

# Executive Summary

## Objectives of Study

AECOM Singapore Pte Ltd was appointed by the Housing & Development Board (“HDB”) to carry out an Environmental Impact Study (EIS) for the construction and operational phases of proposed housing with supporting amenities and infrastructure in Mount Pleasant area (hereinafter referred to as the “Study Area”). This EIS Report was formed: (1) to inform HDB of major issues according to HDB’s conceptual plan at an early master planning stage; (2) to provide a high-level identification, prediction and evaluation of potential environmental impacts and their acceptability that are likely to arise as a result of the Study Area ; (3) to propose mitigation measures; and (4) to evaluate the acceptability of residual impacts after implementation of these recommended measures.

## Project Description

The Study Area is bounded by Mount Pleasant Road to the north, Bukit Brown Woods to the west, Thomson Road to the east, and the Pan Island Expressway (PIE) to the south, which is larger than the proposed development area. It covers a total area of approximately 71.6 hectares (ha) (see Figure 1). It is currently a mix of cemetery park land, forested area, institutional recreational spaces and facilities, and the Mount Pleasant MRT and North-South Corridor (NSC) construction areas. The Study Area is predominantly zoned “Residential (Subject to Detailed Planning)” in URA’s gazetted Master Plan 2019, while the Kopi Sua Cemetery is zoned “Cemetery”. The Study Area also covers a portion of Mount Pleasant Road, which is a gazetted heritage road with the Black & White bungalows situated alongside. More details about the project background and surrounding environment are provided in Sections 3 and 5 of the EIS report.

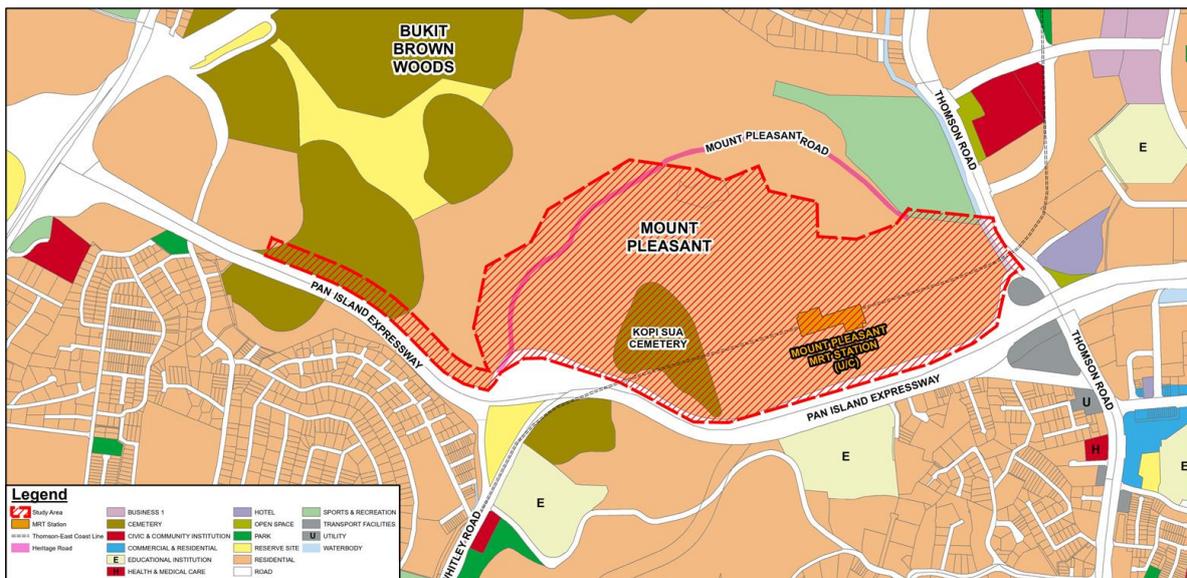


Figure 1 - Gazetted Land Use of the Study Area as per URA Master Plan 2019

The construction (e.g. site clearance, building construction) and operational activities (e.g. roads and buildings operation) within the Study Area are expected to potentially affect the nearby human and ecologically sensitive receptors from the aspects of air quality, airborne noise, ground-borne vibration, hydrology and surface water quality, soil and groundwater quality, biodiversity, landscape and visual amenity. These identified potential impacts were then assessed in the EIS.

## Environmental Baseline Findings

Baseline studies for the identified potential impacts were carried out between Jan 2019 to September 2020 around the Study Area. The summary of the baseline findings is provided below. More details can be found in Sections 7, 8, 9, 10, 11, 12 and 13 of the EIS report.

