

Agreement No. CE 35/2012(CE)



Planning and Engineering Study for  
**Housing Sites in Yuen Long South**

INVESTIGATION

**Environmental Impact  
Assessment Report -  
Environmental Monitoring  
and Audit Manual**

July 2017

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# 1 Introduction

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## 1.1 Background

**1.1.1** In order to address the demand for land for housing, the Policy Addresses (i.e. from Year 2012 to Year 2015) announced the review of agricultural land in the North District and Yuen Long, which is mainly deserted or being used for industrial purposes and/or temporary storage purposes, as one of the land supply measures. Furthermore, the recent Policy Addresses in Year 2016 to Year 2017 mentioned Yuen Long South (YLS) development as a medium and long-term land supply measure.

**1.1.2** To optimise the use of degraded brownfield sites so as to release their development potential in meeting the territory's medium to long-term housing needs, the Planning and Engineering Study for the Housing Sites in YLS – Investigation (the Study) commenced in November 2012 to examine the future land use, optimise the development potential of the degraded brownfield, improve existing degraded environment and ascertain the feasibility for public and private housing developments and other uses within the YLS Potential development Area (PDA) with supporting infrastructures and community facilities (The Project).

**1.1.3** The YLS PDA is located to the south of Yuen Long New Town, and in the proximity of Tin Shui Wai New Town and the planned Hung Shui Kiu (HSK) New Development Area (NDA). The area is connected with the urban areas by strategic road links, including Route 3 and Yuen Long Highway (YLH).

**1.1.4** The PDA, which has an area of 223.5 hectares (ha), is surrounded by YLH to the north and Tai Lam Country Park to the south. The PDA includes the Tong Yan San Tsuen (TYST) area, a piece of land zoned “Undetermined” (“U”) on TYST Outline Zoning Plan (OZP) as well as two small pieces of land in the Tai Tong area which are zoned “Other Specified Uses” annotated “Rural Use” (“OU(RU)”) on Tai Tong OZP.

**1.1.5** The YLS PDA is currently rural in character with a mixture of land uses. The predominant uses are brownfield operations including open storage yards, warehouses, workshops, industrial operations, etc. These brownfield operations are intermingled with rural settlements and residential developments, agricultural land, livestock farms and vacant land. Proliferation of brownfield sites including open storage yards, warehouses and industrial workshops has resulted in degradation of the rural environment due to noise nuisances to surrounding residents, and



discharge of industrial waste water, i.e. from daily cleaning at the working area, waste water from workshops after heavy rainfall, etc. Furthermore, any of these industrial premises which may not be properly connected to sewer system could result in discharge of untreated sewage into nearby water bodies and hence deteriorate water quality.

**1.1.6** Planning Department (PlanD) and Civil Engineering and Development Department (CEDD) of the HKSAR commissioned Ove Arup and Partners Hong Kong Limited (Arup) in 2012 to undertake the Planning and Engineering Study for Housing Sites in YLS – Investigation (the Study). The Study will examine the future land use, optimise the development potential, and ascertain the feasibility for public and private housing developments in the YLS PDA. Specifically, the Study will:

- examine and identify sites within the YLS PDA for public and private housing developments, supporting Government, Institution or Community (G/IC) facilities, open space and/or amenities and other uses, and review the boundaries of the PDA;
- recommend appropriate development parameters for the development sites;
- ascertain the feasibility and acceptability of the Study proposals in terms of traffic and other infrastructure capacities, urban design, environment, air ventilation, etc.;
- identify and propose engineering infrastructure works that are needed to support the Study proposals; and
- undertake a three-stage Community Engagement (CE) Programme to solicit public views on the Study proposals within the PDA as input to this Study.

**1.1.7** The findings and recommendations of the Study will serve as a reference for the revision of the TYST OZP, Tai Tong OZP and the prevailing OZPs that will be affected by the development proposals to guide the YLS developments and engineering infrastructure upgrading works identified.

**1.1.8** The location of Project is shown in **Figure 1.1**. Descriptions of the Project elements have been further elaborated and presented in **Section 2.1**.

## **1.2 Purpose of the Manual**

**1.2.1** The purposes of this Environmental Monitoring and Audit (EM&A) Manual are to :

- Guide the set up of an EM&A programme to ensure compliance with the EIA recommendations;
- Specify the requirements for monitoring equipment;
- Propose environmental monitoring points, monitoring frequency etc;
- Propose Action and Limit Levels; and
- Propose Event and Action Plans.

**1.2.2** This Manual outlines the monitoring and audit programme for the construction and operation of the proposed Project and provides systematic procedures for monitoring, auditing and minimizing environmental impacts.

**1.2.3** Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines (HKPSG) have served as environmental standards and guidelines in the preparation of this Manual. In addition, this EM&A Manual has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (EIAO-TM).

**1.2.4** This Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) under the context of EM&A;
- Project organization for the EM&A works;
- The basis for, and description of the broad approach underlying the EM&A programme;
- Details of the methodologies to be adopted, including all laboratories and analytical procedures, and details on quality assurance and quality control programme;
- The rationale on which the environmental monitoring data will be evaluated and interpreted;
- Definition of Action and Limit Levels;
- Establishment of Event and Action Plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints; and

- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures.

### 1.2.5

For the purpose of this manual, the ER shall refer to the Engineer as defined in the Construction Contract, in cases where the Engineer's powers have been delegated to the ER, in accordance with the Construction Contract. The ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

## 2 Project Description

### 1.3 General Description of the Project

**1.3.1** The YLS PDA covers approximately 223.5 ha and is located to the south of Yuen Long New Town and bounded by YLH to the north and Tai Lam Country Park to the south. The PDA is divided into three areas, i.e. Area 1, Area 2 and Area 3. Other than development within the PDA, there are supporting infrastructure works outside the PDA boundaries, which include the following:

- New slip roads connecting the PDA to Pok Oi Interchange and a new PTI next to Yoho Midtown;
- New PTI next to Yoho Midtown;
- New TYST Reclaimed Water Service Reservoir and its associated works;
- Partial decking of Yuen Long Nullah along Kung Um Road and Kiu Hing Road;
- Modification works on the trunk roads connecting TSWW Interchange;
- Modification works on the primary distributor roads connecting TYST Interchange;
- Other new local roads connecting the PDA;
- Rising Main for water supplies and sewage;
- New sewer from YLS STW to existing inlet chamber of the NWNT effluent tunnel at San Wai for discharging to the Urmston Road submarine outfall.

### 1.4 Designated Project

**1.4.1** The Project is a Designated Project (DP) under Item 1 Schedule 3 of the EIA Ordinance - Engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100,000. To implement the Project, there are various infrastructure items among some of which are classified as DPs under Schedule 2 of the EIA Ordinance. The list and details are shown in **Figure 2.1** and the table below.

**Table 2.1** Summary of Schedule 2 DPs

DP Reference No.	Schedule 2 Designated Project		Work Component / Reference in RODP
DP1	Part I, A.1	A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major	Construction of Trunk Roads (TSWW Interchange)

DP Reference No.	Schedule 2 Designated Project		Work Component / Reference in RODP
		extensions or improvements to existing road	
DP2	Part I, A.1	A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major extensions or improvements to existing road	Construction of new Primary Distributor Roads (TYST Interchange)
DP3	Part I, A.1	A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major extensions or improvements to existing road	Construction of two new Distributor Roads (Road D1 to Road D2)
DP4 <sup>[1]</sup> (By others)	Part I, A.3	A tramway and its associated stations	Environmentally Friendly Transport Services (EFTS)
DP5	Part I, A.8	A road or railway bridge more than 100 m in length between abutments	Construction of slip roads at the TYST Interchange
DP6	Part I, A.9	A road fully enclosed by decking above and by structure on the sides for more than 100 m	Construction of partly depressed road/ underpass located at TSWW Interchange and full enclosures at TYST Interchange
DP7 <sup>[1]</sup> (by others)	Part I, F.2	Sewage treatment works with an installed capacity of more than 5,000 m <sup>3</sup> per day and located at less than 200 m from existing / planned receivers	Construction of YLS STW (Site OU3.3)
DP8	Part I, F.3(b)	A sewage pumping station with an installed capacity of more than 2,000 m <sup>3</sup> per day and located at less than 150 m from existing / planned receivers	Construction of two new SPSs (Sites OU1.12 and OU2.2)
DP9 <sup>[1]</sup> (by others)	Part I, F.4	An activity for the reuse of treated sewage effluent from a treatment plant	Construction of Reclaimed Water Service Reservoir for reuse of reclaimed water
DP10	Part I, I.1(b)(vii)	A drainage channel or river training and diversion works less than 300 m from the nearest boundary of an existing conservation area	Yuen Long Nullah revitalisation/decking along Kung Um Road and Kiu Hing Road

Notes:

[1] The project element is a separate DP to be constructed and operated by the future relevant project proponents. The future relevant project proponents shall conduct separate studies, including EIA for approval under the EIA Ordinance if necessary, to determine its feasibility and implementation programme. However, the site formation work for this DP will be covered in this EIA.

### ***DP 1, 2 and 3 Part I, A.1 – Construction of trunk roads, primary distributor roads and district distributor roads***

#### **1.4.2**

The major objective of the proposed road network is to improve connectivity with Yuen Long New Town, the proposed HSK NDA, and provides a direct access and egress to YLH. Long Hon Road is proposed

to be upgraded and extended to Kung Um Road to form a key corridor of the PDA.

**1.4.3** The road system would provide direct and convenient access of freight traffic between the Employment Belt and YLH without travelling through the residential neighbourhood. The TSWW Interchange (trunk roads) is improved to increase traffic movements and cater for direct access between the Employment Belt and YLH through the westbound carriageway.

**1.4.4** The improved TYST Interchange (primary distributor roads) would be modified to cater for all traffic movements to and from YLH, Long Tin Road and Long Hon Road.

**1.4.5** In addition, district distributor Road D1 will connect through TYST Interchange and Area to Area 2 and 3 of the PDA, and district distributor Road D2 will connect Kung Um Road, Lam Tai West/East Road to Road D1.

**1.4.6** In addition, a pair of slip roads (local distributor roads) running on both sides and parallel with YLH from Kung Um Road eastward are proposed to provide connectivity to YLH via Shap Pat Heung Interchange. These roads are local distributor roads which are not DPs.

**1.4.7** For the northern section of Kung Um Road and Kiu Hing Road (local distributor roads) along Yuen Long Nullah, road widening would be undertaken through partial decking of Yuen Long Nullah. For Kung Um Road, the existing two lanes will be kept and changed to one-way direction, with minor road improvement works including road widening and footpath provision. For Kiu Hing Road, the existing one lane road would be upgraded as standard one-way 2-lane single carriageway. This proposal allows provision of adequate road space for vehicles and pedestrians. These roads are local distributor roads which are not DPs.

**1.4.8** Since the proposed works involve construction and major improvements of trunk roads, primary distributor roads and district distributor roads, they will be DPs under Item A.1 of Schedule 2, Part I of EIA Ordinance.

***DP 4 - Part I, A.3 - Construction of Environmentally Friendly Transport Services (EFTS) – subject to further review***

**1.4.9** The RODP has reserved a corridor for the extension of the EFTS proposed under the HSK NDA project with possible connection to West Rail Tin Shui Wai Station. The reserve navigates through the storage/workshops, residential, commercial and other land reserves within the PDA. As mentioned in the approved HSK EIA report, a



modern low profile tram system has been assumed for the purpose of the EIA. However, the EFTS system is a separate DP to be constructed and operated by the future operator who would need to prepare and submit a separate EIA Study for approval under the EIA Ordinance.

***DP 5 - Part I, A.8 – Construction of a road bridge more than 100m in length between abutments***

**1.4.10** As part of the road improvement works, an elevated viaduct section of more than 100m in length are proposed at TYST Interchange in the RODP.

**1.4.11** Since the proposed works involve construction of a road bridge more than 100m in length between abutments in the RODP, it will be a DP under Item A.8 of Schedule 2, Part I of EIA Ordinance.

***DP 6 - Part I, A.9 – Construction of a road fully enclosed by decking above and by structure on the sides for more than 100m in length***

**1.4.12** As part of the TSWW Interchange improvement works, a depressed road/ underpass of more than 100m in length beneath the at-grade roundabout at the TSWW Interchange is proposed in the RODP. In addition, full enclosures at TYST Interchange are also required in order to comply the noise criteria.

**1.4.13** Since the proposed works involve construction of a fully enclosed road of more than 100m in length in the RODP, it will be a DP under Item A.9 of Schedule 2, Part I of EIA Ordinance.

***DP 7 - Part I, F.2 – Construction of a Sewage Treatment Works – subject to further review***

**1.4.14** With other major developments including HSK NDA, Kam Tin South and housing sites at Wang Chau, there is neither spare sewage treatment capacity at the nearby San Wai Sewage Treatment Work (SWSTW) nor Yuen Long Sewage Treatment Works (YLSTW) for the YLS development, despite planned upgrading of these sewage treatment works (STWs). There is also little scope to further expand these two STWs after discussions with the relevant authorities.

**1.4.15** An “OU(STW)” zone at the southern end of Kung Um Road is reserved for the construction of an aboveground STW (YLS STW) for treatment and disposal of sewage arising from the PDA. Based on the sewage estimation according to the RODP, the treatment capacity of YLS STW would have an Average Dry Weather Flow (ADWF) of 24,000m<sup>3</sup>/day.

**1.4.16** Since the proposed works involve construction of sewage treatment works with installed capacity more than 5,000m<sup>3</sup> per day, and they are located close to the planned receivers in the RODP, it will be a DP under

Item F.3(b) of Schedule 2, Part I of EIA Ordinance. However, the STW is a separate DP to be constructed and operated by the future operator who would need to prepare and submit a separate EIA for approval under the EIA Ordinance.

***DP 8 - Part I, F.3(b) – Construction of two sewage pumping stations***

**1.4.17** Two “OU(RCP&SPS)” zones are intended for the sewage pumping stations (SPSs) and refuse collection points (RCPs).

**1.4.18** The SPS site located to the east of TYST Interchange in Area 1 is reserved for an intermediate SPS to pump the sewage collected from the Area 1 for further discharge by gravity sewerage to the YLS STW for treatment, as well as an RCP. The ADWF of the SPS would be approximately 4,700m<sup>3</sup>/day.

**1.4.19** The other SPSs site located to the west of the northern end of Kung Um Road in Area 2 is reserved to retain the existing Lung Tin SPS, construct a SPS to pump the sewage collected from the Areas 2 and 3 by underground gravity sewers to the on-site STW for treatment, as well as an RCP. The ADWF of the SPS would be approximately 23,280m<sup>3</sup>/day at the northern end of Kung Um Road.

**1.4.20** Since the proposed works involve construction of SPS with installed capacity more than 2,000m<sup>3</sup> per day, and they are located close to the planned receivers in the RODP, it will be a DP under Item F.3(b) of Schedule 2, Part I of EIA Ordinance.

***DP 9 - Part I, F.4 - An activity for the reuse of reclaimed water from a treatment plant – subject to further review***

**1.4.21** An area at the southern end of TYST is reserved for the construction of a Reclaimed Water Service Reservoir for reuse of reclaimed water generated from the YLS STW.

**1.4.22** Since the proposed works involve reuse of reclaimed water from a treatment plant, it will be a DP under Item F.4 of Schedule 2, Part I of EIA Ordinance. However, the reuse activity is a separate DP to be constructed and operated by the future operator who would need to prepare and submit a separate EIA for approval under the EIA Ordinance.

***DP 10 - Part I, I.1(b)(vii) - Yuen Long Nullah Revitalisation***

**1.4.23** Yuen Long Nullah would be partially decked to provide space for road widening and provision of landscaped footpaths at Kung Um Road and Kiu Hing Road. The nullah would also be reviatlised and integrated in the urban design and landscape framework.

**1.4.24** Since the proposed works involve a drainage channel or river training less than 300m from the nearest boundary of an existing Conservation Area under TYST OZP Plan No. S/YL-TYST/10, it will be a DP under Item I.1(b)(vii) of Schedule 2, Part I of EIA Ordinance.

**1.4.25** This EIA study will therefore cover all the Schedule 2 DPs mentioned except DP4, DP7 and DP9 in **Table 2.1**.

## **1.5 Development Programme of the Project**

**1.5.1** In order to ensure a balanced and programmed development with orderly rehousing/relocation of qualified clearerees, the PDA including the associated engineering infrastructure is proposed to be divided into four main stages for implementation as illustrated in **Figure 2.2**. The target for first population intake of the development is Year 2027.

### **Key Developments in Stage 1**

**1.5.2** Stage 1 involves fast track delivery of an initial public housing site at the northern part of the PDA next to Kung Um Road to facilitate first intake of population in Year 2027. In addition, two Village Re-site Areas will be needed in Stage 1 for re-provisioning of private lots, which are subjected to Village Removal Terms (VRT), affected in the later Stage 2 development.

**1.5.3** New road connection from the initial housing site to existing Tai Kei Leng Road and road improvement and nullah decking along Yuen Long Nullah to the northern most section Kung Um Road/Kiu Hing Road from YLH to Shap Pat Heung Road will also be carried out in Stage 1 to improve traffic connectivity for the initial development.

### **Key Developments in Stage 2**

**1.5.4** Stage 2 is mainly for developing the remaining developments in the northern part of the PDA next to Kung Um Road and the Employment Belt at TYST for multi-storey buildings and open storage site.

**1.5.5** To support the main thrust of the YLS development, major infrastructure works including modification of TYST Interchange, construction of the slip roads and its PTI at Yuen Ching Road, STW, STW, new sewer from YLS STW to existing inlet chamber of the NWNT effluent tunnel at San Wai for discharging to the Urmston Road submarine outfall, SPSs, Reclaimed Water Service Reservoir, partial decking and revitalisation of the Yuen Long Nullah to the south of YLH and road improvement works at the southern Kiu Hing Road and Wong Nai Tun Tsuen Road will be carried out in the Stage 2 development.

**1.5.6** For re-provisioning of private lots which are subjected to VRT and to be affected in Stage 3, another Village Resite Area in southern part of PDA along Kung Um Road will also be needed at this stage.

**Key Developments in Stage 3**

**1.5.7** Stage 3 is mainly for developing the sites and the associated infrastructure in the southern part of the YLS PDA along Kung Um Road, including the Hillside River Corridor, reedbed/ retention pond and retention lake.

**Key Developments in Stage 4**

**1.5.8** The final Stage 4 is mainly for developing the sites in the PDA at TYST. Major works for modification of TSWW Interchange is programmed to be carried out this later Stage 4 to avoid substantial traffic impact and diversions of undertaking modification of TYST and TSWW Interchanges at the same time.

**1.6 Construction Programme**

**1.6.1** It is anticipated that the new town development will be commissioned in phases. The construction works are targeted to commence in Year 2020 and are summarised in **Table 2.2** below.

