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10. Ecological Impact (Terrestrial)

10.1 Legislation, Standards and Guidelines

10.1.1 Local Legislation, Standards and Guidelines

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

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations (Cap. 96A)
- Wild Animals Protection Ordinance (WAPO) (Cap. 170)
- Country Parks Ordinance (Cap. 208) and its subsidiary legislation
- Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) and relevant annexes 8, 9, 11, 16, 17, 20 and 21 of the associated Technical Memorandum (EIAO-TM)
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation
- EIAO Guidance Note No. 6/2010 – Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective
- EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment
- EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys
- Hong Kong Planning Standards and Guidelines
- Planning, Environment & Lands Branch Technical Circular (PELBTC) No. 1/97/Works Branch Technical Circular (WBTC) No. 4/97 – Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures.
- New Nature Conservation Policy
- Hong Kong Biodiversity Strategy and Action Plan (2016-2021)
- List of Wild Animals under State Protection
- List of Wild Plants under State Protection

10.1.2 International Conventions and Guidelines

10.1.2.1 The relevant international conventions and guidelines applicable to this EcoIA include the following:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES")
- United Nations Convention on Biological Diversity

- The International Union for Conservation of Nature (IUCN) Red List of Threatened Species

10.2 Background Information

10.2.1.1 This Section presents the findings of an assessment of potential terrestrial ecological impacts associated with the Project. It summarises baseline information gathered from the literature review and baseline ecological surveys on the terrestrial ecological resources in the Assessment Area, which includes areas within 500 metres distance from the boundary of the Project (hereafter refer to as the Project Area), and describes the ecological importance of this area.

10.2.1.2 The proposed alignment of the Project will be mainly located on land. There are also proposed barging points at marine area near Tuen Mun Chek Lap Kok Tunnel Road (hereafter referred to as "TM-CLKT"), which will only involve deployment and mooring of floating pontoons at the seawalls of TMCLKT. Concrete sinkers (10 to 20 tonne, approximately 2m x 2m x 2m, per each) or anchors would be sunk into the seabed for mooring of the floating pontoons. These sinkers or anchors would stay on the seabed during the construction period, and would be retrieved after construction. No marine piling nor marine works are anticipated for setting up these barging points. Given the very small scale of temporary marine habitat disturbance at the artificial seawalls of TM-CLKT, which are of low ecological importance, marine ecological surveys and marine ecological impact assessment are not necessary to be conducted under the EIA Study.

10.3 Literature Review

10.3.1.1 Upon commencement of the ecological assessment, a literature review was conducted to search for relevant scientific papers, reports and previous reports etc. to identify any available ecological baseline information. Based on recent aerial photos and relevant previous studies, habitats and species of conservation importance recorded previously were identified. General studies (if any), which may not necessarily focus on the Assessment Area, were also reviewed and relevant information was extracted from the report(s). The Project (including alignment and temporary works area) are as shown in **Figure 10.1** and the Assessment Area of the terrestrial ecological impact assessment is defined as a 500m distance from the Project and temporary works area as shown in **Figure 10.1**..

10.3.2 Recognised Sites of Conservation Importance

10.3.2.1 The Assessment Area falls within the below-mentioned sites of conservation importance, including Lam Tei and Yick Yuen Conservation Area and Tai Lam Country Park. A portion of the Project is located within Tai Lam Country Park. The extent of the sites of conservation importance are as shown in **Figure 10.2**.

10.3.3 Lam Tei and Yick Yuen Conservation Area

10.3.3.1 The Lam Tei and Yick Yuen Conservation Area within the Assessment Area is zoned as Conservation Area under the Approved Lam Tei and Yick Yuen OZP NO. S/TM-LTYY/12 (**Figure 10.2**).

10.3.3.2 The planning intention of this zone is to protect and retain the existing natural landscape,

ecological or topographical features of the area for conservation, educational and research purposes and to separate sensitive natural environment such as Country Park from the adverse effects of development.

10.3.3.3 There is a general presumption against development in this zone. In general, only developments that are needed to support the conservation of the existing natural landscape or scenic quality of the area or are essential infrastructure projects with overriding public interest may be permitted.

10.3.4 Tai Lam Country Park

10.3.4.1 Tai Lam Country Park is the second largest country park (approximately 5412 ha) within Hong Kong. A portion of the alignment falls within the country park (**Figure 10.2**).

10.3.4.2 The country park was mostly barren landscape with scant vegetation a few decades ago. Afforestation only began in 1952 after the completion of Tai Lam Chung Reservoir to protect the catchwaters from erosion and soil loss. Common species such as Taiwan Acacia (*Acacia confusa*), Brisbane Box (*Lophostemon confertus*), Chinese Red Pine (*Pinus massoniana*), Slash Pine (*Pinus elliottii*) and Swamp Mahogany (*Eucalyptus robusta*) were extensively planted and now form a majority of the vegetation cover within the park. Native tree species such as *Machilus* spp. and Castanopsis (*Castanopsis fissa*), are also able to regenerate in a significant scale under such conditions [1].

10.3.4.3 The reforested landscape within the country park now provides a habitat that supports a wide diversity of native species. For example, various bird species, Chinese Pangolin (*Manis pentadactyla*), Leopard Cat (*Prionailurus bengalensis*) and Red Muntjac (*Muntiacus muntjak*); reptiles like Bicoloured Stream Snake (*Opisthotropis lateralis*), Chinese Cobra (*Naja atra*), Garnot's Gecko (*Hemidactylus garnotii*), Reeve's Smooth skink (*Scincella reevesii*) and Chinese Waterside Skink (*Tropidophorus sinicus*); as well as amphibians like the Green Cascade Frog (*Rana chloronota*), Asiatic Painted Frog (*Kaloula pulchra*), Butler's Pigmy Frog (*Microhyla butleri*), Ornate Pigmy Frog (*Microhyla fissipes*), Asian Common Toad (*Bufo melanostictus*) and Hong Kong Cascade Frog (*Amolops hongkongensis*). Freshwater fish species such as *Opsariichthys bidens* and Rice fish (*Oryzias curvinotus*) are common within the streams of the country park.

10.3.5 Siu Lang Shui Site of Special Scientific Interest

10.3.5.1 Siu Lang Shui Site of Special Scientific Interest (SLS SSSI) is situated around 600m to the northwest of the Pillar Point magazine site (**Figure 10.2**), occupying an area of around 2.3 hectares covering a plantation slope composed of *Acacia confusa* and *Eucalyptus torelliana* and naturally colonized with native species at the northern part of the closed and restored SLS Landfill managed by the EPD. Designated in 2008, SLS SSSI has been known as the largest overwintering site of Danaids, including Blue-spotted Crow, Common Indian Crow, Striped Blue Crow, Common Tiger, Ceylon Blue Glassy Tiger, Blue Tiger and Dark Blue Tiger in Hong Kong since 1999 [2].

[1] AFCD. 2023. Tai Lam Country Park. Agriculture, Fisheries and Conservation Department, HKSAR, Hong Kong.

[2] Planning Department. (2008). Register of Sites of Special Scientific Interest (SSSIs). Retrieved from: https://www.pland.gov.hk/pland_en/resources/access/pec/SSSI.html. Accessed on April 2023.

10.3.5.2 The condition of SLS as an overwintering danaid ground has been monitored by Green Power (GP) since 2009. The number of overwintering danaids surveyed and publicized. by GP in each year since 2009, where available, are tabulated in **Table 10.1**. The exact location of and the dates when these overwintering danaids were observed are unspecified. From October 2022 to January 2023, 601 overwintering danaids were observed at SLS and reported [3].

Table 10.1 Overwintering Danaids Recorded in Siu Lang Shui by Green Power since 2009

Year of overwintering danaid survey	Number of overwintering danaids reported by Green Power
Late 2022 to early 2023	601
Late 2020 to early 2021	195
Late 2019 to early 2020	649
Late 2016 to early 2017	59
Late 2015 to early 2016	66
Late 2014 to early 2015	1587
Late 2013 to early 2014	41
Late 2012 to early 2013	230
Late 2011 to early 2012	5000-6000
Late 2010 to early 2011	601
Late 2009 to early 2010	65
Late 2008 to early 2009	41

10.3.6 Species/ Areas of Conservation Importance from Reviewed Literature

10.3.6.1 A literature review has been conducted to characterise the existing ecological conditions of the Assessment Area and to identify habitats and species of conservation concern in the area. A number of relevant studies including but not limited to the following were reviewed:

- DIR-295/2022 - Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau) (Highways Department, 2022) [4]
- EIA-293/2023 – Traffic Improvement Scheme in Tuen Mun (Highways Department, 2023) [5]
- EIA-280/2022 - Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So

[3] Green Power. (2023). Press Release: "Overwintering Danaids Survey" recorded the largest Danaid population in Fan Lau in South Lantau, and No Danaids in Deep Water Bay for the first time (Chinese only) (19 Mar 2023). Accessed on March 2023.

[4] Highways Department (2022). Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau).

[5] Highways Department (2023). Traffic Improvement Scheme in Tuen Mun.

Kwun Wat) (CEDD, 2022) [6]

- EIA-279/2022 - Tuen Mun South Extension (MTR Corporation Ltd, 2022) [7]
- EIA-263/2020 - Development at San Hing Road and Hong Po Road, Tuen Mun (CEDD, 2020) [8]
- EIA-174/2009 - Tuen Mun - Chek Lap Kok Link (Highways Department, 2009) [9]

10.3.6.2 Findings of the review of these key sources are summarised in the following sections. The ecological survey periods and surveyed flora/ fauna groups presented in the above studies are tabulated in **Table 10.2** and a map showing their respective assessment areas, whenever defined, is provided in **Figure 10.3**.

10.3.6.3 Special attention was paid to ecologically sensitive areas, and species of conservation importance (i.e. species protected by local legislation, endemic to Hong Kong or South China, listed in international conventions for conservation of habitat/wildlife, listed in IUCN Red Data Book or those of the South China region and considered as rare in the territory or having special conservation importance by scientific studies etc.). The information gathered from the literature review was evaluated and the information gaps concerning assessment of the potential ecological impacts arising from the Project on the terrestrial environment were identified (see **Section 10.3.12**). The species of conservation importance with known locations are shown on **Figure 10.4**.

Table 10.2 Previous Studies Relevant to the Assessment Area

Study	Survey Period	Flora and Fauna Groups Surveyed
DIR-295/2022 Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau)	May 2022 – Jun 2022	Habitat & Vegetation, Terrestrial Mammals, Avifauna, Herpetofauna, Butterfly and Odonate, Aquatic Fauna
EIA-293/2023 Traffic Improvement Scheme in Tuen Mun	Apr 2022 – May 2022	Habitat & Vegetation, Terrestrial Mammals, Avifauna, Herpetofauna, Butterfly and Odonate, Aquatic Fauna
EIA-280/2022 Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat)	Jul 2017 – Nov 2017	Habitat & Vegetation, Terrestrial Mammals, Avifauna, Herpetofauna, Butterfly and Odonate, Aquatic Fauna
EIA-279/2022 Tuen Mun South Extension	Jan 2021 – Jun 2021	Habitat & Vegetation, Terrestrial Mammals, Avifauna, Herpetofauna, Butterfly and Odonate, Aquatic Fauna
EIA-263/2020 Development at San Hing	Jun 2018 – Nov 2018, Mar 2020 – Apr 2020	Habitat & Vegetation, Terrestrial Mammals, Avifauna, Herpetofauna,

[6] Civil Engineering and Development Department (2022). Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat).

[7] MTR Corporation Ltd (2022). Tuen Mun South Extension.

[8] Civil Engineering and Development Department (2020). Development at San Hing Road and Hong Po Road, Tuen Mun.

[9] Highways Department, Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office (2009). Tuen Mun - Chek Lap Kok Link.

Study	Survey Period	Flora and Fauna Groups Surveyed
Road and Hong Po Road, Tuen Mun		Butterfly and Odonate, Aquatic Fauna
EIA-174/2009 Tuen Mun - Chek Lap Kok Link	Sep 2003 – May 2004, Aug 2008 – Feb 2009	Habitat & Vegetation, Terrestrial Mammals, Avifauna, Herpetofauna, Butterfly and Odonate, Aquatic Fauna

10.3.7 Habitat and Vegetation

10.3.7.1 Based on a review of the recent aerial photos and the habitat maps prepared for previously approved EIA studies, most habitats present within the Assessment Area ranged from mixed woodland, plantation, shrubland/grassland, coastal area, and developed area. The other minor habitats include agricultural land, reservoir and some watercourses including both natural and channelized ones of various extents.

10.3.7.2 Six (6) flora species of conservation importance were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIAs as listed in **Table 10.3** below and their known locations are shown in **Figure 10.4**. Details of the flora species of conservation importance are shown in **Table 10.3**.

Table 10.3 Flora of Conservation Importance Recorded from Previous Studies

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Flora				
Incense Tree	*Aquilaria sinensis*	土沉香	Protected under Cap. 586, Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Near Threatened" status in China and under State protection (Category II) in China, listed as "Vulnerable" in China Plant Red Data Book, included in Illustrations of Rare & Endangered Plant in Guangdong Province, TSLCHP: VU, IUCN: VU, CITES(II)	[4], [5]
Small Persimmon	*Diospyros vaccinioides*	小果柿	TSLCHP: EN, IUCN: CR	[6]
Luofushan Joint-fir	*Gnetum luofuense*	羅浮買麻藤	IUCN: NT	[3], [5]
Tsoong's Tree	*Michelia odora*	觀光木	Protected under Cap. 96A, Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China, listed as "Rare" in China Plant Red Data Book, included in Illustrations of Rare & Endangered Plant in Guangdong Province, IUCN: VU	[4]
Pitcher Plant	*Nepenthes mirabilis*	豬籠草	Protected under Cap. 96A, Cap. 586, Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China, TSLCHP: VU, CITES(II)	[1], [5], [6]

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Red Azalea	*Rhododendron simsii*	紅杜鵑	Protected under Cap. 96A	[1]

Notes:
Conservation Status:

a. Cap. 96A: Forestry Regulations, the subsidiary legislation of Forests and Countryside Ordinance
b. Cap. 586: Protection of Endangered Species of Animals and Plants Ordinance
c. Xing, F.W., Ng, S.C., Chau, L.K.C. 2000. Gymnosperms and angiosperms of Hong Kong. Memoirs of the Hong Kong Natural History Society 23: 21-136.
d. AFCD (2003) Rare and Precious Plants of Hong Kong. Agriculture, Fisheries and Conservation Department, HKSAR, Hong Kong.
e. Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants.
f. Wu & Hu (1988). Illustration of Rare & endangered plant in Guangdong Province.
g. TSLCHP – Threatened Species List of China's Higher Plants (2017). VU = Vulnerable, EN = Endangered
h. IUCN – International Union for Conservation of Nature Red List of Threatened Species (2022). NT = Near Threatened, VU = Vulnerable
i. CITES – Under Appendix (I), Appendix (II) or Appendix (III) of Convention on International Trade in Endangered Species of Wild Flora and Fauna

Previous Studies:

[1] Highways Department, Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office (2009). Tuen Mun - Chek Lap Kok Link.
[2] Civil Engineering and Development Department (2020). Development at San Hing Road and Hong Po Road, Tuen Mun.
[3] MTR Corporation Ltd (2022). Tuen Mun South Extension.
[4] Civil Engineering and Development Department (2022). Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat).
[5] Highways Department (2022). Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau).
[6] Highways Department (2023). Traffic Improvement Scheme in Tuen Mun.

10.3.8 Terrestrial Mammals

10.3.8.1 Five (5) terrestrial mammal species of conservation importance recorded within the Assessment Area and its vicinity from previous surveys/ approved EIAs as listed in **Table 10.4** below and their known locations are shown in **Figure 10.4**. Details of the terrestrial mammal species of conservation importance are shown in **Table 10.4**.

Table 10.4 Terrestrial Mammals of Conservation Importance Recorded from Previous Studies

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Terrestrial Mammals				
Least Horseshoe Bat	*Rhinolophus pusillus*	小菊頭蝠	Cap.170, Fellowes: PRC (RC)	[3]
Japanese Pipistrelle	*Pipistrellus abramus*	東亞家蝠	Cap.170	[3]
Unidentified Bat	-	-	Cap. 170	[5], [6]
Pallas's Squirrel	*Callosciurus erythraeus*	赤腹松鼠	Cap. 170	[6]

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Red Muntjac	*Muntiacus muntjak*	赤麂	Fellowes: PRC, RLCV(NT)	[6]

Notes:
Conservation Status:

a. Cap. 170: Protected under Wild Animals Protection Ordinance
b. Fellowes – Fellowes et al. (2002): PRC = Potential Regional Concern, RC = Regional Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.

Previous Studies:

[1] Highways Department, Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office (2009). Tuen Mun - Chek Lap Kok Link.
[2] Civil Engineering and Development Department (2020). Development at San Hing Road and Hong Po Road, Tuen Mun.
[3] MTR Corporation Ltd (2022). Tuen Mun South Extension.
[4] Civil Engineering and Development Department (2022). Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat).
[5] Highways Department (2022). Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau).
[6] Highways Department (2023). Traffic Improvement Scheme in Tuen Mun.

10.3.9 Avifauna

10.3.9.1 Thirteen (13) avifauna species of conservation importance were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIAs as listed in **Table 10.5** below and their known locations are shown in **Figure 10.4**. Details of the avifauna species of conservation importance are shown in **Table 10.5**.

Table 10.5 Avifauna of Conservation Importance Recorded from Previous Studies

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Avifauna				
Black-crowned Night Heron	*Nycticorax nycticorax*	夜鷺	Fellowes: (LC)	[1], [6]
Grey Heron	*Ardea cinerea*	蒼鷺	Fellowes: PRC	[3]
Great Egret	*Ardea alba*	大白鷺	Fellowes: PRC (RC)	[3], [4], [6]
Intermediate Egret	*Ardea intermedia*	中白鷺	Fellowes: RC	[3]
Little Egret	*Egretta garzetta*	小白鷺	Fellowes: PRC (RC)	[1], [3], [4], [6]
Pacific Reef Heron	*Egretta sacra*	岩鷺	Fellowes: (LC), CSMPS (II), CRDB: Rare	[6]
Crested Goshawk	*Accipiter trivirgatus*	鳳頭鷹	Cap. 586, CSMPS (II), RLCV(NT), CRDB: Rare, CITES (II)	[3]
Black Kite	*Milvus migrans*	黑鳶	Cap. 586, Fellowes: (RC), CSMPS (II), CITES (II)	[1], [3], [4], [5], [6]

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Avifauna				
Collared Scops Owl	*Otus lettia*	領角鴞	Cap. 586, CSMPS (II), CITES(II)	[6]
White-throated Kingfisher	*Halcyon smyrnensis*	白胸翡翠	Fellowes: (LC)	[5]
Ashy Drongo	*Dicrurus leucophaeus*	灰卷尾	Fellowes: LC	[3]
Rufous-capped Babbler	*Stachyridopsis ruficeps*	紅頭穗鶥	Fellowes: LC	[5]
Black-throated Laughingthrush	*Pterorhinus chinensis*	黑喉噪鶥	Class 2 Protected Animal of China	[5], [6]

Notes:

Conservation Status:

a. All birds in Hong Kong are protected under Cap. 170 – Protected under Wild Animals Protection Ordinance
b. Cap. 586: Protection of Endangered Species of Animals and Plants Ordinance
c. Fellowes – Fellowes et al. (2002): LC = Local Concern, PRC = Potential Regional Concern, RC = Regional Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
d. CSMPS– China State Major Protection Status: Appendix (I) or Appendix (II)
e. RLCV – Red List of China's Vertebrate (2016): NT = Near Threatened, VU: Vulnerable
f. CRDB – China Red Data Book (1998): VU = Vulnerable
g. State Forestry Administration & Ministry of Agriculture (1989). List of Wild Animals under State Protection.
h. CITES – Under Appendix (I), Appendix (II) or Appendix (III) of Convention on International Trade in Endangered Species of Wild Flora and Fauna

Previous Studies:

[1] Highways Department, Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office (2009). Tuen Mun - Chek Lap Kok Link.
[2] Civil Engineering and Development Department (2020). Development at San Hing Road and Hong Po Road, Tuen Mun.
[3] MTR Corporation Ltd (2022). Tuen Mun South Extension.
[4] Civil Engineering and Development Department (2022). Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat).
[5] Highways Department (2022). Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau).
[6] Highways Department (2023). Traffic Improvement Scheme in Tuen Mun.

10.3.10 Herpetofauna

10.3.10.1 Two (2) herpetofauna species of conservation importance were recorded within the Assessment Area and its vicinity from previous surveys/ approved EIAs as listed in **Table 10.6** below and their known locations are shown in **Figure 10.4**. Details of the herpetofauna species of conservation importance are shown in **Table 10.6**.

