

5 Ecological Impact

5.1 Introduction

5.1.1 This section presents the ecological baseline resource within the assessment area, and the results of assessment of the potential ecological impacts resulting from the construction and operation of the Project. According to the EIAO-TM, baseline conditions for ecological components of the Measures required to mitigate any identified adverse impacts are recommended, where appropriate, and residual impacts assessed.

5.2 Relevant Legislation, Standards and Guidelines

5.2.1 The relevant local legislation, standards and guidelines applicable to the present study for the assessment of ecological impact include:

- a. Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations (Cap. 96A);
- b. Wild Animals Protection Ordinance (Cap. 170);
- c. Country Parks Ordinance (Cap. 208) and its subsidiary legislation;
- d. Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) and relevant annexes 8, 9, 11, 16, 17, 20 and 21 of the associated Technical Memorandum (EIAO-TM);
- e. Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation;
- f. EIAO Guidance Note No. 6/2010 – Some Observations on Ecological Assessment from the Environmental Impact Assessment Ordinance Perspective (GN 6/2010);
- g. EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment (GN 7/2010);
- h. EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys (GN 10/2010);
- i. EIAO Guidance Note No. 11/2010 – Methodologies for Marine Ecological Baseline Surveys (GN 11/2010)
- j. Hong Kong Planning Standards and Guidelines;
- k. List of Wild Animals under State Protection

5.2.2 International conventions and guidelines potentially relevant include:

- a. Convention on International Trade in Endangered Species of Wild Fauna and Flora (“CITES”);
- b. United Nations Convention on Biological Diversity

5.3 Methodology for Baseline Establishment

Location and Area

5.3.1 The Project site is located at the eastern part of Tai Po Industrial Estate (TPIE), including the existing TPSTW and the proposed expansion area. TPSTW has been a secondary sewage treatment works since the plants of Stage I commissioned in 1979. Several upgrading projects were completed in 1983, 2010 and 2013. It currently occupies 13 hectares of land. Together with the proposed expansion area, the Project site falls within an area zoned “Other Specified

Uses” annotated “Sewage Treatment Works” (“OU(STW)”) on the approved Tai Po Outline Zoning Plan (OZP) No. S/TP/30.

Terrestrial Ecological Impact Assessment Area

- 5.3.2 The assessment area for terrestrial ecology covers all land-based areas within 500m from the Project site. The assessment area for terrestrial ecology is illustrated in **Figure 5.1**.

Aquatic Ecological Impact Assessment Area

Background

Effluent Disposal Arrangement of the Project

- 5.3.3 Under the existing Tolo Harbour Effluent Export Scheme (THEES), the treated effluent from TPSTW is collected in the Tai Po Effluent Pumping Station (TPEPS) and then pumped via a rising main and a submarine pipeline to the effluent pumping station at Sha Tin. The effluent is subsequently pumped to the Sha Tin Portal of the THEES tunnel at Ah Kung Kok, which then conveys the effluent to Kai Tak River for discharge into the Kai Tak Approach Channel (KTAC) and Kwun Tong Typhoon Shelter (KTTS) in Victoria Harbour. In addition, effluent from TPSTW may be discharged via the existing emergency outfall into Tolo Harbour under emergency condition or during the THEES maintenance period. No change to the existing effluent disposal arrangement is proposed under the Project.

Nature of Proposed Project Works

- 5.3.4 The future effluent from the Project will be discharged to the THEES or the existing emergency outfall in Tolo Harbour. No new effluent outfall will be constructed under this Project. Upgrading or modification of the exiting emergency outfall of TPSTW is also not necessary. Hence, no marine works would be carried out for this Project. There would be no loss of marine habitats due to the construction and operation of this Project. All the proposed Project works are land-based within the Tai Po industrial Estate and located outside the aquatic and marine environments.

Assessment Areas

- 5.3.5 In accordance with the EIA Study Brief, the aquatic ecological impact assessment area should be the same as the water quality impact assessment area. The water quality impact area as defined in the EIA Study Brief shall comprise areas within 500 m from the boundary of the Project site and works of the Project including the discharge point of treated effluent from the Project under the THEES and shall cover Tolo Harbour and Channel Water Control Zone (WCZ) and Victoria Harbour WCZ and water sensitive receivers in the vicinity of the Project.

Victoria Harbour WCZ

- 5.3.6 The discharge point of the Project in Victoria Harbour WCZ is located at Kai Tak River, which is a man-made concrete nullah of about 2.4 km long in highly developed urban land for drainage purpose. It is designed to receive treated sewage effluent from THEES, urban runoff and stormwater from a large catchment of old urbanized areas in Diamond Hill, Tsz Wan Shan, Wong Tai Sin, Kowloon City and Sun Po Kong. The nullah has been continually modified and disturbed to suit the development needs in the vicinity. The Kai Tak River Improvement project including reconstruction of the nullah such as deepening the nullah bed to increase its drainage capacity was completed in 2018. Although this improvement project also covered works to revitalize the nullah, there is no plan to change the historic and existing uses of this nullah to receive treated sewage effluent and urban runoff and to alleviate flooding problem in

urbanized area. Therefore, it is suitable to consider this nullah as part of the urban drainage system, which is a non-sensitive receiver of this Project.

- 5.3.7 KTAC and KTTS of about 90 hectares are embayed waters bounded by the ex-airport runway at the west and two breakwaters in the south. These marine water bodies receive the same discharge from Kai Tak River as well as other storm discharges e.g. from Jordan Valley and Kwun Tong. The KTAC in particular was highly disturbed. Thirteen (13) hectares of the seabed of KTAC have been subject to dredging conducted under the recent Kai Tak Development (KTD) project. Both the approach channel and typhoon shelter are not ecologically sensitive.
- 5.3.8 There would be no disturbance to marine or drainage bed sediments in Victoria Harbour WCZ under this Project. No natural habitats would be directly affected by the Project during construction and operation. Following the existing disposal arrangement, only treated effluent that meets the effluent discharge standards will be diverted to Victoria Harbour WCZ. There has been no ecological concern in relation to treated effluent discharge to Kai Tak River, KTAC and KTTS since the commissioning of the THEES. As such, Victoria Harbour WCZ has been excluded in the ecological impact assessment of this EIA study. The same approach has been adopted in all past relevant approved EIAs including EIA for Sha Tin Sewage Treatment Works Stage III Extension, EIA for TPSTW Stage V and EIA for Sha Tin Cavern Sewage Treatment Works.

Tolo Harbour and Channel WCZ

- 5.3.9 Emergency discharge of primarily treated / settled effluent may occur in Tolo Harbour via the existing emergency outfall of TPSTW under emergency situations (e.g. power failure). Ecologically important areas such as Sites of Special Scientific Interest have been previously recorded in Tolo Harbour. The assessment area for aquatic ecology covers the Tolo Harbour and Channel WCZ only.

Literature Review

- 5.3.10 Desktop literature review on the existing ecological condition was conducted. Relevant studies or surveys reviewed include but not limited to the following:
- a. Approved EIA Report for Shuen Wan Golf Course (EIAO Register No. AEIAR-221/2019);
 - b. Approved EIA for Sha Tin Cavern Sewage Treatment Works (EIAO Register No. AEIAR-202/2016);
 - c. Project Profile for Sediment Removal at Yim Tin Tsai, Yim Tin Tsai East Fish Culture Zone (Application No. DIR-191/2009);
 - d. Approved EIA for Development of a Bathing Beach at Lung Mei, Tai Po (EIAO Register No. AEIAR-123/2008);
 - e. Approved EIA for Drainage Improvement in Sha Tin and Tai Po (EIAO Register No. AEIAR-110/2007);
 - f. Approved EIA for the Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong, (EIAO Register No. AEIAR-071/2003);
 - g. Approved EIA for the Feasibility Study for Housing Development at Whitehead and Lee On in Ma On Shan, Sha Tin (EIAO Register No. AEIAR-068/2002);
 - h. Hong Kong Biodiversity (AFCD newsletter);
 - i. Hong Kong Bird Watching Society (HKBWS) study reports;
 - j. Biodiversity Database (AFCD); and

k. Other publications on the conservation status and distribution of local flora and fauna.

- 5.3.11 All available information were collated and evaluated to identify any information gap relating to the establishment of the ecological profile of the terrestrial environment, and to determine the ecological surveys needed for the ecological impact assessment.

Ecological Field Surveys

- 5.3.12 Ecological surveys were conducted to address the requirements in establishing the ecological baseline profile. The surveys followed the requirements of the pertinent of Annexes 8 and 16 of the Technical Memorandum as well as EIAO GN 6/2010, GN 7/2010, GN 10/2010 and GN 11/2010. The ecological survey programme is summarized in **Table 5.1** below.

Table 5.1 Ecological Survey Programme

Survey Type	Survey Group	2020					2021
		Aug	Sep	Oct	Nov	Dec	Jan
Terrestrial Habitat & Vegetation Survey			✓				✓
Terrestrial Day-time Fauna Survey	Mammals	✓	✓		✓		✓
	Avifauna	✓	✓	✓	✓	✓	✓
	Roosting/Pre-roosting*	✓	✓	✓	✓	✓	✓
	Flightline*	✓	✓	✓	✓	✓	✓
	Herpetofauna	✓	✓	✓			✓
	Butterfly & Odonate	✓	✓	✓		✓	
	Aquatic Fauna (Freshwater)	✓	✓	✓		✓	
Terrestrial Night-time Fauna Survey	Mammal	✓			✓		✓
	Avifauna	✓	✓	✓	✓	✓	✓
	Herpetofauna	✓	✓	✓			✓
Marine Survey	Intertidal		✓				✓
	Benthos	✓				✓	
	Dive Survey			✓			

Note: *Survey were conducted twice a month.

- 5.3.13 All ecological field surveys were carried out in a manner that would not cause any unnecessary stress or damage to any species or habitats.
- 5.3.14 All floral and faunal species of conservation importance recorded during the surveys were photographed as far as possible and the locations of the records were marked.
- 5.3.15 A comprehensive species list of each taxa surveyed was compiled, with the conservation status, protection status, and other relevant information (such as distribution, rarity, etc.) for each species reported.

Terrestrial Survey

Habitat Survey

- 5.3.16 Habitats within the assessment area were identified by making reference to the latest available aerial photographs obtained from Lands Department. Ground-truthing was conducted once per season. Habitats identified were illustrated on a habitat map of an appropriate scale to show the distribution and coverage of each habitat type (see **Figures 5.2**).
- 5.3.17 Ecological characteristics of each identified habitat type, such as size, vegetation type, dominant floral species present, species abundance and diversity, community structure, naturalness, seasonal patterns and inter-dependence of habitats and species, and presence of any features of ecological importance, were recorded and discussed. Representative

photographs of each habitat and any important ecological features were provided (see **Appendix 5.4** and **5.5**).

Vegetation Survey

- 5.3.18 Vegetation survey was conducted once per season. Floral species observed during the surveys were identified to species level as far as possible, with their relative abundance recorded. A plant species list presenting the recorded floral species and presence of species of conservation concern was established for the assessment area. The plant species list also presented the conservation status, the form (e.g. herbaceous, shrub/tree) and categorized whether the species is native or exotic. Nomenclature and conservation status of floral species follows Corlett *et al.* (2000) and AFCD (2003, 2007, 2008, 2009 and 2011).

Terrestrial Mammal Survey

- 5.3.19 Surveys for terrestrial mammals were conducted along transects. Since most mammalian species in Hong Kong occur at low densities, surveys for mammals included both direct observation and active searching for signs of occurrence (including potential roost, footprints and droppings). Night-time surveys were conducted to supplement the findings from day-time surveys.
- 5.3.20 With regards to bats, night-time surveys were carried out mainly at and near the proposed works area, where direct impact to bats and/or bat roost(s) may occur. Bat detector was used during the surveys. Due to the limited information published in Hong Kong, identification of bats recorded may not be possible.
- 5.3.21 Nomenclature of species follows AFCD Hong Kong Biodiversity Database. The commonness and conservation status for each species are presented. Scientific names are not mentioned in main text but can be seen in **Appendix 5.2**.

Avifauna Survey

- 5.3.22 Survey for birds were conducted monthly (between August 2020 and January 2021) by transect count with the aid of a pair of binoculars at a suitable time (usually in early morning) when birds are most active. Night-time surveys were conducted to detect presence of nocturnal species. Avifauna species were detected either by direct sighting or by their call. Species recorded were identified and quantified, with special reference to behaviours such as feeding, roosting and breeding.
- 5.3.23 A comprehensive list of avifauna species recorded from the assessment area was prepared, with wetland-dependence, conservation and/or protection status indicated. Nomenclature follows the updated List of Hong Kong Birds published by HKBWS. Scientific names are not mentioned in the main text but can be seen in **Appendix 5.2**.
- 5.3.24 Apart from the monthly transect count surveys stated above, specific surveys to identify the pre-roost and roost locations (s) with the abundance of Collared Crow, Black Kite and ardeids were conducted twice a month (between August 2020 and January 2021), in accordance with Clause 2 of Appendix D of ESB-321/2019. At least three surveyors were positioned at different vantage point (see **Figure 5.1**), with view covering the Project site and most areas within the 500m assessment area. Surveys were conducted about one hour before sunset according to Hong Kong Observatory and continue after sunset until the light condition become unsuitable for counting birds.
- 5.3.25 The flight movement of Collared Crow and ardeids to and from their roosting sites identified in the survey mentioned above, were also recorded, by species, abundance, time, height and direction of travelling.

Herpetofauna Survey

- 5.3.26 Herpetofauna transect survey was conducted three times in wet season (August – early October 2020) and once in dry season (January 2021). All potential habitats for amphibian and reptile were actively searched throughout the survey. Microhabitats were examined or deliberately uncovered to reveal any presence of the amphibians in aquatic habitats was conducted to indicate breeding activities. All herpetofauna observed and all vocalizing amphibians were identified, enumerated and recorded according to the habitat from which they are observed.
- 5.3.27 All life form of amphibians, including adult, juvenile, tadpole and egg, were recorded to indicate the breeding potential within the assessment area. Owing to the nocturnal behavior of most herpetofauna species, night-time surveys were also conducted.
- 5.3.28 Nomenclature follows AFCD Hong Kong Biodiversity Database. The commonness and conservation status for each species are presented. Scientific names are not mentioned in main text but can be seen in **Appendix 5.2**.