**Table 2.2** Works packaging for the YLS Development

<b>Works Package</b>	<b>Land Clearance &amp; Construction Period</b>	<b>Description of Works</b>
Stage 1 Works - Phase 1a) Initial Housing Site / Road Improvement Works	2020 to 2027	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Internal Road, Pipe works and Landscaping</li> <li>• Nullah Decking and Road Works for Kung Um Road/Kiu Hing Road and New Local Distributor to Tai Kei Leng Rd</li> </ul>
Stage 1 Works - Phase 1b) Initial Housing Site / Resite Village House	2020 to 2029	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Internal Roads, Pipeworks, Utilities and Landscaping</li> <li>• Re-site Village House Construction (Zone 1 and Zone 2)</li> <li>• Construction of Public Housing</li> </ul>
Stage 2 Works - Phase 2a) Multi-Storey Building/ Open Storage Site (To the South West of TSWW Interchange)	2022 to 2028	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Internal Roads, Pipeworks, Utilities and Landscaping</li> <li>• Construction of Multi-storey Buildings</li> <li>• Preparation of Open Storage Site</li> </ul>

Stage 2 Works - Phase 2b) Northern Sites along Kung Um Road, Kung Um Road Improvement and Reclaimed Water Service Reservoir	2023 to 2033	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Internal Roads, Pipeworks, Utilities and Landscaping</li> <li>• Tin Tsuen Channel Revitalisation</li> <li>• Kung Um Road/Kiu Hing Road/Wong Nai Tun Tsuen Road Improvement/ Yuen Long Nullah Revitalisation and Landscaping</li> <li>• Reclaimed Water Service Reservoir and Service Road</li> <li>• Re-site Village House Construction</li> <li>• Tin Tsuen Channel Revitalisation</li> <li>• Construction of Private Housing</li> <li>• Construction of Public Housing</li> <li>• Construction of Government Facilities</li> </ul>
Stage 2 Works - Phase 2c) External Roads (Tong Yan San Tsuen Interchange Improvement, Shap Pat Heung Interchange Improvement)	2025 to 2032	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• TYST Interchange Improvement and Landscaping</li> <li>• Yuen Long West Nullah Revitalisation</li> <li>• Re-site Village House Construction (in Zone 3)</li> <li>• Shap Pat Heung Interchange Improvement and Landscaping</li> </ul>
Stage 2 Works - Phase 2d) Sewage Treatment Works	2023 to 2029	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Sewage Treatment Works</li> <li>• Pumping Station</li> </ul>
Stage 2 Works - Phase 2e) Multi-Storey Buildings (Remaining)	2025 to 2033	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Internal Roads, Pipeworks, Utilities and Landscaping</li> <li>• Construction of Multi-storey Buildings</li> </ul>
Stage 3 Works - Phase 3) Southern Sites Along Kung Um Road, Kung Um Road Improvement	2031 to 2038	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Internal Roads, Pipeworks, Utilities and Landscaping</li> <li>• Hillside River Corridor &amp; Retention Lake</li> <li>• Construction of Private Housing</li> <li>• Construction of Public Housing</li> <li>• Construction of Government Facilities</li> </ul>
Stage 4 Works - Phase 4a) Sites in Tong Yan San Tsuen and Internal Roads	2032 to 2038	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• Internal Roads, Pipeworks, Utilities and Landscaping</li> <li>• Retention Tank/Lake</li> <li>• Construction of Private Housing</li> <li>• Construction of Government Facilities</li> </ul>
Stage 4 Works - Phase 4b) TSWW Interchange Improvement	2032 to 2038	<ul style="list-style-type: none"> <li>• Decontamination and Site Formation Works</li> <li>• TSWW Interchange Improvement and Landscaping</li> </ul>

## 1.7 Concurrent Projects

**1.7.1** In order to assess the cumulative impacts, a review of best available information to identify a number of other projects that are undergoing planning, design, construction and/or operation within the construction and/or operation period for this Study has been conducted and a list of the tentative concurrent projects identified at this stage is summarised below and **Figure 2.3** shows the locations of these concurrent projects.

- HSK NDA Planning and Engineering Study;
- Engineering Works at Lin Cheung Road Site, Sham Shui Po and Wang Chau, Yuen Long;
- Site Formation and Infrastructural Works for the Development at Long Bin, Yuen Long, Feasibility Study;
- Site Formation and Infrastructural Works for the Development near Tan Kwai Tsuen, Yuen Long – Feasibility Study;
- Improvement to Pok Oi Interchange;
- Elevated Pedestrian Corridor in Yuen Long Town Connecting with Long Ping Station – Investigation, Design and Construction;
- Improvement of Yuen Long Town Nullah (Town Centre Section) – Stage 1 Improvement Works – Design and Construction;
- Improvement of Yuen Long Town Nullah (Town Centre Section) – Stage 2 Beautification Works – Design and Construction;
- Design-Build-and-Operate contract for upgrading San Wai Sewage Treatment Works – Phase 1;
- Cycle Tracks Connecting North West New Territories with North East New Territories – Tuen Mun to Sheung Shui section (Stage 1);
- Property Development of Kam Sheung Road Station and its adjoining areas; and
- Greening Master Plan (GMP) for Yuen Long - Greening Works in Tuen Mun and Yuen Long.



## 3 Project Organization

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### 1.8 Project Organization

**1.8.1** The proposed project organization and lines of communication with respect to environmental protection works are shown in **Appendix 3.1**.

**1.8.2** The leader of the ET shall be an independent party from the Contractor and has relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the ER.

**1.8.3** The responsibilities of respective parties are:

#### **The Contractor**

- Implement the EIA recommendations and requirements;
- Employ an ET to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- Provide assistance to ET in carrying out monitoring and auditing;
- Submit proposals on mitigation measures in case of exceedances of Action and Limit Levels in accordance with the Event and Action Plans;
- Implement measures to reduce impact where Action and Limit Levels are exceeded; and
- Adhere to the agreed procedures for carrying out compliant investigation.

#### **Environmental Team**

- Set up all the required environmental monitoring stations;
- Monitor various environmental parameters as required in the EM&A Manual;
- Analyse the environmental monitoring and audit data, review the success of EM&A programme, confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions, and to identify any adverse environmental impacts arising;
- Carry out site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation measures, and take proactive actions to pre-empt problems;
- Audit and prepare audit reports on the environmental monitoring data and site environmental conditions;

- Report on the environmental monitoring and audit results to the IEC, Contractor, the ER and EPD or its delegated representative;
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit Levels in accordance with the Event and Action Plans;
- Undertake regular on-site audits / inspections and report to the Contractor and the ER of any potential non-compliance;
- Follow up and close out non-compliance actions; and
- Adhere to the procedures for carrying out environmental complaint investigation.

#### **Engineer or Engineer's Representative**

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Assist the Project Proponent in employing an IEC to audit the results of the EM&A works carried out by the ET;
- Comply with the agreed Event Contingency Plan in the event of any exceedance;
- Adhere to the procedures for carrying out complaint investigations.

#### **Independent Environmental Checker**

- Review the EM&A works performed by the ET (at not less than monthly intervals);
- Audit the monitoring activities and results (at not less than monthly intervals);
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and location of sensitive receivers;
- Report the audit results to the ER and EPD in parallel;
- Review the EM&A reports (monthly and quarterly summary reports) submitted by the ET;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- Check the mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;

- Check the mitigation measures that have been recommended in the EIA and this Manual, and ensure they are properly implemented in a timely manner, when necessary; and
- Report the findings of site inspections and other environmental performance reviews to ER and EPD.

**1.8.4** Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

**1.8.5** The ET Leader shall have at least 7 years of experience in conducting EM&A for infrastructure projects. His / Her qualification shall be vetted by the ER and the IEC. And the IEC should possess at least 7 years of experience in EM&A.

## 4 Environmental Submission

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### 1.9 Introduction

**1.9.1** The Contractor shall prepare the Environmental Management Plan (EMP) (including a Waste Management Plan, WMP), Construction Method Statement prior to the commencement of construction works and obtain approval from ER and IEC and other relevant authorities to encompass the recommended environmental protection / mitigation measures with respect to their latest construction methodology and programme.

### 1.10 Environmental Management Plan

**1.10.1** A systematic EMP shall be set up by the Contractor to ensure effective implementation of the mitigation measures, monitoring and remedial requirements presented in EIA, EM&A and Environmental Mitigation Implementation Schedule (EMIS) (See **Appendix 4.1**). The ER and the IEC will audit the implementation status against the EMP and advise the necessary remedial actions required. These remedial actions shall be enforced by the ER through contractual means.

**1.10.2** The EMP will require the Contractor (together with its sub-contractors) to define in details how to implement the recommended mitigation measures in order to achieve the environmental performance defined in the Hong Kong environmental legislation and the EIA documentation.

**1.10.3** The review of on-site environmental performance shall be undertaken by ER and IEC through a systematic checklist and audit once the construction works commences. The environmental performance review programme comprises a regular assessment on the effectiveness of the EMP. Reference should be made to ETWBTC 19 / 2005 “Environmental Management on Construction Sites” or its latest versions, and any other relevant Technical Circulars.

### 1.11 Waste Management Plan

**1.11.1** As part of EMP, the Contractor shall include WMP for the construction of the Project and prior to the commencement of construction works submit to the ER and IEC for approval. Where waste generation is unavoidable, the opportunities for recycling or reusing should be maximized. If wastes cannot be recycled, recommendations for appropriate disposal routes should be provided in the WMP. A method statement for stockpiling and transportation of the excavated materials and other construction wastes should also be included in the WMP and

be approved before the commencement of construction works. All mitigation measures arising from the approved WMP shall be fully implemented.

**1.11.2** For the purpose of enhancing the management of Construction and Demolition (C&D) materials including rock, and minimizing its generation at source, construction works would be undertaken in accordance with the Section 4.1.3 of Chapter 4 in the Project Administration Handbook for Civil Engineering Works (PAH) .

## **1.12 Construction Method Statement**

**1.12.1** In case the Contractor would like to adopt alternative construction methods or implementation schedules, it is required to submit details of methodology and equipment to the ER for approval before the work commences. Any changes in construction method shall be reflected in a revised EMP or the Contractor will be required to demonstrate the manner in which the existing EMP should accommodate the proposed changes. The Contractor may need to apply for a Variation of Environmental Permit (VEP) from EPD before commencement of any construction activities.

## 5 Air Quality Impact

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### 1.13 Introduction

**1.13.1** The EIA has considered the potential air quality impacts during both the construction and operation phases of the Project. Fugitive dust and vehicular emission would be the key impacts during the construction phase and operation phase respectively.

### 1.14 Air Quality Parameters

**1.14.1** Monitoring and audit of the Total Suspended Particulate (TSP) levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action taken to rectify the situation.

**1.14.2** One-hour TSP levels shall be measured to indicate the impacts of construction dust on air quality. The 1-hour TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B. Upon approval of the IEC, 1-hour TSP levels can be measured by direct reading method which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.

**1.14.3** All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, and any other local atmospheric factors affecting or affected by site conditions, etc., shall be recorded down in detail. A sample data sheet is shown in **Appendix 5.1**.

### 1.15 Monitoring Equipment

**1.15.1** High volume samplers (HVSs) complying with the following specifications shall be used for carrying out the 1-hour TSP monitoring:

- 0.6 – 1.7 m<sup>3</sup> per minute adjustable flow range;
- Equipped with a timing / control device with +/- 5 minutes accuracy for 24 hours operations;
- Installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- Capable of providing a minimum exposed area of 406cm<sup>2</sup>;
- Flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;



- Equipped with a shelter to protect the filter and sampler;
- Incorporated with an electronic mass flow rate controller or other equivalent devices;
- Equipped with a flow recorder for continuous monitoring;
- Provided with a peaked roof inlet;
- Incorporated with a manometer;
- Able to hold and seal the filter paper to the sampler housing at horizontal position;
- Easily changeable filter; and
- Capable of operating continuously for a 24-hour period.

**1.15.2** The ET is responsible for the provision, installation, operation, maintenance, dismantle of the monitoring equipment. They shall ensure that sufficient number of HVSs with an appropriate calibration kit is available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc., shall be clearly labelled.

**1.15.3** Initial calibration of dust monitoring equipment shall be conducted upon installation and thereafter at fortnightly intervals. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated annually. The concern parties such as IEC shall properly document the calibration data for future reference. All the data should be converted into standard temperature and pressure condition.

**1.15.4** The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded in the data sheet as mentioned in **Appendix 5.1**.

**1.15.5** If the ET proposes to use a direct reading dust meter to measure 1-hour TSP levels, they shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable results to the HVS. The instrument should also be calibrated regularly, and the 1-hour sampling shall be determined periodically by the HVS to check the validity and accuracy of the results measured by direct reading method.

**1.15.6** Wind data monitoring equipment shall also be provided and set up for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location shall be proposed by the

ET and agreed with the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:

- The wind sensors should be installed at 10m above ground so that they are clear of obstructions or turbulence caused by buildings;
- The wind data should be captured by a data logger, the data shall be downloaded for analysis at least once a month;
- The wind data monitoring equipment should be re-calibrated at least once every six months; and
- Wind direction should be divided into 16 sectors of 22.5 degrees each.

**1.15.7** In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from the IEC.

## **1.16 Laboratory Measurement / Analysis**

**1.16.1** A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be Hong Kong Laboratory Accreditation Scheme (HOKLAS) accredited.

**1.16.2** If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER and the measurement procedures shall be demonstrated to the satisfaction of the ER and IEC. IEC shall regularly audit to the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the ER with one copy of the Title 40 of Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his / her reference.

**1.16.3** Filter paper of size 8" x 10" shall be labelled before sampling. It shall be a clean filter paper with no pinholes, and shall be conditioned in a humidity-controlled chamber for over 24-hours and be pre-weighed before use for the sampling.

**1.16.4** After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity-controlled chamber followed by accurate weighing by an electronic balance with readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.

## 1.17 Monitoring Locations

**1.17.1** **Figure 5.1** and **Figure 5.1a** to **Figure 5.1c** show the locations of the proposed construction dust monitoring stations. The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from the IEC.

**Table 5.1** Construction dust monitoring locations

ID	ASR ID	Location	Phases of the Project	Impact Monitoring Period <sup>[1]</sup>
<i>Existing Air Sensitive Receivers</i>				
DM-1	A113	Shan Ha Tsuen House No. 613F	Stage 1	Year 2022 –2029
DM-2	A106	Village House along Kung Um Road	Stage 2	Year 2023 –2033
DM-3	A30	Village House, Kung Um Road	Stage 3	Year 2033 - 2038
DM-4	A34	House no. 128, Kung Um Road	Stage 3	Year 2033 - 2038
DM-5	W-A1	House 33, Park Villa	Stage 4	Year 2034 - 2038
DM-6	W-A14	Sha Tseng Tsuen	Stage 4	Year 2034 - 2038

Note:

[1] The monitoring period is subject to the construction programme of the relevant contracts in the Construction Stage.

**1.17.2** When alternative monitoring locations are proposed, the proposed site should, as far as practicable:

- be at the site boundary or such locations close to the major dust emission source;
- be close to the sensitive receptors; and
- take into account the prevailing meteorological conditions.

**1.17.3** The ET shall agree with the ER in consultation with the IEC on the position of the HVS for the installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

- a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- no two samplers should be placed less than 2 meters apart;
- the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;

- a minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samplers;
- a minimum of 2 meters separation from any supporting structure, measured horizontally is required;
- no furnace or incinerator flue is nearby;
- airflow around the sampler is unrestricted;
- the sampler is more than 20 meters from the dripline;
- any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- a secured supply of electricity is needed to operate the samplers.

**1.17.4** The ET may, depending on site conditions and monitoring results, decide whether additional monitoring locations shall be included or any monitoring locations could be removed / relocated during any stage of the construction phase.

## **1.18 Baseline Monitoring**

**1.18.1** Baseline monitoring shall be carried out at all of the designated monitoring locations (see **Table 5.1**) for at least 14 consecutive days prior to the commissioning of major construction works to obtain 1-hour TSP samples. The selected baseline monitoring stations should reflect baseline conditions at the impact stations. One-hour sampling should also be done at least 3 times per day while the highest dust impact is expected.

**1.18.2** During the baseline monitoring, there should not be any major construction or dust generation activities in the vicinity of the monitoring stations. Before commencing baseline monitoring, the ET shall inform the IEC of the baseline monitoring programme such that, if required, the ER can conduct on-site audit to ensure accuracy of the baseline monitoring results.

**1.18.3** In case the baseline monitoring cannot be carried out at the designated monitoring locations, the ET Leader shall carry out the monitoring at alternative locations that can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the ER and agreed with the IEC.

**1.18.4** In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

**1.18.5** Ambient conditions may vary seasonally and shall be reviewed once every three months. When the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining the updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with the IEC and EPD.

## 1.19 Impact Monitoring

**1.19.1** The ET shall carry out impact monitoring during the entire construction period unless specified in **Table 5.1**. For regular impact monitoring of 1-hour TSP, the sampling frequency of at least 3 times in every 6 days should be undertaken when the highest dust impact occurs. Before commencing impact monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the monitoring results.

**1.19.2** In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in the following section, shall be conducted within the specified timeframe after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified, and agreed with the ER and the IEC.

## 1.20 Action and Limit Levels

**1.20.1** The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 1-hour TSP. **Table 5.2** shows the air quality criteria, namely Action and Limit Levels to be used.

**Table 5.2** Action and Limit Levels for air quality

Parameters	Action	Limit
1-hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ , Action level = (baseline level * 1.3 + Limit level)/2; For baseline level $> 384 \mu\text{g}/\text{m}^3$ ,	500 $\mu\text{g}/\text{m}^3$

<b>Parameters</b>	<b>Action</b>	<b>Limit</b>
	Action level = Limit level	



## 1.21 Event and Action Plan

1.21.1 Should non-compliance of the air quality criteria occur, actions in accordance with the Action Plan in **Table 5.3** shall be carried out.

**Table 5.3** Event and Action Plan for air quality

Event	Action			
	ET	IEC	ER	Contractor
Action level exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform IEC and ER;</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency to daily.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor’s working method.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Rectify any unacceptable practice;</li> <li>2. Amend working methods if appropriate.</li> </ol>
Action level exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC and ER;</li> <li>3. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>4. Repeat measurements to confirm findings;</li> <li>5. Increase monitoring frequency to daily;</li> <li>6. Discuss with IEC and Contractor on remedial actions required;</li> <li>7. If exceedance continues, arrange meeting with IEC and ER;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor’s working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ET on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise Implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit proposals for remedial to ER within 3 working days of notification;</li> <li>2. Implement the agreed proposals;</li> <li>3. Amend proposal if appropriate.</li> </ol>
Limit level exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> </ol>

Event	Action			
	ET	IEC	ER	Contractor
	2. Inform ER, Contractor and EPD; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	2. Notify Contractor; 3. Ensure remedial measures properly implemented.	2. Submit proposals for remedial actions to IEC within 3 working days of notification; Implement the agreed proposals; 4. Amend proposal if appropriate.
Limit level exceedance for two or more consecutive samples	1. Notify IEC, ER, Contractor and EPD; 2. Identify source; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency to daily; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer’s Representative

## 1.22 Mitigation Measures

1.22.1 Mitigation measures for dust control have been recommended in the EIA Report. The Contractor shall be responsible for the design and implementation of these measures. Mitigation measures are not required for the operation phase. All the proposed mitigation measures are summarized in the Environmental Mitigation Implementation Schedule (EMIS) in **Appendix 4.1**.

### Construction Phase

1.22.2 Recommended mitigation measures to minimise the adverse impacts on air quality during construction phases of the Project including all DPs are detailed below.

1.22.3 In order to reduce the dust emission from the Project and achieve compliances of relevant criteria at ASRs, requirements as stated in the Air Pollution Control (Construction Dust) Regulation should be followed and the following dust suppression measures should be incorporated by the Contractor to control the dust nuisance throughout the construction phase:

- Watering once per hour on exposed worksites and haul road;
- Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;
- Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;
- A stockpile of dusty material should not be extended beyond the pedestrian barriers, fencing or traffic cones;
- The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;
- Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;
- When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;

- The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;
- Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;
- Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;
- Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;
- Any skip hoist for material transport should be totally enclosed by impervious sheeting;
- Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides;
- Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed;
- Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system; and
- Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shortcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.

