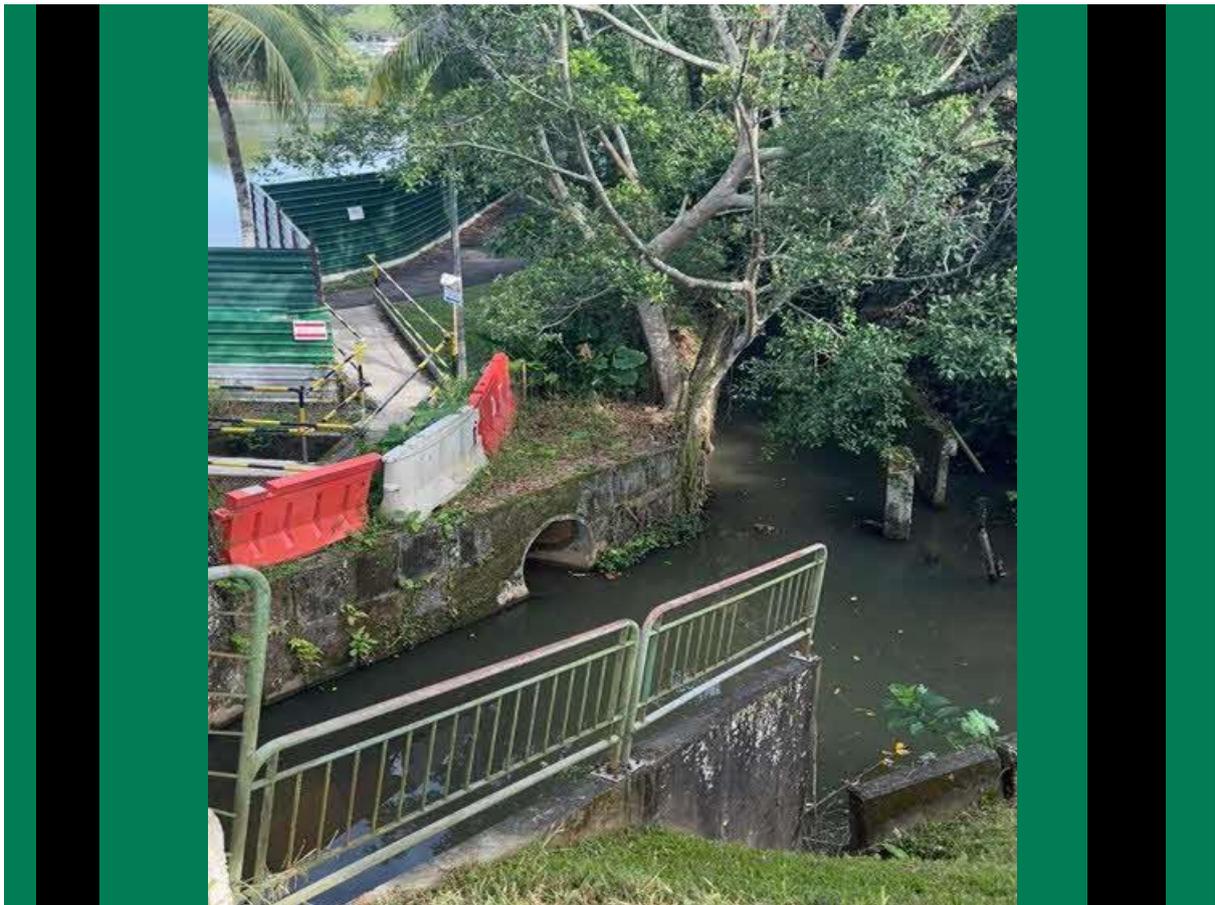


## Specialist Consultancy Services for Environmental Impact Assessment (EIA) at Chencharu (Site 2)

National Parks Board  
NParks/F/1/2024

Executive Summary



## Introduction

The National Parks Board (NParks) has appointed Jacobs (under the contracting entity of CH2M Hill Singapore Pte Ltd) on behalf of the Housing & Development Board (HDB) on 29 July 2024 to conduct Specialist Consultancy Services for an Environmental Impact Assessment (EIA) at Yishun (“hereinafter referred as “the EIA Study”). This Report for Site 2 has been prepared as one of the deliverables of the EIA Study for the later phases of upcoming public housing developments at Chencharu in Yishun (referred to as the “Project”).

