Low
Marine water	Low to moderate
Mixed woodland	Low to moderate
Plantation woodland	Low
Sandy shore	Low
Seawall	Low
Watercourse	Low for channelized/culverted sections, moderate for uphill natural sections

Table 8.5 Habitats and their ecological value in AEIAR-236/2022

Habitat	Ecological value
Developed area	Moderate for the area with night roosting ardeids Low in other areas
Mixed woodland	Low to moderate
Modified watercourse	Low to moderate
Plantation	Low
Village/orchard	Low

Table 8.6 Habitats and their ecological value in CE 57/2017 (CE) - Site Formation and Infrastructure Works Public Housing Developments at Tuen Mun Central – Investigation, Design and Construction

Habitat	Ecological value
Developed area/wasteland	Very low
Grassland	Low
Shrubland	Medium
Mixed woodland	Low
Woodland	Medium
Natural watercourse	Medium
Modified watercourse	Low
Plantation	Low
Village/orchard	Low

Table 8.7 Flora species of conservation importance recorded around the Project Site of the current Project from the reviewed literature

Species	Locations	Protection Status ^{2 3 4 5 7 8 9 10}	Distribution ¹	Rarity ¹	Source
<i>Aquilaria sinensis</i>	Developed area and mixed woodland outside Project Sites but within Assessment Area of the current Project	IUCN Red List of Threatened Species (2021): 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	EIA-280/2022 CE 57/2017 (CE)

Species	Locations	Protection Status ^{2 3 4 5 7 8 9 10}	Distribution ¹	Rarity ¹	Source
<i>Diospyros vaccinioides</i>	Shrubland/ grassland outside Project Sites but within Assessment Area of the current Project (within TLCP)	IUCN Red List: Critically Endangered	Shrubland	Very common	CE 57/2017 (CE)
<i>Camellia sinensis</i>	Mixed woodland outside Project Sites but within Assessment Area of the current Project	Cap.96A Threatened Species List of China's Higher Plants (Vulnerable)	Forest; Sunset Peak and Tai Mo Shan; also planted	Rare	CE 57/2017 (CE)
<i>Michelia odora</i>	Developed area outside the Project Site but within Assessment Area of the current Project	Cap. 96A Listed in Rare and Precious Plants of Hong Kong China Plant Data Book: Rare Included in Illustrations of Rare & Endangered Plants in Guangdong Province Vulnerable in IUCN (2022)	Montane forest. Tai Mo Shan	Very Rare	EIA-280/2022
<i>Neottopteris nidus</i>	Plantation outside the Project Site but within Assessment Area of the current Project	Cap. 96A	Forest	Restricted	EIA-280/2022

Notes:

1. Corlett *et al.* (2000). Hong Kong Vascular Plants: Distribution and Status.
2. IUCN (2022). IUCN Red List Version 2021-3.
3. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2022). 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 8.8 Fauna species of conservation importance recorded within the Assessment Area of the current Project from the reviewed literature

Scientific Name ¹	Common Name ¹	Locations	Rarity and Distribution in Hong Kong ¹	Conservation status ^{2,3,4,5,6,7,8}	Source
Bird (all wild birds in Hong Kong are protected under CAP.170)					
<i>Ardea alba</i>	Great Egret	Recorded in Sea and Channel outside the Project Site of current Project	Common resident and winter visitor. Widely distributed in Hong Kong	Fellowes et al. (2002): PRC,(RC)	EIA-280/2022 AEIAR-236/2022
<i>Egretta garzetta</i>	Little Egret	Recorded in Sea, Developed Area and Channel outside the Project Site of current Project	Common resident. Widely distributed in lowlying wet or coastal areas in Hong Kong	Fellowes et al. (2002): PRC,(RC)	EIA-280/2022 AEIAR-236/2022 CE 57/2017 (CE)
<i>Milvus migrans</i>	Black Kite	Recorded in Developed Area outside the Project Site of current Project	Common resident and winter visitor. Widely distributed in Hong Kong and occurs in many types of habitats	Class 2 Protected Animal of China; Fellowes et al. (2002): (RC); Appendix 2 of CITES; Cap. 586	EIA-280/2022
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	Recorded in the Developed Area and Sandy Shore outside the Project Site of current Project	Common Resident. Mainly found in coastal mudflat and mangroves, also seen in inland fishponds, wet agricultural areas	Class 2 Protected Animal of China; Fellowes <i>et al.</i> (2002): (LC)	EIA-280/2022 CE 57/2017 (CE)
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	Recorded in Channel outside the Project Site of current Project	Common resident, migrant and winter visitor. Widely distributed in Hong Kong.	Fellowes <i>et al.</i> (2002): PRC,(RC)	AEIAR-236/2022 CE 57/2017 (CE)

Scientific Name ¹	Common Name ¹	Locations	Rarity and Distribution in Hong Kong ¹	Conservation status 2,3,4,5,6,7,8	Source
<i>Ardeola bacchus</i>	Chinese Pond Heron	Recorded in Channel outside the Project Site of current Project	Common resident. Widely distributed in Hong Kong.	Fellowes et al. (2002): PRC,(RC)	AEIAR-236/2022 CE 57/2017 (CE)
<i>Centropus sinensis</i>	Greater Coucal	Recorded in Mixed Woodland outside the Project Site of current Project	Common resident. Widely distributed in Hong Kong.	Class 2 Protected Animal of China; China Red Data Book Status: (Vulnerable)	AEIAR-236/2022
<i>Dicrurus leucophaeus</i>	Ashy Drongo	Recorded in Mixed Woodland outside the Project Site of current Project	Uncommon winter visitor. Found in Shing Mun, Tai Po Kau.	Fellowes et al. (2002): LC	AEIAR-236/2022
<i>Corvus torquatus</i>	Collared Crow	Recorded in Channel outside the Project Site of current Project	Locally common resident. Found in Inner Deep Bay area, Nam Chung, Kei Ling Ha, Tai Mei Tuk, Pok Fu Lam, Chek lap Kok, Shuen Wan, Lam Tsuen.	Fellowes et al. (2002): LC; IUCN Red List Status: (Vulnerable); Red List of China Vertebrates: (Near Threatened)	AEIAR-236/2022
<i>Accipiter trivirgatus</i>	Crested Goshawk	Recorded in Mixed Woodland outside the Project Site of current Project	Uncommon, widely distributed in woodlands and shrublands throughout Hong Kong.	Cap.586; Class 2 Protected Animal of China; China Red Data Book Status: (Rare); Red List of China's Vertebrates: Near Threatened	AEIAR-236/2022

Scientific Name ¹	Common Name ¹	Locations	Rarity and Distribution in Hong Kong ¹	Conservation status 2,3,4,5,6,7,8	Source
<i>Chalcophaps indica</i>	Emerald Dove	Recorded in Mixed Woodland outside the Project Site of current Project	Scarce but widespread resident. Widely distributed in woodland throughout Hong Kong.	China Red Data Book Status: Vulnerable	CE 57/2017 (CE)
Dragonfly					
<i>Zygonyx iris</i>	Emerald Cascader	Recorded in Plantation outside the Project Site of current Project	Common. Widely distribute in moderately clean, rapidly flowing forested streams throughout Hong Kong	Fellowes <i>et al.</i> (2002): PGC	EIA-280/2022
Butterfly					
<i>Hypolimnas misippus</i>	Danaid Eggfly	Recorded in Plantation outside the Project Site of current Project	Uncommon. Found in scattered areas including Ngau Ngak Shan, Lung Kwu Tan, Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang	Fellowes <i>et al.</i> (2002): LC	EIA-280/2022
Mammal					
<i>Cynopterus sphinx</i>	Short Nosed Fruit Bat	Recorded in Developed Area outside the Project Site of current Project	Very common. Very widely distributed in urban and countryside areas throughout Hong Kong.	(Cap.170); Red List of China's Vertebrates: Near Threatened	AEIAR-236/2022 CE 57/2017 (CE)
<i>Rhinolophus pusillus</i>	Least Horseshoe Bat	Recorded in Developed Area outside the Project Site of current Project	Uncommon. Widely distributed in countryside areas throughout Hong Kong	(Cap.170); Fellowes <i>et al.</i> (2002): PRC (RC)	AEIAR-236/2022

Scientific Name ¹	Common Name ¹	Locations	Rarity and Distribution in Hong Kong ¹	Conservation status ^{2,3,4,5,6,7,8}	Source
<i>Callosciurus erythraeus</i>	Pallas's Squirrel	Recorded in the Developed area outside the Project Site of current Project	Fairly widely distributed, with the <i>styani</i> subspecies found in the New Territories (e.g. Tai Lam, Shing Mun and Tai Po Kau), and the <i>thai</i> subspecies found on the Hong Kong Island (e.g. Tai Tam and Pok Fu Lam).	(Cap. 170)	EIA-280/2022
Marine fauna					
<i>Guaiaegorgia</i> sp.	/	Recorded in Sea outside the Project Site of current Project	Common. Common in western waters ⁴	/	EIA-280/2022
<i>Oulastrea crispata</i>	Zebra coral	Recorded in Sea outside the Project Site of current Project	Common. Many places in Hong Kong ³	Cap. 586	EIA-280/2022

Notes

1. AFCD (2022). Hong Kong Biodiversity Database.
2. Cap. 170 Wild Animals Protection Ordinance
3. Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance.
4. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2022). Appendices I, II and III.
5. Fellowes *et al.* (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong.
 - For conservation status listed by Fellowes *et al.* (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
6. List of State Protected Wild Animals, promulgated by the State Council
7. Zheng and Wang (1998). China Red Data Book of Endangered Animals: Aves.
8. Jiang *et al.* (2016). Red List of China's Vertebrates

Abbreviations:

- Conservation Status in Fellowes *et al.* (2002): LC = Local Concern; PRC = Potential Regional Concern; RC = Regional Concern

Ecological Survey Results

Habitat & Vegetation

8.4.10 There were 9 types of habitats identified within the Assessment Area, namely channel, developed area, plantation, sandy shore, sea, shrubland/grassland, natural watercourse, semi-natural watercourse and mixed woodland (**Table 8.9**).

Habitats within the Project Site

- 8.4.11 The LFRSR NB&SB site was dominated by developed area, composing Tsing Wun Road, Lung Mun Road and Wong Chu Road. Roadside plantation was also identified next to and under the roads within the Project Site. This site was dominated by exotic landscape species such as *Acacia confusa*, *Acacia auriculiformis*, *Melaleuca cajuputi* subsp. *cumingiana* and *Schefflera arboricola*. Self-seeded tree species such as *Leucaena leucocephala* and *Macaranga tanarius* var. *tomentosa* were also commonly found.
- 8.4.12 The HWRSR site consists of developed area, including Hoi Wing Road and Tuen Mun Road, plantation on the engineering slopes along Tuen Mun Road, small area of mixed woodland and short section of semi-natural watercourse. The section of semi-natural watercourse within this site was highly disturbed and modified with some human structure. In general, this site was largely planted with an exotic tree species *Acacia auriculiformis*. Some self-seeded trees including *Leucaena leucocephala* and *Macaranga tanarius* var. *tomentosa* could also be commonly found. Apart from trees, weedy species were also commonly encountered within the site, they include *Panicum maximum* and *Paederia scandens*. Besides, *Dicranopteris pedate* was largely recorded on the engineering slopes.

