土木工程拓展署
CEDD Civil Engineering and Development Department

規劃署
Planning Department

Agreement No. CE 2/2011 (CE)

Hung Shui Kiu New Development Area Planning and Engineering Study – Investigation

土木工程拓展署
New Territories North and West Development Office
Civil Engineering and Development Department

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Hung Shui Kiu New Development Area Planning and Engineering Study - Investigation

Environmental Monitoring and Audit Manual

(Ref.113-03)

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AECOM ASIA COMPANY LIMITED

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1 INTRODUCTION

1.1 Project Background

1.1.1 The Hung Shui Kiu New Development Area (HSK NDA) was formerly studied under "Planning and Development Study on North West New Territories" (the NWNT Study) from 1997 to 2003. The NWNT Study was an integrated planning and engineering study to identify NDAs in North West New Territories (NWNT) in response to projections of housing demand for Hong Kong arising from the Territorial Development Strategy Review in 1996. The NWNT Study identified HSK suitable as a NDA to accommodate a population of about 160,000 and to provide 48,000 jobs upon full development. The NWNT Study identified 450 ha for the HSK NDA. Various land uses including residential, government, institution or community, education, recreation, business use, open spaces, port back-up, green belt, etc. were proposed.

1.1.2 The HSK NDA proposals were subsequently shelved in 2003 in light of an anticipated slower population growth at that time. Under the study of Hong Kong 2030: Planning Vision and Strategy (the HK2030 Study) completed by Planning Department (PlanD) in 2007, the HSK NDA identified in the NWNT Study was revisited and recommended for implementation to address the long-term housing demand and provide employment opportunities. The Chief Executive announced in his 2007-08 Policy Address the planning for the NDA in HSK as one of the ten major infrastructure projects for economic growth.

1.1.3 Having regard to the substantial changes in planning circumstances and public aspiration since completion of the NWNT Study, the boundary of the HSK NDA was tentatively expanded to 790 ha in 2011. A comprehensive planning and engineering study on the HSK NDA was commissioned in 2011.

1.1.4 The planning and engineering study is to revisit the findings and recommendations of the NWNT Study, to take into account changes in the latest circumstances and public aspiration so as to confirm the feasibility of the proposed developments to meet long-term housing, social, economic and environmental needs, and to prepare a recommended outline development plan (RODP) and preliminary engineering design for the development.

1.2 The Assignment

1.2.1 In August 2011, AECOM Asia Company Limited (AECOM) was commissioned by the Civil Engineering and Development Department (CEDD) and Planning Department (PlanD) to undertake the HSK NDA Planning and Engineering Study (the “Study”). The Study aims to formulate a feasible land-use framework for the HSK NDA (refer to **Figure 1.1** for location plan) to meet the long-term housing and other land-use needs of Hong Kong. The Study aims to formulate an outline development plan (ODP), layout plans for the NDA and an implementation programme. Technical assessments to confirm the feasibility and environmental acceptability of the development proposals are also required.

1.3 Designated Projects

1.3.1 The HSK NDA (herein referred to as the “Project”) is a designated project (DP) under Item 1 Schedule 3 of Environmental Impact Assessment Ordinance (EIAO) - 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, as it covers an area of 714 ha and will accommodate a total population of 218,000.

1.3.2 In addition, based on the Revised RODP, the Project would comprise the following DPs by virtue of items A.1, A.2, A.3, A.8, A.9, B.5, F.1, F.3(b), F.4, G.2 and Q.1, of Schedule 2 of the EIAO (**Table 1.1** and **Figure 1.2** and **Figure 1.3**).

