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SPECIALIST CONSULTANCY SERVICES AT HDB DEVELOPMENT (NORTHERN) PROJECT 1

Environmental Management and Monitoring Plan for Earthworks



Submitted by:



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Consultancy Services at HDB Development (Northern) Project 1**

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ABBREVIATIONS

Abbreviation	Definition
AWP	Admiralty West Prison
BMP	Best Management Practices
CCA	Core Conservation Area
CCTV	Close-circuit Television
EMMP	Environmental Management and Monitoring Plan
EBS	Environmental Baseline Study
ECM	Earth Control Measure
ECMO	Earth Control Measure Officer
ECO	Environmental Control Officer
EIA/S	Environmental Impact Assessment/Study
EMMP	Environmental Management and Monitoring Plan
EPHA	Environmental Public Health Act
EPM	Environmental Protection and Management
FM	Frequency Modulated
GPS	Global Positioning System
HDB	Housing Development Board
ha	Hectares
ISA	International Society of Arboriculture
IUCN	International Union for the Conservation of Nature
km	kilometre
Leq	equivalent continuous noise level
LTA	Land Transport Authority
m	meter
mg/L	milligram per litre
mins	minutes
MRT	Mass Rapid Transit
NEA	National Environment Agency
NParks	National Parks Board
PAR	Photosynthetic Active Radiation
PM ₁₀	particulate matter with diameter ≤ 10 micrometres
PM _{2.5}	particulate matter with diameter ≤ 2.5 micrometres
PPE	Personal Protective Equipment
PUB	Public Utilities Board
QECP	Qualified Erosion Control Professional
s	seconds
SECR	Site Environmental Control Report
SING	Singapore Botanic Gardens' Herbarium
SO	Superintending Officer

TAC	TEMBUSU Asia Consulting Pte Ltd
TPZ	Tree Protection Zone
TSS	Total Suspended Solid
VCO	Vector Control Operator
VTA	Visual Tree Assessment

1 INTRODUCTION

1.1 Project Background

As reflected in the Master Plan since 2003, an indicative area of Woodlands North has been safeguarded for part residential and road use. Due to its close proximity to Admiralty Park, the Housing & Development Board (HDB) had appointed AECOM Singapore Pte Ltd (AECOM) in 2018 to carry out an Environmental Impact Study (EIS) to assess the potential impacts and recommend mitigating measures for the project development.

The area is slated for development as part of the expanded Woodlands Regional Centre, which was announced under HDB's Remaking Our Heartland programme in 2017. Poised to be transformed as a "Star Destination of the North", the expanded Woodlands Regional Centre will comprise of Woodlands Central and Woodlands North Coast. The residential area to be developed will be part of the expanded Woodlands Regional Centre, which was showcased by HDB in 2019. Leveraging on the area's natural terrain, the Woodlands North residential development shall offer a "Housing-in-the-Woods" experience, giving residents a panoramic view of the parks in the area and the Straits of Johor.

Almost half of the site boundary was occupied by the former Admiralty West Prison (AWP) and an interim road network that would be removed once Woodlands North Coast Road is completed. The rest of the area is largely composed of secondary vegetation, including a native-dominated freshwater swamp forest found near/at the southwestern corner of the proposed residential land that had been assessed to be of high ecological value.

Due to the ecological sensitivity of the site, environmental consultancy services are required to provide a baseline update and validate the identified impacts from HDB's Environmental Impact Study (EIS) report published in 2021. Additionally, the scope of services includes conducting a detailed hydrological study of existing waterbodies in the project site, developing an Environmental Management and Monitoring Plan (EMMP) specifications for each construction stage, as well as monitoring and reporting of mitigation measures in the project site. This EMMP would cover only the earthworks portion and there would be additional three EMMP documents, which cover subsequent phases of development that would be submitted for review in due course.

1.2 Summary of Environmental Study

An Environmental Study was conducted to provide an updated baseline assessment of the project site, identify the sensitive receptors, assess the potential impacts with reference to the 2021 published EIS report, recommend appropriate mitigation measures to reduce the residual impacts to acceptable levels during the earthworks and infrastructure works phase. The potential impacts on the following environmental aspects have been considered in this assessment:

- Biodiversity
- Noise

- Hydrology & Water Quality
- Ambient Air Quality
- Vibration
- Light
- Waste Management
- Vector Control

Overall, environmental impacts from this development project are expected from activities associated with vegetation clearance and earthworks during the construction phase, which may impact flora and fauna within and around the site, as well as the human receptors around the site. During the operational phase, main impacts are those associated with the increase in human presence as well as changes in the natural landscape of the site. These impacts are of negligible to major levels. With the diligent implementation of mitigation measures, these impacts can be reduced to mostly moderate levels and lower, with some unavoidable major impacts such as habitat clearance.

Biodiversity

Current baseline surveys supplemented previous field data from baseline surveys conducted in 2018 and 2019 (AECOM, 2021). Field survey methodologies including flora transects, visual fauna transects, camera trapping, netting and trapping of aquatic fauna, and acoustic bat recording.

The aim of the current biodiversity study was to update the previous biodiversity baseline established by AECOM in their field surveys conducted in 2018 and 2019 (AECOM, 2021). There is a slight reduction in size of the study area as shown in Figure 1.1. due to actual infrastructure and building development works and the remaining land being safeguarded as Park and waterbody as per URA Master Plan 2019.

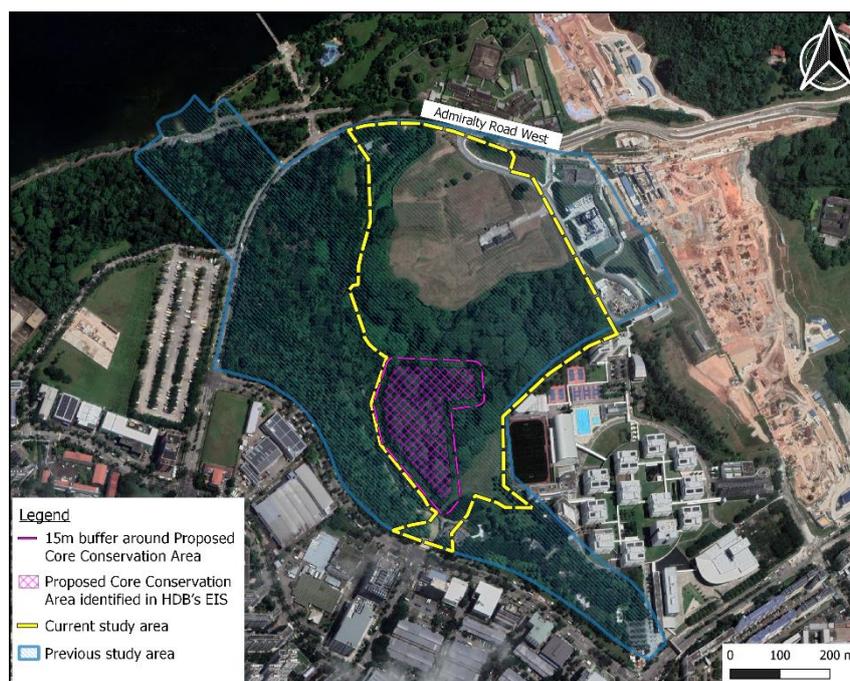


Figure 1.1. Map showing the previous and current study area

A total of 280 flora species were observed within the current study area. 58 species of conservation significance were found to be naturally occurring, however, several of the fauna species of conservation value found during the past baseline surveys are not within the current project area. The most prevalent forest habitat type consisted of abandoned-land forest, followed by scrubland habitat. The southwestern edge was occupied by a continuous patch of freshwater swamp forest followed by continuous patch of native-dominated secondary forest towards the east. Both habitats are included in the proposed Core Conservation Area (CCA) identified in HDB's EIS and contain nationally Critically Endangered and Endangered species. In the freshwater swamp forest, nationally Critically Endangered species such as *Macaranga recurvata*, *Rourea minor*, and nationally Endangered *Garcinia griffithii* were recorded. In native-dominated forest species such as Critically Endangered *Molineria capitulata* and *Psychotria cf. maingayi* were found.

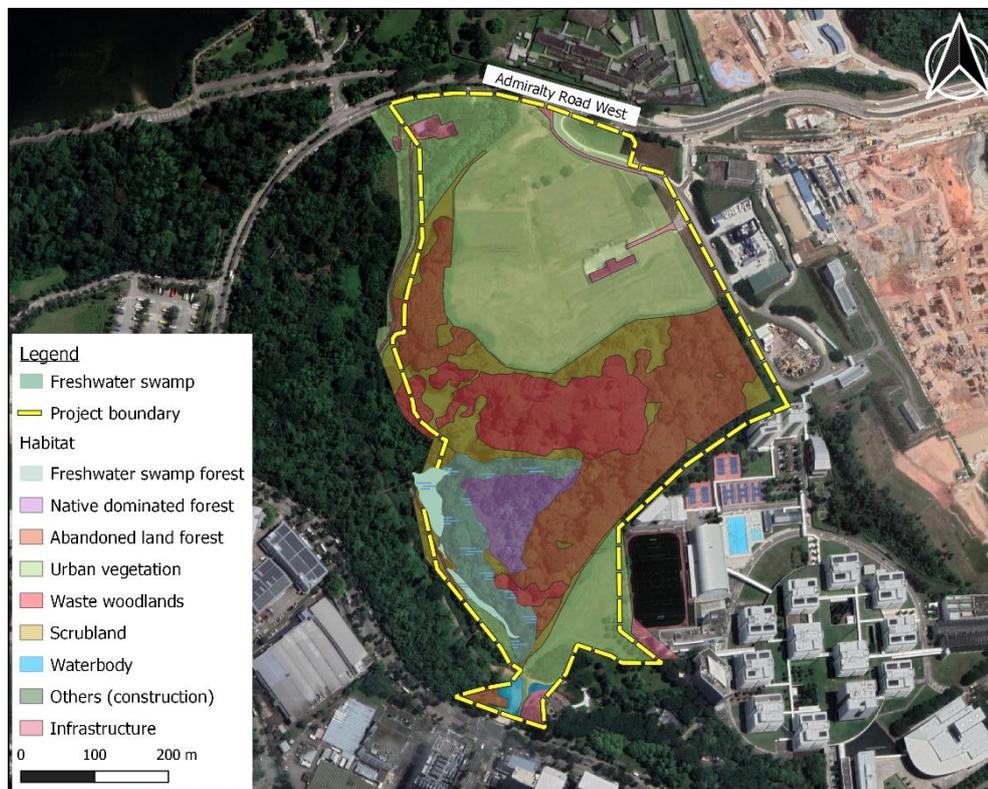


Figure 1.2. Map showing habitats and streams in the project site

Together with two other forest habitats (abandoned-land forest and waste woodlands), the area provides important habitats for rare and threatened animals, particularly nesting raptors and other birds. In terms of fauna, the main species of conservation value were birds, given lack of direct connectivity between this forested site and other forested sites around Singapore. Together, 126 fauna species (birds, mammals, reptiles, amphibians, butterflies, odonates, freshwater fish, and molluscs) were found within the project study area. There were several threatened species across taxonomic groups, including the changeable hawk-eagle (*Nisaetus cirrhatus*), the common birdwing butterfly (*Troides helena cerberus*) and the Singapore bent-toed gecko (*Cyrtodactylus majulah*). Several

species found, including the Singapore bent-toed gecko, depend on specific habitat requirements for their continued survival.

Through the retention of the proposed Core Conservation Area, many direct impacts to species and habitats of importance will be avoided. However, impacts from project activities are still likely to have impacts to biodiversity, including disturbance and mortality of species of conservation value, loss and degradation of sensitive habitats, loss of greenery, and potential human-wildlife conflict. With the implementation of appropriate mitigation measures, including the erection of hoarding around the site, salvaging of plants and translocation of fauna, and measures to avoid human-wildlife conflict, it is expected that any such impacts will be reduced to mostly minor levels and below.

Physical parameters

Figure 1.3 shows the monitoring points of the various physical parameters carried out during the baseline survey update.



Figure 1.3. Map showing all physical parameters monitoring points in the project site

Hydrology & Water Quality

The project site is located within the Sungei Cina Catchment. One main natural stream passes through the proposed CCA. The stream has been retained as it is within the Core Conservation Area. The main source of flow within the stream is from the runoff of

upstream urban area in the forest. By ensuring that the upcoming development does not affect the stream too much and with ensured sources of water flow, the impacts on the swamp are likely to be minimal. Though the diversion of catchment flow away from proposed CCA for future drainage plan shows no risk of flooding, it may otherwise also be important to ensure that minimal discharge flow during dry weather condition will be maintained. In the latest hydrological study completed in Nov 2022 as indicated in Figure 1.4, the proposed subcatchment, A1 of the drainage plan (0.4724 ha) that has been designed to discharge flow into CCA is sufficient to satisfy the minimum flow requirement of 3m³/day (as per HDB's EIS report recommendation) to ensure the survival of the freshwater swamp forest.

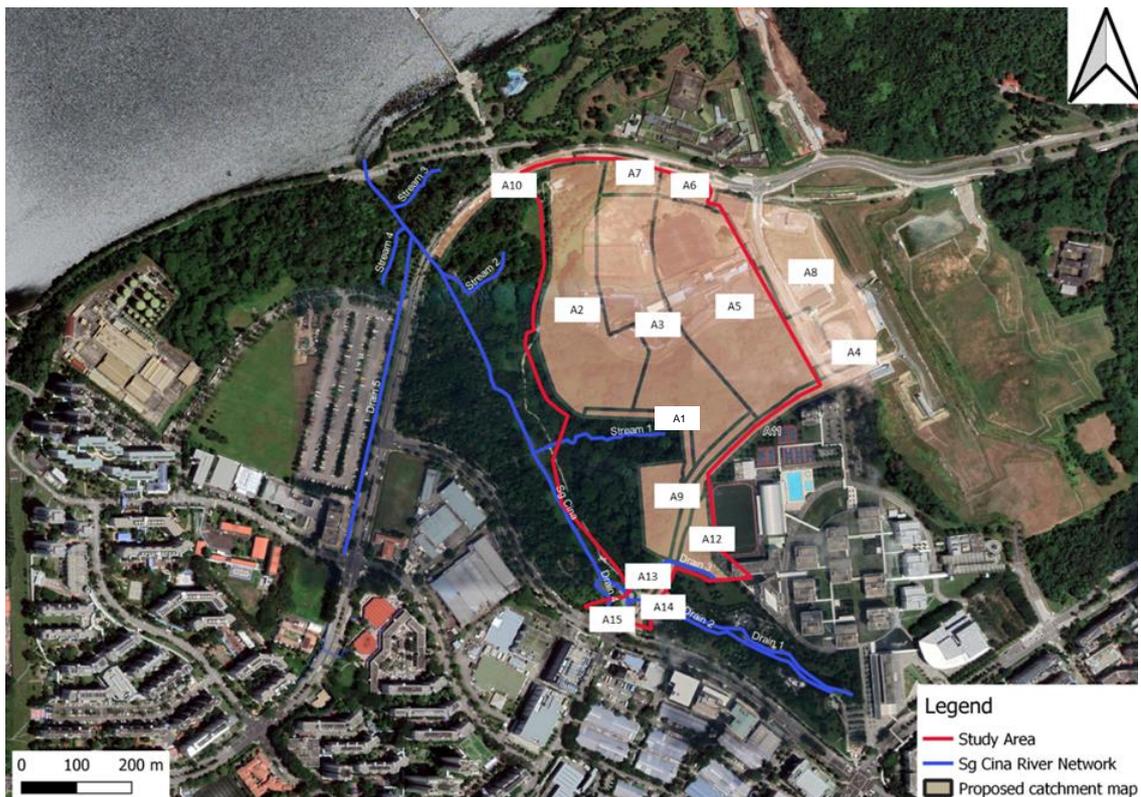


Figure 1.4 Catchment map for the HDB development

In general, the surface water quality of this stream complied with the applicable standards except for the Total Suspended Solids, Ammoniacal Nitrogen and Iron. Possible impacts from the construction phase of proposed project includes disturbance to local hydrological pattern due to the construction of the road near the freshwater swamp forest within project footprint, impact to water quality due to sediment runoff and trade effluent discharge. Recommended mitigation measures – such as properly implementing Earth Control Measures (ECMs) and managing trade effluent/sewage discharge – will help to reduce the impact of the project on water quality.

Noise

As the project site is vegetated, it is inhabited by various fauna species which may be sensitive to noise. There are sensitive human receptors (e.g. people working on the site, people at Republic Polytechnic Sports Complex and the people at Admiralty Park) situated within the project study area. A seven-day continuous (24x7) noise monitoring

was carried out at three locations (Figure 1.3), which established that baseline noise levels generally complied with Singapore's noise regulations. It is anticipated that the main noise sources during the construction phases will be associated with vehicle movements, high-impact stationary, and mobile equipment. The overall impact of noise on the sensitive receptors (e.g. people working on the site, people at Republic Polytechnic Sports Complex and the people at Admiralty Park) has been assessed as moderate and can be further reduced to minor and below if the recommended noise mitigation measures are implemented.

Ambient Air Quality

A seven-day continuous (24x7) air monitoring was carried out at three locations (Figure 1.3) to establish baseline air quality levels. The baseline air quality levels are within Singapore's air quality targets and project study area enjoys good air quality. There are sensitive human receptors within project study area. The air quality will potentially be affected by activities associated with earthworks, especially from an increase in airborne particulates and heavy-vehicle exhaust emissions. Mitigation measures are recommended to reduce the direct impact on local air quality to minor levels and below.

Vibration

Currently there are no major sources of vibration within project study area. Main vibration sources include mainly vehicular traffic along Admiralty Road. Baseline monitoring was carried out at three locations (Figure 1.3) to establish baseline vibration levels. There are sensitive receptors located adjacent to project study area, including animals in forested areas and humans in the nearby premises. The overall impact of vibration has been assessed as moderate and can be further reduced to minor through the recommended mitigation measures including the use of equipment or methods which generate lower vibration levels.

Light

Impacts of light pollution during the construction period may take place, but such impacts are expected to be minor. Additionally, there is moderate baseline light levels from the streetlights surrounding the project site. Nonetheless, mitigation measures such as the appropriate positioning of artificial lights during the construction are recommended to further reduce the impacts of light pollution.

Waste Management

It is anticipated that the main sources of waste during construction phase will be from cut vegetation, excavated material, general construction waste, personal waste and/or hazardous waste. During the operational phase of the project, waste generated is likely to be household waste. With the implementation of the mitigation measures proposed – such as implementing a waste management plan, reusing timber wastes for wood industry, properly disposing the waste through licensed collectors, including animal-proof binds, and educational measures – any negative impact is expected to be reduced to an acceptable level.

Vector Control

The primary impact of the construction phase of the project is potential increase in the immediate vector population. Secondary to this, an increase in the number of vectors

has the potential to increase the likelihood of vector-borne diseases affecting humans. Key mitigation measures include source reduction and effective drainage through implementation of vector control plan. With its implementation, it is expected that these impacts can be reduced to an insignificant level. Considering the sensitive nature of the forested area, fogging is not recommended to be carried out as part of vector control measures.

Table 1.1. Summary of key mitigation measures to be implemented

Environmental aspect	Key mitigation measures
Biodiversity	<ul style="list-style-type: none"> • Erect hoarding and noise barriers around the work site • Restricted work timings • Establish Tree Protection Zones • Plant Salvaging and planting of native species • Pre-felling fauna inspections • As far as practicable, avoid commencement of tree felling during peak bird breeding period (March to July) • Directional clearance towards the core conservation area • Implement additional measures within the retained stream area <ul style="list-style-type: none"> • Avoid placement of boreholes near native, mature trees • Salvage or retain all conservation significant flora where possible • No construction works at night • Monitor tree and vegetation health during the construction phase • Daily checks of Earth Control Measures (ECM) blankets and pits by ECO • ECM blankets to be made of wildlife-friendly, biodegradable material • Environmental training sessions for workers • Identify plants of high conservation significance for transplantation • Replanting of new planting verges with native plant species • Implementation of wildlife-safe designs • Enhance planted areas around core conservation area
Hydrology and Surface Water Quality	<ul style="list-style-type: none"> • Ensure no site investigation boreholes are located within 10m of the stream within proposed CCA identified in HDB's EIS report for Woodlands North • Implement PUB-approved ECM Plan including: <ul style="list-style-type: none"> • Secondary containment for slurry storage tanks • Storage tanks for slurry • Controlled site discharges • Open sump • Minimum dry weather flow of 3m³/day to be maintained in the stream within proposed CCA identified in HDB's EIA report for Woodlands North • Regular water quality and flow monitoring • Concrete wash bays to be located away from waterbodies • Emergency spill kits to be present to handle any chemical spillage • Trade effluent management • Oil & fuel spillage and waste disposal
Noise	<ul style="list-style-type: none"> • Restricted work timings • Use of quieter construction equipment • Construction personnel to be trained in noise-reduction behaviours • Install 6m high noise barriers (STC 20) around the work site • Acoustic enclosures to reduce noise at the following locations <ul style="list-style-type: none"> • Around drilling rigs for SI works • For equipment such as compressors • Continuous noise monitoring throughout construction duration
Ambient Air Quality	<ul style="list-style-type: none"> • Implement the dust suppression plan • Regular watering to reduce dust emissions from exposed site surfaces • Regular maintenance of construction vehicles and fuel-burning equipment • Provision of additional dust screen near sensitive receptors if required • Stockpiles to be located away from sensitive receptors • Stockpiles to be covered with impervious sheeting or dampened with water
Ground-borne Vibration	<ul style="list-style-type: none"> • Use of low-vibration equipment where possible

Environmental aspect	Key mitigation measures
	<ul style="list-style-type: none"> • Switch off machinery when not in use • Keep haul roads in good condition for smooth travelling surface • Route heavily loaded trucks away from sensitive receptors where possible • Vibrating equipment to be placed on isolators • Control speed of vehicles at worksite • Advanced notification to nearby sensitive receptors about work activities
Light	<ul style="list-style-type: none"> • No night works allowed • Turn off all unnecessary lights outside working hours • Implement an NParks-approved Lighting Management Plan • Minimum number/ intensity of lights needed for safety and security • Any temporary lighting for nighttime should be fully shielded, facing downwards, and directed away from forested areas
Waste Management	<ul style="list-style-type: none"> • Implementation of waste management plan • Compliance to all waste related regulations • No illegal dumping of waste into forested areas • Recovery of scrap metals for recycling • Reuse surplus excavated material within project site as much as possible • Disposal of inert general waste by an NEA-licensed general waste collector
Vector Control	<ul style="list-style-type: none"> • Implementation of vector management plan • Food to be stored in rodent-proof rooms/cabinets • Compliance to all vector control related regulations • Vector control team to carry out regular checks of work areas

Table 1.2. Summary of residual impacts

Environmental aspect	Impacts before mitigation	Impacts after mitigation
Biodiversity	Major to Minor	Minor
Hydrology and Surface Water Quality	Major to Minor	Minor
Noise	Moderate	Minor
Ambient Air Quality	Moderate to Minor	Minor to Negligible
Ground-borne Vibration	Moderate	Minor
Light	Moderate	Minor
Waste Management	Moderate to Negligible	Negligible
Vector Control	Minor	Negligible

Environmental Management and Monitoring Plan

An Environmental Management and Monitoring Plan (EMMP) has been proposed to manage the identified environmental impacts during construction phase. It also includes environmental monitoring requirements comprising of on-site visual compliance monitoring and physical monitoring. These will help to verify the effective implementation of mitigation measures during construction stage. This EMMP takes the recommendations set out in the EIA report and as the general framework, and provides further details based on updated project activities.

