



Specialist Consultancy Services for Environmental Baseline Study (EBS) on Choa Chu Kang N1

Executive Summary

Housing & Development Board (HDB)

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Project Description & Objectives

AECOM Singapore Pte Ltd was appointed by the Housing & Development Board (HDB) to carry out an Environmental Baseline Study ('EBS') on Choa Chu Kang N1, zoned "Residential (Subject to Detailed Planning)" in Urban Redevelopment Authority (URA)'s gazetted Master Plan 2019 (hereinafter referred to as 'the Project'). Choa Chu Kang N1 (hereafter referred to as "CCK N1") site is bounded by Woodlands Road in the east and Kranji Expressway in the north, with an estimated area of approximately 21.7 ha (hereafter referred to as "Study Area"). Majority of the Study Area is covered by managed vegetation, while the Pang Sua Canal is located along the western and southern edges.

This Study aims to understand the baseline environmental (i.e. biodiversity, hydrology, water quality and groundwater level) conditions and ecological connectivity of the CCK N1 Study Area in order to inform the ecological value of this site, which in turn serves to guide detailed planning for this site.

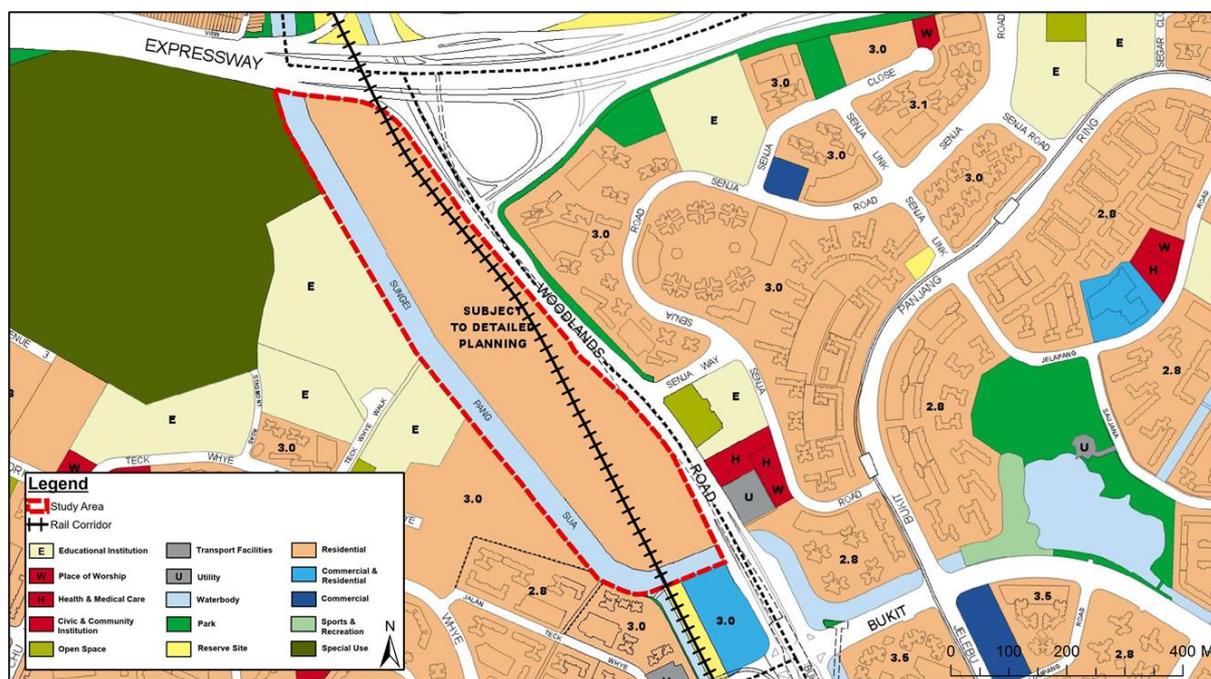


Figure 1 Proposed Land Use of Study Area and its surroundings (Source: URA's gazetted Master Plan 2019)

Environmental Baseline Findings

Baseline studies on biodiversity, hydrology and water quality were conducted for the Study Area, and an overview of the findings is provided below. More information can be found below as well as from Sections 7 and 8 of the report.