Table 1.1 Schedule 2 Designated Projects in the HSK NDA

Designated Project Reference No.	Schedule 2 Designated Project		Work Component / Reference in Revised RODP
DP1 [1]	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 road (Road P1)
DP2 [1]	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 eight new distributor roads (Roads D1 to D8)
DP3 [2]	Part I, A.2	A railway and its associated stations	Construction of new West Rail Hung Shui Kiu Station (HSK Station) (Site 4-34)
DP4 (Potential DP) [2]	Part I, A.3	A tramway and its associated stations	Construction of Environmentally Friendly Transport Services (EFTS) – subject to further review
DP5 [1]	Part I, A.8	A road or railway bridge more than 100 m in length between abutments	Construction of slip roads between: Road D8 Junction and existing Castle Peak Road; Junction of D8/P1 and Junction of D7/P1; and Kong Sham Western Highway (KSWH) connection to Road D3
DP6 [1]	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 and partly decked-over roads located at Road D2, Road D4, and Road D6
DP7 (Potential DP) [2]	Part I, B.5	A container back-up area, container storage, container handling or container packing area (including a container vehicle parking area) more than 5 ha in size and within 300 m of an existing or planned receiver	Construction of a new container back-up and storage area (Sites 3-1, 3-4, 3-5, 3-13 and 3-14) – subject to further review
DP8 [2]	Part I, F.1	Sewage treatment works with an installed capacity of more than 15,000 m^3 per day	Construction of new HSK Sewage Treatment Works (STW) (Site 3-26 and part of existing San Wai STW)

Designated Project Reference No.	Schedule 2 Designated Project		Work Component / Reference in Revised RODP
DP9 [1]	Part I, F.3(b)	A sewage pumping station – (b) with an installed capacity of more than 2,000 m^3 per day and a boundary of which is less than 150 m from an existing or planned receiver	Construction of four new sewage pumping stations (SPS) (Sites 2-34, 3-41, 3-48 and 4-35)
DP10 [2]	Part I, F.4	An activity for the reuse of treated sewage effluent from a treatment plant	Construction of flushing water service reservoirs (FLWSR) for reuse of reclaimed water at Tan Kwai Tsuen and Fung Kong Tsuen (Site 3-3 and Site 5-40)
DP11 [2]	Part I, G.2	A refuse transfer station	Construction of one refuse transfer station (RTS) (Site 3-12)
DP12 [1]	Part 1, Q.1	All projects including new access roads, railways, sewers, sewage treatment facilities, earthworks, dredging works and other building works partly or wholly in an existing or gazetted proposed country park or special area, a conservation area, an existing or gazetted proposed marine park or marine reserve, a site of cultural heritage, and a site of special scientific interest.	Construction of Road P1 and a slip-road from KSWH to Road D3 partly located within the "Conservation Area" of Yuen Tau Shan

Note:
1 Subject to an Environmental Permit (EP) application under this EIA Study.
2 Subject to separate EIA Study, as required.

DP 1 - Construction of New Primary Distributor Road (Road P1)

1.3.3 The majority of the new primary distributor road (Road P1) located under the existing KSWH at the western Project area (approximately 3.2 km in length), provides a service access with 2 lanes per direction to both the "I" areas and the new core area around the proposed HSK Station. Alignment options have been reviewed to minimise impacts on the DBL project mitigation ponds (wetland compensation area) located in the immediate vicinity of the road, opposite Site 3-26.

1.3.4 The at-grade alignment will have several connections to the proposed district distributor roads (Road D1/D5/D6/D7/D8). Two pairs of slip roads will be constructed to connect between the at-grade Road P1 and existing KSWH. In addition, a pair of slip roads along Road P1 will be constructed between the existing KSWH and at-grade Road D6 to facilitate the traffic connection at north western part of the Project area.

DP2 - Construction of Eight New Distributor Roads (Roads D1 to D8)

1.3.5 A total of eight Distributor Roads are proposed. All will provide a major role in servicing proposed land uses and existing developments (including villages where linkages have been provided). These comprise:

- **Road D1**: This road provides a partly dual three and partly dual two, west to east primary connection at the northern part of the Project area linking Tin Shui Wai (TSW) with the KSWH and providing links to District Distributors that provide the secondary links to the south of the Project area. The local road from a section of Road D1 near Lau Fau Shan to serve the residential sites and commercial sites in the northern part of the Project area will be restricted to private cars access only. A section of Road D1 from KSWH to road junction of Road D4/D3/D1 will be partly depressed and partly decked-over to allow crossing of the EFTS alignment. A section of Road D1 near the roundabout with Tin Wah Road will be a bridge structure (not greater than 30 m in length between abutments) to allow the local road to/from residential sites in the northern part of the Project area in parallel with Lau Fau Shan Road to the end of Site 2-1.

- **Road D2**: Comprises a north-south primary route that links to Ping Ha Road and Hung Tin Road. Road D2 is planned to dual 2 standards by widening of existing Ping Ha Road to enhance the magnitude of residential development and reduce the environmental adverse noise impact that is realisable in the north east of the Project area. The link will accommodate the traffic capacity currently carried along the Tin Ying Road and Ping Ha Road and also has the capacity to service existing and proposed development. Most of the Road D2 is constructed at-grade, except a section of approximately 450 m which is a depressed road in order to improve pedestrian connectivity between the residential Sites 1-5, 1-6 and 2-31.