Table 10.6 Herpteofauna of Conservation Importance Recorded from Previous Studies

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Amphibian				
Chinese Bullfrog	*Hoplobatrachus rugulosus*	虎紋蛙	Fellowes: PRC, CSMPS(II), RLCV(EN)	[5]
Lesser Spiny Frog	*Quasipaa exilispinosa*	小棘蛙	Fellowes: PGC, RLCV(VU), IUCN(VU)	[6]

Notes:
Conservation Status:

a. Fellowes – Fellowes et al. (2002): PRC = Potential Regional Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
b. CSMPS– China State Major Protection Status: Appendix (I) or Appendix (II)
c. RLCV – Red List of China's Vertebrate (2016): EN = Endangered

Previous Studies:

[1] Highways Department, Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office (2009). Tuen Mun - Chek Lap Kok Link.
[2] Civil Engineering and Development Department (2020). Development at San Hing Road and Hong Po Road, Tuen Mun.
[3] MTR Corporation Ltd (2022). Tuen Mun South Extension.
[4] Civil Engineering and Development Department (2022). Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat)
[5] Highways Department (2022). Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau).
[6] Highways Department (2023). Traffic Improvement Scheme in Tuen Mun.

10.3.11 Butterfly and Odonate

10.3.11.1 Three (3) butterfly and one (1) odonate species of conservation importance were recorded in the Assessment Area from previous surveys/ approved EIAs as listed in **Table 10.7** below and their known locations are shown in **Figure 10.4**. Details of the butterfly and odonate species of conservation importance are shown in **Table 10.7**.

Table 10.7 Butterfly and Odonate of Conservation Importance Recorded from Previous Studies

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Distribution in Hong Kong[1]	Previous Studies
Butterfly					
Common Onyx	*Horaga onyx*	斑灰蝶	-	Rare	[6]
Danaid Egg-fly	*Hypolimnas misippus*	金斑蛱蝶	Fellowes: LC	Uncommon	[6]
Small Cabbage White	*Pieris rapae*	菜粉蝶	-	Rare	[6]

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Distribution in Hong Kong[1]	Previous Studies
Butterfly					
Odonate					
Emerald Cascader	*Zygonyx iris*	彩虹蜻	Fellowes: PGC	-	[6]

Notes:

1. Distribution in Hong Kong refers to AFCD database: Available at Chan, A., Cheung, J., Sze, P., Wong, A., Wong, E. and Yau, E. 2011. A Review of the Local Restrictedness of Hong Kong Butterflies. Hong Kong Biodiversity 21: 1-12

Conservation Status:

a. Fellowes – Fellowes et al. (2002): LC = Local Concern, PRC = Potential Regional Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.

Previous Studies:

[1] Highways Department, Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office (2009). Tuen Mun - Chek Lap Kok Link.

[2] Civil Engineering and Development Department (2020). Development at San Hing Road and Hong Po Road, Tuen Mun.

[3] MTR Corporation Ltd (2022). Tuen Mun South Extension.

[4] Civil Engineering and Development Department (2022). Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat)

[5] Highways Department (2022). Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau).

[6] Highways Department (2023). Traffic Improvement Scheme in Tuen Mun.

10.3.12 Aquatic fauna

10.3.12.1 Three (3) aquatic fauna species of conservation importance were recorded in the Assessment Area from previous surveys/ approved EIAs as listed in **Table 10.8** below and their known locations are shown in **Figure 10.4**. Details of the aquatic fauna species of conservation importance are shown in **Table 10.8**.

Table 10.8 Aquatic Fauna of Conservation Importance Recorded from Previous Studies

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Previous Studies
Freshwater Invertebrate				
Freshwater Crab	*Cryptopotamon anacoluthon*	鰓刺溪蟹	Fellowes: PGC, IUCN(VU)	[6]
Freshwater Crab	*Nanhaipotamon hongkongense*	香港南海溪蟹	Fellowes: PGC	[6]
Freshwater Crab	*Somanniathelphusa zanklon*	鐮刀束腰蟹	Fellowes: GC, IUCN(EN)	[6]

Notes:

Conservation Status:

a. Fellowes – Fellowes et al. (2002) : PGC = Potential Global Concern, GC = Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.

b. IUCN – International Union for Conservation of Nature Red List of Threatened Species (2022). VU

= Vulnerable, EN : Endangered

Previous Studies:

[1] Highways Department, Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office (2009). Tuen Mun - Chek Lap Kok Link.

[2] Civil Engineering and Development Department (2020). Development at San Hing Road and Hong Po Road, Tuen Mun.

[3] MTR Corporation Ltd (2022). Tuen Mun South Extension.

[4] Civil Engineering and Development Department (2022). Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat)

[5] Highways Department (2022). Ground Investigation Works within Tai Lam Country Park for Route 11 (Section between Yuen Long and North Lantau).

[6] Highways Department (2023). Traffic Improvement Scheme in Tuen Mun.

10.3.13 Evaluation & Identification of Information Gap

10.3.13.1 The information gathered from the literature review were evaluated to identify any information gaps. While the baseline ecological information of areas around Pillar Point and Tuen Mun were assessed, information gaps exist for the ecological habitats and communities in Tai Lam Country Park where part of the proposed underground tunnel section is located, Lam Tei and Yick Yuen Conservation Area and So Kwun Wat which are areas not covered in previous studies. Hence, detailed ecological surveys were required to obtain a comprehensive and updated baseline ecological condition of the Assessment Area described in **Section 10.5**.

10.4 Ecological Field Survey Methodology

10.4.1 Survey Scope

10.4.1.1 The purpose of the ecological surveys is to collect up-to-date ecological baseline information of the Assessment Area and verify the information from literature review for subsequent assessment of the ecological value of the habitats and species and evaluation of the potential ecological impacts resulting from the proposed works.

10.4.2 Habitat & Vegetation

10.4.2.1 Habitats within the Assessment Area was mapped based on government latest aerial photos and field ground-truthing. Representative areas of each habitat type was surveyed on foot. Plant species of each habitat type encountered and their relative abundance were recorded with special attention to rare or protected species. The location(s) of any plant species of conservation importance encountered were recorded. Nomenclature and conservation status of plant species will follow Corlett *et al.* (2000) [10].

10.4.3 Terrestrial Mammals

10.4.3.1 All sightings, tracks, and signs of mammals (including droppings) within the representative area within the Assessment Area was surveyed actively. The location(s) of any mammal species of conservation importance encountered were recorded, along with

[10] Corlett RT, Xing FW, Ng SC, Chau LKC & Wong LMY (2000). Hong Kong vascular plants: distribution and status. Memoirs of the Hong Kong Natural History Society 23:1-157.

notable behaviour. Night surveys were conducted to survey nocturnal mammal species (e.g., bats). Hand torch was used to search for the nocturnal mammals, bat detector was adopted to locate bats, if necessary. Nomenclature for mammals will follow Shek (2006) [11].

10.4.4 Avifauna

10.4.4.1 The avifauna of each habitat type within the Assessment Area was surveyed using transect count method. The presence and abundance of avifauna species at various habitats observed from transects was recorded visually and aurally. Bird species encountered outside sampling transects but within the Assessment Area were also recorded. Night surveys was conducted to record nocturnal avifauna (e.g., owls). The location(s) of any avifauna species of conservation importance encountered were recorded, along with notable behaviour. Ornithological nomenclature in this study will follow the most updated List of Hong Kong Birds from Hong Kong Bird Watching Society.

10.4.5 Herpetofauna

10.4.5.1 Herpetofauna was surveyed through direct observation and active searching in all potential hiding places such as among leaf litter, inside holes, under stones and logs within the representative area of the Assessment Area. During the surveys, all reptiles and amphibians sighted and heard were recorded. Auditory detection of species-specific calls was used to survey frogs and toads during night surveys. The location(s) of any herpetofauna species of conservation importance encountered were recorded, along with notable behaviour. The nomenclature and conservation status shall follow Karsen *et al.* (1998) [12] and Chan *et al.* (2005) [13].

10.4.6 Butterfly and Odonate

10.4.6.1 Butterfly and odonate surveys were conducted by transect count method. All the butterflies and odonates encountered were recorded and have their abundance recorded. Butterfly and odonate species encountered outside transects but within the Assessment Area will also be recorded. The location(s) of any butterfly and odonate species of conservation importance encountered were recorded, along with notable behaviour. Particular attention was paid to any overwintering butterflies in the potential works area at Siu Lang Shui and its vicinity. The nomenclature and conservation status for butterflies and odonates will follow *Chan* et al. (2011) [14] and *Tam* et al. (2011) [15], respectively.

10.4.7 Aquatic Fauna

10.4.7.1 Aquatic fauna, including freshwater macro-invertebrates (e.g. freshwater crabs, shrimps,

[11] Shek CT (2006). Field guide to the terrestrial mammals of Hong Kong. AFCD.

[12] Karsen SJ, Lau MW & Bogadek A (1998). Hong Kong Reptiles and Amphibians. Provisional Urban Council, Hong Kong.

[13] Chan KFS, Cheung KS, Ho CY, Lam FN, Tang WS, Lau MWN & Bogadek A (2005). A Field Guide to the Amphibians of Hong Kong. Friends of the Country Parks Cosmos Book Limited, Hong Kong.

[14] Chan A, Cheung J, Sze P, Wong A, Wong E & Yau E (2011). A Review of the Local Restrictedness of Hong Kong Butterflies. Hong Kong Biodiversity 21: 1-12.

[15] Tam TW, Leung KK, Kwan BSP, Wu KKY, Tang SSH, So IWY, Cheng JCY, Yuen EFM, Tsang YM & Hui WL (2011). The Hong Kong Dragonflies. AFCD, Friends of Country Park and Cosmos Books Ltd. Hong Kong. p.367.

freshwater molluscs and aquatic insect larvae) and fishes, in the watercourses were studied by direct observation and active searching, within relevant habitats of the Assessment Area. Organisms were recorded and identified to the lowest possible taxon, and their relative abundance were reported. The location(s) of any freshwater species of conservation importance encountered were recorded, along with notable behaviour. Nomenclature for fish will follow Lee et *al.* (2004) [16], while those for the macro-invertebrates will follow Dudgeon (2003) [17].

10.4.8 Survey Programme

10.4.8.1 A survey programme covering the flora and fauna groups for terrestrial ecological surveys is presented in **Table 10.9**. The ecological surveys were undertaken in the period between July 2022 and December 2022, covering at least a 6-month duration in both dry and wet seasons to collect ecological baseline information within and near the Project as well as the Assessment Area. Transects and sampling points are as presented in **Appendix 10.1**.

Table 10.9 Ecological Survey Programme

Survey	Method	Survey Frequency	Wet Season				Dry Season	
			Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22
Habitat and Vegetation	Day survey by transect	Twice in wet season; Once in dry season	✓		✓		✓	
Terrestrial Mammal	Day and night survey by transect, active search and bat detector	Once per month for 4 months in wet season; Once per month for 2 months in dry season	✓	✓	✓	✓	✓	✓
Bird	Day and night survey by transect	Once per month for 4 months in wet season; Once per month for 2 months in dry season	✓	✓	✓	✓	✓	✓
Herpetofauna	Day and night survey by transect	Once per month for 4 months in wet season; Once per month for 2 months in dry season	✓	✓	✓	✓	✓	✓

[16] Lee LF, Lam KS, Ng KY, Chan KT & Young LC (2004). Field guide to the freshwater fish of Hong Kong. Friends of the Country Parks and Cosmos Books Ltd: Hong Kong.

[17] Dudgeon D (2003). Hong Kong Field Guides: Hillstreams. The Department of Ecology & Biodiversity and the Virtual School of Biodiversity, The University of Hong Kong.

Survey	Method	Survey Frequency	Wet Season				Dry Season	
			Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22
Butterfly and Odonate	Day survey by transect	Once per month for 4 months in wet season; Once per month for 2 months in dry season	✓	✓	✓	✓	✓	✓
Aquatic Fauna	Day survey by direct observation and active search	Once per month for 4 months in wet season; Once in dry season	✓	✓	✓	✓	✓	

10.5 Ecological Baseline Conditions

10.5.1 Habitat and Vegetation

10.5.1.1 There were eight types of terrestrial habitat identified within the Assessment Area, namely mixed woodland, fung shui woodland, plantation, shrubland/grassland, watercourse, reservoir, agricultural land and developed area (Figure 10.6a-c). These habitats within the assessment area are shown in **Table 10.10**. Photographic records of each habitat are presented in **Appendix 10.2**. A total of 303 plant species were recorded during the ecological baseline surveys (**Appendix 10.3**). Thirteen flora species of conservation importance, namely *Aquilaria sinensis*, *Artabotrys hongkongensis*, *Arundina graminifolia*, *Brainea insignis*, *Diospyros vaccinioides*, *Enkianthus quinqueflorus*, *Geodorum densiflorum*, *Gnetum luofuense*, *Nepenthes mirabilis*, *Ormosia emarginata*, *Pavetta hongkongensis*, *Rhododendron simsii*, and *Thysanotus chinensis* were identified in mixed woodland, plantation, shrubland/grassland, watercourse and reservoir during the surveys (**Table 10.11**). The following text elaborates the ecological conditions, flora and fauna recorded at each habitat during the ecological survey.

10.5.1.2 Among these habitats, five terrestrial habitats including mixed woodland, plantation, shrubland/grassland, watercourse and developed area were found within the aboveground works sites/works areas of the Project Area and four terrestrial habitats including mixed woodland, plantation, shrubland/grassland and developed area were found above the underground works sites/works areas of the Project Area. In general, the aboveground Project Area was predominated by developed area.

10.5.1.3 Among these habitats, six terrestrial habitats including mixed woodland, plantation, shrubland/grassland, watercourse, reservoir and developed area were found within the Tai Lam Country Park. Three terrestrial habitats including mixed woodland, shrubland/grassland and watercourse were found above the underground works sites/works areas of the Project Area within the Tai Lam Country Park. None of the aboveground Project Area will be located within the country park.

Table 10.10 Area of Terrestrial Habitats Identified within the Assessment Area

Habitat	Within the Project Area (aboveground)		Within the Project Area (underground)		Within the Proposed Works Area		Within the Magazine Site (Aboveground)		Within the Magazine Site (Underground)		Within the Assessment Area		
	Size (ha)	Length (km)	Size (ha)	Length (km)	Size (ha)	Length (km)	Size (ha)	Length (km)	Size (ha)	Length (km)	Size (ha)	Length (km)	Percentage (%)
Mixed Woodland	~1.9	-	~7.8	-	~0.3	-	-	-	<0.1	-	~263.0	-	~21.4
Fung Shui Woodland	-	-	-	-	-	-	-	-	-	-	~2.6	-	~0.2
Plantation	~3.1	-	~0.9	-	~0.7	-	0.7	-	0.6	-	~94.1	-	~7.7
Shrubland/ Grassland	~0.9	-	~8.4	-	-	-	0.1	-	-	-	~389.7	-	~31.7
Watercourse	~0.1	~0.3	<0.1	~1.0	-	-	-	-	-	-	~17.3	~33.4	~1.4
Reservoir	-	-	-	-	-	-	-	-	-	-	~1.6	-	~0.1
Agricultural Land	-	-	-	-	-	-	-	-	-	-	~7.6	-	~0.6
Developed Area	~11.8	-	~2.9	-	8.9	-	1.9	-	<0.1	-	~451.9	-	~36.8
Total	17.8	0.3	20.0	1.0	9.9	<0.1	2.7	-	0.6	-	1244.9	33.4	100%

10.5.2 Mixed Woodland

10.5.2.1 Patches of mixed woodland were recorded within the Assessment Area, mainly developed from plantation through natural succession. Mainly located in Tai Lam Country Park, Lam Tei Irrigation Reservoir, Hung Shui Hang Reservoir, So Kwun Wat, Sam Shing Hui, Shek Kok Tsui and Pillar Point (**Figures 10.5,** Figure 10.5a-c). The total area of this habitat is approximately 263.0 ha and accounts for 21.4% of the overall Assessment Area. Due to the vicinity to village houses and main roads, woodlands at Sam Shing Hui along Tuen Mun Road and Shek Kok Tsui along Lung Fu Road receive a relatively higher level of disturbance, especially on their fringes. While woodland patches connecting shrubland habitat within the Tai Lam Country Park are more mature.

10.5.2.2 This habitat has a sparse canopy, with tree heights ranging from 2 m to 12 m depending on the local topography and the canopy species. Dominant tree species within this habitat are mainly mature exotic species commonly planted in past afforestation schemes, including *Acacia auriculiformis*, *Acacia confusa*, *Lophostemon confertus*, *Pinus elliottii*, and *Pinus massoniana*, with occasional self-colonised native tree species such as *Aporosa dioica*, *Castanopsis fissa* and *Celtis sinensis*. The mid-storey of this habitat mainly consist of native tree and shrub species (e.g., *Cratoxylum cochinchinense*, *Ilex asprella* and *Microcos nervosa*) and the understory occupied by shrubs and climbers including *Desmos chinensis*, *Phyllanthus cochinchinensis* and *Zanthoxylum nitidum*, it is also occupied by common herbs such as *Dianella ensifolia*, *Liriope spicata*, and *Pteris semipinnata*.

10.5.2.3 A total of 135 plant species were recorded in this habitat. Six flora species of conservation importance were recorded including *Aquilaria sinensis*, *Artabotrys hongkongensis*, *Diospyros vaccinioides, Enkianthus quinqueflorus , Geodorum densiflorum* and *Gnetum luofuense*. Their protection and/or conservation status are presented in **Table 10.11**.

10.5.2.4 The total area of mixed woodland within the Project Area (including underground and aboveground) is approximately 10 ha while only small patches of mixed woodland (2.2 ha) fall within the aboveground project area at Lam Tei Quarry Site, Wah Fat Playground,

Pillar Point (next to TM-CLKT) and So Kwun Wat, in which the vegetation composition was largely related to the connected mixed woodland. Two flora species of conservation importance, *Diospyros vaccinioides* and *Gnetum luofuense*, were recorded near Pillar Point and near Wah Fat Playground, respectively, within the Project Area (aboveground).

10.5.3 Fung Shui Woodland

10.5.3.1 Three patches of fung shui woodland was recorded near Tin Hau Temple and Ching Uk Tsuen (with eastern and western patches) within the Assessment Area. Mainly located next to So Kwun Wat San Tsuen (**Figure 10.5b**). The total area of this habitat is approximately 2.6 ha and accounts for 0.2% of the overall Assessment Area. Due to the vicinity to village houses, disturbance due to anthropogenic activities were observed.

10.5.3.2 Tin Hau Temple Fung Shui Wood – A fung shui wood stand with closed canopy and conspicuous layer stratification is present at the immediate east of Tin Hau Temple in So Kwun Wat Tsuen Road. It was largely dominated by *Ixonanthes reticulata* reaching as tall as 20 metres and other common tree species in Hong Kong, while the understorey was densely recruited with native tree, shrub and climber species also commonly found in other lowland woodlands in Hong Kong, including the mixed woodlands within the assessment area.

10.5.3.3 Ching Uk Tsuen Fung Shui Wood – Notably, the canopy of the fung shui wood adjacent to So Kwun Wat San Tsuen was dominated by *Ixonanthes reticulata* and other lowland secondary woodland dominants, such as *Aporusa dioica*. Shade-tolerant *Psychotria asiatica* was abundantly found in the understorey. Fruit tree species, such as *Artocarpus heterophyllus* and *Litchi chinensis*, were also abundantly found. Most of the plant species recorded within Ching Uk Tsuen Fung Shui Wood can also be found in other mixed woodlands within the assessment area.

10.5.3.4 Three flora species of conservation importance were recorded including *Ixonanthes reticulata*, *Ormosia emarginata* and *Pavetta hongkongensis*. Their protection and/or conservation status are presented in **Table 10.11**.

10.5.4 Plantation

10.5.4.1 Plantations mainly refer to areas planted with tree and shrub species for landscaping purposes. The total area of plantation is approximately 94.1 ha and accounts for 7.7 % of the overall Assessment Area. Exotic landscaping species were commonly recorded including *Acacia confusa*, *Casuarina equisetifolia*, *Lophostemon confertus* and *Pinus elliotti*.

10.5.4.2 A total of 29 plant species were recorded in this habitat. One flora species of conservation importance was recorded within this habitat, namely *Gnetum luofuense*. Their protection and/or conservation status are presented in **Table 10.11**.