The flora baseline survey helped to identify and map the various vegetation types, while the fauna study set out to determine the current faunal diversity and distribution within the site. Both surveys also served to identify species of conservation significance present in the area (refer to Table 1 and Table 2 for the technical definitions of the conservation status used to derive the conservation significance of the species recorded). The biodiversity baseline surveys revealed that the Study Area is characterised largely by managed vegetation, comprising clusters of trees planted for landscape purposes, and turf area. As such, this supports the presence of fauna species that are adapted to disturbed habitats. There were also records of a few uncommon and rare fauna species within the Study Area. The Study Area consists of mostly exotic plant species and does not have a large number of species of conservation significance (see Table 1). However, the presence of large mature trees, such as Senegal mahogany (*Khaya senegalensis*) and raintree (*Samanea saman*), could provide a conducive shelter

for the fauna species. Although the Study Area may not be rich in its wildlife generally, its geographical location serves as a conduit for wildlife dispersal and/or movement to other larger forest patches and surrounding green space in proximity [P-1].

Table 1 Definition of Each National Conservation Status for Flora (Davison et al., 2008; Chong et al., 2009).

National conservation status	Definition
Vulnerable	More than 250, but fewer than 1,000 mature individuals
Endangered	Fewer than 250 mature individuals
Critically Endangered	Fewer than 50 mature individuals or more than 50, but fewer than 250 mature individuals
Presumed Extinct	Not recorded within the last 30 years

Table 2 Definition of Each National and Global Conservation Status for Fauna (Davison et al., 2008; Soh et al., 2019; Jain et al., 2018; IUCN, 2012).

Conservation status	Definition
National	
Vulnerable	More than 250 individuals in total, but fewer than 1,000 mature individuals
Endangered	Fewer than 250 mature individuals
Critically Endangered	Fewer than 250 individuals in total or fewer than 50 mature individuals
Presumed Nationally Extinct	Not recorded within the last 50 years
Global	
Vulnerable	Faces a high risk of extinction in the wild
Endangered	Faces a very high risk of extinction in the wild
Critically Endangered	Faces an extremely high risk of extinction in the wild
Extinct in the Wild	Only survives through cultivation, captivity or as a naturalized population(s) outside its natural range
Extinct	Globally extinct, including those in captivity or through cultivation

The hydrological baseline study aimed to identify and map the watercourses present in the Study Area, and to study their water flow conditions and bank characteristics. Baseline water quality surveys also determined the water quality of these watercourses. Based on the hydrological studies, there are four (4) catchment areas within the Study Area which feeds into the surrounding four (4) watercourses. Both Pang Sua Canal (D1) and concrete drain at the northeast of site (D2) have relatively poor water quality for survival of aquatic life. This aligns with biodiversity findings which noted that Pang Sua Canal supported poor aquatic life at the time of survey.



Figure 2 Vegetation distribution in the Study Area

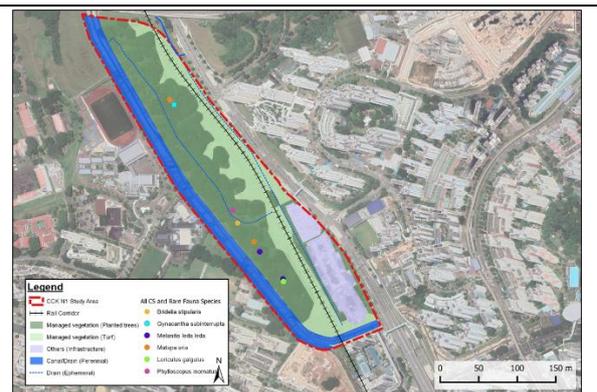


Figure 3 Distribution of flora and fauna species of conservation significance in the Study Area