- **Air Quality** – Baseline air monitoring was conducted at one (1) location near Mount Pleasant Road. All pollutant (i.e. dust/ particulate matters, PM<sub>10</sub> and PM<sub>2.5</sub>) concentrations were found to be within the Singapore Ambient Air Quality Long Term Targets.

- **Airborne Noise** – Baseline noise monitoring was carried out at four (4) locations along roadsides within the Study Area to obtain baseline noise levels ( $L_{Aeq}(12\text{ hour})$ ,  $L_{Aeq}(1\text{ hour})$ ,  $L_{Aeq}(15\text{ min})$ ,  $L_{Aeq}(5\text{ min})$ ), which showed slightly elevated noise levels either for residential area or noise sensitive premises (i.e. hospitals, library, etc) mainly due to the Pan Island Expressway (PIE) nearby.
- **Ground-borne Vibration** – Baseline vibration monitoring was conducted at three (3) locations along roadsides within the Study Area. The average peak particle velocity ranged from 0.32 to 0.92 PPV, mainly due to the intermittent traffic pass-by on main road as observed during the vibration monitoring.

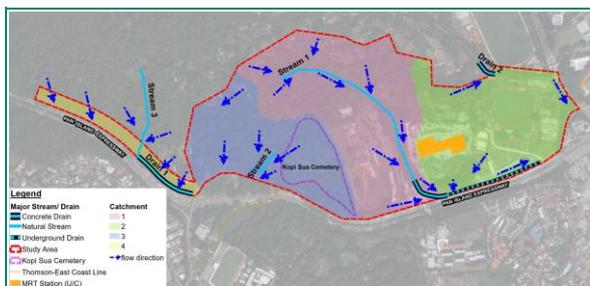


Figure 2 - Existing Waterbodies in the Study Area



Figure 3 - Distribution of Flora Species of Conservation Significance and Vegetation Types



Figure 4 - Key Ecological Receptors in Study Area



Figure 5 - Overall Number of Fauna Species Recorded at Each Sampling Point along Transects

- **Hydrology and Surface Water Quality** (see Figure 2) – Two (2) naturalised streams (i.e. Streams 2 and 3) and one (1) partially naturalised stream (i.e. Stream 1), as well as two (2) stormwater drains (i.e. Drains 1 and 2) were identified as watercourses within the four (4) catchment areas. Baseline water quality sampling was conducted at a total of seven (7) sampling locations across the five watercourses. The water quality in all the natural streams were found to be suitable for aquatic life.
- **Soil Quality** – A total of seven (7) boreholes was established to understand the baseline soil and groundwater conditions within the Study Area. Soil samples were mainly clayey silt with heavy metals and selected PAHs<sup>1</sup>, but all were below the DIVs<sup>2</sup>.
- **Groundwater Quality** – The groundwater was found to be slightly acidic to neutral and dominated by freshwater characteristics. Groundwater near Stream 3 generally flows towards the south-southwest direction, while that near Stream 1 and 2 generally flows towards the southeast direction. Groundwater samples reported detections of heavy metals, but mostly below the DIVs and the ANZGFMWQ<sup>3</sup>, except for copper and zinc that exceeded ANZGFMWQ.
- **Vegetation Distribution** (see Figure 3) – The Study Area is composed of managed vegetation (46.23%), followed by the abandoned-land forest (25.94%), managed vegetation (cemetery)<sup>4</sup> (5.27%), native-dominated low secondary forest (4.27%), scrubland and herbaceous vegetation (4.12%) and waste woodlands (3.54%). The remaining 10.62% of the Study Area was covered by an existing construction area.

<sup>1</sup> Polycyclic Aromatic Hydrocarbons (PAHs)

<sup>2</sup> Dutch Intervention Values (DIV)

<sup>3</sup> Australian and New Zealand Guidelines for Fresh and Marine Water Quality for Freshwater (ANZGFMWQ)

<sup>4</sup> The vegetation in the Kopi Sua Cemetery is defined separately as Managed Vegetation (Cemetery) as it was found to be maintained by a group of caretakers, where its floristic composition is observed to be largely different from other managed vegetation in the private compound areas (e.g. roadside trees and shrubs, managed lawns, landscape plantings).