10.5.4.3 The total area of plantation within the Project Area (including underground and aboveground components) is approximately 6.1 ha while some patches of plantation (3.1 ha) fall within the Project Area (aboveground) at Lam Tei Quarry Site, So Kwun Wat, Wah Fat Playground, Pillar Point (next to TM-CLKT), aboveground road works along Lung Mun Road, So Kwun Wat and Siu Lang Shui, in which the vegetation composition was largely related to the connected mixed woodland. The flora diversity and abundance

of this habitat is generally low with limited vegetation and trees that were occasionally planted for landscaping purpose. No flora species of conservation importance was recorded within the Project Area (aboveground).

10.5.5 Shrubland/Grassland

10.5.5.1 The total area of shrubland/grassland is approximately 389.7 ha and accounts for 31.7% of the overall Assessment Area. This habitat within Assessment Area mainly recorded on hilltops and hillsides, usually adjacent to woodland. The ecological condition and species composition of shrubland/grassland are generally homogenous in nature, including those located along the hillsides of Tai Lam Country Park.

10.5.5.2 This habitat consists of a mix of grassland and shrubland with plant heights usually being under 2m. Dominant shrub species include native species such as *Baeckea frutescens*, *Dianella ensifolia*, and *Litsea rotundifolia var. oblongifolia*, while some of the most abundant climbers, *Hypserpa nitidia* and *Mussaenda pubescens* were recorded. *Polyspora axillaris* is a dominant tree species within the habitat, while occasional tree species such as *Adinandra milletti*, *Microcos nervosa*, *Litsea glutinosa* and *Schefflerra heptaphylla* are also sparsely distributed within the habitat. The dominant fern species covering hillside shrubland and grassland areas is *Dicranopteris pedata*.

10.5.5.3 A total of 98 plant species were recorded in this habitat. Seven flora species of conservation importance were recorded including *Brainea insignis*, *Diospyros vaccinioides*, *Gnetum luofuense*, *Nepenthes mirabilis*, *Ormosia emarginata*, *Ormosia semicastrata* and *Thysanotus chinensis*. Their protection and/or conservation status are presented in **Table 10.11**.

10.5.5.4 The total area of shrubland/grassland within the Project Area (including underground and aboveground) is approximately 9.4 ha while only small patches of shrubland/grassland (0.9 ha) fall within the Project Area (aboveground) at Lam Tei Quarry Site and Pillar Point (next to TM-CLKT), in which the vegetation composition was largely related to the connected shrubland/grassland. No flora species of conservation importance was recorded within the Project Area (aboveground).

10.5.6 Watercourse

10.5.6.1 Watercourses ranged from natural to semi-natural and totally channelized within the Assessment Area. The total length of watercourse is approximately 33.4 km.

Natural Watercourse

10.5.6.2 Multiple natural watercourses were recorded along the hillsides of Tai Lam Country Park, Castle Peak, Pillar Point and Siu Lang Shui. The stream beds of natural watercourses varies from boulders, cobbles and gravel substrate. The flora composition of these watercourses are more diverse compared to channelized and semi-natural watercourses. Commonly recorded species such as *Eriocaulon* sp., *Lepidosperma chinense*, *Pteris 18ampanu* and *Neyraudia reynaudiana* predominate the banks of these watercourses, occasional shrub and tree species are sparsely distributed along the banks including *Ficus pyriformis*, *Ilex memecylifolia* and *Litsea monopetala*.

10.5.6.3 Two flora species of conservation importance were recorded in natural watercourses,

namely *Arundina graminifolia* and *Nepenthes mirabilis*. Their protection and/or conservation status are presented in **Table 10.11**.

Semi-natural Watercourse

10.5.6.4 Semi-natural watercourses mainly refer to watercourses with sections of it modified while retaining a relatively natural stream bed and stream bank. Multiple semi-natural watercourse were recorded within the Assessment Area, They were recorded along foothills of Tai Lam Country Park and Pillar Point. The flora composition of these watercourses largely relate to the habitat types in their immediate surrounding environment. Commonly recorded species such as *Alocasia macrorrhizos*, *Dicranopteris ampan*, *Mikania micranta* and *Pteris ampanu* predominate the banks of these watercourses.

10.5.6.5 One flora species of conservation importance was recorded in semi-natural watercourses, namely *Nepenthes mirabilis*. Their protection and/or conservation status are presented in **Table 10.11**.

10.5.6.6 The total length of watercourses within the Project Area (including underground and aboveground components) is ~1.3 km while some watercourse sections (~0.3 km) fall within the Project Area (aboveground) at Lam Tei Quarry Site, Wah Fat Playground and Pillar Point (next to TM-CLKT).

10.5.6.7 For the semi-natural watercourse located within the Project Area near Lam Tei Quarry (hereafter refer to as S1) (i.e ~ 140 m), it is considered a seasonal stream with limited waterflow and moderate level of disturbance due to its close vicinity to the quarry site. The streambed of S1 is naturally cobbled with mostly sandy substrate. The banks were observed to be overgrown and covered by *Alocasia macrorrhizos*, *Mikania micranta* and *Thysanolaena latifolia*.

10.5.6.8 For the semi-natural watercourse located within the Project Area near Wah Fat Playground (hereafter refer to as S2) (i.e. ~ 70 m), it is considered as a seasonal stream and with a small pool (~3m x 2m) found at the mid-stream with the bed covered by muddy substrate and leaf litter, surrounded by chunks of concrete. Apart from stagnant water was observed in the small pool, S2 was observed to be dried out throughout the whole survey period. The lower section of that stream which locate outside the Project Area was observed with continuous low water flow feeding from another watercourse outside the Project Area (hereafter refer to as S2A). Common species such as *Alocasia macrorrhizos*, *Lepidosperma chinense* and *Pteris vittata* were recorded along the bank of these watercourses.

10.5.6.9 For the watercourse located within the Project Area near Pillar Point (next to TM-CLKT) (hereafter refer to as S3) (i.e. ~ 150 m), it is considered as a seasonal stream and with limited waterflow. The lower section of S3 was observed to be completely channelized with limited vegetation. The upper section is semi-natural with a cobbled streambed and with sandy and gravel substrate. Common species such as *Dicranopteris pedata* and *Pteris vittata* were recorded along the bank of S3.

10.5.6.10 No flora species of conservation importance was recorded in this habitat within the Project Area (aboveground).

Channelized Watercourse

10.5.6.11 Channelized watercourses within the Assessment Area include the Tuen Mun River Channel, watercourse along Fu Tei Ha Tsuen, So Kwun Wat San Tsuen, the foothills of Castle Peak and Tai Lam Country Park. They are usually located within close vicinity to developed areas and are completely modified with concrete stream bank and stream bed. Vegetation is limited except for herb species such as *Bidens alba*, *Cypreus sp.*, *Pteirs vittata* and *Wedelia trilobata* which are mostly sparsely distributed, though they were also recorded to dominate certain sections of the channelized watercourse such as the one along So Kwun Wat San Tsuen.

10.5.6.12 One flora species of conservation importance was recorded in channelized watercourses, namely *Ceratopteris thalictroides*. Their protection and/or conservation status are presented in **Table 10.11**.

10.5.7 Reservoir

10.5.7.1 Two reservoirs were found within the Assessment Area which include Lam Tei Irrigation Reservoir and Hung Shui Hang Irrigation Reservoir. The total area of reservoir is approximately 1.6 ha and accounts for 0.1 % of the overall Assessment Area. Plants are mainly recorded along the edge of the reservoir. Commonly recorded species include planted tree species such as *Lophostemon confertus* and *Melaleuca cajuputi* subsp. *cumingiana* as well as native herb species such as *Lepidosperma chinense* and *Neyraudia reynaudiana*.

10.5.7.2 A total of 14 plant species were recorded in this habitat. One flora species of conservation importance was recorded within this habitat, namely *Nepenthes mirabilis*. Their protection and/or conservation status are presented in **Table 10.11**.

10.5.8 Agricultural Land

10.5.8.1 Agricultural land mainly refers to wet and dry fields that villagers use to plant crops and small orchards for agricultural purposes. The total area of agricultural land is approximately 7.6 ha and accounts for 0.6% of the overall Assessment Area. Species recorded are mainly crop and orchard species such as *Artocarpus heterophyllus*, *Carica papaya*, *Citrus* sp., *Curcuma* sp., *Dicliptera chinensis*, *Hibiscus sabdariffa*, *Latuca sativa* and *Spinnacia oleracea*.

10.5.8.2 A total of 22 plant species were recorded in this habitat. No flora species of conservation importance were recorded within the Assessment Area.

10.5.9 Developed Area

10.5.9.1 Developed area within the Assessment Area refers to large-scaled public facilities, infrastructure, areas occupied by village houses (e.g. Fu Tei Ha Tsuen and So Kwun Wat San Tsuen), orchard and urban development such as various buildings, main roads, car parks, paved roads, buildings, construction sites, artificial ponds made for recreational purpose and sitting out areas. The total area of developed area is approximately 451.9 ha and accounts for 36.8% of the overall Assessment Area. Plants recorded in this habitat were mainly ornamental species for roadside planting and within landscaping areas. Exotic landscaping tree and shrub species such as *Acacia confusa*, *Albizia lebbeck*,

Calliandra haematocephala, *Chukrasia tabularis* and *Spathodea campanulata* dominated this habitat. Other self-colonised ruderal species include *Bidens alba*, *Leucaena leucocephala* and *Mikania micrantha*.

10.5.9.2 A total of 129 plant species were recorded in this habitat. No flora species of conservation concern was recorded within this habitat.

10.5.9.3 The total area of developed area within the Project Area (including underground and aboveground components) is approximately 25.5 ha while approximately 11.8 ha of the Project Area (aboveground) fall within developed area, mainly located at Lam Tei Quarry Site, So Kwun Wat, Wah Fat Playground, Sam Shing Hui, Pillar Point, aboveground road works along Lung Mun Road and Siu Lang Shui. The flora diversity and abundance of this habitat is generally low with limited vegetation and trees that were occasionally planted for landscaping purpose. No flora species of conservation importance was recorded within the Project Area (aboveground).

Table 10.11 Flora of Conservation Importance Recorded within the Assessment Area

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Flora					
Incense Tree	*Aquilaria sinensis*	土沉香	Protected under Cap. 586, Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Near Threatened" status in China and under State protection (Category II) in China, listed as "Vulnerable" in China Plant Red Data Book, included in Illustrations of Rare & Endangered Plant in Guangdong Province, TSLCHP: VU, IUCN: VU, CITES(II)	Mixed Woodland	-

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Hong Kong Eagle's Claw	*Artabotrys hongkongensis*	香港鷹爪花	Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Least Concern" status in China	Mixed Woodland	-
Bamboo Orchid	*Arundina graminifolia*	竹葉蘭	Protected under Cap. 96A, Cap. 586	Watercourse	-
Cycad-fern	*Brainea insignis*	蘇鐵蕨	Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China and under State protection (Category II) in China, TSLCHP: VU, CITES(II)	Shrubland/Grassland	-
Water Fern	*Ceratopteris thalictroides*	水蕨	Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China and under State protection (Category II) in China	Watercourse	-
Small Persimmon	*Diospyros vaccinioides*	小果柿	TSLCHP: EN, IUCN: CR	Mixed Woodland, Shrubland/Grassland	✓ (1 individual recorded in mixed woodland within Project Area at southern portal)
Chinese New	*Enkianthus*	吊鐘花	Protected under Cap.	Mixed	-

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Year Flower	*quinqueflorus*		96A	Woodland	
Dense-flowered Geodorum	*Geodorum densiflorum*	地寶蘭	Protected under Cap. 96A, Cap. 586, CITES(II)	Mixed Woodland	-
Luofushan Joint-fir	*Gnetum luofuense*	羅浮買麻藤	IUCN: NT	Mixed Woodland, Shrubland/Grassland, Plantation	✓ (a small patch recorded in mixed woodland within Project Area near Wah Fat Playground)
Ixonanthes	*Ixonanthes reticulata*	黏木	Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China, TSLCHP: VU, IUCN: VU	Fung Shui Woodland	-
Pitcher Plant	*Nepenthes mirabilis*	豬籠草	Protected under Cap. 96A, Cap. 586, Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China, TSLCHP: VU, CITES(II)	Shrubland/Grassland, Watercourse, Reservoir	-
Emarginate-leaved Ormosia	*Ormosia emarginata*	凹葉紅豆	Under State protection (Category II) in China	Fung Shui Woodland, Shrubland/Grassland	-
Soft-fruited Ormosia	*Ormosia semicastrata*	軟莢紅豆	Under State protection (Category II) in China	Shrubland/Grassland	-

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Hong Kong Pavetta	*Pavetta hongkongensis*	香港大沙葉	Protected under Cap. 96A	Fung Shui Woodland	-
Red Azalea	*Rhododendron simsii*	紅杜鵑	Protected under Cap. 96A	Shrubland/Grassland	-
Chinese Frienge Lily	*Thysanotus chinensis*	異蕊草	Listed as "Rare" status in Corlett *et. al.* (2000)	Shrubland/Grassland, Plantation	-

Notes:
Conservation Status:

a. Cap. 96A : Forestry Regulations, the subsidiary legislation of Forests and Countryside Ordinance
b. Cap. 586 : Protection of Endangered Species of Animals and Plants Ordinance
c. Corlett *et al*. (2000). Hong Kong vascular plants: distribution and status.
d. Xing, F.W., Ng, S.C., Chau, L.K.C. 2000. Gymnosperms and angiosperms of Hong Kong. Memoirs of the Hong Kong Natural History Society 23 : 21-136.
e. AFCD (2003) Rare and Precious Plants of Hong Kong. Agriculture, Fisheries and Conservation Department, HKSAR, Hong Kong.
f. TSLCHP – Threatened Species List of China's Higher Plants (2017). VU = Vulnerable, EN = Endangered
g. IUCN – International Union for Conservation of Nature Red List of Threatened Species (2022). NT = Near Threatened, CR = Critically Endangered
h. CITES – Under Appendix (I), Appendix (II) or Appendix (III) of Convention on International Trade in Endangered Species of Wild Flora and Fauna

10.5.10 Terrestrial Fauna

10.5.10.1 Wildlife recorded during the ecological surveys described in **Section 10.3** are presented below. The photos of the recorded species of conservation importance are presented in **Appendix 10.4**. Full list of fauna species recorded during the ecological surveys for the Project are presented in **Appendix 10.5 – Appendix 10.11**. The locations of species of conservation importance in the Assessment Area are shown in **Figure 10.5** and Figure 10.5a–c.

10.5.11 Terrestrial Mammals

10.5.11.1 Ten mammal species were recorded within the Assessment Area (**Appendix 10.5**) during the survey period, in which a total of eight mammal species of conservation importance were recorded, including Chinese Noctule, Japanese Pipistrelle, Chinese Pipistrelle, *Myotis* sp., Unidentified Bat, Pallas's Squirrel, Masked Palm Civet and Red Muntjac. Their protection and/or conservation status are presented in **Table 10.12**. Among the recorded terrestrial mammal species the echolocation calls of a Japanese Pipistrelle was recorded in developed area within the proposed Pillar Point Magazine Site.

Table 10.12 Terrestrial Mammals of Conservation Importance Recorded within the Assessment Area

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Terrestrial Mammals					
Chinese Noctule	*Nyctalus plancyi*	中華山蝠	Cap.170, Fellowes: PRC (RC)	Mixed Woodland, Developed Area	-
Japanese Pipistrelle	*Pipistrellus abramus*	東亞家蝠	Cap.170	Mixed Woodland, Shrubland/Grassland	✓ (1 individual recorded in developed area within Pillar Point Magazine Site)
Least Pipistrelle	*Pipistrellus tenuis*	小伏翼	Cap.170, RLCV(NT)	Developed Area	-
Chinese Pipistrelle	*Hypsugo pulveratus*	灰伏翼	Cap.170, Fellowes: (LC)	Developed Area	-
-	*Myotis* sp.	鼠耳蝠屬	Cap.170	Mixed Woodland	-
Unidentified Bat	-	-	Cap.170	Mixed Woodland, Plantation	-
Pallas's Squirrel	*Callosciurus erythraeus*	赤腹松鼠	Cap.170	Plantation	-
Masked Palm Civet	*Paguma larvata*	果子狸	Cap.170, Cap.586, Fellowes: PRC, CITES(III)	Mixed Woodland	-
Red Muntjac	*Muntiacus muntjak*	赤麂	Fellowes: PRC, RLCV(NT)	Shrubland/Grassland	-

Notes:
Conservation Status:

a. Cap. 170 : Protected under Wild Animals Protection Ordinance
b. Fellowes – Fellowes et al. (2002) : PRC = Potential Regional Concern, RC = Regional Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
c. RLCV – Red List of China's Vertebrate (2016) : NT = Near Threatened

10.5.12 Avifauna

10.5.12.1 Forty-eight avifauna species were recorded within the Assessment Area (**Appendix 10.6**)

during the survey period. A total of sixteen avifauna species are of conservation importance including Black-crowned Night Heron, Great Egret, Little Egret, Pacific Reef Heron, Crested Serpent Eagle, Black Kite, Eastern Buzzard, Greater Coucal, Collared Scops Owl, Brown Fish Owl, Grey Nightjar, White-throated Kingfisher, Rufous-capped Babbler, Black-throated Laughingthrush, Indochinese Yuhina and Siberian Blue Robin. Their protection and/or conservation status are presented in **Table 10.13**. Among the recorded avifauna species one Siberian Blue Robin was recorded in plantation within the proposed Siu Lam Magazine Site.

Table 10.13 Avifauna of Conservation Importance Recorded within the Assessment Area

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Avifauna					
Black-crowned Night Heron	*Nycticorax nycticorax*	夜鷺	Fellowes: (LC)	Watercourse, Sea Water	-
Great Egret	*Ardea alba*	大白鷺	Fellowes: PRC (RC)	Sea Water	-
Little Egret	*Egretta garzetta*	小白鷺	Fellowes: PRC (RC)	Sea Water	-
Pacific Reef Heron	*Egretta sacra*	岩鷺	Fellowes: (LC), CSMPS (II), CRDB: Rare	Sea Water	-
Crested Serpent Eagle	*Spilornis cheela*	蛇鵰	Cap. 586, Fellowes: (LC), CSMPS (II), RLCV (NT), CRDB: VU, CITES (II)	Shrubland/Grassland	-
Black Kite	*Milvus migrans*	黑鳶	Cap. 586, Fellowes: (RC), CSMPS (II), CITES (II)	Mixed Woodland, Plantation, Shrubland/Grassland	-
Eastern Buzzard	*Buteo japonicus*	普通鵟	Cap. 586, CSMPS (II), CITES(II)	Shrubland/Grassland	-
Greater Coucal	*Centropus sinicus*	褐翅鴉鵑	CSMPS(II)	Shrubland/Grassland	-
Collared Scops Owl	*Otus lettia*	領角鴞	Cap. 586, CSMPS (II), CITES(II)	Shrubland/Grassland	-
Brown Fish Owl	*Ketupa zeylonensis*	褐漁鴞	Cap. 586, Fellowes: RC, CSMPS (II), RLCV(EN), CITES (II)	Developed Area	-
Grey Nightjar	*Caprimulgus jotaka*	普通夜鷹	Fellowes: LC	Mixed Woodland	-
White-throated	*Halcyon*	白胸翡翠	Fellowes: (LC)	Shrubland/Grassland,	-

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Kingfisher	*smyrnensis*			Reservoir	
Rufous-capped Babbler	*Stachyridopsis ruficeps*	紅頭穗鶥	Fellowes: LC	Mixed Woodland	-
Black-throated Laughingthrush	*Pterorhinus chinensis*	黑喉噪鶥	Class 2 Protected Animal of China	Mixed Woodland, Plantation, Shrubland/Grassland	-
Indochinese Yuhina	*Yuhina torqueola*	栗耳鳳鶥	Fellowes: (LC)	Plantation	-
Siberian Blue Robin	*Larvivora cyane*	藍歌鴝	Fellowes: LC	Plantation	✓ (1 individual recorded in plantation within Siu Lam Magazine Site)

Notes:
Conservation Status:

a. All birds in Hong Kong are protected under Cap. 170 – Protected under Wild Animals Protection Ordinance
b. Cap. 586 : Protection of Endangered Species of Animals and Plants Ordinance
c. Fellowes – Fellowes et al. (2002) : LC = Local Concern, PRC = Potential Regional Concern, RC = Regional Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
d. CSMPS– China State Major Protection Status : Appendix (I) or Appendix (II)
e. RLCV – Red List of China's Vertebrate (2016) : NT = Near Threatened, EN : Endangered
f. CRDB – China Red Data Book (1998) : VU = Vulnerable
g. State Forestry Administration & Ministry of Agriculture (1989). List of Wild Animals under State Protection.
h. CITES – Under Appendix (I), Appendix (II) or Appendix (III) of Convention on International Trade in Endangered Species of Wild Flora and Fauna

10.5.13 Herpetofauna

10.5.13.1 Twenty-one herpetofauna species were recorded within the Assessment Area (**Appendix 10.7** and **Appendix 10.8**) during the survey period, including nine reptile species and eleven amphibian species. A total of three amphibian species and five reptile species are of conservation importance including Hong Kong Cascade Frog, Chinese Bullfrog, Lesser Spiny Frog, Indian Forest Skink, Copperhead Racer, Common Wolf Snake, Common Rat Snake and Many-banded Krait. Their protection and/or conservation status are presented in **Table 10.14**. None of them were recorded within the Project Area (aboveground).