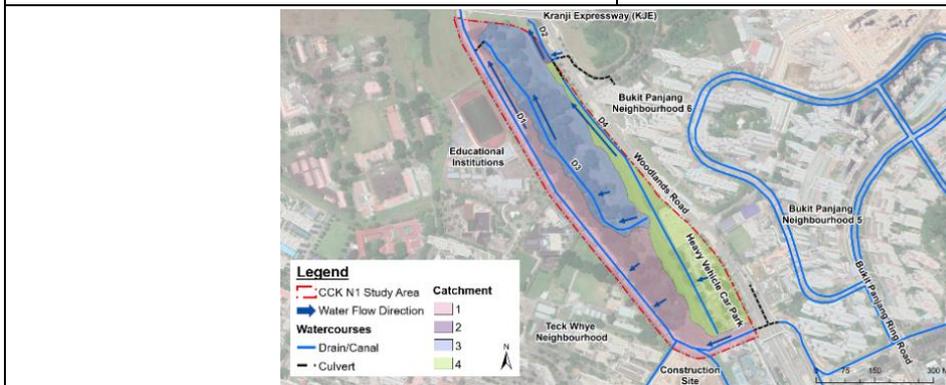


Figure 4 Existing waterbodies in the Study Area

- **Vegetation Distribution** (see Figure 2) – CCK N1 mainly constitutes managed vegetation, comprising clusters of tree species planted for landscaping purposes (9.62 ha; 45.2%) which occupies about half of the Study Area, and turf area (5.36 ha; 25.2%). Existing canal and infrastructure, such as the heavy vehicle carpark and defunct bus terminal take up 6.32 ha (29.6%) of the Study Area.
- **Biodiversity, Flora** (see Figure 3) – The floristic assessment identified a total of 115 species from 45 families, of which, majority are exotic (77 species; 67.0%), only 27 species are native (23.5%), and 11 (9.5%) are cryptogenic (i.e., species that has unknown or uncertain origins). Only one nationally Vulnerable climber species, *Bridelia stipularis*, is considered to be a species of conservation significance.
- **Biodiversity, Large Plant Specimens and Other Specimens of Values** – Ninety-one large plant specimens were recorded in the Study Area, largely dominated by Senegal mahogany (*Khaya senegalensis*) and raintree (*Samanea saman*). Other specimens of value consist of two keystone species with two specimens respectively: Malayan banyan (*Ficus microcarpa*) and weeping fig (*F. benjamina*), with a spread that ranges from 3-8 m. In addition, a bamboo cluster, *Bambusa cf. heterostachya* with a spread of 2.5 m, were also identified to be possible roosting habitat for bamboo bats.
- **Biodiversity, Fauna** (see Figure 3) – The field assessment recorded 89 species, with more than half of the assemblage dominated by birds (36 species) and butterflies (18 species). Only one species of conservation significance (Table 2), the nationally Endangered blue-crowned hanging-parrot (*Loriculus galgulus*), which is now considered locally widespread and common, was observed within the Study Area.

While not considered of conservation significance, several other uncommon faunas were also recorded. These include the uncommon dingy duskhawker (*Gynacantha subinterrupta*) that is usually found in forested areas, and two moderately rare butterflies: evening brown (*Melanitis leda leda*), which is usually sighted in grasslands, thickets, or among dense vegetation, and common reeye (*Matapa aria*), which is usually sighted in various habitat types where bamboo clusters are present in urban parks, wastelands and nature reserves. [W-1].

Nine migratory bird species were also recorded, including the rare yellow-browed warbler (*Phylloscopus inornatus*) and uncommon migrant species, yellow-rumped flycatcher (*Ficedula zanthopygia*). These records show the value of the Study Area in supporting these uncommon species and migratory birds.

Other species of conservation significance that may utilise the Study Area to move between habitats include the globally Critically Endangered and nationally Endangered straw-headed bulbul (*Pycnonotus zeylanicus*), the globally Vulnerable smooth-coated otter (*Lutrogale perspicillata*), and the globally and nationally Critically Endangered Sunda pangolin (*Manis javanica*) [P-1;P-2]. These species have been recorded in surrounding green spaces and may disperse to the Study Area. The watercourse within the Study Area is poor in aquatic life and is more likely to be used by fauna to move between habitats.