- **Road D3**: Provides a link between Road D4/D1 and Road D5. A depressed road will be constructed near the roundabout of Road D4/D1 to avoid reduction on the traffic flow efficiency to and from Road D1. A section of Road D3 will be constructed in abutment for connection from slip road from KSWH to the at-grade section of Road D3.

- **Road D4**: Provides a link between Road D1/D3 to Road D2 to facilitate an eastward connection to TSW New Town and Castle Peak Road via Road D4. This route will serve to alleviate the pressure on other west to east links. A section of Road D4 of approximately 300 m length will be constructed as depressed road with partial pedestrian decking-over to facilitate access, and thus increasing connectivity between Sites 2-30 and 2-32.

- **Road D5**: Provides a link between the services areas (e.g. Special Industry (Logistics Facility)) and connects to Road P1 in the west and Tin Ha Road in the east. The whole section of Road D5 will be at-grade with a roundabout with Road D3.

- **Road D6**: Connects with Road D8 along its alignment. The route will play a major role in servicing the proposed HSK Station and related development as well as the proposed commercial sites and mixed commercial/residential development. To avoid conflict to pedestrian activity in the Regional Plaza near the proposed HSK Station, half of Road R6 will be constructed in depressed road of approximate 550 m length with partial decking-over in the Regional Plaza section.

- **Road D7**: Road D7 provides access from Road P1 to the commercial sites at Sites 4-12, 4-13 and 4-16.

- **Road D8**: Road D8 provides a connection between the proposed Road P1 and Castle Peak Road. The route will provide an important west to east link whilst also providing a major means of access to the proposed HSK Station, the civic node at Site 4-31, and the commercial and residential developments located east of the proposed HSK Station. The road will be constructed at-grade with a depressed EFTS crossing under Road D8.

DP3 - Construction of New West Rail Hung Shui Kiu Station (Site 4-34)

1.3.6 A new WRL Station will be built at the south of the Project area. This railway station will be important for transportation in the southern part of Project area in addition to the road traffic at Road P1 and Castle Peak Road. Railway associated facilities such as ventilation shafts etc. would be located in the vicinity of the station. As the construction of the station would be undertaken under a separate EIA, station details are not currently available. However, a proposed schematic layout of the station is proposed for the purpose of this EIA (**Figure 4.8.1**). Any details required for the EIA assumptions are described in the relevant EIA sections (e.g. Chapter 4 – Noise Impact).

DP4 - Construction of Environmental Friendly Transport Services –Potential DP subject to further review

1.3.7 The proposed EFTS traverses the core residential, commercial and other land reserves within the Project area. The separation between stations is walking distance to facilitate public access. A modern low profile tram system has been assumed for the purpose of the EIA; however, the system that will ultimately be used is subject to further study. The GTC reserve allocated to the tram will be also abutted by cycle and pedestrian routes. This will allow the public to cycle within vehicle free routes. The quality of the reserve will be enhanced through the application of high and low profile landscape treatments. A depot associated with the proposed EFTS is located at Site 3-18. Most of the alignment of the EFTS will be constructed at-grade, except some sections will be depressed and elevated at junctions within the proposed carriageway.

DP5 - Construction of Slip Roads between: Road D8 Junction and Existing Castle Peak Road; Junction of D8/P1 and Junction of D7/P1; and KSWH Connection to Road D3

1.3.8 The proposed slip roads have a length of more than 100 m in length between abutments. Two pairs of slip roads will be constructed near the two roundabouts of Road D8 and Road D7. They provide connection between at-grade Road P1 and existing elevated KSWH in order to improve the traffic connectivity to the Project area. Another pair of slip roads will be constructed from the existing KSWH to at-grade Road D3 to provide direct traffic connection to the port-back up areas and the logistic facilities at the western part of the Project.

DP6 - Construction of Partly Depressed and Partly Decked-over Roads Located at Road D2, D4 and D6

1.3.9 Some sections of Road D2, D4 and D6 are enclosed by decking above and by structure on the side for more than 100 m and hence classified as DP under Item A.9 Part 1, Schedule 2 of the EIAO.