1.3 Objective of the EMMP

The Environmental Management and Monitoring Plan (EMMP) is a systematic approach to mitigate environmental impacts and monitor the implementation of these mitigation

measures to ensure that project implementation will not cause any significant adverse impact to the site and the surrounding environment. It is also a useful tool to assess whether the mitigation measures taken are effective to reduce or mitigate the potential impacts caused by this project to minimal and acceptable levels during the construction.

1.4 General Scope of the EMMP

Before the construction works start, the appointed Consultant must establish a detailed EMMP presented in this document, which is to be implemented and monitored by the Contractors during the earthwork construction phase. The EMMP shall be submitted and approved by relevant authorities prior to the start of any construction activities. The EMMP shall also cover all site investigation works (e.g., soil investigation, trial trenching, etc), and constructions works including temporary works.

The EMMP is to include the identified mitigation measures of this EIA and shall address the methodologies of the construction works prior to their commencement. Additionally, Fauna and Flora Management Plans recommended in this chapter need to be incorporated in EMMP with involvement of biodiversity specialists finetune and implement ecological mitigation measures recommended in this report. The EMMP should also include waste management practices including restricting use & spillage of chemicals during construction phase into surrounding forested area.

The EMMP shall include environmental monitoring, which will be conducted by the Contractor. It comprises of compliance inspections for prescribed mitigation measures and ambient environmental data collection, generally requiring sample collection and analysis. The environmental monitoring activities should also ensure that the project does not cause any significant long-term environmental impacts, in particular cumulative impacts, and that the existing environmental conditions and biodiversity is maintained.

Monthly environmental monitoring reports with all monitoring results (compliance and ambient monitoring), identified problems and additional actions taken to mitigate these problems should be prepared and submitted to the relevant authorities during the construction phase. Each subsequent monthly monitoring reports should report on successful or failed follow-up actions until a problem has been effectively mitigated.

1.5 Document Structure

The EMMP is structured as follows:

- Chapter 1 introduces the purpose and general scope of EMMP.
- Chapter 2 provides the project background and site utilisation plan.
- Chapter 3 outlines applicable legislation, regulations, and guidelines to EMMP.
- Chapter 4 provides the EMMP management framework.
- Chapter 5 outlines Biodiversity Management Plan, covering Wildlife Management Plan and Wildlife Rescue Protocol.
- Chapter 6 presents Environmental Management Plans for various environmental aspects.
- Chapter 7 discusses Environmental Monitoring Plan
- Chapter 8 presents the EMMP reporting requirements.

2 PROJECT OVERVIEW

2.1 Project Location

The project site is located at the North of Singapore, near Admiralty Park and Republic Polytechnic. It is bounded by Admiralty Road West to the north, Admiralty Park and Riverside Road to the west, Republic Polytechnic to the South and the Woodlands North Mass Rapid Transit (MRT) station to the east (see Figure 2.1). Approximately half the area is occupied by the former Admiralty West Prison, with the remaining land comprising largely of secondary vegetation.

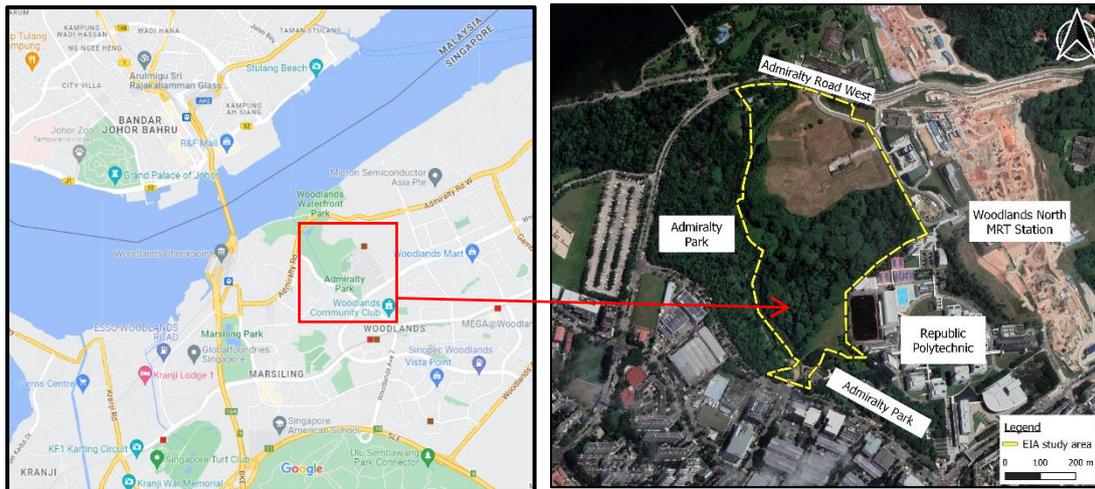


Figure 2.1. Project location plan

2.2 Project Scope and Implementation Schedule

Due to the vegetated state and undulating terrain of the project site, the proposed developments would entail civil engineering works such as site clearance (removal of existing trees and vegetation), earthworks cutting/filling within site to achieve desirable platform levels required for the proposed development; construction of roads, drains, sewer works, building works, utilities/services laying and other related works. This document shall specify and guide the development of the EMMP for the earthworks phase only.

The entire development will be carried out in the following six phases, with phase 4,5 and 6 running concurrently. All activities are expected to be completed within 84 months from the project's date of commencement. The implementation schedule is provided in Table 2.1.

Table 2.1. Implementation schedule of entire project

Stage	Description of Works
I	Updating EIS
II	EMMP
III	Coordination with the Earthworks contractor

Stage	Description of Works
IV	Coordination with the Roadworks contractor
V	Coordination with the Sewer contractor
VI	Coordination with the Building contractor

2.3 Site Layout

The project site boundary for the earthwork phase is shown in Figure 2.2 and described below. **Appendix A** provides the overall site layout of the EMMP project area.

Earthworks and Civil Works

All earthwork activities are expected to be completed within 30 months from the project's date of commencement.

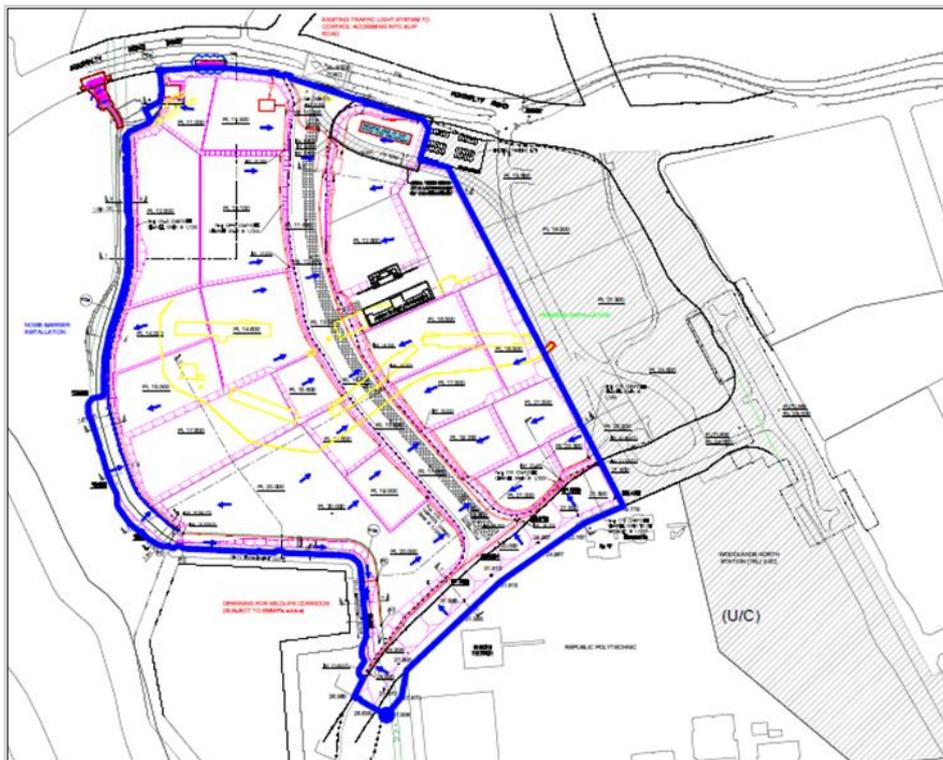


Figure 2.2. Earthworks project boundary

2.4 Construction Activities Associated with Proposed Project

Following construction activities are expected to take place during execution of the proposed project:

- Site clearing, earthworks, and general construction activities (e.g., soil mixing clearing and preparation, trench excavation, backfill, compaction, spoil handling and transport.)

- Stockpiling and materials handling (delivery, unloading, and use of construction aggregates etc.)
- Vehicle movements and emissions as a result of equipment, materials and personnel movement in and out of construction work areas
- Use of high impact stationary and mobile equipment such as pavement breakers, excavators, dozers, etc. leading to variable and sporadic noise levels, typically repeating over time
- Equipment/ plant maintenance and refuelling activities potentially leading to hazardous waste and accidental leaks or spills
- Workforce activities leading to generation of general waste
- Storage and disposal of solid and liquid waste

2.5 Site Utilisation Plan

An indicative site utilisation plan for the project worksite is presented below in Figure 2.3. Appendix B provides the site utilisation plan of the project area.

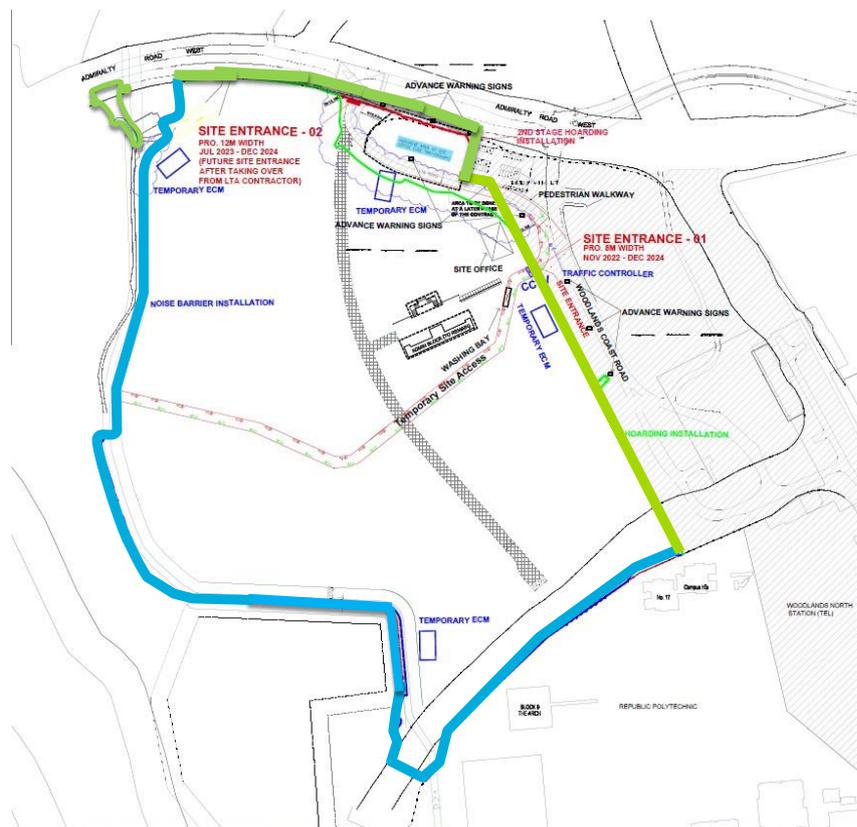


Figure 2.3. Site utilisation plan

The components of site utilisation plan are described as follows:

- Boundary Hoarding – A hoarding (indicated in green) is to be installed along the project boundary line to demarcate the project worksite and to control the access. The hoarding along the roadside can be 2.0m.
- Noise Barrier – A 6m high noise barrier (indicated in blue) is to be installed along

the project boundary line facing the Core Conservation Area, Admiralty Park, Republic Polytechnic and hostels within Republic Polytechnic.

- Temporary site Access Road – To make use of the existing access road be along the central east to west direction of the site.
- 10m width access road – To be constructed as the main North-South access road.
- Washing Bay – To be set up near the main entrance.
- Site office – To be built near to the main entrance.
- Temporary ECM Pond – 1 within each clearing zone, total of 4 numbers to be constructed. Figure 2.3 shows the respective ECM pond numbers.

2.6 Site clearance construction sequence

Construction Sequence-01

- Set up Temporary Access Road at the Centre of project site.
- Hoarding Installation (green line) along the Woodlands North Coast Road.
- Noise Barrier (light blue line) erection along the boundary line, toward Admiralty Park & Polytechnic side.
- ECM Pond construction at Zone 1-1 for Tree Felling & Site Clearance.



Figure 2.4. Construction sequence 1

Construction Sequence-02

- Tree-felling at Zone 1-1.
- Surface water controlling during the Site Clearance & tree-Felling will be controlled by ECM Pond & Earth-Drain.
- ECM Pond construction at Zone 1-2 for construction of the 10m width access & backfill.

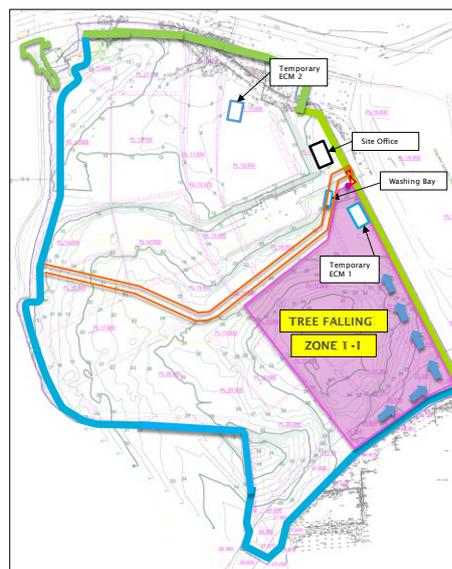


Figure 2.5. Construction sequence 2

Construction Sequence-03

- Excavation at Zone 1-1 to platform level from highest point to lowest point will be disposed and using for the backfill for Zone 1-2.
- Construct 10m width access road & C8 drain.
- Surface water will be controlled by the earth drain & permanent drain.
- ECM Pond construction at Zone 2-1 & 2-2 to control the water for tree felling & site clearance.

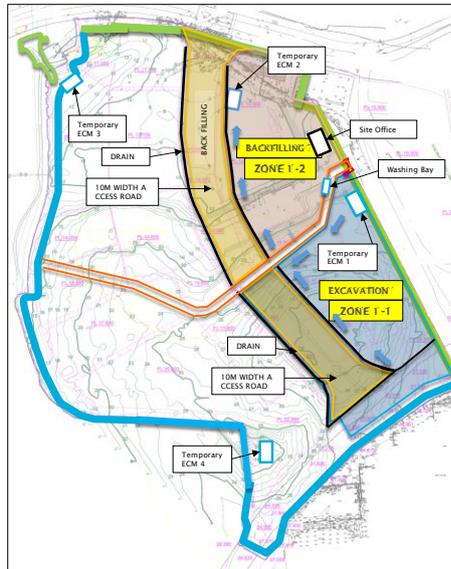


Figure 2.6. Construction sequence 3

Construction Sequence-04

- Turfing on the platform level at Zone 1
- Tree felling & Site clearance at Zone 2
- Surface water control during the site clearance & tree felling by ECM pond & Earth drain.

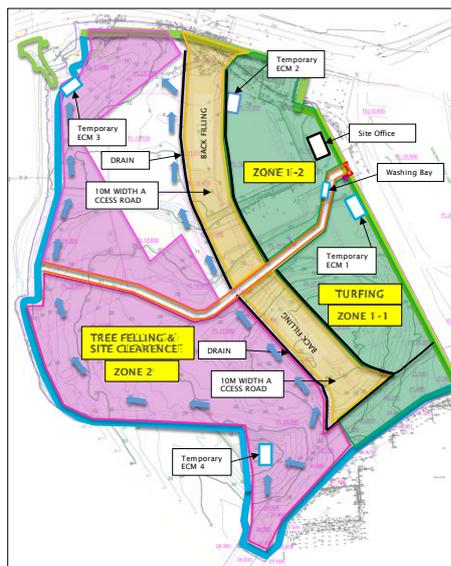


Figure 2.7. Construction sequence 4

Construction Sequence-05

- Excavation at Zone 2-1 to platform level from highest point to lowest point, excavated soil will be disposed and will be used for the backfill in Zone 2-2.
- Backfill at Zone 2-2 platform level using excavated soil.
- Surface water will be controlled by Permanent drain & Earth drain.

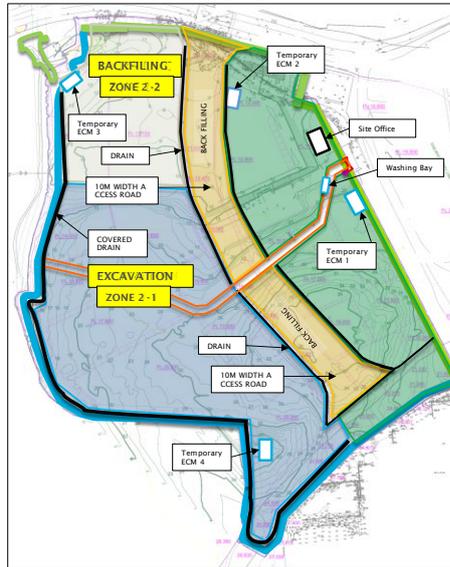


Figure 2.8. Construction sequence 5

Construction Sequence-06

- After completion of Excavation & Backfill in Zone 2, Turfing works will be commenced to reinstate the land.
- Turfing will be done for the whole Zone 2 area as a final stage.



Figure 2.9. Construction sequence 6

3 APPLICABLE LEGISLATIONS AND GUIDELINES

The table below lists relevant legislations, regulations, and guidelines which govern the various environmental parameters within Singapore, which are to be complied during the implementation of EMMP.