Habitats within the Assessment Area

- 8.4.13 Two major channels identified within the Assessment Area were part of the Tai Lam Chung Catchwater which is connecting to the Tai Lam Chung Reservoir, and part of the Tuen Mun River Channel. Due to the channelized nature of the habitat, the growing space is limited, tree species such as *Cleistocalyx nervosum* found in the Tai Lam Chung Catchwater existed in shrub form. Grass and herb species, such as *Miscanthus sinensis* and *Pennisetum alopecuroides* were found in the Tai Lam Chung Catchwater. For the Tuen Mun River, some landscape tree species, such as *Hibiscus tiliaceus* and *Melia azedarach*, were planted at the bank of some areas. Besides, a short man-made drainage channel is also found in the southeast of the Assessment Area near Cafeteria Old Beach which was largely paved with concrete and with little vegetation.
- 8.4.14 Developed area within the Assessment Area consisted of villages, residential areas, roads, and other anthropogenic structures. This habitat was largely paved with concrete and was prone to human disturbance. Vegetation colonizing in this habitat mainly consisted of landscape/ornamental species such as *Acacia confusa*, *Delonix regia* and *Melaleuca cajuputi* subsp. *cumingiana* and weedy species such as *Paspalum distichum*, *Panicum maximum* and *Wedelia trilobata*.
- 8.4.15 Sandy shore within the Assessment Area runs along the coastline of Sam Shing area, the sandy shore is a natural habitat in nature, however, the backshore is modified/developed. Besides, most of the areas are gazetted beaches prone to human disturbance. The habitat was planted with exotic tree species such as *Casuarina equisetifolia* and native tree species such as *Hibiscus tiliaceus* and *Pongamia pinnata*.
- 8.4.16 Shrubland/grassland was found at the hillside and hilltop of the hills at the eastern and western parts of the Assessment Area. The habitat was formed where trees are difficult to recolonize the due to unfavorable factors such as rapid hill fires, poor soil quality or strong wind. Grass and herb species such as *Dicranopteris pedate* and *Cymbopogon hamatulus*, and shrub species such as *Polyspora axillaris* and *Rhodomyrtus tomentosa* could also commonly encountered in the habitat.
- 8.4.17 Several watercourses were identified at the southeast, eastern and western parts of the Assessment Area. The downstream of most of the watercourses were semi-natural with some human disturbance found. While the upstream of most of the watercourses remained natural. The beds and banks of the watercourses are composed of stones and gravels in general.

- 8.4.18 Mixed woodland stands were found at the hillside of the hill to the eastern and western parts of the Assessment Area, besides, two isolated mixed woodland stands were also identified surrounding the Sam Saint Temple and behind the Tin Hau Temple Plaza. The mixed woodland next to temples and villages was prone to human disturbance. The structure of mixed woodland was rather simple in general, with a short canopy (about 6-10m) composed pioneer tree species such as *Celtis sinensis*, *Macaranga tanarius* var. *tomentosa* and *Sterculia lanceolata* and exotic tree such as *Leucaena leucocephala* and *Acacia auriculiformis*. Light gaps could be found and the understorey was simple and was mainly colonized by herb and shrub species that accommodating some human disturbance, such as *Microstegium ciliatum*, *Alocasia macrorrhizos*, *Ligustrum sinense* and *Lantana camara*.
- 8.4.19 Plantation within the Assessment Area was mainly in forms of roadside, hillside plantation and plantation on engineering slopes. Trees found in this habitat were mainly plantation species such as *Acacia auriculiformis*, *Acacia confusa* and *Lophostemon confertus*, and pioneer tree species such as *Macaranga tanarius* var. *tomentosa* and *Schefflera heptaphylla*. The understorey was rather bare or with simple structure covered by weedy species such as *Wedelia trilobata*, *Alocasia macrorrhizos* and *Lantana camara*, and native climber species such as *Parthenocissus dalzielii* and *Paederia scandens*. Besides, plantation associating with village areas was planted with fruit trees such as *Dimocarpus longan*, *Carica papaya* and *Clausena lansium*.
- 8.4.20 Sea within the Assessment Area was located next to the sandy shore near Sam Shing Estate. The sea is prone to human disturbance from human activities such as littering, swimming and logistic activities. No vegetation was found in sea.

Habitats within TLCP

- 8.4.21 Part of the TLCP was within the Assessment Area but outside the Project Site. Five types of habitats were found in the part of the TLCP, namely channel, developed area, mixed woodland, shrubland/grassland and watercourse. Native herb *Nepenthes mirabilis* which is a species of conservation importance was found. The structure of the mixed woodland within TLCP is simple, with a short and sparse canopy (about 6-8m) composed of exotic tree species such as *Acacia confusa*, *Pinus elliotii* and *Lophostemon confertus*, and pioneer native tree species such as *Schefflera heptaphylla*. Besides, native herb species such as *Boehmeria nivea* var. *tenacissima* and *Hedyotis acutangular* were also commonly found in the mixed woodland in TLCP. *Diospyros vaccinioides*, a shrub species of conservation importance was found in shrubland/grassland. Native shrub species such as *Atalantia buxifolia* and *Eurya nitida*, and native climber species such as *Cocculus orbiculatus* and *Caesalpinia crista* were found in this habitat. Native herb species such as *Pteris vittate*, *Thysanolaena latifolia* and *Miscanthus sinensis* were found along sides of the watercourses.

Table 8.9 Habitat recorded within the Project Site and Assessment Area

Habitat	Within the Project Sites		Outside Project Sites but within the Assessment Area		Within the Assessment Area		Percentage of habitats within the Assessment Area by size (%)
	Size (ha)	Length (m)	Size (ha)	Length (m)	Size (ha)	Length (m)	
Channel	/	/	13.85	3126.49	13.85	3126.49	3.8
Developed Area	9.98	/	210.47	/	220.45	/	60.55
Natural watercourse	/	/	0.13	1985.38	0.13	1985.38	0.04
Plantation	3.09	/	35.37	/	38.46	/	10.56
Sandy Shore	/	/	0.66	/	0.66	/	0.18

Habitat	Within the Project Sites		Outside Project Sites but within the Assessment Area		Within the Assessment Area		Percentage of habitats within the Assessment Area by size (%)
	Size (ha)	Length (m)	Size (ha)	Length (m)	Size (ha)	Length (m)	
Sea	/	/	21.32	/	21.32	/	5.86
Semi-natural Watercourse	0.02	28.55	0.26	1575.05	0.28	1603.6	0.08
Shrubland/Grassland	/	/	22.51	/	22.51	/	6.18
Mixed Woodland	0.35	/	46.05	/	46.4	/	12.74
Total	13.44	28.55	350.62	6686.92	364.06	6715.47	100

Vegetation

- 8.4.22 A total of 257 plant species were recorded within the Assessment Area, among which 153 and 94 are known to be native and exotic to Hong Kong respectively and the remaining 10 species are of uncertain origin (**Appendix 8.1**). *Diospyros vaccinioides*, *Dalbergia assamica*, *Nepenthes mirabilis* and *Vitis balanseana* are the four flora species of conservation importance recorded within the Assessment Area. Locations of these species of conservation importance within the Assessment Area are shown in **Figure 8.4.1, 8.4.2 and 8.4.3**.
- 8.4.23 *Dimocarpus longan* is exotic to Hong Kong and not considered of conservation importance, despite being listed as vulnerable in Threatened Species List of China's Higher Plants (Qin *et al.* 2017), listed as vulnerable in China Plant Red Data Book (Fu and Chin, 1992), and/or listed under Category II in the List of Wild Plants under State Protection (State Forestry Administration & Ministry of Agriculture 2021).
- 8.4.24 *Lagerstroemia indica*, *Camellia japonica*, *Magnolia grandiflora*, *Michelia x alba* and *Yulania liliiflora* are protected under Cap. 96A. *Lagerstroemia indica* is also regarded as rare by Corlett *et al.* (2000). However, all species are exotic and the recorded individuals were cultivated. Thus, they are not considered as species of conservation importance.
- 8.4.25 *Araucaria heterophylla* is listed as Vulnerable by IUCN (2022), however, it is exotic and the recorded individual was cultivated. Thus, it is not considered as species of conservation importance.
- 8.4.26 *Neottopteris nidus* is protected under Cap. 96A, but the recorded individual is cultivated. Thus, it is not considered as species of conservation importance.
- 8.4.27 *Podocarpus macrophyllum* is listed as Vulnerable under Threaten Species list of China Higher Plant (Qin *et al.* 2017), and listed under Category II in the List of Wild Plants under State Protection (State Forestry Administration & Ministry of Agriculture 2021). However, the recorded individuals are cultivated. Thus, it is not considered as species of conservation importance.
- 8.4.28 *Pinus massoniana* is listed as endangered in China Plant Red Data Book (Fu and Chin, 1992). However, the recorded individuals are cultivated. Thus, it is not considered as species of conservation importance.
- 8.4.29 *Cycas revoluta* is listed under Category II in the List of Wild Plants under State Protection (State Forestry Administration & Ministry of Agriculture 2021). However, it is exotic and the recorded individuals were cultivated. Thus, it is not considered as species of conservation importance.
- 8.4.30 *Casuarina equisetifolia* is regarded as rare by Corlett *et al.* (2000), yet it is exotic and cultivated. It is not considered as species of conservation importance.