The area of these proposed developments (hereinafter referred to as the “Subject Site”) spans an approximate area of thirty-three (33) hectares and is bounded by Sembawang Road, Yishun Avenue 1 / 2, Yishun Walk, and ongoing construction works for the first phase of public housing developments in Chencharu (Figure 1). The Subject Site has been occupied by various brownfield uses since the late 1800s, including agricultural, commercial, and recreational uses. Currently, the Subject Site is occupied by ornamental fish farms, temporary worksites, and other recreational and research uses that have or are in the process of vacating (e.g. ORTO Leisure Park, SingHealth’s National Large Animal Research Facility, etc.). The land use within the Subject Site is predominantly zoned “Residential (Subject to Detailed Planning)” in URA’s gazetted Master Plan 2019 (Figure 2) and was announced in 2024 for housing developments as part of the new Chencharu housing area within Yishun Town, given its proximity to Khatib MRT and the existing town fabric of Yishun.

The EIA Study focuses on two separate, non-contiguous sites located within the Subject Site (Figure 1). Site 1 consists of a forested patch with an approximate area of seven (7) hectares along Yishun Avenue 1. Baseline surveys are currently ongoing for Site 1 at the time of writing, and a separate report will be published when ready. Site 2 consists of an earth drain with an approximate length of 869 meters (m) and width of 18 m running from Sembawang Road to Yishun Avenue 2. Site 2 will be the focus of this report.