Table 3.1. List of applicable Singapore legislations, regulations, and guidelines

Parameter	Legislation, Regulations and Guidelines
General	<ul style="list-style-type: none"> • Environmental Protection and Management Act, 2002 • Environmental Public Health Act, rev. 2002 • Singapore Code of Practice on Pollution Control (SS593: 2013)
Biodiversity	<ul style="list-style-type: none"> • The Wildlife Act 2020 • The Parks and Trees Act 2006 • The Parks & Trees Regulations 2006 • The Parks & Trees Preservation Order 1998 • Parks & Trees (Composition of Offences Regulations) 2006 • Parks & Trees (Planning Areas) Notifications 2006 • Parks & Trees (Heritage Road Green Buffers) Order 2006 • Singapore Red Data Book, Second Edition, 2008 • Singapore Red Data Book, Third Edition (online), 2021 • IUCN Red List of Threatened Species to assess species vulnerability (2021) • CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) 1983 • NParks Biodiversity Impact Assessment (BIA) Guidelines (2021)
Noise	<ul style="list-style-type: none"> • Environmental Protection and Management Act 2002, Part VIII Noise Control • Environmental Protection and Management (Control of Noise at Construction Sites) Regulations 2008 • Environmental Protection and Management (Boundary Noise Limits for Factory Premises) Regulations 2008 • NEA Code of Practice on Pollution Control SS 593 (2013) • Code of Practice for Noise Control on Construction and Demolition Sites SS602 (2014)
Surface Water Quality	<ul style="list-style-type: none"> • Sewerage and Drainage Act 2001 • Sewerage and Drainage (Surface Water Drainage) Regulations 2007 • Sewerage and Drainage (Trade Effluent) Regulations revised 2007 • Environmental Protection and Management Act 2002, Part V on water pollution • Environmental Protection and Management Act (Trade Effluent) Regulations 2008 • PUB Code of Practice on Surface Water Drainage (2018) • PUB Handbook on Managing Urban Runoff (2013) • NEA Code of Practice on Pollution Control SS 593 (2013) • PUB Guidebook on Erosion and Sediment Control at Construction Sites (2018)
Ambient Air Quality	<ul style="list-style-type: none"> • Environmental Protection and Management Act 2002, Part IV on Air Pollution Control • Environmental Protection and Management (Vehicle Emissions) Regulations 2008

Parameter	Legislation, Regulations and Guidelines
	<ul style="list-style-type: none"> • Environmental Protection and Management (Prohibition on Use of Open Fires) Order 2008 • Environmental Protection and Management (Air Impurities) Regulations 2008 • NEA Singapore Ambient Air Quality Targets (2011) • NEA Code of Practice on Pollution Control SS 593 (2013)
Waste Management	<ul style="list-style-type: none"> • Environmental Protection and Management Act 2002, Part VII on Hazardous Substances • Environmental Protection and Management (Hazardous Substances) Regulations 2008 • Environmental Public Health (General Waste Collection) Regulations 2000 • Environmental Public Health (Toxic Industrial Waste) Regulations 2000 • NEA Code of Practice on Pollution Control SS 593 (2013)
Vector Control	<ul style="list-style-type: none"> • NEA guidelines on "Rainwater Collection System and Mosquito Prevention" • Control of Vectors and Pesticides Act 2002 • Environmental Public Health Act (EPHA) 2002

4 ENVIRONMENTAL MANAGEMENT & MONITORING PLAN FRAMEWORK

4.1 Objectives

The objectives of this EMMP are to:

- Ensure compliance with legislation and guidelines.
- Verify environmental performance through information on impacts as they occur.
- Provide feedback for continual improvement in environmental performance.
- Monitor actual impacts of the Project activities on sensitive receptors so that impacts not anticipated in the EIA or long-term impacts which exceed the levels anticipated in the EIA can be identified and appropriate mitigation measures can be adopted in time.

4.2 Organization Chart and Roles & Responsibilities

The EMMP organization chart is as shown in Figure 4.1.

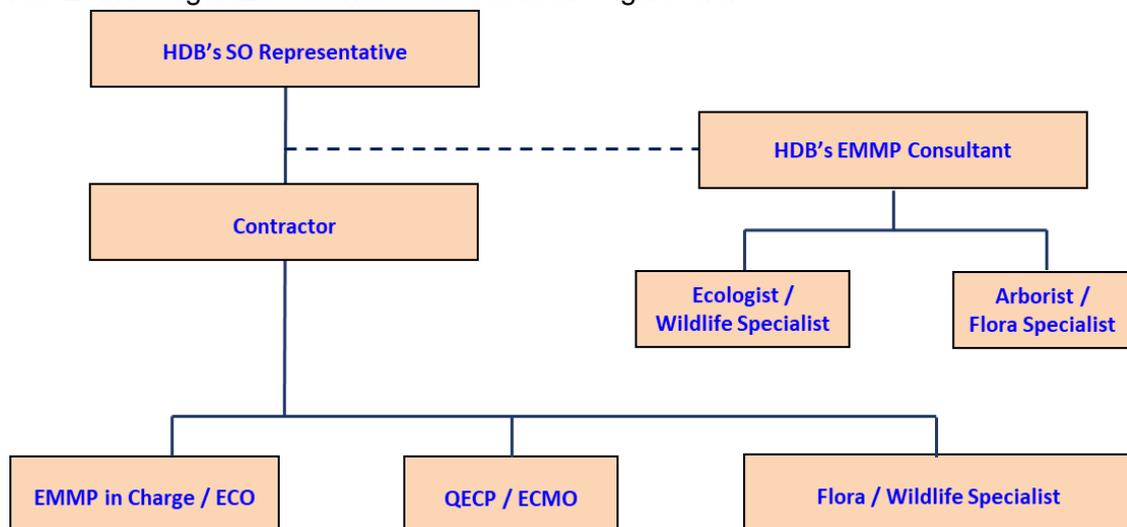


Figure 4.1. EMMP Organization Chart

The roles and responsibilities of key stakeholders are as follows.

4.2.1 HDB's Superintending Officer's (SO) Team

- **HDB's SO Representative**
 - To be the point of contact for HDB.
 - To oversee implementation of an EMMP for the duration of the construction phase.
 - To liaise with HDB in mobilising necessary resources to fulfil EMMP requirements as and when required.
 - To liaise with authorities for EMMP consultation as and when required.

4.2.2 Contractor's Team

- **Contractor's Project Manager**

- To implement a EMMP for the duration of earthwork construction phase.
 - To ensure all necessary EMMP measures are adhered to.
 - To ensure daily compliance checks on all environmental aspects as per EMMP requirements are met.
 - To assume ownership of construction activities, including compliance with relevant legislation, guidelines and best practice.
 - To liaise with authorities for EMMP consultation as and when required.
- ***Contractor's EMMP In-charge / Environmental Control Officer***
 - To be the point of contact for the Contractor
 - To act as EMMP in-charge and lead the implementation and reporting requirements of EMMP during construction phase.
 - To conduct all necessary EMMP monitoring and fulfil reporting requirement.
 - Responsible for managing all environmental issues arising from the construction work which includes the monitoring and ensuring the implementation and management of change of the EMMP, the environmental performance of the project, investigation of incidents, inspections of site and implementing corrective/ preventive measures.
 - To carry out daily compliance checks on all environmental aspects as per EMMP requirements.
 - To conduct daily toolbox meetings with construction workers including sub-contractors.
 - To prepare monthly Site Environmental Performance Reports.
 - To coordinate with EMMP Consultant Team/ EMMP team members for advice on specific issues related to EMMP implementation.
 - To monitor ECM performance and coordinate with QECP on specific issues.
- ***Contractor's Arborist***
 - To implement environmental mitigation measures for flora aspect as per EMMP.
 - To set up Tree Protection Zones (TPZ) for trees to be retained within the site.
 - To conduct fortnightly site visits for flora monitoring to monitor the trees retained within the project site.
 - To monitor all clearance and tree felling activities as and when applicable.
 - To provide monthly reports to the EMMP Consultant Team.
 - To implement recommendations pertaining to tree protection from the EMMP Consultant's arborist.
 - To assist in reporting requirements of EMMP during construction phase.
 - To liaise with NParks on addressing any comments/ requirements related to flora implementation measures.
- ***Contractor's Animal Management Specialist***
 - To manage any ad-hoc wildlife encounters during construction phase.
 - To liaise with NParks on appropriate areas for translocation of wildlife within the project site.
- ***Contractor's Qualified Erosion Control Professional (QECP)***

- Responsible to prepare, submit and obtain approval for the ECM Plan from PUB prior to contractors start work.
 - To ensure that the contractors implement the ECM in compliance with the ECM Plan.
 - Periodic monitoring of the performance of the ECM Plan.
- **Contractor's Earth Control Measures Officer (ECMO)**
 - The ECMO is responsible to implement all ECM requirements in compliance with the ECM Plan approved by PUB.

4.2.3 HDB's EMMP Consultant's Team

- **EMMP Consultant**
 - To prepare the EMMP document in consultation with Contractor during pre-construction phase.
 - To assist in obtaining authority approval for EMMP.
 - During construction phase, review the physical monitoring results (Air, Water, Noise) provided by the Client as per approved EMMP.
 - Conduct one site visit per fortnight during construction phase to monitor the implementation of mitigation measures for biodiversity.
 - Prepare a monthly monitoring report upon receiving all the data, which includes highlighting and advising on any potential issues regarding the EMMP implementation.
 - Conduct ad-hoc site visits by ecologist when necessary to advise Client on response protocol in the case of fauna mortality, trapped animals, or human-wildlife conflict.
 - To conduct one training covering EMMP requirements as well as Biodiversity & Environmental Awareness prior to the commencement of activities on site
 - To conduct refresher training on Biodiversity & Environmental Awareness briefing to site personnel once every 6 months.
- **Consultant's Arborist / Flora Specialist**
 - To prepare project site specific flora management plan as part of EMMP, utilizing the EMMP framework recommended in the EIA and assist contractor in obtaining authority approval.
 - To provide guidance and supervision, to ensure that all the works related to trees are conducted in a safe and professional manner.
 - To visit the site monthly to oversee the implementation of flora management plan.
 - To review the flora that will be affected, and to provide monitoring and advice to the contractor on matter related to transplantation and reinstatement.
 - To assist in selecting a nursery, carrying out salvaging of native plants, and maintaining the salvaged saplings.
 - To advise and implement specific measures in the case of tree pruning prior clearance, tree injury, and construction activities affecting tree roots.
 - To provide checks that Tree Protection Zone (TPZ) is not being encroached.
 - To monitor the health of trees located directly outside the project boundary.

- To assist in reporting requirements of EMMP during construction phase.
 - To liaise with NParks on addressing any comments/ requirements related to flora implementation measures.
- **Consultant's Ecologist / Wildlife Specialist**
 - To prepare project site specific fauna management plan as part of EMMP and assist contractor in obtaining authority approval.
 - To conduct a pre-clearance wildlife inspection and prepare Wildlife management protocols as necessary during site clearance stage.
 - To provide advice and inspection related to wildlife throughout the construction duration and to identify, rescue & manage any trapped and/or injured wildlife at project site.
 - To visit the site fortnightly to oversee the implementation of fauna management plan and to provide biodiversity awareness training to site personnel.
 - To train and guide the contractor regarding wildlife management.
 - To determine if fauna habitats have been degraded beyond authorised working area and to recommend contingency plans if mitigating measures are ineffective.
 - To assist in reporting requirements of EMMP during construction phase.
 - To liaise with NParks on addressing any comments/ requirements related to wildlife implementation measures.

4.3 Training and Awareness

To ensure effective implementation of mitigation and monitoring measures, all relevant construction personnel (i.e., Project Manager, Construction Manager, EMMP In-charge / ECO, Site Supervisor, Foreman, Construction Worker Team Leader, etc.) will be made aware of the EMMP requirements prior to commencement of on-site work. The Contractor shall ensure that trainings are conducted before starting the construction work and at a regular interval during construction phase for the site personnel. The recommended training program is provided in Table 4.1.

Table 4.1 Training Programme for Site Personnel.

Training Schedule	Training Topics	Conducted By	Target Audience	Frequency
Prior to commencement of activities on site	EMMP Requirements Biodiversity & Environmental Awareness	EMMP Consultant	Environmental Manager/ ECO/ Project Manager / Construction Manager/ Construction Engineers/ Site Supervisors/ Sub-contractors	Once
Refresher training	Biodiversity & Environmental Awareness Briefing	Consultant's EMMP In-charge/ ECO	Site Personnel including Sub-contractors	Every six months during construction phase
Toolbox	Briefing to include	Contractor's	Construction Workers	Daily

meetings	reminders on wildlife encounters and environmental protection	EMMP In-charge/ ECO	including Sub-contractors	
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Every training session shall be documented and reported as part of best practices.

4.4 Environmental Incidence Protocol

4.4.1 Response Procedure

The monthly environmental monitoring may result in observations of failed or inadequate mitigation measures. Also, a public complaint/observation may be received. In the event that a failure is discovered, that failure must be reported to the EMMP In-charge / Contractor's Project Manager within shortest possible time.

The EMMP In-charge / Project Manager will then be responsible for ensuring adequate follow-up activities. This may include:

- Consultation with the EMMP Consultant Team / QECP / VCO / PRO.
- Arranging an immediate appropriate response on guidance of the EMMP Consultant Team / QECP / VCO as necessary.
- Reporting and consultation with the relevant authorities (e.g., NEA, NParks, PUB, etc) if required.

In the event of violation of relevant standards/regulations/complaints, the environmental management practices at site are to be reviewed immediately with appropriate mitigation actions taken immediately to reduce impacts to acceptable levels.

4.4.2 Incidence Reporting Flowchart

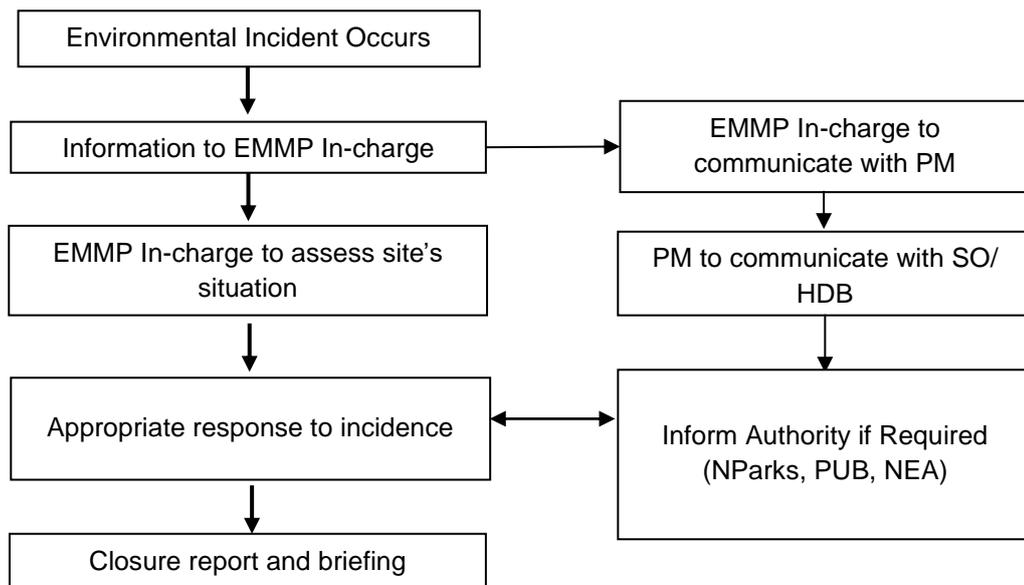


Figure 4.2. Environmental incidence reporting flowchart

Contractor's organisation chart

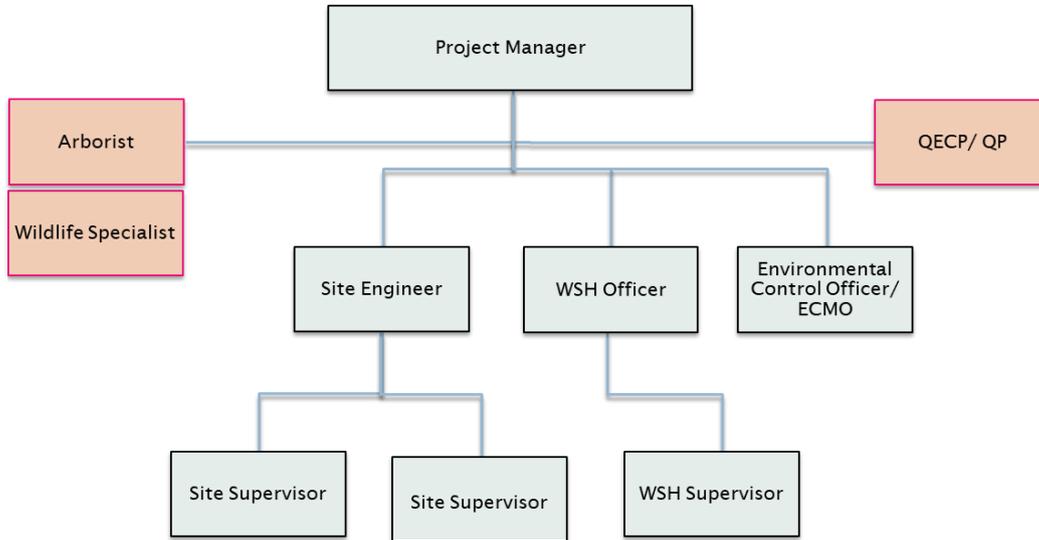


Figure 4.3. Contractor's organisation chart

Communication Details

Authorities/ Relevant Contacts	Contact Number
NParks Animal Response Center	1800 476 1600
ACRES Wildlife Rescue	9783 7782
PUB	1800 2255 782
NEA	6225 5632

5 MANAGEMENT PLANS FOR BIODIVERSITY

5.1 Wildlife Management Plan

Given the location of the site includes a proposed core conservation area within, it is necessary to minimise impacts to fauna species on the site. The development of a proper Wildlife Response and Rescue Plan will help to reduce impacts to fauna, while also reducing the risk of human-wildlife conflict, which may pose a human health and safety issue if not managed.

Wildlife management should commence prior to construction works. This is to ensure that animals within the site are safely moved outside the working boundaries, either by passive shepherding or capture-and-release. A Wildlife Response and Rescue Plan should then be put in place for the duration of the construction period for animals that may get trapped or injured within the construction site. Regular inspections should be conducted throughout the construction phase to ensure no fauna is trapped or injured at the worksite.

All construction personnel are to be sufficiently trained on biodiversity issues on the site and how to respond to sightings of fauna.

5.1.1 *Applicable Legislations*

- The Wildlife Act 2020
- The Animals and Birds Act 2002
- Fisheries Act 2002
- Endangered Species (Import and Export) Act 2017
- The Parks and Trees Act 2006
- The Parks & Trees Regulations 2006
- The Parks & Trees Preservation Order 1998
- Parks & Trees (Composition of Offences Regulations) 2006
- Parks & Trees (Planning Areas) Notifications 2006
- Parks & Trees (Heritage Road Green Buffers) Order 2006
- Singapore Red Data Book, Second Edition, 2008
- IUCN Red List of Threatened Species to assess species vulnerability 2021
- CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention) 1983

5.1.2 *Recommended Mitigation Measures*

- No night works (i.e., limit construction activities to 8am – 6pm), except in the case of work exigencies and planned night works
- Ensure project layout avoids targeted sensitive receptors and habitats, including the stream within proposed CCA identified in HDB's EIS report for Woodlands North
- Identify plants of high conservation significance to be transplanted
- Establish Tree Protection Zones (TPZ) for trees to be retained
- Hoard up entire work site. Permanent hoarding is to be embedded along the

perimeter of the working boundaries.

- As far as practicable, avoid the commencement of tree felling during the peak bird breeding period (February to July)
- Visually inspect trees and holes for nesting birds and species of conservation value prior to felling
- Replant new planting verges with native plant species
- Conduct phased /directional clearance of towards core conservation area as well as fauna translocation where required
- Conduct monthly diurnal and nocturnal fauna monitoring transect surveys to take note of changes in fauna diversity till the completion of earthwork.
- Conduct daily checks of ECM blankets and pits to rescue any entrapped fauna
- Implement proper ECMs to prevent impact to adjacent habitats
- Utilise inert construction material
- Ensure equipment, vehicles, and footwear are clean prior to commencing works
- Establish designated areas for food and waste disposal
- During the construction phase, conduct information sessions for workers on what to do upon encountering wildlife
- Conduct regular monitoring of trees and vegetation health during construction phase within project site.

5.1.3 Monitoring Requirements

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
Biodiversity Monitoring <ul style="list-style-type: none"> • Avoiding clearance of vegetation outside working boundaries • Minimisation of disturbance to sensitive species • Minimisation of disturbance to sensitive habitats • Avoiding human wildlife conflict 	On-site Visual and Compliance Monitoring								
	Habitat Loss and Degradation	<ul style="list-style-type: none"> • Hoarding to be erected prior to vegetation clearance to demarcate working boundaries • Retain vegetation within Core Conservation Area 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check • Water quality monitoring 	Entire project site (near / within forested area)	<ul style="list-style-type: none"> • Proper installation of temporary hoarding/ barriers • Absence of vegetation clearance outside working boundaries 	• Fortnightly during construction phase	• Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor/ EMMP In-charge • Ecologist • Arborist 	HDB/ Superintending Officer (SO)
	Species Mortality	<ul style="list-style-type: none"> • Properly designated Tree Protection Zones (TPZ) prior to construction • Visual inspection of trees and holes for nesting birds prior to felling • Directional clearance of vegetation • Translocation of identified plant species • Translocation of targeted animal species • Daily checks of ECM nets for entrapped 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site (near / within forested area)	<ul style="list-style-type: none"> • Proper TPZ installation • Retention of tree health • Absence of mechanical damage on trees • Absence of nesting birds • Absence of large mammal species • Absence of entrapped fauna 	<ul style="list-style-type: none"> • Monthly during construction phase (for TPZ inspection) • Prior to vegetation clearance (for wildlife translocation and fauna inspection) • Daily for fauna entrapment 	• Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor/ EMMP In-charge • Ecologist • Arborist 	HDB/ SO

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
		fauna							
	Human-wildlife Conflict	<ul style="list-style-type: none"> Briefing to on-site workers on dos and don'ts, as well as notes on safety. Areas are to be demarcated for food consumption and storage 	<ul style="list-style-type: none"> Visual monitoring Compliance check 	Entire project site (near forested area)	<ul style="list-style-type: none"> No injuries due to wild animals 	<ul style="list-style-type: none"> Fortnightly during construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor/ EMMP In-charge Ecologist 	HDB/ SO

5.1.4 Biodiversity Awareness Training

Prior to any construction activities, all construction personnel are to attend a biodiversity awareness training by the EMMP consultant. This training should impart important information on the ecological importance of the site, and the importance of minimising impacts to the natural environment. Also, they should be trained on the common fauna species they may encounter, and what to do should they have any wildlife encounters.

After the initial training, refresher training and toolbox briefings are to be conducted with the details specified in the following Table 5.1.