### **Operation Phase**

#### **1.22.4**

The following at-source mitigation measures should be implemented to control odour emission from the proposed STW and SPS:

- Potential odour sources should be enclosed;

- Negative pressure should be maintained within the facilities;
- Installation of deodouriser with an odour removal efficiency of at least 99.5% to control odour emission via ventilation exhaust;
- Exhaust of the deodouriser should be oriented away from sensitive receivers and vertically upwards to avoid direct facing to any sensitive receivers; and
- Maintenance of deodouriser should be regularly conducted to ensure good condition.

**1.22.5** For the planned air sensitive uses within the odour exceedance area, the following measures should be adopted:

- No sensitive uses should be introduced in exceedance area within the planned DO3.1.

## 6 Noise Impact

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### 1.23 Introduction

**1.23.1** The EIA has considered the potential noise impacts during both the construction and operational phases of the Project. Noise monitoring is proposed to be conducted during construction and operational phases.

**1.23.2** In the following sections, noise monitoring parameters, monitoring equipment, monitoring locations, baseline monitoring, impact monitoring, Action and Limit levels, Event and Action Plan and mitigation measures during construction and operational phases of the Project are discussed.

### 1.24 Noise Monitoring Parameters for Construction Noise

**1.24.1** Construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq(30min)}$  shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods,  $L_{eq(5min)}$  shall be employed for comparison with the Noise Control Ordinance (NCO) criteria. A sample data sheet is shown in **Appendix 6.1**.

**1.24.2** As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference.

### 1.25 Monitoring Equipment for Construction Noise

**1.25.1** As referred to in the Technical Memorandum (TM) issued under the NCO, sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agrees to within 1.0 dB.

**1.25.2** Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.

**1.25.3** The ET is responsible for the provision, installation, operation, maintenance, dismantle of the monitoring equipment. He shall ensure



that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

## 1.26 Monitoring Locations for Construction Noise

**1.26.1** The most representative and affected Noise Sensitive Receivers (NSRs) were selected as monitoring stations and details could be referred to EIA Report. The locations of construction noise monitoring stations are summarised in **Table 6.1** and shown in **Figure 6.1** and **Figure 6.1a** to **Figure 6.1e**.

**Table 6.1** Proposed construction noise monitoring locations

Monitoring Station ID	NSR ID	Description	Impact Period <sup>[1]</sup>	Monitoring
<b>Existing Noise Sensitive Receivers</b>				
CM1	E1_SHT_R04	Village house in Shan Ha Tsuen	Q3 2020 – Q3 2027, Q1 2035 – Q4 2035	
CM2	E2_TLY_R01	Village house in Tin Lung Yuen	Q3 2020 – Q2 2028, Q3 2024, Q1 2035	
CM3	E4_LTT_R01	Village house in Lung Tin Tsuen	Q3 2020 – Q2 2028	
CM4	E4_TLT_R02	Village house in Tin Liu Tsuen	Q3 2020 – Q4 2027	
CM5	E4_HTS_R01	Village house in Ha Tsuen Shi	Q1 2027 – Q4 2029, Q1 2031 – Q3 2035	
CM6	E4_KMYLS_E03	Kwong Ming Ying Loi School	Q4 2028 – Q3 2029	
CM7	E1_RLS_R02	Residential block in Recours La Serre	Q4 2024 – Q1 2025, Q3 2035 – Q4 2036	
CM8	E1_ELD_R02	Residential block in Eldorado	Q4 2026 – Q3 2027, Q1 2028 – Q3 2028, Q3 2034 – Q2 2035	
CM9	E4_PST_R01	Village house in Pak Sha Tsuen	Q1 2021 – Q2 2021, Q2 2024 – Q1 2025, Q1 2027 – Q4 2029, Q1 2031 – Q4 2035	
CM10	E4_WNT_R11	Village house in Wong Nai Tun Tsuen	Q2 2027 – Q3 2027, Q3 2029 – Q2 2031, Q3 2034, Q2 2035, Q4 2035	
<b>Planned Noise Sensitive Receivers</b>				
CM11	P_R2.2_R10	Public housing	Q3 2020 – Q1 2028	
CM12	P_R2.2_R17	Public housing	Q3 2020 – Q3 2027, Q2 2028 – Q1 2029	
CM13	P_VR1.1_R01	Village rehousing	Q4 2024 – Q3 2025, Q3 2034, Q1 2035 – Q4 2035	
CM14	P_R2.4_R06	Public housing	Q3 2023 – Q4 2023	
CM15	P_E2.1_E02	Planned primary school	Q3 2033 – Q4 2033	

Note:

[1] The monitoring period is subject to the construction programme of the relevant contracts in the construction stage.

**1.26.2** The ET shall select the monitoring locations from the above table based on the locations of the construction activities and seek approval from

ER and agreement from the IEC and EPD to the proposal. The monitoring locations should be chosen based on the following criteria:

- At locations close to the major site activities which are likely to have noise impacts;
- Close to the most affected existing noise sensitive receivers; and
- For monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

**1.26.3** The monitoring station shall normally be at a point 1m from the exterior of the sensitive receiver building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3 dB(A) shall be made to the free field measurements. The ET shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

**1.26.4** The status and locations of the NSRs may change after issuing this Manual. In such case, the ET shall propose updated monitoring locations and seek approval from IEC and agreement from EPD on the proposal.

## **1.27 Baseline Monitoring for Construction Noise**

**1.27.1** The ET shall carry out baseline noise monitoring in all identified monitoring stations at least 2 weeks prior to the commencement of the construction works. There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  shall be carried out daily for a period of at least two weeks in a sample period of 5 minutes or 30 minutes between 0700 and 1900, and 5 minutes between 1900 and 0700. A schedule on the baseline monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

**1.27.2** In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the ER for approval.

## 1.28 Impact Monitoring for Construction Noise

**1.28.1** Construction noise monitoring should be carried out at the designated monitoring station when there are Project-related construction activities being undertaken within a radius of 300 m from the monitoring stations. The monitoring frequency should depend on the scale of the construction activities. An initial guide on the monitoring is to obtain one set of 30-minute measurement at each station between 0700 and 1900 hours on normal weekdays at a frequency of once a week when construction activities are underway.

**1.28.2** During normal construction working hour (0700-1900 Monday to Saturday), monitoring of  $L_{eq, (30min)}$  noise levels (as six consecutive  $L_{eq, (5min)}$  readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the EIAO-TM.

**1.28.3** If construction works are extended to include works during the hours of 1900 - 0700, additional weekly impact monitoring shall be carried out during evening and night-time works. Applicable permits under NCO shall be obtained by the Contractor.

**1.28.4** In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Event and Action Plan in **Table 6.3**, shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

**1.28.5** A schedule on the compliance monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

## 1.29 Action and Limit Levels for Construction Noise

**1.29.1** The ET shall compare the construction noise monitoring results with noise criteria. **Table 6.2** shows the noise criteria, namely Action and Limit Levels to be used.

**Table 6.2** Action and Limit Levels for construction noise

Time Period	Action Level	Limit Level
0700 - 1900 hours on normal weekdays	When one documented complaint is received	75 dB(A) *

Notes:

If works are to be carried out during restricted hours, the conditions stipulated in the construction noise permit issued by the Noise Control Authority have to be followed.

\* Reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

### 1.30 Event and Action Plan for Construction Noise

1.30.1 Should non-compliance of the noise criteria occur, actions in accordance with the Event and Action Plan in **Table 6.3** shall be carried out.

**Table 6.3** Event and Action Plan for construction noise

Event	Action			
	ET	IEC	ER	Contractor
Action Level Exceedance	<ol style="list-style-type: none"> <li>1. Notify IEC, ER and Contractor;</li> <li>2. Carry out investigation;</li> <li>3. Report the results of investigation to the IEC, ER and Contractor;</li> <li>4. Discuss with the Contractor and formulate remedial measures;</li> <li>5. Increase monitoring frequency to check mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analysed results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures are properly implemented</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IEC and ER;</li> <li>2. Implement noise mitigation proposals.</li> </ol>
Limit Level Exceedance	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC, ER, EPD and Contractor;</li> <li>3. Repeat measure-ments to confirm findings;</li> <li>4. Increase monitoring frequency;</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid</li> </ol>

Event	Action			
	ET	IEC	ER	Contractor
	5. Carry out analysis of Contractor’s working procedures to determine possible mitigation to be implemented; 6. Inform IEC, ER and EPD the causes and actions taken for the exceedances; 7. Assess effectiveness of Contractor’s remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	remedial actions; 2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer’s Representative

## 1.31 Noise Monitoring Parameters for Operational Road Traffic Noise

**1.31.1** The ET should carry out monitoring of road traffic noise after the works under Contract are completed and commence the operation of the Project. The road traffic noise during operation of the Project should be measured in terms of the A-weighted equivalent of  $L_{10(1-hr)}$ . During the road traffic noise measurement, traffic count should be undertaken concurrently. Supplementary information for data auditing and statistical results such as  $L_{eq}$  and  $L_{90}$  should also be obtained for reference.

## 1.32 Monitoring Equipment for Operational Noise

**1.32.1** The requirement of monitoring equipment for both operational road traffic noise and fixed noise could be referred to **Section 6.3**.

## 1.33 Monitoring Locations for Operational Road Traffic Noise

**1.33.1** Those most affected NSRs identified in the EIA Report are selected as the noise monitoring locations in this EM&A Manual. The locations of road traffic noise monitoring stations after final population intake are summarised in **Table 6.4** and shown in **Figure 6.2** and **Figure 6.2a** to **Figure 6.2e**. The locations for operational noise monitoring shall be defined during detailed design on the basis of the status of the most up-to-date information on proposed developments surrounding the Project.

**Table 6.4** Proposed road traffic noise monitoring locations

Monitoring Station ID	NSR ID	Description
OM1	E4_TKLT_R05	Village house in Tai Kei Leng Tsuen
OM2	E4_TLT_R12	Village house in Tin Liu Tsuen
OM3	E4_LA_E01	Lutheran Academy
OM4	E4_JC_R01	Residential block in Jasper Court
OM5	E1_PV_R04	Residential block in Park Villa
OM6	E4_PST_R17	Village house in Pak Sha Tsuen

**1.33.2** The ET shall select the monitoring location and seek approval from ER and agreement from the IEC and EPD to the proposal. The ER/IEC/EPD may also request a closer locations based on on-site

conditions and environmental complaint. The monitoring locations should be chosen based on the following criteria:

- At locations close to the noise mitigation measures such as noise barriers;
- Close to the most affected existing noise sensitive receivers; and
- For monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

**1.33.3** The monitoring station shall normally be at a point 1m from the exterior of the sensitive receiver building facade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3 dB(A) shall be made to the free field measurements. The ET shall agree with the IEC on the monitoring position and the corrections adopted.

## **1.34 Impact Monitoring for Operational Road Traffic Noise**

**1.34.1** The ET should prepare and deposit to EPD, at least 6 months before the operation of the proposed roads under the Project, a monitoring plan for the purpose of assessing the accuracy of road traffic noise predictions by comparing the noise impact predictions with the actual impacts. The monitoring plan should contain monitoring locations, monitoring schedules, methodology of noise monitoring including noise measurement procedures, traffic counts and speed checks, and methodology of comparison with the predicted levels. The ET should implement the monitoring plan in accordance with the deposited monitoring plan unless with prior justifications. Monitoring details and results including the comparison between the measured noise levels and the predicted levels should be recorded in a report to be deposited with EPD within one month of the completion of the monitoring. The report should be certified by the ET Leader before deposit with EPD.

**1.34.2** Road traffic noise monitoring shall be carried out at all the designated road traffic noise monitoring stations. The following is an initial guide on the road traffic noise monitoring requirements during the operation phase:

- one set of measurements at the morning traffic peak hour on normal days;



- one set of measurements at the evening traffic peak hour on normal days;
- a concurrent census of traffic flow and percentage heavy vehicles shall be conducted for the Project Road and the existing road network in the vicinity of each measurement point;
- average vehicle speed estimated for Project Road and the existing road network in the vicinity of each measuring point; and
- the two sets of monitoring data shall be obtained within the first year of operation upon the completion of proposed road works or occupation year of the proposed development.

**1.34.3** Measured noise levels shall be compared with the predicted noise levels by applying appropriate conversion corrections to allow for the traffic conditions at the time of measurement.

## **1.35 Event and Action Plan for Operational Road Traffic Noise**

**1.35.1** For the road traffic noise, the measured / monitored noise levels shall be compared with the predicted results and the predicted traffic flow conditions (calculated noise levels based on concurrent traffic census obtained). In cases discrepancies are observed, explanation shall be given to justify the discrepancies.

## **1.36 Commissioning Test for Operational Fixed Plant Noise**

**1.36.1** The maximum allowable sound power levels of the identified fixed noise sources have been predicted in the EIA report. The Contractor should implement and refine the specified sound power levels as appropriate to ensure compliances with the noise standards stipulated in the EIAO-TM and NCO for the fixed plant operations.

**1.36.2** The Contractor should also carry out a noise commissioning test for all fixed noise sources before operation of the Project, in order to ensure compliance of the noise levels with the EIAO-TM's stipulated noise standard.

## **1.37 Mitigation Measures**

### **Construction Phase**

**1.37.1** The EIA Report has recommended construction noise mitigation measures including the use of quiet plant, retractable noise barriers,

temporary noise barriers and enclosures, etc. All the proposed mitigation measures are summarized in the EMIS in **Appendix 4.1**.

**1.37.2** As the construction of the Project may involve different parties, it is proposed to set up a liaison group among relevant government departments, contractors of the Works contracts etc. during construction phase of the Project to ensure proper implementation of all proposed mitigation measures.

### **Operational Phase**

#### ***Road Traffic Noise***

**1.37.3** Due to the nature of the Project, the Project will be implemented in 4 phases and thus road traffic noise impact assessments at interim years and ultimate year have been conducted. A series of noise mitigation measures are proposed including 1) absorptive vertical barriers and cantilevered noise barriers along some sections of Project Roads and Kung Um Road; 2) LNRS on some road sections ; 3) semi-enclosures or full enclosures at primary distributor roads at TYST Interchange and Kung Um Road; 4) nullah features / barriers along some sections of Yuen Long Nullah (Kiu Hing Road); 5) provision of acoustic windows for some planned public and private housing; 6) alternative building orientation for some planned schools to alleviate adverse road traffic noise impact on the affected NSRs. The required mitigation measures under the above mentioned project stages are listed in **Table 6.5a** to **Table 6.5d** and are shown in **Figure 6.3** and **Figure 6.3a** to **Figure 6.3c**.

**Table 6.5a Extents and locations of proposed low noise road surfacing**

<b>ID</b>	<b>Location</b>	<b>Approximate Length, m</b>	<b>Figure Reference</b>
<b>Stage 1</b>			
LNRS28	Lam Tai East Road	465	<b><u>Figure 6.3b</u></b>
LNRS32	Kiu Hing Road (North of YLH)	260	<b><u>Figure 6.3b</u></b>
LNRS35	Proposed Road L1	410	<b><u>Figure 6.3b</u></b>
LNRS36	Proposed Road L1	410	<b><u>Figure 6.3b</u></b>
LNRS37	Proposed Road L1	375	<b><u>Figure 6.3b</u></b>
LNRS38	Proposed Road L1	375	<b><u>Figure 6.3b</u></b>
LNRS45	Kung Um Road (North of YLH)	40	<b><u>Figure 6.3b</u></b>
<b>Stage 2</b>			
LNRS02	Proposed Road L12	290	<b><u>Figure 6.3a</u></b>
LNRS03	Proposed Road L20	1050	<b><u>Figure 6.3a</u></b>
LNRS05	Proposed Road L12	130	<b><u>Figure 6.3a</u></b>
LNRS06	TYST Interchange	120	<b><u>Figure 6.3a</u></b>
LNRS07	TYST Interchange	265	<b><u>Figure 6.3a</u></b>
LNRS08	TYST Interchange (Loop)	625	<b><u>Figure 6.3a</u></b>
LNRS09	Slip Road near TYST Interchange	555	<b><u>Figure 6.3a</u></b>
LNRS10	TYST Interchange	125	<b><u>Figure 6.3a</u></b>
LNRS11	TYST Interchange	140	<b><u>Figure 6.3a</u></b>
LNRS12	TYST Interchange	115	<b><u>Figure 6.3a</u></b>
LNRS13	Long Tin Road	230	<b><u>Figure 6.3a</u></b>
LNRS14	TYST Interchange	80	<b><u>Figure 6.3a</u></b>
LNRS15	Slip Road near TYST Interchange	160	<b><u>Figure 6.3a</u></b>

<b>ID</b>	<b>Location</b>	<b>Approximate Length, m</b>	<b>Figure Reference</b>
LNRS16	TYST Interchange	95	<u>Figure 6.3a</u>
LNRS20	Proposed Road L14	50	<u>Figure 6.3a</u>
LNRS21	Proposed Road D1	935	<u>Figure 6.3a</u>
LNRS22	Proposed Road D1	930	<u>Figure 6.3a</u>
LNRS23	Proposed Road D2	510	<u>Figure 6.3c</u>
LNRS24	Proposed Road D2	510	<u>Figure 6.3c</u>
LNRS27	Lam Tai West Road	475	<u>Figure 6.3b</u>
LNRS29	Proposed Road L2	90	<u>Figure 6.3b</u>
LNRS30	Lam Tai West Road	385	<u>Figure 6.3b &amp; c</u>
LNRS31	Lam Tai East Road	385	<u>Figure 6.3b &amp; c</u>
LNRS33	Proposed Road L25	2165	<u>Figure 6.3b &amp; c</u>
LNRS39	Tai Kei Leng Road	310	<u>Figure 6.3b</u>
LNRS40	Tai Kei Leng Road	320	<u>Figure 6.3b</u>
LNRS41	Tai Kei Leng Road	430	<u>Figure 6.3b</u>
LNRS43	Long Ho Road	215	<u>Figure 6.3b</u>
LNRS47	TYST Interchange	210	<u>Figure 6.3a</u>
LNRS48	Proposed Road L5	140	<u>Figure 6.3c</u>
<b>Stage 3 and 4</b>			
LNRS01	Slip road near TSWW Interchange	140	<u>Figure 6.3a</u>
LNRS04	Proposed Road L13	90	<u>Figure 6.3a</u>
LNRS17	Shan Ha Road	95	<u>Figure 6.3a</u>
LNRS18	Proposed Road L15	100	<u>Figure 6.3a</u>
LNRS19	Proposed Road L15	250	<u>Figure 6.3a</u>
LNRS25	Proposed Road D1	795	<u>Figure 6.3c</u>

ID	Location	Approximate Length, m	Figure Reference
LNRS26	Proposed Road D1	790	<a href="#">Figure 6.3c</a>
LNRS34	Proposed Road L6	640	<a href="#">Figure 6.3c</a>
LNRS42	Proposed Road L18	100	<a href="#">Figure 6.3a</a>
LNRS46	Proposed Road L15	115	<a href="#">Figure 6.3b</a>
LNRS49	Proposed Road L7	130	<a href="#">Figure 6.3c</a>
LNRS50	TYST Road	315	<a href="#">Figure 6.3a</a>

Note:

[1] The provision of LNRS should be constructed and maintained by responsible parties, i.e. CEDD and Highways Department respectively.