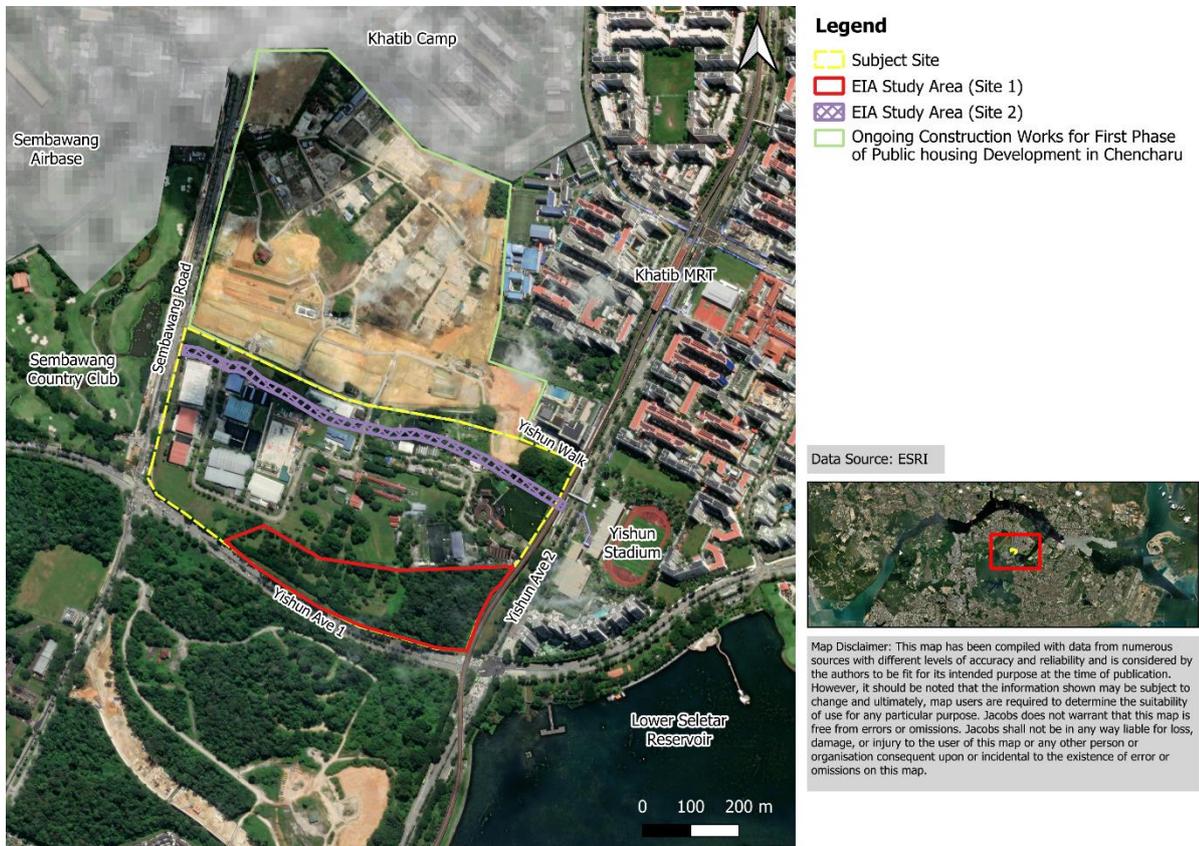


Figure 1: Overview of EIA Study Area for Site 2 and Subject Site Boundary

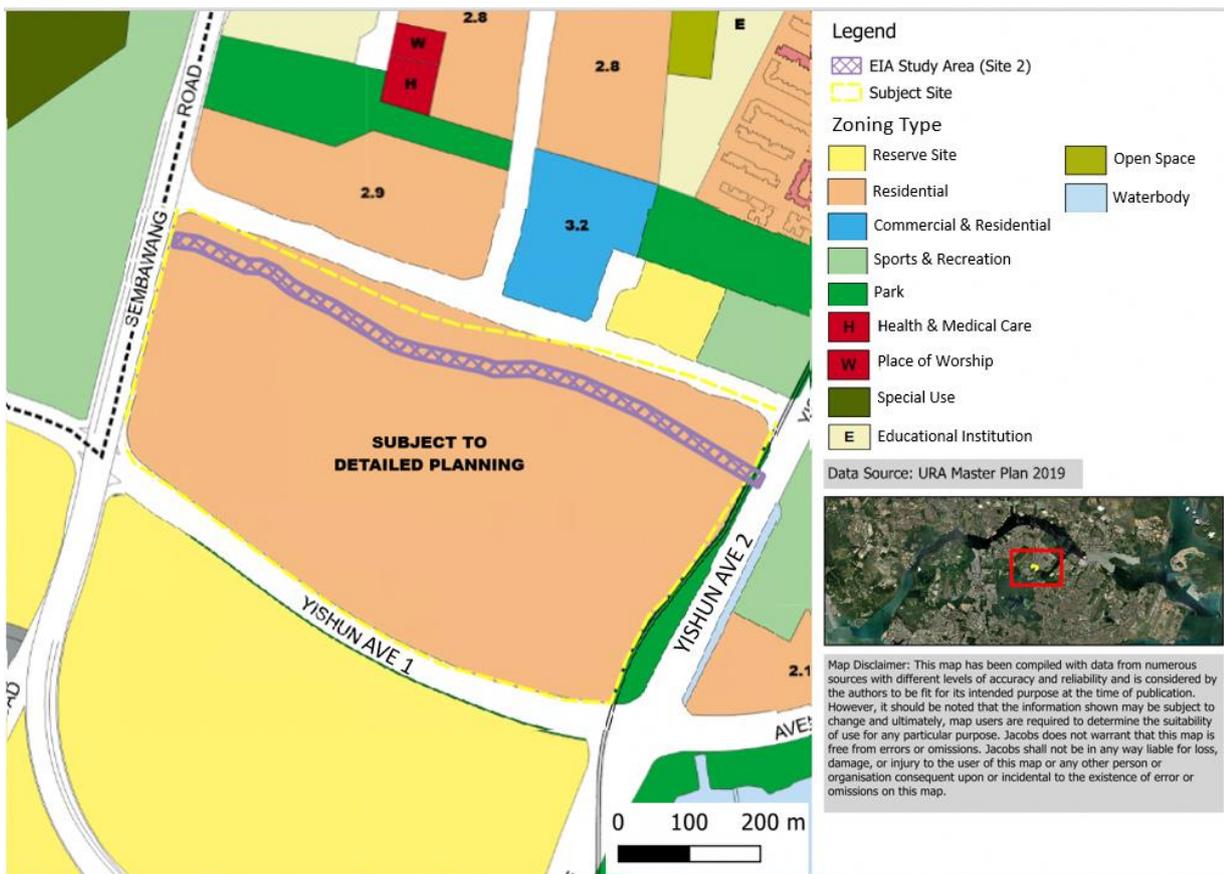


Figure 2: Land Use Intent

## Project Description and Objectives

The earth drain (Site 2) is not naturally occurring. It was originally constructed in the 1980s to drain discharge from surrounding brownfield agricultural and recreational uses into Lower Seletar Reservoir, given its primary function as a drain. Due to evolving land use needs and the limited drainage capacity of the current earth drain, drain diversion and upgrading works are required to support the future drainage needs of upcoming residential developments and ensure compliance with the updated drainage standards. This will be conducted in phases, where the eastern half will be diverted to a new 4-meter-wide box drain and backfilled in the near-term, while the remaining western half will be similarly diverted and backfilled in later years.

The EIA study, as presented in the Report for Site 2, hence aims to:

- 1) Identify and describe the existing conditions for water quality, ecology, and aquatic biodiversity (freshwater fish, decapod crustaceans, odonates, herpetofauna) of Site 2,
- 2) Identify, quantify, and assess the potential environmental impact of the proposed diversion works,
- 3) Recommend and justify effective mitigation measures to reduce any identified impact areas,
- 4) Identify, predict, and evaluate the residual impact after the implementation of proposed mitigation measures.

The Modified Rapid Impact Assessment Matrix (RIAM) will be used as the impact assessment methodology to assess the overall impact to the key environmental aspects from the development of this Project. RIAM is a semi-quantitative impact assessment method modified/ adopted from Pastakia (1998) and Ijas et al. (2009). This modified RIAM approach applies a scoring matrix (quantitative indicators) for impact evaluation in the form of Environmental Scores (ES) which range from extreme positive impact to critically negative impact for each specific project activity with consideration of the sensitivity level of the existing baseline environmental conditions.