Butterfly and Odonate Survey

- 5.3.29 Transect surveys were conducted for butterflies and odonates three times in the wet season (August – early October 2020) and once in dry season (December 2020), with species mainly detected by direct observation. For butterflies, active searching for larvae and pupae within 5m of transect was also conducted. For odonates, special attention was paid to aquatic habitats such as watercourses. All species observed were identified to species level and quantified. Species occurring outside 5m of transect but within the assessment area was also recorded. The surveys were conducted at suitable weather condition to avoid overcast weather when butterflies and odonates are mostly less active, thus less to be detected.
- 5.3.30 Nomenclature follows AFCD Hong Kong Biodiversity Database. The commonness and conservation status for each species are presented. Scientific names are not mentioned in main text but can be seen in **Appendix 5.2**.

Freshwater Fauna Survey

- 5.3.31 Aquatic fauna survey was conducted at identified watercourses within the assessment area. Aquatic fauna, including freshwater macro-invertebrates and fishes, were identified and studied by direct bank side counting and other standard field sampling techniques as appropriate.
- 5.3.32 Nomenclature follows AFCD Hong Kong Biodiversity Database. The commonness and conservation status are presented. Scientific names of any identified species are presented in **Appendix 5.2**.

Marine Survey

- 5.3.33 The marine and intertidal survey carried out under the approved EIA for Shuen Wan Golf Course covered the coastal area around the artificial seawall of Shuen Wan Restored Landfill as well as the natural shore (rocky shore and sandy shore) to the east of the landfill site. With reference to the literature review, limited survey data is available along the southern coasts of Tai Po Industrial Estate. The marine survey of this EIA study therefore focused on the coastal area to the south of Tai Po Industrial Estate to fill the data gap.

Intertidal Fauna Survey

- 5.3.34 Intertidal surveys consisted of qualitative walkover surveys along the coastlines where accessible, and quantitative transect surveys at selected locations (see **Figure 5.3**). Intertidal

surveys covered both wet and dry season. Local tide tables according to Hong Kong Observatory were checked to assess tidal level at the site and to schedule suitable timing of surveys.

- 5.3.35 For qualitative walkover surveys, organisms encountered were identified to the lowest possible taxonomic level, and their relative abundance. For quantitative transect surveys, at each survey location, one 20 m horizontal transect along the coastline was surveyed at each of three tidal levels (high, middle and low). On each transect, five quadrats (25 cm x 25 cm) were placed randomly to assess the abundance and diversity of organisms. All organisms found in each quadrat were identified and recorded to the lowest possible taxonomic level, and density to be calculated. Sessile species in each quadrat were identified to the lowest possible taxonomic level and estimated as percentage cover on the substrate surface. No soft shore was surveyed, therefore no core sample was collected.

Benthic Fauna Survey

- 5.3.36 Benthos sampling was undertaken at two sampling sites (B1 and B2) near the waters of Tai Po Waterfront Park (see **Figure 5.3**). The sampling sites were fixed by GPS on board. The wet season sampling was conducted during ebb tide on 16 August 2020 and the dry season sampling was conducted during flood tide on 6 December 2020, both under sunny weather.
- 5.3.37 At every sampling site, three replicates of sediment samples were collected using a van Veen grab (0.1m² sampling area x 15cm biting depth). Collected samples were accepted when at least two-third of grab volume was filled. A photographic record of the sediment texture and colour was taken. The samples were washed with gentle seawater through a stack of plastic sieve boxes with 1.0mm and 0.5mm mesh sizes. Large animals that were visible from the residues were hand-picked into a small plastic vial. All remains were transferred into a plastic container for temporary storage.
- 5.3.38 After arrival to laboratory, the samples were preserved with 70% ethanol solution followed by staining with 1% Rose Bengal solution. The samples were stored for one day to ensure sufficient preservation and staining. The fauna collected were sorted out from the sediment residues on a white tray with the aid of magnifying glass. For quality assurance, the sediment residues of one-third sorted samples were randomly rechecked. No missed fauna was found in the recheck.
- 5.3.39 The collected specimens were identified to the lowest possible taxonomic level. Examination of morphological features of the specimens was undertaken with the aid of both stereoscopic and compound microscopes. The taxonomic classification was conducted in accordance with following references: Arthropod: Dai and Yang (1991), Dong (1991), Ren (2012); Echinoderm: Liao (1997, 2003); Echiuran and Sipunculan: Zhou *et al.* (2007); Mollusk: Qi (2004); Polychaete: Day (1967), Gallardo (1967), Fauchald (1977), Yang and Sun (1988), Wu *et al.* (1997), Sun and Yang (2004). The number of individuals of each species was recorded by counting the anterior portions of the fauna only. Total biomass of each species was determined as preserved wet weight, after blotting the organisms on filter paper for three minutes before weighing to the nearest 0.0001 g.

Dive Survey

- 5.3.40 A spot-dive reconnaissance check was conducted along modified shoreline of TPWP (see **Figure 5.3**) on 18th October 2020 under sunny weather. The survey route covered the existing emergency outfall of TPSTW. A zig-zag dive route was conducted along the shoreline focusing on subtidal hard substratum (e.g. boulder blocks seawall and vertical seawall) and muddy sea floor at water depth 1.0-2.0m. The survey aimed to check and locate any presence of coral communities, including hard corals, octocorals and black corals. For locations of high (or

relatively higher) coral coverage, the shore location were recorded with a GPS device (model: GARMIN 78s). Representative photographs of coral were taken.

- 5.3.41 Since coral was found during the spot-check dives, one shore location with coral was chosen for detailed Rapid Ecological Assessment (REA) with reference to DeVantier *et al.* (1998). The REA survey was conducted on 24 October 2020 under cloudy weather while the water visibility was fair (3-4 m). At the REA location (T1), a 100m transect line was laid along the subtidal hard substratum at 1.5-2.0m water depth. During the REA survey, detailed information of corals was recorded including number of colonies, type, size, relative coverage, health condition and translocation feasibility.

5.4 Literature Review Results

Terrestrial Habitat and Vegetation

- 5.4.1 Ecological impact assessment was carried out under the approved EIA for Shuen Wan Golf Course, EIAO Registered No. AEIAR-221/2019 (SWG C EIA). The assessment covered the following areas, which are relevant to the current EIA study.

- a. The Shuen Wan Restored Landfill (SWRL);
- b. TPSTW;
- c. TPIE;
- d. Tai Po Waterfront Park (TPWP);
- e. Tolo Harbour;
- f. Pre-roosting/Roosting Site(s) of Collared Crow; and
- g. Roosting Site(s) of Black Kite

- 5.4.2 The SWRL and most of the areas within 500m from the SWRL have been highly developed.

- 5.4.3 A total of seven types of terrestrial habitats identified under SWGC EIA are within the assessment area of this Project, including secondary woodland, plantation, grassland, turfgrass, watercourse, seawall and developed area. The following sections present the findings from SWGC EIA on habitat and flora within these seven relevant habitats.

Secondary Woodland

- 5.4.4 Secondary Woodland was located on hillsides, succeeded from shrubland/grassland which survived hill fire from grave sites. Most of the secondary woodland stands were young with canopy heights ranging from 6 to 10m and some were heavily covered with climbers. Species commonly recorded included *Alangium chinese*, *Ficus hispida*, *Mikania micrantha* and *Alocasia macrorrhizos* etc.

Plantation

- 5.4.5 Plantation was recorded on slopes of the SWRL and on hillsides along Ting Kok Road, Lo Fai Road and at the fringes of residential areas (i.e. Casa Brava in the north). Exotic species including *Acacia* spp., *Eucalyptus* spp., *Casuarina equisetifolia* and *Lophostemon confertus* were commonly recorded in the canopy.

Grassland

- 5.4.6 Scattered patches of grassland were recorded mainly along roads of the Temporary Golf Driving Range (TGDR) and on engineered slopes in the current assessment area. Grasslands were mainly composed of ruderal species including *Bidens alba*, *Wedelia trilobata* with

scattered exotic trees including *Leucaena leucocephala*.

Turfgrass

- 5.4.7 Turfgrass was recorded on the TGDR within the current assessment area. Grass species including *Axonopus compressus* and *Paspalum* spp. were commonly recorded.

Watercourse

- 5.4.8 One minor watercourse were recorded north of Ting Kok Road near Ha Hang Village within the current assessment area. Only lower section fell within the current assessment area. The lower section was channelized along footpath and modified to flow into underground culverts below Ting Kok Road.

Seawall

- 5.4.9 The coastlines along TPWP within the current assessment area were modified to seawall, mostly in rip-rap form. Little vegetation was recorded on the rocky surface with some weeds, herbs, climbers and young trees in the crevices.

Developed Area

- 5.4.10 TPIE, villages, roads and build-up area within the TGDR constituted developed area in current assessment area. Plant species recorded were mainly common landscape and roadside trees as well as ruderal species.

Floral Species of Conservation Importance

- 5.4.11 Two young individuals of *Aquilaria sinensis* were recorded on the slopes of the SWRL.

Terrestrial Fauna

- 5.4.12 Only a very minor portion of secondary woodland identified under SWGC EIA is within the current assessment area of this Project. Terrestrial fauna recorded in the secondary woodland of SWGC EIA are not considered in this literature review. The following sections present the findings from SWGC EIA (except otherwise specified) on fauna within the remaining six relevant habitats including plantation, grassland, turfgrass, watercourse, seawall and developed area.

Mammal

- 5.4.13 Two non-volant mammal species were recorded within the SWRL and none of them is considered of conservation importance. A few Leschenault's Rousette and Japanese Pipistrelle (bat species) were observed in plantation. All bats are protected under Cap. 170 in Hong Kong.

Avifauna

- 5.4.14 Forty-three bird species were recorded within the SWRL. Most of the recorded species are common and widely distributed in Hong Kong. Both species richness and abundance of birds within the SWRL were ranked as low.
- 5.4.15 Fifty-seven bird species were recorded in the surrounding areas of the SWRL. Both species richness and abundance of birds were low in plantation, and very low in other habitat types.
- 5.4.16 Sixteen species recorded are considered to be of conservation importance. Seven of these species of conservation importance were recorded within the SWRL. Except Collared Crow and Black Kite, the bird species of conservation importance were present in low abundance within the SWRL.

Pre-roosting/Roosting Site of Collared Crow

- 5.4.17 Collared Crow is an uncommon and localized resident in Hong Kong (Carey *et al.* 2001). The SWRL is one of the two larger communal roosting locations for Collared Crow in Hong Kong (Stanton *et al.* 2014; Stanton 2017). It is globally threatened, listed as Vulnerable (IUCN 2020) as the population of this species in China has declined greatly during the last few decades (Leader *et al.* 2016).
- 5.4.18 Roof tops of buildings in TPSTW were identified as the major pre-roosts of Collared Crow (SWGCEIA). Pre-roosting was also recorded once in northern plantation, and occasionally in southwestern plantation and turfgrass platforms of TGDR.
- 5.4.19 A communal roost of between 12 and 100 birds was recorded within the plantation of the SWRL as a roost under the SWGC EIA. Survey findings of the SWGC EIA showed that Collared Crow would change the pre-roost and final roost locations over time.

Roosting Site of Black Kite

- 5.4.20 Black Kite is the commonest raptor species in Hong Kong and is frequently recorded from various habitat types (Carey *et al.* 2001). Numbers of Black Kite in Hong Kong usually peak in December and January (*ibid.*).
- 5.4.21 A maximum count of 147 Black Kites roosting was recorded at the plantation within the SWRL. The night roosts of Black Kites were scattered among the plantation woodland (along the eastern to southern boundary) across the study. The number of Black Kites roosting in the SWRL during the peak over-wintering season was very low.

Roosting Site of non-breeding Ardeids

- 5.4.22 AFCD (2020) conducted a survey on 13 March 2020 at TPSTW as part of the territory-wide study on roosting sites of ardeids in winter 2019/20. A total of 45 Great Egrets and 48 Little Egrets were recorded night-roosting within TPSTW. AFCD (unpublished data) recorded only around ten ardeids in early 2019 and slight location change in late 2019.

Herpetofauna

- 5.4.23 Seven species of reptile were recorded in the SWRL and the plantation outside the SWRL but within 500m from the SWRL. Most are widely distributed in Hong Kong. Except Common Rat Snake in the SWRL, none of the recorded species is of conservation importance.
- 5.4.24 Six species of amphibian were recorded in the SWRL as well as the developed area and plantation outside the SWRL but within 500m from the SWRL. Most are widely distributed in Hong Kong. None of the recorded species is of conservation importance.

Butterfly and Odonate

- 5.4.25 Thirty-nine species of butterfly were recorded in the SWRL as well as the developed area and plantation outside the SWRL but within 500m from the SWRL. Most are very common/common and widely distributed in Hong Kong. None of the recorded species is considered of conservation importance.
- 5.4.26 Fourteen species of odonate were recorded in the SWRL and the plantation and developed area outside SWRL but within 500m from the SWRL. Most are abundant/common and widely distributed in Hong Kong. Except Tiger Hawker in the SWRL, none of the recorded species is considered of conservation importance.

Freshwater Fauna

5.4.27 Aquatic surveys conducted in the SWGC EIA covered the watercourse in the current assessment area. No aquatic fauna was recorded in the current assessment area. Seven freshwater fauna species were reported in the upper watercourses, outside the current assessment area.

Marine Habitat

Sites of Conservation Importance

5.4.28 Ting Kok Site of Special Scientific Interest (SSSI), Kei Ling Ha Mangal SSSI and Hoi Ha Wan Marine Park lie in the coastal area of Tolo Harbour within the assessment area for aquatic ecology, but they are at least 8km (in terms of the shortest water travelling distance) from the existing emergency outfall of TPSTW. A summary of these sites of conservation importance is provided in **Table 5.2**. Their locations are shown in **Figure 5.4**.

