8 ECOLOGICAL IMPACT

8.1 Introduction

8.1.1 This chapter presents an assessment of potential impacts on ecological resources within the assessment area, and the results of assessment of the potential ecological impacts from the construction and operation phases of the proposed improvement to So Kwun Po Interchange.

8.1.2 According to the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO), the baseline conditions for the ecological components of the terrestrial and aquatic environment were evaluated based on information from available literature and field surveys conducted for the purposes of this EIA. The potential impacts on any ecologically sensitive receivers within the assessment area were assessed. Measures required to mitigate any identified adverse impacts were recommended, where appropriate, and residual impacts were assessed.

8.2 Legislation, Standards, and Guidelines

Ordinances and Regulations

8.2.1 The relevant legislation and associated guidelines related to this study include:

- Forests and Countryside Ordinance (CAP.96) and its subsidiary legislation, the Forestry Regulations;
- Wild Animals Protection Ordinance (CAP.170);
- Environmental Impact Assessment Ordinance (EIAO) (CAP.499);
- Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) Annexes 8 and 16; and
- Protection of Endangered Species of Animals and Plants Ordinance (CAP.586) and its subsidiary legislation.

8.2.2 This study assessment makes reference to the following guidelines and standards:

- Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10, "Conservation";
- PELB Technical Circular 1/97 / Works Branch Technical Circular 4/97,"Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures";
- EIAO Guidance Note No. 3/2010 - Flexibility and Enforceability of Mitigation Measures Proposed in an Environmental Impact Assessment Report;
- EIAO Guidance Note No. 6/2010 - Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective;
- EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment; and,
- EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys.

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

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

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

Criteria of Evaluating Species of Conservation Importance

8.2.4 Species of flora and fauna with conservation importance are given special attention. In accordance with Table 3, Annex 8 of the TM-EIAO, the ecological value of species is assessed in terms of protection status, distribution, and rarity. Flora or fauna species protected by the following laws/regulations, listed under the following conventions and/or endemic to Hong Kong, are considered to be species of conservation importance. However, this excludes exotic species, cultivated individuals, escaped cultivars or captive species, vagrants and introduced species which have lower ecological value. Species which are classified by IUCN as Near Threatened (NT), Least Concern (LC), Data Deficient (DD), or Not Evaluated (NE), and not covered by any other laws/regulations/conventions are not considered of conservation importance in the current Project. Species listed as "Near Threatened" in other guidelines/regulations, such as Red List of China Vertebrates, are also not considered of conservation importance in the current Project.

- The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species (Species which are classified by IUCN as Near Threatened (NT), Least Concern (LC), Data Deficient (DD), or Not Evaluated (NE), and not covered by any other laws/regulations/conventions are not considered of conservation importance);
- China Plant Red Data Book;
- China Species Red List;
- Category I or II protected species in mainland China;
- Threatened Species List of China's Higher Plants (Qin *et al*. 2017);
- Red List of China's Vertebrates;
- Rare and Precious Plants of Hong Kong (2003);
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- Forestry Regulations (CAP.96A) which are subsidiary legislation of the Forests and Countryside Ordinance (CAP.96);
- Wild Animals Protection Ordinance (CAP.170) (except birds as all wild birds are protected under the ordinance but their conservation importance is not equal);
- Protection of Endangered Species of Animals and Plants Ordinance (CAP.586);
- PRC Wild Animal Protection Law;

- Plant species considered 'Rare' or 'Very Rare' listed by Corlett *et al.* (2000) where applicable; and
- Fauna species considered of concern in Fellowes *et al.* (2002).

8.3 Assessment Methodology

Assessment Area

8.3.1 The Assessment Area for ecological impact assessment covered the Project Site and area within 500m from the boundary (**Figure 8.1**).

Literature Review

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

Table 8.1 Reviewed Literature

Relevant literature	Terrestrial and aquatic ecology					
	Habitat and Vegetation	Terrestrial Mammal	Avifauna	Herpetofauna	Butterfly and Odonate	Aquatic Fauna
Annual report and other publications of The Hong Kong Bird Watching Society	-	-	✓	-	-	-
AEIAR-175/2013 - Agreement No. CE61/2007(CE) North East New Territories New Development Areas Planning and Engineering Study – Investigation Final Environmental Impact Assessment Report (ARUP 2013)	✓	✓	✓	✓	✓	✓
AEIAR-052/2002 - Sheung Shui to Lok Ma Chau Spur Line	✓	✓	✓	✓	✓	✓
Distribution and preference of landscape features and foraging sites of insectivorous bats in Hong Kong urban parks (Tong 2016)	-	✓	-	-	-	-

Ecological Survey Methodology

8.3.3 The methodology of the ecological surveys makes reference to the technical guidelines of ecological assessment in Annexes 16 of Technical Memorandum under Environmental Impact Assessment Ordinance and the relevant Guidance Notes (GN 7/2010 and GN 10/2010).

8.3.4 Surveys on habitat and vegetation, avifauna, ardeid roost, egretry, ardeid fligh path, butterfly and odonate, herpetofauna, terrestrial mammal and aquatic fauna were conducted.

8.3.5 Ecological field surveys were undertaken for 6 months, covering the dry and wet season and both breeding and non-breeding seasons of ardeid (with the survey period should cover at least 3 months of ardeid breeding season). The survey period was from December 2021 to May 2022 (**Table 8.2**).

Table 8.2 Proposed Ecological Survey Programme

Survey	2021		2022									
	Dec		Jan		Feb		Mar		Apr		May	
	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT
Habitat and Vegetation	✔	-	-	-	-	-	-	-	-	-	✔	-
Avifauna	-	-	✔	✔	-	-	✔	-	-	-	✔	✔
Ardeid Roost	✔#	-	✔^	-	✔^	-	✔^	-	✔^	-	✔^	-
Egretry	-	-	-	-	-	-	✔	-	✔	-	✔	-
Ardeid Flight Path	-	-	-	-	-	-	✔^	-	✔^	-	✔^	-
Butterfly and Odonate	-	-	✔	-	-	-	✔	-	-	-	✔	-
Herpetofauna	-	-	-	-	-	-	✔	✔	✔	✔	✔	✔
Terrestrial Mammal	-	-	✔	✔	-	-	✔	✔	-	-	✔	✔
Aquatic Fauna	-	-	-	-	✔	-	-	-	-	-	✔	-

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

#Ardeid roost survey in Dec 2021 was conducted in daytime

^Ardeid roost survey during Jan to May 2022 and Ardeid Flight Path were be conducted in the evening (approximate an hour before sunset and last until the nightfall)

8.3.6 **Habitat and Vegetation:** Habitats within the assessment area were mapped based on government latest aerial photos and field ground-truthing. Walk-over surveys were conducted at representative areas of each habitat type. Vascular plant species in each habitat type were identified (with the aid of binoculars when necessary) and their relative abundance were recorded, with special attention to rare and protected species. Color photographs were taken of all habitats encountered on site and of ecological features of special importance. Habitat map of the assessment area was produced at a suitable scale using GIS software showing the types and locations of habitats and species of conservation importance in the assessment. Nomenclature of vascular plant species follows Hong Kong Herbarium (2022), whilst their rarity in Hong Kong follows Corlett *et al.* (2000) and Yip *et al.* (2010) where applicable.

The physical environment, including all recognized sites of conservation importance, conservation areas and other ecological sensitive areas, and assessment of whether these sites/areas will be affected by the Project or not were described. The ecological characteristics of each habitat type such as size, vegetation type, species present, dominant species found, species richness and abundance of major taxa groups, community structure, seasonal patterns, ecological value, inter-dependence of the habitats and species, and presence of any features of ecological importance were also described.

8.3.7 **Avifauna:** The avifauna of each habitat types within the assessment area were surveyed using transect count method, the survey transect is shown in **Figure 8.1**. All avifauna seen or heard were identified and their abundance recorded by habitat. Signs of breeding (e.g. nests, recently fledged juveniles) were recorded, if any. As some birds (e.g., owls, nightjars) are nocturnal, night surveys were also conducted. Nocturnal birds were identified by active searching using spot-light and by their calls. Ornithological nomenclature follows AFCD (2021).

8.3.8 **Ardeid Flight Path:** The North District Park Egretry and Day Roost (NDPEDR) contains both breeding and roosting ardeids. As breeding activity is more important for avifauna conservation and it is anticipated that ardeids are using similar flight paths during breeding and non-breeding

seasons, surveys on flight paths of ardeids at NDPEDR were undertaken at Ardeid Survey Point (**Figure 8.1**) monthly between March and May 2022 during ardeids breeding season to investigate the flight directions of both breeding and roosting ardeids. The flight paths of ardeid individuals taking off from the NDPEDR were recorded on map, by making reference to land features. Flight height was also be recorded. Focus was put on birds carrying out long-distance flights from the NDPEDR, especially those to their feeding grounds. As Black-crowned Night Heron is active at night, the flight path surveys were conducted in the evening, the survey was commenced approximately an hour before sunset and last until the nightfall. "Flight path" is defined as the path of an individual flying incident, while "flight-line" is defined as a line that presenting the direction of a groups of flight paths with similar direction.

8.3.9 **Egretry:** The numbers of nests in the NDPEDR were counted in daytime during breeding season (March to May, 2022) at the Ardeid Survey Point (**Figure 8.1**).

8.3.10 **Ardeid Roost:** The NDPEDR is also a day-roost for Black-crowned Night Heron, the number of Black-crowned Night Heron roosting there were counted six times during non-breeding season and breeding season between December 2021 and May 2022 in evening (approximately an hour before sunset and last until the nightfall), except December 2021 where the ardeid roost was conducted in daytime, at the Ardeid Survey Point (**Figure 8.1**).

8.3.11 **Butterflies and Odonates:** Odonates and butterflies within the assessment area were surveyed quantitatively using the transect method, the transect is shown in **Figure 8.1**. Odonates and butterflies observed were identified and their abundance was recorded by habitat. Odonates and butterflies encountered outside survey transects but within the assessment area were recorded in order to produce a complete species list. Nomenclature of odonate follows AFCD (2021).

8.3.12 **Herpetofauna:** Herpetofauna within the assessment area were surveyed by active search. All reptiles and amphibians sighted were recorded. As herpetofauna are mostly nocturnal, night surveys were carried out. Potential microhabitats of herpetofauna such as wall, fallen logs, litter, channel/nullah, fishpond margins, underneath of stones or other materials, artificial container (e.g., pots) were searched during surveys to locate cryptic or secretive herpetofauna species. Amphibians were also identified by their calls during night surveys. Nomenclature follows AFCD (2021).