## Environmental Baseline Results

### Water Quality

This report adopts the Environmental Protection and Management (EPM) (Trade Effluent) Regulations administered by the National Environmental Agency (NEA) as a proxy measure for water quality, which specifies the allowable limits for trade effluent discharge into various types of watercourses.

The survey results showed that most metrics did not exceed the limits listed in the EPM. However, the results showed that arsenic had exceeded the limit for discharge into a controlled watercourse ( $>10 \mu\text{g/l}$ ) at each sampling station during the wet weather event and one dry weather event, with an average level of  $15.31 \mu\text{g/l}$  recorded across all samples. During the wet weather event, exceedances for pH (10.7) and oil and grease ( $1.29 \text{ mg/l}$ ) were also observed at one sampling point, while exceedances for iron ( $1,871 \mu\text{g/l}$ ;  $1,028 \mu\text{g/l}$ ) and total suspended solids ( $315 \text{ mg/l}$ ;  $36.2 \text{ mg/l}$ ) were observed at two sampling points respectively. These exceedances are likely due to drainage from surrounding brownfield uses along the catchment given Site 2's primary function as a drain. These results were shared with the PUB, Singapore's National Water Agency who verified that arsenic levels in Lower Seletar Reservoir and its treated water remained at non-detectable levels after this isolated exceedance event, and there was no resultant risk to public health and safety.

The report also assessed water quality against Dutch Intervention Values (DIV) to estimate the potential for soil or groundwater contamination. The results indicated that the water quality of the earth drain did not exceed the specified thresholds for soil or groundwater contamination.

The full results can be found in **Section 4** and Appendices in the Report for Site 2.

### Ecology and Biodiversity

#### Fauna Baseline Results

The aquatic assessment recorded 38 species, comprising 9 odonate, 8 amphibian, 2 reptile, 2 decapod crustacean, and 17 fish species. **No aquatic fauna species of conservation significance were recorded.** The aquatic faunal assemblage was exotic dominated with more than 70% of the fish species recorded being exotic and likely introduced via the ornamental pet trade. The native species observed were mostly widespread and common species which are found in areas with disturbed habitat conditions.