Table 5.2 Sites of Conservation Importance in Marine Assessment Area

Sites	Remarks
Ting Kok SSSI	<ul style="list-style-type: none"> ■ SSSI located in the coastal area near Ting Kok Village over 2km (in terms of land-based distance) and over 8 km (in terms of water travelling distance) from the existing emergency outfall of TPSTW. ■ This site supports mangrove community consisting of <i>Kandelia obovata</i>, <i>Aegiceras corniculatum</i>, <i>Lumnitzera racemosa</i>, <i>Avicennia marina</i> and <i>Bruguiera gymnorhiza</i>. ■ Frequently used as educational site for studying mangrove.
Kei Ling Ha Mangal SSSI	<ul style="list-style-type: none"> ■ The site lies in the southeast coastal area of Tolo Harbour in Three Fathoms Cove over 8.5 km away from the existing emergency outfall of TPSTW. ■ The site is one of the largest stands of mangrove in Hong Kong supports rare species <i>Bruguiera gymnorhiza</i> and the uncommon <i>Lumnitzera racemose</i>.
Hoi Ha Wan Marine Park	<ul style="list-style-type: none"> ■ The site lies in the northern coastline of Sai Kung Peninsula over 13 km away from the existing emergency outfall of TPSTW. ■ This site is favourable to coral communities as it is a sheltered bay under the influence of oceanic waters. ■ In the marine park, coral species <i>Pavona decussata</i>, <i>Platygyra sinensis</i> and <i>Porites lobata</i> occupy the shallow habitats and <i>Alveopora irregularis</i> and <i>Stylocoeniella guentheri</i> occupy the deeper habitats, while <i>Cyphastrea spp.</i> were found throughout different depths.

Marine Ecological Resources

5.4.29 Tolo Harbour is characterized by a diversity of intertidal habitats including sandy shore, rocky shores (natural rocky shores and artificial seawalls), mudflat and mangrove stands.

5.4.30 Based on literature review, areas of conservation importance include coral communities and mangrove stands scattered in Tolo Harbour and Tolo Channel areas. The indicative locations of these stationary species are shown in in **Figure 5.4**.

5.4.31 Other species of conservation importance found in Tolo Harbour also include a shrimp species (*Metapenaeus sp.*) and seahorse (*Hippocampus kuda*).

5.4.32 With reference to the Monitoring of Marine Mammals in Hong Kong Waters (2018-19) Final Report, AFCDD (2019), Tolo Harbour and Tolo Channel WCZ are not important habitats for Chinese White Dolphin (*Sousa chinensis*) and Finless Porpoise (*Neophocaena phocaenoides*).

Coral Communities

- 5.4.33 The seawall along SWRL and the nearby rocky shore to the east were surveyed for coral communities (SWGCEIA). Two species of hard corals *Oulastrea crispata* and *Leptastrea purpurea* were recorded during the survey. *Oulastrea crispata* is commonly found in Hong Kong, as this species is tolerant of extreme environments; while *Leptastrea purpurea* is abundant in Hong Kong. *Oulastrea crispata* was distributed in patches along the artificial and nearby rocky shore at less than 5% coverage. Only one colony of *Leptastrea purpurea* was found on the artificial seawall.
- 5.4.34 Dive surveys along the coastline of Sha Tin Hoi and the nearby waters were carried out in 2015 under the EIA for Sha Tin Cavern Sewage Treatment Works, EIAO Register No. AEIAR-202/2016 (CSTW EIA). Limited marine life was recorded from survey, with three species of hard coral recorded at the western coastline of Sha Tin Hoi, including *Favites chinensis*, *Oulastrea crispata*, and *Porites lutea*, with a low coral coverage of <1% to 5%. All three recorded species were either dominant or common in Hong Kong.
- 5.4.35 Dive surveys were conducted along the artificial shoreline of Sha Tin Hoi, Ma On Shan and Tai Po in 2014 under the project "Relocation of Sha Tin Sewage Treatment Works to Cavern – Feasibility Study". The dive survey results are presented in the CSTW EIA. Three species of hard corals including *Oulastrea crispata*, *Favites chinensis*, and *Porites lutea* were recorded at inner Tolo Harbour between Ma Liu Shui and Tai Po Kau. Low coverage of hard corals (around 1% to less than 5%) was recorded. All three recorded species were either dominant or common in Hong Kong.
- 5.4.36 The dive surveys conducted under the EIA for Development of a Bathing Beach at Lung Mei, Tai Po, EIAO Register No. AEIAR-202/2016 (LMB EIA) recorded a number of coral colonies of *Oulastrea crispata*, *Cyphastrea serailia* and *Psammocora superficialis* along the artificial shoreline of Tai Mei Tuk, Ma Shi Chau, and Yeung Chau, which are located more than 4 km away from the existing emergency outfall of TPSTW. A low coral coverage of less than 5% was recorded at the sites. All coral species recorded were common and abundant, no soft or black corals were found.
- 5.4.37 In the EIA for Drainage Improvement in Sha Tin and Tai Po, EIAO Register No. AEIAR-110/2007 (DISTTS EIA), a subtidal survey was undertaken off the shore of Shuen Wan. This area did not support corals as no individual colonies of either hard or soft corals were recorded.
- 5.4.38 Dive surveys were conducted along the coasts of Tai Po Landing Point and Pak Sha Tau Chau under the EIA for the Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong, EIAO Register No. AEIAR-071/2003 (TPSGP EIA). The Tai Po Landing (located just south of TPIE and SWRL) was found to support low coverage of hard coral (*Oulastrea crispata*), which is commonly found in Hong Kong.
- 5.4.39 Coral surveys were undertaken in 2001 off the western coast of Wu Kai Sha Tsui under the EIA for the Feasibility Study for Housing Development at Whitehead and Lee On in Ma On Shan, Sha Tin, EIAO Register No. AEIAR-068/2002 (Whitehead EIA). One colony of black coral *Antipathes sp.* was identified. *Antipathes sp.* is widespread and not uncommon in Hong Kong. The black coral colony was small and covered less than 1% coverage, and is located more than 5 km away from the existing emergency outfall of TPSTW. No hard corals or other rare species were observed.
- 5.4.40 Based on literature review, hard coral species with high coral cover are located at Wong Wan Tsui, Fung Wong Wat, Wong Chuk Kok Tsui, South Wong Chuk Kok Tsui and Gruff Head with a

high coral cover. Hoi Ha Wan is also a location with high coral coverage. Moderate to high diversity of hard coral species were recorded at Hoi Ha Wan Pier, Hoi Ha Wan Coral Beach and Hoi Ha Wan Moon. The recorded species in these areas include dominant / abundant species and common hard corals. Uncommon hard coral species, soft corals and black corals were also recorded. However, all these coral sites are located near or outside the Tolo Channel over 13 km away from TPSTW.

- 5.4.41 All corals and organisms in Marine Parks are protected under Marine Park Ordinance (Cap. 476). All corals identified in literatures are protected under Cap. 586 Protection of Endangered Species of Animals and Plants Ordinance.

Benthos

- 5.4.42 Subtidal benthic surveys in the coastal area around SWRL were conducted under the SWGC EIA. The species recorded are all common and widespread in Hong Kong without special conservation importance, except for one individual of *Metapenaeus sp.* Shrimps of the genus *Metapenaeus* are common in mangrove and estuarine areas in Hong Kong but are considered to be Vulnerable in China as reported in the SWGC EIA.
- 5.4.43 Site specific benthic surveys were conducted under other EIA projects listed in Section 5.3.10. No species of conservation importance was recorded.

Mangrove Stands

- 5.4.44 Literature review indicated that mangrove habitats are located in Ting Kok, Shuen Wan, Sam Mun Tsai, Tolo Pond, Nai Chung, Sai Keng, Kei Ling Ha Lo Wai, Kei Ling Ha Hoi, Sham Chung, Lai Chi Chong, Lo Fu Wat and Fung Wong Wat. Mangrove species recorded include *Kandelia obovata*, *Excoecaria agallocha*, *Aegiceras corniculatum*, *Avicennia marina*, *Bruguiera gymnorrhiza* and *Lumnitzera racemosa*. The most extensive mangrove stands are located in the northern Tolo Harbour within Ting Kok SSSI. The diversity of mangal species in Ting Kok SSSI was relatively high.
- 5.4.45 As stipulated in the EIAO-TM, established mangrove stand of any size is considered as important habitat in Hong Kong.

Seahorse

- 5.4.46 Surveys were conducted between March 2012 and October 2013 under Phase II of the "Systematic Pipefish and Seahorse Survey", in which Spotted Seahorse (*Hippocampus kuda*) was recorded at various locations within Tolo Harbour, namely Lung Mei, Yeung Chau, Three Fathoms Cove, Lo Fu Wat, Fung Wong Wat, Hoi Ha Wan and Tap Mun. The closest location, Yeung Chau, is located over 8 km (in terms of water travelling distance) away from the Project discharge point.
- 5.4.47 As reported in the Project Profile for Sediment Removal at Yim Tin Tsai, Yim Tin Tsai East Fish Culture Zone (Application No. DIR-191/2009), seahorses (*Hippocampus kuda*) were previously found in the coastal area of inner Tolo Harbour near the southeast corner of TPIE.
- 5.4.48 *Hippocampus kuda* is still found in reasonable numbers in Hong Kong's eastern waters. It is categorized as "Vulnerable" in the IUCN Red List due to the observation of a global population decreasing trend, however, not protected under the local legislation.

5.5 Field Survey Results

Terrestrial Habitat and Vegetation

- 5.5.1 Within the 500m assessment area of this Project, a total of 6 habitats were identified, including

sea, artificial seawall, semi-natural watercourse, grassland, plantation and developed area. Sea is not a terrestrial habitat and is not considered further in the terrestrial ecological impact assessment. The Project site is completely developed area, including the existing TPSTW and proposed expansion area.

- 5.5.2 The areas of each type of habitats present within the Project site and the 500m assessment area are listed in **Table 5.3**, while a habitat map is provided in **Figure 5.2**. Representative photographs of these habitats are provided in **Appendix 5.4**.

Table 5.3 Habitats present within the Project Site and the 500m Assessment Area

Habitat	Area of each habitat identified					
	Project Site		500m Assessment Area (excluding Project Site)		Total	
	ha	%	ha	%	ha	%
Artificial Seawall	-	-	0.67	0.47	0.67	0.43
Semi-natural Watercourse	-	-	0.03	0.02	0.03	0.02
Grassland	-	-	13.96	9.84	13.96	8.96
Plantation	-	-	38.54	27.16	38.54	24.75
Developed Area	13.81	100.00	88.72	62.51	102.53	65.84
Total	13.81		141.92		155.73	

- 5.5.3 A list of floral species recorded during the surveys with their relative abundance within each habitat is provided in **Appendix 5.1**. A total of 162 plant species were recorded within the assessment area, including the Project site, 69 of which were native species. No species of conservation importance was recorded.

Artificial Seawall

- 5.5.4 The coastlines along TPWP and the SWRL within the assessment area were modified to artificial seawall in rip-rap form. Vegetation was recorded on the upper seawall, aside the pedestrian trail, mostly common exotic species.

Semi-natural Watercourse

- 5.5.5 A short section of semi-natural watercourse, which is located north to the Ting Kok Road, falls within the assessment area. Bankside is dominated by weedy species *Ipomoea cairica*.

Grassland

- 5.5.6 Grasslands within the assessment area are all located at the SWRL, under the management of Environmental Protection Department (EPD). Two platforms have been landscaped and converted into TGDR for general public use since April 1999. Other grasslands are located at the northwest of the SWRL and at the roadside near the entrance of TGDR next to Ting Kok Road.

Plantation

- 5.5.7 Plantation was one of the dominant terrestrial habitats recorded within the assessment area. The largest one is located at the SWRL, covering all the fill slopes with dominant exotic species *Acacia* spp., under management of EPD. Other large plantation areas are located at the TPWP and on hillsides north to Ting Kok Road. The small areas of secondary woodland on hillside north to Ting Kok Road recorded in the SWGC EIA, was considered as plantation under current

study, based on the dominance of floral species.

Developed Area

- 5.5.8 More than half of the assessment area was Developed Area, consists of mainly the TPIE, roads, build-up areas in TPWP and TGDR, and small residential area to the north of Ting Kok Road. Plant species recorded were mainly common landscape and roadside vegetation as well as ruderal species.

Terrestrial Faunal Survey Findings

Mammal

- 5.5.9 No non-volant mammal species was recorded during the survey within the Project site and the assessment area. Due to isolation by developed areas, utilization of habitats within the assessment area is expected to be low.
- 5.5.10 An unidentified bat species was recorded within the Project site during night-time survey occasionally. No roosting individual was recorded within the Project site throughout the survey period. All bats are protected under Cap. 170 in Hong Kong. No bat was recorded in the 500m assessment area during the survey period.

Avifauna

- 5.5.11 Fifty-two bird species were recorded within the Project site (**Appendix 5.2**). Most of the recorded species are common and widely distributed in Hong Kong. Twelve species are considered to be of conservation importance.
- 5.5.12 Forty-three bird species were recorded within the assessment area (outside the Project site). Most of the recorded species are common and widely distributed in Hong Kong. Eleven species are considered to be of conservation importance.
- 5.5.13 Black-crowned Night Heron is considered of Local Concern (Fellowes *et al.* 2002) on the basis of restrictedness in breeding and/or roosting site rather than in general occurrence; however, no breeding or roosting within the assessment area was recorded. Maximum count of 20 Black-crowned Night Herons was recorded within the Project site. Black-crowned Night Heron has been recorded within the assessment area (outside the Project site) occasionally in low abundance.
- 5.5.14 Chinese Pond Heron is considered of Potential Regional Concern (Fellowes *et al.* 2002). Maximum count of 12 Chinese Pond Herons was recorded within the Project site. Chinese Pond Heron has been recorded within the assessment area (outside the Project site) occasionally in low abundance.
- 5.5.15 Eastern Cattle Egret is considered of Local Concern (Fellowes *et al.* 2002) on the basis of restrictedness in breeding and/or roosting site rather than in general occurrence; however, no breeding or roosting site of this species was recorded within the assessment area. Maximum count of 33 Eastern Cattle Egret was recorded within the Project site. Eastern Cattle Egret which known to forage in grassy area, has been recorded in this habitat (outside the Project site) occasionally in low abundance.
- 5.5.16 Grey Heron is considered of Potential Regional Concern (Fellowes *et al.* 2002). Maximum count of 7 Grey Herons was recorded within the Project site. Grey Heron has been recorded within the assessment area (outside the Project site) occasionally in low abundance.
- 5.5.17 Great Egret is considered of Potential Regional Concern (Fellowes *et al.* 2002). Maximum count of 37 Great Egrets was recorded within the Project site. Great Egret has been recorded

relatively high in number of individuals within the assessment area (outside the Project site); maximum count of 80 individuals was recorded in flight across Tolo Harbour and maximum count of 82 individuals was recorded at the artificial seawall along the TPWP.