Table 10.14 Herpteofauna of Conservation Importance Recorded within the Assessment Area

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within Project Area
Amphibian					
Hong Kong Cascade Frog	*Amolops hongkongensis*	香港湍蛙	Cap.170, Fellowes: PGC, RLCV(EN), IUCN(EN)	Watercourse	-
Chinese Bullfrog	*Hoplobatrachus rugulosus*	虎紋蛙	Fellowes: PRC, CSMPS(II), RLCV(EN)	Watercourse	-
Lesser Spiny Frog	*Quasipaa exilispinosa*	小棘蛙	Fellowes: PGC, RLCV(VU), IUCN(VU)	Watercourse	-
Reptile					
Indian Forest Skink	*Sphenomorphus indicus*	銅蜓蜥	Fellowes: LC	Mixed Woodland	-
Copperhead Racer	*Coelognathus radiatus*	三索錦蛇	Fellowes: PRC, RLCV(EN), CRDB: EN	Watercourse	-
Common Wolf Snake	*Lycodon aulicus*	白環蛇	RLCV(NT)	Mixed Woodland	-
Common Rat Snake	*Ptyas mucosus*	滑鼠蛇	Cap.586, Fellowes: PRC, RLCV(EN), CRDB: EN, CITES(II)	Watercourse	-
Many-banded Krait	*Bungarus multicinctus*	銀環蛇	Fellowes: PRC, RLCV(EN), CRDB: VU	Mixed Woodland	-

Notes:
Conservation Status:

a. Cap. 170 : Protected under Wild Animals Protection Ordinance
b. Cap. 586 : Protection of Endangered Species of Animals and Plants Ordinance
c. Fellowes – Fellowes et al. (2002) : PRC = Potential Regional Concern, PGC = Potential Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
d. CSMPS– China State Major Protection Status : Appendix (I) or Appendix (II)
e. RLCV – Red List of China's Vertebrate (2016) : NT = Near Threatened, VU = Vulnerable, EN : Endangered
f. CRDB – China Red Data Book (1998) : VU = Vulnerable, EN : Endangered
g. CITES – Under Appendix (I), Appendix (II) or Appendix (III) of Convention on International Trade in Endangered Species of Wild Flora and Fauna

10.5.14 Butterfly and Odonate

10.5.14.1 Fifty-three butterfly species and nineteen odonate species were recorded within the Assessment Area (**Appendix 10.9** and **Appendix 10.10**) during the survey period. A total of five butterfly species are of conservation importance including Metallic Cerulean, Malayan, Danaid Egg-fly, Swallowtail and Small Cabbage White. A total of four odonate species of conservation importance were recorded including Dancing Shadow-emerald, Emerald Cascader, Scarlet Basker and Dingy Dusk-hawker. Their protection and/or conservation status are presented in **Table 10.15**. Among the recorded butterfly and odonate species one Scarlet Basker was recorded in developed area within the proposed Siu Lam Magazine Site..

Table 10.15 Butterfly and Odonate of Conservation Importance Recorded within the Assessment Area

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Distribution in Hong Kong[1]	Recorded Habitat	Presence within Project Area
Butterfly						
Metallic Cerulean	*Jamides alecto*	素雅灰蝶	-	Very Rare	Plantation	-
Malayan	*Megisba malaya*	美姬灰蝶	Fellowes: LC	Very Rare, Species of Conservation Concern	Mixed Woodland	-
Danaid Egg-fly	*Hypolimnas misippus*	金斑蛱蝶	Fellowes: LC	Uncommon	Shrubland/ Grassland, Developed Area	-
Swallowtail	*Papilio xuthus*	柑橘鳳蝶	-	Rare	Mixed Woodland, Shrubland/ Grassland	-
Small Cabbage White	*Pieris rapae*	菜粉蝶	-	Rare	Developed Area	-
Odonate						
Dancing Shadow-emerald	*Idionyx victor*	威異偽蜻	Fellowes: LC	-	Developed Area	-
Dingy Dusk-hawker	*Gynacantha subinterrupta*	細腰長尾蜓	Fellowes: LC	-	Fung Shui Woodland	-
Scarlet Basker	*Urothemis signata*	赤斑曲鈎脈蜻	Fellowes: LC	-	Developed Area	✓ (1 individual recorded in developed area within Siu Lam Magazine

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Distribution in Hong Kong[1]	Recorded Habitat	Presence within Project Area
Butterfly						
						Site)
Emerald Cascader	*Zygonyx iris*	彩虹蜻	Fellowes: PGC	-	Watercourse	-

Notes:

1. Distribution in Hong Kong refers to AFCD database: Available at Chan, A., Cheung, J., Sze, P., Wong, A., Wong, E. and Yau, E. 2011. A Review of the Local Restrictedness of Hong Kong Butterflies. Hong Kong Biodiversity 21: 1-12

Conservation Status:

a. Fellowes et al. (2002): LC = Local Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.

10.5.15 Aquatic Fauna

10.5.15.1 Seven freshwater fish species and twenty-five freshwater invertebrate species were recorded within the Assessment Area (**Appendix 10.11**) during the survey period. A total of four freshwater invertebrate species are of conservation importance including *Zygonyx iris* (nymph), *Cryptopotamon anacoluthon*, *Nanhaipotamon hongkongense* and *Somanniathelphusa zanklon*. Predaceous Chub is the only freshwater fish species of conservation importance recorded. Their protection and/or conservation status are presented in **Table 10.16**. Among the recorded three freshwater crab species, ~5 individuals of *Somanniathelphusa zanklon* were recorded in the small pool located at the middle section of the seasonal watercourse within the Project Area (aboveground) near Wah Fat Playground (S2). At lower section of S2A which locate outside the Project Area (aboveground), all the three freshwater crab species including *Cryptopotamon anacoluthon*, *Nanhaipotamon hongkongense* and *Somanniathelphusa zanklon* were recorded.

Table 10.16 Aquatic Fauna of Conservation Importance Recorded within the Assessment Area

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within or near the Project Area
Freshwater Vertebrate					
Predaceous Chub	*Parazacco spilurus*	異鱲	CRDB: VU	Watercourse connected to Lam Tei Irrigation Reservoir	-
Freshwater Invertebrate					
Emerald Cascader	*Zygonyx iris*	彩虹蜻	Fellowes: PGC	Nymphs were observed within watercourse in Tai Lam Country Park	-

Common Name	Scientific Name	Chinese Name	Protection/ Conservation Status	Recorded Habitat	Presence within or near the Project Area
Freshwater Crab	*Cryptopotamon anacoluthon*	鰓刺溪蟹	Fellowes: PGC, IUCN(VU)	Watercourse within Tai Lam Country Park and S2A	~10 individuals recorded close to the Project Area (aboveground) near Wah Fat Playground
Freshwater Crab	*Nanhaipotamon hongkongense*	香港南海溪蟹	Fellowes: PGC	Watercourse within Tai Lam Country Park and S2A	~1 individual recorded close to the Project Area (aboveground) near Wah Fat Playground
Freshwater Crab	*Somanniathelphusa zanklon*	鐮刀束腰蟹	Fellowes: GC, IUCN(EN)	Watercourse S2 & S2A	✓ (~5 individuals recorded in a small pool at the middle of the seasonal watercourse within Project Area (aboveground) near Wah Fat Playground)

Notes:
Conservation Status:

a. Fellowes – Fellowes et al. (2002) : PGC = Potential Global Concern, GC = Global Concern. Letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
b. CRDB – China Red Data Book (1998) : VU = Vulnerable
c. IUCN – International Union for Conservation of Nature Red List of Threatened Species (2022). VU = Vulnerable, EN : Endangered

10.6 Evaluation of Habitats and Species

10.6.1.1 The ecological importance evaluation of each terrestrial habitat type within the Assessment Area is presented in **Table 10.17 – Table 10.24**. The species of conservation importance identified within the Assessment Area during the surveys are evaluated in **Table 10.25**, in accordance with Annex 8 of EIAO-TM. The locations of these species of conservation importance, whenever available, are presented in Figure 10.5a – c.

Table 10.17 Evaluation of Mixed Woodland within the Assessment Area

Criteria	Mixed Woodland
Naturalness	Semi-natural habitat, with extensive coverage of planted species for afforestation purposes as well as self-colonised native tree species
Size	Approx. 263 ha within the Assessment Area

Criteria	Mixed Woodland
Diversity	Moderate diversity of plant species and structural complexity Low to moderate diversity of fauna species.
Rarity	Six flora species of conservation interest *Aquilaria sinensis*, *Artabotrys hongkongensis*, *Diospyros vaccinioides*, *Enkianthus quinqueflorus*, *Geodorum densiflorum* and *Gnetum luofuense* Fauna species of conservation importance recorded during the surveys include: Mammal – Chinese Noctule, Japanese Pipistrelle, *Myotis* sp, Unidentified Bat, Masked Palm Civet Avifauna – Black Kite, Grey Nightjar, Rufous-capped Babbler, Black-throated Laughingthrush Herpetofauna – Indian Forest Skink, Common Wolf Snake, Many-banded Krait Butterfly – Malayan, Swallowtail
Re-creatability	It takes approximately 15 years for a young mixed woodland to be developed
Fragmentation	Slightly fragmented, Mixed woodland belts are observed within Tai Lam Country Park and at the foothills of Castle Peak
Ecological Linkage	Functionally links to the shrubland/grassland mosaic and watercourse in close proximity
Potential Value	Moderate potential value to become a more mature woodland if given sufficient time and protection from disturbances such as hill fires
Nursery/ Breeding Ground	No significant nursery or breeding ground recorded
Age	Ranging from 15 years to 30 years
Abundance/ Richness of Wildlife	Low to moderate for avifauna and butterfly and low for rest of fauna groups
Overall Ecological Value	**Moderate** for more mature woodland within Tai Lam Country Park **Low to Moderate** for other woodlands close to developed area at Lam Tei Quarry, Wah Fat Playground, Shek Kok Tsui and Pillar Point

Table 10.18 Evaluation of Fung Shui Woodland within the Assessment Area

Criteria	Fung Shui Woodland
Naturalness	Semi-natural, comprising fruit tree species likely cultivated by villagers nearby, naturally recruited plant species
Size	Approx. 2.6 ha within the Assessment Area
Diversity	Low to medium floral diversity and low faunal diversity
Rarity	Three flora species of conservation importance were recorded during the ecological surveys: *Ixonanthes reticulata*, *Ormosia emarginata* and *Pavetta hongkongensis* Fauna species of conservation importance recorded during the surveys include: Odonta – Dingy Dusk-hawker
Re-creatability	Re-creatable, if given several decades of absence of both natural and artificial disturbance (e.g. hill fires)

Criteria	Fung Shui Woodland
Fragmentation	Slightly fragmented, split in between by plantation, watercourse, agricultural land and developed area
Ecological Linkage	Functionally links to the mixed woodland, plantation, shrubland/grassland mosaic and watercourse in close proximity
Potential Value	Moderate to high, as they have remained largely undisturbed over the last 70 years and the canopy dominants have reached their mature size
Nursery/ Breeding Ground	No significant nursery or breeding ground observed
Age	At least 70 years of age
Abundance/ Richness of Wildlife	Low abundance of different groups of terrestrial fauna
Overall Ecological Value	**Moderate to High**

Table 10.19 Evaluation of Plantation within the Assessment Area

Criteria	Plantation
Naturalness	Man-made habitat with intensive human disturbances
Size	Approx. 94.1 ha within the Assessment Area
Diversity	Low floral diversity and structure complexity Low diversity of terrestrial fauna species
Rarity	One flora species of conservation importance, namely *Gnetum luofuense* was recorded during the surveys. Fauna species of conservation importance recorded during the surveys include: Mammal – Unidentified Bat, Pallas's Squirrel Avifauna – Black Kite, Black-throated Laughingthrush, Indochinese Yuhina, Siberian Blue Robin Butterfly – Metallic Cerulean
Re-creatability	Readily re-creatable
Fragmentation	Fragmented and scattered within Assessment Area
Ecological Linkage	Weak ecological linkage with adjacent natural and semi-natural habitats
Potential Value	Low
Nursery/ Breeding Ground	No significant nursery or breeding ground recorded
Age	Not applicable
Abundance/ Richness of Wildlife	Low to moderate for avifauna and butterfly and low for rest of fauna groups
Overall Ecological Value	**Low**

Table 10.20 Evaluation of Shrubland/Grassland within the Assessment Area

Criteria	Shrubland/Grassland
Naturalness	Semi-natural habitat, mainly covered by native shrub and grass species
Size	Approx. 389.7 ha within the Assessment Area
Diversity	Moderate diversity of plant species and structural complexity Low to moderate diversity of fauna species.
Rarity	Seven flora species of conservation interest *Brainea insignis, Diospyros vaccinioides, Gnetum luofuense, Nepenthes mirabilis, Ormosia emarginata, Ormosia semicastrata, Rhododendron simsii* and *Thysanotus chinensis* were recorded Fauna species of conservation importance recorded during the surveys include: Mammal – Japanese Pipistrelle, Red Muntjac Avifauna – Crested Serpent Eagle, Black Kite, Eastern Buzzard, Greater Coucal, Collared Scops Owl, White-throated Kingfisher, Black-throated Laughingthrush Butterfly – Danaid Egg-fly, Swallowtail
Re-creatability	It takes approximately 5 years for shrubland/grassland to regenerate
Fragmentation	Mainly existing as continuous patches at uphill areas and surrounded by mixed woodland
Ecological Linkage	Functionally linked to mixed woodland and watercourses in close proximity
Potential Value	Low to moderate. Potential to become mature shrubland and then young mixed woodland if given sufficient time and protection from disturbance
Nursery/ Breeding Ground	No significant nursery or breeding ground recorded
Age	Ranging from 5 years to 10 years
Abundance/ Richness of Wildlife	Low to moderate for avifauna and butterfly and low for rest of fauna groups
Overall Ecological Value	**Low to moderate**

Table 10.21 Evaluation of Watercourse within the Assessment Area

Criteria	Natural Watercourse	Semi-natural Watercourse	Channelized Watercourse
Naturalness	Natural watercourses were mostly recorded at hillside areas, subject to low human disturbance	Semi-natural watercourses were mostly recorded at foothill areas, subject to low to moderate human disturbance S1, S2, S2A and upper section of S3 are considered as semi-natural watercourse	Totally channelized watercourse mainly located within close vicinity of developed area with moderate human disturbance Lower section of S3 is considered as channelized watercourse
Size	Approx. 17.3 ha (~33.4 km) within the Assessment Area		
Diversity	Low floral diversity and moderate structural	Low floral diversity and moderate structural complexity	Low floral diversity and low structural

Criteria	Natural Watercourse	Semi-natural Watercourse	Channelized Watercourse
	complexity Low to moderate faunal diversity	Low to moderate faunal diversity	complexity Low faunal diversity
Rarity	Two flora species of conservation interest *Arundina graminifolia* and *Nepenthes mirabilis* were recorded Fauna species of conservation importance recorded during the surveys include: Herpetofauna – Lesser Spiny Frog Aquatic Fauna – Predaceous Chub, *Cryptopotamon anacoluthon* and *Nanhaipotamon hongkongense*	One flora species of conservation interest *Nepenthes mirabilis* was recorded Fauna species of conservation importance recorded during the surveys include: Avifauna – Black-crowned Night Heron Herpetofauna – Hong Kong Cascade Frog, Chinese Bullfrog Aquatic Fauna – *Cryptopotamon anacoluthon, Nanhaipotamon hongkongense* and *Somanniathelphusa zanklon* (i.e.All three aquatic fauna species were recorded in S2A while only *Somanniathelphusa zanklon* was recorded in S2)	One flora species of conservation interest *Ceratopteris thalictroides* was recorded Fauna species of conservation importance recorded during the surveys include: Herpetofauna – Hong Kong Cascade Frog, Copperhead Racer, Common Rat Snake Odonate – Emerald Cascader
Re-creatability	Difficult to be re-created	Re-creatable when suitable hydrological conditions are available	Re-creatable when suitable hydrological conditions are available
Fragmentation	Not applicable		
Ecological Linkage	Functionally linked to mixed woodland and shrubland/grassland.		
Potential Value	Moderate	Low to moderate	Low
Nursery/ Breeding Ground	Potential nursery ground and breeding grounds for amphibians, damselflies, dragonflies and aquatic fauna	Potential nursery ground and breeding grounds for amphibians, damselflies, dragonflies and aquatic fauna	No significant nursery or breeding ground recorded
Age	Not applicable		
Abundance/ Richness of Wildlife	Low to moderate for odonates, amphibian and aquatic fauna, low for other terrestrial fauna groups	Low to moderate for odonates, amphibian and aquatic fauna, low for other terrestrial fauna groups	Low for all terrestrial fauna groups
Overall Ecological Value	**Moderate**	**Low to Moderate**	**Low**

Table 10.22 Evaluation of Reservoir within the Assessment Area

Criteria	Reservoir
Naturalness	Artificial habitat surrounded by mixed woodland and shrubland/grassland
Size	Approx. 1.6 ha within the Assessment Area

Criteria	Reservoir
Diversity	Low diversity of plant species and terrestrial fauna species
Rarity	One flora species of conservation importance, namely Nepenthes mirabilis was recorded during the surveys. Fauna species of conservation importance recorded during the surveys include: Avifauna – White-throated Kingfisher
Re-creatability	Reservoir is re-creatable, while surrounding vegetation (e.g. landscaping tree species) at the banks will need time to grow
Fragmentation	No fragmentation within reservoir
Ecological Linkage	Functionally linked to mixed woodland, shrubland/grassland and watercourses in close proximity
Potential Value	Low
Nursery/ Breeding Ground	No significant nursery or breeding ground recorded.
Age	Unknown
Abundance/ Richness of Wildlife	Low abundance and richness for terrestrial fauna species.
Overall Ecological Value	**Low**

Table 10.23 Evaluation of Agricultural Land within the Assessment Area

Criteria	Agricultural Land
Naturalness	Man-made habitat for agricultural purposes
Size	Approx. 7.6 ha within the Assessment Area
Diversity	Low floral diversity and structure complexity Low diversity of terrestrial fauna species
Rarity	No flora or fauna species of conservation importance recorded during the surveys.
Re-creatability	Readily re-creatable
Fragmentation	Fragmented and scattered within Assessment Area
Ecological Linkage	Weak ecological linkage with adjacent natural and semi-natural habitats
Potential Value	Low
Nursery/ Breeding Ground	No significant nursery or breeding ground recorded
Age	Not applicable
Abundance/ Richness of Wildlife	Low for all fauna groups
Overall Ecological Value	**Very low**

Table 10.24 Evaluation of Developed Area within the Assessment Area

Criteria	Developed Area
Naturalness	Man-made habitat with intensive human disturbances
Size	Approx. 451.9 ha within the Assessment Area
Diversity	Low to moderate diversity of plant species Low diversity of terrestrial fauna species
Rarity	No flora of conservation importance has been recorded Fauna species of conservation importance recorded during the surveys include: Mammal – Chinese Noctule, Least Pipistrelle, Chinese Pipistrelle Avifauna – Brown Fish Owl Butterfly – Danaid Eggfly, Small Cabbage White Odonate – Dancing Shadow-emerald
Re-creatability	Readily re-creatable
Fragmentation	Fragmented and scattered within Assessment Area
Ecological Linkage	Weak ecological linkage with adjacent natural and semi-natural habitats
Potential Value	Low
Nursery/ Breeding Ground	No significant nursery or breeding ground recorded
Age	Not applicable
Abundance/ Richness of Wildlife	Low for all fauna groups
Overall Ecological Value	**Very low**

Table 10.25 Evaluation of Species of Conservation Importance Recorded during Survey within the Assessment Area

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Flora							
Incense Tree	*Aquilaria sinensis*	• Protected under Cap. 586 • Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Near Threatened" status in China and under State protection (Category II) in China • Listed as "Vulnerable" in China Plant Red Data Book • Included in Illustrations of Rare & Endangered Plant in Guangdong Province • Listed as "Vulnerable" in Threatened Species List of China's Higher Plants (2017) • Listed as "Vulnerable" in International Union for Conservation of Nature Red List of Threatened Species (IUCN) (2023) • Appendix (II) of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	Common in Hong Kong	✓[4]	✓	-	Recorded around Wah Fat Playground according to literature Recorded in mixed woodland north of Lam Tei Irrigation Reservoir