Table 5.1. Details of refresher training and daily toolbox briefings

Training Schedule	Training Topics	Conducted By	Target Audience	Frequency
Prior to commencement of activities on site	EMMP Requirements Biodiversity & Environmental Awareness	EMMP Consultant	Environmental Manager/ ECO/ Project Manager / Construction Manager/ Construction Engineers/ Site Supervisors/ Sub-contractors	Once
Refresher training	Biodiversity & Environmental Awareness Briefing	Consultant's EMMP In-charge/ ECO	Site Personnel including Sub-contractors	Every six months during construction phase
Toolbox meetings	Briefing to include reminders on wildlife encounters and environmental protection	Contractor's EMMP In-charge/ ECO	Construction Workers including Sub-contractors	Daily

5.1.5 Wildlife Management during Site Clearance

Wildlife management during tree clearance is a requirement for the project site. Directional clearance will allow for the passive shepherding of mobile fauna species, while capture-and-release of animals found within the project site may be required for other species. Examples of target species that may require capture-and-release are listed in Table 5.2. Directional clearance is done in order to:

- Minimise the risk of road hazards and kills from the terrestrial fauna that are displaced from the project site onto adjacent roads.
- Minimise the risk of human-wildlife conflict from animals remaining within the project boundaries.
- Encourage wildlife movement into designated forested areas located outside of the project site's boundary.

Site clearance to be conducted in the following steps:

- Permanent hoarding along proposed working boundary along Admiralty Road

West and Woodlands North Coast Road to prevent entrance of fauna species into construction area and prevent animals from running onto the road.

- Manual clearing of undergrowth in phases.
- Inspection of trees and tree holes for arboreal fauna, and relocation by qualified agencies and/or specialists.
- Felling of trees.
- Phased installation and relocation of permanent & temporary hoarding to prevent return of wildlife.

Upon completion of the tree felling in the project area, the permanent hoarding will cover the full perimeter of the project worksite. Site clearance for the construction of ECM ponds shall follow the same approach.

Target Species

A list of target fauna species has been developed based on the findings of the EIA. Besides species encountered during the baseline surveys, other probable species that exist on the site were also included. This list was developed with the following considerations:

- probable presence of species in the Project area prior to construction;
- risks to species from being in close proximity to construction activities;
- practicality of relocating species from the construction site;
- conservation significance of species; and
- risk of road kills, road hazards, and/or human-wildlife conflict arising from uncontrolled species displacement from the project area.

The target species in the list in Table 5.2 have been categorised into two groups depending on their habits, and thus the approach required for wildlife shepherding. Fauna species in the first category are in general highly mobile species in which a passive approach is recommended, while fauna species in the second category are less mobile and would require a more active approach to shepherding.

Table 5.2. List of identified target species

Category	Species	Active Hours
Category 1 – Passive Shepherding	Long-tailed macaque Common palm civet	Diurnal Nocturnal
Category 2 – Capture-and-release	King cobra Black spitting cobra Reticulated python Wagler’s pit viper Clouded monitor Malayan water monitor Other snake species	Diurnal Diurnal Nocturnal Nocturnal Diurnal Diurnal Diurnal and nocturnal

For wild boars found at or around the site at any time during the project, NParks is to be informed as soon as possible at nparks_wildlife_management@nparks.gov.sg for advice and subsequent action. An approved wild pig removal contractor must also be

engaged to trap and remove the said animals, the process of which may take about 4–8 weeks.

Methodology and Approach

Directional tree clearance should only be scheduled during daylight hours (8 am to 6 pm). It may include a combination of the following activities:

- installation of hoarding along project boundaries, which would help to guide target terrestrial fauna in the intended direction of movement and as a barrier to prevent wildlife displacement onto adjacent roads;
- installation of temporary hoarding to along width of cleared areas to prevent wildlife from re-entering the cleared areas;
- the pre-existing fence along the temporary access road may be used as a temporary hoarding by securing a tarp over the fence to ensure no animals can pass through;
- systematic pattern of tree clearance in the site in order to encourage wildlife to encourage wildlife to move in an intended direction of movement towards adjacent refuge habitats, and;
- careful survey to check for the presence of target fauna species and any active nests or dens.

Prior to any tree felling, the site is to be inspected by an ecologist to ensure that no target fauna and active nests or dens remain. After clearance of undergrowth, cleared areas should be hoarded up to prevent target terrestrial fauna from entering the site.

The wildlife inspection prior to tree felling and vegetation clearance will also check for any entrapped animals within the hoarded area to be cleared. This inspection will be valid for 7 days only, during which the trapped animals have to be secured away from the site and clearance must be conducted. If more than 7 days has passed and site clearance is not done yet, the inspection should be carried out again.

In the event that any target fauna listed in Table 5.2 are encountered during this process, the following actions which have been developed with the consideration of reducing stress to fauna while ensuring the effectiveness of the exercise shall be taken:

- i) Passive Shepherding: These are highly mobile species where passive shepherding is likely to be effective. When species in this category are encountered, personnel should allow the animal to move on its own accord. If necessary, personnel may talk loudly or make some noise by clapping their hands together to encourage the animal to move. If any individual fauna does not move on its own after sufficient time (i.e., up to one hour) has passed, the EMMP team is to decide on whether to call NParks Animal Response Centre or ACRES for the appropriate removal of the animal.

Should the team encounter a visibly injured animal, NParks Animal Response Centre or ACRES should be called immediately for the next course of action.

No attempt should be made by the EMMP team, workers, or other unqualified personnel at any point to handle animals on site. Handling animals without

appropriate certification is illegal under the recent Wildlife Act of June 2020.

- ii) Capture-and-release: Species in this group are less mobile and/or venomous, and a passive shepherding approach is deemed to be ineffective and/or unsafe. A capture-and-release approach will be needed to ensure safe relocation of these fauna from the site prior to construction. In the event that these species are encountered, NParks Animal Response Centre or ACRES should be called immediately for the next course of action. Capture-and release of animals encountered should be conducted by an approved wildlife management company.

Before each individual tree is felled, the Wildlife Specialist shall inspect the tree for the presence of fauna, including birds, bats, arboreal mammals, and arboreal herpetofauna. The ecologist should do the following:

- Check the crown of the tree for bird nests
- Check along the trunk from the bottom up for holes in which animals could be nesting
- Scan the trunk and all the branches for animals using the tree
- Scan the ground for potential nests, eggs, or burrows

Photographs of all nests, tree holes, and burrows should be taken for record purposes. In the event that the presence of birds, bats, arboreal mammals and herpetofauna, are found on the tree, tree felling, or transplanting must be postponed until the animal has left the tree on its own accord.

Tree felling or transplanting should not commence during the prime breeding season for birds in Singapore, between the months of February to July. Outside these months, if active nests are detected on the tree, nests shall be left undisturbed until the young birds have fledged. Inactive nests should be removed to minimise the possibility of a new nesting attempt. Tree felling or transplanting shall occur only when no active nests are present on the tree.

Once tree felling is completed, the tree should be inspected again for any animals that were not detected earlier. Should an animal be detected after felling, NParks Animal Response Centre or ACRES should be contacted immediately, especially since the animal might be injured.

Through the undertaking of general approach, a register shall be maintained to record:

- the activities that were carried out,
- the species, numbers, Global Positioning System (GPS) locations, dates, timings, and actions taken (if any) for each target fauna which was identified, and
- the description, GPS location, and actions taken (if any) for each burrow, inhabited tree hole and nest that was identified.

Spatial Visualisation of Directional Clearance

The figures below illustrate the overall scheduled phasing for directional clearance. These activities should take place during daylight hours only (i.e., 8 am to 6 pm) and a minimum of one rest day (i.e., Sunday) per week shall be provided to reduce disturbance

to wildlife. Tree felling may commence three days after the understory vegetation has been cleared.

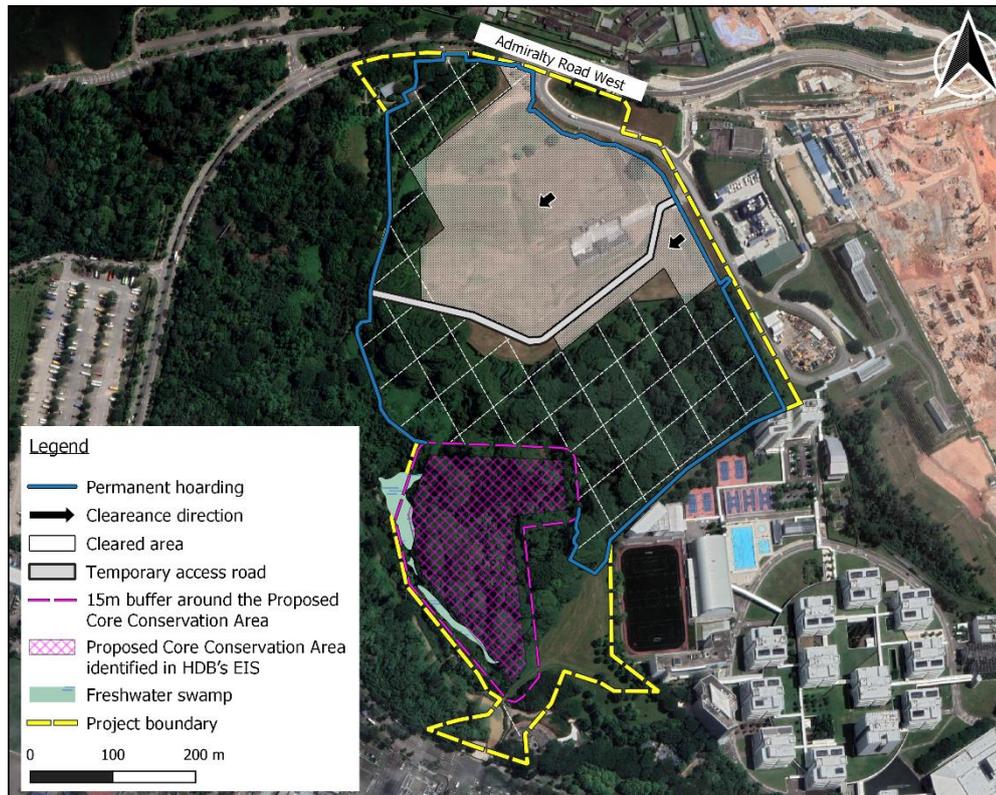


Figure 5.1. Directional Clearance 1

The first sequence (Figure 5.1) is setting up a temporary access road at the center of the project site. Permanent hoarding is to be erected along the entire working boundaries of the project, except for the core conservation area. Due to the proximity of the site to residential areas and Woodlands Checkpoint, Admiralty Road West is used by many vehicles hence speed bumps and signs informing drivers to slow down should be placed along Admiralty Road West to encourage drivers to slow down, particularly during the construction phase.

As per NParks' requirements, all permanent hoarding is to be embedded 30 cm underground. The Contractor is to discuss with the QECF on methods to ensure that ponding does not occur adjacent to the embedded hoarding through appropriate drainage design, the creation of drainage holes, or other suitable methods. Permanent hoarding plans are to be approved by NParks.

The second sequence (Figure 5.2 & 5.3) consists of tree felling at the eastern side of the project site. Prior to any vegetation clearance, all tree holes, nests, and burrows should also be inspected for wildlife. Directional clearance should commence from the northeast corner of the working area where the non-forested area is located. In all other areas (i.e., forested areas including near Admiralty Park and the core conservation area), directional clearance should take place in segments of 50 m by 50 m, as shown by the gridlines, in the direction of the black arrows. This is to encourage fauna to move to the core conservation area at the south of the project site.

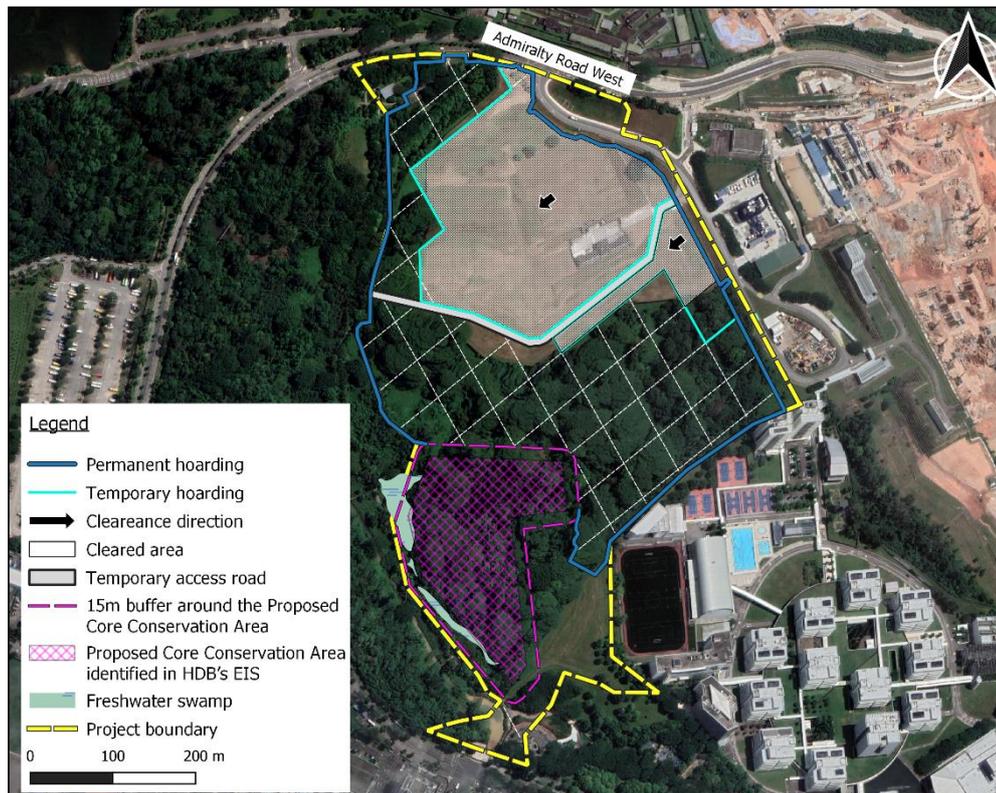


Figure 5.2. Directional Clearance 2

All cleared areas within the site should be temporarily hoarded up, indicated by the light blue lines. The pre-existing fence along the temporary access road may be utilised as a temporary hoarding by securing a tarp over the fence. This is due to the difficulty of erecting a permanent hoarding within a forested area prior to clearance. Prior to any vegetation clearance in progressive segments, all tree holes, nests, and burrows should also be inspected for wildlife. Directional clearance should take place in the direction of the black arrows, to encourage fauna to move to the core conservation area south of the project boundary.

In the event of any wildlife incidences, a wildlife management company would have to be engaged for capture and release. This is to ensure the survivability of the wildlife in the project site.

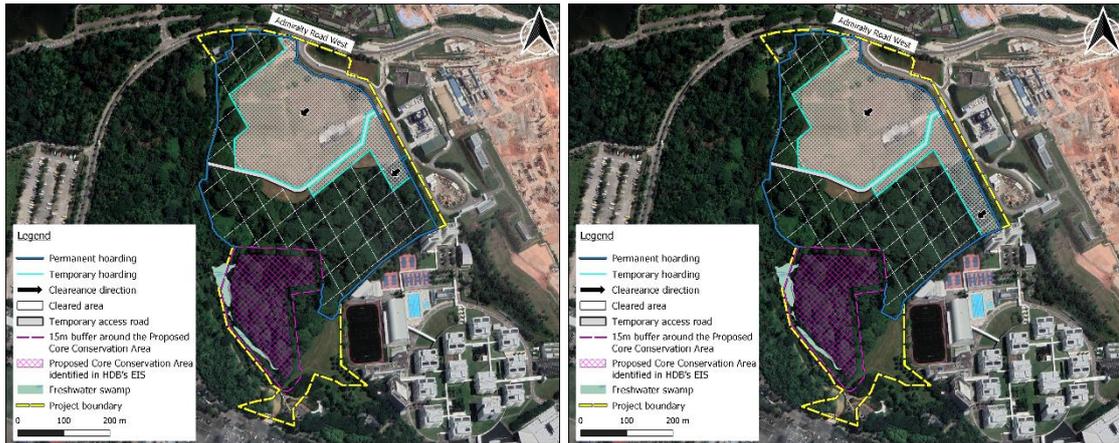


Figure 5.3 Directional Clearance 3

Temporary hoarding should be erected along the light blue lines shown in each stage of directional clearance (from Figure 5.1 to Figure 5.7). The purpose of the temporary hoarding is to prevent any fauna from entering areas that have been cleared. This means that with each 50 m by 50 m segment of undergrowth cleared, the location of the temporary hoarding should also move to surround those areas. Temporary hoarding shall be erected three days after undergrowth clearance and before tree felling of each area. Upon completion of directional clearance in the current segment, the boundary of the cleared areas should be hoarded up by permanent hoarding and temporary hoarding.

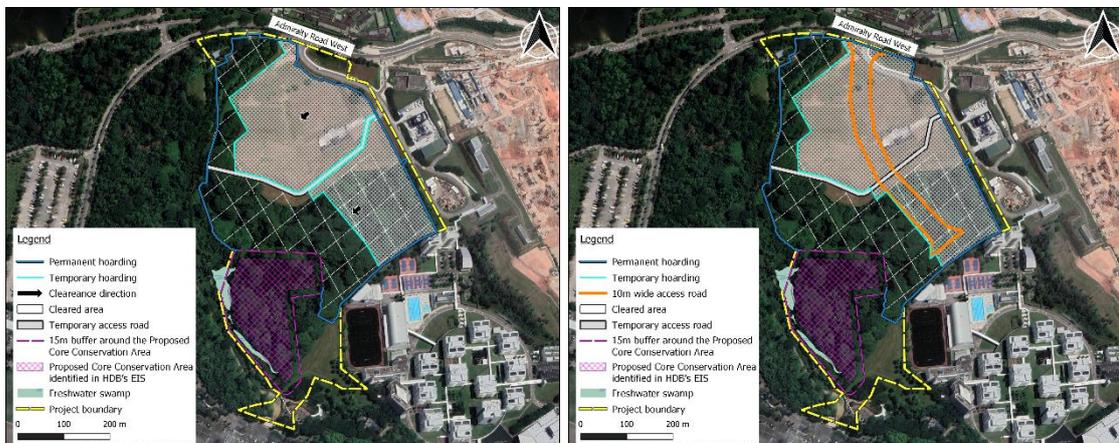


Figure 5.4. Directional Clearance 4

The third sequence (Figure 5.4) uses the excavated soil from the cleared area east of the project site to backfill the northeastern part of the project site, where the land is at a lower elevation. Prior to any backfilling works in the northern segment and the construction of the 10 m wide access road, all tree holes, nests, and burrows should be inspected for wildlife. Permanent hoarding in the northeast corner is to be shifted outwards to allow for the construction of the 10 m wide access road.

Directional clearance should take place in the direction of the black arrows, to encourage fauna to move to the core conservation area south of the site. There should be no gaps between hoarding to prevent fauna species from entering the site. Following which, the

construction of a 10 m wide access road should commence. Backfilling works should be carried out as soon as possible after tree clearance to allow for turfing to be done earlier to reduce the impacts of sediment runoff into adjacent areas.

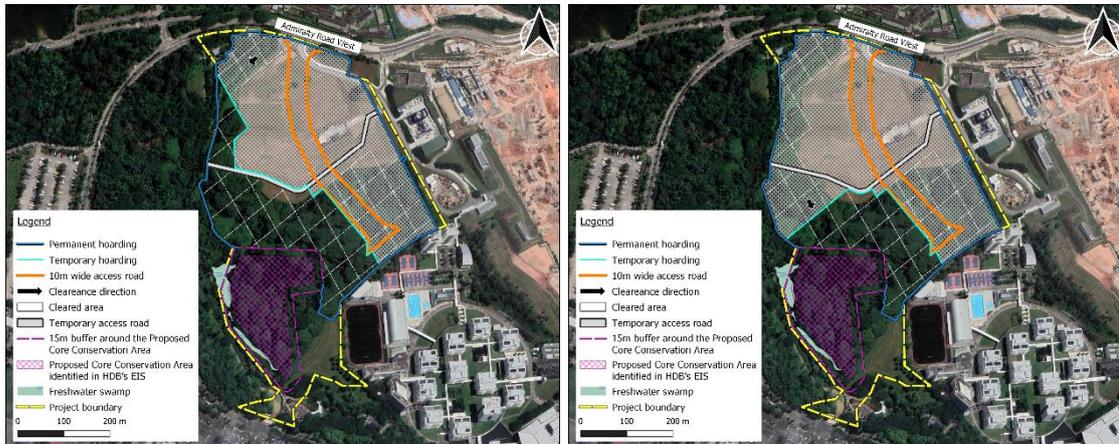


Figure 5.5. Directional Clearance 5

The fourth sequence is directional clearance from the northmost area, continuing in 50 m by 50 m segments as demarcated by the grid lines. Directional clearance should also take place in the direction of the black arrows to encourage fauna to move to the core conservation area. Prior to any vegetation clearance, all tree holes, nests, and burrows should be inspected for wildlife. After each 50 m by 50 m segment has been cleared, the area should be temporary hoarded along the light blue lines.

In the event of any wildlife incidences, a wildlife management company would have to be engaged for capture and release.



Figure 5.6. Directional Clearance 6

Directional clearance is to continue along each 50 m by 50 m segment until the entire working area has been cleared.