- 5.5.18 Little Egret is considered of Potential Regional Concern (Fellowes *et al.* 2002). During the early morning transect survey, maximum count of 2 Little Egrets (mean of 0.5 in six surveys) was recorded foraging within the Project site. Single occasion of 136 Little Egret was recorded at the large *Ficus* trees in the southwest portion of the TPSTW. Little Egret has been recorded relatively high in number of individuals within the assessment area (outside the Project site); maximum count of 190 individuals was recorded in flight across Tolo Harbour and maximum count of 207 individuals was recorded at the artificial seawall along the TPWP.
- 5.5.19 Great Cormorant is considered of Potential Regional Concern (Fellowes *et al.* 2002). Two occasions of Great Cormorant flying across the assessment area from Tolo Harbour to the northwest were recorded. Maximum count of 19 individuals was all recorded outside the Project site.
- 5.5.20 Black Kite is considered of Regional Concern (Fellowes *et al.* 2002) on the basis of restrictedness in breeding and/or roosting site rather than in general occurrence. Roosting site within the SWRL has been recorded. It is also listed in Appendix II of the CITES, and hence are protected under Cap. 586. Maximum count of 40 individuals was recorded at the roost. Only one individual Black Kite was encountered in the Project site over the survey period. Four individuals of this species was recorded in flight across the Project site.
- 5.5.21 Eastern Buzzard is listed in Appendix II of the CITES, and hence are protected under Cap. 586. Only 1 individual was recorded in flight across the Project site over the entire survey period.
- 5.5.22 Black-winged Stilt is considered of Regional Concern (Fellowes *et al.* 2002), however, only one individual was recorded on a single occasion (on migration) within the SWRL.
- 5.5.23 White-throated Kingfisher is considered of Local Concern (Fellowes *et al.* 2002) on the basis of restrictedness in breeding and/or roosting site rather than in general occurrence; however, no breeding or roosting site within the assessment area was recorded. Only one individual of this species encountered over the survey period and it was recorded within the TPSTW.
- 5.5.24 Collared Crow is considered of Local Concern (Fellowes *et al.* 2002) and listed as Vulnerable on IUCN Red List (IUCN 2021). During the early morning transect survey, maximum count of 15 Collared Crows (mean of 9.7 in six surveys) was recorded foraging within the Project site. During the roost count survey, up to 89 Collared Crows was occasionally recorded passing by the Project site prior to their pre-roost and/or roost. Relatively high in number of individuals was also recorded within the assessment area (outside the Project site).
- 5.5.25 Red-billed Starling is considered of Global Concern (Fellowes *et al.* 2002); however, the global population estimate has been revised and the species is no longer considered globally threatened (BirdLife International 2017). A listing of Regional Concern (RC) based on the importance of the large roosts in Deep Bay area, is considered to be more appropriate (Mott, 2008). Red-billed Starling is now listed as Least Concern on IUCN Red List (IUCN 2021). No roosting site of Red-billed Starling was recorded within the assessment area. Thirty-seven individuals of this species were recorded in the Project site and the remaining count of 16 individuals were recorded in the plantation outside the Project site.
- 5.5.26 White-shouldered Starling is considered of Local Concern (Fellowes *et al.* 2002) on the basis of restrictedness in breeding and/or roosting site rather than in general occurrence; however, no breeding or roosting site within the assessment area was recorded. Only a single bird was recorded within the TPSTW over the survey period.

Ardeid Use of the TPSTW

- 5.5.27 Ardeids, made up of Grey Herons, Great Egrets, Little Egrets and Black-crowned Night Herons, were regularly observed during daytime surveys at the sedimentation tanks of the TPSTW. These were often in relatively low numbers. Many of these birds would depart at dusk in the direction towards Tai Po Town Centre. On occasion, birds would stage at the large *Ficus* trees in the southwest of the TPSTW before leaving the Project site.
- 5.5.28 A morning count on 28 October 2020 recorded 136 Little Egrets at the large *Ficus* trees in the southwest portion of the TPSTW, indicating overnight roosting (**Figure 5.5**). An evening count on 5 November 2020 recorded 319 individuals of egrets landing on the *Ficus* trees after sunset (**Figure 5.5**); however, species of these egrets were unidentified and the number of individuals staying on the *Ficus* trees were uncertain due to insufficient light with most appearing to depart (see photo in **Appendix 5.5**). Pre-roost / roost survey results for ardeids are presented in **Appendix 5.3**.
- 5.5.29 Based on the observations during transect surveys and roosting/pre-roosting surveys, given that the generally low abundance of ardeids loafing and/or foraging within the Project site combined with the very low coverage of droppings under the *Ficus* trees it is considered that the TPSTW is unlikely to be a regular roosting site of non-breeding ardeids, though may be used sporadically.
- 5.5.30 No day-time roosting of Black-crowned Night Heron was recorded within the Project site and assessment area.

Pre-roosting/Roosting Site of Collared Crow

- 5.5.31 Contrary to the findings of SWGC EIA, no proper pre-roost gathering was recorded within the Project site, though up to 89 Collared Crows have been recorded in the TPSTW were of birds following their usual daytime activities. Pre-roosting sites were located in the adjacent SWRL.
- 5.5.32 Pre-roosting of Collared Crow was recorded at the SWRL; either on the taller trees or on the grassy areas of the TGDR (Labelled A and B respectively on **Figure 5.5**). The highest pre-roost count was of 114 Collared Crows recorded from the higher platform of the TGDR in early October 2020, with all staying at the grassland after sunset.
- 5.5.33 Roosting of Collared Crow was mainly recorded at the eastern plantation of the SWRL. The highest count of roosting birds was 107, recorded in August 2020.
- 5.5.34 Number of Collared Crow pre-roosting and/or roosting within the assessment area were at the peak in October 2020. The abundance within the Project site and assessment area decreased in the following survey months.
- 5.5.35 The pre-roosting and roosting sites of Collared Crow are presented in **Figure 5.5**. Total number of individuals recorded at pre-roost and final roost during surveys, are presented in **Appendix 5.3**.

Pre-roosting/Roosting Site of Black Kite

- 5.5.36 Black Kites were recorded soaring above the SWRL and Tolo Harbour during roost surveys. The highest count was of 40 Black Kites recorded roosting at the southeast plantation of the SWRL, in early September 2020. The abundance within the assessment area decreased significantly in the following survey months. The survey results are presented in **Appendix 5.3**.
- 5.5.37 The roosting site of Black Kite is presented in **Figure 5.5**.

Flightlines of Collared Crow and Non-breeding Ardeids

Collared Crow

- 5.5.38 'Local movement corridors' are different to flightlines as they are not (or do not appear to be) directly between roosting site and foraging, but instead form part of the birds' daily movements/behavior. Daytime surveys recorded Collared Crows throughout TPSTW, loafing on lamp posts, planted trees, rooftop or sedimentation tanks. Birds would congregate in loose groups on the rooftop of the Central Building Complex about an hour before sunset, before returning to pre-roosting/roosting sites in the SWRL. Collared Crows departing the TPSTW would follow a broad route directly between the site and the pre-roost locations in the SWRL, see **Flightline A** in **Figure 5.6a**.
- 5.5.39 Meanwhile, there were three broad flightlines recorded for birds arriving from locations in the wider Tolo Harbour area. The indicative direction of these flightlines are illustrated as **Flightline B, C and D** in **Figure 5.6a**.

Non-breeding Ardeids

- 5.5.40 One flightline of non-breeding ardeids was identified. The indicative direction of non-breeding ardeids' flightline is illustrated in **Figure 5.6b**.
- 5.5.41 The only flightline in the context of this Study was **Flightline 1**, with 424 observations of individual ardeids following this route (mean = 35.3, n = 12 surveys); it should be noted that this is a relatively low number of birds for a flightline. Ardeids following this flightline were departing the Project Site in the dusk, towards the roosts outside the assessment area. The highest count of departing birds was 114 in October 2020, made up of Little Egrets, Great Egrets and Eastern Cattle Egrets, presumably made up of migrant birds given time of the year.
- 5.5.42 Ardeids would depart from various daytime foraging locations within the TPSTW, across or over the large *Ficus* trees in the southwest portion of the Project site (in the vicinity of the proposed expansion area), south down Dai Kwai Street, then skirt around the tall APT Satellite Company building and then head west along the harbor front, as individuals or in small flocks prior to sunset.
- 5.5.43 Small numbers of ardeids were occasionally recorded coming from the southern and western assessment area to the eastern area of the TPSTW. These ardeids did not roost at the TPSTW and likely departed the site along **Flightline 1**, later in the survey period.

Herpetofauna

- 5.5.44 Only one reptile species was recorded within the Project site (**Appendix 5.2**), Long-tailed Skink which is widely distributed throughout Hong Kong.
- 5.5.45 Two amphibian species and one reptile species were recorded within the assessment area (outside the Project site) (**Appendix 5.2**). All are widely distributed throughout Hong Kong.
- 5.5.46 No species of conservation importance was recorded throughout the survey period.

Butterfly and Odonate

- 5.5.47 Seven butterfly species were recorded within the Project site. All are assessed as Common or Very Common in Hong Kong (AFCD 2021), except Plains Cupid, which is Uncommon.
- 5.5.48 Thirteen butterfly species were recorded within the assessment area (outside the Project site). All are assessed as Common or Very Common in Hong Kong (AFCD 2021), except Swallowtail

and Metallic Cerulean, which are Rare and Very Rare respectively. Indicative locations of species of conservation importance are presented in **Figure 5.2**.

5.5.49 Four odonate species were recorded within the Project site. All are assessed as Common or Abundant in Hong Kong (AFCD 2021).

5.5.50 Four odonate species were recorded within the assessment area (outside the Project site). All are assessed as Abundant in Hong Kong (AFCD 2021).

Freshwater Communities

5.5.51 No freshwater aquatic fauna was recorded in the short section of semi-natural watercourse within the assessment area.

Marine Ecological Survey Findings

Intertidal Communities

5.5.52 A total of 8 and 17 species of intertidal fauna were recorded in wet and dry season surveys respectively (**Appendix 5.2**). *Saccostrea cucullata* and *Brachidontes variabilis* were the dominant species recorded at the middle and lower tidal zone of the artificial seawall. No species of conservation interest was recorded.

Benthic Infauna

5.5.53 Benthic surveys at 2 sampling points (3 replicates in each location) recorded 12 individuals of organisms from 4 species in 3 families in 2 phyla during wet season, and 37 individuals of organisms from 5 species in 4 families in 2 phyla during dry season. A total of 7 species were recorded, including 4 in phylum Mollusca and 3 in phylum Annelida. No species of conservation interest was recorded.

5.5.54 Details of benthic survey findings are presented in the appended benthic survey report (**Appendix 5.6**).

Subtidal Hard Substrate Communities

5.5.55 The sub-tidal environment within the spot-check dive survey and REA surveys was an artificial shoreline consisted of mainly large boulders. The survey route was nearly devoid of coral. Only one small colony of *Oulastrea crispata* was found at the eastern section of survey route along the shore of TPIE. This coral species is widely distributed with high tolerance to water turbidity (AFCD, 2016). The very shallow sub-tidal zones supported abundant biofouling fauna and fish communities.

5.5.56 Two individuals of spotted seahorse *Hippocampus kuda* were found along the REA transect T1. It is categorized as Vulnerable in IUCN Red List of Threatened Species and listed in Appendix II of CITES.

5.5.57 Details of coral survey findings are presented in the appended coral survey report (**Appendix 5.7**).

5.6 Evaluation of Baseline Ecological Conditions

Habitat within Project Site

Developed Area

5.6.1 The Project site covers 13.81ha developed area, including the existing TPSTW and the proposed expansion area. Vegetation within the Project Site were dominated by cultivated

plant species mainly *Mangifera indica*.

- 5.6.2 An individual of one floral species of conservation importance, *Aquilaria sinensis* was found within the Project Site, to the west of the maintenance building. The origin (cultivated or not) of the individual tree was unknown.
- 5.6.3 A total of 52 bird species were recorded within the Project Site. Twelve of these are species of conservation importance (maximum count in parentheses), including Black-crowned Night Heron (20), Chinese Pond Heron (12), Eastern Cattle Egret (33), Grey Heron (7), Great Egret (37), Little Egret (transect survey: 2; roosting survey: 136), Black Kite (5), Eastern Buzzard (1), White-throated Kingfisher (1), Collared Crow (transect survey: 15; roosting survey: 89), Red-billed Starling (37) and White-shouldered Starling (1).
- 5.6.4 Black-crowned Night Heron, Eastern Cattle Egret, White-throated Kingfisher and White-shouldered Starling are considered to be of Local Concern (Fellowes *et al.* 2002) on the basis of restrictedness in breeding and/or roosting sites rather than in general occurrence. However, no breeding or roosting sites of these 4 species were recorded within the Project Site.
- 5.6.5 Only 1 reptile, 7 butterfly and 4 odonate species were recorded within the Project Site. All are common or abundant, and widely distributed in Hong Kong (AFCD 2021) except one butterfly species (Plains Cupid), which is Uncommon. Butterfly species considered to be Uncommon by AFCD, are usually not considered to be species of conservation concern except specifically mentioned.
- 5.6.6 Very occasional night roosting of non-breeding ardeids was found within the Project Site. No Collared Crow roost is located within the Project Site.