- **Biodiversity, Flora** (see Figure 3) – A total of 378 species of vascular plants (e.g. ferns and flowering plants) was recorded, in which about 23.54% were of true conservation significance<sup>5,6</sup>, located mostly within the native-dominated secondary forest and abandoned-land forest in the Study Area. A total of 225 large trees, palms and bamboos (≥ 3m in girth/spread) were documented within the Study Area with a mix of common and exotic species.
- **Biodiversity, Fauna** (see Figure 5) – About 35.25% of the 468 species of probable occurrence<sup>7</sup> identified from desktop study were confirmed during the fauna field assessment. The highest species richness was recorded in the cemetery area with managed vegetation. Overall, a total of 14 species of conservation significance<sup>5</sup> were recorded, including one damselfly (i.e. Collared Threadtail<sup>8</sup>), one butterfly (i.e. Common Rose), one reptile (i.e. Asian Softshell Turtle<sup>8</sup>), ten bird (e.g. Crested Goshawk, White-rumped Shama) and one bat species (i.e. bamboo bats<sup>9</sup>).
- **Ecological Value** (see Figure 4) – The Study Area has a mix of features with low to high ecological values, with medium to high ecological value due to its proximity to the Central Catchment Nature Reserve, as well as the presence of: (1) Native-dominated secondary forest of medium-high ecological value; (2) Abandoned-land forest of medium ecological value; (3) A heritage tree (*Ficus kurzii*) along Mount Pleasant Road; (4) 225 large specimens of trees, palms or bamboos across the site; (5) Bamboo clusters and the critically endangered Lesser Bamboo Bat (*Tylonycteris* sp.); (6) Fauna of conservation significance<sup>5,7</sup> at all three streams.
- **Landscape and Visual Amenity** – The Study Area consist of a mix of disturbed natural habitat, managed land, construction, and residential development. The landscape and visual amenity values within the Study Area are mainly contributed by the managed vegetation with a mix of exotic and commercially available native species, as well as the colonial character of the Black and White Bungalows with heritage features along Mount Pleasant Road.

### Impact Assessment Approach and Methodology

Section 6 describes the overall approach of an EIS. Sections 7, 8, 9, 10, 11, 12 and 13 of the EIS report discuss the assessment methodologies and findings in specific to the potential impacts assessed for the construction and operational phases of the Study Area.

### Key Mitigation Measures

Table 1 summarizes the key mitigation measures and best management practices that have been recommended for adoption during the construction and operational phases of the Study Area. More details can be found in Sections 7, 8, 9, 10, 11, 12 and 13 of the EIS report.

**Table 1: Recommended Key Mitigation Measures and Best Management Practices**

Environ-mental Parameter	Key Mitigation Measures and Best Management Practices	
	For Construction Phase	For Operational Phase
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>• Develop and implement an Air Pollution Control Plan (APCP);</li> <li>• Implement best management practices on site (e.g. erect hoarding around dusty activities, water suppression, perform wheel-washing, use water-assisted dust sweepers, transport/ store fine materials</li> </ul>	<p><u>No suggestion of mitigation measures would be required</u>, as the air quality impact significance is expected to be Negligible to Minor.</p>

<sup>5</sup> The global conservation status for fauna follow the International Union for Conservation of Nature (IUCN) Red List, while the local conservation status for both flora and fauna follow the Singapore Red Data Book (SRDB) and other updated local checklists if available. Threatened species listed as nationally and/or globally Vulnerable, Endangered, Critically Endangered, or Presumed Extinct (see Table 12-2 in EIS report for definitions) were considered species of conservation significance in this study.

<sup>6</sup> See Appendix B2 in the EIS Final Addendum Report for the list of locally conservation significant plants.

<sup>7</sup> See Appendix D in the EIS Final Addendum Report for the list of fauna species of probable occurrence.

<sup>8</sup> The Asian Softshell Turtle (*Amyda cartilaginea*) and Collared Threadtail (*Prodasineura collaris*) are stream dependent fauna species which are "locally threatened" (see Footnote 5).

<sup>9</sup> Bamboo bats (*Tylonycteris* sp.), also known as flat-headed bats, are insectivorous bats that roost in the internodes of bamboo. In Singapore, there are two species of bamboo bats—the Lesser Bamboo Bat (*Tylonycteris fulvida*) and the Greater Bamboo Bat (*Tylonycteris malayana*), where the former is listed as "Critically Endangered" (see Footnote 5). Since there was difficulty in differentiating the bamboo bats caught from their physical attributes and calls, without identifying to species level, it was assumed with possibility to be the critically endangered Lesser Bamboo Bat.