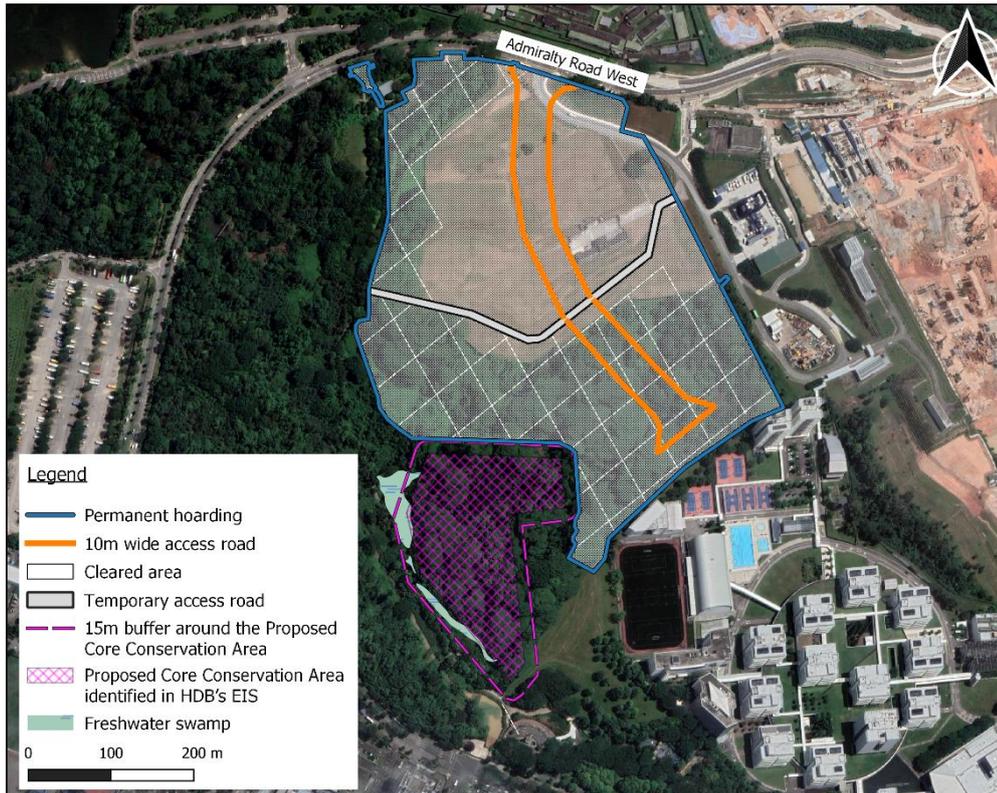


Figure 5.7. Directional Clearance 7

Once directional clearance has been completed, the full working area should be hoarded up following the site plan. Permanent hoarding along the dark blue lines is to maintain its height of 2 m, with a noise barrier of 6 m. There should be no gaps between hoarding to prevent fauna species from entering the site.

5.1.6 Wildlife Response and Rescue Plan

Even upon the completion of wildlife shepherding works, it is highly probable that animals might be able to enter the site and get trapped, particularly burrowing or climbing animals. Whenever fauna is encountered within the working areas, all construction activities should be stopped immediately, and the Wildlife Response and Rescue Plan should be followed. Workers are to notify their supervisor, who will in turn contact the designated ecologist. The ecologist will then decide the next appropriate course of action.

All documentations of wildlife are to be captured in photographs, and a Wildlife Incident Form provided in **Appendix C** is to be filled.

Table 5.3. Wildlife response and rescue plan

Particular	Within the project site				Outside project site		
Timeframe	During working hours				Any time		
Animal type	Highly mobile animals (e.g., wild pig, feral dog, and long-tailed macaques)		Non-large animals			Any	
			Venomous / poisonous (e.g., king cobra, wagler's pit viper, black spitting cobra)		Non-venomous / -poisonous (e.g., Painted bronzeback)		
Animal condition	Alive / Moving / Resting	Dead	Alive / Moving / Resting	Dead	Any	-	
Risk To human	High	Low	High	Low	Low	-	

Particular	Within the project site					Outside project site
Response	<ul style="list-style-type: none"> a. Stop work on work site b. Report to PM c. PM to report to EMMP In-charge d. EMMP In-charge to inform Wildlife Specialist, who will contact NParks/ ACRES for next steps if necessary 	<ul style="list-style-type: none"> a. Barricade affected area b. Report to PM c. PM to report to EMMP In-charge d. EMMP In-charge to inform Wildlife Specialist. e. If required, Contractor to assist with transporting of the Wild Animal to Disposal Location 	<ul style="list-style-type: none"> a. Stop work at affected area; if possible, barricade affected area b. Report to PM c. PM to report to EMMP In-charge d. EMMP In-charge to inform Wildlife Specialist, who will contact NParks/ ACRES for next steps if necessary 	<ul style="list-style-type: none"> a. Barricade affected area b. Report to PM c. PM to report to EMMP In-charge d. EMMP In-charge to inform Wildlife Specialist. e. If required, Contractor to assist with transporting of Wild Animal to Disposal Location 	<ul style="list-style-type: none"> a. Stop work at affected area; if possible, barricade affected area b. Report to PM c. PM to report to EMMP In-charge d. EMMP In-charge to inform Wildlife Specialist, who will contact NParks/ ACRES for next steps if necessary 	<ul style="list-style-type: none"> a. Notify NParks Animal Response Centre/ ACRES hotline if necessary
Remarks	<ul style="list-style-type: none"> • No attempts shall be made by Contractors to handle the animal • Contractor to take photograph of the animal if possible. • Contractors shall allow the animal to leave the site without harassment / handling • If animal is trapped, notify NParks Animal Response Centre or ACRES hotline • For wild pigs found at or around the site, 	<ul style="list-style-type: none"> • Contractor to take photograph of the animal 	<ul style="list-style-type: none"> • No attempts shall be made by Contractors to handle the animal • Contractor to take photograph of the animal if possible. • Contractors shall allow the animal to leave the site without harassment / handling • If animal is trapped, notify NParks Animal Response Centre or ACRES hotline 	<ul style="list-style-type: none"> • Contractor to take photograph of the animal. 	<ul style="list-style-type: none"> • No attempts shall be made by contractors to handle the animal • Contractor to take photographs of the animal if possible. • Contractors shall allow the animal to leave the site without harassment / handling • If animal is trapped, notify NParks Animal Response Centre or ACRES hotline 	<ul style="list-style-type: none"> • Contractor is encouraged to report • Reports could be from Public and/or Contractor's Staff • If required, EMMP In-charge to contact PM for assistance of transferring Wildlife Animal Carcass to Disposal Location

Particular	Within the project site					Outside project site
	NParks is to be informed as soon as possible at for advice and subsequent action. An approved wild pig removal contractor must also be engaged to trap and remove the animal.					

5.2 Flora Management Plan

The following Flora Management Plan lays out the details on nursery engagement, how to carry out salvaging of nature plants, how to maintain salvaged saplings, how to carry out tree protection works, the required components of tree assessments and monthly monitoring, etc. The tree protection and assessment duties should come under an ISA Certified Arborist.

Within the areas to be cleared, trees to be retained will be identified at construction phase. These retained trees should be protected with appropriate TPZ. Additionally, hoarding to be implemented around the project site to prevent unnecessary vegetation damage outside the project area. Any native flora species found within cleared land should be salvaged whenever possible.

5.2.1 Salvaging Native Plants, Setting Up of Nursery, and Reinstatement

Selecting a Nursery

Before proceeding with the site clearance, a nursery should be set up to be a holding area for the salvaged native plants. This nursery can either be owned by HDB / NParks or managed externally by vendors.

The nursery should adequately be equipped with all the necessary resources such as irrigation system and other miscellaneous gardening tools or machineries to manage all salvaged plants. The nursery should have area separate sectors segregated for both sun loving and shade loving plants. As a rule of thumb, shade loving plants need to be kept in locations with shade cloth or temporary shelter where the sunlight intensity is preferably between 60-90 Photosynthetic Active Radiation (PAR) and maintaining at least 85% of humidity through means such as misting or other alike techniques. In general, the temperature within the nursery should not exceed 30°C.

Salvage and Transfer Native Plants to Nursery

Before any site clearance, efforts can be taken to salvage native tree, shrub, climbers, ferns and palm saplings with local conservation status of LC, VU, EN and CR. These salvaged saplings shall be in healthy and vigorous condition, free from pest and diseases infestation with proper documentation or records such as species identification, photos and tagged with unique tagged numbers. NParks would be sending their staff to site to salvage native plants that are of local conservation status.

Only saplings with a girth of 0.3 m or less are to be tagged and harvested. The root ball size of saplings will be determined in consultation with an Certified Arborist. The general rule of thumb of root ball size for transplanting is that for every 1 cm increase in tree stem diameter, there should be 8cm increase in root ball width. For example, a diameter of 5cm would require 40 cm root ball width. The height of root ball should range from 35–50 cm depending on the root condition. Minimal tree pruning i.e. deadwooding (removal of dead and defective branches) should be done using appropriate gardening tools that are disinfected before each cutting prior to being transplanting it out to the

nursery.

In the nursery, tree saplings should be unloaded from the transport vehicle, either mechanically by crane lorry or manually lifting the sapling from the secured root ball to ensure that it don't breaks up during the shifting process. The saplings should be placed into the bags or containers in the nursery site. After placing the tree sapling into the polythene bag, remove the burlap and backfill the space/gaps with clean approved soil mix. Staking support shall be provided only when necessary to keep the plant upright. The saplings shall be placed at the location with adequate spacing between them based on their desirable growth condition i.e under sun / under shade. Cuttings from climbers shall be dipped into growth hormone and inserted into a container with a mixture of sand and soil. Individual saplings shall be salvaged from site, transported, and placed in the temporary nursery site within a day.

There should be a proper inventory of the salvaged saplings consisting of information such as the tag number, photo, and species.



Figure 5.8. Example of a tagged native sapling



Figure 5.9. Examples of temporary nursery

Growth and Maintenance of Salvaged Native Plants

The newly harvested saplings should be maintained until the saplings have sufficiently established. The transplanted climbers and epiphytes are to be placed under shade until they have established and sprouting of young leaves occur. Once each tree has been transplanted, daily maintenance activities should begin. The Nursery Manager should provide all material, equipment, and labours required for maintenance of salvaged saplings. There should be sufficient spacing to allow for the salvaged saplings to establish and grow to their natural characteristics. Table 5.4 outlines the maintenance regime.

For good overall form and structure of the harvested saplings, it is recommended to carry out formative pruning on the harvested tree saplings in accordance with ANSI A-300 pruning standards (ISA). Manual weeding should be carried out regularly for the harvested saplings. All weeds should be removed before mulching. Regular mulching should be applied to all harvested saplings at the receiving site. The mulch used should be friable, odour-free high grade mature composts.

Table 5.4. Maintenance regimes for salvaged plants at nursery

Regime	Frequency	Material
Watering	Daily, except for the rainy days	Non potable water 5L for trees <0.1m in girth and at least 30L for trees >0.3m in girth
Fertilization	As and when necessary i.e signs of deterioration	E.g., Fish kelp, humic acid, high EC molasses
Pesticide	As and when required	Pesticide should be avoided whenever possible. Use organic certified solutions instead
Mulching	Once a month	Mulch should have a minimum thickness of 20 mm, should be an approved friable, odour-free high grade mature compost or an approved mix, with C:N ratio between 12:1 and 25:1. Mulch pH must be between 5.5 to 7.
Weeding	Once fortnightly	Weeding should be done manually and before mulching
Pruning	As and when required i.e deadwooding, crown cleaning	Clean and well - maintained (sharp) cutters. Cutters must be wiped clean in between cuts.

Site Reinstatement Works Using Salvaged Native Plants

Generally, the cleared site will be turfed back with cowgrass (*Axonopus compressus*) by contractor as reinstatement measure. That being said, it is strongly recommended for both contractor and main stakeholders (HDB / NParks) to consider using any of the salvaged native plants for reinstatement works as this will improve our local forests and green spaces plants diversity and mitigate certain extent of biodiversity loss arising from the clearance of the site.

Should the salvaged plants had been planted on reinstatement sites, the following ISA Best Management Practices (BMP) are to be implemented, including watering for at least eight weeks to ensure survival and establishment.

The criteria of satisfactory saplings include (but are not limited to):

- Saplings are in good health, free from injury, pest and disease with good taper
- Unless necessary, saplings of tree species can be self-supporting and planted without staking (except for climbers and shrubs). If, and when staking is necessary, there should be a regular monitoring to ensure the stake materials do not cause mechanical injuries to the saplings and to remove them once the stakings are deemed not required.
- Saplings of excurrent species should have a defined central leader with apical bud intact
- Root flare must be visible and in good condition
- When shaking or handling the unsupported root ball, at least 90% of the soil volume must remain intact
- Girdling root should be removed within planting bag before planting and transplanting

5.2.2 Assessment and Monitoring of Trees to be Protected

The Arborist needs to perform pre-construction tree assessment for trees at proposed development site before any construction activities (including planned and ad-hoc site clearance) particularly for those within the core conservation area as well those adjacent of the working site (along boundary / hoarding line). The Arborist should follow the Site Layout Plan and Topography Plan to determine extent of tree roots and tree crown affected by the development. Based on site observation, construction drawing and design, estimated work area boundary, the Arborist shall produce tree assessment report recording tree information such as tree photos, species, height, girth, crown spread, tree health, form, structure, site conditions. This assessment should also come with an impact assessment whereby any extent of construction activities affecting the tree and the recommended mitigations measures are documented. This assessment shall be used as the benchmark for the arborist during the monthly monitoring of the retained trees and their TPZ. Prior to proceeding with the approved site clearance, the arborist shall first assess the existing trees along fringe of CCA, highlighted in green in Figure 5.10 to pick up any trees of significant value. Should any such species be identified, he /she shall recommend appropriate measures to ensure that they are protected from the effects of the site/ trees clearance highlighted in yellow i.e no free falling during cutting and / or controlled directional clearance.

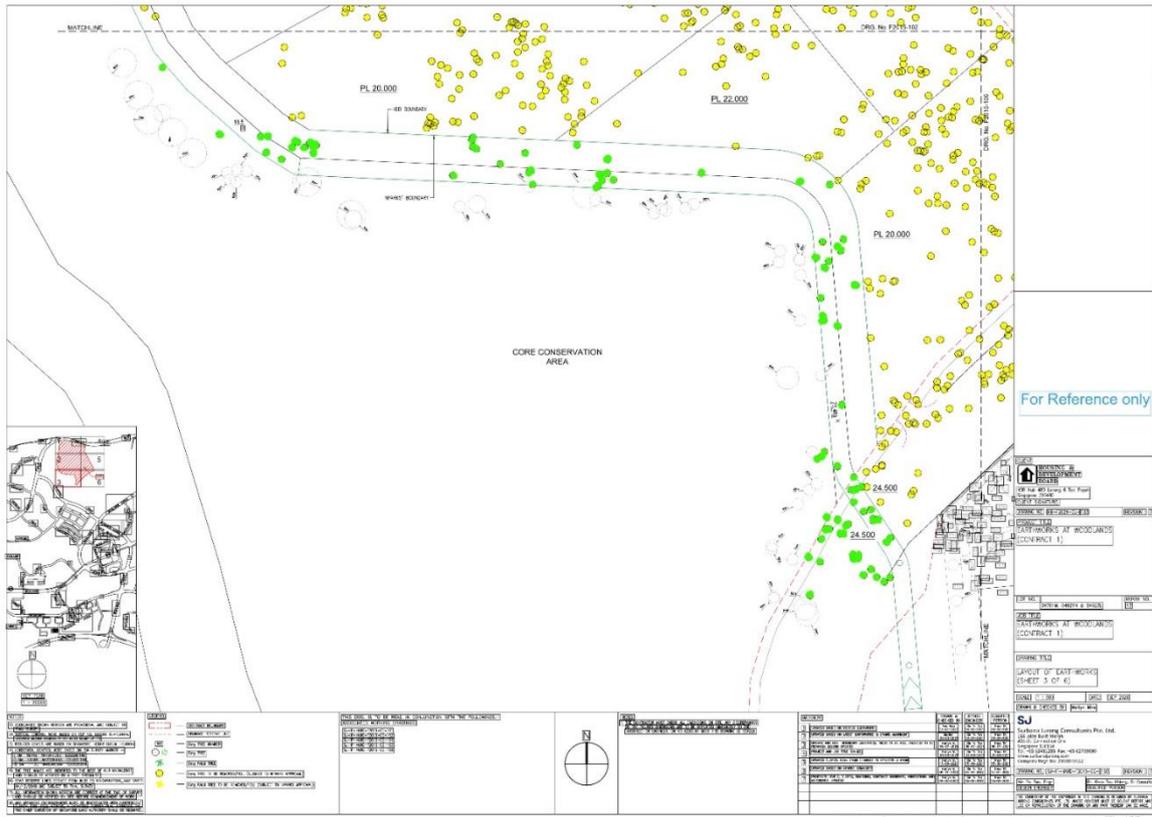


Figure 5.10. Tree felling plan along CCA

Tree pruning such as deadwooding to remove defective/ dead branches should be the first line of mitigation measures. Periodical selective pruning i.e. crown thinning and raising can be done to maintain overall tree form. Tree Support Systems such as Tree Guying and Root Anchoring must be considered if the tree is deemed to be susceptible to wind throw.

5.2.3 Tree Protection Zones

While the retention of established trees within most of the construction footprint is difficult, it is possible to retain large trees that fall either (1) inside a footprint that can afford flexibility in location or (2) outside of construction footprint but within areas with other construction needs. For example, underground pipelines can possibly be rerouted, interim storage site can be repositioned to avoid a native mature tree within or at the border of such site. A TPZ is an area demarcated to protect individual trees to minimize the impacts of construction activities (including root damage, mechanical trunk damage, damage due to soil compaction, etc) on the tree. NParks (2018) has included some guidelines on Tree Protection Zones in their *Guidelines on Greenery Provision and Tree Conservation for Developments*.

TPZ size varies depending on tree size (Table 5.5). Generally, the contractor should already take into considerations and factor in the workspace required for their work activities to not interfere major roots of the trees and their TPZ. This should be in consultation with the Arborist, where necessary. If the contractor requires extra space during construction period, the area should be surveyed for native plant species to be retained on site and suitable native ones to be salvaged to the nursery before any clearance. By default, no form or type of work activities and materials should encroach into the TPZ of the retained trees. In the event of any spillage into the TPZ, the contractor should clear it up immediately and notify the arborist who shall do an assessment of the tree. If there are any significant and irreversible damages found, the contractor shall replace the tree with preferably alike species.

Table 5.5. TPZ size required for different girth range

Girth	Recommended TPZ (radius)
<0.5m	1 m
>0.5m but less than 1m	2 m
>1m but less than 1.5m	3 m
>1.5m but less than 2m	4 m
>2m	5 m
Fig trees and Trees with Critically Endangered status	Prescribed individually by Arborist on a case-by-case basis

The table above serves as a general guideline for tree conservation. It is advisable for the Arborist to recommend the TPZ. Depending on both the crown and root spread, a larger tree may be required as determined on a case-by -case basics especially for trees with a girth size of >2m.

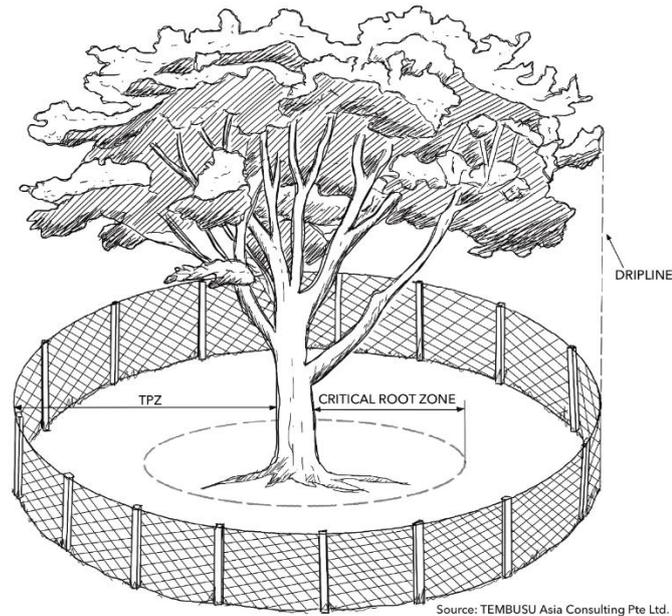


Figure 5.11. Tree Protection Zone Diagram

The following specifies guidelines for construction activities within and outside the TPZ, extracted from NParks (2018).

Inside TPZ

- There must be no excavation, raising or lowering of soil level, compaction or any form of construction activities including temporary works within the hoarded area.
- Dumping of debris, excavated materials and/or storage of construction materials and equipment are not allowed within the TPZ.
- The demolition of drains, structures within the TPZ should be carried out manually and backfilled with Approved Soil Mixture (ASM) immediately.
- Trees are to be watered regularly if rainfall is inadequate.
- Trees are to be fertilised if soil tests or deficiency symptoms indicate they are nutrient stressed.

Outside TPZ

- If major roots are encountered during excavation, the applicant may like to seek advice from a Certified Arborist, as cutting of major roots may affect the stability of the tree. Where possible, alternative proposals should be explored to avoid the need to cut the roots.
- In cases where the trees are managed by NParks (e.g., trees within the park connector planting verge), or are required by NParks to be conserved (e.g., trees with girth >1.0m within TCA or vacant land), approval from NParks must be obtained before the major root can be cut. If approval is granted by NParks to cut the roots, this must be done appropriately by landscape personnel with a clean cut using a chainsaw.
- All building debris and chemical wastes should not be burned or buried within green verges on the site.

5.2.4 Tree Felling Within Forested Areas

Before felling trees, the Arborist must ensure native saplings have already been tagged, identified, and transplanted to the nursery. The Arborist must also survey, identify, and confirm the trees to be protected in the surrounding area and establish a tree felling plan based on site condition and tree crown spread.