Table 5.4 Evaluation of Developed Area within the Project Site

Criterion	Developed Area
Naturalness	Man-made habitat
Size	13.81ha
Diversity	Low flora diversity and very low fauna diversity, but low to moderate diversity of bird species.
Rarity	One flora species of conservation importance was recorded, an individual of <i>Aquilaria sinensis</i> . Twelve bird species of conservation importance were recorded.
Re-creatability	Readily re-creatable
Fragmentation	N/A
Ecological Linkage	Not functionally linked to habitats of conservation importance
Potential Value	Low
Nursery/ Breeding Ground	Not found.
Age	Since 1979.
Abundance/ Richness of Wildlife	Low to moderate abundance of bird species, very low for other fauna.
Overall Ecological Value	Low to moderate

Habitat within Assessment Area

Artificial Seawall

- 5.6.7 Approximately 0.67ha artificial seawall falls within the 500m assessment area, including the sections of approximately 910m along TPWP and approximately 271m along the SWRL.

Table 5.5 Evaluation of Artificial Seawall within the Assessment Area

Criterion	Artificial Seawall
Naturalness	Man-made habitat.
Size	0.67ha (1.18 km)
Diversity	Very low diversity of floral and faunal species (15 plant species, 4 bird species and 5 butterfly species); very low diversity of intertidal fauna
Rarity	One butterfly species of conservation importance was recorded
Re-creatability	Readily re-creatable
Fragmentation	Not fragmented from the Tolo Harbour
Ecological Linkage	Linked with Tolo Harbour and other marine waters
Potential Value	Low to moderate
Nursery/ Breeding Ground	Recruitment of sessile species
Age	N/A
Abundance/ Richness of Wildlife	High abundance of dominant species such as <i>Saccostrea cucullata</i>
Overall Ecological Value	Low to moderate

Semi-natural Watercourse

- 5.6.8 Only 0.03ha (approximately 50m in length) semi-natural watercourse falls within the 500m assessment area. It is located north to Ting Kok Road, next to a horticulture garden. This small tributary originated from the northern hilly areas, ended up joining the underground culvert with modification and connected to Tolo Harbour. No freshwater species were recorded in the section within the assessment area. One dragonfly species Common Red Skimmer was recorded. The bankside vegetation was dominated by exotic species *Wedelia trilobata* and *Ipomoea cairica*.

Table 5.6 Evaluation of Semi-natural Watercourse within the Assessment Area

Criterion	Semi-natural watercourse
Naturalness	Natural bottom except the end of the section joining the underground culvert. Partly modified.
Size	0.03ha
Diversity	Very low diversity of floral and faunal species
Rarity	No species of conservation importance recorded.
Re-creatability	Not re-creatable for natural section
Fragmentation	Not fragmented from the water source in the northern hilly areas
Ecological Linkage	Linked with tributaries in the northern hilly areas
Potential Value	Low
Nursery/ Breeding Ground	Not found
Age	N/A
Abundance/ Richness of Wildlife	Low abundance of fauna
Overall Ecological Value	Low

Grassland

- 5.6.9 13.96ha of the assessment area was grassland, including the two platforms of TGDR, the

northwestern grassland of the SWRL and the grassland next to the entrance of public access to the TGDR. Vegetation within the grassland was dominated by *Axonopus compressus*.

- 5.6.10 A total of 16 bird species were recorded in grassland. Three of these are species of conservation importance.
- 5.6.11 The grassland within the SWRL is used by Collared Crow as pre-roost.

Table 5.7 Evaluation of Grassland within the Assessment Area

Criterion	Grassland
Naturalness	Semi-natural under management of TGDR
Size	13.96ha
Diversity	Low diversity of flora and fauna
Rarity	Three bird species of conservation importance.
Re-creatability	Re-creatable
Fragmentation	Fragmented by access road within the SWRL
Ecological Linkage	Linked to the plantation
Potential Value	Moderate
Nursery/ Breeding Ground	Not found
Age	TGDR since 1999.
Abundance/ Richness of Wildlife	High abundance of Collared Crow. Low abundance of other fauna.
Overall Ecological Value	Moderate

Plantation

- 5.6.12 38.54ha of the 500m assessment area was plantation, including the plantation within the SWRL, TPWP and government-managed slopes north to Ting Kok Road. Except the plantation within the SWRL, all plantation are fragmented from the Project Site by the TPIE.
- 5.6.13 A total of 32 bird species were recorded in plantation. Eight of these are species of conservation importance, which were all recorded within the SWRL, including (maximum count in parentheses) Chinese Pond Heron (4), Eastern Cattle Egret (1), Grey Heron (1), Great Egret (4), Little Egret (16), Black Kite (40), Collared Crow (107) and Red-billed Starling (16). These species were recorded occasionally in low abundance, except Black Kite and Collared Crow.
- 5.6.14 Pre-roosting behavior of Collared Crow, roosting sites of Collared Crow and Black Kite were recorded within the SWRL throughout the survey period (Sections 5.5.31 to 5.5.37). The roost was located at the plantation to the east and south of the SWRL, adjacent to Tolo Harbour.

Table 5.8 Evaluation of Plantation within the Assessment Area

Criterion	Plantation
Naturalness	Man-made with natural succession
Size	38.54ha
Diversity	Low to moderate diversity of bird species. Very low diversity of other fauna.
Rarity	Eight bird species of conservation importance. One butterfly species of conservation importance.
Re-creatability	Re-creatable
Fragmentation	Fragmented by Ting Kok Road from hilly areas to the north.
Ecological Linkage	Plantation in SWRL linked to the grassland and Tolo Harbour.

Criterion	Plantation
Potential Value	Moderate for plantation in SWRL. Low for other plantation within the assessment area.
Nursery/ Breeding Ground	Not found.
Age	Shuen Wan Landfill restored since 1997.
Abundance/ Richness of Wildlife	Relatively higher abundance of Collared Crow in context of Hong Kong. Low abundance of other fauna.
Overall Ecological Value	Plantation in the SWRL: Moderate Other plantation within the assessment area: Low

Developed Area

- 5.6.15 More than half of the assessment area was developed area, including mainly the TPIE, roads, some residential area at the north. A total of 10 bird species were recorded within this habitat. All are common and widely distributed in Hong Kong (AFCD 2021), except Collared Crow which was recorded occasionally loafing on rooftops or lamp posts in very low abundance.

Table 5.9 Evaluation of Developed Area within the Assessment Area (excluding Project Site)

Criterion	Developed Area
Naturalness	Man-made habitat
Size	88.72ha
Diversity	Low flora diversity. Very low fauna diversity.
Rarity	Occasional record of Collared Crow loafing
Re-creatability	Readily re-creatable
Fragmentation	N/A
Ecological Linkage	Not functionally linked to habitats of conservation importance
Potential Value	Very low
Nursery/ Breeding Ground	Not found
Age	N/A
Abundance/ Richness of Wildlife	Very low abundance of fauna
Overall Ecological Value	Very low

Intertidal fauna

- 5.6.16 Intertidal habitats within the survey area are considered to be of low ecological value due to its man-made features and the low fauna and flora diversity recorded. No rare species or species of conservation importance were recorded.

Table 5.10 Evaluation of intertidal fauna within the Survey Area

Criterion	Intertidal fauna
Naturalness	Natural
Size	N/A
Diversity	Low diversity of flora and fauna
Rarity	No species of conservation importance recorded.
Re-creatability	N/A

Criterion	Intertidal fauna
Fragmentation	Not fragmented from the open sea
Ecological Linkage	Linked to the open sea
Potential Value	Low to moderate
Nursery/ Breeding Ground	Recruitment of sessile species on hard substrate in both tidal and sub-tidal zones at the seawall
Age	N/A
Abundance/ Richness of Wildlife	High abundance of sessile species widely distributed in Hong Kong including <i>Saccostrea cucullata</i> . Low to moderate abundance of motile species including gastropods and crabs.
Overall Ecological Value	Low

Benthic Environment

- 5.6.17 The benthic environment of the survey area was evaluated to be of very low ecological value due to the very low fauna diversity and very low wildlife abundance. No rare species or species of conservation importance were recorded.

Table 5.11 Evaluation of benthic environment within the Survey Area

Criterion	Benthic Environment
Naturalness	Muddy substratum under long-term organic enrichment at moderate level.
Size	N/A
Diversity	Very low diversity of fauna (7 species recorded)
Rarity	No species of conservation importance recorded.
Re-creatability	N/A
Fragmentation	Not fragmented from the open sea
Ecological Linkage	Linked to the open sea
Potential Value	Low
Nursery/ Breeding Ground	Not found.
Age	N/A
Abundance/ Richness of Wildlife	Very low abundance
Overall Ecological Value	Very low

Sub-tidal Environment

- 5.6.18 Subtidal hard substrate habitat is considered to be of low ecological value. Common coral species were present, however their diversity and abundance were very low. Only 1 small colony of one coral species was recorded.

Table 5.12 Evaluation of sub-tidal environment within the Survey Area

Criterion	Sub-tidal environment
Naturalness	Artificial shoreline consisted of mainly large boulders
Size	N/A
Diversity	Very low diversity (1 species recorded)

Criterion	Sub-tidal environment
Rarity	Spotted Seahorse <i>Hippocampus kuda</i> in very low abundance (2 individuals)
Re-creatability	N/A
Fragmentation	Not fragmented from the open sea
Ecological Linkage	Linked to the open sea
Potential Value	Low to moderate
Nursery/ Breeding Ground	Not found.
Age	N/A
Abundance/ Richness of Wildlife	Very low abundance (1 small colony recorded) High abundance of biofouling fauna and fish community
Overall Ecological Value	Low

Species of Conservation Importance

5.6.19 Recorded species of conservation importance were evaluated based on the ecological surveys and literature review, and summarized in **Table 5.13** below.

Table 5.13 Evaluation of Species of Conservation Importance

Species	Occurrence ^[1]	Conservation & Protection Status ^[2]	Distribution ^[3]
Flora			
Incense Tree <i>Aquilaria sinensis</i>	PS (DA)	CITES (II); IUCN (VU); Cap. 586; State Protection (Category II) in China	Common in Hong Kong
Birds			
Black-crowned Night Heron <i>Nycticorax nycticorax</i>	PS (DA); AA (IF, AS)	(LC)	Common resident and winter visitor. Widely distributed in Hong Kong.
Chinese Pond Heron <i>Ardeola bacchus</i>	PS (DA); AA (IF, PI)	PRC (RC)	Common resident. Widely distributed in Hong Kong.
Eastern Cattle Egret <i>Bubulcus coromandus</i>	PS (DA); AA (Gr, PI)	(LC)	Resident and common passage migrant. Widely distributed in Hong Kong.
Grey Heron <i>Ardea cinerea</i>	PS (DA); AA (IF, PI, AS)	PRC	Common winter visitor. Found in Deep Bay area, Starling Inlet, Kowloon Park, Cape D'Aguilar.
Great Egret <i>Ardea alba</i>	PS (DA); AA (IF, PI, AS)	PRC (RC)	Common resident and winter visitor. Widely distributed in Hong Kong.
Little Egret <i>Egretta garzetta</i>	PS (DA); AA (IF, PI, AS)	PRC (RC)	Common resident. Widely distributed in coastal areas throughout Hong Kong.
Great Cormorant <i>Phalacrocorax carbo</i>	AA (IF)	PRC	Common winter visitor. Widely distributed in coastal areas throughout Hong Kong.
Black Kite <i>Milvus migrans</i>	PS (DA, IF); AA (IF, PI)	(RC); CITES (II); Cap. 586	Common resident and winter visitor. Widely distributed in Hong Kong.
Eastern Buzzard <i>Buteo japonicas</i>	PS (IF)	CITES (II); Cap. 586	Common winter visitor.

Species	Occurrence ^[1]	Conservation & Protection Status ^[2]	Distribution ^[3]
Black-winged Stilt <i>Himantopus</i> <i>Himantopus</i>	AA (Gr)	RC	Common passage migrant. Found in Deep Bay area, Long Valley, Kam Tin.
White-throated Kingfisher <i>Halcyon smyrnensis</i>	PS (DA)	(LC)	Common resident. Widely distributed in coastal areas throughout Hong Kong.
Collared Crow <i>Corvus torquatus</i>	PS (DA); AA (DA, Gr, IF, Pl)	LC; IUCN(VU)	Uncommon resident. Found in Inner Deep Bay area, Nam Chung, Kei Ling Ha, Tai Mei Tuk, Pok Fu Lam, Chek Lap Kok, Shuen Wan, Lam Tsuen.
Red-billed Starling <i>Spodiopsar sericeus</i>	PS (DA); AA (Pl)	GC ^[4]	Common winter visitor. Widely distributed in Hong Kong.
White-shouldered Starling <i>Sturnia sinensis</i>	PS (DA)	(LC)	Common passage migrant. Found in Kam Tin, Deep Bay area, Po Toi Island, Long Valley, Victoria Park, Ho Chung, Ma Tso Lung, Mui Wo, Lam Tsuen Valley.
Butterflies			
Metallic Cerulean <i>Jamides alecto</i>	AA (Pl)	-	Very Rare
Swallowtail <i>Papilio xuthus</i>	AA (AS)	-	Rare
Corals			
<i>Oulastrea crispata</i>	AA (Sub-tidal hard substrate habitat)	Cap. 586	Common coral species

Notes:

- Occurrence: PS = Project Site; AA = Assessment Area (Outside Project Site); DA = Developed Area; IF = In Flight; Gr = Grassland; Pl = Plantation; AS = Artificial Seawall.
- Conservation and Protection Status refers to Fellowes et al. (2002), CITES (2021) and IUCN (2021).
 - Conservation status by Fellowes et al. (2002): GC = Global Concern; RC = Regional Concern; PRC = Potential Regional Concern; LC = Local Concern. Letters in parentheses indicate that assessment is on the basis of restrictedness of breeding and/or roosting sites rather than general occurrence.
 - Conservation status by CITES (2021): II = Appendix II.
 - Conservation status by IUCN (2021): VU = Vulnerable.
 - Cap. 586: Protection of Endangered Species of Animals and Plants Ordinance
- Distribution follows Hong Kong Biodiversity Database (AFCD 2021).
- Red-billed Starling was considered to be of Global Concern (Fellowes et al. 2002). However, the global population estimate has been revised and the species is no longer considered globally threatened (BirdLife International 2010). A listing of Regional Concern (RC), based on the importance of the large roost present near Deep Bay, is considered to be more appropriate.