There were also incidental records of 3 terrestrial species, with 1 butterfly and 2 mammal species recorded. Among these incidental records, only the long-tailed macaque (*Macaca fascicularis*) was assessed to be a species of conservation significance given that it is globally Endangered, though it is classified as nationally Least Concern.

The total species count across both aquatic and incidental terrestrial species for Site 2 is 41 (**Table 1**). The full results and list of species recorded can be found in **Section 5** and Appendices of the Report for Site 2.

**Table 1: Summary of Recorded Faunal Species**

Faunal Group	All species	Native Species	Species of Conservation Significance
<b>Odonate</b>	9	9 (100.0%)	0
<b>Dragonfly</b>	7	2 (100.0%)	0
<b>Damselfly</b>	2	2 (100.0%)	0
<b>Herpetofauna</b>	10	6 (60.0%)	0
<b>Amphibian</b>	8	5 (62.5%)	0

Faunal Group	All species	Native Species	Species of Conservation Significance
Reptile	2	1 (50.0%)	0
Freshwater Decapod Crustacean	2	1 (50.0%)	0
Freshwater Fish	17	5 (29.4%)	0
Butterfly*	1	1 (100.0%)	0
Mammal*	2	2 (100.0%)	1

Note: \*Opportunistic records of terrestrial species

### Habitat Conditions

Most of the earth drain was soft-bottomed with common native and exotic flora species, both spontaneous and cultivated, growing along the riparian banks along the earth drain. Aquatic vegetation was scarce and only observed at limited areas. There was a mix of habitat conditions observed, including shadier vegetated areas with steeper banks, open sunny areas with more gradual banks, and some spots with litter, debris and concrete structures.

The habitat type for Site 2 was assessed to be of **low ecological value** overall, given that it contains mostly exotic fauna species, with no unique flora or fauna species observed.

## Minimum Control Measures

**Table 2** shows the minimum controls commonly implemented in Singapore for similar drain diversion activities.

**Table 2: Description of Minimum Controls Implemented at Construction Phase**

Impact	Minimum Controls Adhered to Applicable Regulations and COPs
<b>Sedimentation/ Soil Erosion</b>	<p style="text-align: center;"><b>Water Quality</b></p> <ul style="list-style-type: none"> <li>▪ Before work commences, submit a detailed ECM proposal duly endorsed by a Qualified Erosion Control Professional (QECP) to PUB and copied to HDB indicating: <ul style="list-style-type: none"> <li>- Plans to minimise exposed surfaces for the proposed diversion and backfilling activities.</li> <li>- Implementation of effective sediment control facilities (including storage and treatment facilities).</li> <li>- ECM systems that will be put in place prior to the commencement of physical works.</li> <li>- A Clearance Certificate that is obtained prior to the commencement of physical works.</li> <li>- Revisions or updates to the ECM systems during construction to control silty discharge, where necessary.</li> <li>- ECM shall not be removed prior to the completion of physical works. Relevant approvals from PUB shall be obtained for removal of ECM upon the completion of physical works.</li> <li>- Condition of ECM shall be inspected regularly and during/after every rain event.</li> <li>- QECP shall carry out regular audit/reviews for every stage of the construction works and revise the ECM on-site accordingly.</li> </ul> </li> <li>▪ Earth surfaces or slopes adjacent to any drain shall be close turfed, paved or covered with appropriate materials.</li> <li>▪ Bare surfaces shall be covered up with appropriate materials before rain and daily works should be halted to reduce the volume of silty water to be contained and treated.</li> <li>▪ The treatment of silty water shall be closely monitored, and the treatment shall be halted immediately if silty water is being discharged to the public drain.</li> </ul>
<b>Water Pollution/ Trade Effluent Discharge</b>	<ul style="list-style-type: none"> <li>▪ Discharge from the site into public drains shall not contain total suspended solids (TSS) in concentrations greater than the prescribed legal limits for a controlled watercourse, i.e., 30 mg/L.</li> </ul>