The trees to be felled shall be inspected for any fauna as per guidelines provided in wildlife management plan (Section 5.1). Such trees will be marked with red & white tape and no tree felling operation shall be carried out within 5 m from the said tree until approval is given to proceed.

Before commencing tree felling works, the supervisor, banksman, and foreman shall conduct site safety survey to assess work area carefully for hazardous trees, detached branches or limbs, steep slopes, powerlines etc. while fauna specialist will inspect the tree felling protection zone if the site is free of wildlife activities. Once the areas have been secured (cleared of any targets), the banksman should signal the excavator operator to commence work for trees felling. The excavator operator should first clear off the shrubs and small trees (<5 m height) to create a clear working zone or path with no blind spots. The excavator operator shall operate cautiously and fell all small trees and shrubs in a safe manner, aware of the location of the other trees to be protected.

Once the clearance can proceed, the excavator operator needs visually assess trees for integrity, direction of fall and environmental conditions to ensure that all other people are a safe walking distance away - two tree lengths minimum and five on a down slope. Operator should clear immediate area in front of tree and level where required. Rip base of tree to reduce root ball where appropriate. If required, create a dirt ramp to assist tree pushing. During the tree pushing process, the operator is to:

- Raise excavator arm as high as possible leaving sufficient leverage capability;
- Gently apply force using bucket with teeth against tree;
- Push tree using hydraulic arm, never use tracks to push tree;
- Firmly nudge tree using hydraulics and excavator arm;
- Do not ever bang tree with repeated force.

The recommended tree cutting method should be the notch cut (Figure 5.12). The foreman shall determine the direction of falling and ensure the tree does not land on any property, cause injury, or damage nearby Trees to be Protected. To avoid trees leaning to an unintended direction when performing a third cut, the excavator should assist to prevent fall back and guide the tree to fall into the intended direction. In avoidance of any unforeseen scenarios during the felling, an escape route should be pre-determined. By default, the escape route should be at an angle approximately 135 degrees from the direction of fall or 45 degrees opposite the direction of fall. Once the tree has been fell, the tree cutter shall cut the tree trunk into shorter lengths for easy clearing of the debris from site.

If the tree has a height more than 7m, crown reduction needs to be done with a crane lorry. Before the lorry crane can enter the site, the Contractor has to prepare proper access for the lorry crane to enter the site and access the tree location. The Contractor

must ensure that the access ground is stable enough that can allow the lorry crane to deploy its outrigger. When the access is ready, the Contractor will then mobilize the lorry crane to enter the site to reduce tree height to 7 m in order to adopt the notch cut method for trees less than 7 m in height.

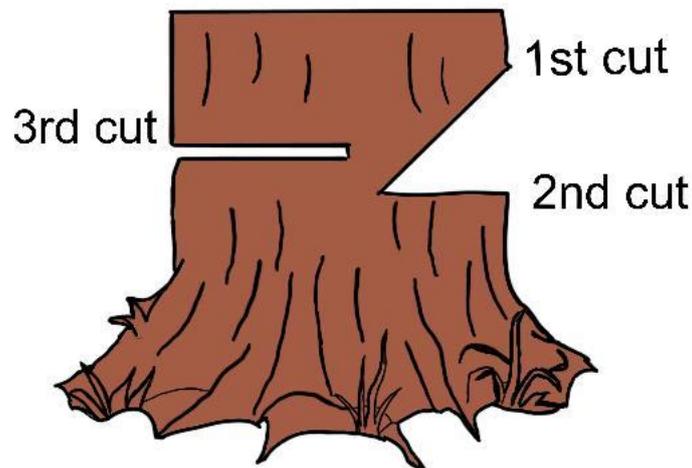


Figure 5.12. Illustration of a notch cut

5.2.5 Flora Protection Outside Working Boundaries

Most of the time, clearance of forest or site will inevitably create gaps and fragments where non-native species can enter vital habitat such as native-dominated secondary forest and exposing trees to various abiotic stress. To prevent such situation from arising, there ought to be a screening buffer of planting outside the project footprint. Buffers are the most efficient means of protecting forest fragments as they absorb and reduce impacts from surrounding development. As recommended, the Contractor should consider using salvaged plants to plant up these buffer zones outside working boundary whenever a gap occurs due to a tree fall or ad-hoc site clearance as an effort to protect flora diversity and forest habitats outside working boundaries.

The primary reason why screening buffer is vital is because the removal of forest fringe can cause trees within the forested zone to be exposed to environmental factors such as sun scorch, windthrow effect resulting in them being damaged. The exposed trees will also potentially be overtaken by invasive plants. All these unfavourable factors will increase the trees to fail e.g. uprooting, snapping which will cause significant loss to our forest ecology value and diversity

5.3 Lighting Management Plan (LMP)

There is no need to develop a light management plan as there will be no night work.

5.4 Biodiversity Monitoring Requirements

Specific monitoring requirements for biodiversity are proposed based on recommendation from the EIS report in this section.

5.4.1 Fauna Monitoring

Fauna monitoring surveys will comprise of transect surveys and site inspection surveys conducted together. There should be regular inspections to ensure that the implementation of mitigation measures for fauna protection are in place and effective in the mitigation of impacts. Sensitive biodiversity should also be monitored to ensure that their presence has not been adversely affected by the works. The following section outlines transect surveys, visual site inspection and aquatic monitoring recommendations. Figure 5.13 proposes the transects to be implemented per month beginning one month prior to construction and ending two months after reinstatement.

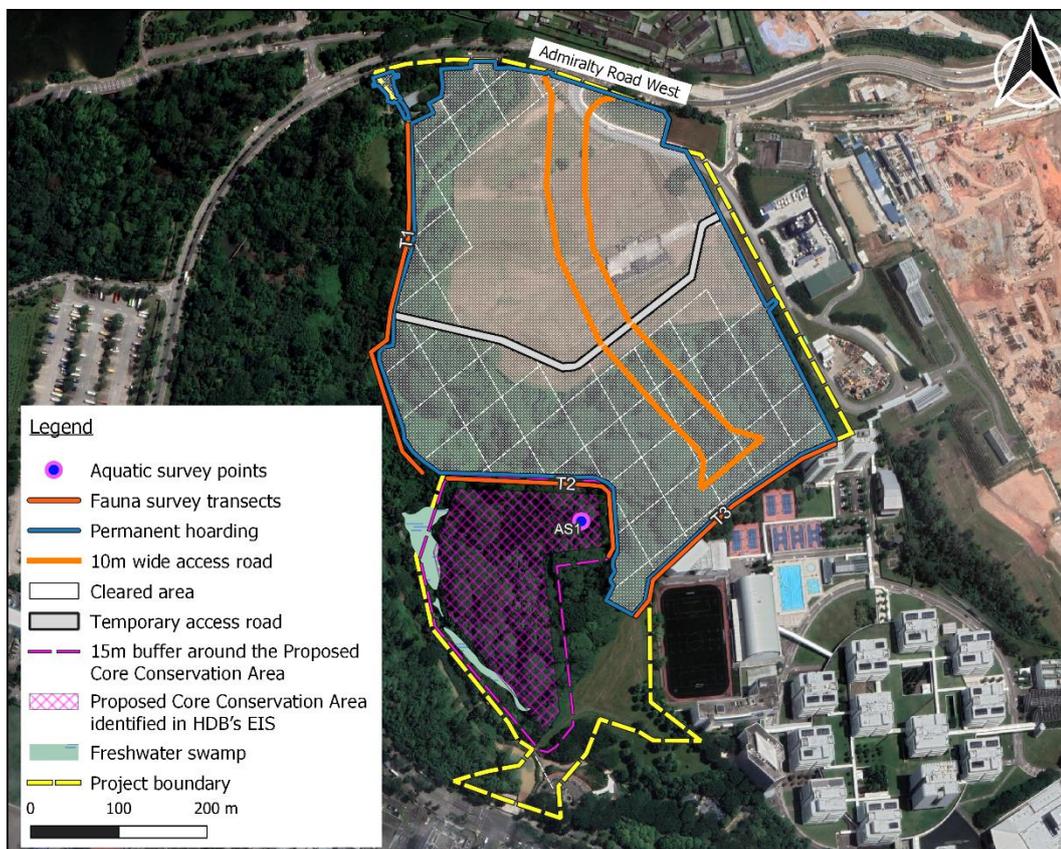


Figure 5.13. Terrestrial Transect & Aquatic survey point

Monitoring of CCA

Due to the ecological sensitivity of CCA, monitoring of CCA shall be carried out along the stream and hoarding area only to check on terrestrial / aquatic fauna and flora. This is to prevent extensive disturbance and damage the integrity to the conservation zone.

Terrestrial & Aquatic Fauna Transect Surveys

Monthly diurnal and nocturnal fauna survey:

- Fauna surveys will be conducted along terrestrial and aquatic transects and will

target the following fauna groups: butterflies; herpetofauna (amphibians and reptiles); birds; and mammals. Comparison of species presence can be made with the baseline studies, where appropriate, to provide an indication of the changes in fauna diversity.

Aquatic Fauna Surveys

Due to the importance of the natural stream which flows to the freshwater swamp as habitat for rare aquatic fauna, monthly aquatic fauna surveys are recommended. The surveys should target fish and odonate surveys. The points and methodology should closely follow the EIA, so that data can be comparable to the baseline. The data collected should be compared on a monthly basis, which can provide an indication on any major changes in aquatic fauna diversity.

Visual Site Inspection

Monthly inspections of hoarding surrounding the worksite:

- There should be no clearance of vegetation outside the hoarding boundary. Additionally, the hoarding should be implemented with no gaps between, to ensure that animals are not able to enter the site. Specifications for hoarding should also follow directives from NParks.

Monthly inspection of habitats:

- Besides forested areas immediately surrounding the hoarding, visual inspections should also be made of sensitive habitats, especially the freshwater swamp and the connecting natural stream. There should be no visible impacts to the stream, including, but not limited to, loss of vegetation, siltation, visible increased sedimentation or erosion, presence of oil, etc.

5.4.2 Flora Monitoring

As many plant species of conservation value are found within and around the project site, regular checks need to be carried out to ensure that the implementation of mitigation measures for flora and trees protection are in place and effective for the mitigating of the construction activities impacts. The following section outlines monitoring recommendation for flora protection.

For the monitoring of flora, the flora specialist and arborist should have access to the documents listed in Section 5.2.2.

Monitoring of Retained Trees

During the construction stage, the Arborist shall conduct monthly inspections of trees to be protected. Table 5.6 below presents Visual Tree Assessment (VTA) data to be included in the monthly inspection report. Photo documentation of each tree and its observations especially abnormalities noted should be included in the report during the development period. In addition, the Arborist is also required to provide observations on TPZ condition base on the parameters as reflected in the Table 5.7 to supplement the main VTA report.

Table 5.6. Parameters to take note during monthly tree inspections

Tree Assessment
Vigour of tree (Poor, Normal, Good)
Crown density (Sparse, Normal, Dense)
Leaf size (Normal, Small)
Foliage colour (Normal, Chlorotic)
Presence of diebacks (Yes, No) (%)
Presence of dried branches (Yes, No) (%)
Exposed deadwood on branches and trunk (Yes, No)
Cavity/ fruiting bodies on branches and trunk (Yes, No)
Mechanical injuries on branches and trunks (Yes, No)
Root collar visible (Yes, No)
Visible roots cut (Yes, No)
Mechanical injuries on roots (Yes, No)
Cavity / fruiting bodies on roots (Yes, No)
Pests/diseases infestation (Yes, No)
Soil condition (Limited volume, Saturated, Compacted, Pavement over roots)
Wind Exposure (Protected, Partial, Full, Wind funnelling)
Pruning history (Crown cleaned, Thinned, Raised, Reduced, Topped)

Table 5.7 Parameters to note for TPZ inspection

TPZ Condition
TPZ barriers properly installed / maintained
Evidence of illegal encroachment (by materials, machineries, equipment)
Evidence of physical damages to tree
Evidence of toxic spillage
Evidence of soil compaction around trunk and root flare

5.5 Water Quality Monitoring

Given the importance of good water quality in the maintenance of healthy aquatic habitats, in-situ, and ex-situ surveys of water quality in the stream should be conducted.

6 ENVIRONMENTAL MANAGEMENT PLANS

An EIA was carried out for the project site that established baseline conditions within study area, assessed the impacts, and recommended the mitigation measures. The following management plans provide the potential impacts and mitigation measures that are to be implemented during construction phase.

It is recommended to review the whole environmental management plan every quarter to update or adjust the applicable mitigation measures and monitoring requirements based on the various site considerations such as work progress, site utilisation, change in work methods, environmental incident, failure of mitigation measures etc.

6.1 Air Pollution Control Plan

6.1.1 Applicable Legislations

- Environmental Protection and Management Act 1999, Part IV on Air Pollution Control
- Environmental Protection and Management (Vehicle Emissions) Regulations 2008
- Environmental Protection and Management (Prohibition on Use of Open Fires) Order 2008
- Environmental Protection and Management (Air Impurities) Regulations 2008
- Singapore Ambient Air Quality Targets (2011)

6.1.2 Identified Impacts and Recommended Mitigation Measures

Identified Impacts	Recommended Mitigation Measures
<ul style="list-style-type: none">• Disturbance to wildlife due to dust• Impact on residents due to generation of fugitive dust	<ul style="list-style-type: none">• Implement dust control measures to suppress dust to reduce its impact. This includes using dust screens and water suppression systems to control the amount of dust.• Plant more trees along the edge of Admiralty Park can serve as a natural barrier to filter vehicular emissions that may be harmful to animals• To implement dust suppression plan• Personal protective equipment i.e. face mask to be worn during dust exposure• Use of hoarding at project boundary to minimise dust generation by attenuating wind forces.• Install hard surfaced access routes• Use of regular watering to reduce dust emissions from exposed site surfaces

Identified Impacts	Recommended Mitigation Measures
	<ul style="list-style-type: none"> • Proper maintenance of construction vehicles and fuel burning equipment • Only use cutting, grinding and sawing equipment with dust suppression water spray mechanisms • Erect hoarding around dusty activities and site boundary of minimum 1.8m height (following BCA guideline) • Impose and signpost maximum speed-limit of 25 km/hr on paved roads and 15km/hr on unpaved roads and work areas • Revegetate earthworks and exposed areas / soil stockpiles • Intermittently-used vehicles and machinery are to be shut down between work periods

6.1.3 Monitoring Requirements

Air Quality Monitoring	On-site Visual and Compliance Monitoring									
	<ul style="list-style-type: none"> • Minimisation of human health & biodiversity impacts due to dust pollution • Minimisation of human health impacts due to exhaust emissions 	Fugitive dust emissions	<ul style="list-style-type: none"> • Verify implementation of dust suppression plan • Watering to reduce dust emissions from exposed areas • Washing bay • Implementation of vehicular speed limit • Covered stockpiles • Use of PPE (face mask) by construction personnel 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	All construction areas	<ul style="list-style-type: none"> • Approved dust suppression plan 	<ul style="list-style-type: none"> • During entire construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge 	HDB/ SO
		Exhaust emission from construction machineries operations	<ul style="list-style-type: none"> • Maintenance frequency of vehicles and machineries 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	All construction areas	<ul style="list-style-type: none"> • No visible exhaust plume, dark smoke etc. 	<ul style="list-style-type: none"> • During entire construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge 	HDB/ SO
	On-site Air Quality Monitoring									

	Particulate matter emission from construction activities	<ul style="list-style-type: none"> PM_{2.5} and PM₁₀ 	<ul style="list-style-type: none"> Dust sampler 	Spread across entire project site	<ul style="list-style-type: none"> Singapore Ambient Air Quality Targets 	<ul style="list-style-type: none"> 24hr (1 day) continuous monitoring Once a Month 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge 	HDB/ SO
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6.2 Noise Management Plan

This noise management plan provides overall management framework for mitigation measures and monitoring requirements. A detailed Noise Management Plan (NMP) in accordance with NEA requirement is to be prepared incorporating below information as well as additional information such as baseline noise levels, and corrected noise standard limits.

6.2.1 Applicable Legislations

- Environmental Protection and Management Act 2002, Part VIII Noise Control
- Environmental Protection and Management (Control of Noise at Construction Sites) Regulations 2008
- NEA Code of Practice on Pollution Control SS 593 (2013)
- LTA Best Environmental Practices: Noise Control at LTA Sites (2013)
- Code of Practice for Noise Control on Construction and Demolition Sites SS602 (2014)

6.2.2 Identified Impacts and Recommended Mitigation Measures

Identified Impacts	Recommended Mitigation Measures
<ul style="list-style-type: none"> Disturbance to wildlife due to noise Impact to construction workers and nearby residential areas due to exposure to high 	<p><u>Existing (AECOM)</u></p> <ul style="list-style-type: none"> Avoid carrying out any work at night and minimise noise even in daytime. Adhere to NEA's noise control guidelines. To source for quieter construction equipment as far as possible. E.g., through use of silent piler. Plant more trees along the edge of the forest can serve as a natural barrier to light, noise and filter dust that comes from the construction site <p><u>Additional (TAC)</u></p> <ul style="list-style-type: none"> Personnel are to wear appropriate Personal Protective Equipment (PPE) at all times while on the construction site Quieter equipment and vehicles with low noise levels to be used

Identified Impacts	Recommended Mitigation Measures
noise levels of construction activities	<ul style="list-style-type: none"> • All noise and acoustic barriers to be able to achieve at least 10 dB(A) noise reduction from source noise levels • No night works (i.e., limit construction activities to 8 am – 6 pm), except in the case of work exigencies and planned nightwork, with the implementation of the LMP approved by NParks • To consider erection of temporary acoustic barriers around piling equipment • For piling work, to consider the use of quieter piling methods • Acoustic enclosures to be considered for compressors, generators, drilling tools etc. • Noise level monitoring throughout all phases to ensure that the construction noises remain within acceptable limits • Display signboards near the Core Conservation Area to create awareness of proper behaviours within natural areas

6.2.3 Monitoring Requirements

Noise Monitoring	On-site Visual and Compliance Monitoring								
	<ul style="list-style-type: none"> • Minimisation of biodiversity disturbance due to construction noise • Minimisation of nuisances to human due to construction noise 	Disturbance to biodiversity and human due to construction noise	<ul style="list-style-type: none"> • Noise barriers around construction work areas • Utilisation of quieter equipment and vehicles with low noise levels • Use of PPE by construction personnel at all times while on the construction site 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site	<ul style="list-style-type: none"> • Environmental Protection and Management (Control of Noise at Construction Sites) 2008 	<ul style="list-style-type: none"> • Monthly during entire construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contract or/ EMMP In-charge • ECO
Noise Monitoring	On-site Noise Monitoring								
		Noise generated from construction work	<ul style="list-style-type: none"> • Leq 12 hrs • Leq 1 hr • Leq 5 mins 	<ul style="list-style-type: none"> • Sound level meter 	Spread across entire project site	<ul style="list-style-type: none"> • Environmental Protection and Management (Control of Noise at 	<ul style="list-style-type: none"> • Continuous (24x7) boundary noise monitoring • During entire 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contract or/ EMMP In-charge • ECO

					Construction Sites) 2008	construction phase			
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6.3 Water Pollution Management Plan

6.3.1 Applicable Legislations

- Sewerage and Drainage Act 2001
- Sewerage and Drainage (Surface Water Drainage) Regulations 2007
- Sewerage and Drainage (Trade Effluent) Regulations revised 2007
- LTA Best Environmental Practices: Earth Control Measures (2014)
- Environmental Protection and Management Act 2002, Part V on water pollution
- Environmental Protection and Management Act (Trade Effluent) Regulations 2008
- PUB Code of Practice on Surface Water Drainage (2018)
- LTA, Best Environmental Practices: Water Resource Management at LTA Sites (2011)
- PUB Handbook on Managing Urban Runoff (2013)
- PUB Guidebook on Erosion and Sediment Control at Construction Sites (2018)

6.3.2 Identified Impacts and Recommended Mitigation Measures

Surface Water Quality

Identified Impacts	Recommended Mitigation Measures
<ul style="list-style-type: none"> • Land-use change due to the future development • Sediment loads from construction activities • Changes in water quality due to overflow causing cross contamination of 	<ul style="list-style-type: none"> • Diversion of stormwater run-off from the existing drain to the swamp forest • Diversion of stormwater run-off from future development to freshwater stream • Silt curtain installation in freshwater pond • Implementation proper Earth Control Measures (ECMs). • Contractor to provide storage tanks of adequate size and sufficient numbers to temporarily store trade effluent before treatment and disposal. • Contractor to provide sampling point and inspection for collection of trade effluent to be tested for parameters stipulated in the Regulations, depending on the discharge point (i.e., sewer, watercourse, controlled watercourse).

Identified Impacts	Recommended Mitigation Measures
<p>temporary ECM tank in excavation zone 2-1</p>	<ul style="list-style-type: none"> • Regular water quality monitoring is to be conducted according to the proposed Environmental Monitoring Plan during construction and post-construction stage. • Regular monitoring of discharged flow rate. (Monthly) • Contractor should install and maintain trade effluent treatment facilities as per NEA's requirements. • Appropriate concrete wash out areas should be provided and should not be performed in or near any water body. • Storage silos should have secondary containment. • To ensure that bentonite is contained within the working area and does not enter any watercourses or surface water drains. • Bentonite use should be monitored so that excessive use could be identified to prevent bentonite materials from escaping into the ground and potentially polluting groundwater. • Vehicle fuelling and major maintenance to be minimised within the project area. • Foreign material should not be illegally disposed at the water bodies but removed from site by an NEA-licensed general waste collector. • Appropriate concrete wash out areas should be provided and should not be performed in or near any water body. • Emergency spill kits should be provided by contractor on site in the event of any chemical spillages. Emergency response team should also be trained in the use of these spill kits.