5.7 Identification of Potential Terrestrial Ecological Impacts

- 5.7.1 The potential direct and indirect ecological impacts arising from the proposed upgrading works are identified and assessed in this section in accordance with Annexes 8 and 16 of the EIAO-TM. The potential impacts are categorized as follows:
- Direct impact of habitat loss during construction phase
 - Direct impact to pre-roosting/roosting Collared Crow and Black Kite
 - Direct impact to roosting non-breeding ardeids
 - Direct impact to flightlines of Collared Crow and non-breeding ardeids

- e. Direct impact to flora species of conservation importance
- f. Disturbance impact to pre-roosting/roosting sites during construction phase
- g. Disturbance impact to fauna species of conservation importance
- h. Disturbance impact during operational phase
- i. Cumulative impacts with concurrent projects

5.8 Identification of Potential Marine Ecological Impacts

- 5.8.1 No marine works are proposed under this Project. This Project would not cause any direct marine ecological impact. Under normal operation of this Project and the Tolo Harbour Effluent Expert Scheme (THEES), the treated effluent from the Project would be diverted to the Victoria Harbour for disposal. This Project would not cause any adverse impact upon the marine life in Tolo Harbour during normal operation.
- 5.8.2 Regular maintenance of the THEES tunnel is however required to ensure proper functioning and integrity of the tunnel. During the inspection or maintenance of the THEES tunnel, temporary effluent discharge into the Tolo Harbour is unavoidable to provide a safe and dry zone within the THEES tunnel for inspection or maintenance works. During the THEES maintenance period, disinfected secondary effluent would be discharged from this Project via the existing emergency outfall of TPSTW. The existing Sha Tin Sewage Treatment Works (STSTW) will be relocated to caverns under the Sha Tin Cavern Sewage Treatment Works (CSTW) project. The CSTW is currently being constructed and will be operated before commissioning of this Project. During the THEES maintenance period, the disinfected secondary effluent from the CSTW project will also be discharged to Tolo Harbour via the existing emergency outfall of STSTW. Locations of the emergency outfall of TPSTW and STSTW are shown in **Figure 5.4**.
- 5.8.3 Emergency discharges from the Project would be the consequence of pump failure, interruption of the electrical power supply or failure of treatment units. Under the emergency situation, primarily treated effluent would be discharged to Tolo Harbour via the existing emergency outfall of TPSTW.
- 5.8.4 The potential indirect ecological impacts of this Project include the following:
- a. Changes in water quality due to THEES maintenance discharge to Tolo Harbour; and
 - b. Changes in water quality due to emergency discharge to Tolo Harbour in case of plant or power failure.

5.9 Evaluation of Potential Terrestrial Ecological Impacts in Absence of Mitigation Measures

Direct Impact

Direct Impact of Habitat Loss during Construction Phase

- 5.9.1 The 13.81ha Project Site is solely developed area, including the existing TPSTW and the proposed expansion area. No habitat of conservation importance was recorded. Although the Project site is highly disturbed, low to moderate diversity and abundance of bird species were recorded within the Project site, with 12 bird species of conservation importance. The proposed works involve the demolition of existing facilities with construction of upgraded treatment facilities within the TPSTW. It is expected that birds foraging in the TPSTW will become quickly habituated to the upgraded facilities. For the duration of demolition/construction, other areas will be available as foraging/loafing habitats to all bird species currently utilizing this highly disturbed habitat. In particular, the existing treatment

units in the eastern portion of TPSTW will not be demolished under this Project and these existing facilities as well as other areas outside TPSTW would still be available for any birds including Collared Crow to perch/loaf on as part of their normal daytime activities. The direct ecological impact of temporary loss of developed area habitat is expected to be **Minor**.

Direct Impact to Pre-roosting/Roosting Collared Crow and Black Kite

- 5.9.2 Pre-roosting sites of Collared Crow were recorded in the SWRL. The proposed works area of demolition and redevelopment is approximately 200m away from the nearest pre-roosting site of Collared Crow, and more than 650m away from the nearest roosting site of Collared Crow and Black Kite (**Figure 5.5**). No direct impact to the pre-roosting/roosting sites of Collared Crow and roosting site of Black Kite within the SWRL is expected.

Direct Impact to Roosting Non-breeding Ardeids

- 5.9.3 From the recent survey findings, ardeids were only recorded roosting three times (from 6 morning transect surveys and 12 evening roost surveys over a 6-month survey period) within the Project Site at the southwestern tree group (**Figure 5.5**) adjacent to the proposed expansion area. There are also historical records of trees of TPSTW being used as an ardeid night roost (AFCD 2020). The roost is thus considered sporadically used. The construction of the Project including the demolition of existing facilities in TPSTW would cause a loss of the occasional night roosting habitat for the non-breeding ardeids.
- 5.9.4 The concerned tree group (with occasional ardeid night roosting) is currently located at the southern edge of the existing TPSTW (**Figure 5.5**). With incorporation of the proposed expansion site under this Project, the existing location of the concerned tree group would be shifted to a more inner area of the Project site and would become a key area for installation of new facilities. The existing anaerobic digestion facilities of TPSTW handle the sewage sludge from TPSTW only. This Project would involve a new anaerobic co-digestion system to accommodate or utilize sewage sludge from TPSTW and other Sewage Treatment Works in Hong Kong, as well as organic / pre-treated food waste from the adjoining EPD's Organic Waste Pre-treatment Centre. Due to this Project, the feedstocks of the anaerobic digestion system would be significantly increased from less than 35 dry tonnes /day (dt/d) to over 200 dt/d. The available space in the Project site is limited. Due to the significant increase in the feedstocks of anaerobic digestion and also the need to upgrade the sewage treatment capacity of TPSTW from 120,000 m³/d to 160,000 m³/d, as well as the need to comply with the building height restriction in TPSTW, adjusting the construction works limit to preserve the concerned tree group *in-situ* is not practical. The need and benefit of this Project are presented in Section 2.4. Construction of this Project will tentatively commence in 2025 for completion in 2036. The concerned tree group will be removed from its existing location at the interim construction stage (tentatively in or after 2031) and will be transplanted to other suitable locations of TPSTW as far as practicable. If transplantation is found impractical during the design or construction stage, compensation of suitable trees within TPSTW will be implemented.
- 5.9.5 Given the low frequency of occupancy of the night roost and that the trees are proposed to be transplanted/compensated and in view that there are numerous trees in the vicinity that could also be used by night roosting birds, the impact to roosting non-breeding ardeids is expected to be of **Minor to Moderate** significance.

Direct impact to Flightlines of Collared Crow and Non-breeding Ardeids

- 5.9.6 The eastern existing facilities of TPSTW do not involve any new buildings, thus no obstruction on the flightline of Collared Crow between TPSTW and the SWRL will be resulted. Also, the proposed upgrade works separated by the SWRL, will not pose any impact to the flightlines of

Collared Crows across the Tolo Harbour. Therefore, no impact to flightlines of Collared Crow is expected.

- 5.9.7 The identified flightline of non-breeding ardeids were all recorded departing the TPSTW across the TPIE. All recorded individuals were flying at least 10m above ground. The existing industrial buildings in TPIE around the Project Site include Oriental Press Centre (13 storeys) to the west of TPSTW, Vita Green Product Co. Ltd. (8 storeys) to the south of TPSTW, etc. The tallest facilities in the existing TPSTW are 3-storey high, which does not exceed the building height restriction of 3 storeys under the "OU(STW)" zone of the approved Tai Po OZP. All new facilities of this Project are low-rise with building height similar to the nearby existing industrial development in TPIE. Thus no obstruction on the flightlines of non-breeding ardeids are anticipated, therefore impacts are considered to be **negligible/insignificant**.

Direct impact to Flora Species of Conservation Importance

- 5.9.8 An individual of *Aquilaria sinensis* was recorded within the Project site. The tree was recorded on a planter to the west of the maintenance building, with other cultivated species such as *Livistona chinensis* and *Plumeria rubia*. The origin of the individual remains unknown, whether cultivated or not. The planter falls within the new TPSTW layout, where demolition and redevelopment are proposed. It is recommended either preserve *in-situ* or transplantation within the new TPSTW, the impact is considered to be **insignificant**.

Indirect Impacts

Disturbance Impact to Pre-roosting/Roosting Sites during Construction Phase

- 5.9.9 The slope of the SWRL adjacent to eastern boundary of TPSTW was elevated a maximum of 20m (CEDD 2021) from the ground and covered with well-developed plantation. Given that the proposed works area of demolition and redevelopment is approximately 200m away from the nearest pre-roosting site of Collared Crow, and more than 650m away from the nearest roosting site of Collared Crow and Black Kite, the plantation in between is an existing barrier to separate the source of disturbance. As mentioned, the surrounding area is highly developed, these sites are situated under the prevailing high level of disturbance. No night-time construction work is proposed under this Project. Currently, the occasional night roost within this highly disturbed area is already under a certain level of glare disturbance from the existing artificial lighting in TPSTW. It is anticipated that the increase in disturbance during construction phase, will not pose significant impact to the pre-roosting and/or roosting sites within the SWRL with the recommended mitigation measures and good site practice in place.

Disturbance Impact to Fauna Species of Conservation Importance

- 5.9.10 A total of 14 bird and 2 butterfly species of conservation importance were recorded within the Project Site and/or the 500m assessment area. The 500m assessment area are highly developed; therefore, most of the fauna have been recorded in very low abundance due to the prevailing high level of disturbance. The bird species of conservation importance including Little Egret and Collared Crow have been recorded with relatively high abundance due to the foraging opportunities around the settling tanks of the TPSTW. These species are tolerant of human activity in the current TPSTW. Disturbance including noise, dust, glare and/or human activities will increase during construction phase and potentially affect the animal behaviors. The abundance and distribution of fauna might be temporarily reduced. The disturbance impacts are expected to be Low to Moderate for the bird species of conservation importance within the Project Site but Low for those within the assessment area if unmitigated. The butterfly species of conservation importance have been recorded within the SWRL and artificial seawall, which are separated from the proposed works; therefore, no impact to the butterfly species of conservation importance is expected.

Disturbance Impacts during Operational Phase

- 5.9.11 During operational phase of upgraded TPSTW, the disturbance impacts are anticipated to be similar level of current TPSTW. No adverse ecological impact is expected.

Cumulative Impacts with Concurrent Projects

- 5.9.12 Relevant concurrent major projects in the adjacent area are the Shuen Wan Golf Course (EIAO Register No. AEIAR-221/2019), the Upgrading of Tolo Harbour Effluent Export Scheme (THEES) proposed under “Agreement No. CE 13/2015 (DS)” and the Development of Organic Waste Pre-treatment Centre (New Territories East) proposed under “Agreement No. CE 5/2021 (EP)”. Anticipated cumulative impacts of the projects are evaluated based on available information on these projects.
- 5.9.13 The proposed Shuen Wan Golf Course will replace the existing habitats within the SWRL with similar habitats. According to the approved EIA Report of Shuen Wan Golf Course, with the implementation of the mitigation measures, no adverse residual impacts to terrestrial ecology and marine ecology are anticipated. About 25ha of plantation trees within the SWRL will be impacted due to the golf course project. 10ha of new trees including native trees will be planted and the plantation lost will be replaced by other vegetation forms (such as turfgrass and landscape vegetation). Though a temporary reduction in plantation area, the major tree groups frequently used as roosting sites will be preserved.
- 5.9.14 The proposed THEES upgrading works mainly involve the expansion of the Tai Po Effluent Pumping Station (TPEPS) within the existing TPSTW site, installation of a new submarine pipeline (across the inner Tolo Harbour) and laying of a new effluent rising mains (connecting the new TPEPS to the new submarine pipeline). The TPEPS expansion within the existing TPSTW will be incorporated into the construction programme of this Project and has been considered in the assessment in Sections 5.7.1 to 5.9.11. The new submarine pipeline will be installed by the Horizontal Directional Drilling (HDD) method, which is a trenchless method with no disturbance to the seabed and marine habitat. The laying of the new rising mains would be undertaken in the developed area in the southern TPIE. The proposed driving pit and reception pit of the HDD works are proposed to be located at the helipad in TPIE (within the assessment area) and Pak Shek Kok (outside the assessment area) respectively. The proposed THEES upgrading project will be subject to review in the next detailed design stage.
- 5.9.15 The proposed Organic Waste Pre-treatment Centre (OWPC) involves the re-development of the existing Shuen Wan Leachate Pre-treatment Works and the existing pilot-scale Food Waste Pre-treatment Facilities to the north of the existing TPSTW site into a full-scale organic waste (mostly food waste) pre-treatment plant to receive and pre-treat the source-separated food waste for transferring to the TPSTW and / or off-site anaerobic digesters in other STWs for co-digestion with sewage sludge. The site of the proposed OWPC is a developed or disturbed habitat. The proposed OWPC is considered minor in scale with an area of about 1.1 hectares only. It is tentatively scheduled to commence construction in 2025 for completion by 2029, which is concurrent with the construction programme of this Project. No bird roosting activity has been identified within the proposed OWPC site under this EIA. A separate environmental review report will be prepared to recommend necessary environmental mitigation measures and draw up Environmental Monitoring and Audit (EM&A) requirements for the proposed OWPC for approval by the relevant government departments. The potential impacts of ecology, air quality, noise, water quality, waste management implication, landscape and visual etc. will be assessed for the proposed OWPC according to the scope of “Agreement No. CE 5/2021 (EP)”.
- 5.9.16 The proposed works for upgrading TPSTW (this Project) will involve modification of developed area and the construction works will be implemented in phases to minimize the

extent of disturbance impacts at a time. Mitigation measures are recommended under this EIA to minimize the potential ecological impact as detailed in Section 5.11 below. No unacceptable cumulative impacts on terrestrial ecological resources are expected.