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Hong Kong Eagle's Claw	*Artabotrys hongkongensis*	• Listed in AFCD (2003) Rare and Precious Plants of Hong Kong "Least Concern" status in China	Distributed in Tai Tam, Nam Fung Road, Lantau Peak	-	✓	-	Recorded in mixed woodland within Tai Lam Country Park
Bamboo Orchid	*Arundina graminifolia*	• Protected under Cap. 96A, Cap. 586	Common in Hong Kong	-	✓	-	Recorded in watercourse downstream of Hung Shui Heung Irrigation Reservoir
Cycad-fern	*Brainea insignis*	• Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China and under State protection (Category II) in China • Listed as "Vulnerable" in Threatened Species List of China's Higher Plants (2017) • Appendix (II) of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	Common in Hong Kong	-	✓	-	Recorded in shrubland/grassland within Tai Lam Country Park
Water Fern	*Ceratopteris thalictroides*	• Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China and under State protection (Category II) in China	Rare. Found in wetlands.	-	✓	-	Recorded in watercourse near So Kwun Wat San Tsuen

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Small Persimmon	*Diospyros vaccinioides*	• Listed as "Endangered" in Threatened Species List of China's Higher Plants (2017) • Listed as "Critically Endangered" in International Union for Conservation of Nature Red List of Threatened Species (IUCN) (2023)	Common all around forests and hillslopes of Hong Kong	-	✓	✓ (1 individual recorded in mixed woodland within Project Area at southern portal)	Widely distributed in mixed woodland and shrubland/grassland within the Assessment Area.
Chinese New Year Flower	*Enkianthus quinqueflorus*	• Protected under Cap.96A	Very rare in Hong Kong	-	✓	-	Recorded in mixed woodland within Tai Lam Country Park
Dense-flowered Geodorum	*Geodorum densiflorum*	• Protected under Cap.96A and Cap.586 • Appendix (II) of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	Distribution can be found in Wong Nai Chung, Aberdeen, Sai Kung	-	✓	-	Recorded in mixed woodland near Lam Tei Quarry

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Luofushan Joint-fir	*Gnetum luofuense*	• Listed as "Near Threatened" in International Union for Conservation of Nature Red List of Threatened Species (IUCN) (2023)	Common and widely distributed in Hong Kong	✓[3]	✓	✓ (a small patch recorded in mixed woodland within Project Area near Wah Fat Playground)	Recorded within Wu Shan Recreatiom Playground according to literature Widely distributed in mixed woodland, plantation, and shrubland/grassland within the Assessment Area.
Ixonanthes	*Ixonanthes reticulata*	• Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China • Listed as "Vulnerable" in Threatened Species List of China's Higher Plants (2017) • Listed as "Vulnerable" in International Union for Conservation of Nature Red List of Threatened Species (IUCN) (2023)	Common. Distributed in forests	-	✓	-	Recorded in Ching Uk Tsuen Fung Shui Wood

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Tsoong's Tree	*Michelia odora*	• Protected under Cap.96A • Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China • Listed as "Rare" in China Plant Red Data Book • Included in Illustrations of Rare & Endangered Plant in Guangdong Province • Listed as "Vulnerable" in International Union for Conservation of Nature Red List of Threatened Species (IUCN) (2023)	A rare species in Hong Kong, only found in Tai Mo Shan	✓[4]	-	-	Recorded around Wah Fat Playground according to literature

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Pitcher Plant	*Nepenthes mirabilis*	• Protected under Cap.96A and Cap.586 • Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Vulnerable" status in China • Listed as "Vulnerable" in Threatened Species List of China's Higher Plants (2017) • Under Appendix (II) of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	Distribution can be found in Tai Lam Chung, So Kwun Wat, Castle Peak, Lantau Island	✓[1]	✓	-	Recorded along watercourse around Pillar Point according to literature Recorded in watercourse and shrubland/grassland around Lam Tei Irrigation Reservoir, Hung Shui Hang Irrigation Reservoir, Tai Lam Country Park, uphills near Shek Kok Tsui and Siu Lang Shui.
Emarginate-leaved Ormosia	*Ormosia emarginata*	• Under State protection (Category II) in China	Common in Hong Kong	-	✓	-	Recorded in western patch of Ching Uk Tsuen Fung Shui Wood and shrubland/grassland within Tai Lam Country Park
Soft-fruited Ormosia	*Ormosia semicastrata*	• Under State protection (Category II) in China	Restricted in Hong Kong, Distribution can be found in Tai Tam, Wong Nai Chung, Tai Po Kau, Ma On Shan	-	✓	-	Recorded in shrubland/grassland within Tai Lam Country Park

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Hong Kong Pavetta	*Pavetta hongkongensis*	• Protected under Cap.96A	Common in Hong Kong	-	✓	-	Recorded in westerm patch of Ching Uk Tsuen Fung Shui Wood
Red Azalea	*Rhododendron simsii*	• Protected under Cap.96A	Distribution can be found in Victoria Peak, Mount Collinson, Kowloon Peak and Lion Rock, Ma On Shan, Tai Mo Shan, Sharp Island, Castle Peak, Pat Sin Leng, Sai Kung Peninsula, Lantau	✓[1]	✓	-	Recorded along watercourse around Pillar Point according to literature Recorded in shrubland/grassland south of Lam Tei Quarry within Tai Lam Country Park
Chinese Frienge Lily	*Thysanotus chinensis*	• Listed in AFCD (2003) Rare and Precious Plants of Hong Kong of "Least Concern" status in China	Rare. Distributed in grassland.	-	✓	-	Recorded in shrubland/grassland north of Pillar Point Magazine Site
Mammal							
Chinese Noctule	*Nyctalus plancyi*	• Protected under Wild Animals Protection Ordinance (Cap. 170) • Potential Regional Concern by Fellowes et al. (2002) • Breeding/ roosting site listed as Regional Concern by Fellowes et al. (2002)	Fairly widely distributed in countryside areas throughout Hong Kong.	-	✓	-	Sound recorded in mixed woodland near Lam Tei Quarry, Pillar Point and developed area around So Kwun Wat San Tsuen.

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Least Horseshoe Bat		• Protected under Wild Animals Protection Ordinance (Cap. 170) • Potential Regional Concern by Fellowes et al. (2002) • Breeding/ roosting site listed as Regional Concern by Fellowes et al. (2002)	Widely distributed in countryside areas throughout Hong Kong.	✓[3]	-	-	Recorded around Wu Shan Recreation Playground according to literature
Japanese Pipistrelle	*Pipistrellus abramus*	• Protected under Wild Animals Protection Ordinance (Cap. 170)	Widely distributed throughout Hong Kong.	✓[3]	✓	✓ (1 individual recorded in developed area within Pillar Point Magazine Site)	Recorded around Pillar Point and Wu Shan Recreation Playground according to literature Sound recorded in mixed woodland and shrubland/grassland near Lam Tei Quarry and Pillar Point.
Least Pipistrelle	*Pipistrellus tenuis*	• Protected under Wild Animals Protection Ordinance (Cap. 170) • Near Threatened on Red List of China's Vertebrate (2016)	Ten-something records found in Nam Chung, Sheung Wo Hang, Lin Ma Hang, Plover Cove Country Park, Yuen Long, Shek Pik, Deep Water Bay, Ho Pui and Ho Chung.	-	✓	-	Sound recorded in developed area around So Kwun Wat San Tsuen.

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Chinese Pipistrelle	*Hypsugo pulveratus*	• Protected under Wild Animals Protection Ordinance (Cap. 170) • Breeding/ roosting site listed as Local Concern by Fellowes et al. (2002)	Only several records in the countryside areas at Ting Kau, Ma On Shan and Lin Ma Hang, and several records of stray individuals inside buildings.	-	✓	-	Sound recorded in developed area around So Kwun Wat San Tsuen.
-	*Myotis sp.*	• Protected under Wild Animals Protection Ordinance (Cap. 170)	-	-	✓	-	Sound recorded in mixed woodland near Pillar Point.
Unidentified Bat	-	• Protected under Wild Animals Protection Ordinance (Cap. 170)	-	-	✓	-	Sound recorded in mixed woodland around Lam Tei Irrigation Reservoir and plantation around Lam Tei Quarry.
Pallas's Squirrel	*Callosciurus erythraeus*	• Protected under Wild Animals Protection Ordinance (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).	-	✓	-	Recorded in plantation adjacent to Siu Lang Shui Road

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Maked Palm Civet	*Paguma larvata*	• Potential Regional Concern by Fellowes et al. (2002) • Appendix III of CITES; • Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). • Protected under Wild Animals Protection Ordinance (Cap. 170)	Widely distributed in countryside areas throughout Hong Kong, except for Lantau Island and northwestern New Territories.	-	✓	-	Recorded in mixed woodland to the western upstream of Hung Shui Heung Reservoir
Red Muntjac	*Muntiacus muntjak*	• Potential Regional Concern by Fellowes et al. (2002) • Near Threatened on Red List of China's Vertebrate (2016)	Very widely distributed in countryside areas throughout Hong Kong.	-	✓	-	Recorded in shrubland/grassland of Tai Lam Country Park
Avifauna							
Black-crowned Night Heron	*Nycticorax nycticorax*	• Breeding/ roosting site listed as Local Concern by Fellowes *et al.* (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident and migrant, widely distributed in Hong Kong	✓[1]	✓	-	Recorded along watercourse around Pillar Point according to literature Recorded in watercourse near Pillar Point and sea water around Castle Peak Beach
Grey Heron	*Ardea cinerea*	• Potential Regional Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common winter visitor. Found in Deep Bay area, Starling Inlet, Kowloon Park, Cape D'Aguilar.	✓[3]	-	-	Recorded along Tuen Mun River Channel according to literature

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Great Egret	*Ardea alba*	• Potential Regional Concern by Fellowes et al. (2002) • Breeding/ roosting site listed as Regional Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident, migrant and winter visitor. Widely distributed in Hong Kong.	✓[3,4]	✓	-	Recorded along Tuen Mun River Channel and around Castle Peak Beach according to literature Recorded in sea water around Castle Peak Beach
Intermediate Egret	*Ardea intermedia*	• Regional Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Resident and passage migrant. Found in Deep Bay area, Tai Long Wan, Starling Inlet, Tai O, Cape D'Aguilar	✓[3]	-	-	Recorded along Tuen Mun River Channel according to literature
Little Egret	*Egretta garzetta*	• Potential Regional Concern by Fellowes et al. (2002); • Breeding/ roosting site listed as Regional Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident and widely distributed in coastal area throughout Hong Kong	✓[1,3,4]	✓	-	Recorded along Tuen Mun River Channel, watercourse around Pillar Point, seashore around Castle Peak Bay and TM-CLKT according to literature Recorded in sea water around Castle Peak Beach and TM-CLKT

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Pacific Reef Heron	*Egretta sacra*	• Breeding/ roosting site listed as Local Concern by Fellowes et al. (2002); • Appendix II of China State Major Protection Status • Rare on China Red Data Book (1998) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident and widely distributed in coastal areas throughout Hong Kong	-	✓	-	Recorded in sea water around TM-CLKT
Crested Serpent Eagle	*Spilornis cheela*	• Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). • Appendix II of China State Major Protection Status; • Near Threatened on Red List of China's Vertebrate (2016); • Breeding/ roosting site listed as Local Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident. Widely distributed in shrublands on hillsides throughout Hong Kong.	-	✓	-	Calling was heard in the shrubland/grassland close to Siu Lang Shui

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Crested Goshawk	*Accipiter trivirgatus*	• Appendix II of CITES; • Appendix II of China State Major Protection Status; • Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) • Rare on China Red Data Book (1998) • Near Threatened on Red List of China's Vertebrate (2016) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident. Widely distributed in woodlands and shrublands throughout Hong Kong.	✓[3]	-	-	Recorded around Wu Shan Recreation Playground according to literature
Black Kite	*Milvus migrans*	• Breeding/ roosting site listed as Regional Concern by Fellowes et al. (2002); • Appendix II of CITES; • Appendix II of China State Major Protection Status; • Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident and winter visitor, widely distributed in Hong Kong	✓[1,3,4]	✓	-	Recorded hovering above Pillar Point, Siu Shan Court and Sam Shing Hui according to literature Widespread across the Assessment Area and recorded hovering over mixed woodland, plantation, shrubland/grassland

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Eastern Buzzard	*Buteo japonicus*	• Appendix II of CITES; • Appendix II of China State Major Protection Status; • Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common winter visitor and widely distributed in Hong Kong	-	✓	-	Flew over shrubland/grassland around Siu Lang Shui
Greater Coucal	*Centropus sinicus*	• Appendix II of China State Major Protection Status	Common resident. Widely distributed in Hong Kong.	-	✓	-	Recorded in shrubland/grassland west of Pillar Point Magazine Site
Collared Scops Owl	*Otus lettia*	• Appendix II of CITES; • Appendix II of China State Major Protection Status; • Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586). • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident and widely distributed in shrubland throughout Hong Kong	-	✓	-	Calling was heard in the shrubland/grassland close to Shek Kok Tsui

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Brown Fish Owl	*Ketupa zeylonensis*	• Appendix II of CITES; • Appendix II of China State Major Protection Status; • Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) • Regional Concern by Fellowes et al. (2002) • Endangered on Red List of China's Vertebrate (2016) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Scarce resident. Widely distributed in Hong Kong.	-	✓	-	Recorded perching on fence within Developed Area within close vicinity to a watercourse at So Kwun Wat
Grey Nightjar	*Caprimulgus jotaka*	• Local Concern by Fellowes et al. (2002)	Scarce passage migrant. Widely distributed in Hong Kong.	-	✓	-	Recorded in mixed woodland downstream of Lam Tei Irrigation Reservoir
White-throated Kingfisher	*Halcyon smyrnensis*	• Breeding/ roosting site listed as Local Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident. Widely distributed in coastal areas throughout Hong Kong.	✓[5]	✓	-	Recorded around Lam Tei Irrigation Reservoir according to literature Recorded at Lam Tei Irrigation Reservoir and shrubland/grassland within Tai Lam Countr Park

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Ashy Drongo	*Dicrurus leucophaeus*	• Local Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Uncommon winter visitor. Found in Shing Mun, Tai Po Kau.	✓[3]	-	-	Recorded around Wu Shan Recreation Playground according to literature
Rufous-capped Babbler	*Stachyridopsis ruficeps*	• Potential Local Concern by Fellowes et al. (2002); • Protected under Wild Animals Protection Ordinance (Cap. 170)	Common resident and widely distributed in coastal areas throughout Hong Kong	-	✓	-	Calling was heard in the mixed woodland near Lam Tei Quarry
Black-throated Laughingthrush	*Pterorhinus chinensis*	• Class 2 Protected Animal of China	Common resident. Widely distributed in woodland and shrubland throughout Hong Kong.	-	✓	-	Recorded in mixed woodland around Hung Shui Heung Irrigation Reservoir, upstream of Lam Tei Irrigtion Reservoir and Ching Uk Tsuen, plantation and shrubland/grassland east of upstream leading into Lam Tei Irrigation Reservoir within Tai Lam Country Park

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Indochinese Yuhina	*Yuhina torqueola*	• Breeding/ roosting site listed as Local Concern by Fellowes et al. (2002) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Uncommon but increasing winter visitor, scarce and localised in summer.	-	✓	-	Recorded in plantation around Siu Lang Shui
Siberian Blue Robin	*Larvivora cyane*	• Local Concern by Fellowes et al. (2002)	Scarce passage migrant. Widely distributed in woodland throughout Hong Kong.	-	✓	✓ (1 individual recorded in plantation within Siu Lam Magazine Site)	Recorded in plantation adjacent to Siu Lam Freshwater Supplies Reservoir
Amphibian							
Lesser Spiny Frog	*Quasipaa exilispinosa*	• Potential Global Concern by Fellowes et al. (2002); • Vulnerable on Red List of China's Vertebrate (2016)	Widely distributed in upland forest streams throughout Hong Kong	-	✓	-	Recorded in watercourse within Tai Lam Country Park and Hung Shui Hang Irrigation Reservoir.

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Hong Kong Cascade Frog	*Hoplobatrachus rugulosus*	• Potential Global Concern by Fellowes et al. (2002); • Endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2022) • Endangered on Red List of China's Vertebrate (2016) • Protected under Wild Animals Protection Ordinance (Cap. 170)	Widely distributed in mountain streams in Hong Kong, except Lantau Island.	-	✓	-	Recorded in watercourse within Tai Lam Country Park
Chinese Bullfrog	*Hoplobatrachus rugulosus*	• Potential Regional Concern by Fellowes et al. (2002); • Appendix II of China State Major Protection Status; • Endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2022)	Widely distributed in Hong Kong.	-	✓	-	Recorded in watercourse near Lam Tei Quarry
Reptile							
Indian Forest Skink	*Sphenomorphus indicus*	• Local Concern by Fellowes et al. (2002)	Widely distributed throughout Hong Kong.	-	✓	-	Recorded in mixed woodland west of Ching Uk Tsuen

Common Name	Scientific Name	Protection Status	Distribution, Rarity and other Notes	Literature	Surveys	Presence within Project Area	Remarks
Copperhead Racer	*Coelognathus radiatus*	• Potential Regional Concern by Fellowes et al. (2002); • Endangered on Red List of China's Vertebrate (2016); • Endangered on China Red Data Book	Widely distributed throughout Hong Kong.	-	✓	-	Recorded in watercourse within Tai Lam Country Park
Common Wolf Snake	*Lycodon aulicus*	• Near Threatened on Red List of China's Vertebrate (2016);	Widely distributed at low elevations throughout Hong Kong Island, Lantau Island and Lamma Island.	-	✓	-	Recorded in mixed woodland above Wah Fat Playground
Common Rat Snake	*Ptyas mucosus*	• Potential Regional Concern by Fellowes et al. (2002); • Endangered on Red List of China's Vertebrate (2016); • Appendix II of CITES • Endangered on China Red Data Book (1998) • Protected under Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586).	Widely distributed in Hong Kong	-	✓	-	Recorded in watercourse within Tai Lam Country Park
Many-banded Krait	*Bungarus multicinctus*	• Potential Regional Concern by Fellowes et al. (2002); • Endangered on Red List of China's Vertebrate (2016); • Vulnerable on China Red Data Book	Common and widely distributed in Hong Kong.	-	✓	-	Recorded in mixed woodland outside the Lam Tei Irrigation Reservoir.

Butterfly							
Metallic Cerulean	*Jamides Alecto*	-	Very rare, distributed in Victoria Peak, Fung Yuen, Chuen Lung, Mui Wo.	-	✓	-	Recorded in fung shui woodland near Tin Hau Temple and plantation east of Pillar Point Magazine Site
Malayan	*Megisba malaya*	• Local Concern by Fellowes et al. (2002);	Very rare, distributed in North Lantau Island.	-	✓	-	Recorded in mixed woodland around Siu Lam.
Danaid Egg-fly	*Hypolimnas misippus*	• Local Concern by Fellowes et al. (2002);	Uncommon, distributed in Ngau Ngak Shan, Lung Kwu Tan, Hong Kong Wetland Park, Mount Parker, Cloudy Hill, Lin Ma Hang.	-	✓	-	Recorded in shrubland/grassland around hilltop beside Lam Tei Irrigation Reservoir and developed area around So Kwun Wat.
Swallowtail	*Papilio xuthus*	-	Rare, distributed in Kap Lung, Ma On Shan, Tai Tam, Sha Lo Wan, Kat O, Lung Kwu Tan, Wu Kau Tang, Lung Kwu Chau	-	✓	-	Recorded in shrubland/grassland around hilltop beside Lam Tei Irrigation Reservoir.
Small Cabbage White	*Pieris rapae*	• Potential Global Concern by Fellowes et al. (2002);	Rare, distributed in Shep Mun Kap, Fan Lau, Ngong Ping, Kam Tin, Ho Chung, Luk Keng, Tuen Mun Ash Lagoon	-	✓	-	Recorded in developed area around So Kwun Wat.