**Table 6.5b Extents and locations of proposed noise barriers**

Noise Barrier ID <sup>[1]</sup>	Location	Barrier Type	Height, m	Approximate Length, m	Figure Reference
<b>Stage 1</b>					
CB_E02	Proposed Road L1	Cantilevered Barrier	5+3m at 45°	265	<a href="#">Figure 6.3b</a>
CB_E03	Proposed Road L25	Cantilevered Barrier	4+3m at 45°	15	<a href="#">Figure 6.3b</a>
CB_E04	Proposed Road L25	Cantilevered Barrier	4+3m at 45°	80	<a href="#">Figure 6.3b</a>
CB_E05	Proposed Road L25	Cantilevered Barrier	4+3m at 45°	90	<a href="#">Figure 6.3b</a>
CB_E26	Proposed Road L25	Cantilevered Barrier	4+3m at 45°	30	<a href="#">Figure 6.3b</a>
CB_E27	Proposed Road L25	Cantilevered Barrier	4+3m at 45°	20	<a href="#">Figure 6.3b</a>
VB_E14	Proposed Road L1	Vertical Barrier	3	20	<a href="#">Figure 6.3b</a>
VB_E25	Proposed Road L25	Vertical Barrier	2	11	<a href="#">Figure 6.3b</a>
VB_E42	Proposed Road L1	Vertical Barrier	3	155	<a href="#">Figure 6.3b</a>
VB_E47	Proposed Road L1	Vertical Barrier	3	25	<a href="#">Figure 6.3b</a>
VB_P17	Lam Tai East Road	Vertical Barrier	6	50	<a href="#">Figure 6.3b</a>
<b>Stage 2</b>					
CB_E01	Proposed Road L12	Cantilevered Barrier	5+3m at 45°	75	<a href="#">Figure 6.3a</a>
CB_E16	Tai Kei Leng Road	Cantilevered Barrier	5+3m at 45°	95	<a href="#">Figure 6.3b</a>

Noise Barrier ID <sup>[1]</sup>	Location	Barrier Type	Height, m	Approximate Length, m	Figure Reference
CB_E18	Tai Kei Leng Road	Cantilevered Barrier	5+3m at 45°	65	<a href="#">Figure 6.3b</a>
CB_E19	Kung Um Road	Cantilevered Barrier	5+3m at 45°	50	<a href="#">Figure 6.3b</a>
CB_E20	Kung Um Road	Cantilevered Barrier	5+3m at 45°	20	<a href="#">Figure 6.3b</a>
CB_E21	TYST Interchange	Cantilevered Barrier	5+3m at 45°	65	<a href="#">Figure 6.3a</a>
CB_E22	Kung Um Road	Cantilevered Barrier	5+3m at 45°	11	<a href="#">Figure 6.3b</a>
CB_E25	TYST Interchange	Cantilevered Barrier	5+3m at 45°	25	<a href="#">Figure 6.3a</a>
CB_P10	Lam Tai West Road	Cantilevered Barrier	5+3m at 45°	40	<a href="#">Figure 6.3b</a>
NF_E01	Yuen Long Nullah	Nullah Feature / Barrier	5	80	<a href="#">Figure 6.3b</a>
NF_E05	Yuen Long Nullah	Nullah Feature / Barrier	3	150	<a href="#">Figure 6.3b</a>
NF_E06	Yuen Long Nullah	Nullah Feature / Barrier	3	115	<a href="#">Figure 6.3b</a>
VB_E03	Proposed Road L20	Vertical Barrier	3	140	<a href="#">Figure 6.3a</a>
VB_E04	Proposed Road L11	Vertical Barrier	5	70	<a href="#">Figure 6.3a</a>
VB_E05	TYST Interchange	Vertical Barrier	6 <sup>[2]</sup>	100	<a href="#">Figure 6.3a</a>
VB_E06	Proposed Road L12	Vertical Barrier	1	20	<a href="#">Figure 6.3a</a>
VB_E08	Proposed Road L12	Vertical Barrier	3	40	<a href="#">Figure 6.3a</a>
VB_E10	TYST Interchange	Vertical Barrier	5	25	<a href="#">Figure 6.3a</a>
VB_E11	TYST Interchange	Vertical Barrier	5	125	<a href="#">Figure 6.3a</a>
VB_E12	TYST Interchange	Vertical Barrier	6	125	<a href="#">Figure 6.3a</a>
VB_E13	TYST Interchange	Vertical Barrier	6	95	<a href="#">Figure 6.3a</a>
VB_E15	Slip Road near TYST Interchange	Vertical Barrier	3	95	<a href="#">Figure 6.3a</a>
VB_E16	Slip Road near TYST Interchange	Vertical Barrier	6	125	<a href="#">Figure 6.3a</a>
VB_E17	Slip Road near TYST Interchange	Vertical Barrier	6	95	<a href="#">Figure 6.3a</a>
VB_E18	Shan Ha Road	Vertical Barrier	5	75	<a href="#">Figure 6.3a</a>
VB_E19	TYST Interchange	Vertical Barrier	6	125	<a href="#">Figure 6.3a</a>
VB_E20	Proposed Road D1	Vertical Barrier	3	110	<a href="#">Figure 6.3a</a>
VB_E23	Proposed Road L25	Vertical Barrier	1	9	<a href="#">Figure 6.3c</a>
VB_E26	Proposed Road L25	Vertical Barrier	5	20	<a href="#">Figure 6.3b</a>
VB_E27	Proposed Road L25	Vertical Barrier	4	25	<a href="#">Figure 6.3b</a>

Noise Barrier ID <sup>[1]</sup>	Location	Barrier Type	Height, m	Approximate Length, m	Figure Reference
VB_E28	Proposed Road L25	Vertical Barrier	5	9	<a href="#">Figure 6.3b</a>
VB_E29	Proposed Road L25	Vertical Barrier	5	9	<a href="#">Figure 6.3b</a>
VB_E30	Proposed Road L25	Vertical Barrier	5	8	<a href="#">Figure 6.3b</a>
VB_E31	Proposed Road L25	Vertical Barrier	3	6	<a href="#">Figure 6.3b</a>
VB_E32	Proposed Road L25	Vertical Barrier	3	25	<a href="#">Figure 6.3b</a>
VB_E33	Proposed Road L25	Vertical Barrier	3	30	<a href="#">Figure 6.3b</a>
VB_E34	Proposed Road L25	Vertical Barrier	1	16	<a href="#">Figure 6.3c</a>
VB_E35	Proposed Road L25	Vertical Barrier	4	50	<a href="#">Figure 6.3c</a>
VB_E36	Proposed Road L25	Vertical Barrier	5	7	<a href="#">Figure 6.3c</a>
VB_E37	Proposed Road L25	Vertical Barrier	5	7	<a href="#">Figure 6.3c</a>
VB_E38	Proposed Road L25	Vertical Barrier	5	13	<a href="#">Figure 6.3c</a>
VB_E39	Proposed Road L25	Vertical Barrier	5	30	<a href="#">Figure 6.3c</a>
VB_E40	Proposed Road L25	Vertical Barrier	3	12	<a href="#">Figure 6.3c</a>
VB_E41	Proposed Road L25	Vertical Barrier	3	13	<a href="#">Figure 6.3c</a>
VB_E43	Proposed Road L1	Vertical Barrier	3	20	<a href="#">Figure 6.3b</a>
VB_E45	Tai Kei Leng Road	Vertical Barrier	3	285	<a href="#">Figure 6.3b</a>
VB_E48	Tai Kei Leng Road	Vertical Barrier	3	50	<a href="#">Figure 6.3b</a>
VB_E49	Tai Kei Leng Road	Vertical Barrier	3	70	<a href="#">Figure 6.3b</a>
VB_E53	Proposed Road L12	Vertical Barrier	4	19	<a href="#">Figure 6.3a</a>
VB_E54	Proposed Road D1	Vertical Barrier	4	25	<a href="#">Figure 6.3a</a>
VB_E55	Proposed Road D1	Vertical Barrier	5	20	<a href="#">Figure 6.3a</a>
VB_E56	Kung Um Road	Vertical Barrier	1	8	<a href="#">Figure 6.3c</a>
VB_P18	Lam Tai West Road	Vertical Barrier	4	75	<a href="#">Figure 6.3b</a>
VB_P19	Lam Tai East Road	Vertical Barrier	3	30	<a href="#">Figure 6.3b</a>
VB_P20	Lam Tai East Road	Vertical Barrier	3	25	<a href="#">Figure 6.3b</a>
<b>Stage 3 and 4</b>					
VB_E01	TSWW Interchange	Vertical Barrier	5	145	<a href="#">Figure 6.3a</a>
VB_E02	TSWW Interchange	Vertical Barrier	4	75	<a href="#">Figure 6.3a</a>

Noise Barrier ID <sup>[1]</sup>	Location	Barrier Type	Height, m	Approximate Length, m	Figure Reference
VB_E07	Proposed Road L13	Vertical Barrier	4	40	<a href="#">Figure 6.3a</a>
VB_E09	Proposed Road D1	Vertical Barrier	3	100	<a href="#">Figure 6.3a</a>
VB_E21	Proposed Road L15	Vertical Barrier	3	35	<a href="#">Figure 6.3a</a>
VB_E22	Proposed Road L15	Vertical Barrier	2	100	<a href="#">Figure 6.3a</a>
VB_E46	Proposed Road D1	Vertical Barrier	4	25	<a href="#">Figure 6.3a</a>
VB_E51	Proposed Road L15	Vertical Barrier	2	25	<a href="#">Figure 6.3b</a>
VB_E52	TSWW Interchange	Vertical Barrier	3	80	<a href="#">Figure 6.3a</a>
VB_P01	Proposed Road L15	Vertical Barrier	3	25	<a href="#">Figure 6.3a</a>
VB_P02	Proposed Road D1	Vertical Barrier	5	220	<a href="#">Figure 6.3a</a>
VB_P05	Proposed Road D1	Vertical Barrier	4	100	<a href="#">Figure 6.3a</a>
VB_P06	Proposed Road L15	Vertical Barrier	4	40	<a href="#">Figure 6.3a</a>
VB_P07	Proposed Road D2	Vertical Barrier	3	45	<a href="#">Figure 6.3c</a>
VB_P08	Proposed Road D2	Vertical Barrier	3	45	<a href="#">Figure 6.3c</a>
VB_P09	Proposed Road D1	Vertical Barrier	5	75	<a href="#">Figure 6.3c</a>
VB_P10	Proposed Road D1	Vertical Barrier	5	195	<a href="#">Figure 6.3c</a>
VB_P11	Proposed Road D1	Vertical Barrier	3	80	<a href="#">Figure 6.3c</a>
VB_P12	Proposed Road L6	Vertical Barrier	3	25	<a href="#">Figure 6.3c</a>
VB_P23	Proposed Road L20	Vertical Barrier	3	30	<a href="#">Figure 6.3a</a>
VB_P26	Proposed Road L20	Vertical Barrier	2	35	<a href="#">Figure 6.3a</a>
VB_P29	Proposed Road D1	Vertical Barrier	6	90	<a href="#">Figure 6.3c</a>
CB_P05	Proposed Road L20	Cantilevered Barrier	5+3m at 45°	40	<a href="#">Figure 6.3a</a>
CB_P06	Proposed Road D1	Cantilevered Barrier	5+3m at 45°	95	<a href="#">Figure 6.3c</a>
CB_P07	Proposed Road D1	Cantilevered Barrier	5+3m at 45°	55	<a href="#">Figure 6.3c</a>
CB_P08	Proposed Road D1	Cantilevered Barrier	5+3m at 45°	90	<a href="#">Figure 6.3c</a>
CB_P09	Proposed Road D1	Cantilevered Barrier	5+3m at 45°	50	<a href="#">Figure 6.3c</a>
CB_P11	Proposed Road L20	Cantilevered Barrier	5+3m at 45°	40	<a href="#">Figure 6.3a</a>
CB_P18	Proposed Road L6	Cantilevered Barrier	5+3m at 45°	45	<a href="#">Figure 6.3c</a>
CB_P19	Proposed Road L6	Cantilevered Barrier	5+3m at 45°	40	<a href="#">Figure 6.3c</a>



Noise Barrier ID <sup>[1]</sup>	Location	Barrier Type	Height, m	Approximate Length, m	Figure Reference
CB_P20	Proposed Road L6	Cantilevered Barrier	5+3m at 45°	50	<u>Figure 6.3c</u>

Note:

[1] Noise barrier ID with prefix E indicates barrier required to protect existing NSRs and prefix P indicated barrier required to protect planned NSRs.

[2] VB\_E05 is located on the retained wall of the depressed road. The height of this vertical barrier shall be incorporated with the retained wall such that the overall height of the retained wall and the vertical barrier is 6m from the road surface.

[3] The provision of noise barrier should be constructed and maintained by responsible parties, i.e. CEDD and Highways Department respectively.

**Table 6.5c Extents and locations of proposed enclosure**

Enclosure ID	Location	Enclosure Type <sup>[1]</sup>	Approximate Length, m	Figure Reference
<b>Stage 1</b>				
SE04	Yuen Long Nullah - Kung Um Road	Semi-enclosure	70	<b><u>Figure 6.3b</u></b>
SE05	Yuen Long Nullah - Kung Um Road	Semi-enclosure	30	<b><u>Figure 6.3b</u></b>
<b>Stage 2</b>				
SE01	Slip Road near TYST Interchange	Semi-enclosure	310	<b><u>Figure 6.3a</u></b>
SE02	Slip Road near TYST Interchange	Semi-enclosure	160	<b><u>Figure 6.3a</u></b>
SE03	Slip Road near TYST Interchange	Semi-enclosure	255	<b><u>Figure 6.3a</u></b>
FE01	TYST Interchange	Full enclosure	180	<b><u>Figure 6.3a</u></b>
FE02	TYST Interchange	Full enclosure	175	<b><u>Figure 6.3a</u></b>
FE03	TYST Interchange	Full enclosure	195	<b><u>Figure 6.3a</u></b>
FE04	TYST Interchange	Full enclosure	180	<b><u>Figure 6.3a</u></b>

Note:

[1] 6m tall enclosure are assumed in the road traffic noise assessment for conservative purpose.

[2] The provision of enclosures should be constructed and maintained by responsible parties, i.e. CEDD and Highways Department respectively

[3] All full enclosures and semi-enclosures are proposed to protect existing NSRs.

**Table 6.5d Locations of proposed alternative building orientation for the planned schools**

Site ID	NSR Description <sup>[1]</sup>	Figure Reference
<b>Stage 2</b>		
E2.1	Planned Primary School	<u>Figure 6.3c</u>
E2.3	Planned Primary School	<u>Figure 6.3c</u>
<b>Stage 3 and 4</b>		
E3.1	Planned Primary School	<u>Figure 6.3c</u>
E3.3	Planned Primary School	<u>Figure 6.3c</u>

**Table 6.5e Proposed at-receiver mitigation measures at planned sites**

Site ID	Proposed Additional Mitigation Measures	Uses <sup>[1]</sup>	Applied to	Figure Reference
R2.1a	Acoustic windows	R	11/F – 30/F	<u>Figure 6.3b</u>
R2.2	Acoustic windows	R	4/F – 34/F	<u>Figure 6.3b</u>
OU1.1	Acoustic windows	R	5/F – 12/F	<u>Figure 6.3a</u>
OU1.2a	Acoustic windows	R	1/F – 12/F	<u>Figure 6.3a</u>

Note:

[1] R – Residential Premises; E – Educational Institutions.

**1.37.4** Environmental reviews shall be conducted at the later design stage to review and ascertain the proposed provisional noise mitigation measures taking into account the latest design standard at that time for the suitability and application of the LNRS materials.

**1.37.5** Noise impact assessment at the planned residential sites is proposed to be conducted by future developers at the detailed design stage to study whether the future development layout would avoid exposing excessive road traffic noise levels so as to minimise the scale / extent of the proposed mitigation measures.

***Fixed Noise Sources***

**1.37.6** For the proposed noise sources which are located near to existing and planned NSRs, the following tentative noise mitigation measures shall be considered:

- All the pumps should be enclosed inside building structures;
- Proper selection of quiet plant to reduce the tonality at NSRs;
- Installation of silencer / acoustic enclosure / acoustic louver for the exhaust of ventilation system; and
- Openings of ventilation system should be located away from NSRs as far as practicable.

**1.37.7** The maximum allowable sound power level for the planned fixed noise sources as presented in **Section 5.7.3** of the EIA Report should be achieved such that the nearest NSRs can be in compliance with the noise criteria stipulated in the EIAO-TM.

**1.37.8** Project proponent would further liaise and agree with relevant departments on the responsibility of implementation and maintenance of the predicted maximum allowable sound power level for the planned fixed plant noise sources in the detailed design stage.

***Rail Noise***

**1.37.9** As discussed in **Section 5.8.3** of the EIA report, the proposed EFTS is a Schedule 2 DP under the EIA Ordinance. The proposed EFTS will be designed, constructed and operated by the others. The associated environmental impacts will be adequately addressed in a separate EIA study to be prepared and submitted under the EIA Ordinance by the future operator.

## 7 Water Quality Impact

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### 1.38 Introduction

**1.38.1** The EIA Report has assessed the water quality impacts associated with the Project. According to the EIA Report, the water quality impact could be minimized with the implementation of mitigation measures. The water quality monitoring programme as discussed below could ensure the implementation of the recommended mitigation measures and provide continue improvements to the environmental conditions.

### 1.39 Water Monitoring Parameters

**1.39.1** The monitoring shall normally be established by measuring the dissolved oxygen (DO), dissolved oxygen saturation (DO%), temperature, turbidity, salinity, pH and suspended solids (SS) in water bodies at all designated locations as specified in **Section 7.5**.

**1.39.2** The measurements shall be taken at all designated monitoring stations 3 days per week during construction phase. The interval between two sampling surveys shall not be less than 36 hours.

**1.39.3** Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. DO, pH value, salinity, temperature and turbidity should be measured in-situ whereas other parameters should be determined by an accredited laboratory.

**1.39.4** Other relevant data shall also be recorded, including monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena or work underway at the construction site.

### 1.40 Monitoring Equipment

**1.40.1** Dissolved Oxygen, Dissolved Oxygen Saturation and Temperature Measuring Equipment

**1.40.2** The dissolved oxygen (DO) measuring instruments should be portable and weatherproof. The equipment should also complete with cable and sensor, and DC power source. It should be capable of measuring:

- A DO level in the range of 0 – 20 mg/L and 0 – 200% saturation; and
- A temperature of 0 – 45 degree Celsius.

**1.40.3** The equipment should have a membrane electrode with automatic temperature compensation complete with a cable.

**1.40.4** Should salinity compensation not be built-in to the DO equipment, in-situ salinity should be measured to calibrate the DO measuring instruments prior to each measurement.

### **1.40.5 Turbidity Measuring Equipment**

**1.40.6** The turbidity measuring instruments should be a portable and weatherproof with DC power source. It should have a photoelectric sensor capable of measuring turbidity level between 0 – 1000 NTU (for example, Hach model 2100P or an approved similar instrument).

### **1.40.7 Salinity Measuring Equipment**

**1.40.8** A portable salinometer capable of measuring salinity in the range of 0 – 40 parts per thousand (ppt) should be provided for measuring salinity of the water at each monitoring location.

### **1.40.9 pH Measuring Equipment**

**1.40.10** A portable pH meter capable of measuring a pH range between 0.0 and 14.0 shall be provided under the specified conditions (e.g., Orion Model 250A or an approved similar instrument).

### **1.40.11 Positioning Equipment**

**1.40.12** A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for maritime (RTCM) Type 16 error message “screen pop-up” facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instrument of similar accuracy, should be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

### **1.40.13 Water Depth Detector**

**1.40.14** A portable, battery-operated echo sounder should be used for water depths determination at each designated monitoring station. The detector can either be hand held or affixed to the bottom of the work

boat, if the same vessel is to be used throughout the monitoring programme.