Impact	Minimum Controls Adhered to Applicable Regulations and COPs
	<p data-bbox="715 342 880 376"><b>Water Quality</b></p> <ul data-bbox="726 392 1437 1359" style="list-style-type: none"><li data-bbox="726 392 1437 495">▪ All wastewater generated at the site must be properly treated and disposed of. No discharge of untreated wastewater into public drains or land is allowed.</li><li data-bbox="726 504 1437 636">▪ Oil and chemicals in drums, carboys, containers, etc. shall be stored in a designated storage area within a building or covered shed with concrete floors and facilities to contain any accidental leak or spillage.</li><li data-bbox="726 645 1437 777">▪ Waste oil and chemicals generated from site activities, as well as all leaks and spillage, shall only be sent to a licensed toxic industrial waste collector for proper disposal.</li><li data-bbox="726 786 1437 918">▪ Bunds of stockpiled materials such as earth from trench work shall not be longer than 10 m. Gaps of at least 1 m width shall be provided between the bunds to allow the free flow of surface runoff.</li><li data-bbox="726 927 1437 1104">▪ Material from any stockpile shall not be allowed to fall or be washed into the drain. Adequate preventive measures, including the provision of proper and stable barricades or screens where necessary, shall be provided.</li><li data-bbox="726 1113 1437 1359">▪ All used water discharged from temporary toilets, sanitary appliances and washing facilities at the site must be collected and disposed of via temporary sanitary facilities. The design shall be in accordance with the General Requirements for temporary sanitary facilities for Construction Site and obtain NEA's Clearance Certificate on Environmental Health.</li></ul>

Impact	Minimum Controls Adhered to Applicable Regulations and COPs
<p><b>General</b></p>	<p><b>Water Quality</b></p> <p><b>Biodiversity</b></p> <ul style="list-style-type: none"> <li>▪ Install hoarding to delineate the worksite.</li> <li>▪ Avoid fogging by implementing preventive measures for mosquito breeding to remove sources of stagnant water or water-bearing receptacles, e.g. clear discarded items daily, store materials appropriately, level up ground depression/uneven surfaces, ensure effective drainage flow.</li> <li>▪ Visual checks by an ecologist for animal entrapments on-site during backfilling works, ECBs and among construction materials and equipment</li> <li>▪ Visual checks for gaps in hoarding.</li> <li>▪ Execute a wildlife response plan when a trapped/ injured/ dead/ dangerous animal is encountered around or within the worksite according to <b>Appendix 1A</b>, Section 10 of Wildlife Act.</li> </ul>
<p><b>Vegetation Clearance</b></p>	<ul style="list-style-type: none"> <li>• Conduct inspections of fauna prior to felling or removal of vegetation. This should be done by an ecologist who is able to identify wildlife and/ or active nesting structures, such as bird nests, tree hollows and/or burrows, and bamboo clusters.</li> <li>• Implement soil erosion control measures as soon as vegetation has been removed and soil is exposed (refer to <b>Section 4.5.1</b>).</li> <li>• Engage a Qualified Erosion Control Professional (QECP) to formulate and implement an Earth Control Measures (ECM) plan in accordance with PUB requirements.</li> </ul>

## Recommended Mitigation Measures

### Water Quality

The overall proposed approach to mitigate any potential adverse impact from the proposed diversion works on water quality during the construction phase involves the following measures:

- **Erosion Control:** Reduce the volume of sediments that can be generated or washed off during rainfall events. The key strategies are to minimise the extent of bare earth areas (erodible surfaces) on-site and to protect any unavoidable bare earth surfaces.
- **Sediment Control:** Capture the sediments washed down from the site and reduce TSS in surface water discharges. The key strategies are to contain and treat the surface runoff from the site before it is discharged into the watercourse.
- **Trade Effluent Management:** Control and treat discharge of wastewater on-site before it is discharged into the watercourse.
- **Management of Pollutive Substances:** Control the storage, use and disposal of hazardous substances used on-site to avoid accidental leakage.

The full list of recommended mitigation measures for water quality is presented in **Section 4.5** of the Report of Site 2.