8.3.13 **Mammals:** Mammal surveys (including day and night-time surveys) were carried out and covered representative habitats within the assessment area. Mammals, including their breeding/roosting sites, within the assessment area were surveyed by active search. All sightings, tracks, and signs of mammals found were recorded. As some mammal species (e.g., bats) are nocturnal, night surveys were conducted. Nomenclature of mammal follows the biodiversity database maintained by Agriculture, Fisheries and Conservation Department (AFCD 2021). Potential habitats and locations for roosting, commuting, foraging and drinking of bats were surveyed, particular attention was paid to the potential roosting sites adjacent to and within the Project Site, such as the trees, potential roosts under the bridges and buildings. The calls of bats were recorded during and after sunset continuously for 4 hours by ultrasonic bat detector (Wildlife Acoustics: Echo Meter Touch 2 PRO). 1 ultrasonic bat detector was used for each survey. The files were saved for later analysis with computer software (Kaleidoscope, Echo Meter). Bats were also surveyed by direct count and observation of behaviour, including the size, flying pattern and height.

8.3.14 **Freshwater Communities:** Surveys of freshwater communities were undertaken at the stream/watercourse (either natural and man-made) likely to be affected by the Project by means of direct observation with the aid of binoculars. The Aquatic Sampling Points is shown in **Figure 8.1**. Surveys of freshwater communities were not undertaken in ponds as the ponds within assessment area are enclosed man-made landscape pond and fung shui pond where no wildlife is anticipated to be presence. All freshwater fauna found were identified to the lowest

possible taxonomic level with their abundance recorded, and the nomenclature for fish follows AFCD (2021).

8.3.15 Apart from the abovementioned survey methodology, special attention was also paid for those wildlife groups and habitats with conservation importance, including but not limited to the following:

(a) vegetations and plantations;

(b) watercourses especially Shek Sheung River as foraging grounds for wildlife;

(c) avifauna including ardeids (e.g. Black-crowned Night Heron);

(d) egretry and/or roosting location(s) of ardeids and their flight paths (in particular the direction of flight to and from the egretry and/or roosting location(s) and height of flight path over the Project site);

(e) mammal (in particular, bats species) and their breeding/roosting sites; and

(f) any other habitats/species identified as having special conservation interest by this EIA study.

Methodology for the Ecological Impact Assessment

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

8.3.17 Suitable methodology was used, with consideration of other projects in the vicinity of the Project Site and reasonably likely to occur at the time, to identify and quantify as far as possible any direct (e.g. loss of habitats), indirect (e.g. changes in water qualities, hydrology, light, noise, traffic and human activity and other disturbance generated by the construction and operation activities, etc.), on-site, off-site, primary, secondary and cumulative ecological impacts on the wildlife groups and habitats identified such as direct loss of habitats, destruction of habitats, reduction of species abundance/diversity, loss of roosting, breeding and/or feeding grounds, reduction of ecological carrying capacity, loss in ecological linkage and function, habitat fragmentation and any other possible disturbance caused by the Project, in particular the following:

(a) noise, glare, dust and other human disturbance to wildlife during construction and operation phases of the Project;

(b) indirect ecological impacts due to changes in the water quality and hydrology, as a result of surface run-off any associated disinfection activities, temporary sewage overflow, accidental discharge of untreated sewage, etc. in the water bodies, drainage channels and other wildlife habitats in the assessment area during construction and operation phases;

(c) impacts on birds due to collision to transparent or semi-transparent or reflective noise barriers, if any, and any above-ground structure;

(d) impacts on egretry, roosting and breeding ardeids, and their flight paths;

(e) impacts arising from and/or associated with the proposed works e.g. direct mortality of fauna (e.g. road-kill), barrier effect on mobile species, disturbance impacts;

(f) impacts due to increase in human activities and disturbance during the construction and operation phases of the Project such as increase in light intensity; and

(g) cumulative impacts due to other planned and committed concurrent development projects at or near the Project area.

8.3.18 The significance and acceptability of the ecological impact using defined criteria in the TM and based on the best and latest information available during the course of the EIA study were evaluated, using quantitative approach as far as practicable and covering construction and operation phases of the Project as well as the subsequent management and maintenance requirement of the Project.

8.3.19 Possible alternatives and practicable mitigation measures to avoid, minimise and/or compensate for the adverse ecological impacts identified during construction of the Project were recommended.

8.3.20 The feasibility and effectiveness of the recommended mitigation measures was evaluated, and the scope, type, location, implementation arrangement, resources requirement, subsequent management and maintenance of such measures were defined.

8.3.21 The residual ecological impacts after implementation of the proposed mitigation measures were determined and quantified as far as possible.

8.3.22 The significance and acceptability of the residual ecological impacts using well-defined criteria in Annex 8 of the TM was evaluated and whether off-site mitigation measures are necessary to mitigate the residual impacts and affirmative were determined.

8.3.23 The need for and recommend any ecological monitoring programme required was also reviewed.

8.4 Ecological Baseline Condition

Literature Review

Recognized site of conservation importance

8.4.1 There is no recognized site of conservation importance within the Project Site nor the Assessment Area.

Important Habitats

North District Park Egretry and Day Roost

8.4.2 The North District Park Egretry and Day Roost (NDPEDR) is located at the northeast part of the assessment area and it is close to the northeast boundary of the Project Site. The NDPEDR is firstly recorded in June 2020. It is located on the trees within the pond of the North District Park (NDP). According to the Hong Kong Bird Watching Society (Anon 2022), in 2022, forty-four nests of Black-crowned Night Heron were found, accounting for 3.4% of the total ardeid nests / 11.8% of the total Black-crowned Night Heron nests recorded in Hong Kong. It is the ninth largest egretry in Hong Kong and it is the one of the eleven egretries in Hong Kong nested by Black-crowned Night Heron. Besides, the NDPEDR is also the day-roosting site of Black-crowned Night Heron.

Man Kam To Road Egretry

8.4.3 The Man Kam To Road Egretry is located outside the Assessment Area of the current Project and is located about 2 km to the north away from the Project Site. It was first discovered in 2009. In 2022, 14 nests of Little Egret and 24 nests of Chinese Pond Heron were recorded by Hong Kong Bird Watching Society (HKBWS), accounting for 3% of total nests recorded in Hong Kong (Anon 2022).

Long Valley

8.4.4 Long Valley is located outside the Assessment Area of the current Study and about 1.5km to the west of the Project site. Long Valley is a piece of fresh water agricultural wetland, it supports half of local avifauna species (The Conservancy Association, 2005).

Habitat and species of conservation importance

8.4.5 In the EIA study of North East New Territories New Development Areas (AEIAR-175/2013), part of the assessment area in that EIA overlaps with the northern part of the Assessment Area of the current study. In that overlapping area, six habitats were recorded, namely dry agriculture, grassland, orchard, plantation, village area and urban. In general, the ecological values of these habitats were ranked as "Low" to "Low to moderate". **Table 8.3** shows the detail of the ecological value of each of the habitat. While no species of conservation importance was recorded in that overlapping area.

8.4.6 According to the EIA study of Technical Study on Partial Development of Fanling Golf Course Site (EIA-282/2022), part of the assessment area in that EIA overlaps with a small area near the western boundary of the Assessment Area of the present study. There are five habitats identified in the overlapped area including active agricultural land, developed area, mixed woodland, orchard and watercourse. **Table 8.4** shows the detail of the ecological value of each of the habitats. While no species of conservation importance was not recorded in that overlapping area.

8.4.7 In the EIA study of Lok Ma Chau Spur Line (AEIAR-052/2002), small area of assessment area overlaps with the western part of the Assessment Area of the current Project. The habitats within the overlapping part include developed area and plantation forest which are of low ecological value (**Table 8.4**). No species of conservation importance was recorded in the overlapping part.

Table 8.3 Habitats and their ecological value in AEIAR-175/2013

Habitat	Ecological Value
Dry agriculture	Low
Grassland	Low
Orchard	Low
Plantation	Hillside plantation: Low to Moderate Roadside and Urban Plantation: Low
Village area	Low
Urban	Low

Table 8.4 Habitats and their ecological value in AEIAR-052/2002

Habitat	Ecological Value
Developed area	Low
Plantation forest	Low

8.4.8 As mentioned in **Section 8.4.2**, the NDPEDR is located within the Assessment Area. According to HKBWS (Anon 2022), Black-crowned Night Heron was found using there. Black-crowned Night Heron is considered as Local Concerned by Fellowes *et al.* (2002). (**Table 8.5**).

8.4.9 According to Tong (2016), four bat species were found in the NDP, they include Lesser Bamboo Bat *Tylonycteris pachypus*, Japanese Pipistrelle *Pipistrellus abramus*, Least Pipistrelle *Pipistrellus tenuis* and Chinese Pipistrelle *Hypsugo pulveratus.* They are all protected under CAP.170 in Hong Kong. Apart from CAP.170, Lesser Bamboo Bat and Chinese Pipistrelle are also considered as Local Concerned by Fellowes *et al.* (2002). (**Table 8.5**).

Table 8.5 Fauna species of conservation importance recorded within the Assessment Area of the current Project from the reviewed literature

Scientific Name [1]	Common Name [1]	Locations	Rarity and Distribution in Hong Kong [1]	Conservation status [3,4,5,6]	Source
Bird (Remarks: all wild bird species are protected under CAP.170 Wild Animals Protection Ordinance in Hong Kong [2])					
Nycticorax nycticorax	Black-crowned Night Heron	NDPEDR	Common resident and winter visitor. Widely distributed in Hong Kong.	Fellowes *et al.* (2002): (LC)	Anon (2022)
Mammal					
Tylonycteris pachypus	Lesser Bamboo Bat	NDP	Fairly widely distributed in countryside areas throughout Hong Kong.	Fellowes et al. (2002): (LC); (CAP.170)	Tong (2016)
Pipistrellus abramus	Japanese Pipistrelle	NDP	Very Common Widely distributed throughout Hong Kong.	(CAP.170)	Tong (2016)
Pipistrellus tenuis	Least Pipistrelle	NDP	Uncommon 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.	(CAP.170)	Tong (2016)
Hypsugo pulveratus	Chinese Pipistrelle	NDP	Rare/Species of Conservation Concern 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.	Fellowes et al. (2002): (LC); (CAP.170)	Tong (2016)

Scientific Name [1]	Common Name [1]	Locations	Rarity and Distribution in Hong Kong [1]	Conservation status [3,4,5,6]	Source

Notes:
1. AFCD (2021). Hong Kong Biodiversity Database.
2. CAP.170 Wild Animals Protection Ordinance
3. CAP.586 Protection of Endangered Species of Animals and Plants Ordinance.
4. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2020). Appendices I, II and III.
5. Fellowes *et al.* (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong.
   - For conservation status listed by Fellowes *et al.* (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.
6. List of State Protected Wild Animals, promulgated by the State Council

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

RC = Regional Concern

Identification of information gap

8.4.10 As the reviewed literature is not covering the entire assessment area of the current Project, thus, an ecological survey is proposed to be conducted to obtain a complete ecological baseline information.