6.3.3 Monitoring Requirements

<p>Water Quality Monitoring</p> <ul style="list-style-type: none"> Minimisation of impact to stream within proposed CCA identified in HDB's EIS report for Woodlands North due to contaminated site run-off Minimisation of impact to terrestrial habitats due to erosion of topsoil 	On-site Visual and Compliance Monitoring								
	ECM non-compliance	<ul style="list-style-type: none"> Verify implementation of ECM Plan Perimeter cut-off drains, perimeter silt fence, silt traps, sedimentation basin and silt treatment system 	<ul style="list-style-type: none"> Visual monitoring Compliance check ECM checklist 	Construction area with earthworks	ECM Plan designed by a QECP	<ul style="list-style-type: none"> Daily compliance monitoring During entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO QECP 	HDB/ SO
	On-site Water Quality Monitoring								
	ECM discharge (sediment runoff)	<ul style="list-style-type: none"> Total Suspended Solids (TSS) 	<ul style="list-style-type: none"> Implementation of TSS monitor and CCTV including a Silty Imagery Detection System (SIDS) 	<ul style="list-style-type: none"> Final ECM discharge points 	<ul style="list-style-type: none"> Less than 50 mg/L for TSS Sewerage and Drainage (Surface Water Drainage) Regulation 2007 	<ul style="list-style-type: none"> Real-time continuous during entire construction phase 	<ul style="list-style-type: none"> TSS report Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO 	HDB/ SO
	Contamination of water resources through trade effluent discharge	<ul style="list-style-type: none"> All parameters identified in EPM (Trade Effluent) Regulations for Controlled Watercourse 	<ul style="list-style-type: none"> Ex-situ monitoring 	<ul style="list-style-type: none"> At every discharge outlet 	<ul style="list-style-type: none"> EPM (Trade Effluent) Regulations for Controlled Watercourse 	<ul style="list-style-type: none"> Monthly during entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO 	HDB/ SO

		<ul style="list-style-type: none"> • Additional parameters: • Aluminium, Conductivity, Turbidity, Total nitrogen, Total phosphorous, Total organic carbon, Ammonia, Enterococcus 							
	Degradation of stream habitat (Construction phase monitoring)	<ul style="list-style-type: none"> • All parameters identified in EPM (Trade Effluent) Regulations for Controlled Watercourse 	<ul style="list-style-type: none"> • In-situ and ex-situ monitoring 	<ul style="list-style-type: none"> • Same locations as per baseline surveys at the stream 	<ul style="list-style-type: none"> • EPM (Trade Effluent) Regulations for Controlled Watercourse • Baseline results 	<ul style="list-style-type: none"> • Monthly during entire construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge • ECO 	HDB/ SO
	Degradation of stream habitat (Operational phase monitoring)	<ul style="list-style-type: none"> • All parameters identified in EPM (Trade Effluent) Regulations for Controlled Watercourse • Flow velocity 	<ul style="list-style-type: none"> • In-situ and ex-situ monitoring 	<ul style="list-style-type: none"> • Same locations as per baseline surveys at the stream 	<ul style="list-style-type: none"> • EPM (Trade Effluent) Regulations • Baseline results 	<ul style="list-style-type: none"> • Monthly for 6 consecutive months after construction is complete 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge • ECO 	HDB/ SO

6.4 Vibration Management Plan

As there will be no demolition work involved during this phase, vibration monitoring can be omitted.

6.5 Light Management Plan

6.5.1 Identified Impacts and Recommended Mitigation Measures

Identified Impacts	Recommended Mitigation Measures
<ul style="list-style-type: none"> Disturbance to the flora and fauna due to light coming from construction activities 	<ul style="list-style-type: none"> Construction lights shall be directed downwards and inwards, towards project site (i.e., directly away from forested areas) No night works would be allowed. All unnecessary lights should be turned off outside working hours

6.5.2 Monitoring Requirements

Light Impact Monitoring	On-site Visual and Compliance Monitoring								
	<ul style="list-style-type: none"> Minimisation of light pollution impacts on ecological processes 	Light pollution affecting sensitive species	<ul style="list-style-type: none"> Appropriate positioning of lights Scheduling of activity during nightworks Turn off all unnecessary lights outside working hours 	<ul style="list-style-type: none"> Visual monitoring Compliance check 	Entire project site (near forested area)	<ul style="list-style-type: none"> Absence of nightworks All artificial lights to be downward facing, turned away from forested areas 	During entire construction phase	Monthly Environmental Performance Report	<ul style="list-style-type: none"> Contractor/ EMMP In-charge Ecologist

6.6 Waste Management Plan

6.6.1 Applicable Legislations

- Environmental Protection and Management Act 2002, Part VII on Hazardous Substances
- Environmental Protection and Management (Hazardous Substances) Regulations 2008
- Environmental Public Health (General Waste Collection) Regulations 2000
- Environmental Public Health (Toxic Industrial Waste) Regulations 2000
- Best Environmental Practices: Construction Waste Management at LTA Sites (2009)

6.6.2 Identified Impacts and Recommended Mitigation Measures

Identified Impacts	Recommended Mitigation Measures
<ul style="list-style-type: none"> • Disposal of cut vegetation • Disposal of excavated material • Disposal of general waste material • Disposal of hazardous waste • Human-Wildlife conflict 	<ul style="list-style-type: none"> • To develop solid waste management plan • Timber/wood to be recovered for use in the wood industry as far as possible • Surplus excavated material to be reused within project site as fill, landscaping, erosion control and restoration wherever practicable • Scrap metals to be recovered and sent for recycling as scrap • Inert general waste to be collected and disposed through an NEA-licensed general waste collector • All non-hazardous wastes to be handled and disposed of in accordance with EPH (General Waste Collection) Regulations • All hazardous wastes to be handled and disposed of in accordance with EPH (Toxic Industrial Wastes) Regulations • Disposal of hazardous waste to be conducted by an NEA-licensed general waste collector for hazardous waste • Installation of monkey-proof bins

6.6.3 Monitoring Requirements

Waste Management Monitoring	On-site Visual and Compliance Monitoring								
	<ul style="list-style-type: none"> • Minimising the impacts due to improper disposal of hazardous and general waste 	Improper disposal of hazardous waste leading to land pollution	<ul style="list-style-type: none"> • Engagement of NEA licensed general waste collector for hazardous waste • Record of waste disposal 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site	<ul style="list-style-type: none"> • Environmental Public Health (Toxic Industrial Wastes) Regulation, 2000 	During entire construction phase	Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor/ EMMP In-charge • ECO • QCEP
Improper disposal of construction waste leading to land		<ul style="list-style-type: none"> • Verify implementation of solid waste management plan • Engagement of NEA licensed 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	<ul style="list-style-type: none"> • Construction waste storage location • General 	<ul style="list-style-type: none"> • Environmental Public Health (General Waste Collection) Regulation, 	During entire construction phase	Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor/ EMMP In-charge • ECO 	HDB/ SO

	pollution	general waste collector • Record of waste disposal		waste storage location	2000				
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6.7 Vector Control Plan

6.7.1 Applicable Legislations

- Control of Vectors and Pesticides Act 2002
- NEA guidelines on “Rainwater Collection System and Mosquito Prevention
- LTA Best Environmental Practices: Vector Control at LTA Sites (2019)

6.7.2 Identified Impacts and Recommended Mitigation Measures

Identified Impacts	Recommended Mitigation Measures
<ul style="list-style-type: none"> • Increase in the number of mosquitoes may cause irritation to people residing nearby • Increase in the number of vectors may cause irritation to people residing nearby • Increase in incidence of dengue fever and vector-related diseases (secondary impact) 	<ul style="list-style-type: none"> • Contractor to engage an NEA-registered vector control operator to prepare and implement vector management plan • An in-house vector control team to check construction sites for breeding of mosquitoes • Construction worksite to be kept free of litter; construction wastes shall be disposed promptly into bulk waste containers and the containers shall be emptied daily • Educate residents on household practices to control mosquito breeding • Anti-mosquito oil and insecticides including BTI shall be applied into stagnant water at least once a week. The application should be repeated after rain as the oil and insecticides would be washed away by the rain • Thermal fogging shall not be carried out due to location of project site within forested area • Worksite shall be kept litter-free and refuse bins shall always be covered tightly • Construction workers' food provisions shall be stored in rodent-proof rooms or cabinets • In-house vector control team and vector control operator to check for rodent burrows every week • To implement mitigation measures to control mosquito numbers and other vectors • To aid the authorities to investigate outbreaks of vector-borne diseases if required • Any significant increase in numbers of vectors shall be reported to the NEA and investigated

6.7.3 Monitoring Requirements

On-site Visual and Compliance Monitoring									
Vector Monitoring <ul style="list-style-type: none"> Minimising the impacts due to increase in vector related diseases 	Increase in the Incidence of vectors & related diseases	<ul style="list-style-type: none"> Verify implementation of vector control management plan Engagement of NEA registered vector control operator Appointment of an in-house vector control team 	<ul style="list-style-type: none"> Visual monitoring Compliance check 	Entire project site	<ul style="list-style-type: none"> Vector control management plan Control of Vectors and Pesticides Act, 2002 	<ul style="list-style-type: none"> During entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor/ EMMP In-charge ECO 	HDB/ SO

7 ENVIRONMENTAL MONITORING PLAN

The summary of the proposed Environmental Monitoring Plan is presented in this chapter. Environmental monitoring parameters are to follow the locations identified in Figure 7.1. The updated monitoring locations and the discharge points would be updated if there are any changes in future the contractor comes on board, subjected to changes when we receive the construction plan.

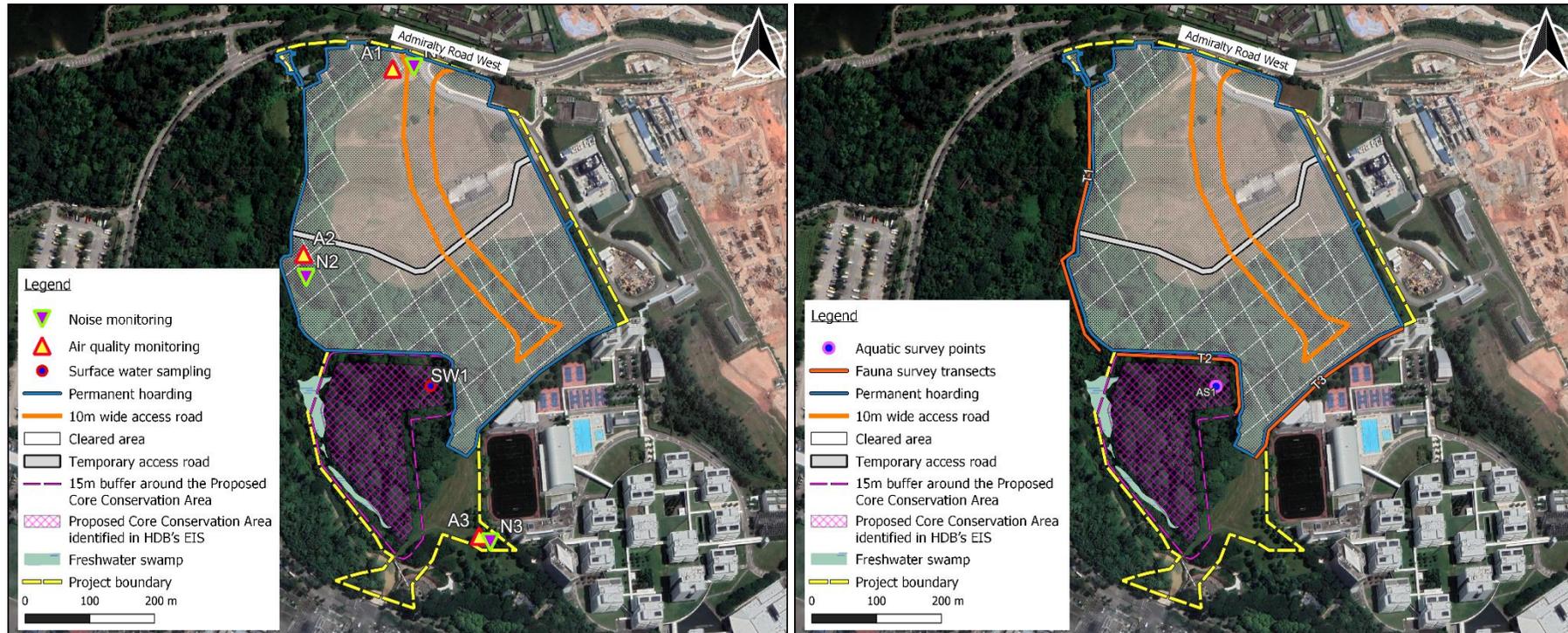


Figure 7.1 Monitoring locations during construction phase.

It is recommended to review the monitoring plan and locations regularly to update or adjust the monitoring requirements based on the various site considerations such as work progress, site utilisation, change in work methods, environmental incident, failure of measures etc.

Table 7.1. Environmental monitoring plan for construction phase

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
Biodiversity Monitoring <ul style="list-style-type: none"> • Avoiding clearance of vegetation outside working boundaries • Minimization of disturbance to sensitive species • Minimization of disturbance to sensitive habitats • Avoiding human wildlife conflict 	On-site Visual and Compliance Monitoring								
	Habitat Loss and Degradation	<ul style="list-style-type: none"> • Hoarding to be erected prior to vegetation clearance to demarcate working boundaries • Terrestrial & Aquatic Fauna monitoring • Retain vegetation within Core Conservation Area 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check • Water quality monitoring 	Entire project site (near / within forested area)	<ul style="list-style-type: none"> • Proper installation of temporary hoarding/ barriers • Absence of vegetation clearance outside working boundaries 	• Fortnightly during construction phase	• Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor / EMMP In-charge • Ecologist • Arborist 	HDB/ Superintending Officer (SO)
	Species Mortality	<ul style="list-style-type: none"> • Properly designated Tree Protection Zones (TPZ) prior to construction • Visual inspection of trees and holes for nesting birds prior to felling • Directional clearance of vegetation • Translocation of identified plant species 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site (near / within forested area)	<ul style="list-style-type: none"> • Proper TPZ installation • Retention of tree health • Absence of mechanical damage on trees • Absence of nesting birds • Absence of large mammal species • Absence of 	<ul style="list-style-type: none"> • Monthly during construction phase (for TPZ inspection) • Prior to vegetation clearance (for wildlife translocation and fauna inspection) • Daily for fauna 	• Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor / EMMP In-charge • Ecologist • Arborist 	HDB/ SO

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
		<ul style="list-style-type: none"> • Translocation of targeted animal species • Daily checks of ECM nets for entrapped fauna 			entrapped fauna	entrapment			
	Human-wildlife Conflict	<ul style="list-style-type: none"> • Briefing to on-site workers on dos and don'ts, as well as notes on safety. • Areas are to be demarcated for food consumption and storage 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site (near forested area)	<ul style="list-style-type: none"> • No injuries due to wild animals 	<ul style="list-style-type: none"> • Fortnightly during construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge • Ecologist 	HDB/ SO
Noise Monitoring	<u>On-site Visual and Compliance Monitoring</u>								
	<ul style="list-style-type: none"> • Minimisation of biodiversity disturbance due to construction noise • Minimisation of nuisances to human due 	Disturbance to biodiversity and human due to construction noise	<ul style="list-style-type: none"> • Noise barriers around construction work areas • Utilisation of quieter equipment and vehicles with low noise levels • Use of PPE by construction personnel at all times while on the construction site 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site	<ul style="list-style-type: none"> • Environmental Protection and Management (Control of Noise at Construction Sites) 2008 	<ul style="list-style-type: none"> • Monthly during entire construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge • ECO

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
to construction noise	<u>On-site Noise Monitoring</u>								
	Noise generated from construction work	<ul style="list-style-type: none"> Leq 12 hrs Leq 1 hr Leq 5 mins 	<ul style="list-style-type: none"> Sound level meter 	Spread across entire project site	<ul style="list-style-type: none"> Environmental Protection and Management (Control of Noise at Construction Sites) 2008 	<ul style="list-style-type: none"> Continuous (24x7) boundary noise monitoring During entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO 	HDB/ SO
Water Quality Monitoring <ul style="list-style-type: none"> Minimisation of impact to stream within proposed CCA identified in HDB's EIS report for Woodlands North due to contaminated site run-off Minimisation of impact to terrestrial 	<u>On-site Visual and Compliance Monitoring</u>								
	ECM non-compliance	<ul style="list-style-type: none"> Verify implementation of ECM Plan Perimeter cut-off drains, perimeter silt fence, silt traps, sedimentation basin and silt treatment system 	<ul style="list-style-type: none"> Visual monitoring Compliance check ECM checklist 	Construction area with earthworks	<ul style="list-style-type: none"> ECM Plan designed by a QECP 	<ul style="list-style-type: none"> Daily compliance monitoring During entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO QECP 	HDB/ SO
	<u>On-site Water Quality Monitoring</u>								
ECM discharge (sediment runoff)	Total Suspended Solids (TSS)	<ul style="list-style-type: none"> Implementation of TSS monitor and CCTV including a Silty Imagery Detection 	<ul style="list-style-type: none"> Final ECM discharge points 	<ul style="list-style-type: none"> Less than 50 mg/L for TSS Sewerage and Drainage (Surface Water Drainage) Regulation 2007 	<ul style="list-style-type: none"> Real-time continuous during entire construction phase 	<ul style="list-style-type: none"> TSS report Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO 	HDB/ SO	

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
habitats due to erosion of topsoil			System (SIDS)						
	Contamination of water resources through trade effluent discharge	<ul style="list-style-type: none"> All parameters identified in EPM (Trade Effluent) Regulations for Controlled Watercourse Additional parameters: Aluminium, Conductivity, Turbidity, Total nitrogen, Total phosphorous, Total organic carbon, Ammonia, Enterococcus 	<ul style="list-style-type: none"> Ex-situ monitoring 	<ul style="list-style-type: none"> At every discharge outlet 	<ul style="list-style-type: none"> EPM (Trade Effluent) Regulations for Controlled Watercourse 	<ul style="list-style-type: none"> Monthly during entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO 	HDB/ SO
	Degradation of stream habitat (Construction phase monitoring)	<ul style="list-style-type: none"> All parameters identified in EPM (Trade Effluent) Regulations for Controlled Watercourse 	<ul style="list-style-type: none"> In-situ and ex-situ monitoring 	<ul style="list-style-type: none"> Same locations as per baseline surveys at the stream 	<ul style="list-style-type: none"> EPM (Trade Effluent) Regulations for Controlled Watercourse Baseline results 	<ul style="list-style-type: none"> Monthly during entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO 	HDB/ SO
	Degradation of stream habitat (Operational phase)	<ul style="list-style-type: none"> All parameters identified in EPM (Trade Effluent) Regulations for 	<ul style="list-style-type: none"> In-situ and ex-situ monitoring 	<ul style="list-style-type: none"> Same locations as per baseline 	<ul style="list-style-type: none"> EPM (Trade Effluent) Regulations Baseline results 	<ul style="list-style-type: none"> Monthly for 6 consecutive months after construction 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor / EMMP In-charge ECO 	HDB/ SO

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
	monitoring)	Controlled Watercourse • Flow velocity		surveys at the stream		is complete			
Air Quality Monitoring <ul style="list-style-type: none"> • Minimisation of human health & biodiversity impacts due to dust pollution • Minimisation of human health impacts due to exhaust emissions 	<u>On-site Visual and Compliance Monitoring</u>								
	Fugitive dust emissions	<ul style="list-style-type: none"> • Verify implementation of dust suppression plan • Watering to reduce dust emissions from exposed areas • Washing bay • Implementation of vehicular speed limit • Covered stockpiles • Use of PPE (face mask) by construction personnel 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	All construction areas	<ul style="list-style-type: none"> • Approved dust suppression plan 	<ul style="list-style-type: none"> • During entire construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge 	HDB/ SO
	Exhaust emission from construction machineries operations	<ul style="list-style-type: none"> • Maintenance frequency of vehicles and machineries 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	All construction areas	<ul style="list-style-type: none"> • No visible exhaust plume, dark smoke etc. 	<ul style="list-style-type: none"> • During entire construction phase 	<ul style="list-style-type: none"> • Monthly Environmental Performance Report 	<ul style="list-style-type: none"> • Contractor / EMMP In-charge 	HDB/ SO
	<u>On-site Air Quality Monitoring</u>								

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
	Particulate matter emission from construction activities	• PM2.5 and PM10	• Dust sampler	Spread across entire project site	• Singapore Ambient Air Quality Targets	• 24hr (1 day) continuous monitoring • Once a Month	• Monthly Environmental Performance Report	• Contractor / EMMP In-charge	HDB/ SO
Light Impact Monitoring • Minimisation of light pollution impacts on ecological processes	On-site Visual and Compliance Monitoring								
	Light pollution affecting sensitive species	<ul style="list-style-type: none"> • Appropriate positioning of lights • Scheduling of activity during nightworks • Turn off all unnecessary lights outside working hours 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site (near forested area)	<ul style="list-style-type: none"> • Absence of nightworks • All artificial lights to be downward facing, turned away from forested areas 	• During entire construction phase	• Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor/ EMMP In-charge • Ecologist 	HDB/ SO
Vector Monitoring • Minimising the impacts due to increase in vector related diseases	On-site Visual and Compliance Monitoring								
	Increase in the Incidence of vectors & related diseases	<ul style="list-style-type: none"> • Verify implementation of vector control management plan • Engagement of NEA registered vector control operator • Appointment of an in-house vector control team 	<ul style="list-style-type: none"> • Visual monitoring • Compliance check 	Entire project site	<ul style="list-style-type: none"> • Vector control management plan • Control of Vectors and Pesticides Act, 2002 	• During entire construction phase	• Monthly Environmental Performance Report	<ul style="list-style-type: none"> • Contractor/ EMMP In-charge • ECO 	HDB/ SO

Monitoring Category	Impact	Monitoring Parameters	Monitoring Method	Location	Standards / Criteria	Time / Duration / Frequency	Reporting	Implementation	Supervision
Waste Management Monitoring <ul style="list-style-type: none"> Minimising the impacts due to improper disposal of hazardous and general waste 	On-site Visual and Compliance Monitoring								
	Improper disposal of hazardous waste leading to land pollution	<ul style="list-style-type: none"> Engagement of NEA licensed general waste collector for hazardous waste Record of waste disposal 	<ul style="list-style-type: none"> Visual monitoring Compliance check 	Entire project site	<ul style="list-style-type: none"> Environmental Public Health (Toxic Industrial Wastes) Regulation, 2000 	<ul style="list-style-type: none"> During entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor/ EMMP In-charge ECO QECP 	HDB/ SO
	Improper disposal of construction waste leading to land pollution	<ul style="list-style-type: none"> Verify implementation of solid waste management plan Engagement of NEA licensed general waste collector Record of waste disposal 	<ul style="list-style-type: none"> Visual monitoring Compliance check 	<ul style="list-style-type: none"> Construction waste storage location General waste storage location 	<ul style="list-style-type: none"> Environmental Public Health (General Waste Collection) Regulation, 2000 	<ul style="list-style-type: none"> During entire construction phase 	<ul style="list-style-type: none"> Monthly Environmental Performance Report 	<ul style="list-style-type: none"> Contractor/ EMMP In-charge ECO 	HDB/ SO

8 EMMP REPORTING

8.1 Site Environmental Control Report by Environmental Control Officer

As per Code of Practice for Environmental Control Officers for Construction Sites, the ECO shall prepare the Site Environmental Control Programme before work commences at the worksite. Further, ECO shall submit the Site Environmental Control Report (SECR) to Project Manager covering assessment of the environmental efforts carried out and review the effectiveness of these measures.