### **1.40.15 Water Sampling Equipment**

**1.40.16** A water sampler is required for SS monitoring. It should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

### **1.40.17 Sample Containers and Storage**

**1.40.18** Water samples for SS should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and shipment to the testing laboratory. The samples shall be delivered to the laboratory within 24 hours of collection and be analysed as soon as possible after collection.

### **1.40.19 Calibration of In-Situ Instruments**

**1.40.20** The pH meter, DO meter and turbidimeter shall be checked and calibrated before use. DO meter and turbidimeter shall be certified by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re-calibrated at quarterly basis throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring station.

### **1.40.21 Back-up Equipment and Vessels**

**1.40.22** Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, malfunction, etc.

**1.40.23** The water quality monitoring will involve four monitoring stations and measurements should be conducted within the prescribed tidal conditions in order to ensure the measurement / samples are representative. A multi-probe monitoring equipment set integrated with water sampler(s) is highly recommended to improve the monitoring efficiency. Depending on the actual operation, more than one field

survey vessels might be required simultaneously to ensure the monitoring are conducted within the acceptable monitoring period. The ET shall also consider the use of unattended automatic sampling / monitoring devices at fixed stations where monitoring are required throughout the construction period. The use of such unattended automatic devices, however, shall be subject to the approval of the ER, IEC and EPD.

## 1.41 Laboratory Measurement / Analysis

**1.41.1** At least 3 replicate samples from each independent sampling event are required for the SS measurement which shall be carried in a HOKLAS or international accredited laboratory. Where water depth is allowed, sampling should be conducted at three water depths which are 1m below water surface, mid-depth, and 1m above the river bed. If the sampling water depth is less than 6m, the mid-depth may be omitted. If the water depth is less than 3m, only the mid-depth may be omitted. Sufficient water samples shall be collected at the monitoring stations for carrying out the laboratory measurement and analysis. The laboratory determination work shall start within 24 hours after collection of the water samples. The analysis for suspended solids is presented in **Table 7.1**.

**Table 7.1** Laboratory analysis

Parameters	Analytical Method	Reporting Limit
Suspended Solid (SS)	APHA 2540-D	0.5mg/L

## 1.42 Monitoring Locations

**1.42.1** Water quality monitoring will be carried out at 23 locations of the inland water nearby the project site.

**1.42.2** The proposed water quality monitoring locations are shown in **Figure 7.1** and **Figure 7.1a** to **Figure 7.1d** and listed in **Table 7.2**. The ET shall seek approval from IEC and EPD for any alternative monitoring locations.



**Table 7.2** Locations of proposed water quality monitoring stations

WSR	Monitoring Station ID	Description	Easting	Northing
S01	U1	Upstream monitoring	819607.2	830336.8
	U2	Upstream monitoring	820349.8	830641.4
	U3	Upstream monitoring	820866.1	832474.4
	U4	Upstream monitoring	821377.8	832436.5
	M1	Gradient monitoring	820411.8	832047.3
	M2	Gradient monitoring	820079.4	832131.9
	M3	Gradient monitoring	820688.8	833135.2
	M4	Gradient monitoring	820902.2	833149.5
	D1	Impact monitoring	820714.3	833512.5
S02	U5	Upstream monitoring	818815.2	832102.7
	M5	Gradient monitoring	819353.9	832616.3
S03	U6	Upstream monitoring	819100.9	832084.9
	U7	Upstream monitoring	819241.3	831909.8
	M6	Gradient monitoring	819323.1	832215.2
S02/S03	D2	Impact monitoring	819772.3	833566.9
S04	U8	Upstream monitoring	819466.3	830906.1
	D3	Impact monitoring	819869.1	830823.0
S05	EIS-1	Baseline/ Impact monitoring	820107.9	830222.6
S13	U9	Upstream monitoring	822139.0	833166.4
	D4	Impact monitoring	821751.5	833671.1
S17	M7	Gradient monitoring	818779.4	832770.2
	D5	Impact monitoring	818574.0	833663.1
S20	U10	Upstream monitoring	818718.5	832373.2

Notes:

The proposed monitoring locations are subject to adjustment with regard to the actual site condition and accessibility at the time of monitoring. The adjusted monitoring locations shall be agreed with EPD.

## 1.43 Baseline Monitoring

**1.43.1** Baseline conditions for water quality shall be established and agreed with EPD prior to commencement of construction works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the construction works and to demonstrate the suitability of the proposed impact and control monitoring stations.

**1.43.2** The baseline monitoring shall be conducted for at least 4 weeks prior to the commencement of construction works. The proposed water quality monitoring schedule shall be submitted to EPD by the ET at least 2 weeks before the first day of the monitoring month. The interval between two sets of monitoring shall not be less than 36 hours. EPD shall also be notified immediately for any changes in schedule.

**1.43.3** In general, where the difference in value between the first and second in-situ measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings should be taken.

**1.43.4** There should be no construction work in the vicinity of the stations during the baseline monitoring. The baseline data will be used to establish the Action and Limit Levels. The determination of Action and Limit Levels will be discussed in **Section 7.8**.

**1.43.5** **Table 7.3** below summarizes the proposed monitoring frequency and water quality parameters for baseline monitoring.

**Table 7.3** Proposed water quality monitoring programme for baseline monitoring

Item	Baseline Monitoring
Monitoring Period	At least 4 weeks prior to the commencement of construction work
Monitoring Frequency	3 Days in a Week
Monitoring Locations	All stations listed in <b>Table 7.2</b>
Monitoring Parameters	Dissolved oxygen (DO), dissolved oxygen saturation (DO%), temperature, turbidity, salinity, pH and suspended solids (SS).
Intervals between 2 Sets of Monitoring	Not less than 36 hours

## 1.44 Impact Monitoring

**1.44.1** The impact monitoring shall be conducted during construction period. The purpose of impact monitoring is to ensure the implementation of the recommended mitigation measures, provide effective control of any malpractices, and provide continuous improvements to the environmental conditions. The proposed water quality monitoring schedule shall be submitted to EPD by the ET at least 2 weeks before the first day of the monitoring month. The interval between two sets of

monitoring shall not be less than 36 hours. EPD shall also be notified immediately for any changes in schedule.

**1.44.2** In general, where the difference in value between the first and second in-situ measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings should be taken.

**1.44.3** In case of project-related exceedances of Action and/or Limit Levels, the impact monitoring frequency shall be increased according to the requirement of Event and Action Plan. The details of Event Action Plan will be discussed in **Section 7.9**.

**1.44.4** **Table 7.4** below summarises the proposed monitoring frequency and water quality parameters for and impact monitoring.

**Table 7.4** Proposed water quality monitoring programme for impact monitoring

Item	Impact Monitoring
Monitoring Period	During entire construction period
Monitoring Frequency	3 Days in a Week
Monitoring Locations	All stations listed in <b>Table 7.2</b>
Monitoring Parameters	Dissolved oxygen (DO), dissolved oxygen saturation (DO%), temperature, turbidity, salinity, pH and suspended solids (SS)
Intervals between 2 Sets of Monitoring	Not less than 36 hours

## 1.45 Action and Limit Levels

**1.45.1** The Action and Limit Levels for water quality are defined in **Table 7.5** below.

**Table 7.5** Action and Limit Levels for water quality

Parameters	Action Level	Limit Level
DO in mg/L (Surface, Middle & Bottom)	<u>Surface and Middle</u> 5 percentile of baseline data. <sup>[1]</sup>  <u>Bottom</u> 5 percentile of baseline data	<u>Surface and Middle</u> 4 mg/L or 1 percentile of baseline data. <sup>[1]</sup>  <u>Bottom</u> 2 mg/L or 1 percentile of baseline data
SS in mg/L	95 percentile of baseline data or	99 percentile of baseline data or 130% of

Parameters	Action Level	Limit Level
	120% of upstream control station. <sup>[2]</sup>	upstream control station. <sup>[2]</sup>
Turbidity in NTU	95 percentile of baseline data or 120% of upstream control station. <sup>[2]</sup>	99 percentile of baseline data or 130% of upstream control station. <sup>[2]</sup>
pH	Beyond the range of 6.6 to 8.4	Beyond the range of 6.6 to 8.4

Notes:

[1] For DO, non-compliance occurs when monitoring results is lower than the limits.

[2] For SS and turbidity, non-compliance occurs when monitoring results is larger than the limits.

## 1.46 Event and Action Plan

**1.46.1** Should non-compliance of the criteria occur, action in accordance with the Event and Action Plan in the **Table 7.6** below shall be carried out.

**Table 7.6** Event and Action Plan for water quality

Event	Action			
	ET	IEC	ER	Contractor
Action level exceedance for one sampling day	<ol style="list-style-type: none"> <li>1. Inform IEC, Contractor and ER;</li> <li>2. Check monitoring data, all plant, equipment and Contractor's working methods; and</li> <li>3. Discuss remedial measures with IEC and Contractor and ER.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, ER and Contractor on the implemented mitigation measures;</li> <li>2. Review proposals on remedial measures submitted by Contractor and advise the ER accordingly; and</li> <li>3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with IEC, ET and Contractor on the implemented mitigation measures;</li> <li>2. Make agreement on the remedial measures to be implemented;</li> <li>3. Supervise the implementation of agreed remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) of impact;</li> <li>2. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>3. Rectify unacceptable practice;</li> <li>4. Check all plant and equipment;</li> <li>5. Consider changes of working methods;</li> <li>6. Discuss with ER, ET and IEC and purpose remedial measures to IEC and ER; and</li> <li>7. Implement the agreed mitigation measures.</li> </ol>
Action level exceedance for more than one consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat in-situ measurement on next day of exceedance to confirm findings;</li> <li>2. Inform IEC, contractor and ER;</li> <li>3. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>4. Discuss remedial measures with IEC, contractor and ER</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, Contractor and ER on the implemented mitigation measures;</li> <li>2. Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and</li> <li>3. Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET, IEC and Contractor on the proposed mitigation measures;</li> <li>2. Make agreement on the remedial measures to be implemented ; and</li> <li>3. Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify source(s) of impact;</li> <li>2. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>3. Rectify unacceptable practice;</li> <li>4. Check all plant and equipment and consider changes of working methods;</li> <li>5. Discuss with ET, IEC and ER and submit proposal of remedial measures to ER and</li> </ol>

Event	Action			
	ET	IEC	ER	Contractor
	5. Ensure remedial measures are implemented			IEC within 3 working days of notification; and 6. Implement the agreed mitigation measures.
Limit level exceedance for one sampling day	<ol style="list-style-type: none"> <li>Repeat measurement on next day of exceedance to confirm findings;</li> <li>Inform IEC, contractor and ER;</li> <li>Rectify unacceptable practice;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Consider changes of working methods;</li> <li>Discuss mitigation measures with IEC, ER and Contractor; and</li> <li>Ensure the agreed remedial measures are implemented</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with ET, Contractor and ER on the implemented mitigation measures;</li> <li>Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and</li> <li>Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with ET, IEC and Contractor on the implemented remedial measures;</li> <li>Request Contractor to critically review the working methods;</li> <li>Make agreement on the remedial measures to be implemented; and</li> <li>Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>Identify source(s) of impact;</li> <li>Inform the ER and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment and consider changes of working methods;</li> <li>Discuss with ET, IEC and ER and submit proposal of additional mitigation measures to ER and IEC within 3 working days of notification; and</li> <li>Implement the agreed remedial measures.</li> </ol>
Limit level exceedance for more than one consecutive sampling days	<ol style="list-style-type: none"> <li>Inform IEC, contractor and ER;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IEC, ER and Contractor; and</li> <li>Ensure mitigation measures are implemented; and</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with ET, Contractor and ER on the implemented mitigation measures;</li> <li>Review the proposed remedial measures submitted by Contractor and advise the ER accordingly; and</li> <li>Review and advise the ET and ER on the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>Discuss with ET, IEC and Contractor on the implemented remedial measures;</li> <li>Request Contractor to critically review the working methods;</li> <li>Make agreement on the remedial measures to be implemented;</li> <li>Discuss with ET and IEC on the effectiveness of the</li> </ol>	<ol style="list-style-type: none"> <li>Identify source(s) of impact;</li> <li>Inform the ER and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment and consider changes of working methods;</li> <li>Discuss with ET, IEC and ER and submit proposal of additional mitigation</li> </ol>

Event	Action			
	ET	IEC	ER	Contractor
	5. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days		implemented mitigation measures; and 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the dredging activities until no exceedance of Limit level.	measures to ER and IEC within 3 working days of notification; and 6. Implement the agreed remedial measures. 7. As directed by the ER, to slow down or stop all or part of the dredging activities until no exceedance of Limit level.

Notes:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer’s Representative

Each step of actions required shall be implemented within 1 working days unless otherwise specified or agreed with EPD.

The water quality at TCE-WQM2b should be dominated by the operation of CMP. In case exceedance is recorded, the ET shall collate the monitoring data for CMP and evaluate the possible causes of the exceedance.

## 1.47 Mitigation Measures

1.47.1 The EIA Report has recommended construction phase mitigation measures. All the proposed mitigation measures are summarized in the EMIS in **Appendix 4.1**.

### Construction Phase

#### *General Site Operation*

1.47.2 The following practice and measures should be implemented for all the construction works including construction works near watercourses, construction of Reclaimed Water Service Reservoir and general site operations, if applicable.

1.47.3 In accordance with the Professional Persons Environmental Consultative Committee Practice Notes on Construction Site Drainage (ProPECC PN 1/94), Environmental Protection Department, 1994 best management practices should be implemented as far as practicable as below:

- At the start of site establishment, perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers should be provided on site to direct stormwater to silt removal facilities.
- Diversion of natural stormwater should be provided as far as possible. The design of temporary on-site drainage should prevent runoff going through site surface, construction machinery and equipment in order to avoid or minimize polluted runoff. Sedimentation tanks with sufficient capacity, constructed from pre-formed individual cells of approximately 6 to 8 m<sup>3</sup> capacities, are recommended as a general mitigation measure which can be used for settling surface runoff prior to disposal. The system capacity shall be flexible and able to handle multiple inputs from a variety of sources and suited to applications where the influent is pumped.
- The dikes or embankments for flood protection should be implemented around the boundaries of earthwork areas. Temporary ditches should be provided to facilitate the runoff discharge into an appropriate watercourse, through a silt/sediment trap. The silt/sediment traps should be



incorporated in the permanent drainage channels to enhance deposition rates.

- The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94. The detailed design of the sand/silt traps should be undertaken by the contractor prior to the commencement of construction.
- Construction works should be programmed to minimize surface excavation works during the rainy seasons (April to September). All exposed earth areas should be completed and vegetated as soon as possible after earthworks have been completed. If excavation of soil cannot be avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces should be covered by tarpaulin or other means.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit should be removed regularly and disposed of by spreading evenly over stable, vegetated areas.
- If the excavation of trenches in wet periods is necessary, it should be dug and backfilled in short sections wherever practicable. Water pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.
- All open stockpiles of construction materials (for example, aggregates, sand and fill material) should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and storm runoff being directed into foul sewers.
- Precautions to be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecasted, and actions to be taken during

or after rainstorms are summarized in Appendix A2 of ProPECC PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events.

- All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facilities should be provided at every construction site exit where practicable. Wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains.
- Oil interceptors should be provided in the drainage system downstream of any oil/fuel pollution sources. The oil interceptors should be emptied and cleaned regularly to prevent the release of oil and grease into the storm water drainage system after accidental spillage. A bypass should be provided for the oil interceptors to prevent flushing during heavy rain.
- Construction solid waste, debris and rubbish on site should be collected, handled and disposed of properly to avoid water quality impacts.
- All fuel tanks and storage areas should be provided with locks and sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled fuel oils from reaching water sensitive receivers nearby.
- Regular environmental audit on the construction site should be carried out in order to prevent any malpractices. Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the water bodies, marsh and ponds.

**1.47.4** By adopting the best management practices, it is anticipated that the impacts of general site operation will be reduced to satisfactory levels before discharges. The details of best management practices will be highly dependent to actual site condition and Contractor shall apply for a discharge license under WPCO.

### ***Prevention of Accidental Spillage of Chemicals***

- 1.47.5** The chemicals used during construction, such as fuel, oil, solvents and lubricants shall be properly stored and contained in designated area with secondary containment to prevent spillage and contamination of the nearby water environment.
- 1.47.6** Any maintenance activities and workshops with chemicals use shall be located away from watercourses on hard standings within a bunded area. Sumps and oil interceptors should be provided as appropriate.
- 1.47.7** The Contractor shall register as a chemical waste producer and employ licensed collector for collection of chemical waste from the construction site. Any chemical waste generated shall be managed in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

### ***Sewage from Workforce***

- 1.47.8** Portable chemical toilets and sewage holding tanks should be provided for handling the construction sewage generated by the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets to cater 0.23 m<sup>3</sup>/day/employed population and be responsible for appropriate disposal and maintenance.
- 1.47.9** Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project. Regular environmental audit on the construction site should be conducted in order to provide an effective control of any malpractices and achieve continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the Project would not cause water quality impact after undertaking all required measures.

### ***Contaminated Groundwater and Site Runoff***

- 1.47.10** To prevent the water quality due to the contaminated water from the area with contamination, the following mitigation measures should be adopted.
- Cover the contaminated soil and surface to prevent the generation of contaminated water.
  - No open stockpiling of contaminated soil should be allowed to prevent generation of contaminated water due to precipitation.

- Contaminated water, either from groundwater or runoff, should be treated by wastewater treatment facility (WTF) to an acceptable level as indicated in TM-DSS before disposal if the deployment of such WTF is feasible.
- Recharging the contaminated groundwater back to the aquifer should be sought if treatment of the contaminated groundwater by WTF is not feasible, subject to the agreement with EPD.

### ***Construction Works near/ within Watercourses***

**1.47.11** Apart from the general site best management practices, extra care shall be paid for works near watercourses to minimise the potential water quality impacts, especially for the construction of deck over Yuen Long Nullah and revitalisation works of Yuen Long Nullah, Tin Tsuen Channel and Yuen Long West Nullah. The measures described in ETWB TC (Works) No. 5/2005 “Protection of natural streams / rivers from adverse impacts arising from construction works” should be adopted where applicable. The major measures are list below:

- Cofferdams and impermeable sheet piles should be installed as appropriate to isolate the flow of the nullah from the construction works area. The detailed design of the cofferdams will be conducted by the Contractor during the construction phase to fulfil the requirements in DSD Technical Circular No. 1/2017 “Temporary Flow Diversions and Temporary Works Affecting Capacity in Stormwater Drainage System” for DSD approval, in order to formulate feasible options of these temporary structure.
- Stockpiling of construction materials and dusty materials should be located from any watercourses, contained in bunded areas and covered with tarpaulin.
- Construction debris and spoil should be covered with tarpaulin during storage. Timely removal of materials away from the site for disposal should be arranged to avoid being washed into the nearby watercourses.
- Water pumps should be used to collect any wastewater and construction site surface runoff within the cofferdam/ temporary works platform. The collected wastewater shall be properly treated before discharge.

- Toe-board and bunds shall be provided along the edge of the works area/ temporary platform to prevent wastewater/ debris from falling into the watercourses.
- Any temporary works site inside the watercourses should be temporarily isolated, such as by placing of sandbags or silt curtains with lead edge at bottom and properly supported props to prevent adverse impact on the water quality.
- Proper shoring may need to be erected in order to prevent soil / mud from slipping into the inland water bodies.
- Construction effluent, site run-off and sewage should be properly collected and/or treated.