Ecological Survey Results

Habitat

8.4.11 There were eight types of habitats identified within the Assessment Area, namely agricultural land, channel, developed area, mixed woodland, orchard, plantation, pond and shrubland/grassland. Among these habitats, two habitats, namely developed area and plantation were also found within the Project Site. The Project Site was co-dominated by developed area and plantation (**Table 8.6**).

8.4.12 Agricultural land located at the northern and the southern parts of the Assessment Area. Agricultural land under both active and abandoned farming practice were found. This habitat was dominated by crops such as *Brassica oleracea* var. *italica, Lactuca sativa* var. *ramosa* and *Zingiber officinale* and weedy species such as *Ipomoea cairica* and *Panicum maximum*.

8.4.13 Channel within the Assessment Area include the channelized section of Shek Sheung River that running from the southwest boundary to the middle of the Assessment Area. This section was channelized with bed and bank paved with grasscrete. Vegetation was found growing at the pits of the grasscrete and they are mainly weedy or hydrophilic species such as *Alternanthera paronychioides, Commelina diffusa, Hydrocotyle verticillata* and *Wedelia trilobata*. Low abundance of ardeids were observed lingering along the channel, thus, this channel is considered as a potential foraging ground for ardeids.

8.4.14 Developed area within the Assessment Area consisted of roads, villages, residential areas, and other anthropogenic structures. This habitat is the dominant habitat within the Assessment Area and was prone to human disturbance. Vegetation colonizing in this habitat mainly consisted of plantation/landscape species such as *Delonix regia, Ixora chinensis* and *Bauhinia purpurea* and weedy species such as *Bidens alba*, *Youngia japonica* and *Panicum maximum*.

8.4.15 Scattered patches of plantation were associating with developed area and distributed mainly in the middle and the northern part of the Assessment Area. They were mainly in form of roadside planation and plantation within the NDP. This habitat was planted with plantation species such as *Melaleuca cajuputi* subsp. *cumingiana, Ficus virens* var. *sublanceolata* and *Bauhinia purpurea*.

8.4.16 Shrubland/grassland was found at the hilltop of an unnamed small hill to the southeast of the of the Assessment Area. Plenty of graves were found in this habitat, indicating that this habitat

may be prone to certain degree of human disturbance. Shrubs and grasses could be commonly found, they include *Miscanthus sinensis, Dicranopteris pedata* and *Wikstroemia indica.*

8.4.17 Isolated mixed woodland stands were identified within the Assessment Area, and they were highly fragmented and interspersed with developed area and shrubland/grassland. As most of the woodland stands were associating with urbanized area, sign of human disturbance, such as occurrence of weeds and pioneer tree species, could be observed. Some exotic trees were also observed. The structure of the woodland stands was also simple in general and with low diversity. The canopies generally reached 6 to 12m, and the common trees observed included *Cinnamomum camphora, Macaranga tanarius* var. *tomentosa* and *Syzygium jambos.*

8.4.18 Two ponds were identified to the east next to the Project Site. They are a landscape pond located within the NDP and a fung shui pond in Fanling Wai. The pond in Fanling Wai is largely paved with concrete and only sparse vegetation could be found. The pond in the NDP was planted with landscape species, such as *Taxodium distichum* and *Schefflera actinophylla*, at the bunds and the small islands. The NDPEDR is also located at trees on the three small islands within this pond.

8.4.19 A small patch of orchard was identified near the southwest boundary of the Assessment Area. This habitat was under active cultivation of fruit trees and small number of crops. Common species recorded in this habitat include *Clausena lansium* and *Litchi chinensis.*

8.4.20 In general, there is no significant seasonal difference among the surveyed habitats, except for the NDPEDR which will be further discussed in **S.8.4.32** to **S.8.4.34**. The inter-dependence of habitats and species will be described in habitat evaluation tables as **Table 8.11.1** to **Table 8.11.8**.

Table 8.6 Habitat recorded within the Project Site and Assessment Area

Habitat	Within the Project Site		Outside Project Site but within Assessment Area		Within the Assessment Area		Percentage of habitats within the Assessment Area by size (%)
	Size (ha)	Length (m)	Size (ha)	Length (m)	Size (ha)	Length (m)	
Agricultural land	-	-	3.83	-	3.83	-	2.10
Channel	-	-	1.30	607.57	1.30	607.57	0.72
Developed area	7.10	-	147.00	-	154.10	-	84.55
Shrubland/ Grassland	-	-	2.67	-	2.67	-	1.46
Mixed woodland	-	-	10.21	-	10.21	-	5.60
Orchard	-	-	0.44	-	0.44	-	0.24
Plantation	2.66	-	6.32	-	8.98	-	4.93
Pond	-	-	0.73	-	0.73	-	0.40
Total	**9.76**	**-**	**172.49**	**607.57**	**182.25**	**607.57**	**100**

Vegetation

8.4.21 A total of 265 plant species were recorded within the Assessment Area, among which 102 and 145 are known to be native and exotic to Hong Kong respectively and the remaining 18 species are of uncertain origin (**Appendix 8.1**). Two flora species of conservation importance, *Ardisia villosa* and *Xylosma longifolium* were recorded within the Assessment Area.

8.4.22 *Ardisia villosa* and *Xylosma longifolium* are native species that being considered as "very rare" and "rare", respectively, by Corlett *et al.* (2000). Thus, they are considered as species of conservation importance in the present study. Their recorded locations are illustrated in **Figure 8.2**.

8.4.23 **Table 8.7** summarizes species that are not considered as species of conservation importance though having protection/conservation status and/or being considered as rare or very rare by Corlett *et al*. (2000).

Table 8.7 Species that are not considered as species of conservation importance though having protection/conservation status and/or being considered as rare or very rare

Species	Rarity in Hong Kong [1]	Protection/conservation status [2 3 4 5 6 7 8 9 10]	Reason for not being considered as species of conservation importance
Araucaria heterophylla	/	IUCN Red List (Vulnerable)	Cultivated and exotic
Bauhinia corymbosa	Very rare	/	Cultivated and exotic
Camellia japonica	/	CAP.96A	Cultivated and exotic
Casuarina equisetifolia	Rare	/	Cultivated and exotic
Cycas revoluta	/	Wild plant under State protection (category II)	Cultivated and exotic
Dimocarpus longan	Restricted	China Plant Red Data Book (Vulnerable) Wild plant under State protection (category II) Threatened Species List of China's Higher Plants (Vulnerable)	Exotic
Epipremnum pinnatum	Very rare	/	Cultivated and exotic
Impatiens balsamina	/	Rare and Precious Plants of Hong Kong (Endangered in China)	Cultivated and exotic
Lagerstroemia speciosa	/	CAP.96A	Cultivated and exotic
Litchi chinensis	Restricted	China Plant Red Data Book (Vulnerable) Threatened Species List of China's Higher Plants (Endangered)	Cultivated and exotic
Michelia x *alba*	/	CAP.96A	Cultivated and exotic
Pinus massoniana	Common	China Plant Red Data Book (Endangered)	Cultivated
Podocarpus macrophyllus	Restricted	Wild plant under State protection (category II) Threatened Species List of China's Higher Plants (Vulnerable)	Cultivated
Rhodoleia championii	Very rare	CAP.96A Rare and Precious Plants of Hong Kong (Vulnerable in China)	Cultivated
Terminalia catappa	Very rare	/	Cultivated and exotic

Notes:

1. Corlett *et al*. (2000). Hong Kong vascular plants: distribution and status.
2. International Union of Conservation for Nature. (2022). The IUCN Red List of Threatened Species. Version 2021-3.
3. Convention on International Trade in Endangered Species of Wild Flora and Fauna (2022). Appendices I, II and III.
4. Qin *et al*. (2017). Threatened Species List of China's Higher Plants.
5. Fu & Chin (1992). China Plant Red Data Book – Rare and Endangered Plants.
6. Wu *et al*. (1988). Illustration of Rare & endangered plant in Guangdong Province.
7. Hu *et al*. (2003). Rare and Precious Plants of Hong Kong.
8. CAP.586 Protection of Endangered Species of Animals and Plants Ordinance.
9. State Forestry Administration & Ministry of Agriculture. (1999). List of Wild Plants under State Protection (Part 1).
10. CAP.96A Forests and Countryside Ordinance. CAP.96A Forests and Countryside Ordinance.

Avifauna

8.4.24 Most of the recorded bird species are common and widespread in Hong Kong. Twenty-eight species were recorded within the Assessment Area in total of which seven species were recorded within the Project Site. Among all the twenty-eight species, six were considered as species of conservation importance, none of them were recorded within the Project Site. (**Appendix 8.2**), All wild birds are protected under CAP.170 Wild Animals Protection Ordinance. Locations of the species of conservation importance are shown in **Figure 8.2**, however, individuals that are considered not using the recorded habitat, such as just flying over the habitat, are not shown in **Figure 8.2**.

8.4.25 Black-crowned Night Heron *Nycticorax nycticorax* was recorded in Pond outside the Project Site but within the Assessment Area. This species is considered as Local Concern by Felloews *et al.* (2002), This species is common resident and migrant and widely distributed in Hong Kong. (AFCD, 2022)

8.4.26 Chinese Pond Heron *Ardeola bacchus* was recorded in Pond and Channel outside the Project Site but within the Assessment Area. This species is considered as Potential Regional Concern by Fellowes *et al*. (2002). It is common resident and widely distributed in Hong Kong. (AFCD, 2022)

8.4.27 Great Egret *Ardea alba* was recorded in channel outside the Project Site but within the Assessment Area. It is considered as Potential Regional Concern and (Regional Concern) by Fellowes *et al*. (2002). It is a common resident, migrant and winter visitor widely distributed in Hong Kong.