5.10 Evaluation of Potential Marine Ecological Impacts in Absence of Mitigation Measures

Changes in Water Quality Due to THEES Maintenance Discharge

- 5.10.1 Water quality modelling was performed to simulate a continuous THEES maintenance discharge for a period of 4 weeks during the operational phase. The water quality model results are presented in Section 4. The water quality modelling results for THEES maintenance discharge (Scenario 4) are compared with the model results for baseline scenario without THEES maintenance (Scenario 3) to identify the water quality changes due to the THEES maintenance.

Suspended Solids (SS) Elevation and Sedimentation

- 5.10.2 Marine organisms such as fish and sessile filter feeders would be susceptible to elevated SS in the water column through smothering and clogging of their respiratory and feeding apparatus. Elevation of SS in marine environment could lead to lethal (e.g. mortality) and sub-lethal (e.g. respiratory distress, adverse growth and development) effect on marine life.
- 5.10.3 Potential impacts on benthic organisms, including corals, may arise through excessive sediment deposition. The magnitude of the potential impacts is assessed based on the predicted sedimentation rate. There is no existing legislative standard on SS and sedimentation rate available in Tolo Harbour. Based on literature review, a sedimentation rate higher than 0.1 kg/m²/day would introduce moderate to severe impact upon corals (Pastorok and Bilyard, 1985 and Hawker and Connell, 1992). This sedimentation rate of no more than 0.1 kg/m²/day is adopted as the assessment criterion for protecting the sediment sensitive ecological resources (e.g. corals). The threshold value of local corals to SS adopted by AFCD is 30% increase from ambient level (AFCD, 2005). High levels of SS can lead to fewer coral species, less live coral, lower coral growth rate, greater abundance of branching forms, reduced coral recruitment, decreased calcification and decreased net productivity of corals (Rogers, 1990).
- 5.10.4 Under the maintenance period of THEES tunnel (Scenario 4), all the predicted sedimentation rates in Tolo Harbour are well below the criterion of 0.1 kg/m²/day (**Appendix 4.5**). The maximum increase in SS level at the ecological resources caused by the THEES maintenance (Scenario 4) is predicted to be less than 30% of the baseline level (Scenario 3). Therefore, adverse ecological impacts due to SS elevation and sedimentation are not expected.

Decrease of Dissolved Oxygen (DO)

- 5.10.5 Dissolved oxygen is essential to marine life. The DO levels predicted at all ecological resources under the THEES maintenance event (Scenario 4) are not depleted nor decreased as compared with the baseline level with no THEES maintenance (Scenario 3) (see **Appendix 4.5**). The THEES maintenance would not cause any adverse DO impact in Tolo Harbour.

Release of Nutrients and Increase in Chlorophyll-*a*

- 5.10.6 Nutrients such as TIN are not toxic to marine life but may stimulate algal growth. The presence of a certain amount of algae in water is also not harmful to marine life in general. Only their uncontrolled growth as algal bloom or red tide would adversely affect the environment. Chlorophyll-*a* is a green pigment in plant. The level of chlorophyll-*a* can provide an indication of algae or phytoplankton concentration in marine water. When a large number of algae die, degradation of dead algae would consume the DO in water, The phytoplankton may also

produce biotoxins which could be lethal to fish.

- 5.10.7 The THEES maintenance would not change the annual mean TIN levels at all the identified ecological resources in Tolo Harbour (**Appendix 4.5**). The predicted mean TIN levels in Tolo Harbour range from 0.03 mg/L to 0.11 mg/L under both scenarios. The maximum 5-day running mean chlorophyll-*a* levels predicted at the ecological resources range from 34 – 60 µg/L (in Harbour Subzone), 15 – 39 µg/L (in Buffer Subzone) and 8 – 18 µg/L (in Channel Subzone) under the THEES maintenance (Scenario 4) as compared to the baseline range of 20 – 40 µg/L (in Harbour Subzone), 13 – 20 µg/L (in Buffer Subzone) and 8 – 17 µg/L (in Channel Subzone) (under Scenario 3) (**Appendix 4.5**). The range of chlorophyll-*a* levels mentioned above represents the maximum 5-day running means over the entire 1-year simulation period. The mean chlorophyll-*a* levels predicted under the THEES maintenance (Scenario 4) are much lower. The predicted mean chlorophyll-*a* levels ranged from ≥6 to <15 µg/L in most areas of Harbour Subzone and from ≥3 to < 10 µg/L in most area of Buffer Subzone and Channel Subzone (see Figure 10 of **Appendix 4.4**). The delineation of the three subzones are shown in Figure 10 of **Appendix 4.4**.
- 5.10.8 The model predicted that the TIN and chlorophyll-*a* levels would be temporarily elevated during the THEES maintenance period. The elevations caused by the THEES maintenance discharge are more significant at the coral sites near TPIE and SWGC, which are close to the THEES effluent discharge point but the impact would be reversible (Figures 01 – 12 of **Appendix 4.6**). The predicted magnitude of elevation is significantly reduced in locations further away from the effluent discharge point. The TIN and chlorophyll-*a* levels would return to the condition similar to the baseline levels within about 2 weeks after the end of the maintenance discharge.
- 5.10.9 The THEES is aimed to protect the water quality in Tolo Harbour by diverting the treated sewage effluent loading away for discharge into the Victoria Harbour. Regular inspection and maintenance of the THEES system are inevitable under the existing practice and during the Project operation. The short-term THEES maintenance would safeguard the normal function of the THEES and thus would protect the ecological resources against pollution in the long run.
- 5.10.10 Red tides are natural phenomena which occur seasonally in both polluted and unpolluted waters. It is believed that the formation of red tide is a complicated process. It would depend on a combination of different factors such as the availability of sunlight, wind condition, flow regime, light penetration, salinity distribution, nutrient concentrations, nutrient ratios and species competition, etc. The short-term THEES maintenance discharge may not be a critical factor for triggering red tide in Tolo Harbour. The number of red tide incidents was found lowest from July to November according to the data from 1975 to 2020. The THEES maintenance would be arranged within the period from July to November and should be shortened as far as possible to minimize the chance of algal bloom in Tolo Harbour. The scheduling of the maintenance discharge should also take into account any ongoing blooming event in the area, which may occur outside the blooming season.
- 5.10.11 Appropriate mitigation measures and Project-specific water quality monitoring programme as described in Sections 5.12 and 5.13 should be implemented to minimize the marine ecological impact. With implementation of the mitigation measures and monitoring programme recommended in this EIA, no unacceptable ecological impacts would arise from the THEES maintenance. For information, any potential impacts from red tide or Harmful Algal Blooms (HABs) that may arise in the Tolo Harbour is currently managed and responded under the routine red tide monitoring and management protocol and response plan adopted by the Hong Kong government. AFCD is acting as the coordinator of the Red Tide Reporting Network, to receive reports of red tide, conduct investigation and provide warning of the risk associated and appropriate mitigation measures. The objectives of this red tide monitoring programme

are to provide coordination of monitoring and response to red tides/HABs and fish kills and to compile and synthesize data necessary to effectively manage fisheries resources and the marine ecosystems. The existing red tide monitoring and management plan are described in the AFGD website. (<https://www.afcd.gov.hk/english/fisheries/hkredtide/management/management.html>).

- 5.10.12 The frequency of the THEES maintenance is also remote of no more than once every 5 years. The potential water quality changes induced by the THEES maintenance would be reversible. The overall marine ecological impact in Tolo Harbour due to the short term THEES maintenance are expected to be of **Minor** significance.

Changes in Water Quality Due to Emergency Discharge

- 5.10.13 Emergency discharge of primarily treated sewage may occur for a short period (typically 3 hours) in case of power or plant failure. According to the water quality modelling results, the short-term emergency discharge under Scenario 5 would not cause significant impact upon the predicted SS, DO, TIN and chlorophyll-*a* levels at all ecological resources (including coral communities nearby) as compared to the baseline scenario under Scenario 3 (refer to **Appendix 4.5** and **Appendix 4.8**). No unacceptable ecological impact is predicted for the emergency discharge scenario.

5.11 Mitigation Measures and Residual Impact on Terrestrial Ecology

Identification of Impacts which require Mitigation Measures

- 5.11.1 The potential direct and indirect ecological impacts arising from the proposed Project works are identified and assessed in this section in accordance with Annexes 8 and 16 of the EIAO-TM. The potential impacts are categorized as follows:

Table 5.14 Summary of predicted potential ecological impacts

Description of Impact	Duration	Reversibility	Magnitude	Overall Impact Severity	Mitigation Requirement
Direct impact of habitat loss	Temporary loss of developed area during construction phase	Reversible	Minor	Minor (due to temporary loss of foraging opportunities and availability of other foraging/loafing habitats for birds at construction stage)	No specific mitigation is required but ecological monitoring required to detect any unpredicted impacts to the Collared Crow population due to loss of foraging opportunities
Direct impact to pre-roosting/roosting of Collared Crow and Black Kite	N/A	N/A	N/A	No adverse impacts	Not required

Description of Impact	Duration	Reversibility	Magnitude	Overall Impact Severity	Mitigation Requirement
Direct impact to roosting non-breeding ardeids	Permanent	Irreversible	Moderate for loss of occasional roost	Minor to Moderate (due to occasional usage of the roost and availability of ample alternative roosting sites in the adjacent SWRL)	Transplanting or compensation is required. All noisy construction works within 100m of the tree group should cease at least 1 hour before sunset before the removal / transplantation of the tree group. All noisy construction works within 100m of the transplantation / compensation area should also cease at least 1 hour before sunset after transplantation / compensatory planting.
Direct impact to flightline of Collared Crow and Non-breeding ardeids	N/A	N/A	N/A	No adverse impacts	Not required
Direct impact to flora species of conservation importance	Temporary	Reversible	Minor (unknown origin, found on planted with other cultivated species)	Minor	Preserve in-situ or transplantation
Disturbance impact to pre-roosting/roosting sites during construction phase	Temporary during construction hours	Reversible	Moderate during construction hours; Minor during non-construction hours	Minor (due to distance to the pre-roosting/roosting site, the ability of birds to move away from source of disturbance and availability of ample alternative pre-roosting/roosting sites nearby)	No specific mitigation is required but good site practices and precautionary measures are suggested to be implemented.

Description of Impact	Duration	Reversibility	Magnitude	Overall Impact Severity	Mitigation Requirement
Disturbance impact to fauna species of conservation importance	Temporary during construction phase	Reversible	Minor to Moderate for bird species; Negligible for other fauna	Minor to Moderate for bird species	Good site practices and precautionary measures are suggested to be implemented.
Disturbance impact during operational phase	N/A	N/A	Similar to existing TPSTW	No adverse impacts	Not required
Cumulative impacts	N/A	N/A	N/A	No adverse impacts	Not required

5.11.2 The feasibility, practicability, programming and effectiveness of the recommended mitigation measures have been reviewed by engineer.

Mitigation for Direct Impact to Roosting Non-breeding Ardeids

5.11.3 During the demolition, site clearance works would cause a loss of an occasional night roost habitat for ardeids. Before the removal (transplantation if practicable) of the tree group, the trees should be well-separated from construction works (use of hoarding). All noisy construction works within 100m of the tree group should cease at least 1 hour before sunset.

5.11.4 As the trees are to be removed, mitigation could be by way of transplantation (if practicable) or compensatory planting of suitable trees within the new TPSTW layout. Transplantation Proposal shall be prepared to confirm the location, quantity and condition of the trees within the tree group, and propose methodology and receptor site(s) to transplant any of these trees that are to be affected by the construction works. Compensatory planting of suitable trees within TPSTW shall be implemented if transplanting the identified tree group is impracticable based on the tree assessment. A detailed Compensation Plan shall be prepared by a qualified botanist/ plant ecologist with relevant experience. It is recommended that compensatory planting should be completed before the removal of the roosting trees and the removal of trees should be arranged in wet season when the number of roosting ardeids is generally lower. Tree species to be replanted will make reference to those utilised by ardeids and shall be in heavy standard. The new tree group can provide longer term roosting opportunities. Noisy construction works within 100m from the relevant transplantation/compensation area should cease at least 1 hour before sunset, after the transplantation/compensatory planting.

5.11.5 Avoidance of tree felling/removal/transplantation works at least 1 hour before the sunset is recommended to avoid any direct disturbances to the night roosting activities. Therefore, there will be no residual impact in terms of loss of ardeid roosting habitat.

Mitigation for Disturbance during Construction Phase

Environmental Awareness and Construction Works Boundary

5.11.6 In general, as mentioned, disturbance can be in the form of human activities (construction workers), noise, run-off and dust. Construction workers should be briefed regarding the sensitivity of the areas before the commencement of the works, and requested not to disturb any areas nearby (e.g. plantation adjacent to eastern boundary of TPSTW). Furthermore, the works boundary of different phases should be clearly defined (i.e. fenced with screening

materials) and any works beyond the boundary should be strictly prohibited.

Consideration of Alternative Piling Method

- 5.11.7 Quieter piling method, namely pre-bored steel H piles, would involve a hole (usually 600mm dia.) formed by rotary dill into the ground and to the rock where the upper section in soil is supported by a steel casing. The steel H piles is then inserted and grout is pumped into the hole while the steel casing is removed. No percussive action is required for forming the holes. Based on the preliminary Ground Investigation (GI) data, this quiet piling method is suitable at the Project site and is proposed to be adopted under this Project to minimize the noise impact.
- 5.11.8 Alternatively, in case the future detailed design of the Project reveals that the pre-bored steel H piles are not practical, conventional percussive piling should be used within non-sensitive hours (e.g. close to noon or at least 1 hour before the sunset) as far as practicable.