1.3.10 The district open space (Site 2-32) located to the south of Road D4 and west of Road D2 is intended to act as a buffer between new developments and the villages to the south, and provides flexibility for community farming and farming markets. This district open space and the proposed residential sites are however separated by Roads D2 and D4. A section of the Road D2 is therefore decked-over for approximately 450 m with intermittent openings to improve pedestrian access/connectivity between the residential sites near the TSW Main Channel to “LO”, via Site 2-31 and crossing Road D4. Similarly, to enhance

connectivity with the district open space (Site 2-32), it is proposed to deck over approximately 250 m of Road D4 in order to provide pedestrian crossing and flow from north to south across Road D4.

1.3.11 Approximately 300 m with intermittent openings of Road D6 would be decked-over near the proposed Regional Plaza near the proposed HSK Station. The decked-over structure is intended to maximise the area of Regional Plaza and allow pedestrian crossing to the EFTS station and the western part of development. In particular, a 20 m wide pedestrian street lined with retail shops, cafés and restaurants is proposed as a major pedestrian connection between the communities to the south of Castle Peak Road and the Town Centre. The proposed arrangement of depressing and decking over a section of Road D6 will allow seamless at-grade crossing between commercial complexes on two sides of the proposed HSK Station and provide a pleasant walking environment within the Town Centre.

DP7 - Construction of a New Container Back-up and Storage Area – Potential DP subject to further review

1.3.12 The western part of the Project is planned to serve as "PBU" and logistic facilities area to accommodate existing brownfield operations within the Project area. It is intended to locate these facilities at the west of the Project area to minimise interface issues with planned residential development and communities. The details of this development (i.e. size/area of container back-up area, container storage area) would be determined at the detailed design stage. This development would be a potential designated project where the area was more than 5 ha and within 300 m of an existing or planned receiver (e.g. Sites 3-1, 3-4, 3-5, 3-13 and 3-14).

DP8 - Construction of New HSK Sewage Treatment Works

1.3.13 As the planned SW STW – Phase 1 is not designed to cater for the additional flow generated from the Project, a new HSK STW will be provided to handle the sewage arising from the new population and employment in the Project area. The new HSK STW will be implemented in two phases to serve the different phases of development.

1.3.14 The new HSK STW (Phase 1) will start operation before Stage 2 of the Project (i.e. 2031) to handle the sewage from the Project using Site 3-26. The potential for using part of the land of the existing the SW STW for further expansion of the HSK STW (Phase 2) will also be explored, subject to review of the future population growth. The new HSK STW will be constructed with tertiary treatment for reuse of reclaimed water and secondary plus treatment (with UV disinfection and 75% nitrogen removal) for disposal of effluent with an ultimate design capacity of approximately 85,500 m^3 per day.

1.3.15 As the construction of the STW would be undertaken under a separate EIA, there is currently no information regarding the layout. Any details required for the EIA assumptions are described in the relevant EIA sections (e.g. Chapter 6 – Sewage and Sewerage Treatment Implications).

DP9 - Construction of Four New Sewage Pumping Stations

1.3.16 The sewerage arrangement for the intermediate and ultimate development stages, include four SPS (SPS1, SPS2, SPS3 and SPS4), which will be required to convey the sewage to SW STW- phase 1 and the proposed new HSK STW. The four new SPS will be implemented in two stages and designed with a capacity of 27,000 m^3 per day (SPS1), 39,500 m^3 per day (SPS2), 11,000 m^3 per day (SPS3), and 68,000 m^3 per day (SPS4) (Sites 2-34, 3-41, 3-48 and 4-35, respectively).

1.3.17 Construction of SPS1 and SPS2 (general layout presented in **Figures 2.14** and **2.15 of the EIA Report**, respectively) will be carried out in the intermediate development stage in order to cope with the completion of advance works for the Project. SPS1 is designated to convey sewage from the southern Project area next to Castle Peak Road to SPS2 and then to San Wai STW. SPS2 sewage catchment also includes the western Project area next to KSWH. These two SPSs are tentatively scheduled to be completed by 2029.

1.3.18 Construction of SPS3 and SPS4 (general layout presented in **Figures 2.16** and **2.17 of the EIA Report**, respectively) will be carried out in the ultimate development stage. SPS3 will receive sewage flow from the middle part of the Project area and then convey it to SPS2 for further pumping to the future new HSK STW. SPS4 will collect sewage from northern part of the Project area and divert the sewage from Tin Wah Road to San Wai STW through a proposed new rising main. These two SPSs are tentatively scheduled to be completed by 2031.