8.4.28 Little Egret *Egretta garzetta* was recorded in Developed Area outside the Project Site but within the Assessment Area. This species is considered as Potential Regional Concern by Fellowes *et al*. (2002). It is common resident, migrant and winter visitor. It is reported to be widely distributed in coastal area throughout Hong Kong. (AFCD, 2022)

8.4.29 Black Kite *Milvus migrans* was recorded flying on Developed Area outside the Project Site but within the Assessment Area. This species is considered as Regional Concern by Fellowes *et al*. (2002). It is common resident and winter visitor. It is reported to be widely distributed in Hong Kong. (AFCD, 2022). As the recorded individual was flying over the habitat, it is considered not using the habitat and thus its location is not shown in **Figure 8.2**.

8.4.30 Greater Coucal *Centropus sinensis* was recorded in Agricultural Land outside the Project Site but within the Assessment Area. This species is listed as Class 2 Protected Animal of China. This species is common resident and widely distributed in Hong Kong. (AFCD, 2022)

Breeding activity and roosting activity of the ardeids at NDPEDR

8.4.31 The survey confirmed that the NDPEDR is active in 2022. It was observed that ardeids roost and breed at trees on the three small islands within the landscape pond of the NDP. The approximate distance between the NDPEDR and the nearest piling location is about 55m. The location of the NDPEDR is shown in **Figure 8.1**. The photo of the NDPEDR and the surrounding environment is shown in **Figure 8.5.3**. Black-crowned Night Heron *Nycticorax nycticorax* were

observed using the NDPEDR as both breeding and day-roosting grounds. The results of the ardeid roost survey and the egretry survey are shown in **Table 8.8**.

8.4.32 In general, more day-roosting ardeids were observed in breeding months, i.e. March, April and May. Highest number of day-roosting ardeid was observed in April, 2022 during the survey period (**Table 8.8**).

8.4.33 The egretry survey was conducted during the breeding months, i.e. March, April and May. More nests were found during April and May than March (**Table 8.8**).

Table 8.8 Number of day-roosting Black-crowned Night Heron recorded during the ardeid roost survey and number of Black-crowned Night Heron nest recorded during the egretry survey

Month	Number of day-roosting Black-crowned Night Heron individual	Number of Black-crowned Night Heron nest
Dec 2021	8*	-
Jan 2022	27	-
Feb 2022	34	-
Mar 2022	44	3
Apr 2022	79	27
May 2022	62	28

Note:
* Ardeid roost survey in Dec 2021 was conducted in daytime, while surveys of other months were conducted in the evening

Flight-lines of ardeids of NDPEDR

8.4.34 A total number of 198 flight paths were recorded and five flight-line directions were observed (**Figure 8.3, Table 8.9**). Three of the flight-lines (Flight-line 1, 4 and 5) cross with the Project Site, however, no breeding or roosting ardeid from NDPEDR was found landing on area within Project Site.

8.4.35 According to the result of the flight path survey, the majority of flight-lines, Flight-line 1, about 29%, Flight-line 2, about 23% and Flight-line 3, about 25%, are towards the north to southeast directions. While, minority of flight-lines, Flight-line 4, 13% and Flight-line 5, 10%, are towards the southwest to northwest directions. It is considered the reason for fewer ardeids using these flight-lines is due to more existing high rise buildings found along these flight-lines.

8.4.36 For the height of the flight paths, majority (91%) of the flight paths were higher than 15m above the ground level. Among these flight paths, most of them are within >15m - 25m above ground, composing of about 84% of total number of flight paths. The percentage of flight paths of different heights is listed in **Table 8.10**.

Table 8.9 Flight-line observed during the ardeid flight path survey

Flight-line	No. of flight paths in Mar 2022	No. of flight paths in Apr 2022	No. of flight paths in May 2022	Total number of flight path of each flight-lines during 3 months
Flight-line 1	18 (30%)	22 (34%)	18 (25%)	58 (29%)
Flight-line 2	15 (25%)	15 (23%)	16 (22%)	46 (23%)
Flight-line 3	12 (20%)	20 (31%)	17 (24%)	49 (25%)
Flight-line 4	10 (16%)	5 (8%)	10 (14%)	25 (13%)
Flight-line 5	6 (10%)	3 (5%)	11 (15%)	20 (10%)
Total number of flight paths in each months	**61**	**65**	**72**	**Total number of flight paths recorded: 198**

Table 8.10 The percentage of flight paths of different heights recorded during flight path survey

Height of flight path (above the ground level)	Percentage of flight paths
10m – 15m	8.7%
>15m – 20m	42.8%
>20m – 25m	41.5%
>25m – 30m	4.3%
>30m	2.7%

Butterflies and odonate

8.4.37 Ten butterfly species were recorded within the Assessment Area in total, two of butterfly species were recorded within the Project Site (**Appendix 8.3**). No butterfly species was of conservation importance.

8.4.38 Four odonate species were recorded within the Assessment Area in total, two of odonate species were recorded within the Project Site (**Appendix 8.4**). No odonate species are of conservation importance.

Herpetofauna

8.4.39 Three reptile species were recorded within the Assessment Area in total, two of reptile species was recorded within the Project Site (**Appendix 8.5**). No reptile species was considered as species of conservation importance.

8.4.40 Two species of amphibian were recorded within the Assessment Area in total, none of amphibian species was recorded within the Project Site (**Appendix 8.6**). No amphibian species was considered as species of conservation importance.

Terrestrial Mammal

8.4.41 Only bat species was recorded as the terrestrial mammals. Japanese Pipistrelle *Pipistrellus abramus* and a Bent-winged Bat species *Miniopterus* sp. were recorded flying in developed area and plantation outside the Project Site but within the Assessment Area. Japanese Pipistrelle is a very common small-sized bat in urban areas and is widely distributed throughout Hong Kong. Bent-winged Bat species is also protected under Wild Animals Protection Ordinance (CAP.170). The records of bats are summarized in **Appendix 8.7.2**. No bat roosting or breeding activity was recorded. As bats are highly mobile and the recorded individuals were only recorded flying over the habitats, these records are not shown in the habitat map (**Figure 8.2**).

Freshwater Communities

8.4.42 There is only a channel within the Assessment Area, i.e. the channelized section of the Shek Sheung River. A total of four freshwater aquatic species were recorded in this section of channel within the Assessment Area (**Appendix 8.8**, including Common Carp *Cyprinus carpio*, Mozambique Tilapia *Oreochromis mossambicus*, Nile Tilapia *Oreochromis niloticus* and Apple Snail *Pomacea canaliculata*. Among, Nile tilapia was the dominant species. All recorded species within the channel are common and widespread in Hong Kong and no species of conservation importance was recorded.

8.4.43 Common Carp *Cyprinus carpio* was recorded and this species is listed as “Vulnerable” in the IUCN Red List Status. However, Common Carp is not common in streams but occurs in many reservoirs and cultivated in fishponds as food fish. This recorded individual is believed to be released, thus, it is not considered of conservation importance.

8.5 Evaluation of Habitats and Species of Conservation Importance

8.5.1 Ecological importance of the Project Site and habitats within the Assessment Area was evaluated in accordance with the criteria stipulated in Annex 8 of TM-EIAO, and shown in **Tables 8.11.1 to 8.11.8**.

Table 8.11.1 Evaluation of Agricultural Land within Assessment Area

Criterion	Description
Naturalness	Man-made
Size	3.83 ha
Diversity	Low diversity of flora Low diversity of fauna
Rarity	No flora of conservation importance Fauna of conservation importance: Greater Coucal
Re-creatability	Easy to re-create
Fragmentation	N/A
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low
Nursery/ breeding ground	Limited as nursery/breeding ground for fauna due to high level of disturbance
Age	N/A
Abundance/ richness of wildlife	Low abundance of wildlife, comprise mainly widespread species
Ecological value	**Low**

Table 8.11.2 Evaluation of Channel within Assessment Area

Criterion	Description
Naturalness	Man-made
Size	1.30 ha / 607.57 m
Diversity	Low diversity of flora Low diversity of fauna
Rarity	No flora species of conservation importance Fauna species of conservation importance: Chinese Pond Heron, Great Egret
Re-creatability	Easy to re-create
Fragmentation	Not fragmented
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low, because of the concrete nature of the bed and bank. Potential foraging ground for ardeids
Nursery/ breeding ground	No nursery/breeding ground observed
Age	More than 20 years

Criterion	Description
Abundance/ richness of wildlife	Low abundance of wildlife
Ecological value	**Low to medium**

Table 8.11.3 Evaluation of Developed Area within Assessment Area

Criterion	Description	
	Within Project Site	**Outside Project Site but within Assessment Area**
Naturalness	Man-made	Man-made
Size	7.10 ha	147.00 ha
Diversity	Low to medium flora diversity which composing of high proportion of weedy/landscape/ornamental species Low diversity of fauna	Medium flora diversity which composing of high proportion of weedy/landscape/ornamental species Low diversity of fauna
Rarity	No flora of conservation importance No fauna of conservation importance	No flora of conservation importance Fauna species of conservation importance: Little Egret; and species that only flying over that habitat: Black Kite, Japanese Pipistrelle, and Bent-winged Bat species. 4 bat species, Lesser Bamboo Bat, Japanese Pipistrelle, Least Pipistrelle and Chinese Pipistrelle *were* recorded in the NDP area from previous literature
Re-creatability	Easy to re-create	Easy to re-create
Fragmentation	N/A	N/A
Ecological linkage	Not functionally linked to habitats of conservation importance	Not functionally linked to habitats of conservation importance
Potential value	Very low. Most areas are concrete paved providing very limit space for the growth of vegetation. Human disturbance also exists.	Very low. Most areas are concrete paved providing very limit space for the growth of vegetation. Human disturbance also exists.
Nursery/ breeding ground	Limited as nursery/breeding ground for fauna due to high level of disturbance	Limited as nursery/breeding ground for fauna due to high level of disturbance
Age	N/A	N/A
Abundance/ richness of wildlife	Very Low Abundance of wildlife	Low abundance of wildlife
Ecological value	**Low**	**Low**

Table 8.11.4 Evaluation of Mixed Woodland within Assessment Area

Criterion	Description
Naturalness	Semi-natural
Size	10.21 ha
Diversity	Medium diversity of flora