### Ecology and Biodiversity

**Construction Phase:** During the course of the proposed drain diversion and backfilling works, the following mitigation measures are recommended to minimise the impact to existing fauna, on top of the proposed mitigation measures for water quality which would also benefit fauna:

- **Wildlife Management Plan:** Minimise accidental injury or mortality of fauna. Detailed measures include:
  - Allowing water in the earth drain to be completely drained out before commencing any backfilling works.
  - If there are any residual water left in the earth drain, an ecologist is to carry out inspections to rescue and relocate trapped aquatic species downstream or upstream where suitable, before water is pumped out.
  - Before the commencement of backfilling works, an ecologist is to walk the area of the emptied earth drain to be backfilled to ensure that there is no trapped fauna, especially turtles and terrapins, before backfilling works commence.
- **Wildlife Response Plan:** Develop a Wildlife Response Plan in consultation with NParks' Animal Management Centre, for encounters with any trapped, injured or dead wildlife, as well as incidents of human-wildlife conflict within the development, to minimise animal injury and mortality. All site members should be briefed on the Wildlife Response Plan to ensure awareness and compliance.
- **Biodiversity Awareness Training:** Minimise human-wildlife conflict with proper waste and food management. NParks should be notified if any wildlife is spotted and an approved contractor should be engaged to trap and remove it.

**Operational Phase:** Besides the recommended safeguards implemented during the proposed drain diversion and backfilling works, the following measures can also be considered to enhance the ecological and biodiversity value of future developments at the Subject Site:

- **Integration of biophilic ABC (Active, Beautiful, Clean Waters) features** such as rain gardens and vegetated swales within the development that can also be used as bioretention basins to help manage surface water runoff and filter pollutants. These features are planted with lush native foliage, and can potentially create enhanced habitats for native wildlife such as butterflies, birds, odonates and frogs, especially given the degraded conditions of the existing earth drain (**Figure 3**).
- Creation of a new freshwater habitat as part of the upcoming developments, depending on site considerations and technical complexity.



**Figure 3: Biophilic ABC Features that can be Implemented in Future Developments to Attract Local Biodiversity**

The full list of recommended mitigation measures for ecology and biodiversity is presented in **Section 5.5.5** of the Report of Site 2.

## Summary of Impact Assessment and Evaluation of Residual Impact after Mitigation Measures

The implementation of (i) requirements or standard practices of controls commonly applied in Singapore for similar activities and the (ii) additional recommended mitigation measures will reduce the magnitude and permanence of the anticipated impact (**Table 3** and **Table 4**).

For water quality, the impact assessment identified potential risks associated with soil erosion, trade effluent discharge and accidental spillage during the construction phase, which were assessed to have a **Minor Negative** impact based on the minimum control measures implemented for such works. With the implementation of additional recommended mitigation measures, the residual impact significance is effectively reduced to **Minor Negative** but with a **lower magnitude**.

For the habitat receptor, the anticipated impact to habitat loss is assessed to be **Moderate Negative** during the construction phase, considering the nature of the proposed works (where the existing earth drain is intended to be backfilled after the water flow has been diverted) and the low ecological value of the earth drain.

For the faunal receptors, a total of nine (9) fauna species were deemed to be of high ecological value, including the incidentally observed long-tailed macaque and 8 other probable species (consisting of 1 odonate, 2 fish and 5 reptile species), were used to guide the impact assessment. The 8 probable species were included as faunal receptors for a more comprehensive assessment given the survey limitations to record every fauna species present on-site:

- During the construction phase, the impact significance ranged from **No Change to Major Negative** depending on the specific faunal receptor and impact type assessed. Habitat loss was assessed to be **Minor Negative** for species that were less dependent on riparian areas for habitats and food sources, and **Major Negative** for the remaining species. The impact to ecological connectivity ranged from **No Change or Minor Negative** for species that could either continue using the diverted box drain for aquatic movement or did not rely heavily on the earth drain for connectivity, to **Moderate Negative** for species that relied more on open, vegetated riparian areas for connectivity. Although accidental injury or mortality to wildlife was initially assessed to be **Moderate Negative**, the proposed mitigation measures to minimise wildlife mortality (e.g. Wildlife Management Plan, Wildlife Response Plan, Biodiversity awareness training, etc.) could reduce the impact to **Minor Negative**. These mitigation measures and minimum control measures can also help to ensure that the anticipated impact for human-wildlife conflict and human disturbances remain at **Minor Negative**.
- During the operational phase, there is broadly **No Change to Moderate Negative** impact for the faunal receptors. While compensatory measures such as biophilic ABC features may not reduce the loss of connectivity for riparian species, they can still provide alternative forms of enhanced habitat creation within the future developments for other native wildlife.