- 8.4.31 *Bauhinia corymbosa* and *Terminalia catappa* are regarded as very rare by Corlett *et al.* (2000), yet they are exotic and cultivated. They are not considered as species of conservation importance.
- 8.4.32 About eight individuals of *Aquilaria sinensis* were recorded in developed area outside the Project Sites but within Assessment Area. *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). 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 2021). 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, 2022). However, the recorded individuals are all cultivated, thus they are not considered as species of conservation importance in the current Project.
- 8.4.33 From reviewed literature EIA-280/2022, two individuals of *Michelia odora* were recorded in developed area outside the Project Sites of the current Project. The vegetation survey of the current Project verified that these individuals are *Michelia chapensis*. *Michelia chapensis* is protected under Cap. 96A and listed in Rare and Precious Plants of Hong Kong (Least concern in China). Nevertheless, these individuals are cultivated, thus they are not considered as species of conservation importance in the current Project.
- 8.4.34 *Gnetum luofuense* was considered as species of conservation importance in the reviewed literature, CE 57/2017 (CE). This species, however, is a common climber in Hong Kong, it is considered as “very common” and “common” by Corlett *et al.* (2000) and AFCD (2007) respectively. It is not facing any known specific threat in Hong Kong, too. The only conservation status of this species is “Near Threatened” in IUCN Red List of Threatened Species (IUCN 2022), which does not meet the criteria of species of conservation importance stated in **Section 8.2.3**. Thus, this species is not considered as a species of conservation importance in the current Project.
- 8.4.35 *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 Project, *Dalbergia benthamii* and *Dalbergia assamica* were recorded, while *Dalbergia benthamii* and *Dalbergia hancei* were also recorded from previous literature. As *Dalbergia benthamii* and *Dalbergia hancei* are climber which is not relevant to the timber exploitation. In addition, these species are common in Hong Kong, they are not considered as species of conservation importance. About two individuals of tree species *Dalbergia assamica* were recorded in the mixed woodland next to Tin Hau Temple Plaza that outside the Project Site but within the Assessment Area. Apart from CITES and Cap. 586 protection, it is also categorized as “Vulnerable” under the IUCN Red List (IUCN, 2022). Moreover, it is categorized as “Endangered” under Threatened Species List of China’s Higher Plants (Qin *et al.*, 2017). Thus, *Dalbergia assamica* is considered as species of conservation importance in the current Project and the location of the recorded individuals is shown in **Figure 8.4.1, 8.4.2 and 8.4.3**.
- 8.4.36 A clump of *Nepenthes mirabilis* was recorded at the shrubland/grassland edge within TLCP in the Assessment Area. *Nepenthes mirabilis* is protected by Cap 96A Forests and Countryside Ordinance. It is included in the book “Rare and Precious Plants of Hong Kong” (Hu *et al.* 2003). It is threatened by illegal collecting 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. It is also categorized as “Vulnerable” in the Threatened Species List of China’s Higher Plants (Qin *et al.*, 2017).

- 8.4.37 About eight individuals of *Diospyros vaccinioides* were recorded in the shrubland/grassland within TLCP outside the Project Site but within the Assessment Area. *Diospyros vaccinioides* is a shrub that is very common in the shrublands of Hong Kong (Corlett *et al.* 2000). 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, 2022). It is also listed in Threatened Species List of China's Higher Plants (Endangered).
- 8.4.38 A small clump of *Vitis balanseana* was recorded in the mixed woodland outside the Project Site but within the Assessment Area. It is categorized as "Vulnerable, endemic" under Threatened Species List of China's Higher Plant (Qin *et al.*, 2017).

Bird

- 8.4.39 Most of the recorded bird species are common and widespread in Hong Kong. Thirty-three avifauna species were recorded within the Assessment Area in total of which thirteen species were recorded within the two Project Sites. Among all of the thirty-three avifauna species recorded, nine species are of conservation importance, but they were all recorded outside the Project Sites (**Appendix 8.2**). Locations of these species are shown in **Figure 8.4.1, 8.4.2 and 8.4.3**. All wild birds are protected under Cap. 170 Wild Animals Protection Ordinance.
- 8.4.40 Species of conservation importance include Black-crowned Night Heron *Nycticorax nycticorax*, Great Egret *Ardea alba*, Little Egret *Egretta garzetta*, Pacific Reef Heron *Egretta sacra*, Black Kite *Milvus migrans*, Greater Coucal *Centropus sinensis*, Collared Scops Owl *Otus lettia*, White-throated Kingfisher *Halcyon smyrnensis*, Black-throated Laughingthrush *Pterorhinus chinensis*. Detailed information of each species is shown below.
- 8.4.41 Black-crowned Night Heron *Nycticorax nycticorax* was recorded in channel and sea outside the two Project Sites but within the Assessment Area. It is considered as Local Concern by Fellowes *et al.* (2002). It is a common resident and migrant widely distributed in Hong Kong.
- 8.4.42 Great Egret *Ardea alba* was recorded in channel, sandy shore and sea outside the two Project Sites but within the Assessment Area. It is considered as Potential Regional Concern and (Regional Concern) by Fellowes *et al.* (2002). It is a common resident, migrant and winter visitor widely distributed in Hong Kong.
- 8.4.43 Little Egret *Egretta garzetta* was recorded in channel, sandy shore and sea outside the two Project Sites but within the Assessment Area. It is considered as Potential Regional Concern and (Regional Concern) by Fellowes *et al.* (2002). It is a common resident, migrant and winter visitor widely distributed in coastal area throughout Hong Kong.
- 8.4.44 Pacific Reef Heron *Egretta sacra* was recorded in sea outside the two Project Sites but within the Assessment Area. It is listed in Class 2 Protected Animal of China and considered as Rare in China Red Data and as Local Concern by Fellowes *et al.* (2002). It is a common resident widely distributed in coastal area throughout Hong Kong.
- 8.4.45 Black Kite *Milvus migrans* was found soaring above mixed woodland both within and outside TLCP outside the two Project Sites but within the Assessment Area. It is a common resident and winter visitor widely distributed in Hong Kong. It is listed in Appendix 2 of CITES, Class 2 Protected Animal of China and considered of Regional Concern by Fellowes *et al.* (2002). In Hong Kong, Black Kite is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance.
- 8.4.46 Greater Coucal *Centropus sinensis* was recorded in mixed woodland outside the two Project Sites but within the Assessment Area. It is a common resident widely distributed in Hong Kong. This species is considered as Vulnerable in China Red Data Book and listed in Class 2 Protected Animal of China.

- 8.4.47 Collared Scops Owl *Otus lettia* was recorded in plantation and mixed woodland outside the two Project Sites but within the Assessment Area. It is a common resident widely distributed in shrubland throughout Hong Kong. This species is listed in Appendix 2 of CITES and Class 2 Protected Animal of China. In Hong Kong, Collared Scops Owl is protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance.
- 8.4.48 White-throated Kingfisher *Halcyon smyrnensis* was recorded in developed area, plantation and sea outside the two Project Sites but within the Assessment Area. It is a common resident widely distributed in coastal areas throughout Hong Kong. It is listed in Class 2 Protected Animal of China and considered of Local Concern by Fellowes *et al.* (2002).
- 8.4.49 Black-throated Laughingthrush *Pterorhinus chinensis* was recorded in plantation and mixed woodland (both within and outside TLCP) outside the two Project Sites but within the Assessment Area. It is a common resident widely distributed in woodland and shrubland throughout Hong Kong. It is listed in Class 2 Protected Animal of China.

Ardeid night roost

- 8.4.50 Ardeid night roost survey was conducted at Tuen Mun Park ardeid roost, the survey time for the April and May surveys was 18:15 – 19:15 and 18:30 – 19:30 respectively. Four Ardeid species were recorded during the survey include Black-crowned Night Heron *Nycticorax nycticorax*, Chinese Pond Heron *Ardeola bacchus*, Great Egret *Ardea alba* and Little Egret *Egretta garzetta* (**Appendix H**). The roost was dominated by Little Egret *Egretta garzetta*. The maximum counts of the ardeid night roost were 36 individuals of ardeids in April 2022. It was observed that the ardeids of the night roost were not flying to directions of any of the Project Sites. Ardeids mainly Little Egret were observed foraging along the Tuen Mun River Channel and artificial ponds within Tuen Mun Park. As Chinese Pond Heron was only recorded in the Tuen Mun Park ardeid roost that is outside the Assessment Area, thus this species is not considered as a species recorded within the Assessment Area of the Project.

Butterfly

- 8.4.51 Thirty-six butterfly species were recorded within the Assessment Area in total of which two species were recorded within the two Project Sites. Among all the recorded species, three species are of conservation importance, but they were all recorded outside the two Project Sites (**Appendix 8.3**). Locations of these species are shown in **Figure 8.4.1, 8.4.2 and 8.4.3**.
- 8.4.52 Species of conservation importance include Common Onyx *Horaga onyx*, Danaid Eggfly *Hypolimnas misippus* and Small Cabbage White *Pieris rapae*. Detailed information of each species is shown below.
- 8.4.53 Common Onyx *Horaga onyx* was recorded in shrubland/grassland within TLCP outside the two Project Sites but within the Assessment Area. It is a rare species but widely distributed throughout Hong Kong.
- 8.4.54 Danaid Eggfly *Hypolimnas misippus* was recorded in mixed woodland outside the two Project Sites but within the Assessment Area. It is considered as Local Concern by Fellowes *et al.* (2002). It is an uncommon species can be found in Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill and Lin Ma Hang.
- 8.4.55 Small Cabbage White *Pieris rapae* was recorded in mixed woodland within TLCP outside the two Project Sites but within the Assessment Area. It is a rare species can be found in Shep Mun Kap, Fan Lau, Ngong Ping, Kam Tin, Ho Chung, Luk Keng, Tuen Mun Ash Lagoon.

Odonate

- 8.4.56 Most recorded dragonfly species are common/abundant and widespread in Hong Kong. Seven dragonfly species were recorded within the Assessment Area in total, no dragonfly species was recorded within the Project Sites (**Appendix 8.4**). Among all of the seven species, one species is of conservation importance, but it was recorded outside the two Project Sites. Locations of this conservation importance species are shown in **Figure 8.4.1, 8.4.2 and 8.4.3**.
- 8.4.57 Emerald Cascader *Zygonyx iris insignis* was recorded in channel and watercourse within TLCP outside the two Project Sites but within the Assessment Area. It is widely distributed in upland forest streams throughout Hong Kong and considered of Potential Regional Concern by Fellowes *et al.* (2002).

Herpetofauna

- 8.4.58 Six reptile species were recorded within the Assessment Area in total of which one species was recorded within the two Project Sites (**Appendix 8.5**). No reptile species of conservation importance was recorded within the Assessment Area.
- 8.4.59 Seven species of amphibian were recorded within the Assessment Area in total of which one species was recorded within the two Project Sites (**Appendix 8.6**). Among all of the seven species, one species is of conservation importance, but it was recorded outside the two Project Sites. Locations of this species are shown in **Figure 8.4.1, 8.4.2 and 8.4.3**.
- 8.4.60 Lesser Spiny Frog *Quasipaa exilispinosa* was recorded in watercourse in TLCP within the Assessment Area but outside the two Project Sites. This species is widely distributed in upland forest streams throughout Hong Kong. It is considered as Vulnerable in Red List of China's Vertebrates and of Potential Global Concern by Fellowes *et al.* (2002).