Criterion	Description
	Low diversity of fauna
Rarity	Flora species of conservation importance: *Ardisia villosa, Xylosma longifolium* No fauna of conservation importance
Re-creatability	Could be re-created but need time
Fragmentation	Highly fragmented, occurred as small patches, most of them were fragmented by urbanized area
Ecological linkage	Linked to shrubland/grassland
Potential value	Limited potential value due to potential human disturbance from the adjacent urbanized area
Nursery/ breeding ground	Potential breeding ground for terrestrial fauna
Age	More than 20 years
Abundance/ richness of wildlife	Low abundance of wildlife
Ecological value	**Low to medium**

Table 8.11.5 Evaluation of Orchard within Assessment Area

Criterion	Description
Naturalness	Man-made
Size	0.44 ha
Diversity	Low diversity of flora Low diversity of fauna
Rarity	No flora and fauna species of conservation importance
Re-creatability	Easy to re-create
Fragmentation	N/A
Ecological linkage	Not functionally linked to habitats of conservation importance
Potential value	Low
Nursery/ breeding ground	Limited as nursery/breeding ground for fauna due to high level of disturbance
Age	More than 20 years
Abundance/ richness of wildlife	Low abundance of wildlife
Ecological value	**Low**

Table 8.11.6 Evaluation of Plantation within Assessment Area

Criterion	Description	
	Within Project Site	**Outside Project Site but within Assessment Area**
Naturalness	Man-made	Man-made
Size	2.66 ha	6.32 ha

Criterion	Description	
	Within Project Site	Outside Project Site but within Assessment Area
Diversity	Low diversity of flora Low diversity of fauna	Low diversity of flora Low diversity of fauna
Rarity	No flora species of conservation importance No fauna species of conservation importance	No flora species of conservation importance Fauna species of conservation importance: Japanese Pipistrelle and Bent-winged Bat species that were recorded flying over the habitat 4 bat species, Lesser Bamboo Bat, Japanese Pipistrelle, Least Pipistrelle and Chinese Pipistrelle *were* recorded in the NDP area from previous literature
Re-creatability	Easy to re-create	Easy to re-create
Fragmentation	Occurred as patches next to urbanized area	Occurred as patches next to urbanized area
Ecological linkage	Not functionally linked to habitats of conservation importance	Not functionally linked to habitats of conservation importance
Potential value	Limited potential value as most of the areas are associating with urbanized area.	Limited potential value as most of the areas are associating with urbanized area.
Nursery/ breeding ground	Limited for wildlife due to simple habitat structure, high proportion of exotic species	Limited for wildlife due to simple habitat structure, high proportion of exotic species
Age	More than 20 years	More than 20 years
Abundance/ richness of wildlife	Low abundance of wildlife	Low abundance of wildlife
Ecological value	**Low**	**Low**

Table 8.11.7 Evaluation of Shrubland/Grassland within Assessment Area

Criterion	Description
Naturalness	Semi-natural, plenty of graves were found.
Size	2.67 ha
Diversity	Low diversity of flora Very low diversity of fauna
Rarity	No flora species of conservation importance No fauna species of conservation importance
Re-creatability	Could be re-created
Fragmentation	Occur as two patches which are separated by mixed woodland
Ecological linkage	Linked to woodland
Potential value	Low potential value as there are plenty of graves. It is anticipated that this habitat is constantly disturbed by grave sweeping activities.
Nursery/ breeding ground	No nursery/breeding grounds was observed

Criterion	Description
Age	More than 20 years
Abundance/ richness of wildlife	Low abundance of wildlife
Overall ecological value	**Low**

Table 8.11.8 Evaluation of Pond within Assessment Area

Criterion	Description
Naturalness	Man-made as landscape pond and fung shui pond
Size	0.73 ha
Diversity	Low diversity of flora Low diversity of fauna
Rarity	No flora of conservation importance. Fauna species of conservation importance include: Black-crowned Night Heron and Chinese Pond Heron. Black-crowned Night Heron was also be recorded from previous literature. 4 bat species, Lesser Bamboo Bat, Japanese Pipistrelle, Least Pipistrelle and Chinese Pipistrelle *were* recorded in the NDP area from previous literature
Re-creatability	Easy to re-create
Fragmentation	N/A
Ecological linkage	N/A
Potential value	Low due to human disturbance
Nursery/ breeding ground	Breeding ground and day roost site for Black-crowned Night Heron
Age	N/A
Abundance/ richness of wildlife	Low to medium abundance of wildlife
Ecological value	**Medium** for the pond in NDP which providing egretry and the day roost area **Low** for fung shui pond in Fanling Wai

8.5.2 In accordance with Table 6, Annex 8 of the TM-EIAO, the ecological value of species was assessed in terms of protection status (e.g. fauna protected under WAPO (except birds), and flora and fauna protected under regional/global legislation/conventions), species distribution (e.g. endemic), and rarity (e.g. rare or restricted). Flora and fauna species of conservation importance recorded within the Assessment Area are evaluated according to the TM-EIAO in **Table 8.12.1** and **Table 8.12.2** respectively.

Table 8.12.1 Evaluation of Flora Species of Conservation Importance within the Assessment Area

Species Name	Locations	Protection Status	Distribution[1]	Rarity[1]
Ardisia villosa	In mixed woodland outside the Project Site but within the Assessment Area	/	Forest. Recorded from Fanling	Very rare
Xylosma longifolium	In mixed woodland outside the Project Site but within the Assessment Area	/	Forest. Mui Tze Lam (Ma On Shan), Sha Tau Kok, Loi Tung and Lam Tsuen	Rare

Note:
1. Corlett *et al.* (2000). Hong Kong Vascular Plants: Distribution and Status.

Table 8.12.2 Evaluation of Fauna Species of Conservation Importance within the Assessment Area

Species Name [1]	Conservation Status [2,3]	Rarity and Distribution [1]	Location
Mammal			
Japanese Pipistrelle *Pipistrellus abramus*	CAP.170	Widely distributed throughout Hong Kong.	Flying over developed area and plantation outside Project Site but within Assessment Area
Bent-winged Bat species *Miniopterus* sp.	CAP.170	/	
Bird (Remark: all wild bird species are protected under CAP.170 Wild Animals Protection Ordinance in Hong Kong) [2]			
Black-crowned Night Heron *Nycticorax nycticorax*	Fellowes et al. (2002): (LC)	Common resident and migrant. Widely distributed in Hong Kong.	Within Assessment Area but outside Project Site (PO)
Chinese Pond Heron *Ardeola bacchus*	Fellowes et al. (2002): PRC	Common resident. Widely distributed in Hong Kong.	Within Assessment Area but outside Project Site (PO, CH)
Little Egret *Egretta garzetta*	Fellowes et al. (2002): PRC	Common resident, migrant and winter visitor. Widely distributed in coastal area throughout Hong Kong.	Within Assessment Area but outside Project Site(DA)
Great Egret *Ardea alba*	Fellowes et al. (2002): PRC,(RC)	Common resident and winter visitor. Widely distributed in Hong Kong	Within Assessment Area but outside Project Site (CH)
Black Kite *Milvus migrans*	Fellowes et al. (2002): (RC)	Common resident and winter visitor. Widely distributed in Hong Kong.	Flying over developed area outside Project Site but within Assessment Area
Greater Coucal *Centropus sinensis*	Class 2 Protected Animal of China	Common resident. Widely distributed in Hong Kong.	Within Assessment Area but outside Project Site (AL)

Notes:
1. AFCD (2021). Hong Kong Biodiversity Database.
2. CAP.170 Wild Animals Protection Ordinance
3. Fellowes *et al.* (2002). Wild animals to watch: Terrestrial fauna of conservation concern in Hong Kong.
   - For conservation status listed by Fellowes *et al.* (2002), letters in parentheses indicate that the assessment is on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence.

Abbreviations:
- Conservation Status in Fellowes et al. (2002): LC = Local Concern, RC = Regional Concern, PGC = Potential Global Concern, PRC = Potential Regional Concern

Species Name [1]	Conservation Status [2,3]	Rarity and Distribution [1]	Location
Habitats: AL: Agricultural land; CH: Channel; DA: Developed area; PO: Pond			

8.6 Impact Identification and Prediction

Identification of Key Works

8.6.1 The key works of the Project comprise:

(a) construction of north-south link road of about 700m connecting Pak Wo Road and San Wan Road;

(b) reconstruction of sections of So Kwun Po Road near North District Park;

(c) widening of the north-western slip road from So Kwun Po Road to San Wan Road;

(d) reconstruction/realignment of So Kwun Po Road between Kai Leng Roundabout and Pak Wo Road;

(e) improvement works at the junction of San Wan Road and the proposed north-south link road;

(f) improvement works at the junction of Pak Wo Road and So Kwun Po Road;

(g) modification of the existing pedestrian subway connecting North District Park underneath So Kwun Po Road;

(h) construction of a lift and a staircase linking San Wan Road and elevated So Kwun Po Road;

(i) construction of a pedestrian subway across So Kwun Po Road near Pak Wo Road;

(j) re-provision of the skating rink within North District Park affected by the road works; and

(k) associated works including geotechnical, landscape, drainage, water, electrical and mechanical, environmental mitigations, street lighting and utilities works, as well as installation of street furniture and traffic aids.

8.6.2 Several alternative alignments have been considered during the feasibility stage of the current Project (Agreement No. CE4/2018 (HY) North-South Links as Alternative to So Kwun Po (Kai Leng) Roundabout in North District Feasibility Study). These alternative alignments include the Underpass Option and other Elevated Road Options. However, these alternatives were considered not feasible or not beneficial and they were not chosen. For examples, the Underpass Option may raise problems of limited ground cover, limited land for shaft construction, more serious impacts to existing services and utilities, risk of settlement at neighbouring sensitive receivers, demanding operation and maintenance and cost problem. While other Elevated Road Options may lead to less satisfactory traffic performance, larger scale of works and longer duration of works, encroachment of other land lot boundary, more significant visual impact to other visual sensitive receiver and more significant environmental impacts to the sensitive receivers in the west side of the So Kwun Po Interchange.

8.6.3 The current development scheme is an optimum scheme as it has considered constraints/opportunities from multiple aspects, including engineering constraints, such as maximum gradient and minimum turning radius of the viaduct as per the traffic requirement, adoption of optimized span length and minimize construction traffic impact. Details could be referred from **Section 2** of the EIA Study.