The full impact assessment for water quality is presented in **Sections 4.4 – 4.6**, and the full impact assessment for ecology and biodiversity is presented in **Section 5.5** of the Report for Site 2.

**Table 3: Summary of Impact and Evaluation of Residual Impact for Water Quality and Habitats**

Impact Register	Before Mitigation Measures			Post Mitigation Measures (Residual Impact Significance)	
	Environmental Score (ES)	Range Band of ES / Impact Significance	Key Recommended Mitigation Measures	Environmental Score (ES)	Range Band of ES / Impact Significance
<b>Water Quality</b>					
<b>Construction Phase</b>					
Degradation of water quality due to soil erosion and surface runoff from construction activities	-120	Minor negative impact	Biodegradable ECBs and sediment containment strategies	-60	Minor negative impact
Degradation of water quality due to trade effluent discharge	-120	Minor negative impact	Adopting treatment protocols and regulate discharge	-60	Minor negative impact
Degradation of water quality due to leak or spillage of diesel, oil, and other pollutive substances	-120	Minor negative impact	Bunded storage, spill containment, and emergency response planning	-60	Minor negative impact
<b>Habitats</b>					
<b>Construction Phase</b>					
Loss of habitat	-234	Moderate Negative Impact	No applicable mitigation measures given nature of proposed works (where the existing earth drain is intended to be backfilled after the water flow has been diverted)	-234	Moderate Negative Impact

**Table 4: Summary of Construction and Operational Impact and Evaluation of Residual Impact to Fauna Receptors with Number Indicating Number of Species**

Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
<b>Construction Phase Impact</b>				
Loss of/ reduction in habitats and food sources	0	1	0	8
Accidental injury or mortality	0	2	7	0
Loss/reduction of ecological connectivity for faunal movement	1	3	5	0
Human disturbances	2	7	0	0
Human-wildlife conflict	5	4	0	0
Light disturbances	9	0	0	0
<b>Key recommended mitigation measures:</b>				
<ul style="list-style-type: none"> <li>• <b>Wildlife Management Plan</b> to minimise accidental injury or mortality of fauna during the drain diversion and backfilling process</li> <li>• <b>Wildlife Response Plan</b> for encounters with any trapped, injured, or dead wildlife as well as incidents of human-wildlife conflict within the development to minimise animal injury and mortality</li> <li>• <b>Biodiversity Awareness Training</b> for on-site staff to minimise human-wildlife conflict with proper waste and food management</li> </ul>				
<b>Construction Phase Residual Impact</b>				
Loss of/ reduction in habitats and food sources	0	1	0	8
Accidental injury or mortality	0	9	0	0
Loss/reduction of ecological connectivity for faunal movement	1	3	5	0
Human disturbances	2	7	0	0
Human-wildlife conflict	5	4	0	0
Light disturbances	9	0	0	0
<b>Operational Phase Impact</b>				
Loss/reduction of ecological connectivity for faunal movement	1	3	5	0
Light disturbances	8	1	0	0
Human disturbances	8	1	0	0

Impact Type	No Change	Minor Negative	Moderate Negative	Major Negative
Human-wildlife conflict	8	1	0	0
Accidental injury or mortality	8	1	0	0
<b>Key recommended mitigation measures:</b>				
<ul style="list-style-type: none"> <li>Integration of compensatory measures such as biophilic ABC (Active, Beautiful, Clean Waters) features such as rain gardens and vegetated swales to create enhanced habitats for native wildlife</li> </ul>				
<b>Operational Phase Residual Impact</b>				
Loss/reduction of ecological connectivity for faunal movement	1	3	5	0
Accidental injury or mortality	8	1	0	0
Human disturbances	8	1	0	0
Human-wildlife conflict	8	1	0	0
Light disturbances	8	1	0	0