1.3.19 Since all these SPSs are with an installed capacity of more than 2000 m^3 per day and are located within 150 m from existing and/or planned residential area or educational institution, these SPSs are classified as DPs under Item F.3, Part 1, Schedule 2 of the EIAO.

DP10 - Construction of Flushing Water Service Reservoirs for Reuse of Reclaimed Water at Tan Kwai Tsuen and Fung Kong Tsuen

1.3.20 In order to achieve a sustainable development, reclaimed water from the sewage treatment plant will be reused for flushing water serving the Project. To facilitate the reuse of reclaimed water, service reservoirs at Tan Kwai Tsuen and Fung Kong Tsuen would be constructed (Site 3-3 and Site 5-40).

DP11 - Construction of a Refuse Transfer Station

1.3.21 In the northern part of the Project area along the KSWH, Site 3-12 has been proposed for the provision of a new "RTS" to support the existing NWNT "RTS" and cope with the new population waste generation. A Community Green Station is also co-located within the site to enhance environmental education and help collect different types of recyclables in the local community, which could provide synergistic effect to achieve better operational efficiency.

DP12 - Construction of Road P1 and a Slip Road from Kong Sham Western Highway to Road D3 Partly within the "Conservation Area" of Yuen Tau Shan

1.3.22 A north bound slip road from KSWH is proposed to provide direct access via Road D4 to west part of the Project area which will be located next to KSWH. The slip road and part of Road P1 will be partially located in the "CA" designation of Yuen Tau Shan. The alignment of Road P1 and the slip road will be constructed along the reinforced concrete flood storage ponds to avoid loss of natural/semi-natural habitats.

1.4 Purpose of this Manual

1.4.1 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is 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.

1.4.2 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 minimising environmental impacts.

1.4.3 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 (TM-EIAO).

1.4.4 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 organisation 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.

1.4.5 This EM&A Manual is a dynamic document that should be reviewed regularly and updated as necessary during the construction and operation of the Project.

2 PROJECT DESCRIPTION

2.1 General Description

2.1.1 Adhering to the planning principles for creating a sustainable, people-oriented and balanced community, the Project will be the next generation New Town providing a desirable place to live, work, learn and play for a total population of approximately 218,000. It will also offer development spaces for various commercial and special industrial uses and "Government, Institution and Community" ("G/IC") facilities.

2.1.2 Being the Regional Economic and Civic Hub for the NWNT, the Project will create approximately 150,000 new employment opportunities, and supporting services for people living in the Project area, TSW, Tuen Mun and Yuen Long as well as the proposed Yuen Long New Towns as well as the proposed Yuen Long South development project.

2.1.3 The Project comprises the following elements:

- The provision of about 61,000 **new residential units** will house an estimated new population of about 176,000 persons. With the existing population and population from the planned/committed residential developments within the Project area, the overall population is projected to be around 218,000 persons upon full development.
- **Commercial** sites for office, retail and hotel developments around the proposed HSK Station and existing TSW Station to reinforce their respective roles as "Regional Economic and Civic Hub" and "District Commercial Node", as well as two commercial sites in the northern edge of the Project area to complement local economic activities in the Lau Fau Shan and the northern part of TSW New Town area.
- **Enterprise and Technology Park** for accommodating a variety of innovation and technology uses, which may include research centre, testing & certification use, data centre, modern industries and other related businesses and non-polluting industrial uses.
- **Logistics Facility** to facilitate accommodation of modern logistics buildings.
- Multi-storey buildings on land reserved for **Port Back-Up, Storage and Workshop Uses** to accomodate some of the affected brownfield operations in a land-efficient manner.
- **Industrial** land for general industrial uses.
- A comprehensive **Open Space** network, including a continuous riverside promenade and a Regional Town Park in the centre of the Project area, that would optimise existing natural, cultural and landscape resources and provide recreational and leisure spaces.
- A variety of **"G/IC" facilities** such as social welfare facilities, education facilities, etc. to support the existing neighbourhood and future population.
- A **New HSK Sewage Treatment Works (STW)** with a tertiary and secondary plus treatment process and an ultimate design capacity of approximately 85,500 m^3 per day.
- **Four new Sewage Pumping Stations (SPSs)** with a design capacity of 27,000 m^3 per day (SPS1), 39,500 m^3 per day (SPS2), 11,000m^3 per day (SPS3), and 68,000m^3 per day (SPS4).