Mammal

- 8.4.61 Six mammal species were recorded within the Assessment Area in total, no mammal species was recorded within the two Project Sites (**Appendix 8.7**). Among all the six recorded species, three species are of conservation importance. Locations of these species are shown in **Figure 8.4.1, 8.4.2 and 8.4.3**.
- 8.4.62 Species of conservation importance include Red Muntjac *Muntiacus vaginalis*, Pallas's Squirrel *Callosciurus erythraeus* and two unknown bat species. Detailed information of each species is shown below.
- 8.4.63 Red Muntjac *Muntiacus vaginalis* was recorded in plantation outside the two Project Sites but within the Assessment Area. It is very widely distributed in countryside areas throughout Hong Kong and considered as Potential Regional Concern by Fellowes *et al.* (2002).
- 8.4.64 Pallas's Squirrel *Callosciurus erythraeus* was recorded in mixed woodland outside the two Project Sites but within the Assessment Area. This species is fairly widely distributed, with the styani subspecies found in the New Territories (e.g. Tai Lam, Shing Mun and Tai Po Kau), and the thai subspecies found on the Hong Kong Island (e.g. Tai Tam and Pok Fu Lam). It is protected under Cap. 170 Wild Animals Protection Ordinance.
- 8.4.65 Two unknown bat species were recorded in channel of TLCP and watercourse outside the two Project Sites but within the Assessment Area. All bat species are protected under Cap. 170 Wild Animals Protection Ordinance.

Aquatic Fauna

- 8.4.66 Thirteen aquatic fauna species were recorded within the Assessment Area in total (**Appendix 8.9**). No aquatic fauna species was recorded within the two Project Sites. Among all the recorded species, three species are of conservation importance. Locations of these species are shown in **Figure 8.4.1, 8.4.2 and 8.4.3**.
- 8.4.67 Three freshwater crab species, *Cryptopotamon anacoluthon*, *Nanhaipotamon aculatum* and *Somanniathelphusa zanklon* are considered of conservation importance were recorded in watercourse within the Assessment Area but outside the two Project Sites. Detailed information of each species is shown below.
- 8.4.68 *Nanhaipotamon aculatum* was recorded in watercourse within the Assessment Area but outside the two Project Sites. Although it is listed as Data Deficient under the IUCN Red List, this species is only known from a few localities in the North-western New Territories in Hong Kong.
- 8.4.69 *Cryptopotamon anacoluthon* was recorded in watercourse in TLCP within the Assessment Area but outside the two Project Sites. This crab species is widely distributed within Hong Kong which can be recorded throughout the New Territories, Hong Kong and Lantau Islands. It is listed as Vulnerable under IUCN Red List and considered as Potential Global Concern by Fellowes *et al.* (2002).
- 8.4.70 *Somanniathelphusa zanklon* was recorded in watercourse within the Assessment Area but outside the two Project Sites. This crab species is widely distributed within Hong Kong which can be recorded from the north-western and north-eastern New Territories and Lantau Island. It is listed as Endangered under IUCN Red List and considered as Global Concern by Fellowes *et al.* (2002).

8.5 EVALUATION OF HABITATS AND SPECIES OF CONSERVATION IMPORTANCE

8.5.1 Ecological importance of the Project Site and habitats within the Assessment Area was evaluated in accordance with the criteria stipulated in Annex 8 of TM-EIAO, and shown in Tables 8.10.1 to 8.10.8.

Table 8.10.1 Evaluation of Channel within Assessment Area

Criterion	Description		
	Tuen Mun River Channel	Catchwater in TLCP	Channel near Cafeteria Old Beach
Naturalness	Man-made	Man-made	Man-made, for drainage purpose
Size	3126.49 (13.85ha)		
Diversity	Low diversity of flora Low terrestrial faunal diversity Low aquatic faunal diversity	Low diversity of flora Low to medium terrestrial faunal diversity Low aquatic faunal diversity	Low diversity of flora Low terrestrial faunal diversity Low aquatic faunal diversity
Rarity	No flora species of conservation importance Fauna species of conservation importance: Black-crowned Night Heron <i>Nycticorax nycticorax</i> *, Great Egret <i>Ardea alba</i> *, Little Egret <i>Egretta garzetta</i> *, Chinese Pond Heron <i>Ardeola bacchus</i> * and Collared Crow <i>Corvus torquatus</i> *	No flora species of conservation importance Fauna species of conservation importance: Emerald Cascader <i>Zygonyx iris insignis</i> , Unidentified bat species	No flora and fauna species of conservation importance
Re-creatability	Easy to re-create	Easy to re-create	Easy to re-create
Fragmentation	Not fragmented	Not fragmented	Existed in isolated short section
Ecological linkage	Linked to upstream watercourse and sea, receiving tidal influence from the sea	Linked to upstream watercourse	None
Potential value	Limited due to high level of human disturbance	Limited due to the concrete structure of the bed and bank	Limited due to the concrete structure of the bed and bank
Nursery/ breeding ground	Provide foraging ground and potential roosting site for bird species (Ardeid), no nursery or breeding site was found during the survey	Provide breeding habitats for amphibian, dragonfly and aquatic fauna. Tadpoles of Brown Tree Frog were found along the Channel	No nursery/breeding ground was observed
Age	N/A	N/A	N/A

Criterion	Description		
	Tuen Mun River Channel	Catchwater in TLCP	Channel near Cafeteria Old Beach
Abundance/ richness of wildlife	Medium abundance of terrestrial fauna and freshwater fauna	Medium abundance of terrestrial fauna and freshwater fauna	Low abundance of terrestrial fauna and freshwater fauna
Ecological value	Low	Low	Very Low

Note:

*indicates that species is (also) found in literature review

Table 8.10.2 Evaluation of Watercourse within Assessment Area outside the Project Sites

Criterion	Description	
	Semi-natural section	Natural section
Naturalness	Modified with some human disturbance	Natural
Size	1575.05m	1985.38m
Diversity	Low to medium diversity of flora Low terrestrial faunal diversity Low aquatic faunal diversity	Low to medium diversity of flora Low terrestrial faunal diversity Low aquatic faunal diversity
Rarity	No flora species of conservation importance was found Fauna species of conservation importance: Unidentified bat species, <i>Nanhaipotamon aculatum</i> , <i>Somanniathelphusa zanklon</i>	No flora species of conservation importance was found Fauna species of conservation importance: Lesser Spiny Frog [^] , <i>Quasipaa exilispinosa</i> [^] , Emerald Cascader <i>Zygonyx iris insignis</i> [^] , <i>Cryptopotamon anacoluthon</i> [^]
Re-creatability	Readily recreated	Difficult to be recreated
Fragmentation	Not fragmented in general. Except the semi-natural watercourse at the southeast part of the Assessment Area is fragmented by Tuen Mun Road	Not fragmented in general
Ecological linkage	Linked to shrubland/grassland and mixed woodland.	Linked to shrubland/grassland and mixed woodland. The natural watercourse within TLCP also links to other habitats within TLCP, including shrubland/grassland, mixed woodland and the Tai Lam Chung catchwater
Potential value	Low due to human disturbance	Medium The natural watercourse within TLCP has a higher potential value as it is protected and/or managed under the Country Parks Ordinance

Criterion	Description	
	Semi-natural section	Natural section
Nursery/ breeding ground	Provide breeding habitats for amphibian, dragonfly and aquatic fauna. Tadpoles of Brown Tree Frog were found along the semi-natural watercourse. Freshwater crab juveniles <i>Somanniathelphusa zanklon</i> were observed along the watercourse	Provide breeding habitats for amphibian, dragonfly and aquatic fauna. Tadpoles of Lesser Spiny Frog and Brown Tree Frog were found along the natural watercourse. Freshwater crab juveniles <i>Cryptopotamon anacoluthon</i> were observed along the watercourse within TLCP
Age	N/A	N/A
Abundance/ richness of wildlife	Low abundance of terrestrial fauna and freshwater fauna	Medium abundance of terrestrial fauna and freshwater fauna
Ecological value	Low	Low to Medium for the natural watercourse outside TLCP Medium for the natural watercourse within TLCP

Notes:

^ indicate species recorded within TLCP

Table 8.10.3 Evaluation of Developed Area within Assessment Area outside the Project Sites

Criterion	Description
Naturalness	Man-made
Size	210.47ha
Diversity	Low to medium diversity of flora Low to medium terrestrial faunal diversity
Rarity	Flora species of conservation importance from literature review: <i>Aquilaria sinensis</i> * and <i>Michelia odora</i> * Fauna species of conservation importance: White-throated Kingfisher <i>Halcyon smyrnensis</i> *, Pallas's Squirrel <i>Callosciurus erythraeus</i> *, Little Egret <i>Egretta garzetta</i> *, Black Kite <i>Milvus migrans</i> *, Short Nosed Fruit Bat <i>Cynopterus sphinx</i> *, Least Horseshoe Bat <i>Rhinolophus pusillus</i> *
Re-creatability	Easy to re-create
Fragmentation	N/A
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Very low. Most areas are concrete paved providing very limit space for the growth of vegetation. Besides, there is high level of human disturbance
Nursery/ breeding ground	Limited as nursery/breeding ground for fauna due to high level of disturbance
Age	N/A

Criterion	Description
Abundance/ richness of wildlife	Low to medium abundance of terrestrial fauna
Ecological value	Very low

Note:

*indicates that species is (also) found in literature review

Table 8.10.4 Evaluation of Mixed Woodland within Assessment Area outside the Project Sites

Criterion	Description
	Within Assessment Area
Naturalness	Semi-natural, both native and exotic tree species could be found. Area close to roads, graves and villages exposed to more human disturbance.
Size	46.05ha
Diversity	Medium diversity of flora Medium terrestrial faunal diversity
Rarity	Flora species of conservation importance: <i>Dalbergia assamica</i> and <i>Vitis balansenana</i> Fauna species of conservation importance: Black Kite <i>Milvus migrans</i> [^] , Greater Coucal <i>Centropus sinensis</i> [*] , Collared Scops Owl <i>Otus lettia</i> , Black-throated Laughingthrush <i>Pterorhinus chinensis</i> [^] , Danaid Eggfly <i>Hypolimnas misippus</i> , Small Cabbage White <i>Pieris rapae</i> [^] , Pallas's Squirrel <i>Callosciurus erythraeus</i> , Ashy Drongo <i>Dicrurus leucophaeus</i> [*] , Crested Goshawk <i>Accipiter trivirgatus</i> [*] .
Re-creatability	Readily recreated but trees need time to mature
Fragmentation	The mixed woodland at hillside and in TLCP is relatively continuous. The mixed woodland near village area is fragmented by the villages. Besides, two isolated stands of mixed woodland could be found at the small hills near Sam Shing Estate and Tin Hau Temple Plaza.
Ecological linkage	Linked to shrubland/grassland and watercourse The mixed woodland within TLCP also links to other habitats within TLCP, including shrubland/grassland, natural watercourse and the Tai Lam Chung Catchwater
Potential value	Moderate for mixed woodland at hillside that is not adjacent to developed area. Low for mixed woodland adjacent to developed area and the two isolated stands of mixed woodland due to human disturbance from nearby developed area. The mixed woodland within TLCP has a higher potential value as it is protected and/or managed under the Country Parks Ordinance
Nursery/ breeding ground	No significant findings. Potentially provide breeding habitats for birds, butterflies, reptiles and mammals.
Age	More than 20 years
Abundance/ richness of wildlife	Medium abundance of terrestrial fauna