- **Hydrological Conditions** (see Figure 4) – Four (4) water catchment areas within the vicinity of the Project mainly contribute to four (4) watercourses within the Study Area. The perennial Pang Sua Canal D1 is located along the western and southern lengths of the Study Area. Perennial concrete drain D2 is located at the northeast corner of the site. Ephemeral concrete drain D3 cuts across the centre of the site, discharging into Pang Sua Canal D1 through a culvert. Ephemeral concrete drain D4 located along the eastern section of the Study Area.
- **Water Quality** – Six (6) sampling stations were identified for the Study Area. Generally, water quality findings in Canal D1 and drain D2 had exceeded the aquatic life criteria, aligning with biodiversity findings in Section 7 which showed the poor aquatic life along Pang Sua Canal during the time of field survey. pH in Pang Sua Canal D1 and concrete drain D2 exceeded the NEA guidelines and aquatic life criteria¹, likely due to the concrete surfaces of the surrounding urbanized area (especially from a nearby construction site), as chemicals washed off from concrete could lead to the increased pH. Relatively high Total Suspended Solids and turbidity was observed in Pang Sua Canal D1 and concrete drain D2, which was likely due to flushing from surrounding urban areas (including a nearby construction site). The relatively high nutrient (nitrogen and phosphorus) concentrations in Pang Sua Canal D1 and concrete drain D2 indicated that both watercourses had higher eutrophication potential, which was consistent with the greenish water with algae observed during site survey. Elevated enterococcus counted observed along the Pang Sua Canal D1 and concrete drain D2 were also likely due to stormwater carrying faecal contaminants from the surrounding residential or vegetated area.

¹ The aquatic life criteria indicate the threshold concentration of contaminants that can be present in surface waterbodies before it is likely to harm on the aquatic flora and fauna within it.

Ecological Significance and Connectivity

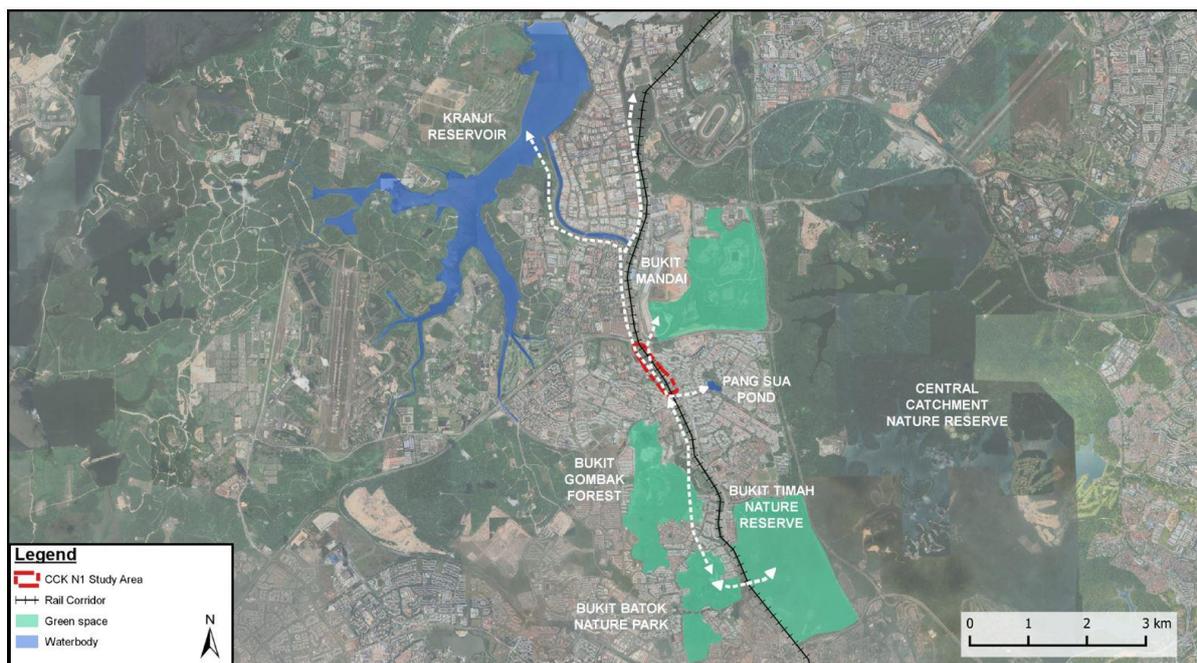


Figure 5 Site Context and potential connectivity between Study Area and other green patches in proximity

The 21.7 ha Study Area, Choa Chu Kang N1, is also known as the Sungei Pang Sua Woodland [P-1; P-2]. It is “an important part of the Green Rail Corridor between Hill View in the south and Stagmont Ring in the north, as it is the only wooded area in-between” [P-2]. The Study Area is also considered as “a conducive stepping stone” [P-10] (i.e., habitat patches in a landscape that facilitates movement of species between other forested patches [P-3]) and “a conduit for wildlife dispersal or movement” [P-10] that could facilitate the dispersal of fauna to the surrounding green spaces, such as Bukit Mandai forest to the northeast and Bukit Gombak forest to the south (Figure 5), and to other larger fragmented habitats, including Bukit Timah Nature Reserve (BTNR) in the southeast, and Mandai Mangrove and Mudflats in the north [P-1], hence, enhancing the ecological connectivity across the landscape.