- A **Fresh Water Service Reservoir (FWSR) and FLWSRs**
- A **RTS** to support the existing NWNT RTS and cope with the new population waste generation.
- **District Cooling System (DCS)** in the vicinity of the proposed HSK Station and the existing TSW Station – subject to further review.
- **Primary Distributor Road** (Dual 2 / Dual 3 Standard) – Road P1.
- Eight **District Distributor Roads** (Dual 2 / Dual 3 Standards).
- **Green Transit Corridor (GTC)** comprising EFTS, pedestrian walkways and cycle tracks, which would traverse the core of residential, commercial and other land reserves within the Project area – details subject to further review.
- **Comprehensive Pedestrian Walkway and Cycle Track Network** to promote walking and cycling within the Project area.

2.2 Revised Recommended Outline Development Plan

2.2.1 The major planning parameters forming the basis of the Revised RODP are provided below and illustrated in **Figure 2.1**.

Table 2.1 Major Planning Parameters of the Revised RODP

Land Use	Area (ha)
Residential	80 (18%)
Residential and Commercial / Residential	80
Economic	105 (24%)
Commercial (office, hotel and retail)	22
Logistics Facilities	37
Port Back Up, Storage and Workshop Uses	24
Enterprise and Technology Park	9
Industrial	13
Public Facilities	86(20%)
Government, Institution or Community (other than Education)	32
Education and Related Uses	28
Public Utilities (Petrol Filling Station, Bus Depot, Regional Plaza, Station, etc.)	26
Open Space	66(15%)
Regional Open Space	16
District Open Space	27
Local Open Space	23
New Roads and Amenity	104(23%)
New Roads	86
Amenity	18
Total	**441**
Others	
Existing Road and River Channel	70
Green Belt (Preserved Knolls & Hillslopes)	54
Retained Existing/ Committed Development (including villages)	149
Grand Total	**714**

2.3 Implementation Programme and Phasing

2.3.1 The Project would be commissioned in phases with the first population intake in Year 2024. The major construction work is targeted to commence in Year 2019 and be completed by Year 2037/2038 for full population intake. A summary of the key construction elements is summarised below. The construction programme is presented in **Appendix 2.1** and phasing illustrated in **Figure 2.2**.

Advance Works

2.3.2 The Advance Works are targeted to bring in early population and employment to the Project area within the capacity of existing strategic infrastructure. The required supporting infrastructure works are therefore minimal. Some industrial sites and a key access roads (Road P1), will be implemented under this development stage. The major site formation and infrastructure works in this development stage will include:

- Site formation works for "Residential" ("R"), "G/IC", "Commercial" ("C") and "Industrial" ("I") sites.
- Two new SPSs (SPS1 and SPS2) (DP9) and associated rising mains.
- Primary Distributor Road P1 under KSWH and associated interchange/junction works connecting with KSWH, Castle Peak Road and other District Distributors (DP1).
- Slip Roads between Road D8 Junction and existing Castle Peak Road; Junction of D8/P1 and Junction of D7/P1 (DP5).
- Essential utilities for the future development of relevant sites in the Project, such as sewerage, watermains, power supply cables and electricity substation (ESS), etc.

Stage 1

2.3.3 In Stage 1, three "OU(PBU+SWU)" sites in the northern part of the Project will be developed. The early completion could provide opportunity for accommodating some of the affected brownfield operations. The major site formation and infrastructure works in this development stage will include:

- Site formation works for the three "OU(PBU+SWU)" sites and two "R" sites.
- A section of District Distributor Road D1 (DP2) connecting the "OU(PBU+SWU)" sites to KSWH.
- Utilities laying works for the future development of relevant sites in the Project, such as sewerage, watermains, power supply cables, etc. along the proposed Road P1.

Stage 2

2.3.4 In Stage 2, the development mainly focuses on areas surrounding the proposed HSK Station and the remaining "OU(PBU+SWU)" sites in the northern part of the Project area.

2.3.5 The major site formation and infrastructure works in this development stage will include:

- District Distributor Road D6, D7 and D8 (DP2 and DP6) and local roads, and associated pedestrian walkway and cycle tracks.
- District Distributor Road D1, a section of Road D3 (DP2) and local roads, and associated pedestrian walkway and cycle tracks.