#### ***Removal/ Diversion of watercourses***

**1.47.12** During removal and diversion of watercourse, precaution measures shall be implemented to prevent adverse water quality impact to the surrounding environment. Good site practices as described in ETWB TC (Works) No. 5/2005 “Protection of natural streams / rivers from adverse impacts arising from construction works” and ProPECC PN 1/94 “Construction Site Drainage” should be adopted where applicable. The following major measures shall be implemented:

- Cofferdams and impermeable sheet piles should be installed as appropriate to isolate the water flow from the construction works area.
- Dewatering or flow diversion shall be conducted prior to the construction works to prevent water overflow to the surrounding area.
- Watercourse removal and flow diversion should be conducted in dry season as far as practicable when the water flow is low.
- Water drained from the watercourse shall be diverted to new/ temporary drainage for watercourse diversion. For watercourse removal, the water drained shall be collected and treated to meet the requirements of WPCO and TM-DSS before discharge.
- Any excavated land-based sediment from the removal/ diversion of watercourse shall be properly stored at bunded areas away from any watercourse and covered with tarpaulin before transporting out of the site.

### ***Removal/ Filing of ponds***

**1.47.13** During ponds filling and removal, the following precaution measures shall be implemented to prevent adverse water quality impact to the surrounding environment.

- Dewatering shall be conducted prior to the construction works to prevent water overflow to the surrounding area.
- Water drained from the ponds shall be collected in appropriate temporary storage tank and reuse on-site as far as practicable. Surplus drained water shall be properly disposal at STW. No direct discharge to stormwater drainage system or marine water should be allow.
- Any excavated land-based sediment from the ponds shall be properly stored at bunded areas away from any watercourse and covered with tarpaulin before transporting out of the site.

### **Operation Phase**

#### ***Emergency Discharge***

**1.47.14** For the protection of the water sensitive receivers, the following mitigation measures will be implemented to the proposed SPS:

- Twin rising mains would be provided. Should one of the duty mains be taken out of operation, the remaining one would still be able to deliver flow;
- Standby pumps and treatment facilities would be provided in case of unexpected breakdown of pumping and treatment facilities such that the standby pumps and treatment facilities could take over and function to replace the broken pumps and treatment facilities; and
- Dual electricity supply or backup power supply facilities such as diesel generator would be provided in case of power failure to sustain the function of pumping and treatment facilities.

**1.47.15** With the implemented mitigation measures, significant impact emergency sewage overflow from the proposed SPSs is not anticipated.

#### ***Change in Drainage System and Road Runoff***

**1.47.16** During operation phase, vehicle dust, tyre scraps and oils might be washed away from the road surface / open areas to the nearby water courses by surface runoff or road surface cleaning. Subject to detailed design and requirement of relevant government departments, the capacities of road drainage system shall cater the runoff from 50 year-

return-period rainstorm. Proper drainage systems with silt traps and oil interceptors should be installed. The design of road gullies with silt traps should be incorporated in later detailed design.

**1.47.17** Runoff will be controlled by best management practice. Runoff will be intercepted by properly designed and managed silt traps at appropriate spacing so that common roadside debris, refuse and fallen leaves etc. can be captured before allowing the runoff to drain into watercourses such as Yuen Long Creek. At the outlets to watercourses, the Project Proponent or the delegated operation parties should manage the road/open area cleaning prior to the occurrence of a storm. Moreover, it is recommended each of the cleaning events should be carried out during low traffic flow period, preferably using either manual methods or mechanical means such as vacuum sweeper/truck equipped with side broom, which is to sweep road sludge and debris into the suction nozzle to increase the removal efficiency of pollutants. The collected pollutants would be tankered away for off-site disposal at landfill sites. After the removal of the pollutants, the pollution levels from stormwater would be much reduced.

**1.47.18** Given the intermittent nature of non-point source pollution and adopting flexible management to suit site conditions, the impact to the receiving water body is insignificant.

***Wastewater from Storage and Workshop Area***

**1.47.19** Discharge license under WPCO should be applied by the tenants in other specific uses (Storage and Workshop, and Open Storage) subject to their future operation needs. Compliance with WPCO for discharge of wastewater will be ensured.

## 8 Sewage & Sewerage Treatment Implications

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### 1.48 Introduction

1.48.1 An assessment of potential impacts due to the sewage arising from the proposed Project has been assessed in **Section 7** of the EIA Report.

### 1.49 Mitigation Measures

#### **Construction Phase**

1.49.1 The sewage generated during the construction stage from the on-site workers will be collected in chemical toilets and disposed of off-site. Therefore, no sewerage impacts are expected from the site during the construction phase. As such, environmental monitoring and audit of the sewerage system is considered not required.

#### **Operation phase**

1.49.2 Equivalent pollution loading from TSE in YLS STW (upon offsetting by credit gained from the existing livestock farms) could be discharged to Yuen Long Nullah adjacent to the STW with strict compliance to the requirement for “No Net Increase in Pollution Loading”, while reedbed is provided a further polish to the tertiary TSE that discharge to Yuen Long Nullah and eventually Deep Bay.

#### **Sewage Treatment by On-site Sewage Treatment Works to up to Tertiary Level**

1.49.3 Following numerous meetings, liaison and coordination amongst CEDD, PlanD, EPD and DSD, it is proposed that the sewage generated from the YLS PDA will be discharged to a new local STW, namely YLS STW for on-site treatment, which is located to the southern end of the PDA. The on-site STW will be designed to achieve a treatment capacity of 24,000m<sup>3</sup>/day in ADWF and up to tertiary level treatment standard to enable for reclaimed water reuse while the rest of sewage effluent is suggested to be treated by secondary plus treatment (with UV disinfection and 75% nitrogen removal) and discharge to the Urmston Road submarine outfall.

#### **Reclaimed Water Reuse in YLS PDA, Existing Area and Other Concurrent Proposed Development in the Vicinity**

1.49.4 The reclaimed water from YLS STW would be prior reused within the YLS area for non-potable usage including toilet flushing, landscape irrigation, street cleansing and water make-up for water features and



flood retention lakes. As per the latest development parameter, there will be 6,660m<sup>3</sup>/day of water demand for toilet flushing in YLS that could be supplied by reclaimed water. For other potential reclaimed water uses in YLS such as landscape irrigation, water make-up for water features and etc., as their water demand are subject to seasonal variation and acceptance of other government departments, they will not be considered in the overall reclaimed water reuse plan at this stage until further details of these infrastructures and acceptance by the corresponding government has been sought.

**1.49.5** Moreover, as part of the urban design of the YLS PDA, the existing Yuen Long Nullah (with some sections to be partially decked to meet the traffic demand) adjacent to the eastern side of the PDA along Kung Um Road will be revitalised by application of both soft and hard landscaping treatments in order to improve its aesthetics and to promote a water friendly culture within the YLS PDA. The tertiary TSE discharged to Yuen Long Nullah can be regarded as a continuous scenic water source as part of the waterscape provided within the revitalised nullah.

**1.49.6** However, as the TSE generated would be excessive that it cannot be totally reused by YLS PDA itself, the tertiary TSE should be properly considered in view of the no net increase in the pollution loading requirement of the Deep Bay Water Control Zone.

**1.49.7** As there are also some proposed development in Long Bin and Tan Kwai Tsuen Development which are both in vicinity of YLS PDA, liaison with the project proponent of these proposed development for adopting reclaimed water for non-potable use (mainly for toilet flushing) are being conducted. As advised by the project proponents of Long Bin and Tan Kwai Tsuen Development, their flushing water demand were estimated to about 4,292m<sup>3</sup>/day (2,375m<sup>3</sup>/day from Long Bing Development and 1,917m<sup>3</sup>/day from Tan Kwai Tsuen Development (on conservative side)) in total. As such, part of the reclaimed water, i.e. 4,292m<sup>3</sup>/day could be discharged to these development for their flushing uses.

#### **Pollution Credit Offsetting by Existing Livestock Farms**

**1.49.8** There are currently 6 number of existing pig and chicken farms scattered in YLS PDA and it is proposed that 5 of these livestock farms would be removed. As it is understood that AFCD are implementing Livestock Keeping License for operation of these livestock farms, the farm operator/ owners shall treat their livestock waste to meet minimum discharge standards as stipulated in the Waste Disposal (Livestock Waste) Regulations (Chapter 354A).

**1.49.9** Hence the pollution loadings generated from these livestock farms are identified as one of the distinct source contributing to the pollution credit in Deep Bay. With some of these existing livestock farms being removed by YLS, their associated pollution credit can hence be released and offset by equivalent amount of pollution loading being discharged from YLS STW to Yuen Long Nullah.

**1.49.10** The pollution loading of 570m<sup>3</sup>/day of residual tertiary TSE being discharged could be offset by the pollution credit gained from those existing livestock farms removed by YLS PDA, which comply with the requirement for “No Net Increase in Pollution Loading” into Deep Bay. On the contrary, if tertiary TSE is not proposed to be discharged to Yuen Long Nullah after removal of living livestock farms, it is considered that it will result in an improvement to the water quality of the downstream Deep Water Bay.

#### **Further Polishing of TSE by Reedbed**

**1.49.11** In the previous project namely Planning and Engineering Study on Development of Lok Ma Chau Loop and existing Tin Shui Wai Wetland Park, it has been proven that reedbed is capable to further polish the TSE by means of biological breakdown process. There is an approximate 4ha area adjacent to YLS STW in the RODP, which would be developed into a reedbed. A small amount of TSE from YLS STW will pass through the reedbed for further polishing before discharging into Yuen Long Nullah.

**1.49.12** However, due to the uncertain pollution removal efficiency of the reedbed, its polishing function would only be regarded as an extra provision and would not be considered in the pollution load offset balance.

#### **Surplus TSE Export Disposal Strategy**

**1.49.13** Having made reference to TSE disposal strategy in HSK NDA, the surplus TSE will be discharged from YLS STW to existing inlet chamber of the Northwest New Territories (NWNT) effluent tunnel at San Wai for discharging to the Urmston Road submarine outfall for deep discharge to the North Western Water Control Zone.

**1.49.14** Alternatively, WSD is implementing a saltwater supply system in the existing NWNT area including Tin Shui Wai and Yuen Long Town area. It can be considered to extend the use of surplus reclaimed water as a supply source to the new saltwater supply system. Liaison with WSD and Department of Health (DH) on transferring surplus reclaimed water to their Tan Kwai Tsuen (TKT) saltwater service reservoir for being utilised by its supply zone is being conducted concurrently.

## **Contingency Plan for the proposed SPS(s) and YLS STW**

**1.49.15** Given the sensitivity of inner Deep Bay in term of water quality and ecology, extensive effort will be expedited to avoid the occurrence for emergency discharges. In order to achieve this, the design of SPSs and STW will be cautiously reviewed to include additional provisions including as follows:

- Twin rising mains would be provided. Should one of the duty mains be taken out of operation, the remaining one would still be able to deliver flow;
- Standby pumps and treatment facilities would be provided in case of unexpected breakdown of pumping and treatment facilities such that the standby pumps and treatment facilities could take over and function to replace the broken pumps and treatment facilities; and
- Dual electricity supply or backup power supply facilities such as diesel generator would be provided in case of power failure to sustain the function of pumping and treatment facilities.

**1.49.16** In view of the above mitigation measures, environmental monitoring and audit of the sewage system is considered not required. The implementation schedule of the relevant mitigation measures is presented in **Appendix 4.1**.

## 9 Ecology

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### 1.50 Introduction

**1.50.1** The EIA has evaluated the ecological consequences of the Project and recommended ecological mitigation measures to avoid, minimize and compensate for the impact arising from the Project.

### 1.51 Mitigation Measures

**1.51.1** Ecological mitigation measures have been formulated in accordance with Annex 16 of the EIAO-TM as are described in the Section 8.8 of the EIA Report and summarised in the Environmental Mitigation Implementation Schedule (EMIS). These measures are described in detail below.

#### **Mitigation Measures for Loss of Hillside Secondary Woodland**

**1.51.2** In order to compensate for the cumulative loss of hillside secondary woodland (~2.42ha in total), woodland mix species shall be planted at an area ratio of at least 1:1 in the adjacent hillside area to the west of the PDA as shown in Figure 8.10 of the EIA Report. The proposed woodland compensation site is approximately 12ha in the hillside area currently zoned as “Conservation Area” and is not uniformly sloping. It includes some steeper areas with large boulders and some areas along the ridges are more gently sloping (slope gradient  $<35^\circ$ ) that are considered suitable for tree planting. The site is considered to be moderately eroded and exposed. Plant species should be selected to include a mix of species with pioneering characteristics (fast-growing/ light-tolerant/ drought-tolerant/ wind-tolerant, etc.) and native species.

**1.51.3** The planting design shall include but not limited to ground preparation works such as clearance of excessive ground herbs, fertilization application, weeding regime and mulching after planting. Before commencement of construction works of the Project, a detailed Woodland Compensation Plan will be submitted and agreed with the relevant authorities.

#### **Mitigation Measures to Minimize Direct Impacts on Flora and Fauna of Conservation Significance**

**1.51.4** Three flora species of conservation importance were identified within PDA or proposed works footprint, including a planted individual of *Ailanthus fordii*, three individuals of *Artocarpus hypargyreus* and approximately 10 small seedlings/ saplings of *Aquilaria sinensis* in a small private nursery near the southern end of Lam Tei West Road.

Both *A. fordii* and *A. sinensis* recorded in this Study are cultivated specimens that can be transplanted to suitable receptor site(s) within the PDA if they will be affected by the proposed works. The three specimens of the possibly naturally established *A. hypargyreus* shall be avoided/ retained through careful design of development layout at the detailed design phase as far as practicable. If on-site retention is not practicable, these specimens of species of conservation importance should be transplanted to suitable receptor site(s) subject to the detailed design at a later stage of the Project. Prior to commencement of construction works, a baseline plant survey shall be conducted within all proposed works areas to ascertain the presence and update the quantities and conditions of any flora species of conservation importance. Any identified flora species of conservation importance within the proposed works area(s) shall either be properly protected or transplanted to suitable receptor site(s). Any transplanted flora specimens of conservation importance shall be properly maintained throughout the construction phase of the Project.

**1.51.5** Prior to commencement of any works which would lead to watercourse loss, any water channels or streams within the proposed works footprint shall be carefully surveyed to identify any aquatic fauna species of conservation importance. Affected aquatic fauna of conservation importance shall be captured and translocated to suitable receptor site(s) including the retained watercourses or the new watercourse prior to commencement of construction works.

#### **Mitigation Measures for Impacts to Watercourse**

**1.51.6** To mitigate for the cumulative loss of approximately 465m of lowland watercourses which are generally fragmented and the loss of these watercourses is considered to result in Low-Moderate ecological impacts, it is proposed that an approximate 575m long semi-natural watercourse to be created along the hillside of the western boundary of Area 3 as an enhancement measure. This semi-natural watercourse is anticipated to act as a catchment for several hillside streams and provide hydrological and ecological connectivity to downstream sections. The watercourses will be zoned as 'Other Specified Uses (Hillside River with Scenic Cycle Track)' ('OU'). The new watercourse shall be designed to maximize ecological opportunities for aquatic flora and fauna and provide new linkages to several fragmented watercourses. Its channel bed and banks should be designed to replicate those streams that it is fed by to provide suitable habitats for native species which are likely to occur here.

**1.51.7** Prior to commencement of construction works in areas affecting watercourses, a Hillside River Corridor Management Plan (HRCMP) shall be prepared by a qualified ecologist with full details of the design construction, hydrology, along with an implementation programme of creation, establishment monitoring and maintenance programme to be agreed with relevant government authorities. Specific reference should be made to making reference to DSD Guidance notes (DSD 2015) and other international practices to maximise wildlife opportunities for this habitat creation.

**Mitigation Measures to Minimize Impacts to Hydrological Disruption or Change in Water Quality to Retained Watercourses**

**1.51.8** Construction phase impacts to the retained natural watercourses will be minimized by ensuring that the designated 15m wide buffer on both sides of the retained natural watercourses will be maintained and properly protected by solid barriers throughout the construction phase. No construction related activities including construction works, storage or traffic shall take place within the retained watercourses and their designated buffer zones. Measures to control construction site run-off and potential water quality impacts arising from the operation of the Project as detailed in **Section 7** of this Manual shall be fully implemented to minimize any induced water quality impacts on aquatic habitats and fauna.

**Mitigation Measures to Minimize Disturbance Impacts (bird collision/ disturbance to egret/ flight-lines/ roosting, nesting, foraging due to buildings)**

**1.51.9** The egret location shall be checked for any evidence of occupation during the ardeid breeding season by a qualified ecologist of the ET prior to the commencement of any works activity within 250m of the egret. A monitoring programme shall be developed with the relevant authorities to confirm the requirements for monitoring the conditions of the egret and potential impacts to egret flight-lines during construction phase and the first 12 months of Project operation.

**1.51.10** Poorly designed noise barriers do pose a risk to flying birds, especially those which utilise transparent material. As a precautionary approach, consideration should be given at the detailed design stage to avoid the use of highly reflective materials in the design, and implementing the use of opaque materials, fritting, breaking up external reflections with stickers or plastic wrap and/or any other bird-friendly design for noise barriers.

### **Mitigation Measures to Minimize Potential direct ecological impacts (mortality) to Nesting Birds within the Project Site**

**1.51.11** There will be a certain amount of vegetation clearance and tree felling required. Many of the trees affected are landscape species; these are often introduced exotic species, with little ecological value, and have been planted for aesthetic appeal. The ecological impacts arising from the loss of these trees are not considered to be significant.

**1.51.12** However, precautionary checks of the vegetation and open areas for the presence of nesting birds should be carried out before vegetation clearance by a suitably experienced ecologist. If active nests are found, site clearance should be postponed until the young have fledged. All workers will be informed that all wild birds, including their nests and eggs, are protected under the Wild Animals Protection Ordinance (Cap. 170).

### **Mitigation Measures to Minimize Potential direct ecological impacts (mortality) to bats within the Project Site**

**1.51.13** Bats are vulnerable to mortality at roosts, especially if the roosts are being utilized by nursing females. Some insectivorous bat species utilize abandoned buildings or trees as roost sites. Fruit bats may utilise Chinese Fan-palms within the Project Site.

**1.51.14** Mortality impacts on bats are predicted to be low in the absence of mitigation; however, direct ecological impact on roosting bats is considered to be low to moderate. Given that bats are a relatively little known group and identification is difficult, it is recommended that on a precautionary basis, prior to the demolition of buildings or felling or transplanting of trees, sites should be checked for the presence of bat roosts by a suitably qualified ecologist. If roosts are found to be occupied by nursing females, demolition should be postponed until the roost is vacated by nursing females.

**1.51.15** If any evidence of roosting bats is found in any built structures, trees or bamboos that are to be removed or transplanted during the construction phase, a suitably qualified ecologist with relevant experience in bat mitigation should develop appropriate mitigation strategies and supervise any removal of structures or vegetation containing bat roosts.

## **1.52 Monitoring and Audit Requirement**

**1.52.1** The implementation of the mitigation measures shall be audited regularly during the construction phase, the establishment phase of the mitigation measures and/or the early (the first 12 months of) operation phase of the Project. Requirements of environmental audit are provided



in Section 15 of this Manual. This will cover the implementation of mitigation measures as are described in Section 8.8 of the EIA Report and the EMIS.