Criterion	Description
	Within Assessment Area
Ecological value	Low to medium

Notes:

*indicates that species is (also) found in literature review

^ indicate species recorded within TLCP

Table 8.10.5 Evaluation of Plantation within Assessment Area outside the Project Sites

Criterion	Description
Naturalness	Man made in nature, but some native species have been colonized in some area
Size	35.37ha
Diversity	Low to medium diversity of flora Medium terrestrial faunal diversity
Rarity	Flora species of conservation importance from literature review includes: <i>Neottopteris nidus</i> * Fauna species of conservation importance: Collared Scops Owl <i>Otus lettia</i> , White-throated Kingfisher <i>Halcyon smyrnensis</i> , Black-throated Laughingthrush <i>Pterorhinus chinensis</i> , Red Muntjac <i>Muntiacus vaginalis</i> , Danaid Eggfly <i>Hypolimnas misippus</i> *, Emerald Cascader <i>Zygonyx iris</i> *
Re-creatability	Easy to re-create
Fragmentation	The plantation at roadside and near developed area is highly fragmented by developed area. The plantation at hillside is relatively continuous.
Ecological linkage	Linked to mixed woodland
Potential value	Limited potential due to disturbance (especially for the roadside plantation) and high proportion of exotic species
Nursery/ ground breeding	No significant findings
Age	Varied. Some plantation patches exist more than 20 years.
Abundance/ richness of wildlife	Medium abundance of terrestrial fauna
Ecological value	Low

Note:

*indicates that species is (also) found in literature review

Table 8.10.6 Evaluation of Sandy Shore and Sea within Assessment Area

Criterion	Description	
	Sandy Shore	Sea
Naturalness	Natural in nature, but backshore is modified/developed. Besides, most of the areas are gazetted	Natural in nature. However, it is subject to human disturbance, such as runoff and rubbish, from the adjacent urbanized area

Criterion	Description	
	Sandy Shore	Sea
	beaches that prone to human disturbance	
Size	0.66ha	21.32ha
Diversity	Low diversity of flora Low terrestrial faunal diversity	No flora was recorded Low terrestrial faunal diversity
Rarity	No flora species of conservation importance recorded Fauna species of conservation importance: Great Egret <i>Ardea alba</i> , Little Egret <i>Egretta garzetta</i> , White-throated Kingfisher <i>Halcyon smyrnensis</i> *	No flora species of conservation importance recorded Fauna species of conservation importance: Black-crowned Night Heron <i>Nycticorax nycticorax</i> , Great Egret <i>Ardea alba</i> *, Little Egret <i>Egretta garzetta</i> *, Pacific Reef Heron <i>Egretta sacra</i> , White-throated Kingfisher <i>Halcyon smyrnensis</i> , <i>Guaiaogorgia</i> sp*, Zebra coral <i>Oulastrea crispate</i> *
Re-creatability	Difficult to recreate	Difficult to recreate
Fragmentation	Fragmented, only small sections are remained. Backshore is modified.	Not fragmented
Ecological linkage	Linked to sea	Linked to sandy shore
Potential value	Low, due to human disturbance	Low, due to human disturbance from adjacent area
Nursery/ breeding ground	No significant findings.	No significant findings.
Age	N/A	N/A
Abundance/ richness of wildlife	Low abundance of terrestrial fauna	Low to medium abundance of terrestrial fauna
Ecological value	Low	Low to medium

Note:

*indicates that species is (also) found in literature review

Table 8.10.7 Evaluation of Shrubland/Grassland within Assessment Area

Criterion	Description
Naturalness	Semi-natural, few exotic species could be found
Size	22.51ha
Diversity	Low to medium diversity of flora Low terrestrial faunal diversity
Rarity	Flora species of conservation importance: <i>Diospyros vaccinioides</i> [^] and <i>Nepenthes mirabilis</i> [^]

Criterion	Description
	Fauna species of conservation importance: Common Onyx <i>Horaga onyx</i> [^] , Emerald Cascader <i>Zygonyx iris</i> ^{*^}
Re-creatability	Could be re-created
Fragmentation	Exist as patches at hilltop and hillside. The patch within TLCP is relatively large.
Ecological linkage	Linked to mixed woodland The shrubland/grassland within TLCP also links to other habitats within TLCP including mixed woodland, natural watercourse and the Tai Lam Chung Catchwater
Potential value	Potentially succeed to woodland but take time The shrubland/grassland within TLCP has a higher potential value as it is protected and/or managed under the Country Parks Ordinance
Nursery/ breeding ground	No significant findings. Potentially provide breeding habitats for birds and butterflies.
Age	At least 20 years
Abundance/ richness of wildlife	Low abundance of terrestrial fauna
Ecological value	Low

Notes:

*indicates that species is (also) found in literature review

[^] indicate species recorded within TLCP

Table 8.10.8 Evaluation of habitats within the Project Sites

Criterion	Description			
	Developed area (This habitat was found in: LFRSR NB&SB & HWRSR)	Plantation (This habitat was found in: LFRSR NB&SB & HWRSR)	Mixed woodland (This habitat was found in: HWRSR)	Semi-natural watercourse (This habitat was found in: HWRSR)
Naturalness	Man-made. Mainly roads and highways. High level of disturbance exists	Man-made. Receiving disturbance from adjacent urbanized area such as roads	Semi-natural, both native and exotic tree species could be found. Receiving disturbance from adjacent urbanized area and structure such as Tuen Mun Road and Sam Saint Temple	Semi-natural. Disturbed by human activities and modified with some human structure.
Size	9.98ha	3.09ha	0.35ha	28.55m
Diversity	Low flora diversity	Low flora diversity	Low flora diversity	Low flora diversity

Criterion	Description			
	Developed area (This habitat was found in: LFRSR NB&SB & HWRSR)	Plantation (This habitat was found in: LFRSR NB&SB & HWRSR)	Mixed woodland (This habitat was found in: HWRSR)	Semi-natural watercourse (This habitat was found in: HWRSR)
	Low terrestrial faunal diversity	Low terrestrial faunal diversity	Low terrestrial faunal diversity	Low terrestrial faunal diversity
Rarity	No flora and fauna species of conservation importance recorded	No flora and fauna species of conservation importance recorded	No flora and fauna species of conservation importance recorded	No flora and fauna species of conservation importance recorded
Re-creatability	Easy to re-create	Easy to re-create	Readily recreated	Readily recreated
Fragmentation	Not fragmented	Highly fragmented, in forms of roadside plantation	Isolated patch of mixed woodland surrounded by urbanized area. Besides, the mixed woodland within Project Site is located at the edge of the patch mixed woodland	The upper section is fragmented by Tuen Mun Road
Ecological linkage	No significant functional or ecological linkage with other habitats	No significant functional or ecological linkage with other habitats	No significant functional or ecological linkage with other habitats	No significant functional or ecological linkage with other habitats
Potential value	Limited due to high levels of human disturbance	Limited due to high levels of human disturbance	Limited due to high levels of human disturbance	Limited due to high levels of human disturbance
Nursery/ breeding ground	No significant record	No significant record	No significant record	No significant record
Age	N/A	Varied. Some plantation patches exist more than 20 years.	More than 20 years	N/A
Abundance/ richness of wildlife	Low abundance of terrestrial fauna	Low abundance of terrestrial fauna	Low abundance of terrestrial fauna	Low abundance of terrestrial fauna
Ecological value	Negligible	Very low	Low	Low



8.5.2 In accordance with Table 6, Annex 8 of the TM-EIAO, the ecological value of species is assessed in terms of protection status (e.g. fauna protected under Cap.170 (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare or restricted). Floral and fauna species of conservation importance recorded within the Assessment Area are evaluated according to the TM-EIAO in **Table 8.11.1** and **Table 8.11.2** respectively.

Table 8.11.1 Evaluation of Flora Species of Conservation Importance within the Assessment Area

Scientific Name	Locations	Protection Status ^{2 3 4 5 6 7 8 9 10}	Distribution ¹	Rarity ¹
<i>Dalbergia assamica</i>	In Mixed Woodland outside the Project Site but within the Assessment Area	Cap. 586 ⁸ Threatened Species List of China's Higher Plants (Endangered) ⁴ IUCN Red List (Vulnerable) ² CITES Appendix II ³	Forest; rare; Pak Kong (Sai Kung) and Tai Mo Shan, where it may be planted; widely planted in Hong Kong.	Rare
<i>Diospyros vaccinioides</i>	In Shrubland/Grassland (within TLCP) outside the Project Site but within the Assessment Area	Threatened Species List of China's Higher Plants (Endangered) ⁴ IUCN Red List (Critically endangered) ²	Shrubland	Very common
<i>Nepenthes mirabilis</i>	In shrubland/grassland (within TLCP) outside the Project Site but within the Assessment Area	Cap.96 ¹⁰ Cap.586 ⁸ Rare and Precious Plants of Hong Kong (Vulnerable in China) ⁷ Threatened Species List of China's Higher Plants (Vulnerable) ⁴ CITES Appendix II ³	Wet, open places on granite and sedimentary rocks	Common
<i>Vitis balanseana</i>	In the Mixed Woodland outside the Project Site but within the Assessment Area	Threatened Species List of China's Higher Plants (Vulnerable, endemic species) ⁴	Shrubland	Restricted

Notes:

1. Corlett *et al.* (2000). Hong Kong vascular plants: distribution and status.
2. International Union of Conservation for Nature. (2022). The IUCN Red List of Threatened Species. Version 2021-3.
3. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2022). 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 *et al.* (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 Forests and Countryside Ordinance.