Environmental Parameter	Key Mitigation Measures and Best Management Practices	
	For Construction Phase	For Operational Phase
	<ul style="list-style-type: none"> <li>with enclosure, re-vegetate earthworks/exposed areas);</li> <li>Impose a maximum-speed-limit of 25 km/hr on paved or surfaced haul roads and 15 km/hr on unpaved haul roads and work areas.</li> </ul>	
<b>Airborne Noise</b>	<ul style="list-style-type: none"> <li>Prioritize the use of construction equipment with lower noise levels;</li> <li>Acoustic shed / enclosure for construction equipment where viable to implement.</li> </ul>	<ul style="list-style-type: none"> <li>Road traffic control with low-speed postings, humps and signage;</li> <li>Apply noise attenuators and other best available technologies/practices for noise control on ACMV system.</li> </ul>
<b>Ground-borne Vibration</b>	<ul style="list-style-type: none"> <li>Use low vibration piling techniques during construction phase;</li> <li>Use rotary bore piling/micro piling techniques for the foundations of the building.</li> </ul>	<ul style="list-style-type: none"> <li>Road traffic control on speed limits and heavy vehicles;</li> <li>Maintenance of road surfaces to be levelled.</li> </ul>
<b>Hydrology and Water Quality</b>	<ul style="list-style-type: none"> <li>Ensure strict compliance with PUB Code of Practice on Surface Water Drainage, e.g.                             <ul style="list-style-type: none"> <li>Implement earth control measures</li> <li>Implement CCTV and Silt Imagery Detection System (SIDS) to monitor surface runoff discharges from sites</li> </ul> </li> <li>Provide enclosed bins and designated waste disposal facilities, with frequent housekeeping checks and waste collections by licensed waste operator/collector.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure strict compliance with PUB Code of Practice on Surface Water Drainage with considerations during design stage to reduce operational peak flow and flood risk, e.g. provide storage system, provide more softscape/ pervious areas, etc.;</li> <li>Provide sufficient disposal bins surrounding the Project to avoid improper waste disposal.</li> </ul>
<p>Project-specific recommendations to mitigate major impact at Stream 1, Stream 3 and Drain 1 in both phases (<i>subject to detailed engineering studies and Authorities' approval – see Table 10-13 in EIS Report</i>)</p> <p><u>Stream 1</u> (mainly to preserve<sup>10</sup> upstream of Stream 1):</p> <ul style="list-style-type: none"> <li>Option A: Realign proposed road at upstream of Stream 1 with 35 m buffer at both sides, convert downstream into drains, provide drain diversion during construction</li> <li>Option B: Replace proposed slip road with a service road along PIE that links to the existing Onraet Road, provide drain diversion for downstream section during construction with the retention of approximately 30% of the upstream of Stream 1 with 35 m buffer on both sides</li> </ul> <p><u>Stream 3</u> (aim to preserve the entire Stream 3):</p> <ul style="list-style-type: none"> <li>Option A: Convert downstream of Stream 3 into culvert structure under the proposed slip road, provide temporary drain diversion during construction</li> <li>Option B: Construct proposed slip road as a cross-over to avoid the stream</li> <li>Option C: Replace proposed slip road with a service road along PIE that links to the existing Onraet Road, so that Stream 3 will remain intact</li> </ul> <p><u>Drain 1</u>: Divert or realign the concrete drain during the construction to minimize flooding risk</p>		
<b>Soil and Ground-water</b>	<ul style="list-style-type: none"> <li>Install piezometers to monitor groundwater level changes in compliance with Building Control Regulations 2003;</li> </ul>	<ul style="list-style-type: none"> <li>Ensure proper storage of toxic chemical waste and hazardous substances/chemicals at designated sheltered area (with</li> </ul>

<sup>10</sup> "Preserve" indicates that there should be no construction/operational activities disturbing the existing conditions of the stream.