Good Site Practices

- 5.11.9 Good site practice and noise management techniques should be adopted to reduce the noise impact from construction site activities. The following measures should be practised during each phase of construction.
- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;
 - Machines and plant (such as trucks, breakers) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
 - Plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from the plantation of SWRL;
 - Silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;
 - Noisy construction activities such as concrete breaking, should be scheduled to less sensitive hours during the day, e.g. midday as far as possible;
 - Mobile plant should be sited as far away from the plantation of SWRL as possible and practicable; and
 - Material stockpiles, site office and other structures should be effectively utilized, where practicable, to screen noise from on-site construction activities.

Use of Quality Powered Mechanical Equipment

- 5.11.10 The Quality Powered Mechanical Equipment (QPME) system was developed by EPD to benchmark construction equipment items which are notably quieter and more environmentally friendly. The Contractor should source quiet plant associated with the construction works from the Powered Mechanical Equipment (PME) listed in the QPME system and other commonly used PME listed in EPD web pages as far as possible.

Use of Movable and Non-reflective Temporary Noise Barriers

- 5.11.11 The elevations of the TGDR area ranged from over 27 mPD to over 39 mPD as compared to the ground level of the construction site of this Project of around 6 mPD. As shown in **Figure 5.5**, the roosting sites of Collared Crow and Black Kite are located along the seafront behind the slope with no direct line of sight to the Project construction works. Any birds located on the plantation along the slope of the northern, eastern and southern boundaries of SWRL including

the roosting sites of Collared Crow and Black Kite would not be adversely affected by the construction noise of this Project considering the large buffer distance (of over 300 m) and the screening effect from the existing topography.

- 5.11.12 Movable and non-reflective temporary noise barriers with sound absorptive materials can be located close to noisy plant and be moved concurrently with the plant along a worksite for effective noise screening from the plantation adjacent to the eastern boundary of TPSTW where the pre-roosting sites of Collared Crow were identified (see **Figure 5.5**). Typical design of the noise barrier could be in the form of a vertical barrier with a small-cantilevered upper portion. A cantilevered top cover would also be adopted as required to block the direct line of sight towards the pre-roosting sites of Collared Crow.
- 5.11.13 These movable and non-reflective temporary noise barriers with sound absorptive materials are recommended to be used for noisy PME including breakers, excavators and generators as far as practicable.

Control of Construction Site Run-off

- 5.11.14 The relevant best practices including the requirements specified in the Professional Persons Environmental Consultative Committee Practice Note on Construction Site Drainage (ProPECC PN 1/94) should be followed to minimize the water quality impacts.

Construction Dust Suppression Measures

- 5.11.15 The dust control measures stipulated in the Air Pollution Control (Construction Dust) Regulations should be implemented for the construction of the proposed Project, where applicable, to minimize the construction dust impacts.

Mitigation of Indirect Disturbance to Roosting Non-breeding Ardeids

- 5.11.16 The concerned tree group located at the southwest portion of TPSTW supports occasional ardeid night roosting. The mitigation measures and good site practices as described above would also serve to protect the roosting non-breeding ardeids from indirect disturbance during the construction phase. Before the removal (or transplantation if practicable) of the concerned tree group at the interim construction stage, the trees should be well-separated from construction works (use of hoarding). Noisy construction works within 100m of the ardeid night roost should cease at least 1 hour before sunset.
- 5.11.17 Construction of this Project would be carried out from 07:00 -19:00. No night-time construction works are proposed under this Project. The intensity of the construction lighting, if required, should be controlled to the lowest possible level. Unnecessary lighting should be turned off outside working hours of the construction sites.

Residual Impact

- 5.11.18 With the implementation of the mitigation measures as mentioned above, no adverse residual impact is anticipated.

5.12 Mitigation Measures and Residual Impact on Marine Ecology

Operational Phase - THEES Maintenance

- 5.12.1 The THEES should be regularly inspected and maintained to ensure that it is functioning properly to avoid any emergency THEES maintenance or unexpected discharge of THEES effluent into the Tolo Harbour.

- 5.12.2 The number of red tide incidents was found lowest from July to November according to the data from 1975 to 2020. The regular THEES maintenance event should be carefully planned and scheduled within the period from July to November to minimize the risk of red tides. The scheduling of the maintenance discharge should also take into account any ongoing blooming event in the area, which may occur outside the blooming season. In planning of the maintenance work and before the maintenance discharge, AFCD should be consulted to seek advice on the potential for red tide occurrence in the receiving water. The maintenance discharge should be rescheduled or postponed based on AFCD's advice, as necessary. Other relevant parties including the key stakeholders for mariculture and fisheries in Tolo Harbour should be informed of the THEES maintenance event prior to any discharge. It is also recommended that shutdown of the THEES if unavoidable, should be shortened as far as possible.

Operational Phase - Emergency Discharge

- 5.12.3 Emergency discharges from the Project would be the consequence of pump failure, interruption of the electrical power supply or failure of treatment units. Dual power supply or ring main supply from CLP should be provided for the Project to prevent the occurrence of power failure. In addition, standby facilities for the main treatment units and standby equipment parts / accessories should also be provided in order to minimize the chance of emergency discharge. The occurrence of such emergency events would therefore be very remote.
- 5.12.4 To provide a mechanism to minimize the impact of emergency discharges and facilitate subsequent management of any emergency, an emergency contingency plan has been formulated by the DSD to clearly state the response procedure in case of pumping stations or sewage treatment works failure. The existing contingency plan developed by DSD is given in **Appendix 4.9**.

Residual Impact

- 5.12.5 With the implementation of the mitigation measures as mentioned above, no adverse residual impact is anticipated.

5.13 Environmental Monitoring and Audit (EM&A)

Terrestrial Ecology

- 5.13.1 This ecological impact assessment has evaluated consequences of the proposed Project and concluded the overall impacts on terrestrial ecology would be of minor significance or no adverse impact with the implementation of mitigation measures. The proposed ecological mitigation measures to avoid, minimize and compensate the identified impacts arising from the proposed Project should be audited regularly as part of the EM&A programme during the construction phase.

Monitoring of Compensation for Occasional Ardeid Night Roost

- 5.13.2 Prior to the site clearance works, tree assessment to the tree group (i.e. the identified occasional night roost for ardeids) within the TPSTW shall be conducted by a qualified botanist/ plant ecologist. Transplantation Proposal shall be prepared to confirm the location, quantity and condition of the trees within the tree group, and propose methodology and receptor site(s) to transplant any of these trees that are to be affected by the construction works. The conditions of the transplanted trees shall be closely monitored at monthly basis throughout the construction period of the Project.

- 5.13.3 Compensatory planting of suitable trees within TPSTW shall be implemented if transplanting the identified tree group is impracticable based on the tree assessment. A detailed Compensation Plan shall be prepared by a qualified botanist/ plant ecologist with relevant experience. The Plan shall include proposals on site preparation works, planting design and layout, planting period, planting methodology, site supervision of planting, post-planting monitoring and maintenance programme.
- 5.13.4 Given the sporadic use of the site by night roosting ardeids, no night roosting bird monitoring is proposed.

Monitoring of Disturbance Impacts during Construction Phase

- 5.13.5 Monthly ecological monitoring, focusing on avifauna species of conservation importance (e.g. Collared Crows and ardeids) utilizing habitats within the 500m assessment area, should be conducted during construction phase to monitor the effectiveness of proposed mitigation measures and detect any unpredicted indirect ecological impacts arising from the proposed Project. Remedial actions can then be recommended, where appropriate, based on the impact monitoring results.
- 5.13.6 Whilst the roosting sites of Collared Crow and roosting sites of Black Kites were identified within SWRL, which are separated from the Project site by the existing topography, monthly monitoring of the pre-roost and night roost of Collared Crows is recommended given its importance.

Monitoring of Disturbance Impacts during Operational Phase

- 5.13.7 Monthly ecological monitoring, focusing on avifauna species of conservation importance (e.g. Collared Crows and ardeids) utilizing habitats within the Project site, should be conducted during operational phase to monitor any changes in foraging habitats by the proposed Project. Remedial actions can then be recommended, where appropriate, based on the impact monitoring results. The monthly ecological monitoring focusing on avifauna species of conservation importance shall continue in the first 3 years after commissioning of the Project. After 3 years of post-monitoring period, a review shall be conducted by DSD to determine whether such monitoring shall be continued. The review results shall be submitted to EPD, AFCD and other relevant parties. Any amendment on the monitoring programme shall be agreed by EPD and AFCD.

Marine Ecology

- 5.13.8 Marine water quality monitoring is recommended in Tolo Harbour for any THEES maintenance event or emergency discharge event. A one-year baseline monitoring programme covering dry and wet seasons is proposed at a frequency of twice per month to establish the baseline water quality conditions in Tolo Harbour. The baseline monitoring programme should be carried out prior to the construction phase of the Project. A New West Plant will be constructed at the proposed expansion site and will be commissioned tentatively in 2029 prior to demolition of the sewage treatment facilities of the existing TPSTW (see Sections 2.2.13 to 2.2.14 or Section 4.6.1). The New West Plant will provide adequate sewage treatment capacity throughout the construction phase.
- 5.13.9 In case of THEES maintenance discharge during the construction phase of the Project and after commissioning of the New West Plant, marine water quality in Tolo Harbour should be monitored daily throughout the maintenance period until the baseline water quality is restored within 2 consecutive days or at least 4 weeks after termination of the discharge (whichever is longer).

- 5.13.10 In case of emergency discharge during the construction phase of the Project and after commissioning of the New West Plant, marine water quality in Tolo Harbour should be monitored daily throughout the emergency discharge period until the baseline water quality is restored within 2 consecutive days or at least 1 weeks after termination of the discharge (whichever is longer).
- 5.13.11 The monitoring programme for the THEES maintenance and emergency discharge events as discussed above shall continue during the construction phase of this Project and in the first 3 years after commissioning of the New West Plant. After the first 3 years of the New West Plant operation, a review shall be conducted by DSD to determine whether such monitoring shall be continued. The review results shall be submitted to EPD, AFCD and other relevant parties. Any amendment on the monitoring programme shall be agreed by EPD and AFCD. Details of the monitoring programme and an event and action plan for the THEES maintenance and emergency discharge are provided in the standalone EM&A Manual.
- 5.13.12 Any potential impacts from red tide or HABs that may arise in the Tolo Harbour should also be managed and responded under the existing routine red tide monitoring and management protocol and response plan adopted by the government in Hong Kong. Details of the existing red tide monitoring and management plan are provided in the AFCD website (<https://www.afcd.gov.hk/english/fisheries/hkredtide/management/management.html>).

5.14 Conclusion

Terrestrial Ecology

- 5.14.1 Literature review and ecological surveys covering August 2020 to January 2021 have been conducted. A total of six habitat types, including developed area, plantation, grassland, sea, artificial seawall and semi-natural watercourse, were recorded within 500m assessment area from the recent surveys, with developed area being the only habitat recorded within the Project Site. The ecological value of developed area within the Project site is Low to Moderate, with 12 bird species of conservation importance recorded. Within the 500m assessment area, the ecological values of the plantation and grassland within the SWRL are evaluated as Moderate, whereas the ecological value of the artificial seawall is evaluated as Low to Moderate. The other plantations and the semi-natural watercourse are considered of Low ecological value. Developed area outside the Project site, including the TPIE, is evaluated as having Very Low ecological value.
- 5.14.2 The Project site and the SWRL supported a significant number of Collared Crows in Hong Kong. Pre-roosting and roosting sites were identified within the SWRL but the locations are likely to change irregularly as observed across the survey period. No direct impact to roosting/pre-roosting sites of Collared Crows is expected. The Project works will cause a temporary loss of foraging habitat. It is expected that birds foraging in the TPSTW will become quickly habituated to the upgraded facilities. For the duration of demolition/construction, the eastern portion of the TPSTW and other surrounding areas will be available as foraging/loafing habitats to all bird species currently utilizing this highly disturbed habitat. The ecological impact of this temporary habitat loss (developed area) is anticipated to be Minor.
- 5.14.3 No potential direct impact on natural habitats within the assessment area is identified as the assessment area consists largely of man-made habitats.
- 5.14.4 An occasional ardeid night roost was identified within the TPSTW. During the survey period, ardeids were only recorded three times roosting at the southwestern tree group to the immediately north of the proposed expansion site. The tree group will be compensated by transplanting or replanting of suitable trees, to provide a potential roosting habitat within the upgraded TPSTW in long term. Felling/removal/transplantation of the concerned tree group

as well as noisy construction works within 100m from the existing / transplanted / compensated tree group shall be ceased at least 1 hour before the sunset to avoid disturbance to the night roosting activities. No residual impact is expected in term of loss of ardeid roosting habitat.

- 5.14.5 With implementation of recommended mitigation measures (e.g. use of quieter piling method, adoption of good site practices, deployment of temporary noise barriers, careful phasing of construction activities, use of QPME and clear delineation of the construction works boundary), no unacceptable adverse residual disturbance impacts would be expected.
- 5.14.6 Ecological monitoring should be conducted during construction phase to monitor the effectiveness of proposed mitigation measures and detect any unpredicted indirect ecological impacts arising from the proposed Project and the implementation of mitigation measures would be subject to regular audit as part of the EM&A programme. Ecological monitoring should also be conducted during operational phase to monitor any changes in foraging habitats by the proposed Project.

Marine Ecology

- 5.14.7 There would be no direct disturbance to seabed or riverbed sediments under the Project and hence loss of marine habitat is avoided. The key marine ecological impact would arise from the changes of water quality due to THEES maintenance and emergency discharge during operational phase. The occurrence of the THEES maintenance and emergency discharge would be remote and the associated water quality changes would be short-term and reversible. According to water quality modelling results, no unacceptable ecological impact is anticipated on marine ecological resources. Nevertheless, an event and action plan and a marine water quality monitoring programme should be implemented for the Project to verify whether or not impact predictions are representative, and to ensure that it would not result in unacceptable impacts. Monitoring of the treated effluent from the Project should be carried out to ensure that the effluent quality would comply with the design standards. No unacceptable residual ecological impacts are expected from the Project.

5.15 References

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