8.6.4 However, under the current scheme, potential impacts may inevitably pose to the ardeids using the NDPEDR as it is close to the development layout. The approximate distance between the NDPEDR and the nearest piling location is about 55m. Major potential impacts include

fragmentation of egretry flight lines and disturbance to breeding and roosting ardeids. These potential impacts will be discussed in the following sections.

Construction Phase (Direct Impact)

Temporary habitat and vegetation loss

8.6.5 Habitats subject to temporary loss include developed area and plantation and their distribution is shown in **Figure 8.4**. The estimated loss of various types of habitats is shown in **Table 8.13**.

8.6.6 The potential impact due to temporary loss of developed area and planation is considered as insignificant as they are man-made and are easily recreated. They will be reinstated after construction phase.

Table 8.13 Estimated size of habitats affected by the Project

Habitats	Habitat loss area (ha)		Ecological value
	Temporary loss	Permanent loss	
Developed Area	0.095	0.19	Low
Plantation	0.056	0.46	Low

Fragmentation of egretry flight-lines

8.6.7 Typical flight-lines involve routes followed between feeding and roosting areas or between feeding and breeding areas. Development located on a flight-line may result in a decrease in the suitability of a foraging, breeding or roosting site by preventing movement between sites. In an extreme case, this may lead to the total abandonment of one or both sites. There may also be an increased risk of mortality by collision with structures constructed on or close to a flight-line. The proposed development might potentially have fragmentation impact on flight-lines of breeding and roosting ardeids at the NDPEDR during both construction and operation phases.

8.6.8 Locating in urbanized area, ardeids in the NDPEDR showed certain level of tolerance and adaptability to the existing human structures of different height nearby, such as village houses, housing estates and the viaduct of the existing So Kwun Po Interchange, with their high mobility. Among the flight directions recorded during the flight path survey, majority of the flight-lines, including Flight-line 1, 2, 3, and 5 (account for about 87% of the total flight paths), were unlikely to be affected by the proposed new road, either there will be no newly constructed structure, or the new structure is below the recorded flight height of ardeids. Only minority of the flight-lines (i.e. flight-line 4, around 13%) passed through the area with proposed new road that is high enough to block the flight-line on the proposed layout. Nevertheless, the actual flight paths to be blocked by the proposed elevated road would be further smaller. The maximum height of the part of elevated road close to flight-line 4 will be about 12m above the ground level, when considering the height of the flight paths, more than 90% of the flight paths are higher than 15m, only minimal flight paths that are likely to be affected, the room above the elevated road will remain not encroached that the ardeids having flight height higher than 12m can still pass through. Besides, the elevated road is not completely block flight-line 4, instead, it is located just close to the flight-line that only partially blockage the flight-line is anticipated. Thus, it is anticipated that only insignificant number of flight paths will be fragmented.

8.6.9 Recent study has also suggested the road bridge may affect night-roosting ardeids by changing their flight behaviour (e.g. erratic flight or altered flight height), but the ardeids still proceeded to the roosting site, as a re-grouped flock or separated into smaller groups when passing through the obstructing structures (Stanton and Klick, 2018). For the affected flight-line, there is sufficient space (about 50m) between the egretry and the proposed new road for the ardeids to make minor adjustments at their flight directions, and they could continue to reach their foraging grounds outside the Project Site, given that the relatively open space above NDP and the surrounding area is maintained. While the change in flight behaviour may result in increased

energy expenditure, as the ardeids in the area showed high adaptability, the potential impact from increased energy expenditure is anticipated to be minor. Thus. the potential impact due to flight-line fragmentation of breeding and roosting ardeids at NDPEDR are considered **Minor**.

Construction Phase (Indirect Impact)

Disturbance generated during construction phase

8.6.10 Indirect impacts on the habitats and associated fauna would be induced from the increased in human disturbance, construction activities, noise and vibration disturbance and night-time light glare during the construction phase. This might temporarily affect the habitat quality and the utilization of adjacent habitats by wildlife during construction phase. Sensitive ecological receiver near the Project Site includes the ardeids of the NDPEDR. Disturbance may discourage ardeid from using the NDPEDR as breeding and roosting sites. These ardeids may be forced to use potential alternative location in the vicinity, such as other mature trees within the NDP, for breeding and day roost.

8.6.11 Noise emitted from the Project construction activity may also affect both roosting and breeding activities of the ardeids, especially for the breeding activity that is more sensitive to disturbance. However, locating in urbanized area, there is existing disturbance including background noise at the NDPEDR, this may indicate that the ardeids using the NDPEDR may have accommodated the disturbance and have certain levels of tolerant against the disturbance. In fact, some of the existing egretries in Hong Kong are located in disturbed and urbanized area, such as Tai Po Market Egretry (also bred by Black Crown Night Heron), Mai Po Village Egretry and Mai Po Lung Village Egretry. This indicates that the ardeids could tolerate certain level of noise during their breeding activity. Night-time light glare may not affect the day roost activity of the ardeids, however, it may potentially affect the ardeid nests during night-time. However, as night-time lighting will only be required for a few days when night-time construction works (works involved interfacing with the existing roads) are needed. Besides, vibration and dust produced by the construction works may also disturb the NDPEDR. Overall, the potential impact due to disturbance to the roosting and breeding activities in the NDPEDR is anticipated to be **Minor to Moderate** and **Moderate** respectively if not mitigated. Mitigation related to reduction of disturbances, controlling night-time light glare and restriction on the construction method/programme within 100m area of NDPEDR will be needed and they will be discussed in the **Section 8.7 - Mitigation Measure**. Besides, regular monitoring of NDPEDR is also proposed, the detail will be discussed in **Section 8.10 - Environmental Monitoring and Audit** and the stand alone EM&A Manual.

8.6.12 Apart from the NDPEDR, there is no other ecological sensitive receiver near the Project Site, as habitats immediate surroundings of the Project Site are developed area and planation, they are of low ecological value, and disturbance is already existing in these areas. The potential impact due to disturbance to habitat and wildlife other than NDPEDR is anticipated to be **insignificant**.

Surface Runoff

8.6.13 During the construction phase, channels near the works areas would potentially be impacted by surface runoff, especially during rainstorm. The surface runoff might be polluted by sedimentation from site surfaces; earth working areas and stockpiles, wash water from dust suppression sprays and wheel washing facilities; and chemicals spillage such as lubrication oils, solvents and petroleum products from maintenance of construction machinery and equipment, and sewage from the construction workforce. Elevated suspended solids levels caused by site runoff could increase the suspended solids load in the water bodies, and could reduce dissolved oxygen levels. A lower oxygen level would affect stationary species, whilst mobile species would tend to temporarily avoid the area. The result could be a temporary reduction in aquatic life abundance and/or change in distribution. This may also indicate that less aquatic life, such as fish, could be provided as food for ardeids, the foraging activity for ardeids may also be affected.

8.6.14 The channelized section of Shek Sheung River will be potentially affected by the surface runoff during construction phase as it is near to the Project Site. The ecological value of the section of Shek Sheung River within Assessment Area is ranked as low to medium as it is channelized and with only low diversity and abundance of fauna recorded. It is considered as a potential foraging ground for ardeids, however, only low abundance of ardeids (ardeids other than Black-crowned Night Heron) were observed using the river, no Black-crowned Night Heron was observed using the river. Thus, the surface runoff may eventually affect the wildlife using the habitats by altering water quality. However, it is expected the impact from surface runoff would be transient and the risk of runoff overflow is low as the Project Site is located in urbanized area. Hence the potential impact due to surface runoff is considered as **Minor to Moderate**. To avoid contamination of water of Shek Sheung River, the construction runoff should be controlled by implementation of mitigation measures such as good site practice. There is no other ecological sensitive waterbody near the Project Site that is likely to be affected by the Project.

Impact to Species of Conservation Importance

Flora

8.6.15 Two flora species of conservation importance, including *Ardisia villosa* and *Xylosma longifolium* were recorded in the Assessment Area. However, both of them are located outside Project Sites, their locations are not affected by the Project, so the significance of ecological impact is considered negligible.

Fauna

8.6.16 Eight fauna species of conservation importance were recorded, and the recorded species could be referred from **Table 8.12.2** of this report. Roosting and breeding activities of Black-crowned Night Heron was found at the NDPEDR near the Project Site and it is potentially impacted by the Project Site, it has been assessed in previous sections. For other fauna species of conservation importance, as all of them were recorded outside the Project Site, and all of them are with high mobility. Besides, except Black-crowned Night Heron, no roosting/breeding activities was recorded including the bat species recorded from the present study (i.e. Japanese Pipistrelle and Bent-winged Bat species) and reviewed literature (i.e. Lesser Bamboo Bat, Least Pipistrelle and Chinese Pipistrelle). Thus, they are not likely to be affected by the Project. The potential direct and indirect impacts to the fauna species of conservation importance, except Black-crowned Night Heron is anticipated to be **insignificant.**

Operation Phase (Direct Impact)

Permanent habitat and vegetation loss

8.6.17 Permanent habitat loss includes developed area and plantation (**Figure 8.4**). The estimated permanent loss of various types of habitats is shown in **Table 8.13**.

8.6.18 The impact due to permanent loss of developed area and planation within Project Sites is considered as insignificant, as they are man-made in nature and of low ecological value. No mitigation is needed for the loss of these habitats.

Fragmentation of light lines

8.6.19 As discussed in the construction phase impact, only minority flight-lines of NDPEDR will be potentially affected by the Project, and there is sufficient space between NDPEDR and the proposed new road for the ardeids to make minor adjustments at their flight directions, the potential fragmentation impacts to breeding and roosting ardeids from NDPEDR are considered **Minor**.

Operation Phase (Indirect Impact)

Indirect impact to habitat

8.6.20 As the project involves construction of a viaduct that the habitats under the viaduct will be shaded during operation phase, the vegetation and wildlife using the habitat may be affected.

As the habitat under the viaduct that will be affected are developed area and plantation, which are man-made and of low ecological value, the potential indirect impact to habitat is anticipated to be **insignificant.**

Disturbance

8.6.21 Indirect impacts due to disturbance, including noise, dust, light glare, to wildlife from human activity and traffic flow along the road will increase during operation phase. Habitats along the alignment of the roads are subjected to existing disturbance from nearby developed area. Fauna sensitive to human disturbance might have already avoided these habitats; while the existing fauna might have already accommodated human disturbance. Besides, according to Chapter 4 - Noise, there will be insignificant noise level contribution from the Project (at most +0.2dB(A)) according to the assessment point at NDPEDR, thus, it is anticipated that there will be no significantly increased operational disturbance. Hence, the potential impact due to disturbance during operation phase is expected to be **Minor**.