Environmental Parameter	Key Mitigation Measures and Best Management Practices	
	For Construction Phase	For Operational Phase
	<ul style="list-style-type: none"> <li>• Conduct a construction risk assessment and prepare a comprehensive construction health, safety and environment plan (e.g. wear PPE on site, provide emergency spill kits on site);</li> <li>• Ensure proper storage of generated toxic chemical waste and chemicals used on-site under shelter within concrete bund walls or in storage containers with good ventilation;</li> <li>• Provide spill trays for all waste/chemical containers and perform regular maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>• access-controlled entrance and concrete bund walls) or in storage containers with good ventilation;</li> <li>• Provide spill trays for all chemical drums, plants and machinery and potential pollutive substances used on site, and ensure regular maintenance.</li> </ul>
<b>Biodiversity</b>	<ul style="list-style-type: none"> <li>• Review conceptual development plan in the Study Area to avoid area of high concentration of flora species and Stream 1 which is a habitat for an odonate of conservation significance. If retained, the adjacent existing vegetation of 35m of both sides of the stream should also be maintained;</li> <li>• Review orientation of proposed commercial and social node to retain the cluster of 11 nos. of Tembusu (<i>Cyrtophyllum fragrans</i>);</li> <li>• Review work areas and access to avoid allocating excessive working spaces, this could prevent works from affecting Stream 2;</li> <li>• Review start location of proposed slip road from PIE to avoid Stream 3 or review construction methods that would minimise impact to the stream and the surrounding vegetation. The most biodiversity sensitive approach would be to avoid Stream 3 completely (refer to Option C in water quality);</li> <li>• The erection of the construction hoarding/ noise barrier (where applicable) shall be directional, starting from the area closest to the busiest road, Thomson Road, then towards Bukit Brown Woods. This is to reduce potential roadkills. The hoarding shall be continuous and complete before work commences;</li> <li>• Once the site hoarding is completed, determine if there are wild pigs within the hoarding;</li> <li>• Prior to works, if wild pigs are present within the hoarding, the contractor shall engage an approved wildlife management specialist to prepare and execute a plan for their removal; and</li> <li>• For all fauna that may be encountered on site, prepare a wildlife response and rescue plan in consultation with an Ecologist and have an NParks approved</li> </ul>	<ul style="list-style-type: none"> <li>• Plant more trees along the edge of the retained vegetation and adjacent forest (Bukit Brown Woods), it can serve as a natural barrier to light, noise and filter vehicular emissions that may be harmful to animals;</li> <li>• Incorporate bird-friendly features for building design, e.g. presence of overhangs, replace continuous glass facades with decorative facades and grilles, UV patterned glass.</li> </ul>

Environmental Parameter	Key Mitigation Measures and Best Management Practices	
	For Construction Phase	For Operational Phase
	wildlife management specialist ready to execute if needed.	
<b>Landscape and Visual Amenity</b>	<ul style="list-style-type: none"> <li>• Tree preservation and avoidance of unintended vegetation removal;</li> <li>• Appropriate design of building facades;</li> <li>• Visual design on noise barriers;</li> <li>• Set up buffer zones from colonial houses;</li> <li>• Implementation of noise and air quality mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>• Landscaping to mimic and merge into the surrounding nature character;</li> <li>• Replanting of trees within Study Area as compensation of tree felling, or along the circumference to soften the hard edge of buildings/ structures as a form of visual relief.</li> </ul>

## Summary of Environmental Impact Assessment

With the implementation of mitigation measures, the overview of impact evaluation for both construction and operational phases are summarised in Table 2.

**Table 2: Summary of Impact Significance for Construction and Operational Phases (Range if applicable)**

Environmental Parameter	Impact Significance (with minimum controls/best practices)	Residual Impact Significance (with mitigation measures)
<b>Air Quality</b>	Negligible to Major	Negligible to Minor
<b>Airborne Noise</b>	Negligible to Moderate (human receptors) Minor to Moderate (ecological receptors)	Negligible to Minor (human receptors) Minor to Moderate <sup>11</sup> (ecological receptors)
<b>Ground-borne Vibration</b>	Minor to Moderate (human receptors) Minor (ecological receptors)	Negligible to Minor (human receptors) Minor (ecological receptors)
<b>Hydrology and Water Quality</b>	Negligible to Major	Negligible to Moderate <sup>12</sup>
<b>Soil and Groundwater</b>	Negligible to Minor	Negligible to Minor
<b>Biodiversity</b>	Negligible to Major	Negligible to Major <sup>13</sup>
<b>Landscape and Visual Amenity</b>	Negligible to Major	Negligible to Minor

A set of Environmental Monitoring and Management Plan (EMMP) has also been developed for each environmental parameter, which will be updated and implemented during construction and operational phases, to ensure the effectiveness of the proposed mitigation measures. The EMMP is described in Section 14 of the EIS report.

<sup>11</sup> While residual noise impact significance remains Moderate for ecological receptors during demolition phase, the impact intensity after applying mitigation measures was expected to be reduced from 17 db(A) to 8 dB (A). To reduce noise further, it is suggested to replace hand held pneumatic breakers with less noisy options, e.g. hand held breaker used for road.

<sup>12</sup> While residual water impact significance has been reduced from Major to Moderate. The impact cannot be reduced further mainly due to the immediate presence of Stream 1 segment adjacent to the construction site, as well as if the Option A of Stream 3 is being selected.

<sup>13</sup> Major residual biodiversity impact significance is still expected due to the irreversible loss of vegetation and habitats during site clearance in construction phase.