Table 8.11.2 Evaluation of Fauna Species of Conservation Importance within the Assessment Area

Species Name ¹	Conservation Status ^{2,3,4,5,6,7,8,12,13}	Rarity and Distribution ^{1,9,10,11}	Locations
Bird (Remark: all wild bird species are protected under Cap. 170 Wild Animals Protection Ordinance in Hong Kong) ²			
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	Fellowes <i>et al.</i> (2002): (LC)	Common resident and migrant. Widely distributed in Hong Kong.	Assessment Area (CH, SE)
Great Egret <i>Ardea alba</i>	Fellowes <i>et al.</i> (2002): PRC,(RC)	Common resident, migrant and winter visitor. Widely distributed in Hong Kong.	Assessment Area (CH, SE, SS)
Little Egret <i>Egretta garzetta</i>	Fellowes <i>et al.</i> (2002): PRC,(RC)	Common resident, migrant and winter visitor. Widely distributed in coastal area throughout Hong Kong.	Assessment Area (CH, SE, SS)
Pacific Reef Heron <i>Egretta sacra</i>	Class 2 Protected Animal of China; China Red Data Book Status: (Rare); Fellowes <i>et al.</i> (2002): (LC)	Common resident. Widely distributed in coastal area throughout Hong Kong.	Assessment Area (SE)
Black Kite <i>Milvus migrans</i>	Class 2 Protected Animal of China; Fellowes <i>et al.</i> (2002): (RC); Appendix 2 of CITES; Cap. 586	Common resident and winter visitor. Widely distributed in Hong Kong.	Assessment Area (MW, both within and outside TLCP)
Greater Coucal <i>Centropus sinensis</i>	Class 2 Protected Animal of China; China Red Data Book Status: (Vulnerable)	Common resident. Widely distributed in Hong Kong.	Assessment Area (MW)
Collared Scops Owl <i>Otus lettia</i>	Class 2 Protected Animal of China; Appendix 2 of CITES; Cap. 586	Common resident. Widely distributed in shrubland throughout Hong Kong.	Assessment Area (MW, PL)
White-throated Kingfisher <i>Halcyon smyrnenensis</i>	Class 2 Protected Animal of China; Fellowes <i>et al.</i> (2002): (LC)	Common resident. Widely distributed in coastal areas throughout Hong Kong	Assessment Area (DA, PL, SE)
Black-throated Laughingthrush <i>Pterorhinus chinensis</i>	Class 2 Protected Animal of China	Common resident. Widely distributed in woodland and shrubland throughout Hong Kong	Assessment Area (MW both within and outside TLCP, PL)
Butterflies			
Common Onyx <i>Horaga onyx</i>	-	Rare. Widely distributed throughout Hong Kong	Assessment Area (SG within TLCP)
Danaid Eggfly <i>Hypolimnas misippus</i>	Fellowes <i>et al.</i> (2002): LC	Uncommon. Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang	Assessment Area (MW)

Species Name ¹	Conservation Status ^{2,3,4,5,6,7,8,12,13}	Rarity and Distribution ^{1,9,10,11}	Locations
Small Cabbage White <i>Pieris rapae</i>	-	Rare. Shep Mun Kap, Fan Lau, Ngong Ping, Kam Tin, Ho Chung, Luk Keng, Tuen Mun Ash Lagoon	Assessment Area (MW within TLCP)
Odonate			
Emerald Cascader <i>Zygonyx iris insignis</i>	Fellowes <i>et al.</i> (2002): PGC	Widely distributed in moderately clean, rapidly flowing forested streams throughout Hong Kong.	Assessment Area (CH within TLCP, WAT within TLCP)
Amphibian			
Lesser Spiny Frog <i>Quasipaa exilispinosa</i>	Fellowes <i>et al.</i> (2002): PGC; Red List of China's Vertebrates: (Vulnerable)	Widely distributed in upland forest streams throughout Hong Kong.	Assessment Area (WAT within TLCP)
Mammal			
Red Muntjac <i>Muntiacus vaginalis</i>	Fellowes <i>et al.</i> (2002): PRC	Very widely distributed in countryside areas throughout Hong Kong.	Assessment Area (PL)
Pallas's Squirrel <i>Callosciurus erythraeus</i>	(Cap. 170)	Fairly widely distributed, with the styani subspecies found in the New Territories (e.g. Tai Lam, Shing Mun and Tai Po Kau), and the thai subspecies found on the Hong Kong Island (e.g. Tai Tam and Pok Fu Lam).	Assessment Area (MW)
Unidentified bat species	(Cap. 170)	-	Assessment Area (CH within TLCP, WAT)
Aquatic Fauna			
<i>Cryptopotamon anacoluthon</i>	IUCN Red List: Vulnerable; Fellowes <i>et al.</i> (2002): PGC	Widely distributed within Hong Kong; recorded throughout the New Territories, Hong Kong and Lantau Islands	Assessment Area (WAT within TLCP)
<i>Nanhaipotamon aculatum</i>	IUCN Red List: Data Deficient	Only known from a few localities in the Northwestern New Territories in Hong Kong	Assessment Area (WAT)
<i>Somanniathelphusa zanklon</i>	IUCN: Endangered; Fellowes <i>et al.</i> (2002): GC	Widely distributed within Hong Kong, recorded from the northwestern and northeastern New	Assessment Area (WAT)

Species Name ¹	Conservation Status ^{2,3,4,5,6,7,8,12,13}	Rarity and Distribution ^{1,9,10,11}	Locations
		Territories and Lantau Island.	

Notes:

1. AFCD (2022). Hong Kong Biodiversity Database.
2. Cap. 170 Wild Animals Protection Ordinance
3. Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance.
4. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2022). Appendices I, II and III.
5. Fellowes *et al.* (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong.
 - For conservation status listed by Fellowes *et al.* (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
6. IUCN Red List of Threatened Species.
7. Jiang, Z. G., Jiang, J. P., Wang, Y. Z., Zhang, E., Zhang, Y. Y., Li, L. L., ... & Dong, L. (2016). Red list of China's vertebrates
8. List of State Protected Wild Animals, promulgated by the State Council
9. Stanton, D.J., Leven, M.R and Hui, T.C.H. (2018). Distribution of *Nanhaipotamon hongkongense* (Shen, 1940) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong. *Journal of Threatened Taxa*. 10. 11156. [10.11609/jott.3619.10.1.11156-11165](https://doi.org/10.11609/jott.3619.10.1.11156-11165).
10. Stanton, D.J. & Leven, M.R. (2016). Distribution, habitat utilisation and conservation status of the freshwater crab, *Somanniathelphusa zanklon* Ng & Dudgeon, 1992 (Crustacea: Brachyura: Gecarcinucidae) endemic to Hong Kong. *Journal of Threatened Taxa* 8(3): 8564–8574; <http://dx.doi.org/10.11609/jott.2070.8.3.8564-8574>
11. Stanton, D.J., Leven, M.R and Hui, T.C.H. (2017). Distribution of *Cryptopotamon anacoluthon* (Kemp, 1918) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong. *Journal of Threatened Taxa* 9(2): 9786–9794; <http://doi.org/10.11609/jott.3007.9.2.9786-9794>
12. Zhao, E. (1998). China red data book of endangered animals: Amphibia and Reptilia.
13. Zheng, G. M. and Wang, Q. S. (1998). China Red Data Book of Endangered Animals: Aves. Science Press, Beijing

Abbreviations:

- Habitats: CH = Channel; DA = Developed Area; MW = Mixed Woodland; PL = Plantation; SE = Sea SS = Sandy Shore; SG = Shrubland/Grassland; WAT = Watercourse (natural and semi-natural)
- Conservation Status in Fellowes *et al.* (2002): GC = Global Concern; RC = Regional Concern; LC = Local Concern; PGC = Potential Global Concern; PRC = Potential Regional Concern

8.6 IMPACT IDENTIFICATION AND PREDICTION

Identification of Key Works

- 8.6.1 There will be widening and construction of new slip roads in the LFRSR NB&SB Site and the HWRSR Site. The key works for each area will be:
- The LFRSR NB&SB Site: construction a pair of grade-separated flyovers or elevated slip roads connecting Tsing Wun Road and Lung Fu Road (northbound and southbound)
 - The HWRSR Site: construction a new slip road connecting Tuen Mun Road northbound to Hoi Wing Road westbound and Tuen Mun Road northbound

Construction Phase (Direct Impact)

Temporary habitat and vegetation loss

- 8.6.2 There will be no temporary loss of habitats for the LFRSR NB&SB Site, all the works to be carried out will be limited within the road layout as shown in **Figure 8.5.1, 8.5.2 and 8.5.3**. For the HWRSR Site, there will also be no work for the area within Project Site boundary but outside the road layout, except for the plantation slope next to the road layout. There will be temporary works such as installation of soil nail on this plantation slope and it will subject to temporary loss. The estimated area size of the temporary loss of plantation is 0.85ha, however, the actual affected area size will be subjected to the later stage of the Project.
- 8.6.3 The potential impact due to temporary loss of the planation slope is considered as insignificant as it is man-made and are easily recreated. It will be reinstated after the construction phase.

Permanent habitat and vegetation loss

- 8.6.4 The area within the proposed road layout will be subject to permanent habitat loss. These habitats include developed area, plantation and a small area of mixed woodland in the HWRSR site (**Figure 8.5.1, 8.5.2 and 8.5.3**). The estimated permanent loss of various types of habitats is shown in **Table 8.12**.
- 8.6.5 The impact due to permanent loss of developed area and planation within Project Sites is considered as insignificant, as they are man-made in nature and supporting low diversity and abundance of fauna and low diversity of flora. No mitigation is needed for the loss of these habitats.
- 8.6.6 There will be about 0.08ha of permanent mixed woodland loss for the HWRSR site. Mixed woodland within Project Site is considered of low ecological value. The mixed woodland within HWRSR is prone to human disturbance from adjacent urbanized habitats and with simple structure. Besides, the affected mixed woodland stand is isolated and has semi-natural nature due to the co-dominant of native and exotic trees, no species of conservation importance was also recorded in the mixed woodland within the Project Site. Similar unaffected habitat could also be found nearby. The potential impact for the loss of small area of mixed woodland is considered as **Minor**, which can be mitigated by compensatory tree planting. As the affected area of mixed woodland is located at the edge, no fragmentation of mixed woodland is anticipated.
- 8.6.7 No foraging or roosting activity of bird was recorded within the Project Sites during survey. Besides, similar unaffected habitats could be found around the Project Sites. It is anticipated

that there will be no significant ecological impact due to the loss of foraging and roosting ground for birds due to habitat loss within Project Site.

Table 8.12 Estimated size of habitats affected by the Project

Habitats within Project Sites	Habitat loss area (ha)						Ecological value
	LFRSR NB&SB		HWRSR site		Total		
	Temp. loss	Perm. loss	Temp. loss	Perm. loss	Temp. loss	Perm. loss	
Developed Area	/*	1.26	/*	0.28	/	1.54	Negligible
Plantation	/*	0.72	0.85	0.38	0.85	1.1	Very low
Mixed Woodland	/	/	/*	0.08	/	0.08	Low

Note:

*There will be no work for the area within Project Site boundary but outside the road layout, except for the plantation slope next to the road layout in HWRSR Site.