Potential bird collision

8.6.22 There will be sections of newly constructed noise barrier along the road. It may cause bird collision when transparent panels are used. As the location of newly constructed noise barrier is located within the range of flight path of the ardeids of the NDPEDR, the ardeids may be prone to potential bird collision. Birds apart from the ardeids may also be prone to potential bird collision. however, the noise barrier will be constructed in urbanized area with low abundance and diversity of birds, it is anticipated that the chance of bird collision is low. Besides, it is anticipated that bird collision may mainly occur for small birds rather than ardeids, as small birds usually fly faster, and the NDPEDR is located far away from the new noise barriers. The potential ecological impact for bird collision is anticipated to be **Minor to Moderate** if not mitigated. Mitigation such as adopting bird friendly design should be considered to reduce the potential impact.

Direct mortality of fauna

8.6.23 Direct mortality of fauna may occur due to roadkill in the new road. As there was low abundance of non-flying terrestrial animals (e.g. mammals, amphibians and reptiles) recorded within the Project Site, chance of roadkill is considered low. Besides, the new road will be elevated that wildlife will not easily to access the road, and there are already existing roads adjacent to the new roads. Hence, the potential ecological impact due to direct mortality of fauna is anticipated to be insignificant.

Impact to water quality

8.6.24 Due to the operational nature of road, surface runoff which containing dust, oil, grease and other pollutants formed by vehicles, will affect the watercourse in the vicinity, in particular during rainy season. However, there will be drainage systems that collect the runoff to the government drainage systems. Hence, no adverse operation water quality issue is anticipated.

8.7 Mitigation Measure

General

8.7.1 The key impacts of the Project include disturbance to the ardeids of the NDPEDR that require proper mitigation measures to minimize these potential impacts.

8.7.2 Mitigation measures will follow the hierarchy detailed in Annex 16 of TM-EIAO, following the order of priority: avoidance, minimization and compensation. Wherever possible, on-site mitigation measures are preferred over off-site mitigations.

Avoidance

8.7.3 Important habitat, NDPEDR, is located outside the Project Site and will not be directly affected by this Project. However, as it is close to the Project Site, in the subsequent stage of the Project, any adjustment in Project Site shall take into consideration of the location of this importance habitat and avoid encroaching it.

Minimization

Minimizing construction disturbance especially to the NDPEDR

8.7.4 Different construction methods for viaduct have been considered, the Cast-in-situ Method has been chosen as this method is the most environmental friendly and would cause minimum environmental impact, such as noise impact. The duration of works of this method would also be shortest. Details of the consideration of construction method could be referred from Chapter 2 – Project Description. Besides, in order to further reduce the disturbance raised from the construction, early contractor's involvement or contract provision on alternate design/cost saving design by the Contractor are also suggested.

8.7.5 To further minimize the construction disturbance to the NDPEDR, only non-percussive piling method within the 100m boundary measured from the NDPEDR for all year around would be allowed. When using non-percussive piling method, it is anticipated that noise impact to the NDPEDR would be much reduced compared to using traditional percussive method. Besides, it is anticipated that the NDPEDR received insignificant vibration effect from the construction when non-percussive piling method is used. Other noisy construction works within 100m area of the NDPEDR should also be avoided in breeding season as far as practicable.

8.7.6 In addition, other mitigation measures that could reduce construction noise shall also be adopted, they include use of Quality Powered Mechanical Equipment (QPME), installation of movable noise barriers and/or hoarding at the boundary of the works limit near the NDPEDR before any construction works, in order to screen out the disturbance, especially noise, caused to the NDPEDR by the construction. Besides, any noisy machineries should be further enclosed by any noise reduction structure such as movable noise barrier/enclosure during their operation. Detailed noise mitigation measures are stated in Chapter 4 – Noise.

8.7.7 Besides, a pre-construction ecological survey that covering the whole breeding season (March to August) will be conducted to find out the peak month(s) of the breeding season (the details of the pre-construction ecological survey will be discussed in **Section 8.10 - Environmental Monitoring and Audit**. Accordingly, the works programme within 100m area of the NDPEDR and Day Roost will be scheduled to minimize construction impacts arising from the proposed site activities by implementation of mitigation measures wherever practicable within the peak month(s) of the breeding season. If possible, the works to be done within 100m area of the NDPEDR will also be arranged as far from the NDPEDR as practicable.

8.7.8 To further safeguard the NDPEDR from noise disturbance during construction phase, before implementation of any construction works within 100m area of the NDPEDR during breeding season, a Construction Noise Management Plan shall be prepared to verify the inventory of noise sources, update the construction noise impact assessment if necessary, assess the effectiveness and practicality of all identified measures and update the proposed noise mitigation measures as necessary. The plan shall also be circulated to relevant authorities, such as Agriculture, Fisheries and Conservation Department (AFCD), for review. Detail can be referred to Chapter 4 – Noise.

8.7.9 Apart from the above noise related mitigation, the elevated extent of the construction works is limited to the viaduct erection equipment along the alignment of proposed bridge work. Erection of any unreasonably tall structures/equipment is not envisaged. Besides, mitigation for reducing night-time light glare from reaching the NDPEDR during night-time construction period should be carried out as far as practicable.

Minimizing indirect disturbance impacts

Construction Site Runoff

8.7.10 During the construction phase, site runoff would need to pass through designed sand/silt removal facilities to reduce the concentration of suspended sediment. In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented on site as far as practicable to control site runoff and drainage at all work sites during construction, so that the treated runoff will be discharged to public drainage system in compliance with the WPCO. Construction effluent, site run-off and sewage should be properly collected and/or treated. Wastewater from a construction site should be managed. Construction works should be programmed to minimize soil excavation works in rainy seasons (April to September). Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms. The details of the mitigation for controlling construction site runoff is given in Chapter 5 – Water Quality.

Other Site Practices

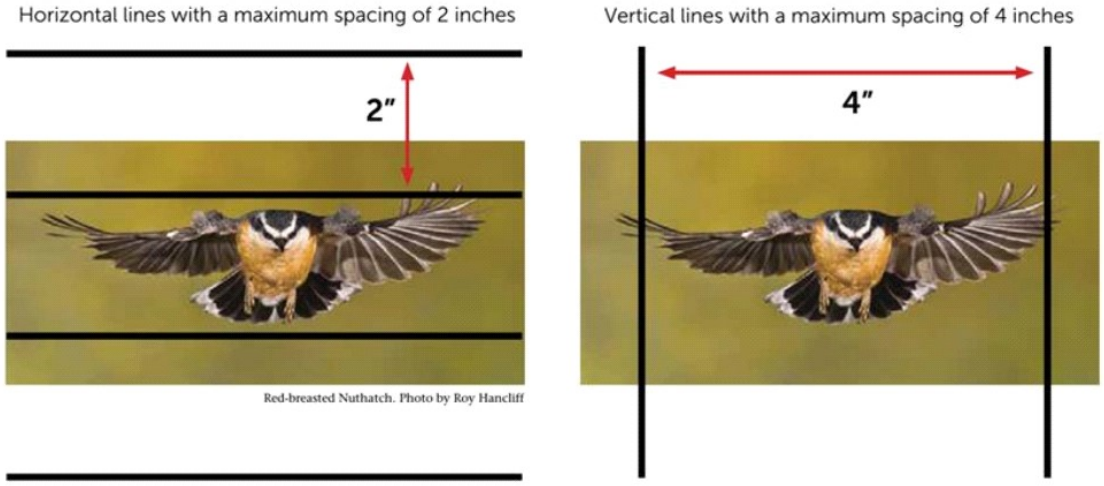
8.7.11 Standard site practices listed as follows would be implemented to minimize potential impacts, including dust, noise and site runoff, on the surrounding environment.

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

Minimization of bird collision

8.7.12 In order to minimize bird collision due to the newly constructed noise barriers along the new roads, bird friendly design should be adopted for the noise barriers when using transparent panels, such as adoption of embedded/superimposed opaque stripes or angled noise barrier panel. Guidelines on Design of Noise Barriers (EPD & HyD, 2022) will be referred for the design of the noise barrier/enclosure to avoid and minimize bird mortality from collision. For the use of opaque stripes, maximum of 2 inches and 4 inches spacing shall be adopted for horizontal and vertical line, respectively. An illustration of noise barrier with the use of different bird-friendly designs when using transparent panels is shown below.

Angled noise barrier panel [1]



Vertical and horizontal stripes pattern [1]

1 Environmental Protection Department and Highways Department, Government of the Hong Kong SAR, Recess for Bridge Pier, 2022, Guidelines on Design of Noise Barriers. 12. 2.3.3.

Table 8.14 Summary of Construction Phase and Operation Phase Impacts

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation/ monitoring required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Construction Phase – Direct Impacts										
Temporary habitat loss	Works areas of the proposed development	Developed area, and plantation within the Project Sites	Low for both developed area and plantaiton	Low to medium diversity of flora Low diversity of fauna	Developed area: 0.095 ha; plantation:0.056 ha	Temporary	Reversible	Minor	Insignificant	No
Fragmentation of flight-lines	Obstruction due to newly formed structure near NDPEDR	Ardeids of the NDPEDR	Medium for the pond providing the egretry and the day roost area	Black-crowned Night-Heron	Insignificant number of flight path	Permanent	Not reversible	Minor	Minor	No
Construction Phase – Indirect Impact										
Disturbance generated during construction phase to habitats other than the NDPEDR	Construction works	Habitats and wildlife near the works area other than the NDPEDR	Low	Terrestrial fauna	Vary	Temporary	Reversible	Minor	Insignificant	Good site practice
Disturbance generated during construction phase to the NDPEDR	Construction works	NDPEDR and the ardeids using it as breeding and roosting sites	Medium for the pond providing the egretry and the day roost area	Black-crowned Night Heron	44 (mean number of Black-crowned Night Heron recorded during ardeid roost survey in months that overlapping with the avifauna survey, i.e. January, March and May)	Temporary	Reversible	Minor to moderate	Minor to moderate for the roosting activity; Moderate for the breeding activity	Strictly use of non-percussive piling method within the 100m are of NDPEDR for all year around. Other noisy construction works within 100m area of the NDPEDR should also be avoided in breeding season as far as practicable

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation/ monitoring required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
										Works programme to be scheduled to minimize construction impacts to NDPEDR during peak month(s) of breeding season A Construction Noise Management Plan shall be prepared before implementation of any construction works within 100m area of the NDPEDR during breeding season Follow mitigation measures stated in Chapter 4 - Noise Mitigation for reducing night-time light glare from reaching the NDPEDR. Regular monitoring of the ardeid day roosting and breeding activities at the NDPEDR.