Species residing in adjacent areas, particularly volant species, can use the Study Area as a stepping stone to disperse to surrounding green spaces. An example is the globally Critically Endangered straw-headed bulbul (*Pycnonotus zeylanicus*) that was recorded at the adjacent Bukit Mandai Forest, Bukit Batok Nature Park (BBNP), and Toh Tuck Forest [P-4; P-5]. Species adapted to using canals can also use the canal to move through the Study Area. According to Guttensohn & Leong (2021), the globally Vulnerable and nationally Endangered smooth-coated otter (*Lutrogale perspicillata*), as well as the globally Critically Endangered Sunda pangolin (*Manis javanica*) that have been observed to move within the canal in the vicinity of the Study Area [P-1]. In the publication, it was also highlighted that there was a recent sighting of the Sunda pangolin (*Manis javanica*) in adjacent areas, such as in the canal south of the Study Area [P-1]. The presence of species of conservation significance, forest-associated species, and migrants demonstrates the value of the Study Area as a stepping stone to surrounding green spaces, such as the Bukit Mandai forest to the northeast and Bukit Gombak forest to the south.

The Sunda pangolin (*Manis javanica*) can be found in areas, such as in nature reserves and degraded forest fragments of Singapore [P-6]. According to Nash et al., (2020), an unpublished data by ACRES showed that this species has also been seen in public areas as some individuals, especially sub-adult males, disperse in search of a home range [P-6]. Hence, this explains their possible presence at the Study Area. Notably, Singapore is a global stronghold for this species and is crucial in contributing to the global conservation of pangolins due to the lack of local poaching pressures, unlike in other countries where it ranges [P-6; P-7]. However, the viability of the local population is still threatened by habitat loss, degradation and fragmentation, and road-related mortality [P-6]. Increasing sustainability and connectivity between habitats is considered a key measure for the conservation of this species [P-6]. Therefore, the Study Area may provide connectivity for this species to safely travel between

fragmented habitats. Other mitigating measures, such as wildlife culverts and overpass, can be implemented to help reduce road-related mortality, and contribute to the overall conservation of this species.

General Recommendations

Based on the key findings and potential for the site to support ecological connectivity, an ecological corridor is recommended to be implemented on the east of the Pang Sua Canal adjacent to the proposed residential development, so that wildlife can continue to use the area as a stepping stone to move between the surrounding green spaces. The proposed corridor will potentially help to facilitate the movement of faunal species, such as small mammals and volant species, even after the proposed development is established. The corridor should be of a reasonable width to ensure the survival of small to medium-sized mammals and for them to utilize the corridor, especially within an urban landscape where limited habitats are available [P-8; W-2], in this case, a larger corridor is recommended [W-2].

Further studies could also be carried out to explore the possibility of localised widening of the ecological corridor to conserve clusters of mature trees, such as the cluster of rain trees located south of the Study Area, which have denser tree canopies that could provide a more conducive microclimate allowing for profusion of ferns and other epiphytic plants and for fauna species. Floral species of conservation significance – *Bridelia stipularis* – would be retained. Keystone species including a specimen of *Ficus microcarpa* and *Ficus benjamina* respectively, with spread of 3 – 8 m and *Bambusa cf. heterosthya* of 2.5m spread – will also be studied for retention.

The greening of the canal will need to be studied together with the design of this ecological corridor to explore the possibility of an optimal and integrated design, taking into consideration the ecological aspects of the corridor, the proposed residential development and infrastructure requirements.

It is expected that the proposed development will result in the loss of some of the existing mature trees within the Study Area. As such, enhancement planting strategies (i.e., planting of keystone species, tiered planting of different layers of vegetation to emulate a forest-like structure that has large trees with close canopy etc.) could be incorporated. However, the planting of new vegetation will require some time for it to mature and to reconstitute a forest-like structure.

Other general recommended features of the proposed ecological corridor, such as strategic placement of light features within the proximity of the ecological corridor, could also be incorporated. Mitigating measures, such as wildlife culverts and overpass across Pang Sua Canal to facilitate safe movements by fauna species could also be considered.

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