Construction Phase (Indirect Impact)

Disturbance such as Noise, Light, Dust and Other Human Activities

8.6.8 Indirect impacts on the habitats and associated fauna would be induced from the increase in human disturbance during the construction phase. Noise and dust generated from construction activities within the Project Site might temporarily reduce the utilization of adjacent habitats by wildlife during construction phase. The habitats immediate surroundings of the Project Site are developed area, plantation, mixed woodland and watercourse, they are of very low to low to moderate ecological value. However, as the Project Sites are located in urbanized area, there are existing disturbance sources surrounding the Project Site, such as roads, highway and residential area. Disturbance is already existing in these areas. Utilization of this type of habitat by fauna is very low due to the high level of disturbance, it is also unlikely that these areas are inhabited by disturbance sensitive animals. In addition, disturbance due to noise, dust and human activities will be short-term and localized. The potential indirect impact due to disturbance during construction phase is ranked as insignificant. Good site practice will be implemented to further minimize the potential impact.

Surface Runoff

8.6.9 Sections of semi-natural watercourse were found adjacent to the LFRSR NB&SB and HWRSR sites. During construction phase, these watercourses would potentially be impacted by surface runoff, especially during rainstorm. The surface runoff might be polluted by sedimentation from site surfaces; earth working areas and stockpiles, wash water from dust suppression sprays and wheel washing facilities; and chemicals spillage such as lubrication oils, solvents and petroleum products from maintenance of construction machinery and equipment, and sewage from the construction workforce. Elevated suspended solids levels caused by site runoff could increase the suspended solids load in the water bodies, and could reduce dissolved oxygen levels. A lower oxygen level would affect stationary species, whilst mobile species would tend to temporarily avoid the area. The result could be a temporary reduction in aquatic life abundance and/or change in distribution.

8.6.10 However, two sections of semi-natural watercourse, the section to the west of the LFRSR NB&SB site and the section to the east of the HWRSR site, are at the upper stream location

that surface runoff is not likely to flow along them, significant potential impact due to surface runoff to these two sections is not anticipated.

- 8.6.11 For the section of semi-natural watercourse that is located within and closely to the west of the HWRSR site, although there will be no direct impact, it may receive surface runoff as it is at a lower stream location. Thus, this section of semi-natural watercourse and the downstream aquatic/marine habitat including sea would be potentially affected. However, the ecological value of semi-natural watercourse is low, the concerned section of semi-natural watercourse is modified with some human structure and highly disturbed, it is observed that this section of semi-natural watercourse received discharge and rubbish from the adjacent developed area. While the ecological value of sea habitat is considered as Low to medium. If without proper control of surface runoff, the potential impact due to runoff to this semi-natural watercourse is considered as **Minor to moderate**. Good site practice will be implemented to minimize the potential impact due to surface runoff.

Impact to Recognized Site of Conservation Importance and importance habitat

Tai Lam Country Park

- 8.6.12 TLCP is outside the Project Sites (the minimum distance between TLCP and the closest Project Site, HWRSR is about 60m) and will not be encroached, direct impact to the Country Park is not anticipated. There is considerable distance from the Project Site to the TLCP. Besides, TLCP is located uphill and away from the Project Site, surface runoff from the Project Site during construction phase is not likely to reach the watercourses within TLCP. Given that the Project would be of small scale, and the disturbance would be localized, the potential indirect impact to TLCP is ranked as insignificant.

Tuen Mun Park ardeid roost

- 8.6.13 The Tuen Mun Park ardeid roost is located far away from the Project Sites, i.e. about 500m away from the Project Sites. Besides, it was observed that the ardeids of the night roost were not flying to directions of any of the Project Sites. Thus, it is anticipated that there will be no significant direct or indirect impact to the Tuen Mun Park ardeid roost.

Impact to Species of Conservation Importance

Flora

- 8.6.14 Four flora species of conservation importance, including *Dalbergia assamica*, *Diospyros vaccinioides*, *Nepenthes mirabilis* and *Vitis balanseana* were recorded in the Assessment Area. However, all of them are located outside Project Sites, their locations are not affected by the Project, so the significance of ecological impact is considered negligible.

Fauna

- 8.6.15 Twenty fauna species of conservation importance were recorded, and the recorded species could be referred from **Table 8.11.2** of this report. However, all of them were recorded outside the Project Site. Besides, most of them are with high mobility except the three freshwater crab species, *Cryptopotamon anacoluthon*, *Nanhaipotamon aculatum* and *Somanniathelphusa zanklon*, and the frog species Lesser Spiny Frog. Thus, they are not likely to be affected by the Project. No roosting site was also recorded within the Project Site, too. The potential direct impact to the mobile species of conservation importance is anticipated to be insignificant. For species of lower mobility, i.e. *Cryptopotamon anacoluthon*, *Nanhaipotamon aculatum* and



Somanniathelphusa zanklon, and Lesser Spiny Frog, they are far away from the Project Sites and their associated watercourses are located uphill and away from the Project Site that are not likely affected by the Project. Thus, the potential ecological impact for the fauna species of conservation importance with lower mobility is also considered as insignificant.

Operational Phase (Indirect Impact)

Disturbance

- 8.6.16 There will be indirect impacts to habitats and wildlife near the Project Site due to disturbance from human activities and traffic flow along the roads during operational phase. However, habitats along the alignment of the roads are subject to existing disturbance from nearby developed area. Fauna sensitive to human disturbance might have already avoided these habitats; while the existing fauna might have already accommodated human disturbance. Hence, the potential impact is expected to be insignificant.

Surface runoff

- 8.6.17 Due to the operational nature of road, surface runoff, containing dust, oil, grease and other pollutants formed by vehicles, will form during raining that may affect the semi-natural watercourse around the Project Sites, especially the semi-natural watercourse located within and closely to the west of the HWRSR site, and the downstream aquatic/marine habitats. However, there will be drainage systems that connect the runoff to the public drainage systems. Hence, no adverse operation water quality issue is anticipated.

Potential bird collision

- 8.6.18 There will be re-provision of sections of noise barriers along the roads in the LFRSR NB&SB sites that may cause bird collision if not mitigated. However, it is anticipated that the number of birds passing through the new roads is low due to the highly disturbing nature of the roads during the operational phase. The potential ecological impact for bird collision is anticipated to be **Minor** if not mitigated. Mitigation such as adopting bird friendly design, such as using falcon sticker, tinted materials should be considered to further reduce the potential impact.

Barrier effect on mobile species

- 8.6.19 Barrier effect may occur due to blockage of the passage of animals between two sides of the new roads. Non-flying terrestrial animals (e.g. mammals, amphibians and reptiles) are prone to this effect. However, there was low abundance of non-flying terrestrial animals recorded within the Project Site. Besides, there are already existing roads adjacent to the new roads, significant additional barrier effect is not anticipated.

Direct mortality of fauna

- 8.6.20 Direct mortality of fauna may occur due to roadkill in the new road. As there was low abundance of non-flying terrestrial animals (e.g. mammals, amphibians and reptiles) recorded within the Project Site. Besides, there are already existing roads adjacent to the new roads. The chance of additional roadkill is anticipated to be low and the potential ecological impact due to direct mortality of fauna is anticipated to be insignificant.

Impact to Tai Lam Country Park during operational phase

- 8.6.21 There may be indirect impacts to the edge of TLCP that facing to the Project Site (the HWRSR site) due to disturbance from human activities and traffic flow along the new road during operational phase. However, this part of the TLCP is already receiving disturbance from the Tuen Mun Road, a similar source of disturbance. Fauna sensitive to human disturbance might have already avoided this area; while the existing fauna might have already accommodated human disturbance. Hence, the potential impact is expected to be insignificant.

8.7 MITIGATION MEASURE

General

- 8.7.1 The key impacts of the Project include loss of small area of mixed woodland and disturbance (e.g. noise, dust, surface runoff) that require proper mitigation measures to minimize these potential impacts.
- 8.7.2 Mitigation measures will follow the hierarchy detailed in Annex 16 of TM-EIAO, following the order of priority: avoidance, minimization and compensation. Wherever possible, on-site mitigation measures are preferred over off-site mitigations.

Avoidance

- 8.7.3 No site or habitat of conservation importance would be directly impacted. Direct impacts on the flora and fauna species of conservation importance would also be avoided. Direct impacts on the TLCP which is located uphill and some distance away from the Project Site of HWRSR is also avoided. In the subsequent stage of the Project, any adjustment in Project Site shall take into consideration of the location of the Country Park and avoid encroaching onto it.

Minimization

Minimizing habitat and tree loss

- 8.7.4 Mixed woodland and semi-natural watercourse within the HWRSR site but outside the road layout will be retained during the construction phase, which could reduce the ecological impact brought by temporary habitat loss due to the Project. Efforts will also be made to minimize tree loss brought by the Project as far as technically feasible during the detailed design stage of the Project. Besides, the temporary loss of plantation will be reinstated by tree planting. The detail of the tree planting is provided in Chapter 9 - Landscape and Visual Impact Assessment.

Minimizing indirect disturbance impacts

Construction Site Runoff

- 8.7.5 During the construction phase, site runoff would need to pass through sedimentation tanks to reduce the concentration of suspended sediment. In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented on site as far as practicable to control site runoff and drainage at all work sites during construction, so that the treated runoff will be discharged to public drainage system in compliance with the WPCO. Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed. Proper locations for discharge outlets

of wastewater treatment facilities well away from the natural streams/ivers should be identified. Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meets the effluent discharge guidelines. The best practices are detailed in Chapter 5 - Water Quality Impact Assessment.

Good Site Practices

- 8.7.6 Standard site practices listed as follows would be implemented to minimize potential impacts, including dust, noise and site runoff, on the surrounding environment. Specific good site practices related to air, noise and water are also specified in the relevant EIA chapters.
- Regular checking should be undertaken to ensure that the work site boundary is not exceeded and that no damage occurs to surrounding areas;
 - Implementation of mitigation measures specified in ProPECC PN 1/94 to control site runoff and drainage during construction;
 - Implementation of noise control measures to reduce impacts of construction noise to wildlife habitats adjacent works area;
 - Implementation of dust control measures at all construction sites to minimize dust nuisance to adjacent wildlife habitats during construction activities;
 - Construction debris and spoil should be covered up and/or properly disposed of as soon as possible to avoid being washed into nearby waterbodies by rain;
 - Good site practice and site precautionary measures will also be implemented to avoid the potential impact due to site runoff. Construction effluent, site runoff and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed with the following approach in descending order;
 - Proper locations for discharge outlets of wastewater treatment facilities well away from the natural streams/ivers should be identified;
 - Effluent monitoring should be incorporated to make sure that the discharged effluent from construction site meets the effluent discharge guidelines; and
 - Supervisory staff should be assigned to station on site to closely supervise and monitor the works.