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation/ monitoring required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
Water quality	Surface runoff from works area	The channelized section of Shek Sheung River	Low to medium	Aquatic organisms and the wildlife using this habitat, such as ardeids	Vary	Temporary	Reversible	Minor to moderate	Minor to moderate	Follow mitigation measures stated in Chapter 5 – Water Quality
Operation Phase – Direct Impact										
Permanent habitat loss	Newly constructed roads	Developed area and plantation within the Project Sites	Low for both developed area and plantation	Low to medium diversity of flora Low diversity of fauna	Developed area: 0.19 ha; plantation: 0.46 ha	Permanent	Not reversible	Minor	Insiginficant	No
Operation Phase – Indirect Impact										
Indirect impact to habitat	Habitat shaded by the viaduct	The habitat under the viaduct	Low for both developed area and plantation	Low to medium diversity of flora Low diversity of fauna	Vary	Permanent	Not reversible	Minor	Insiginficant	No
Disturbance impacts	The new road	Sensitive habitats near the potential development area	Low to low to medium for various habitat types	Terrestrial fauna	Vary	Permanent	Not reversible	Minor	Minor	No
Potential bird collision	The newly built noise barriers along the widen road and new slip road	Birds	N/A	Birds	N/A	Permanent	Not reversible	Minor to Moderate	Minor to Moderate	Adopting bird friendly design
Direct mortality of fauna	The new road	Non-flying terrestrial animals	N/A	Non-flying terrestrial animals	N/A	Permanent	Not reversible	Insignificant	Insignificant	No
Water quality	Surface runoff from works area	The channelized section of Shek Sheung River	Low to medium for the channelized section of Shek Sheung River	Aquatic organisms and the wildlife using this	Vary	Permanent	Not reversible	Insignificant	Insignificant	No

Impact	Sources	Receivers	Nature of impacts						Significance of ecological impact	Mitigation/ monitoring required
			Habitat quality	Species affected	Size / abundance	Duration	Reversibility	Magnitude		
			adjacent to the Project Site	habitat, such as egrets						
Impact to Species of Conservation Importance										
Impact to flora species of conservation importance	Direct impact / disturbance raised from construction and operation phase of the Project	Flora species of conservation importance recorded within the Assessment Area	N/A	Flora species of conservation importance recorded within the Assessment Area	N/A	Both temporary and permanent	Both reversible and not reversible	Insignificant	Insignificant	No
Impact to fauna species of conservation importance other than the Black-crowned Night Heron of the NDPEDR	Direct impact / disturbance raised from construction and operation phase of the Project	Fauna species of conservation importance recorded within the Assessment Area other than the Black-crowned Night Heron of the NDPEDR	N/A	Fauna species of conservation importance recorded within the Assessment Area other than the Black-crowned Night Heron of the NDPEDR	N/A	Both temporary and permanent	Both reversible and not reversible	Insignificant	Insignificant	No

8.8 Cumulative Impacts

8.8.1 In order to assess the cumulative impacts, a review of best available information at the time of preparing this EIA report to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operation period for this Study has been conducted and a list of the concurrent projects identified at this stage is provided in Chapter 2 - Project Description of this EIA report.

8.8.2 The table below (**Table 8.15**) summarizes the relevancy of these concurrent projects. Project relevant to ecology is examined individually.

8.8.3 The construction of the Project is anticipated to commence in the 2025 and the construction works are anticipated to be completed in 2030. Some of the concurrent projects may pose potential cumulative disturbance to the habitat near the Project Sites of the current study during both construction and operation phases. However, majority of the committed and planned concurrent projects in the vicinity of the Project are located within highly urbanised area, where ecological resources are limited. Besides, no adverse ecological impact was anticipated on the loss of developed area and plantation arising from the project. As such, no major cumulative ecological impacts are anticipated from the concurrent projects in the vicinity.

Table 8.15 Cumulative Impacts from Concurrent Projects near the Project Site

<table>
<tr><th>Concurrent Project</th><th>Project Proponent</th><th>Construction Period</th><th>Potential Cumulative Impacts (Construction Phase)</th><th>Potential Cumulative Impacts (Operation Phase)</th></tr>
<tr><td>Housing Development in Ching Hiu Road</td><td>Civil Engineering and Development Department (CEDD) / Housing Department (HD)</td><td>2022 to 2030</td><td rowspan="4">Potential cumulative disturbance impacts to habitats nearby due to the construction works. However, the projects are located within highly urbanized area, where ecological resources are limited. Existing fauna might have already accommodated human disturbance. Significant cumulative ecological impact is not expected.</td><td rowspan="4">Cumulative ecological impacts are not expected as there will be no high disturbance to the environment due to the nature of the concurrent projects.</td></tr>
<tr><td>Housing Development in Fanling Area 17</td><td>CEDD/ HD</td><td>2023 to 2031</td></tr>
<tr><td>Expansion of North District Hospital</td><td>Architecture Service Department (ArchSD) / Hospital Authority (HA)</td><td>2021 to 2028</td></tr>
<tr><td>Reclaimed Water Supply to Sheung Shui and Fanling</td><td>Water Supplies Department (WSD)</td><td>2021 to 2026</td></tr>
<tr><td>Utilities Works and Junction Improvement Works for Partial Development of Fanling Golf Course Site</td><td>Civil Engineering and Development Department (CEDD)</td><td>2024 to 2029</td><td colspan="2">Cumulative ecological impacts are not expected due to considerable separation distance between the Project and these concurrent projects.</td></tr>
</table>

8.9 Residual impacts

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

8.9.2 Among the permanent habitat loss, the loss of developed area will be re-provided by the future roads. Residual impacts would include net loss of 0.46 ha plantation. However, plantation is man-made in nature and supporting low diversity and abundance of fauna and low diversity of flora, the residual impact of habitat loss is considered acceptable.

8.9.3 With the implementation of the recommended mitigation measures and monitoring, it is anticipated that all potential ecological impacts will be reduced to an acceptable level. As a result, no adverse residual impact is anticipated during both construction and operation phases.

8.10 Environmental Monitoring and Audit

8.10.1 A EM&A programme would be conducted to ensure the proper implementation of the aforementioned mitigation measures.

8.10.2 A pre-construction ecological survey that covering the whole breeding season (March to August) will be conducted at the NDPEDR to find out the peak month(s) of the breeding season. The pre-construction ecological survey shall also verify the updated location of the NDPEDR for determining the 100m area around the NDPEDR for concerned mitigation measures and form a baseline information for the monitoring during construction and operation phases, which will be discussed below.

8.10.3 Regular monitoring will be conducted within 100m of the NDPEDR at a frequency of at least monthly or more frequent during construction phase and the first breeding season (March to August) after operation. If the commencement of operation is in the middle of a breeding season, the operation phase monitoring will cover that breeding season and the next breeding season. Regular monitoring aims to monitor the ardeid day roosting and breeding activities, criteria to be monitored include the status, location and extent of NDPEDR, the condition of trees used as breeding and roosting activities, the species, abundance and the returning time of the breeding and roosting ardeids, as well as their flight height and flight line. If any significant decline of the usage of the NDPEDR by ardeids is identified, the cause of the decline, with reference to any changes in site condition or disturbances detected, should be reviewed to identify any unpredicted indirect ecological impacts arising from the proposed Project. Remedial measures should be developed and implemented by the Contractor as necessary.

8.10.4 Both regular monitoring and pre-construction ecological survey should be conducted by experienced ecologist(s) with at least 7 years of relevant working experience. Details of the EM&A requirements should refer to the stand-alone EM&A Manual.

8.11 Conclusion

8.11.1 Ecological impact assessment for the Project was conducted following the EIA Study Brief No. ESB-338/2021 and the guidelines of the TM-EIAO Annexes 8 and 16. Terrestrial and aquatic habitats identified within the Assessment Area include agricultural land, channel, developed area, mixed woodland, orchard, plantation, pond and shrubland/grassland. In general, the habitats within Project Site and Assessment Area are of low ecological value as most of them are within or adjacent to highly urbanized area that receiving human disturbance.

8.11.2 The NDPEDR, where both roosting and breeding activities of Black-crowned Night Heron are found, is located near the Project Site boundary. In order to mitigate the disturbance to it during construction phase, the following specific mitigation measures and monitoring are proposed:

i. Strictly use of non-percussive piling method within the 100m are of NDPEDR for all year around, other noisy construction works within 100m area of the NDPEDR should also be avoided in breeding season as far as practicable;

ii. A pre-construction ecological survey that covering the whole breeding season (March to August) to find out the peak month(s) of the breeding season and to verify and update the location of NDPEDR. Accordingly, works programme shall be scheduled to minimize construction impacts to NDPEDR during peak month(s) of breeding season. If possible, the works to be done within 100m area of the NDPEDR will also be arranged as far from NDPEDR as practicable;

iii. A Construction Noise Management Plan shall be prepared before implementation of any construction works within 100m area of the NDPEDR during breeding season;

iv. Mitigation measures for reducing construction noise, such as use of Quality Powered Mechanical Equipment (QPME), movable noise barrier and non-percussive piling method, and implementation of good site practice; and

v. Regular monitoring of the ardeid day roosting and breeding activities within 100m of the NDPEDR during the course of construction phase and operation phase.

However, the potential impact due to flight-line fragmentation of breeding and roosting ardeids at NDPEDR are considered Minor, because only insignificant number of flight paths will be affected. Besides, Minor potential disturbance impact is also anticipated for the operation disturbance to NDPEDR, as there is existing disturbance that the ardeids might have already accommodated human disturbance, and there will be insignificant noise level contribution from the Project to the NDP. No specific mitigation is needed for these potential impacts.

8.11.3 Potential bird collision during operation phase due to the newly constructed noise barrier is the other key potential impact arising from the Project. However, it is anticipated that bird collision may mainly occur for small birds rather than ardeids, as small birds usually fly faster, and the NDPEDR is located far away from the new noise barriers. To mitigate, bird friendly design should be adopted for the noise barriers when transparent panels are used.

8.11.4 With the implementation of the above mitigation measures, no unacceptable ecological impacts are anticipated to arise from the construction and operation of the Project.

8.12 Reference

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