The ECO shall inspect the construction activities regularly and routinely to ensure that the appropriate environmental protection and pollution control mitigation measures are properly and timely implemented based on the EMMP's recommendations. ECO shall record all observations and actions taken to report them in the SECR. This SECR should form part of EMMP monthly performance report described in next section.

8.2 Monthly Environmental Performance Report

A monthly Environmental Performance Report is to be prepared by EMMP In-charge in assistance with EMMP Team and to be submitted to SO, project management team and relevant authorities. The Performance Report is to include the description of the construction activities being carried out at site during the month and status of implementation of EMMP including information on environmental incidence if any. Table 8.1 provides the monthly environmental performance reporting framework.

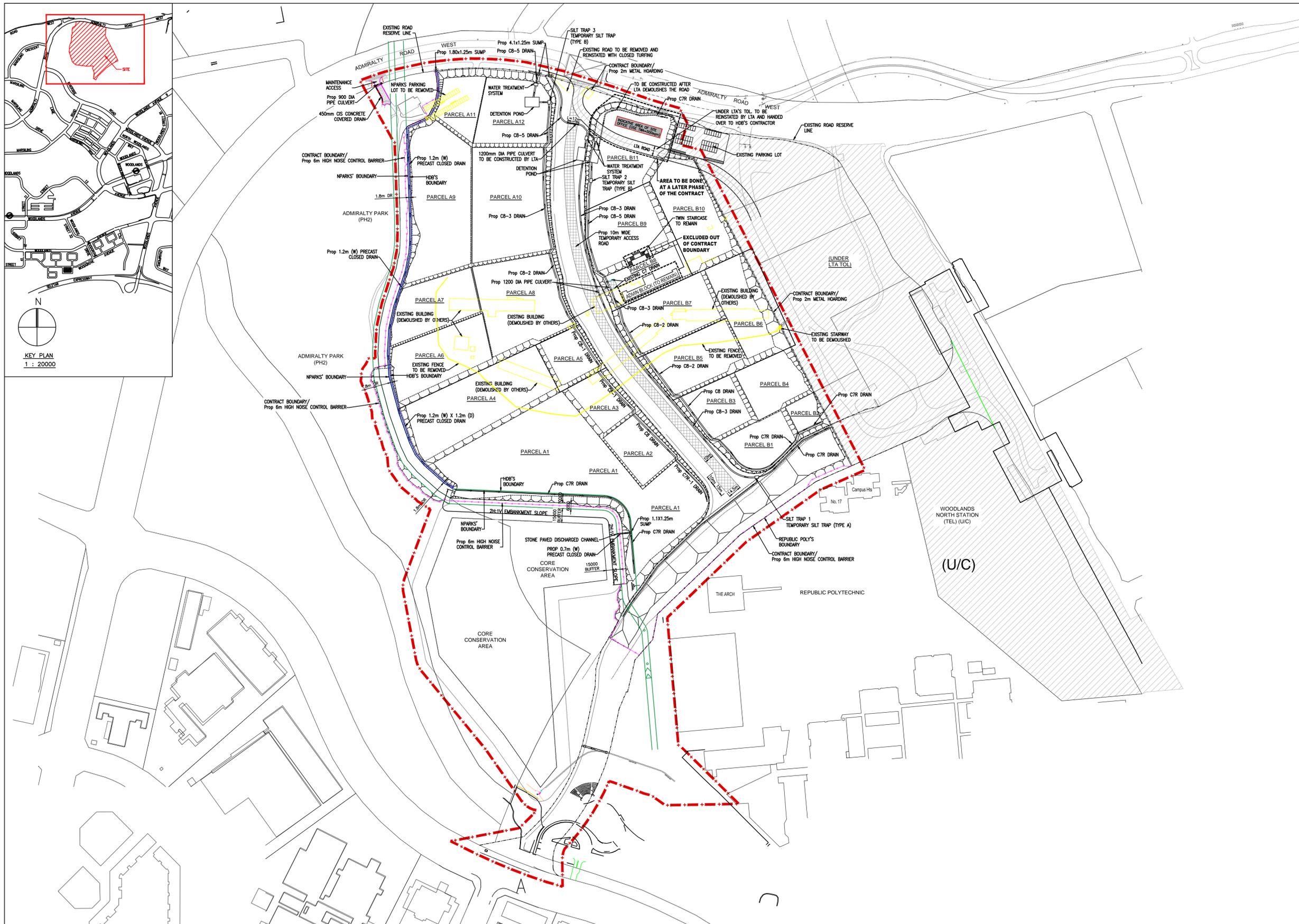
Table 8.1. Monthly Environmental Performance Report framework

Sr. No.	Item	Description
1.	Project Status	Update on project activities within project area
2.	EMMP Implementation Status	Daily observations and actions taken, ECO report, ECM performance checklist, Biodiversity specialists' observations and recommendations, Physical monitoring results (Noise, Air, Surface water quality, ECM discharge) and assessment, Vector control report, Waste disposal record
3.	Environmental Awareness Training	Record of periodic biodiversity awareness training/ toolbox briefings
4.	Environmental Incidence	Environmental Incident report and corrective actions, public feedback & response
5.	Authority Inspection & Findings	Record of Authority inspection visits (i.e., NParks, NEA, PUB) and corrective actions

8.3 Environmental Close-off Report

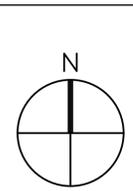
A final environmental close-off report should be prepared after construction work is completed to confirm that no residual impacts are observed.

APPENDIX A – OVERALL SITE PLAN



LEGEND:

	EMMP STUDY AREA (APPROX. 18.8 HA)
	6m HIGH NOISE CONTROL BARRIER
	Prop 2m HIGH HOARDING



NOTES:
 1. THE CONTRACTOR MUST CHECK ALL DIMENSIONS ON SITE. ANY DISCREPANCIES IN THE FIGURED DIMENSIONS ARE TO BE REPORTED IMMEDIATELY TO THE ARCHITECT OR ENGINEER. ON NO ACCOUNT MUST THIS DRAWING BE SCALED.

AMENDMENT	DRAWN & CHECKED BY	DESIGN ENGINEER	QUALIFIED PERSON

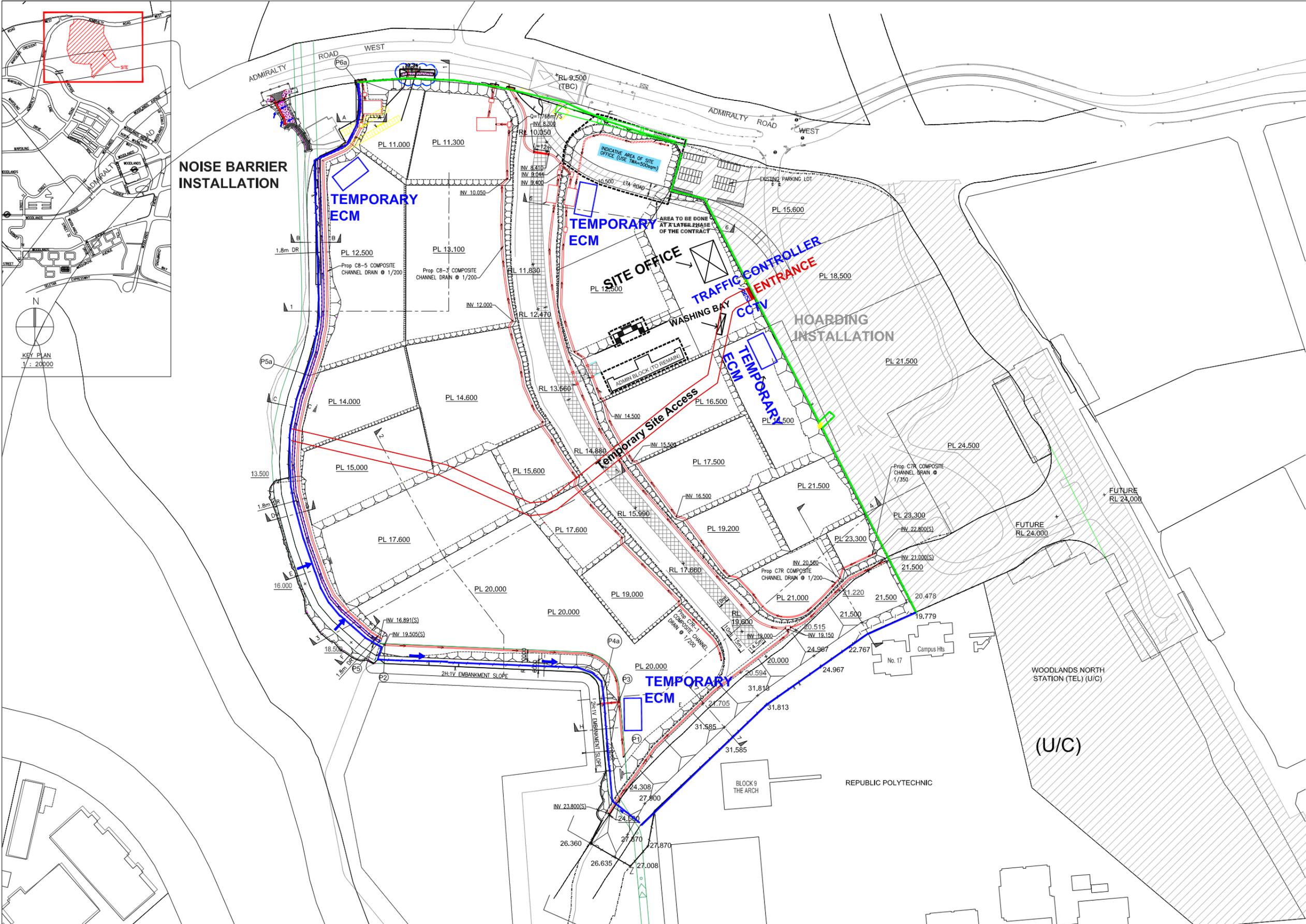
TENDER DRAWING

CLIENT
HOUSING & DEVELOPMENT BOARD
 HDB Hub 480 Lorong 6 Toa Payoh
 Singapore 310480
 CLIENT SIGNATURE: _____

DRAWING NO.	REVISION :
PROJECT TITLE SPECIALIST CONSULTANCY SERVICES AT HDB DEVELOPMENT (NORTHERN) PROJECT 1	
LOT NO. : 04781M, 04921N & 04923L	MUKIM NO. : 13
JOB TITLE ENVIRONMENTAL MANAGEMENT AND MONITORING STUDY AREA	
DRAWING TITLE ENVIRONMENTAL MANAGEMENT AND MONITORING STUDY AREA	
SCALE: 1 : 2000	DATE: JAN 2022
DRAWN & CHECKED BY: Marilyn Mina	

Surbana Jurong Consultants Pte. Ltd. 168 Jalan Bukit Merah #01-01 Connection One Singapore 150168 Tel: +65 62491288 Fax: +65 62739090 www.surbanajurong.com Company Regn No: 200304951Z	
DRAWING NO. SJ-IF-HAWD-F2206-CE-001	REVISION :
Xin Yu Teo, Engr DESIGN ENGINEER	Er. Khoo Tou Khiong, Sr Consultant QUALIFIED PERSON
<small>THE OWNERSHIP OF THE COPYRIGHT IN THIS DRAWING IS RETAINED BY SURBANA JURONG CONSULTANTS PTE. LTD. WHOSE CONSENT MUST BE SOUGHT BEFORE ANY USE OR REPRODUCTION OF THE DRAWING OR ANY PART THEREOF CAN BE MADE.</small>	

APPENDIX B – SITE UTILISATION PLAN

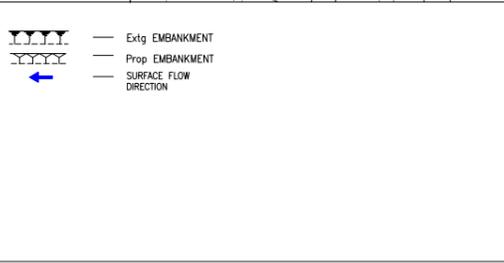


CORRIGENDUM 2

CLIENT HOUSING & DEVELOPMENT BOARD HDB Hub 480 Lorong 6 Toa Payoh Singapore 310480 CLIENT SIGNATURE:	
DRAWING NO. HB-F2024-CE-001	REVISION B
PROJECT TITLE EARTHWORKS AT WOODLANDS (CONTRACT 1)	
LOT NO. : 04781M, 04921N & 04923L	MUKIM NO. : 13
JOB TITLE EARTHWORKS AT WOODLANDS (CONTRACT 1)	
DRAWING TITLE OVERALL LAYOUT OF EARTHWORKS (PHASE 1)	
SCALE: 1 : 1500	DATE: SEP 2020
DRAWN & CHECKED BY: Marilyn Mino	

- GENERAL NOTES:**
- SLOPE OF EMBANKMENT TO BE 2.5 HORIZONTAL TO 1 VERTICAL (3H:1V) UNLESS OTHERWISE STATED WITH CLOSE TURFING ON 200 LAYER OF APPROVED SOIL MIXTURE.
 - REDUCED LEVELS ARE BASED ON SINGAPORE HEIGHT DATUM=0.000m
 - ALL DIMENSIONS SHOWN ARE IN mm UNLESS OTHERWISE STATED
 - ALL SLOPES TO HAVE MINIMUM 600mm CLEARANCE FROM PARCEL LINE
 - DRAIN LEVELS TO BE DECIDED/FINALISED ON SITE
 - THE DESIGNED LEVELS REFER TO THE SURVEY LEVELS AFTER TURF COMPLETION
 - EARTHWORK LEVEL TOLERANCE IS OF ±100mm
 - ALL DESIGNED PARCELS ARE TO BE CLOSE TURFED UNLESS OTHERWISE SPECIFIED
 - ALL DRAIN ARE PRECAST WITH GRADE C25/30 CONCRETE. LENGTH OF PRECAST UNIT SHALL BE 500mm AND 10mm CEMENT MORTAR JOINT SHALL BE PROVIDED BETWEEN THE PRECAST UNIT THROUGHOUT THE THICKNESS OF THE WALL
 - INTERMEDIATE SILT TRAPS ARE TO BE PROVIDED AT 50m C/C FOR THE TEMPORARY DRAINS. TYPE A SILT TRAP IS TO BE PROVIDED FOR C7R DRAINS WHILE TYPE B SILT TRAP IS TO BE PROVIDED FOR C8 DRAINS.

- LEGEND:**
- CONTRACT BOUNDARY
 - Prop 6m HIGH NOISE CONTROL BARRIER
 - Prop 2m HIGH HOARDING
 - DRAINAGE RESERVE LINE
 - Extg SPOT LEVEL
 - Extg DRAIN INVERT LEVEL
 - Extg PLATFORM LEVEL
 - Prop PLATFORM LEVEL (AVERAGE)
 - Prop SPOT LEVEL
 - Prop DRAIN INVERT LEVEL
 - Prop DRAIN SUMMIT INVERT LEVEL
 - Prop CULV INVERT LEVEL
- NOTES:**
- THE SOIL SHALL BE COMPACTED TO MIN 90% OF MAXIMUM DRY DENSITY (DEGREE OF COMPACTION) IN THE CASE OF MORE THAN 500mm BELOW FORMATION LEVEL OR 95% IN THE CASE OF WITHIN 500mm BELOW FORMATION LEVEL



NOTES:

- THE CONTRACTOR MUST CHECK ALL DIMENSIONS ON SITE. ANY DISCREPANCIES IN THE FIGURED DIMENSIONS ARE TO BE REPORTED IMMEDIATELY TO THE ARCHITECT OR ENGINEER. ON NO ACCOUNT MUST THIS DRAWING BE SCALED.
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AMENDMENT	DRAWN & CHECKED BY	DESIGN ENGINEER	QUALIFIED PERSON
A	Marilyn Mino	Xin Yu Teo	Khoo TK
B	Marilyn Mino	Xin Yu Teo	Khoo TK

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DRAWING NO. SJ-IF-HAWD-F2015-CE-001 REVISION **B**

Xin Yu Teo, Engr DESIGN ENGINEER
 Er. Khoo Tou Khiong, Sr Consultant QUALIFIED PERSON

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APPENDIX C – WILDLIFE / FAUNA INCIDENT FORM

WILDLIFE INCIDENT FORM

Part A – Wildlife Incident Details

The CEMMP In-charge is to complete the Form and submit to PM within 24 hours of reporting incident.

Reference No. (by CEMMP In-charge)			
Personnel	Reporting Person	Witness	
Name:			
Contact Number:			
Title / Company:			
Time / Date of Wildlife Encounter	Date	Time	
Affected Area			
Weather:	<input type="checkbox"/> Clear	<input type="checkbox"/> Overcast	<input type="checkbox"/> Thunderstorm
	<input type="checkbox"/> Sunny	<input type="checkbox"/> Others (To Describe):	
Actual Location:			
Description of Area:	<input type="checkbox"/> Vegetated area	<input type="checkbox"/> Non-vegetated area	
	<input type="checkbox"/> Excavated area	<input type="checkbox"/> Others (to describe):	
Activities Carried Out Nearby at Time of Incident:	If there are no active works near wildlife encountered, please state so.		

Details of Animal			
Animal:	Where identifiable, please provide [Common Name (Scientific Name)] If animal cannot be identified, carcass to be described to the best of ability.		
Animal Condition:	<input type="checkbox"/> Active	<input type="checkbox"/> Outwardly injured (e.g. bleeding, limping)	<input type="checkbox"/> Flattened
	<input type="checkbox"/> Stationary	<input type="checkbox"/> Decomposed	<input type="checkbox"/> Trapped
	<input type="checkbox"/> Others (to describe):		
Photographs:	1) Close-up of Animal <input type="checkbox"/> No Close-up available Please provide reason here if close-up photographs could not be obtained, e.g. unsafe to approach		
	2) Animal with surroundings or showing full width of road (if roadkill), indicating where the animal is.		
	<input type="checkbox"/> No photographs available. Reason: e.g. animal moved away too quickly		

Incident Details	
Incident Summary: To be filled by reporting party	Briefly describe when, what, who, where and how the incident happened. <i>Sample incident summary:</i> <i>[Personnel] was conducting [activity] on [date/time] when he observed an [animal] at [location]. The animal was observed to be [condition]. [Personnel] reported the incident to [contractor representative] who contacted the WMO. While awaiting wildlife response, [contractor] barricaded the area and continued monitoring for movement of animal.</i> If EMMP Specialist (Fauna) visited site: Recommended actions
Follow-up Actions: To be filled by CEMMP In-charge	<input type="checkbox"/> Animal rescued to NParks Shelter <input type="checkbox"/> Immediate relocation <input type="checkbox"/> Carcass transported to disposal location <input type="checkbox"/> Others: _____ <input type="checkbox"/> No Action Taken by CEMMP In-charge

Part B – Closure of Incident

Possible Causes	
What is/are the possible cause/s of the incident? (Man / Machine / Management / Medium / Mission)	
Preventive/Corrective Actions	Close-up
To be filled by CEMMP In-charge	To be filled by reporting party
1)	Close-up Action. Close-up Date
2)	Close-up Date
Closure of Incident Report	
Date of Closure of Incident Report:	
Acknowledged by PM (Name/Title):	