Odonate							
Dingy Dusk-hawker	*Gynacantha subinterrupta*	• Local Concern by Fellowes et al. (2002)	Found in well-shaded woodlands. Recorded in Hong Kong Wetland Park, Lantau Island, Ping Shan Chai, Sha Lo Tung and Tai Mo Shan.	-	✓	-	Recorded in western patch of Ching Uk Tsuen Fung Shui Wood
Dancing Shadow-emerald	*Idionyx victor*	• Local Concern by Fellowes et al. (2002)	Found high in the forest canopy or over wooded streams. Widely distributed in wooded streams throughout Hong Kong.	-	✓	-	Recorded in developed area around So Kwun Wat San Tsuen
Scarlet Basker	*Urothemis signata*	• Local Concern by Fellowes et al. (2002)	Common in areas with abandoned fish ponds throughout Hong Kong.	-	✓	✓ (1 individual recorded in plantation within Siu Lam Magazine Site)	Recorded in developed area around So Kwun Wat San Tsuen
Emerald Cascader	*Zygonyx iris*	• Fellowes: PGC	Widely distributed in moderately clean, rapidly flowing forested streams throughout Hong Kong.	-	✓	-	Recorded in watercourse around So Kwun Wat San Tsuen
Freshwater Vertebrate							
Predaceous Chub	*Parazacco spilurus*	• Vulnerable on China Red Data Book	Widely distributed in in most unpolluted hill streams in both upper and lower courses.	-	✓	-	Recorded in watercourse connected to Lam Tei Irrigation Reservoir

Freshwater Invertebrate							
Emerald Cascader	*Zygonyx iris*	• Fellowes: PGC	Widely distributed in moderately clean, rapidly flowing forested streams throughout Hong Kong.	-	✓	-	Nymphs were observed within watercourse in Tai Lam Country Park
Freshwater Crab	*Cryptopotamon anacoluthon*	• Potential Global Concern by Fellowes et al. (2002); • Vulnerable on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2022)	Endemic to Hong Kong	-	✓	-	Found in watercourse within Tai Lam Country Park and near Wah Fat Playground (S2A)
Freshwater Crab	*Nanhaipotamon hongkongense*	• Potential Global Concern by Fellowes et al. (2002)	Endemic to Hong Kong	-	✓	-	Found in watercourse near Wah Fat Playground (S2A)
Freshwater Crab	*Somanniathelphusa zanklon*	• Potential Global Concern by Fellowes et al. (2002); • Vulnerable on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2022)	Endemic to Hong Kong	-	✓	✓ (~5 individuals recorded in watercourse (S2) near Wah Fat Playground)	Found in watercourse near Wah Fat Playground (S2 and S2A)

Notes:

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(13) KFBG (2003) Flora of Hong Kong – Pteridophyta. Kadoorie Farm and Botanic Garden, Hong Kong
(14) Xing, F.W., Ng, S.C., Chau, L.K.C. 2000. Gymnosperms and angiosperms of Hong Kong. Memoirs of the Hong Kong Natural History Society 23: 21-136.

10.7 Impact Identification and Prediction

10.7.1 Project Elements

10.7.1.1 The purpose of this Project is to provide a dual two-lane carriageway and associated connections to the TM-CLKT in the south, and the Yuen Long Highway (YLH) and KSWH in the north, of about 10 km long in total. The Project mainly comprises construction of a road tunnel of about 7.5 km long running through Tuen Mun and Tai Lam Country Park, linking the TM-CLKT and the YLH and KSWH, within the Project Area (underground) by either drill-and-blast/drill-and-break (i.e. section between Northern Portal and Wah Fat Playground, underground adits at Sam Shing Estate) or Tunnel Boring Machine (TBM) (section between Sam Shing Estate and Southern Portal) methods. Other proposed works of the Project within the Project Area (aboveground) include, but not limited to, the following items:

i. Construction of tunnel portals and associated facilities at Tuen Mun Area 40 and Lam Tei Quarry;

ii. Viaducts / at-grade roads from the southern tunnel portal to the roads under planning near Lung Mun Road/Mong Fat Street, and TM-CLKT at Tuen Mun Area 40 (except viaducts / at-grade roads from the northern tunnel portal to the YLH, and the KSWH at Lam Tei East Interchange will be constructed under Route 11 Project);

iii. Associated ventilation buildings, administration building and other ancillary buildings;

iv. Re-provisioning of facilities affected by the proposed works;

v. Possible adits and associated connection with existing roads;

vi. Restoration works for Hong Kong Girl Guide Association - Tuen Mun Campsite (former GGA Campsite);

vii. Potential works area including but not limited to adit main access to tunnels, site office, car parks, remote exhaust facility;

viii. Potential magazine sites (i.e. including Lam Tei, Pillar Point (Siu Lang Shui) and Siu Lam) and associated access road;

ix. Barging points and slurry treatment plant near TM-CLKT; and

x. Associated environmental protection and mitigation works.

10.7.1.2 For the works at Hong Kong Girl Guide Association - Tuen Mun Campsite (former GGA Campsite) next to Wah Fat Playground, as the works mentioned above only involves necessary restoration/refurbishment/repair works within existing buildings/structures, potential impacts on nearby ecological resources/loss of habitat within the Project Area (aboveground) are not anticipated.

10.7.1.3 Potential impacts on ecological resources based on the works mentioned above can arise from both construction and operation phases within the footprint of the Project Area.

10.7.2 Impact Assessment Methodology

10.7.2.1 The potential ecological impacts associated with the above-mentioned works within the

footprint of the Project Area (aboveground) are listed below.

- Ecological impacts to the nearby recognized site of conservation importance at the Lam Tei and Yick Yuen Conservation Area, and Tai Lam Country Park due to the construction and operation of the Project;
- Loss of habitats and associated vegetation;
- Impacts on fauna species of conservation importance;
- Habitat fragmentation and isolation, including restriction of wildlife utilisation of the area (i.e. transit, feeding and roosting), direct mo1tality of fauna (e.g. road-kill), and barrier effect on mobile species, etc.;
- Physical disturbance to the surrounding habitats and associated wildlife due to increased human activities, change in light and noise intensity, dust generation etc. during the construction and operation phases of the Project;
- Water Quality Impacts on watercourses caused by construction site and paved areas surface run-off during the construction and operation phases, respectively, of the Project; and
- Disturbance and impacts to surrounding habitats and associated wildlife related to tunnelling works.

10.7.2.2 Potential impacts that may arise from the construction and operation phases for the development of the Project are assessed following the EIAO-TM Annex 16 guidelines, and the impacts evaluated based on the criteria in EIAO-TM Annex 8.

10.7.2.3 Additional measures for ecological impacts are then described. Finally, predicted unavoidable residual impacts, assuming implementation of all proposed mitigation measures are detailed and quantified wherever necessary.

10.8 Impact Evaluation

10.8.1 Construction Phase

<u>Ecological impacts to the nearby recognized site of conservation importance</u>

10.8.1.1 Parts of Lam Tei and Yick Yuen Conservation Area and Tai Lam Country Park are located in the Northeast portion of the 500m Assessment Area while the SLS SSSI is located 600m away from the Pillar Point Magazine Site. Nevertheless, there is no Project works will be undertaken at the Conservation Area, Country Park (aboveground) and the SSSI, thus no direct impact to these sites of conservation concern is anticipated.

10.8.1.2 Although parts of the Project Area (aboveground) near Lam Tei Quarry and Wah Fat Playground are situated adjacent to the Tai Lam Country Park, deterioration of water quality due to uncontrolled construction site surface run-off entering the ecological sensitive habitats, including but not limited to mixed woodland, shrubland/grassland and watercourses, would not expect to be anticipated due to the its geographic features (Project Area locate at downhill side) and with the implementation of mitigation measures and good site practices as stated in **Section 5.7**. These impacts are unlikely to affect the SLS SSSI and the Lam Tei and Yick Yuen Conservation Area due to the distance between them and the project works. In this regard, impact to sites of conservation concern due to

the proposed Project is anticipated to be negligible.

Loss of habitats and associated vegetation

10.8.1.3 Potential direct habitat loss (permanent and temporary) is expected to occur within the Project Area (aboveground), Proposed Works Area and Magazine Site (Aboveground) at Lam Tei Quarry Site (Northern Portal), aboveground works at Wah Fat Playground, Southern Portal and Other Associated Works in Tuen Mun South, and the three Potential Magazine Sites at Siu Lam, Lam Tei and Pillar Point. As the Project Area (aboveground) is largely located on developed areas of very low ecological value with common vegetation species planted for landscaping purpose and limited wildlife usage, the terrestrial ecological impacts (including habitat and vegetation loss, reduction of species abundance/diversity, loss of feeding grounds, as well as reduction of ecological carrying capacity) due to the Project, is expected to be low. Developed areas are considered to be temporary loss as no habitat change would occur after construction phase and they would be re-provided during the operational phase.

10.8.1.4 Three watercourses within Project Area (aboveground), namely S1, S2 and S3, at the proposed Northern Portal, proposed ventilation building near Wah Fat Playground and the proposed Southern Portal, respectively, will be lost due to the Project. Nevertheless, the concerned watercourses are either seasonal semi-natural stream with no water flow observed throughout the whole survey period (i.e. S2) or seasonal stream with limited waterflow (i.e. S1 and S3). While these watercourses will be directly affected due to the Project, stream diversion works will be carried out to divert any water flow from the upper sections of the concerned watercourses to the lower sections of the watercourses with similar ecological features and/or hydrology setting outside the Project Area. Slope drains would be used to maintain waterflow at S1 and S2, while both slope drain and underground drains would be used to maintain waterflow at S3. The design of the slope drains shall maximize the ecological opportunities for aquatic flora and fauna. Green channel elements should be adopted in the diverted sections. Natural substrates shall be used as far as practicable to facilitate natural succession and colonization of flora and fauna. Reuse of excavated rock materials would also be recommended as it could help in reducing the need for offsite disposal. The proposed stream diversion scheme is as presented in **Figure 10.6a-c**. For S1, the current stream flow is supported by seasonal rainfall while the upstream location will be relocated as the existing slope will be cut due to the Project. Upon completion of stream diversion works, rainwater will be collected from the new upstream location to the lower section of S1 so as to maintain waterflow for lower section. As the stream diversion works at S2 is located strictly within the Project Area, no adverse impacts (e.g. change of surface flow/water level) are anticipated for upper sections of the watercourse within Tai Lam Country Park which is located outside of the Project Area. Stream diversion works will be carried out prior to any construction activities to be conducted in the vicinity of S1, S2 and S3 and will be located outside the Tai Lam Country Park.

10.8.1.5 This Project would unavoidably require removal of certain existing vegetation in various habitats within the Project Area (aboveground), Proposed Works Area and Magazine Site (Aboveground). Floral diversity in these habitats are low or low to moderate, except for mixed woodland and shrubland/grassland which are of moderate floral diversity. The total area of vegetated habitat to be removed and incur permanent loss at Project Area (aboveground) are estimated to be ~6.2 ha (including ~2.2 ha of mixed woodland, ~3.1 ha of plantation and ~0.9 ha of shrubland/grassland). Temporary loss of vegetated habitats are estimated to be ~1.6 ha (including ~1.5 ha of plantation and ~0.1 ha of

shrubland/grassland) at Proposed Works Area and Magazine Site (Aboveground). Upon the completion of works, affected areas at Proposed Works Area and Magazine Site (Aboveground) would be decommissioned and reinstated to its original condition in principle. The affected mixed woodlands at Project Area (aboveground) are scattered woodland fringes dominated by exotic species such as including *Acacia auriculiformis*, *Acacia confusa*, *Lophostemon confertus* and *Pinus elliottii*, which are commonly planted in past afforestation schemes and located beside developed areas such as Lam Tei Quarry, Wah Fat Playground, Lung Fu Road, Siu Lam Fresh Water Supplies Reservoir. These mixed woodlands are therefore subject to existing anthropogenic disturbances (e.g. dust, traffic noise, littering), especially those located near Lam Tei Quarry are subjected to considerable level of disturbance (e.g. noise, dust cause by active operation of mining machinery for rock materials within the quarry). Some common native tree and shrub species are sparsely distributed in shrubland/grassland. Whilst, vegetation in plantation habitat is dominated by exotic landscaping tree species like *Acacia confuse*, *Casuarina equisetifolia*, *Lophostemon confertus* and *Pinus elliotti*. Since the vegetation lost in these three habitats confined to some common species while other natural habitats are nearby and available for associated fauna, impacts due to the vegetation loss are therefore considered to be minor.

10.8.1.6 The extent of habitat loss (permanent and temporary) for each habitat within the Project Area (aboveground), including Northern Portal, Wah Fat Playground, Southern Portal and Other Associated Works in Tuen Mun South, and the three Potential Magazine Sites at Siu Lam, Lam Tei and Pillar Point, due to the Project is presented in **Table 10.26** to **Table 10.32**.

10.8.1.7 Two flora species of conservation importance, *Diospyros vaccinioides* and *Gnetum luofuense*, were recorded in mixed woodland near Pillar Point and near Wah Fat Playground, respectively, within the Project Area (aboveground). Although *Diospyros vaccinioides* and *Gnetum luofuense* are listed under TSLCHP and/or IUCN as species of conservation importance, they are also commonly found in Hong Kong. These flora species of conservation importance would be potentially impacted if unmitigated. The potential direct impacts on flora and fauna species of conservation importance are presented in **Table 10.33**.

Table 10.26 Total Direct Habitat Loss under the Project

Habitat Type	Mixed Woodland	Plantation	Shrubland/ Grassland	Watercourse	Developed Area
Permanent Loss	~2.2ha	~3.1ha	~0.9ha	~0.3km	-
Temporary Loss	-	~1.5ha	~0.1ha	-	~22.5ha

Table 10.27 Potential Direct Habitat Loss within Project Area (Aboveground) of Northern Portal

Habitat Type	Mixed Woodland	Plantation	Shrubland/ Grassland	Watercourse (S1)	Developed Area
Habitat Quality	Low to Moderate	Low	Low to Moderate	Low to Moderate	Very low

Habitat Type	Mixed Woodland	Plantation	Shrubland/ Grassland	Watercourse (S1)	Developed Area
Species	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance
Size/Abundance	Permanent loss of ~ 0.3 ha, small in the context of Hong Kong Moderate diversity of flora and low to moderate diversity of fauna	Permanent loss of ~ 0.7 ha, temporary loss of <0.1ha, small in the context of Hong Kong Low diversity of flora and fauna	Permanent loss of ~ 0.4 ha, temporary loss of <0.1ha, small in the context of Hong Kong Moderate diversity of flora and low to moderate diversity of fauna	Permanent loss of ~ 140m, small in the context of Hong Kong Low diversity of flora and low to moderate diversity of fauna	Temporary loss of 0.2ha, small in the context of Hong Kong Low to moderate diversity of flora and low diversity of fauna
Duration	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases
Reversibility	Irreversible	Reversible	Irreversible	Irreversible	Reversible
Magnitude	Low because the small area affected	Low because the small area affected	Low because the small area affected	Moderate for the size of this habitat being affected	Moderate for the size of this habitat being affected
Overall Impact Severity	Low to Moderate	Low	Low	Low to Moderate	Low

Table 10.28 Potential Direct Habitat Loss within Project Area (Aboveground) around Wah Fat Playground

Habitat Type	Mixed Woodland	Plantation	Watercourse (S2)	Developed Area
Habitat Quality	Low to Moderate	Low	Low to Moderate	Very low
Species	One flora species of conservation importance, namely *Gnetum luofuense*. No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance include: Freshwater Crab (*Somanniathelphusa zanklon*) in S2	No flora species of conservation importance No fauna species of conservation importance

Habitat Type	Mixed Woodland	Plantation	Watercourse (S2)	Developed Area
Size/Abundance	Permanent loss of ~ 0.7 ha, small in the context of Hong Kong Moderate diversity of flora and low to moderate diversity of fauna	Permanent loss of ~ 0.1 ha, temporary loss of ~0.7ha, small in the context of Hong Kong Low diversity of flora and fauna	Permanent loss of ~ 70m, small in the context of Hong Kong Low diversity of flora and low to moderate diversity of fauna	Temporary loss of ~0.9ha, small in the context of Hong Kong Low to moderate diversity of flora and low diversity of fauna
Duration	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases
Reversibility	Irreversible	Reversible	Irreversible	Reversible
Magnitude	Low because the small area affected	Low because the small area affected	Moderate for the size of this habitat being affected	Moderate for the size of this habitat being affected
Overall Impact Severity	Low to Moderate	Low	Low to Moderate	Low

Table 10.29 Potential Direct Habitat Loss within Project Area (Aboveground) of Southern Portal and Other Associated Works in Tuen Mun South

Habitat Type	Mixed Woodland	Plantation	Shrubland/ Grassland	Watercourse (S3)	Developed Area
Habitat Quality	Low to Moderate	Low	Low to Moderate	Low to Moderate	Very low
Species	One flora species of conservation importance, namely *Diospyros vaccinioides* No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance No fauna species of conservation importance
Size/Abundance	Permanent loss of ~ 1.3 ha, small in the context of Hong Kong Moderate diversity of flora and low to moderate diversity of fauna	Permanent loss of ~ 2.3 ha, temporary loss of ~0.1ha, small in the context of Hong Kong Low diversity of flora and fauna	Permanent loss of 0.3 ha, temporary loss of <0.1 ha, small in the context of Hong Kong Moderate diversity of flora and low to moderate diversity of fauna	Permanent loss of ~ 150m, small in the context of Hong Kong Low diversity of flora and low to moderate diversity of fauna	Temporary loss of ~19.4ha, small in the context of Hong Kong Low to moderate diversity of flora and low diversity of fauna

Habitat Type	Mixed Woodland	Plantation	Shrubland/ Grassland	Watercourse (S3)	Developed Area
Duration	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases
Reversibility	Irreversible	Reversible	Irreversible	Irreversible	Reversible
Magnitude	Low because the small area affected	Low because the small area affected	Low because the small area affected	Moderate for the size of this habitat being affected	Moderate for the size of this habitat being affected
Overall Impact Severity	Low to Moderate	Low	Low	Low to Moderate	Low

Table 10.30 Potential Direct Habitat Loss within Project Area (Aboveground) of Potential Magazine Site at Siu Lam

Habitat Type	Shrubland/ Grassland	Plantation	Developed Area
Habitat Quality	Low to Moderate	Low	Very low
Species	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance include: Siberian Blue Robin	No flora species of conservation importance Fauna species of conservation importance include: Scarlet Basker
Size/Abundance	Temporary loss of <0.1ha, small in the context of Hong Kong Moderate diversity of flora and low to moderate diversity of fauna	Temporary loss of <0.1ha, small in the context of Hong Kong Low diversity of flora and fauna	Temporary loss of ~ 0.9 ha, small in the context of Hong Kong Low to moderate diversity of flora and low diversity of fauna
Duration	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases
Reversibility	Irreversible	Reversible	Reversible
Magnitude	Low because the small area affected	Low because the small area affected	Moderate for the size of this habitat being affected
Overall Impact Severity	Low	Low	Low

Table 10.31 Potential Direct Habitat Loss within Project Area (Aboveground) of Potential Magazine Site at Lam Tei

Habitat Type	Developed Area
Habitat Quality	Very low
Species	No flora species of conservation importance No fauna species of conservation importance
Size/Abundance	Temporary loss of ~ 0.1 ha, small in the context of Hong Kong Low to moderate diversity of flora and low diversity of fauna

Habitat Type	Developed Area
Duration	The impact will persist during construction and operation phases
Reversibility	Reversible
Magnitude	Moderate for the size of this habitat being affected
Overall Impact Severity	Low

Table 10.32 Potential Direct Habitat Loss within Project Area (Aboveground) of Potential Magazine Site at Pillar Point

Habitat Type	Plantation	Developed Area
Habitat Quality	Low	Very low
Species	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance include: Japanese Pipistrelle
Size/Abundance	Temporary loss of ~ 0.7 ha, small in the context of Hong Kong Low diversity of flora and fauna	Temporary loss of ~ 0.9 ha, small in the context of Hong Kong Low to moderate diversity of flora and low diversity of fauna
Duration	The impact will persist during construction and operation phases	The impact will persist during construction and operation phases
Reversibility	Reversible	Reversible
Magnitude	Low because the small area affected	Moderate for the size of this habitat being affected
Overall Impact Severity	Low	Low

Impact on fauna species of conservation importance

10.8.1.8 Three species of conservation importance including Japanese Pipistrelle, Siberian Blue Robin and Scarlet Basker were recorded within Project Area (aboveground). They are species with high mobility and only a small area of the habitat would be temporarily lost as such the impact the aforementioned species of conservation importance are considered to be negligible.