Mitigation

Minimization of bird collision

- 8.7.7 In order to minimize bird collision due to the re-provided noise barriers along the new roads, bird friendly design should be adopted for the noise barriers, such as using falcon sticker and tinted materials. Guidelines on Design of Noise Barriers (EPD & HyD, 2003) and Practice Notes No. BSTR/PN/003 (Revision E) Noise Barriers with Transparent Panels (HyD, 2020) could be referred for the design of the noise barrier/enclosure to avoid and minimize bird mortality from collision.

Compensatory tree planting

- 8.7.8 The loss of small area of mixed woodland should be mitigated by compensatory tree planting provided in Chapter 9 - Landscape and Visual Impact Assessment.
- 8.7.9 With the abovementioned mitigation measures, no secondary/induced/additional/synergistic impacts are anticipated. A summary of the impacts in construction and operational phases, with sources, receivers, nature, significance and mitigation required, are provided in **Table 8.13**.



Table 8.13 Summary of Construction Phase and Operational Phase Impacts

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Construction Phase – Direct Impacts										
Temporary habitat loss	Works areas of the proposed development	Plantation within the HWRSR Site but outside the proposed road layout	Very low	Low flora and terrestrial faunal diversity	Estimated 0.85 ha, the actual size will be subjected to the later stage of the Project	Temporary	Reversible	Minor	Insignificant	Reinstatement by tree planting
Permanent habitat loss	The widen road and new slip road	Developed area, plantation and mixed woodland within the proposed road layout the Project Sites	Negligible for developed area; Very low for plantation; Low for mixed woodland	Low flora and terrestrial faunal diversity	Developed area: 1.54 ha; mixed woodland: 0.08 ha; plantation: 1.1 ha	Permanent	Not reversible	Minor	Permanent loss of developed area and plantation: Insignificant; Permanent loss of mixed woodland: Minor	Compensatory tree planting for permanent mixed woodland loss
Construction Phase – Indirect Impact										
Disturbance impacts (noise, dust and other human activities)	Construction works	Sensitive habitats near the works area	Range from “very low” to “low to medium” for various habitat types	Terrestrial fauna	Vary	Temporary	Reversible	Minor	Insignificant	Good site practice
Surface runoff	Surface runoff from works area	Semi-natural watercourse located within and closely to	Low for semi-natural	Aquatic/ marine organisms	Vary	Temporary	Reversible	Minor	Minor to moderate	Follow water quality mitigation measures



Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
		the west of the HWRSR site and the downstream aquatic/marine habitat including sea	watercourse; Low to moderate for sea							suggested in Chapter 5 - Water Quality Impact Assessment
Operational Phase – Indirect Impact										
Disturbance impacts	The widen road and new slip road	Sensitive habitats near the potential development area	Range from “very low” to “low to medium” for various habitat types	Terrestrial fauna	Vary	Permanent	Not reversible	Insignificant	Insignificant	No
Surface runoff	The widen road and new slip road	Semi-natural watercourse located within and closely to the west of the HWRSR site and the downstream aquatic/marine habitat including sea	Low for semi-natural watercourse; Low to moderate for sea	Aquatic/marine organisms	Vary	Permanent	Not reversible	Insignificant	Insignificant	No
Potential bird collision	The re-provided noise barriers along roads	Birds	N/A	Birds	N/A	Permanent	Not reversible	Minor	Minor	Adopting bird friendly design



Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Barrier effect on mobile species	The widen road and new slip road	Non-flying terrestrial animals	N/A	Non-flying terrestrial animals	N/A	Permanent	Not reversible	Insignificant	Insignificant	No
Direct mortality of fauna	The widen road and new slip road	Non-flying terrestrial animals	N/A	Non-flying terrestrial animals	N/A	Permanent	Not reversible	Insignificant	Insignificant	No
Impact to Recognized Site of Conservation Importance/ importance habitat										
Impact to TLCP	Disturbance raised from construction and operational phase of the Project	TLCP	Very low for developed area; Low for channel and plantation; Low for shrubland/grassland; Low to medium for mixed woodland; Medium for natural watercourse	All flora and fauna within TLCP	Channel: 1720.32m Developed area: 0.98ha Natural watercourse: 978.27m Plantation: 0.21ha Shrubland/grassland: 20.52ha Mixed woodland: 4.54ha	Temporary	Reversible	Insignificant	Insignificant	No
Impact to Tuen Mun Park ardeid roost	Disturbance raised from construction and operational phase of the Project	Tuen Mun Park ardeid roost	N/A	The ardeid using Tuen Mun Park ardeid roost	N/A	Both temporary and permanent	Both reversible and not reversible	Insignificant	Insignificant	No
Impact to Species of Conservation Importance										
Impact to flora	Direct impact /	Flora species of	N/A	Flora species of	N/A	Both temporary	Both reversible	Insignificant	Insignificant	No



Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
species of conservation importance	disturbance raised from construction and operational phase of the Project	conservation importance recorded within the Assessment Area		conservation importance recorded within the Assessment Area		and permanent	and not reversible			
Impact to fauna species of conservation importance	Direct impact / disturbance raised from construction and operational phase of the Project	Fauna species of conservation importance recorded within the Assessment Area	N/A	Fauna species of conservation importance recorded within the Assessment Area	N/A	Both temporary and permanent	Both reversible and not reversible	Insignificant	Insignificant	No

8.8 CUMULATIVE IMPACTS

- 8.8.1 In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operational period for this Study has been conducted and a list of the concurrent projects identified at this stage is provided in Section 2 of this EIA report.
- 8.8.2 The table below (**Table 8.14**) summarizes the relevancy of these concurrent projects. Project relevant to ecology is examined individually.
- 8.8.3 The construction of the Project is anticipated to commence tentatively in July, 2024 and end before the end of 2030. Some of the concurrent projects may pose potential cumulative disturbance to the habitat near the Project Sites of the current Project during both construction and operational phases. However, majority of the committed and planned concurrent projects in the vicinity of the Project are located within highly urbanised area, where ecological resources are limited. Besides, no adverse ecological impact was anticipated on the loss of developed area habitat arising from the projects. As such, no major cumulative ecological impacts are anticipated from the concurrent projects in the vicinity.



Table 8.14 Cumulative Impacts from Concurrent Projects near the Project Sites

Concurrent Project	Project Proponent	Construction Programme		Potential Cumulative Impacts (Construction Phase)	Potential Cumulative Impacts (Operational Phase)
		Start	Complete		
Site Formation and Infrastructure Works for Public Housing Developments at Tuen Mun Central – Phase 1	Civil Engineering and Development Department (CEDD)	2021	2024Q3	Potential cumulative construction impact is not anticipated due to heavy construction works of concurrent project completed before commencement of the Project	Cumulative ecological impacts are not expected as there will be no high disturbance to the environment due to the nature of the concurrent projects
Construction of Public Housing Development (PHD) at Yip Wong Road Phase 1 and Phase 2	Housing Department (HD)	2020	2024-2025		
Cycle track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat Section)	CEDD	2023	2026	Potential cumulative disturbance impacts to habitats nearby due to the construction works. However, the projects are located within highly urbanized area, where ecological resources are limited. Existing fauna might have already accommodated human disturbance. Significant cumulative ecological impact is not expected	Cumulative ecological impacts are not expected as there will be no high disturbance to the environment due to the nature of the concurrent projects
Tuen Mun South Extension	MTRCL	2023	2030		Potential cumulative disturbance impacts to nearby habitats are anticipated. However, the projects are located within highly urbanized area, where ecological resources are limited. Existing fauna might have already accommodated
Tuen Mun Bypass	Highway Department (HyD)	2026	2033		



Concurrent Project	Project Proponent	Construction Programme		Potential Cumulative Impacts (Construction Phase)	Potential Cumulative Impacts (Operational Phase)
		Start	Complete		
					human disturbance. Significant cumulative ecological impact is not expected
Reprovision of Tuen Mun Swimming Pool, Tuen Mun Golf Centre Practice Green, Pet Garden and Community Green Station	MTR Corporation Limited (MTRCL)	2023	2030		Cumulative ecological impacts are not expected as there will be no high disturbance to the environment due to the nature of the concurrent projects
Sports Ground and Open Space in Area 16, Tuen Mun	Architectural Services Department (ArchSD)	2023-24	2027-28		

8.9 RESIDUAL IMPACTS

- 8.9.1 Residual environmental impacts refer to the net environmental impact after the implementation of all mitigation measures, with the background environmental conditions and the impact from existing, committed and planned projects in nearby areas being taken into account.
- 8.9.2 Among the permanent habitat loss, the loss of developed area will be re-provided by the future roads. Residual impacts would include net loss of 1.1 ha plantation, and 0.08 ha of mixed woodland. However, plantation is man-made in nature and supporting low diversity and abundance of fauna and low diversity of flora, and the loss of small area of mixed woodland will be mitigated by compensatory tree planting. The residual impact of habitat loss is considered acceptable.
- 8.9.3 For indirect impacts related to noise, dust and other human activities to the terrestrial habitats, flora and fauna species would only be insignificant during both construction and operational phases. While surface runoff during construction phase would cause Minor ecological impact to the section of semi-natural watercourse that is located within and to the west of the HWRSR site and the downstream aquatic/marine habitats if not mitigated. However, with the recommended mitigation measures (e.g. good site practices) in place, the impact will be minimized to very low level and acceptable.
- 8.9.4 With the implementation of the recommended mitigation measures discussed in mitigation section, it is anticipated that all potential ecological impacts will be reduced to an acceptable level. As a result, no adverse residual impact is anticipated during both construction and operational phases.

8.10 CONCLUSION

- 8.10.1 Ecological impact assessment for the Project was conducted following the EIA Study Brief No. ESB-339/2021 and the guidelines of the EIAO-TM Annexes 8 and 16. Terrestrial and aquatic habitats identified within the Assessment Area include channel, developed area, mixed woodland, plantation, sandy shore, sea, shrubland/grassland and natural watercourse and semi-natural watercourse. In general, the habitats within Project Site and Assessment Area are of low ecological value as most of them are within or adjacent to highly urbanized area that receiving human disturbance.
- 8.10.2 The Project Site has avoided recognized site of conservation importance. The Project would cause permanent loss of developed area, plantation and mixed woodland. The key impacts of the Project include loss of small area of mixed woodland which is considered of Minor potential impact, surface runoff causing disturbance to nearby aquatic/marine habitats during construction phase which is considered of Minor to Moderate potential impact, and potential bird collision along the re-provided noise barrier which is considered of Minor potential impact.
- 8.10.3 Mitigation measures proposed under the Project include compensatory tree planting, implementation of good site practice during construction phase, following water quality mitigation measures suggested in Chapter 5 - Water Quality Impact Assessment and adopting bird friendly design for the re-provided noise barriers. With the implementation of the above mitigation measures, no unacceptable ecological impacts are anticipated to arise from the construction and operation of the Project.

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