### **Monitoring of Compensatory Woodland**

**1.52.2** Before commencement of construction works, a detailed Woodland Compensation Plan shall be prepared by a qualified botanist/ plant ecologist with relevant experience in reforestation. The Plan shall be developed based on the latest baseline condition of the proposed woodland planting site prior to commencement of the Project. The qualified botanist/ plant ecologist should review the latest site condition and topography, and determine the implementation details of the planting and monitoring works. The Plan shall include proposals on site preparation works, planting design and layout (such as planting space and arrangement of proposed planting species), planting period (early wet season), planting methodology, site supervision of planting, post-planting monitoring and maintenance programme. Details of the monitoring programme for the compensation woodland shall be included in the Woodland Compensation Plan to allow on-going review of the effectiveness of the implemented plantings and to ensure long-term establishment of the planted species. Details of the monitoring methodology shall include quantitative sampling of survival rates of planted specimens and vegetation coverage with the use of quadrats, and qualitative monitoring by walking over fixed transects along the planting area to record physical conditions and management of the planting site.

**1.52.3** Planting work of compensatory woodland shall be supervised by a qualified plant ecologist/ botanist/ Certified Arborist with relevant experience in reforestation. Planting work shall be conducted in the early wet season (i.e. March/ April). Quantitative baseline monitoring shall be conducted upon completion of planting work in Month 1 of Year 1. Monthly monitoring shall continue throughout the period in Year 1. The monitoring frequency can be reduced to bi-monthly (once in every two months) or quarterly at later stages of the monitoring period depending on the conditions of the planted specimens.

### **Monitoring of Transplantation of Flora Species of Conservation Importance**

**1.52.4** Prior to commencement of construction works, an updated baseline survey shall be conducted by a qualified botanist/ plant ecologist within the proposed works area(s) to identify and update the conditions of any flora species of conservation importance, including but not limited to *Ailanthus fordii*, *Artocarpus hypargyreus* and *Aquilaria sinensis* which



were recorded in PDA during the EIA Study. A Baseline Vegetation Survey and Transplantation Proposal shall be prepared to confirm the locations, quantities and conditions of any identified flora species of conservation importance within the works area(s), and proposed methodology and receptor site(s) to transplant any of these specimens that are to be affected by the construction works. The conditions of the transplanted flora species shall be closely monitored at monthly basis throughout the construction period of the Project. The baseline survey and transplantation proposal shall be prepared by a qualified botanist/plant ecologist with relevant experience.

### **Monitoring of Mitigation Measures on Retained Watercourses and Affected Aquatic Fauna of Conservation Importance**

**1.52.5** A baseline survey shall be conducted in all affected watercourses by a qualified ecologist of relevant experience to confirm the presence, relative abundance, and distribution of any aquatic species of conservation importance prior to any commencement of works which would lead to watercourse loss. A translocation programme shall be designed and developed with relevant authorities to translocate any affected aquatic fauna species of conservation importance. Capture and translocation of species to suitable permanent receptor site(s) (e.g. the retained natural watercourses in PDA or the recreated watercourse) or a holding area shall be conducted by a suitably qualified ecologist before the commencement of any construction works.

**1.52.6** Aquatic faunal monitoring on monthly basis shall be conducted during the construction phase (when there are construction activities within 100m of any retained watercourses) and the first 12 months of the operation phase at the three retained watercourses in Area 1 and Area 3 and the new watercourse along the hillside of the western boundary of Area 3. The monitoring survey shall take the form of quantitative replicate surveys of stream fauna using standardised methodology at fixed points, the number of which should be determined prior to the first monitoring event.

### **Monitoring of Mitigation Measures to Minimize Disturbance Impacts to Tai Tong (Pak Sha Tsuen) Egret**

**1.52.7** Prior to commencement of construction activities, a baseline egret survey shall be conducted during the breeding season to confirm the location of egret, evidence of egret occupation and number of breeding pairs. During the construction phase, for any works within 250m of the egret, the egret shall be monitored weekly during the ardeid breeding season i.e. from March to August by a qualified ecologist to confirm its activity during the breeding season and to

ensure the egretty is not significantly disturbed by nearby construction activities. Monthly flight-line surveys shall be conducted during the ardeid breeding season throughout the construction phase and in the first 12 months of operation phase to confirm flight paths of the egrets are not significantly impacted by the Project.

## 2 Fisheries

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### 2.1 Introduction

**2.1.1** Based on the EIA, no significant impacts arising from construction and operation phases of the Project on pond fisheries are anticipated, no specific monitoring programme for fisheries resources is required. Good site practices for the control of construction site runoff as detailed in **Section 7** of this Manual shall be fully implemented to minimize impacts on water resources for pond fish culture in the Project Area or its vicinity

## 3 Landscape and Visual Impacts

### 3.1 Introduction

**3.1.1** The EIA has recommended EM&A for landscape and visual mitigation measures to be undertaken during the design, construction and operational stages of the project. The design, implementation and maintenance of landscape mitigation measures is a key aspect of this and should be checked to ensure that they are fully realised and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the site audit programme.

### 3.2 Mitigation Measures

**3.2.1** The Landscape and Visual Assessment of the EIA proposes a number of mitigation measures to ameliorate the landscape and visual impacts of the Project. These measures are listed in table below and implementation is summarised in the EMIS in **Appendix 4.1**.

**3.2.2** The Contractor shall be responsible for the maintenance of the landscape works during the establishment period at operation phase. The Project Proponent shall then be responsible for the management and maintenance of the implemented Landscape Mitigation Measures until such time those are successfully handed over to the designated agent/department.

**Table 11.1** Proposed mitigation measures for landscape and visual impacts

Mitigation Measure Code	Summary Description	Mitigate Landscape Impacts	Mitigate Visual Impacts
<i>Construction Phase</i>			
CM1	Optimisation of Construction Areas and Providing Temporary Landscape on Temporary Construction	✓	✓
CM2	Minimise Topographical Changes	✓	✓
CM3	Tree Protection and Preservation	✓	
CM4	Transplanting of Existing Trees	✓	

Mitigation Measure Code	Summary Description	Mitigate Landscape Impacts	Mitigate Visual Impacts
CM5	Screen Hording		✓
CM6	Watercourses of higher ecological value/ Channels Protection	✓	
CM7	Construction Light Control		✓
CM8	Woodland Conservation	✓	
<i>Operation phase</i>			
OM1	Compensatory Planting	✓	
OM2	Woodland Compensation	✓	
OM3	Operation Light Control		✓
OM4	Screen Planting		✓
OM5	Road Side Planting	✓	✓
OM6	Aesthetic Design of Built Development		✓
OM7	Maximise Greening on Engineering Structures and Surfaces		✓
OM8	Noise Barrier Design		✓
OM9	Man-made Channel Improvements	✓	✓
OM10	Slope Landscaping	✓	✓

**3.2.3** Mitigation measures to be implemented during construction should be adopted from the start of construction and be in place throughout the entire construction period. Tree transplantation, preservation of Potentially Registerable Old and Valuable Trees (POVTs), Rare and Protective Vegetation, and compensatory planting should be carried out as early as possible in the Project with transplantation carried out prior to construction starting in any particular area.

**3.2.4** Mitigation measures to be implemented during operation should be integrated into the detailed design and built as part of the construction works so that they are in place on commissioning of the Project.

### **3.3 Baseline monitoring**

**3.3.1** The landscape and visual baseline will be determined with reference to the habitat maps included in the EIA Report and detailed tree survey to be completed before the works can commence as well as preliminary site conditions verification surveys.

## **3.4 Audit Requirement**

**3.4.1** The design stage EM&A requirements for landscape and visual resources comprise the audit of the detailed landscaping and visual specifications to be prepared during the detailed design together with ensuring that the design is sensitive to landscape and visual impacts. The landscape and visual auditor shall review the designs as and when they are prepared and liaise with the landscape architect and design engineer to ensure all measures have been incorporated in the design in a format that can be specified to the Contractor for implementation.

**3.4.2** Site audits should be undertaken during the construction phase of the Project to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives. Site inspections should be undertaken by the ET at least once every two weeks during the construction period and once every two months during the operational phase during a 12-month establishment period, preferably by a Registered Landscape Architect (RLA) employed by the Contractor. In addition, as the Project contains various Schedule 2 Designated Projects (DPs), site inspection program for these DPs shall make reference to the project details and works progress to schedule the inspection works. Particularly audits should be carried out during site clearance when proposed tree retain, tree felling, and transplantation may occur. For all soft landscaping work, including measures involving trees such as tree transplantation, compensatory planting and woodland restoration, there should be at least a 12-month establishment period and maintenance which will commence once soft landscaping in an area has been planted. The broad scope of the audit is detailed below.

- The extent of the agreed works areas should be regularly checked during the construction phase. Any trespass by the contractor outside the limit of the works, including any damage to existing trees and woodland shall be noted.
- The progress of the engineering works should be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken.
- The tree and shrub transplanting and planting operations.

- Topsoil protection and storage operations.
- All existing trees and vegetation within the study area which are not directly affected by the works are retained and protected.
- The methods of protecting existing vegetation proposed by the Contractor are acceptable and enforced.
- All landscaping works are carried out in accordance with the specifications, with particular attention to approved use of herbicides or pesticides.
- The species and mix of new plant species to be planted are suitable and complementary.
- The newly planted trees, shrubs and grassed areas are maintained throughout the establishment period, particularly in respect of the following:
  - a. regular watering, weeding and fertilising of all planting and grass reinstatement;
  - b. regular grass cutting for reinstated areas;
  - c. firming up of plants after periods of strong winds or heavy rain;
  - d. regular checks for and eradication of pests, fungal infection etc.;
  - e. pruning of dead or broken branches; and
  - f. prompt replacement of dead plants and re-grassing of failed areas.

### 3.4.3

The audits during the operation phase will be restricted to the 12 months establishment works of the landscape proposals, with the appropriate agents taking over the maintenance and monitoring after this period as identified in the EIA report. The audit of the compensatory planting will also extend during the one year maintenance period, to ensure the establishment of the compensatory planting. In the event of a non-conformity, the Event and Action Plan as detailed in **Table 11.3** should be followed.

**Table 11.2** Monitoring programme for landscape and visual

Stage	Monitoring Task	Monitoring Report	Form of Approval	Frequency
Design	Monitoring of design works against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken by the Engineer and Landscape Architect, to ensure that they fulfil the intentions of the mitigation measures. Any changes to the design, including design changes on site should also be checked, the design engineer had to ensure that the environmental performance of the design changes are equivalent to or better than the EIA Study predictions and any environmental protection conditions; and to have such environmental performance changes validated by the Independent Checker (Environment).	Report by Engineer confirming that the design conforms to requirements of EP.	Approval by Project Proponent	At completion of design stage
Construction	Monitoring of the contractors operations during the construction period.	Report on Contractor's compliance by ET	Counter-signature of report by IEC	Monthly
Establishment Works (Operation Phase)	Monitoring of the planting works during the 12-months Establishment Period after completion of the construction works.	Report on Contractor's compliance by ET	Counter-signature of report by IEC	Bi-monthly

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

EP – Environmental Permit

## 3.5 Event and Action Plan

**3.5.1** In the event of non-compliance the responsibilities of the relevant parties are detailed in the Event and Action plan provided in **Table 11.3**. The frequency of audit and monitoring by the ET is dependent on the



complexity of the development project, which will be further explored and subject to changes at the detailed design stage.

**Table 11.3** Event/action plan for landscape and visual

Event	Action			
	ET	IEC	ER	Contractor
Design Check	1. Check final design conforms to the requirements of EP and prepare report.	1. Check report. 2. Recommend remedial design if necessary.	1. Undertake remedial design if necessary.	
Non-conformity on one occasion	1. Inform the IEC, ER and the Contractor 2. Discuss remedial actions with IEC, ER and Contractor 3. Monitor remedial actions until rectification has been completed	1. Check report. 2. Check Contractor's working method 3. Discuss with ET, ER and Contractor on possible remedial measures. 4. Advise ER on effective of proposed remedial measures. 5. Check implementation of remedial measures	1. Confirm receipt of notification of non-conformity in writing 2. Review and agree on the remedial measures proposed by the Contractor 3. Ensure remedial measures are properly implemented	1. Identify source and investigate the non-conformity 2. Amend working methods agreed with ER as appropriate 3. Rectify damage and undertake any necessary replacement
Repeated Non-conformity	1. Identify sources 2. Inform the Contractor, IEC and ER 3. Discuss inspection frequency 4. Discuss remedial actions with IEC, ER and Contractor 5. Monitor remedial actions until rectification has been completed	1. Check inspection report 2. Check Contractor's working method 3. Discuss with ET, ER and Contractor on possible remedial measures 4. Advise ER on effectiveness of proposed remedial measures	1. Notify the Contractor 2. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented 3. Supervise implementation of remedial measures	1. Identify source and investigate the non-conformity 2. Amend working methods agreed with ER as appropriate 3. Rectify damage and undertake any necessary replacement. Stop relevant portion of works as determined

Event	Action			
	ET	IEC	ER	Contractor
	6. If non-conformity stops, cease additional monitoring			by ER until the non-conformity is abated.

Note:

ET – Environmental Team

IEC – Independent Environmental Checker

ER – Engineer’s Representative

## 10 Waste Management Implications

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### 3.6 Introduction

**3.6.1** The quantity and timing for the generation of waste during the construction phase have been estimated. Measures including the opportunity for on-site sorting, reusing excavated materials etc., are devised in the construction methodology to minimise the surplus materials to be disposed off-site. Proper disposal of chemical waste should be via a licensed waste collector.

### 3.7 Mitigation Measures

**3.7.1** All the proposed mitigation measures are stipulated in the EIA Report and summarised in the EMIS in **Appendix 4.1**.

**3.7.2** EM&A requirements are required for waste management during the construction phase only and the effective management of waste arising during the construction phase will be monitored through the site audit programme. The aims of the waste audit are:

- To ensure the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner; and
- To encourage the reuse and recycling of material.

**3.7.3** The types and quantities of waste that would be generated during the operation phase have been assessed. It is anticipated there would not be any insurmountable impacts during the operation phase. A trip-ticket system should be operated to monitor all movements of chemical wastes which will be collected by a licensed collector to a licensed facility for final treatment and disposal. Recommendations have been made to ensure proper treatment and proper disposal of these wastes in the EIA Report and summarised in the EMIS in **Appendix 4.1**.

**3.7.4** Measures have been introduced under Section 4.1.3 of the Project Administrative Handbook for Civil Engineering Works (2014 Edition) published by CEDD to enhance the management of C&D materials and to minimise their generation at source. The enhancement measures include (i) drawing up a Construction and Demolition Material Management Plan (C&DMMP) at an early design stage to minimise C&D materials generation and encourage proper management of such materials; (ii) vetting of the C&DMMP prior to upgrading of the project to Category A in the Public Works Programme; and (iii) providing the

Contractor with information from the C&DMMP in order to facilitate the preparation of the Waste Management Plan (WMP) and to minimise C&D materials generation during construction. Projects generating less than 50,000m<sup>3</sup> C&D materials or importing less than 50,000m<sup>3</sup> of fill material are exempted from the C&DMMP. The comments on the C&DMMP given by the Public Fill Committee are summarised in the EMIS and will be incorporated at the detailed design and construction stages.

**3.7.5** The Contractor should prepare a Waste Management Plan (WMP) as part of the Environmental Management Plan (EMP) in accordance with the ETWB TC(W) No. 19/2005 for construction phase. The EMP should be submitted to the Engineer for approval. Mitigation measures proposed in the EIA Report and summarised in the EMIS should be adopted.

## **3.8 Waste EM&A Requirements**

**3.8.1** The Contractor shall be required to pay attention to the environmental standard and guidelines and carry out appropriate waste management and obtain the relevant licence / permits for waste disposal. The ET shall ensure that the Contractor has obtained from the appropriate authorities the necessary waste disposal permits or licences including:

- Chemical Waste Permits / licenses under the Waste Disposal Ordinance (Cap 354);
- Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap 28);
- Effluent Discharge Licence under the Water Pollution Control Ordinance; and
- Approval of Construction & Demolition Material Management Plan (C&DMMP).

**3.8.2** The Contractor shall refer to the relevant booklets issued by the DEP when applying for the licence/permit and the ET shall refer to these booklets for auditing purposes.

## **3.9 Site Audit Requirements**

**3.9.1** Regular audits and site inspections should be carried out during construction phase by the ET to ensure that the recommended good site practices and other recommended mitigation measures are properly implemented by the Contractor. The audits should concern all aspects of on-site waste management practices including waste generation,

storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and contract requirements.

**3.9.2** The requirements of the environmental audit programme are set out in **Section 15** of this Manual. The audit programme will verify the implementation status and evaluate the effectiveness of the mitigation measures.

# 11 Land Contamination Impact

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## 3.10 Introduction

**3.10.1** The EIA Report has assessed the potential contaminated land uses associated with the Project, within the land contamination assessment area and the potential impacts on the future land uses.

## 3.11 Proposed Re-appraisal for Potentially Contaminated Landuses, Industrial Site with No Land Potential for Contamination and Non-Industrial Landuses

**3.11.1** At the time of assessment, the vast majority of the potentially contaminated land uses were occupied by private owners and could not be accessed to undertake a site walkover and determine the site conditions. As such, no Site Investigation (SI) was able to proceed.

**3.11.2** Given that the proposed project would only commence several years from now, it is considered that the land uses of all sites identified within the land contaminated assessment area could change between the time of this Study and the commencement year. As such, further contamination assessment is recommended to be undertaken inclusive of site reappraisal, SI as well as the submission of a supplementary Contamination Assessment Plan(s) (CAP(s)), Contamination Assessment Report(s) (CAR(s)), Remediation Action Plan(s) (RAP(s)) and Remediation Report(s) (RR(s)), which should be submitted to EPD for approval upon completion of remediation works, if any.

## 3.12 Mitigation Measures

### Construction Phase

**3.12.1** If necessary, remediation works would be carried out based on any contaminated sites identified in the abovementioned future contamination assessment. Mitigation measures as outlined in the future RAP(s) should be adhered to throughout remediation works, upon approval from EPD.

**3.12.2** In addition, regular site audits should be carried out to ensure that that the EM&A requirements are being followed. The findings of the audits shall be reports in the EM&A reports.

**Operation phase**

**3.12.3** Given that any contaminated soil / groundwater would be remediated prior to the commencement of the development works, there are no land contaminated issues anticipated in the operation phase.

## 12 Cultural Heritage Impact

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### 3.13 Introduction

#### Terrestrial Archaeology

**3.13.1** Desk-top studies and field visits have been conducted to identify cultural heritage resources within 100m assessment area. There are only one Site of Archaeological Interest (SAI) (i.e. Tsueng Kong Wai SAI) and one Archaeological Potential Area (APA) (i.e. Hung Uk Tsuen (South) APA) situated within the 100m assessment area but outside PDA. Two Sites of Archaeological Interest are identified at about 800 and 1500m from the PDA at Sheung Cheung Wai and Yuen Leng respectively. For some of the private lands that have “Moderate” archaeological potential, they are constrained by accessibility issues and hence surveys cannot be conducted during this EIA. Further archaeological survey will be conducted after land resumption and prior to the commencement of construction. The assessment has considered both the construction and operation phases of the project.

#### Built Heritage

**3.13.2** The Yeung Hau temple at TYST is identified as a Grade 3 historic building and have been preserved within the PDA. There are two declared monuments (i.e. Cheung Ancestral Hall at Shan Ha Tsuen and Tang Ancestral Hall at Ping Shan) within 100m assessment area but outside PDA. In addition, another 14 graded, 1 proposed graded and 1 nil grade historic buildings are located within 100m assessment area but outside PDA. Therefore, impacts on built heritage resources are anticipated to be indirect and of low significance.