10.8.1.9 Five individuals of Freshwater Crab, *Somanniathelphusa zanklon*, were found in a small pool (~3m x 2m) connected at the mid-stream of S2. Apart from stagnant water was observed from the small pool, S2 was observed to be dried out throughout the whole survey period. *Somanniathelphusa zanklon* prefers lowland watercourses or wetland/marsh, with all distribution records below 220m, and is reported as fairly tolerant to organic pollution (Ng and Dudgeon, 1992 [18]). It inhabits both lotic lentic, slow-flowing and low-gradient streams with various degrees of stream modification and channelization, where it burrows in mud and clay banks, as well as the roots of floating plants or the trailing roots and stems of the riparian grasses and other vegetation. In addition, this species is omnivorous with strongly carnivorous tendency, and prefer gastropod prey with

[18] Ng, P.K.L. & Dudgeon, D. 1992. The Potamidae and Parathelphusidae (Crustacea : Decapoda : Brachyura) of Hong Kong. Invertebrate Taxonomy 6: 741–768.

light and fragile shells (Stanton and Leven, 2016 [19]). Since these individuals are less mobile, without mitigation measures, the recorded species of conservation of importance within the Project Area (aboveground) may be affected by the construction works.

10.8.1.10 Outside the Project Area (aboveground), at the lower watercourse section where S2 and S2A is connected, three freshwater crab species including *Somanniathelphusa zanklon*, *Cryptopotamon anacoluthon*, and *Nanhaipotamon hongkongense* were recorded. *Cryptopotamon anacoluthon* inhabits rather clear/ unpolluted, fast flowing hill streams ranging from 8m to 827m, with rocky substratum and shaded/ wooded riparian habitats, as well as accumulations of leaf-litter, in which the latter is functioned as shelter and food source of this species (Ng and Dudgeon, 1992 [20]; Stanton et al., 2017 [21]); despite downstream habitat for this species (as well as many other lowland aquatic species) in Hong Kong are usually fragmented, channelized, piped and polluted under urbanization. *Nanhaipotamon hongkongense* is semi-terrestrial freshwater crab and normally appears at the hillstream clean water habitat (Dudgeon & Corlett, 1994 [22]). It can also be found in places far away from running water, such as moist areas were groundwater seeps through the soil, generally in secondary woodland (Stanton et *al*., 2018 [23]). This watercourse section was observed with continuous low water flow feeding from upper section of S2A outside the Project Area, and thus, the loss of S2 within the Project Area (aboveground) will not affect this section. While slope drains will be used for stream diversion works at S2, waterflow will still be maintained and allow for movement of freshwater crabs between upper sections to lower sections of watercourse. The slope drains shall be designed to maximize the ecological opportunities for aquatic flora and fauna and incorporate natural substrates to avoid causing any barrier effect to the movement of freshwater crabs. Nevertheless, this section will be subject to the potential water quality impact due to the construction activities within the Project Area (aboveground), such impact will be discussed in **Section 10.8.1.16**. Since the location where *Cryptopotamon anacoluthon*, and *Nanhaipotamon hongkongense* were recorded is directly connected to the watercourse within the Project Area (aboveground), these species may potentially be found within the Project Area (aboveground).

10.8.1.11 The potential direct impacts on flora and fauna species of conservation importance are presented in **Table 10.33**.

Table 10.33 Potential Impact on Flora and Fauna Species of Conservation Importance

Criteria	Potential Impact on Species of Conservation Importance
Species	Flora: *Diospyros vaccinoides*, *Gnetum luofuense* Aquatic Fauna: Freshwater Carb (*Cryptopotamon anacoluthon*, *Nanhaipotamon hongkongense* and *Somanniathelphusa zanklon*)
Protection Status	**IUCN Red List (2023)** – Near Threatened: *Gnetum luofuense*; Vulnerable:

[19] Stanton D.J & Leven M.R. 2016. Distribution, habitat utilisation and conservation status of the freshwater crab, Somanniathelphusa zanklon, endemic to Hong Kong. Journal of Threatened Taxa 8(3): 8564–8574.

[20] Ng, P.K.L. & Dudgeon, D. 1992. The Potamidae and Parathelphusidae (Crustacea : Decapoda : Brachyura) of Hong Kong. Invertebrate Taxonomy 6: 741–768.

[21] Stanton D.J., Leven M.R. & Hui T.C.H. 2017. Distribution of Cryptopotamon anacoluthon, a freshwater crab endemic to Hong Kong. Journal of Threatened Taxa 9(2): 9786–9794.

[22] Dudgeon, D. & Corlett, R. (1994): Hills and Streams: An Ecology of Hong Kong. Hong Kong University Press, Hong Kong.

[23] Stanton, David John; Leven, Michael Robertson; Hui, Tommy Chung Hong (2018-01-26). "Distribution of Nanhaipotamon hongkongense (Shen, 1940) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong". Journal of Threatened Taxa. 10 (1): 11156.

Criteria	Potential Impact on Species of Conservation Importance
	Cryptopotamon anacoluthon; Endangered: *Somanniathelphusa zanklon*; Critically Endangered: *Diospyros vaccinoides* **Threatened Species List of China's Higher Plants (2017)** – Endangered: *Diospyros vaccinoides* **Cap. 170 Wild Animals Protection Ordinance** – Japanese Pipistrelle
Distribution	None of the species are considered to be restricted in range.
Rarity	**Species listed in Fellowes et *al*. (2002)** – Local Concern: Siberian Blue Robin, Scarlet Basker; Global Concern: *Somanniathelphusa zanklon*; Potential Global Concern: *Cryptopotamon anacoluthon*, *Nanhaipotamon hongkongense*
Abundance	Abundance of species of conservation importance was low.
Duration	Permanent
Reversibility	Irreversible in the absence of mitigation.
Magnitude	Magnitude would be low due to the small numbers of flora and fauna individuals recorded, and the availability of similar or higher quality habitats nearby.
Overall Impact Severity	For flora species of conservation importance: **Low to moderate** during construction and negligible during operational phases. For fauna species of conservation importance: Negligible during construction phase and operational phase for Japanese Pipistrelle, Siberian Blue Robin and Scarlet Basker **Low to moderate** during construction and negligible during operational phases for *Somanniathelphusa zanklon*, *Cryptopotamon anacoluthon*, and *Nanhaipotamon hongkongense*.

Habitat fragmentation and isolation

10.8.1.12 Construction phase activities have the potential to affect the movement of fauna (particularly terrestrial mammals and herpetofauna) as the Project Area (aboveground) could be obstructed. However, the proposed works would be mainly located in developed area and fringes/ edges of habitats, causing a slight reduction of the core area of the nearby natural habitats. Limited habitat fragmentation and isolation effect, including restriction of wildlife utilisation of the area (i.e. transit, feeding and roosting), direct mo1tality of fauna (e.g. road-kill), and barrier effect on mobile species, etc. are therefore expected.

Physical disturbance to the surrounding habitats and associated wildlife

10.8.1.13 In view of the localised nature of the Project, only habitats and associated wildlife adjacent to the Project Area (aboveground) may be subject to indirect impacts resulting from increased disturbances caused by the Project. Habitats, including those in Tai Lam Country Park, that would potentially receive increased disturbances due to the proposed works mainly include mixed woodland, plantation, shrubland/grassland and watercourses. Indirect impacts on other habitats induced by the Project are not anticipated, since the disturbance would be separated/ screened considerably mixed woodland, plantation, shrubland/grassland and watercourses, and/or, have already been influenced by existing human activities.

10.8.1.14 Dust generated due to proposed works, if not effectively controlled, could affect the health

of adjacent vegetation. Excessive dust covering leaves can lead to reduction in their photosynthetic rates, abrasion and blocking of stomata. Improper dumping of construction materials and waste within and/or near to the Project Area (aboveground) may result in environmental degradation of the surrounding habitat, which is more sensitive for the retained flora species of conservation importance. Artificial lighting (glare) would affect some light sensitive wildlife (e.g. nocturnal fauna) at nearby habitats (e.g. woodland, mixed woodland). This can result in a reduction in the density of faunal population in an area through disorientation from, and attraction to artificial light, and disruptive effects on the light-sensitive cycles of light sensitive/nocturnal species. This can affect migration, foraging/predation and breeding success of species. Potential disturbance by construction noise and increased human activities may cause wildlife to avoid using areas adjacent to the Project Area (aboveground), and thereby reduce wildlife density in the area.

10.8.1.15 These potential impacts are expected to be low, due to its minimal natural ecological resources being affected, especially for those located near Lam Tei Quarry which are already subjected to considerable level of disturbance (e.g. noise, dust cause by active operation of mining machinery for rock materials within the quarry), temporary nature of construction activities and with the implementation of recommended measures (e.g. restriction of strong artificial lighting and provision of screening). Potential disturbance to nearby habitats are presented in **Table 10.34**.

10.8.1.16 For the drill-and-blast/drill-and-break tunnelling works within the Project Area (underground) underneath Tai Lam Country Park and Sam Shing Estate, the majority of the tunnel section would be in granite and the depth of this tunnel section would vary between 43 – 465m below local ground. With sufficient depth below ground and the implementation of mitigation measures such as the installation of acoustic tunnel doors at tunnel portals as discussed in **Section 4.4.3 – Section 4.4.4**, impacts related to noise, vibration and other indirect impacts resulting from tunnelling works are considered negligible. Bat roosts that may be sensitive to ground-borne noise and vibration were also not identified within the Assessment Area. Potential impacts on ecological resources due to tunnelling works within the Project Area (underground) are therefore considered insignificant. Alternative tunnelling methods, including the use of TBM in Tai Lam Country Park were duly explored but considered not suitable from the engineering perspective.

Table 10.34 Potential Disturbance to Nearby Habitats within Assessment Area

Habitat Type	Mixed Woodland	Fung Shui Woodland	Plantation	Shrubland/ Grassland	Watercourse	Reservoir	Agricultural Land	Developed Area
Habitat Quality	Low to Moderate	Moderate to High	Low	Low to Moderate	Low to Moderate	Low	Very low	Very low
Species	Flora species of conservation importance: *Aquilaria sinensis*, *Artabotrys hongkongensis*, *Diospyros vaccinioides*, *Enkianthus quinqueflorus*, *Geodorum densiflorum* and *Gnetum luofuense* Fauna species of conservation importance: Chinese Noctule, Japanese Pipistrelle, *Myotis sp.*, Unidentified Bat, Masked Palm Civet, Black Kite, Grey Nightjar,	Flora species of conservation importance: *Ixonanthes reticulata*, *Ormosia emarginata and Pavetta hongkongensis* Fauna species of conservation importance: Dingy-Dusk Hawker	Flora species of conservation importance: *Gnetum luofuense* Fauna species of conservation importance: Unidentified Bat, Pallas's Squirrel, Black Kite, Black-throated Laughingthrush, Indochinese Yuhina, Siberian Blue Robin, Metallic Cerulean	Flora species of conservation importance: *Brainea insignis*, *Diospyros vaccinioides*, *Gnetum luofuense*, *Nepenthes mirabilis*, *Ormosia emarginata*, *Ormosia semicastrata*, *Rhododendron simsii* and *Thysanotus chinensis* Fauna species of conservation importance: Japanese Pipistrelle, Red Muntjac, Crested Serpent Eagle, Black Kite, Eastern Buzzard, Greater Coucal, Collared Scops Owl, White-	Flora species of conservation importance: *Arundina graminifolia*, *Cerartopteris thalictroides*, *Nepenthes mirabilis* Fauna species of conservation importance: Black-crowned Night Heron, Hong Kong Cascade Frog, Chinese Bullfrog, Lesser Spiny Frog, Copperhead Racer, Common Rat Snake, Emerald Cascader and Freshwater Crab (*Cryptopotamon anacoluthon*, *Nanhaipotamon hongkongense* and *Somanniathelphu*	Flora species of conservation importance: *Nepenthes mirabilis* Fauna species of conservation importance: White-throated Kingfisher	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance: Chinese Noctule, Japanese Pipistrelle, Least Pipistrelle, Chinese Pipistrelle, Brown Fish Owl, Danaid Eggfly, Small Cabbage White, Dancing Shadow-emerald and Scarlet Basker

Habitat Type	Mixed Woodland	Fung Shui Woodland	Plantation	Shrubland/ Grassland	Watercourse	Reservoir	Agricultural Land	Developed Area
	Rufous-capped Babbler, Black-throated Laughingthrush, Indian Forest Skink, Common Wolf Snake, Many-banded Krait and Malayan			throated Kingfisher, Black-throated Laughingthrush	*sa zanklon*)			
Size/ Abundance	~ 263 ha Low to moderate for avifauna and butterfly and low for rest of fauna groups	~2.6ha Low faunal diversity	~ 94.1 ha Low to moderate for avifauna and butterfly and low for rest of fauna groups	~ 389.7 ha Low to moderate for avifauna and butterfly and low for rest of fauna groups	~ 17.3 ha (~33.4 km) Low to moderate for odonates, amphibian and aquatic fauna, low for other terrestrial fauna groups	~ 1.6 ha Low abundance and richness for terrestrial fauna species	~ 7.6 ha Low abundance and richness for terrestrial fauna species	~ 451.9 ha Low abundance and richness for terrestrial fauna species
Duration	Last during working hours in construction phase							
Reversability	Reversible, disturbance will be ceased once works stopped/ completed							
Magnitude	Low, as the works of the Project are temporary and the major Project footprint are underground							
Overall Impact Severity	Low to moderate significance in construction	Low significance in construction phase, and Negligible in	Low to moderate significance in construction phase, and Negligible in	Low to moderate significance in construction phase, and Negligible in	Low to moderate significance in construction phase, and Negligible in	Low significance in construction phase, and Negligible in	Low significance in construction phase, and Negligible in	Low significance in construction phase, and Negligible in operation phase

Habitat Type	Mixed Woodland	Fung Shui Woodland	Plantation	Shrubland/ Grassland	Watercourse	Reservoir	Agricultural Land	Developed Area
	phase, and Negligible in operation phase	operation phase	operation phase	operation phase	operation phase	operation phase	operation phase	

Impacts on watercourses caused by construction site run-off

10.8.1.17 During the proposed works, uncontrolled site runoff may be generated. The uncontrolled runoff may involve sediments, or the contaminants released from site surface, groundwater infiltration, tunnel discharge, drainage channels, stockpiles, earth working area, concrete or cement material, wash water from dust suppression sprays, wheel washing facilities and fuel, oil, solvents/lubricants release from maintenance of construction vehicles and machinery. Without proper site practices to avoid construction run-off during the construction phase, sediment from the run-off, particularly during periods of heavy rain, will raise the turbidity level in the watercourse, which would lead to direct mortality of aquatic fauna such as freshwater crab as discussed in **Section 10.8.1.8**. Increased sediment load in the watercourses may also lead to eutrophication as a result of nutrient enrichment. Eutrophication may then be happened, and severe eutrophication can lead to oxygen depletion and the impoverishment of aquatic communities, as well as animals that prey on them (e.g. herpetofauna). Chemicals from construction run-off may have acute toxic effects on aquatic fauna. Nevertheless, considering the construction activities as described in **Section 5.5**, potential water quality impact through release of pollutants during construction is expected to be highly localised and well controlled. In addition, as discussed in **Section 10.8.1.4**, stream diversion works will be carried out to divert any water flow from the upper sections of the concerned watercourses to the lower section of watercourses which will have similar ecological features and/or hydrology setting outside the Project Area, and thus, excessive water flow entering the construction area will be avoided and the water flow between unaffected sections of the stream will be maintained. Stream diversion works at S2 is located strictly within the Project Area as such no adverse impacts related to construction site run-off are anticipated for upper sections of the watercourse within Tai Lam Country Park which is located outside of the Project Area. Overall, it is considered that indirect impact on the watercourses in terms of water pollution would not be anticipated with the implementation of the mitigation measures and good site practices as stated in **Section 5.7**.

Groundwater drawdown

10.8.1.18 The proposed drill-and-blast/drill-and-break tunnelling works within the Project Area (underground) underneath Tai Lam Country Park and Sam Shing Estate may lead to groundwater infiltration and potential groundwater table drawdown. Any potential drawdown could result in different degrees of settlement and dewatering of surface waterbodies (i.e., Lam Tei Irrigation Reservoir, Hung Shui Hang Irrigation Reservoir, and nearby streams) which may result in impacts to freshwater-associated flora and fauna utilizing these waterbodies. Groundwater in the vicinity may also be depleted.

10.8.1.19 The drill-and-blast/drill-and-break tunnel section would be in granite and with sufficient depth below ground (43 – 465m), together with the implementation of practical groundwater control measures, good practices and mitigation measures as described in **Section 5.7**, adverse impacts from groundwater infiltration is not anticipated. Alternative tunnelling methods, including the use of TBM in Tai Lam Country Park were duly explored but considered not suitable from the engineering perspective.

10.8.1.20 For the TBM tunnelling works within the Project Area (underground) from Tuen Mun Area 44 to Pillar Point, the tunnel sections would be approximately 10 – 60m underneath local ground and seabed. While TBM tunnelling may influence the groundwater levels, the groundwater level would be quickly re-balanced by the surrounding marine

environments. Also, the TBM tunnelling works within Tuen Mun Typhoon Shelter would take place at the granite layer underneath thick marine deposit and alluvium layers, the disturbance to the marine deposit and alluvium layers of Tuen Mun Typhoon Shelter should be minor. For the section between Tuen Mun Area 44 to Pillar Point, the vertical alignment would also go through both granitic and volcanic layers. Therefore, any change of groundwater level caused by the Project would be insignificant and hence significant changes in underground hydrology, hydrodynamic regime, sediment erosion, and deposition patterns are not anticipated.

10.8.2 Operation Phase

10.8.2.1 The Project Area (aboveground) is not situated within any recognized site of conservation importance. Direct ecological impacts on recognized site of conservation importance during operation phase is not anticipated.

10.8.2.2 Given the proposed works would mainly involve underground tunnel, fenced elevated road, located at Lam Tei Quarry which are already subjected to considerable level of disturbance due to active operation of mining machinery, or follow the existing roads which are situated in highly urbanised areas, the TMB is therefore less likely utilized by wildlife which mainly inhabit in the hillside natural habitats. Direct injury/mortality to wildlife (e.g. road-kill) due to the traffic flow along the proposed TMB during operation phase is not expected to be anticipated.

10.8.2.3 Potential disturbances to habitats and wildlife groups during the operation phase includes the increased level of noise and light intensity (glare) from the road traffic and associated facilities, including ventilation buildings and administration buildings due to the Project are mainly restricted to the portal areas which are located at the fringe of natural habitats including mixed woodland, shrubland/grassland and watercourses, and therefore the impacts are predicted to be minimal.

10.8.2.4 Impacts from surface run-off from paved areas and tunnel run-off of the Project during the operation phase are generally much lower than that during the construction phase, as, integral to the design, such as avoidance of direct discharge of tunnel runoff into nearby waterbodies, all surface runoff will be connected to the periphery drainage system, and will pass through a series of silt and oil interceptors within the road gullies as well as a main silt and oil trap, to ensure that there is no pollution into surrounding watercourses or other natural habitats. All such interceptors will be properly maintained on a regular basis to ensure continued function. In addition, sewage effluent from the proposed associated buildings would be discharged through sewers that are connected to public sewerage systems which are located at the vicinity of the buildings. Potential groundwater drawdown is also anticipated to be insignificant with the majority of the tunnel section to be constructed with granite and sufficient depth below ground together with the good practices and mitigation measures adopted during construction phase. And thus, there will be no unacceptable adverse water quality impacts to adjacent ecological sensitive habitats due to the operation of the proposed roads and buildings is anticipated with the proper implementation of these mitigation measures as described in **Section 5.8.3**.

10.8.2.5 Overall, no significant impact on ecological resources is expected during operation phase of the Project.

10.9 Cumulative Impacts

10.9.1 Concurrent Projects

10.9.1.1 In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report to identify a number of other concurrent projects in the vicinity that are undergoing planning, design, construction and/or operation within the construction and/or operation period of the Project has been conducted and presented in **Section 2.10**. Concurrent projects with overlapping construction periods that are of relevance to ecology are included below:

- Traffic Improvement Scheme in Tuen Mun – Widening and Addition of Slip roads at Lung Fu Road/ Tuen Mun Road/ Wong Chu Road/ Hoi Wing Road;
- Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange);
- Route 11 (Section between Yuen Long and North Lantau);
- Underground Quarrying at Lam Tei, Tuen Mun;
- Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat Section); and
- Tuen Mun South Extension.

Projects under study or planning

10.9.1.2 The proposed works of Traffic Improvement Scheme in Tuen Mun – Widening and Addition of Slip roads at Lung Fu Road/ Tuen Mun Road/ Wong Chu Road/ Hoi Wing Road and Widening of Yuen Long Highway (Section between Lam Tei Quarry and Tong Yan San Tsuen Interchange) are still under study or planning and fall within the current assessment area at the Northern Portal and Wah Fat Playground region. According to the best information available at this stage, no confirmed design information of these projects is available. However, with the adoption of ecological mitigation measures to be specified in respective separate studies, adverse cumulative ecological impact from these projects is not anticipated.