**3.13.3** The assessment has considered both the construction and operation phases of the project.

### 3.14 Mitigation Measures

#### Terrestrial Archaeology

##### Construction Phase

**3.14.1** Three areas including area near Tin Shui Wai West Interchange, area near Tong Yan San Tsuen and area near Shan Ha Tsuen will be the subject of further archaeological survey on land resumption to assess the impacts of development. The area is illustrated in **Figure 14.1** and is indicative, reflecting the area to be impacted and therefore the area to be surveyed. The scope and programme of the proposed archaeological work shall be agreed with AMO. Subject to the findings of archaeological



work, appropriate mitigation measures would be proposed by the project proponent in prior agreement with the AMO before the construction phase of the proposed development. The concerned landuses in the RODP, possible impact and proposed mitigation measures are summarised in **Table 14.1.**

**Table 14.1 Predicted Impacts within RODP and Supporting Infrastructures**

<b>Proposed Landuses</b>	<b>Description of works</b>	<b>Possible Archaeological Potential /Heritage Impacts</b>	<b>Proposed Mitigation Measures</b>
<b>Area near Tin Shui Wai West Interchange (Inset 1)</b>			
TSWW Interchange	Improvement works to existing TSWW Interchange	Impacts around edge of interchange works on area of moderate archaeological potential	Archaeological survey will be conducted after the land resumption before the commencement of the proposed development. The scope and programme of the proposed archaeological work shall be agreed with AMO. Subject to the findings of the archaeological work, appropriate mitigation measures would be proposed by the Project Proponent in prior agreement with the AMO. The proposed survey areas have been reviewed based on the proposed development and current site condition.
Road L20	Local distributor with 2 lanes	Impacts across area of moderate archaeological potential	
Road L22	Local distributor with 2 lanes	Impacts across area of moderate archaeological potential	
R5	Low-rise residential development with plot ratio of 1 for private housing	Impacts from residential development across area of moderate archaeological potential	
OU(SU)2	Proposed Multi-Storey Buildings for Storage uses	Impacts from open storage development on area of moderate archaeological potential	
OU(OS)	Area reserved for Open Storage Uses near TSWW interchange	Impacts from open storage development on area of moderate archaeological potential	
A	Slope works and Road Side Amenity	Impacts across area of agricultural land and hillcrest. Area of moderate archaeological potential	
District Open Space	Area designated for Park and recreational uses	Works on district open space on area of moderate archaeological potential	
<b>Area near Tong Yan San Tsuen (Southern study area adjacent location of cloth impressed tiles) (Inset 2)</b>			

Proposed Landuses	Description of works	Possible Archaeological Potential /Heritage Impacts	Proposed Mitigation Measures
R5	Low-rise residential development with plot ratio of 1 for private housing	Impacts from residential development across area of moderate archaeological potential	An archaeological review has recommended an archaeological survey in this area on land resumption. Subject to the findings of archaeological work, appropriate mitigation measures would be proposed by the project proponent in prior agreement with the AMO before the construction phase of the proposed development.
Road L19	Local distributor with 2 lanes	Impacts across area of moderate archaeological potential	
Local Open Space	Area designated for Park and recreational uses	Works on district open space on area of moderate archaeological potential	
<b>Area near Shan Ha Tsuen (Inset 3)</b>			
R2c	Mid-rise residential development with plot ratio of 4 for private housing	Low impact as it is currently disturbed by open storage	Nil
G	Divisional Fire Station and Ambulance Depot	Low impact as it is currently disturbed by open storage	
RSc	High-rise residential development with plot ratio of 5 for public housing	Impacts from residential development across area of moderate archaeological potential	Archaeological survey will be conducted after the land resumption before the commencement of the proposed development. The scope and programme of the proposed archaeological work shall be agreed with AMO. Subject to the findings of the archaeological work, appropriate mitigation
OU(Hillside River Corridor and Scenic Cycle Track)	A proposed new retention lake and a new water channel along Ma Shan with cycle track and footpath,	Impacts across area of agricultural land and hillcrest. Area of moderate archaeological potential	
A	Slope works and Road Side Amenity	Impacts across area of agricultural land and hillcrest. Area of moderate archaeological potential	
Road D1	District Distributor with 4 lanes	Impacts across area of agricultural land and hillcrest. Area of moderate archaeological potential	

Proposed Landuses	Description of works	Possible Archaeological Potential /Heritage Impacts	Proposed Mitigation Measures
			measures would be proposed by the Project Proponent in prior agreement with the AMO. The proposed survey areas have been reviewed based on the proposed development and current site condition.

Note:

The land use “IC” within Area near Tin Shui Wai West Interchange would be excluded in the impact assessment as there is no development within this land use zoning.

The EFTS will follow the alignment of various new roads, in which the archaeological survey, if required, will be carried out after land resumption of YLS development. Thus there will not be any archaeological impact associated with the site formation of EFTS.

**3.14.2** For the areas with low-moderate archaeological potential, AMO should be informed immediately in case of discovery of antiquities or supposed antiquities in the course of the construction works. Agreement from AMO would be sought on the follow-up actions if required.

**Operation phase**

**3.14.3** No adverse impact is anticipated for terrestrial archaeology and thus no further action or mitigation is required during the operation phase.

**Built Heritage**

**Construction Phase**

**3.14.4** The Grade 3 historic building of Yeung Hau temple at Tong Yan San Tsuen should be preserved via a 5m non-construction buffer with screening to prevent visitor and worker access and minimise dust during the construction phase. A site audit should be conducted at 6 month intervals during the construction phase to monitor potential direct impacts as well as indirect impacts from noise, dust, visual and vibration effects from adjacent construction works.

**3.14.5** The presence of this temple within the YLS PDA offers the opportunity for heritage promotion within the community. Built heritage in the form of temples, ancestral halls and buildings throughout the area also offers the opportunity for incorporation of historic buildings into heritage trails or visitor areas which are subject to further study to be conducted during detailed design stage. Once the idea of heritage trails is pursued,

the implementation and management agencies shall also be identified before operation.

**3.14.6** The planned sewer works to the north-west of the PDA near Ha Tsuen Shi are expected to impact a narrow disturbed footprint along Tin Ha Road south of the village. The impact of these works on the declared monument, i.e. Tang Ancestral Hall locates 90m away, are expected to be nil. Thus no mitigation measures are needed.

**3.14.7** A total of 33 graves, which none of these graves yielded dates older than 100 years (no earlier than 1930), were recorded within the 100m assessment area. The potential management measures on these graves are either retain or relocate within the development and are detailed in Section 13.6 of the EIA Report.

**Operation phase**

**3.14.8** The Grade 3 historic building of Yeung Hau temple at Tong Yan San Tsuen will require site access and visitor management measures via visitor and heritage promotion signage.

## 13 Site Environmental Audit

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### 3.15 Site Inspection

**3.15.1** Site inspection provides a direct means to initiate and enforce specified environmental protection and pollution control measures. These shall be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.

**3.15.2** The ET shall be responsible for formulating the environmental site inspection programme as well as the deficiency and action reporting system, and for carrying out the site inspections. The proposal for rectification, if any, should be prepared and submitted to the ET Leader and IEC by the Contractor.

**3.15.3** Regular site inspections shall be carried out and led by the ER and attended by the Contractor and ET at least once per week during the construction phase. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site. It should also review the environmental situations outside the works area which is likely to be affected, directly or indirectly, by the construction site activities of the Project. The ET shall make reference to the following information in conducting the inspection. During the inspection, the following information should be referred to:

- (i) EIA Report recommendations on environmental protection and pollution control mitigation measures;
- (ii) works progress and programme;
- (iii) individual works methodology proposals (which shall include the proposal on associated pollution control measures);
- (iv) contract specifications on environmental protection;
- (v) relevant environmental protection and pollution control legislations; and
- (vi) previous site inspection results.

**3.15.4** The Contractor shall keep the ER and ET Leader updated with all relevant environmental related information on the construction contract necessary for him to carry out the site inspections. Site inspection results and associated recommendations for improvements to the environmental protection and pollution control efforts should be

recorded and followed up by the Contractor in an agreed time-frame. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET, to report on any remedial measures subsequent to the site inspections.

**3.15.5** The ER, ET and the Contractor should also carry out ad-hoc site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of a valid environmental complaint, or as part of the investigation work, as specified in the Event and Action Plan for the EM&A programme.

## **3.16 Environmental Compliance**

**3.16.1** There are statutory requirements on environmental protection and pollution control requirements with which construction activities must comply.

**3.16.2** In order to ensure the works comply with corresponding requirements, all method statements of works should be submitted by the Contractor to the ER for approval and to the ET Leader to ensure sufficient environmental protection and pollution control measures have been included. The Environmental Mitigation Implementation schedule (EMIS) is summarised in **Appendix 4.1**. Any proposed changes to the mitigation measures shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations contained in the EIA Report.

**3.16.3** The ER and ET shall also review the progress and programme of the works to check that relevant environmental legislations have not been violated, and that any foreseeable potential for violating laws can be prevented.

**3.16.4** The Contractor should provide the update of the relevant documents to the ET Leader so that checking can be carried out. The document shall at least include the updated Works Progress Reports, updated Works Programme, method statements, any application letters for different licences / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary and environmental records shall also be available for inspection by the relevant parties.

**3.16.5** After reviewing the document, the ET shall advise the IEC and Contractor of any non-compliance with legislative requirements on environmental protection and pollution control so that they can timely take follow-up actions as appropriate. If the follow-up actions may still result in potential violation of environmental protection and pollution

control requirements, the ER and ET should provide further advice to the Contractor to take remedial action to resolve the problem.

**3.16.6** Upon receipt of the advice, the Contractor shall undertake immediate actions to correct the situation. The ER and ET shall follow up to ensure that appropriate action has been taken in order to satisfy legal requirements.

## **3.17 Choice of Construction Method**

**3.17.1** At times during the construction phase the Contractor may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Contractor is bound to follow the requirements and recommendations in the EIA Study. The Contractor's options for alternative construction methods may introduce adverse environmental impacts into the Project. It is the responsibility of the Contractor and ET, in accordance with established standards, guidelines and EIA Study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection Proforma as shown in **Appendix 15.1** to the IEC for approval. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

## **3.18 Environment Complaints**

**3.18.1** The following procedures should be undertaken upon receipt of any environmental complaint:

- The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;
- The Contractor to investigate, with the ER and ET, the complaint to determine its validity, and assess whether the source of the problem is due to construction works of the Project with the support of additional monitoring frequency and stations, if necessary;
- The Contractor to identify remedial measures in consultation with the IEC, ET and ER if a complaint is valid and due to the construction works of the Project;
- The Contractor to implement the remedial measures as required by the ER and to agree with the ET and IEC any additional

monitoring frequency and stations, where necessary, for checking the effectiveness of the remedial measures;

- The ER, ET and IEC to review the effectiveness of the Contractor's remedial measures and the updated situation;
- The ET to undertake additional monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaint do not recur;
- If the complaint is referred by the EPD, the Contractor to prepare interim report on the status of the complaint investigation and follow-up actions stipulated above, including the details of the remedial measures and additional monitoring identified or already taken, for submission to EPD within the time frame assigned by the EPD; and
- The ET to record the details of the complaint, results of the investigation, subsequent actions taken to address the complaint and updated situation including the effectiveness of the remedial measures, supported by regular and additional monitoring results in the monthly EM&A reports.



## 14 Reporting

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### 3.19 General

**3.19.1** Reports can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper / historic and reactive approach to an electronic / real time proactive approach. All the monitoring data (baseline and impact) shall also be submitted on diskettes or other approved media. The formats for air quality, noise and water quality monitoring data to be submitted shall be separately agreed.

**3.19.2** The ET is responsible for establishing and maintaining a dedicated website throughout the entire construction period for publishing all the relevant environmental monitoring data (including but not limited to the baseline and impact monitoring). The ET shall propose the format and functionality of the website for agreement with the ER and IEC prior to publishing of data. Once the monitoring data are available (e.g. noise, dust, water quality etc) and vetted by the IEC, the ET is responsible to upload the relevant data to the dedicated website.

**3.19.3** Types of reports that the ET shall prepare and submit include baseline monitoring report, monthly EM&A report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly and final review EM&A reports shall be made available to the Director of Environmental Protection.

### 3.20 Baseline Monitoring Report

**3.20.1** The baseline monitoring report shall include at least the following:

- (i) up to half a page executive summary;
- (ii) brief project background information;
- (iii) drawings showing locations of the baseline monitoring stations;
- (iv) monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring locations;
  - monitoring date, time, frequency and duration; and

- quality assurance (QA) / quality control (QC) results and detection limits;
- (v) details of influencing factors, including:
- major activities, if any, being carried out on the site during the period;
  - weather conditions during the period; and
  - other factors which might affect monitoring results;
- (vi) determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data;
- (vii) revisions for inclusion in the EM&A Manual; and
- (viii) comments, recommendations and conclusions.

## 3.21 Monthly Monitoring Reports

**3.21.1** The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET and endorsed by the IEC. The EM&A report shall be prepared and submitted to EPD within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Copies of each monthly EM&A report shall be submitted to the following parties: the IEC, the ER and EPD. Before submission of the first EM&A report, the ET shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

**3.21.2** The ET should prepare and submit a Baseline Environmental Monitoring Report at least one month before commencement of construction of the Project. Copies of the Baseline Environmental Monitoring Report should be submitted to the IEC, ER and EPD. The ET should liaise with the relevant parties on the exact number of copies require.

**3.21.3** The ET shall review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

### **First Monthly EM&A Report**

**3.21.4** The first monthly EM&A report shall include at least the following:

- (i) Executive summary (1-2 pages):
- breaches of Action and Limit levels;

- compliant log
  - notifications of any summons and successful prosecutions;
  - reporting changes; and
  - future key issues.
- (ii) Basic project information:
- project organization including key personnel contact names and telephone numbers;
  - programme;
  - management structure; and
  - works undertaken during the month.
- (iii) Environmental status:
- advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIA Ordinance, submission status under the EP and implementation status of mitigation measures;
  - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
  - drawings showing the project are, any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations).
- (iv) A brief summary of EM&A requirements including:
- all monitoring parameters;
  - environmental quality performance limits (Action and Limit levels);
  - Event-Action Plans;
  - environmental mitigation measures, as recommended in the project EIA Study final report; and
  - environmental requirements in contract documents.
- (v) Implementation status
- advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report.
- (vi) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;

- name of laboratory and types of equipment used and calibration details;
  - monitoring parameters;
  - monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - QA / QC results and detection limits.
- (vii) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - review of the reasons for and the implications of non-compliances, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (viii) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status;
  - record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
  - comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

### Subsequent monthly EM&A Reports

#### 3.21.5 Subsequent monthly EM&A reports shall include at least the following:

- (i) Executive summary (1-2 pages):
  - breaches of Action and Limit levels;
  - compliant log
  - notifications of any summons and successful prosecutions;
  - reporting changes; and
  - future key issues.
- (ii) Basic project information:
  - project organization including key personnel contact names and telephone numbers;
  - programme;
  - management structure; and
  - works undertaken during the month; and
  - any updates as needed to the scope of works and construction methodologies.
- (iii) Environmental status:
  - advice on the status of statutory environmental compliance such as the status of compliance with the environmental permit (EP) conditions under the EIA Ordinance, submission status under the EP and implementation status of mitigation measures;
  - works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
  - drawings showing the project are, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (iv) Implementation status
  - advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Report.
- (v) Monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - monitoring parameters;

- monitoring locations;
  - monitoring date, time, frequency, and duration;
  - weather conditions during the period;
  - any other factors which might affect the monitoring results; and
  - QA / QC results and detection limits.
- (vi) Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - review of the reasons for and the implications of non-compliances, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- (vii) Others
- an account of the future key issues as reviewed from the works programme and work method statements;
  - advice on the solid and liquid waste management status;
  - record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.); and
  - comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.
- (viii) Appendices
- Action and Limit levels;

- graphical plots of trends of the monitoring parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
  - a) major activities being carried out on site during the period;
  - b) weather conditions during the period; and
  - c) any other factors that might affect the monitoring results.
- monitoring schedule for the present and next reporting period;
- cumulative statistics on complaints, notifications of summons and successful prosecutions; and
- outstanding issues and deficiencies.

## **3.22 Final EM&A Review Reports**

### **3.22.1 General**

**3.22.2** The EM&A programme for construction stage should be terminated upon the completion of the construction activities, while the EM&A programme for operation stage should be terminated upon the completion of operation monitoring.

**3.22.3** The proposed termination should only be implemented after the proposal has been endorsed by the IEC, the Engineer and the Project Proponent followed by approval from the Director of Environmental Protection.

### **3.22.4 Final EM&A Review Report for Construction Stage**

**3.22.5** The final EM&A review report for construction stage (to be submitted after completion of construction activities) should contain at least the following information:

- (i) Executive summary (1-2 pages):
- (ii) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (iii) Basic project information including a synopsis of the project organization, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- (iv) A brief summary of EM&A requirements including:

- environmental mitigation measures for construction stage, as recommended in the project EIA Report;
  - environmental impact hypotheses tested;
  - environmental quality performance limits (Action and Limit levels);
  - all monitoring parameters;
  - Event and Action Plans;
- (v) A summary of the implementation status of environmental protection and pollution control / mitigation measures for construction stage, as recommended in the project EIA Report and summarized in the updated implementation schedule;
- (vi) Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the project, including:
- the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- (vii) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (viii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) A description of the actions taken in the event of non-compliance;
- (x) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;
- (xi) A review of the validity of EIA predictions for construction stage and identification of shortcomings in EIA recommendations;
- (xii) Comments (for example, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme for construction stage); and
- (xiii) Recommendations and conclusions (for example, a review of success of the overall EM&A programme for construction stage to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).



### 3.22.6 Final EM&A Review Report for Operation Stage

3.22.7 The final EM&A review report for operation stage (to be submitted after completion of operation monitoring) should contain at least the following information:

- (i) Executive summary (1-2 pages):
- (ii) Drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- (iii) Basic project information including a synopsis of the project organization, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;
- (iv) A brief summary of EM&A requirements including:
  - environmental mitigation measures for operation stage, as recommended in the project EIA Report;
  - environmental impact hypotheses tested;
  - environmental quality performance limits (Action and Limit levels);
  - all monitoring parameters;
  - Event and Action Plans;
- (v) A summary of the implementation status of environmental protection and pollution control / mitigation measures for operation stage, as recommended in the project EIA Report and summarized in the updated implementation schedule;
- (vi) Graphical plots and the statistical analysis of the trends of monitoring parameters over the course of the project, including:
  - the major activities being carried out on site during the period;
  - weather conditions during the period; and
  - any other factors which might affect the monitoring results;
- (vii) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- (viii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;
- (ix) A description of the actions taken in the event of non-compliance;

- (x) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up actions taken and results;
- (xi) A review of the validity of EIA predictions for operation stage and identification of shortcomings in EIA recommendations;
- (xii) Comments (for example, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme for operation stage); and
- (xiii) Recommendations and conclusions (for example, a review of success of the overall EM&A programme for operational stage to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

## **3.23 Data Keeping**

**3.23.1** No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in magnetic media form, and the software copy must be available upon request. Data format shall be agreed with EPD. All documents and data shall be kept for at least one year following completion of the construction contract and one year following completion of the operation phase monitoring for construction phase EM&A and operational EM&A respectively.

## **3.24 Interim Notifications of Environmental Quality Limit Exceedances**

**3.24.1** With reference to the Event and Action Plans, when the environmental quality performance limits are exceeded and if they are proven to be valid, the ET should immediately notify the IEC and EPD, as appropriate. The notification should be followed up with advice to the IEC and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notification is presented in **Appendix 16.1**.