Route 11 (Section between Yuen Long and North Lantau)

10.9.1.3 The proposed development of Route 11 (Section between Yuen Long and North Lantau) will commence in 2025 and completed by 2033 partly overlaps and interfaces with the Northern Portal and magazine sites. According to the best information available at this stage, no confirmed design information of these projects is available. Cumulative ecological impacts, mainly in the form of cumulative habitat loss and disturbance for aboveground works during construction phase, will arise when the construction programme of both projects overlaps. However, as the directly impacted habitats were of comparatively low ecological value and there will be no aboveground works in the Tai Lam Country Park, significant cumulative ecological impact is not expected to arise. Cumulative impacts are expected to arise for underground works, especially for sections near Lam Tei that are close to each other. However, with the implementation of mitigation measures as mentioned in **Section 10.10.8**, no adverse impacts related to groundwater infiltration are anticipated for underground works within the Tai Lam Country Park. Impacts related to related to ground-borne noise and vibration are also not anticipated as noise sensitive receivers such as catchwater tunnels and bat roosts are of relatively far

distance away from the Tuen Mun Bypass Assessment Area.

Underground Quarrying at Lam Tei, Tuen Mun

10.9.1.4 The development of an underground quarry at Lam Tei, Tuen Mun will commence in 2024/25 and will be completed by 2025/27 partly overlaps with the northern portion of the current assessment area. Construction of underground explosive magazine site at Lam Tei Quarry of the current Project will overlap with the construction programme of the development of an underground quarry at Lam Tei. However, as the works are mainly situated in developed area and involve underground works, any adverse cumulative ecological impact (e.g. disturbance) is unlikely to arise.

Cycle Track between Tsuen Wan and Tuen Mun (Tuen Mun to So Kwun Wat Section)

10.9.1.5 The EIA report for Cycle Track between Tsuen Wan and Tuen Mun (AEIAR-239/2022), comprising the development of a new cycling track, was approved with conditions in 2022. The construction programme was expected to start in 2023 and is expected to reach completion in 2026. Despite that part of the cycle track alignment in Wah Fat Playground area along Castle Peak Road – Castle Peak Bay falls within the current assessment area and the construction programme of both projects overlaps in 2026, cumulative ecological impact is not expected as the advance works for the Project, as the project alignment of the cycle track is mainly located within developed area, as such any adverse cumulative ecological impact (e.g. disturbance) is unlikely to arise.

Tuen Mun South Extension

10.9.1.6 The EIA report for Tuen Mun South Extension (AEIAR-236/2022), comprising the extension of the existing Tuen Ma Line southwards by 2.4km, was approved with conditions in 2022. The construction programme was expected to start in 2023 and is expected to reach completion in 2030. As the project alignment of the railway extension is mainly located aboveground and only overlaps with the underground alignment of Tuen Mun Bypass, any adverse cumulative ecological impact (e.g. disturbance) is unlikely to arise.

10.10 Mitigation Measures

10.10.1.1 According to the EIAO-TM Annex 16 and EIAO Guidance Note. 3/2010, ecological impacts on important habitats and the associated wildlife caused by the proposed development should be mitigated by, in order of priority, avoidance, minimization, and compensation approaches to the maximum practical extent.

10.10.2 Avoidance of Impacts to Ecologically Sensitive Habitats

10.10.2.1 The Project alignment has been selected based on environmental and other considerations (refer to **Section 2**). It mainly comprises construction of a road tunnel of about 7.5 km long running through Tuen Mun and Tai Lam Country Park, linking the TM-CLKT and the YLH and KSWH, within the Project Area (underground) by either drill-and-blast/drill-and-break (i.e. section between Northern Portal and Sam Shing Estate) or Tunnel Boring Machine (TBM) (i.e. section between Sam Shing Estate and Southern Portal) methods. Therefore, no aboveground works will be carried out within the recognized sites of conservation importance (including Lam Tei and Yick Yuen Conservation Area and Tai

Lam Country Park) so as to avoid any direct ecological impacts. Consideration has been taken to maximize the distance in between the Project Area and the Tai Lam Country Park to further avoid and minimise indirect impacts on the Country Park.

10.10.3 Minimisation of Habitat Loss/Disturbance and Impacts to Fauna Species of Conservation Importance

10.10.3.1 The alignment option and design of the Project has been substantially evaluated and revised to minimize the impact on the ecological resources, including natural habitats, species of conservation importance and recognised sites of conservation importance (e.g. Tai Lam Country Park) via the following modifications:

- Minimise the clearance of existing trees and vegetation in the natural habitats, particularly those in Tai Lam Country Park, by adopting either drill-and-blast/drill-and-break or TBM method for tunnelling works rather than the conventional Cut-and-Cover method.
- Minimise indirect impacts to Lam Tei Irrigation Reservoir by shifting the link roads and the mainline eastward so as to allow integrated site formation for tunnel portals of TMB and Route 11 which can also reduce environmental impact associated with site formation.
- Minimise direct impact to two species of conservation importance, *Cryptopotamon anacoluthon* and *Nanhaipotamon hongkongense*, by shifting the Project Area away from the perennial stream where these species were recorded.
- Temporary loss of habitat is expected to occur for plantation (~ 1.5ha) and shrubland/grassland (~ 0.1ha) at Proposed Works Area and Magazine Site (Aboveground) during the construction phase. Upon the completion of construction works, these areas would be decommissioned and reinstated to its original condition in principle.

10.10.4 Protection of Flora Species of Conservation Importance

10.10.4.1 As discussed in **Section 10.5.4.2**, two flora species of conservation importance, including one individual of *Diospyros vaccinioides* and a small patch of *Gnetum luofuense*, were recorded in mixed woodland near Pillar Point and near Wah Fat Playground, respectively, within the Project Area (aboveground). Detailed vegetation survey should be conducted by suitably qualified botanist/ecologist for the Project Area (aboveground) within mixed woodland and shrubland/grassland at Pillar Point and near Wah Fat Playground prior to the commencement of construction activities to confirm the presence of flora species of conservation interest. If on-site preservation is not feasible, transplantation and/or mitigation measures would be recommended as far as possible to minimize the unavoidable direct loss of these species. Transplantation proposal for the affected individuals would be prepared if necessary. Potential recipient sites for the affected flora species were identified within close vicinity of their original locations and indicated in **Figure 10.7**.

10.10.5 Protection of Fauna Species of Conservation Importance

10.10.5.1 As discussed in **Section 10.8.1.8** to **Section 10.8.1.10**, fauna species of conservation importance including Freshwater Crab species, *Somanniathelphusa zanklon*, was recorded in S2 while *Somanniathelphusa zanklon*, *Cryptopotamon anacoluthon*, and

Nanhaipotamon hongkongense were recorded were recorded at the lower watercourse section where S2 and S2A is connected. Periphery drainage system surrounding the Project Area is recommended to prevent runoff affecting the three Freshwater Crab species located at S2A.

10.10.5.2 To avoid the potential direct impact on any freshwater crab species of conservation importance, prior to commencement of the stream diversion and construction works near Wah Fat Playground, an update Freshwater Crab survey should be conducted. The survey should be conducted by a qualified ecologist as part of the Environmental Team (ET) and cover the stretch of the watercourse S2 and S2A. Should species of conservation importance be found within the affected watercourse sections, a Freshwater Crab Translocation Plan should be prepared. Freshwater crab translocation should be conducted to move the affected individuals from the Project Area (aboveground) to suitable recipient site(s). A potential recipient site was identified and indicated in **Figure 10.8**. The recipient site was selected as it was observed to be a semi-natural watercourse with permanent flow and has a pre-existing population of other freshwater crab species of conservation concern within its vicinity which suggest the environmental conditions would have the potential to support the translocated individuals.

10.10.5.3 The Freshwater Crab Translocation Plan should be prepared by the qualified ecologist as a part of the ET, certified by the Independent Environmental Checker (IEC) and submitted to AFCD within four months upon completion of the update aquatic survey to agree the detailed translocation procedures including the identified receptor site(s). Approval from the Authority (e.g. AFCD and EPD) should be sought prior to conducting the freshwater crab translocation work.

10.10.5.4 The freshwater crab translocation work should be conducted prior to the commencement of the stream diversion works near Wah Fat Playground, following the approved Freshwater Crab Translocation Plan. Upon the completion of the translocation work, post-translocation survey should be conducted at the recipient site to monitor the effectiveness of translocation.

10.10.6 Measures and Good Site Practice for Minimization of Physical Disturbance to the Surrounding Habitats

10.10.6.1 The following construction phase mitigation measures are proposed to reduce predicted disturbance impacts and impact of water pollution to an acceptable level:

- Strong artificial lighting should not be used in the Project Area (aboveground) near Tai Lam Country Park at night to avoid disturbance to the natural habitats. Lighting required for safety purpose should keep minimal and pointed inward. Clear signs should be erected on site to alert all site staff and workers about the requirement;

- Stream diversion works as discussed in **Section 10.8.1.5** will be carried out to divert any water flow from the upper sections of the watercourses within Project Area (i.e. S1, S2 and S3) to the lower sections of the watercourses with similar ecological features and/or hydrology setting outside the Project Area so as to maintain the flow between unaffected sections of the stream and to avoid excessive water flow entering the construction area. Detailed design of any stream diversion should follow the guidelines in *ETWB Technical Circular (Works) No. 5/2005 (Protection of natural streams/rivers from adverse impacts arising from construction works)* and appropriate construction methods should be used;

- Stream diversion works/works near the periphery of the diverted streams/unaffected downstream sections shall preferably be performed during dry season when waterflow is low to avoid/minimize potential site run-off or associated impacts to the unaffected downstream sections;

- Sandbags/appropriate containment measures shall be used to isolate works near the periphery of the diverted streams/unaffected downstream sections to avoid/minimize potential site run-off or associated impacts to the unaffected downstream sections;

- Periphery drainage system surrounding the Project Area is recommended to prevent runoff affecting the three Freshwater Crab species located at S2A;

- Implementing measures to minimise magnitude of construction runoff and to avoid/ minimise the potential impact of spillage events, if any, and

- Appropriate measures including the provision of temporary movable toilets should be adopted. Controlled wastewater discharge to the nearby water bodies will be implemented in accordance with the guidelines stipulated in Environmental Protection Department (EPD)'s Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN1/94) during the construction works to properly control site run-off and drainage and to minimise the potential water quality impact.

10.10.6.2 Good site practice should also be adopted to minimize potential disturbances to the surrounding habitats, including:

- Avoid any damage and disturbance, particularly those caused by filling and illegal dumping to the surrounding habitats, especially watercourses;

- Excavated materials will be covered and/or properly disposed of as soon as possible to avoid being washed into nearby water bodies;

- Regularly check the site boundaries to ensure that they are not breached and that no damage occurs to surrounding ecologically sensitive habitats (e.g. mixed woodlands, shrubland/grassland and watercourses);

- Prohibit and prevent open fires within the site boundary during construction and provide temporary firefighting equipment in the work areas; and

10.10.7 Compensatory Woodland Planting

10.10.7.1 Mixed woodland in the Project Area (aboveground) will unavoidably be affected as a result of site clearance. The mixed woodland to be lost are mainly woodland fringes, that are next to developed area and are subject to considerable level of human disturbance, as such is considered to be of low to moderate ecological value. Compensatory woodland planting is suggested to compensate the loss of approximately ~2.2ha of mixed woodland. Nevertheless, on-site woodland compensation is not considered feasible due to limited space within the Project Area and on-site impracticability, and thus, off-site compensatory woodland planting is considered the only feasible option.

10.10.7.2 Wooodland compensation would follow the "like for like" basis for provision of off-site mitigation measures to the extent that is practicable according to Annex 16 of EIAO-TM, a compensatory woodland planting ratio of 1:1 in terms of the compensatory planting area (~2.2ha) will be considered and thorough justification for any eventually adopted scenario

deviating from the aforesaid ratio will be provided.

10.10.7.3 In the compensation site selection process, developed areas, plantation and shrubland/grassland with a slope angle smaller than 35° on government land, outside Country Parks, firing range, SSSIs and "Conservation Area" will be considered as potential compensatory woodland planting sites. Compensatory woodlands can be established on vacant developed areas deprived of vegetation, while native tree species can be planted in shrubland/grassland to facilitate succession to woodland. Areas (with approximate size of 3.1 ha) near the Southern Portal in Tuen Mun South (i.e. next to the potential location of compensatory woodland planting sites under the Route 11 Project) fulfilling the criteria above, are identified as potential compensatory woodland planting sites (**Figure 10.9**). The size and extent of the compensatory woodland planting sites will be subject to further review upon to confirmation of the extent of mixed woodland to be lost during the detailed design stage.

10.10.7.4 Compensatory planting with native species is preferred for the purpose of compensatory planting. The native tree species to be selected for planting should be referenced to the native trees occurring in the existing similar habitat within the assessment area. Early and timely arrangement with forest nursery for propagation of the seedlings should be made to ensure the availability of both the species and the quantity required. At maturity, the compensatory planting areas would create a habitat with different layers (i.e. canopy, middle layer and understory), which promotes habitat complexity and in turn enhancing the ecological value. A woodland compensation plan and tree compensation plan will be submitted in the detailed design stage.

10.10.7.5 The management and maintenance of the woodland compensation area should follow the Development Bureau Technical Circular (Works) No. 6/2015 Maintenance of Vegetation and Hard Landscape Features. Details of the management and maintenance program will be included in the woodland compensation plan to be submitted in the detailed design stage and agreed with relevant authorities. With the implementation of the proposed compensatory planting, ecological impact arising from the permanent loss of woodland would be compensated.

10.10.8 Minimization of Groundwater Infiltration

10.10.8.1 Whilst conducting tunnelling works, the Contractor should adopt suitable water control strategies, which are applicable to both TBM tunnelling and drill-and-blast/drill-and-break tunnelling, as far as practicable. With the implementation of suitable mitigation measures no significant impact related to groundwater infiltration is anticipated from the proposed tunnelling works, including those within the Tai Lam Country Park. Detailed measures are as discussed in **Section 5.7.2**.

10.10.9 Mitigation measures for operation phase

10.10.9.1 As discussed in **Section 10.8.2**, no significant impact on ecological resources is expected during operation phase of the Project, and thus, no mitigation measures are considered necessary to be implemented during operation phase.

10.11 Residual Impacts

10.11.1.1 Based on the above assessment as well as review on similar measures that have been

adopted in previous studies, adverse residual impacts from the Project on the ecological resources within and in the vicinity of the Project Area (aboveground) and Project Area (underground) would not be anticipated with the effective implementation of the suggested mitigation and precautionary measures in **Section 10.10**. The identified residual impacts would be the permanent loss of approximately 6.2 ha of habitats with limited ecological value (~2.2ha mixed woodland, ~3.1 ha plantation, ~0.9 ha shrubland/grassland, ~0.3km watercourse). However, these habitats are common within the assessment area and in the context of Hong Kong. In addition, the permanent loss of ~2.2ha of mixed woodland and ~0.3km of watercourses would be mitigated by the off-site compensatory woodland planting, and stream diversion respectively. The residual impact of the loss is therefore considered to be minor and acceptable.

10.12 Environmental Monitoring and Audit (EM&A)

10.12.1 Construction Phase

10.12.1.1 The assessment presented above indicates that unacceptable construction phase impacts and operation phase impacts are not expected to occur to terrestrial ecological resources. The implementation of the ecological mitigation measures and good site practices described in **Section 10.10** will be inspected and subjected to monthly site audit for all works under the Project, including Project Area near Tai Lam Country Park, as part of the ecological monitoring programme during the construction period. Details of environmental monitoring and audit (EM&A) requirements are discussed in the EM&A Manual.

Transplantation of flora species of conservation importance

10.12.1.2 Detailed vegetation survey should be conducted by suitably qualified botanist/ecologist for the Project Area (aboveground) within mixed woodland and shrubland/grassland at Pillar Point and near Wah Fat Playground prior to the commencement of construction activities at the mentioned locations to confirm the presence of flora species of conservation interest. The curriculum vitae of the qualified botanist/ecologist should be submitted to the AFCD for approval and comments prior to the survey. If on-site preservation is not feasible, transplantation and/or mitigation measures would be recommended as far as possible to minimize the unavoidable direct loss of these species. Transplantation proposal for the affected individuals would be prepared if necessary. Potential recipient sites for the affected flora species were identified within close vicinity of its original location and indicated in **Figure 10.7**. A monitoring program should be prepared in the transplantation proposal by a suitably qualified botanist/ecologist prior to the transplantation works and monitor the health conditions of the transplanted individuals upon the completion of transplantation works at the recipient site.

Translocation of freshwater crab species of conservation importance

10.12.1.3 An update ecological survey shall be conducted by a qualified ecologist as part of the ET with focus to the presence of the freshwater crabs prior to the commencement of stream diversion works near Wah Fat Playground. An update ecological survey plan should be prepared by the qualified ecologist, whose curriculum vitae should be submitted together with the survey plan to AFCD for review and comments prior to the commencement of any survey to be conducted. Should freshwater crab species of conservation importance be found within the affected watercourse sections, a Freshwater Crab Translocation Plan

should be prepared. Freshwater crab translocation should be conducted to move the individuals from the project area to suitable recipient site(s). A potential recipient site was identified and indicated in **Figure 10.8**. The Freshwater Crab Translocation Plan should be prepared by the qualified ecologist as a part of the ET, certified by the IEC and submitted to AFCD within four months upon completion of the update aquatic survey to agree the detailed translocation procedures including the identified receptor site(s) and post-translocation monitoring programme. Approval from the Authority (e.g. AFCD and EPD) should be sought prior to conducting the translocation work. The freshwater crab translocation work should be conducted prior to the commencement of the stream diversion works near Wah Fat Playground, following the approved Freshwater Crab Translocation Plan. Upon the completion of the translocation work, post-translocation survey should be conducted at the recipient site to monitor the effectiveness of translocation.

Monitoring of Compensatory Woodland

10.12.1.4 Monitoring of the compensatory woodland should be performed on a regular basis after the first planting, to monitor the survival and establishment of trees and wildlife use. Survey in each compensatory woodland location will commence after the first planting. Randomly selected individuals of each planted species will be tagged and their survival rate will be computed. Supplementary planting will be recommended if deemed necessary. Wildlife use of the planted vegetation will also be monitored. Details of the monitoring will be included in the Woodland Compensation Plan to be submitted in the detailed design stage and agreed with relevant authorities.

Monitoring on Mitigation Measures on Groundwater Infiltration

10.12.1.5 No significant impacts related to ground water infiltration is anticipated for the proposed tunnelling works including those within the Tai Lam Country Park with the implementation of suitable mitigation measures as discussed in **Section 5.7.2**. As an additional precautionary measure, surface water level monitoring at natural watercourses within Tai Lam Country Park, Lam Tei Irrigation Reservoir, and in the vicinity of the tunnelling works would be conducted during the construction and operation stages. Monthly monitoring should be conducted at the selected watercourses to monitor parameters (including water depth and water velocity) to record and evaluate if any abnormal significant decrease of the water level is arising from the Project. In case abnormalities are detected, the monitoring arrangement and remedial measures (if required) should be reported to EPD (who is the EIAO authority), AFCD and other relevant authorities. Details of the monitoring, including the monitoring locations, shall be agreed with AFCD during the detailed design stage prior to commencement of any construction activities.

10.12.2 Operational Phase

10.12.2.1 No operational phase monitoring is considered necessary.

10.13 Conclusions

10.13.1.1 The ecological impact assessment has been carried out based on literature reviews and the focused field surveys of six months covering both wet and dry seasons completed in 2022. According to the Project alignment, the Project will cause potential permanent habitat loss

to mixed woodland (~2.2ha), plantation (~3.1 ha), shrubland/grassland (~0.9 ha) and watercourse (~0.3 km).

10.13.1.2 Majority of the identified impacts are considered to be low in the absence of mitigation measures. However, the potential impact on direct loss of mixed woodland and watercourses and direct ecological impact on flora and fauna species of conservation importance as low to moderate. Necessary mitigation measures and ecological monitoring programme were proposed for the above potential impacts.

10.13.1.3 It is predicted that the impacts will mainly arise during the construction phase, as no major activities would be conducted during the operation phase that would affect the adjacent habitats.

10.13.1.4 Direct impacts on aboveground habitats in sites of conservation importance such as Tai Lam Country Park are avoided while potential indirect impacts and groundwater drawdown resulting from the tunnelling works will be suitably mitigated and monitored during both the construction and operational stages as described in **Section 10.12.1.5**.

10.13.1.5 With the implementation of proposed mitigation measures, adverse residual impacts from the Project on the ecological resources within and in the vicinity of the Project Area during construction and operation phases would not be anticipated. The residual impact of the loss is therefore considered to be minor and acceptable.