- Site formation works for "R", "C", "G/IC" and open space sites in the southern Project area and associated section of the GTC.
- Site formation works for the remaining "OU(PBU+SWU)" sites and RTS in the northern Project area.
- Two new SPSs (SPS3 and SPS4) (DP9) and associated rising mains.
- New HSK STW Phase 1 (DP8).
- A FWSR and FLWSRs for reuse of reclaimed water (DP10) near Tan Kwai Tsuen and associated supply networks.
- DCS near proposed HSK Station (if implemented).
- Utilities for the future development of relevant sites in the Project, such as sewerage, watermains, power supply cables, ESS, etc.

Stage 3

2.3.6 In Stage 3, the development would focus on special industrial sites, public housing sites in the northern Project area, and open space in the middle part of the Project area. Most of the existing brownfield operations are located in the areas under this development stage. The major site formation and infrastructure works in this development stage will include:

- District Distributor Road D4 and Ping Ha Road (Road D2) widening (DP2 and DP6) and local roads, and associated pedestrian walkways and cycle tracks.
- District Distributor Road D3 and D5 (DP2), and associated pedestrian walkways and cycle tracks.
- Slip roads connecting KSWH and Road D3 (DP5 and DP12).
- Site formation works for "R", "C" and "G/IC" sites in the eastern and northern parts of the project area and associated section of GTC.
- Site formation works for "OU(Logistics Facilities)" and "OU(Enterprise and Technology Park)" sites in the western Project area and associated section of GTC.
- New HSK STW Phase 2 (DP8).
- A FLWSR for reuse of reclaimed water near Fung Kong Tsuen (DP10) and associated supply networks.
- Extension of FWSR near Fung Kong Tsuen and associated supply networks.
- Revitalisation of existing Tin Sam Channel and HSK Main Channel.
- Flood retention facilities and open spaces.
- Utilities for the future development of relevant sites in the Project, such as sewerage, watermains, power supply cables, etc.

Stage 4

2.3.7 In Stage 4, the remaining residential development along the TSW Main Channel and the low density residential development in Lau Fau Shan area will be completed. The major site formation and infrastructure works in this development stage will include:

- Local roads serving development sites, and associated pedestrian walkways and cycle tracks.
- Site formation works for "R", "G/IC", "C", open spaces and riverside promenade sites in the eastern and northern Project areas and associated section of GTC.
- Revitalisation of TSW Main Channel.
- Flood retention facilities.
- DCS near existing TSW Station (if implemented).
- Construction of EFTS (DP4) (if implemented), and associated pedestrian walkway and cycle tracks within the GTC.
- Utilities for the future development of relevant sites in the Project, such as sewerage, watermains, power supply cables, etc.

2.4 Summary of Concurrent Projects

2.4.1 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.

- Engineering Study Review for Site Formation and Infrastructure Works at San Hing Road, Tuen Mun - Investigation (and its Additional Services)
- Engineering Study for Site Formation and Infrastructural Works at Hong Po Road – Feasibility Study
- Site Formation and Infrastructural Works for the Development near Tan Kwai Tsuen, Yuen Long – Feasibility Study
- Preliminary Land Use Study for Lam Tei Quarry and the Adjoining Areas
- Yuen Long and Kam Tin Sewerage Disposal Stage 2 and Stage 3
- Tuen Mun Western Bypass
- Proposed Development Under the Study on the Enhancement of the Lau Fau Shan Rural Township and Surrounding Areas
- Planning and Engineering Study for Housing Sites in Yuen Long South – Investigation
- Water Supply to Hung Shui Kiu New Development Area
- Site Formation and Infrastructural Works for the Development at Long Bin, Yuen Long, Feasibility Study

2.5 Project Implementation Schedule

2.5.1 Detailed environmental impact assessment has been conducted and presented in the EIA Report. Mitigation measures have also been identified and recommended. The Project Implementation Schedule (PIS) is presented **Appendix 2.2**. It specifies the extent, locations, time frame and responsibilities for the implementation of the environmental mitigation measures identified.

3 PROJECT ORGANISATION

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

3.1.2 The responsibilities of respective parties are:

The Contractor

3.1.3 The Contractor should report to the Engineer's Representative (ER). The duties and responsibilities of the Contractor are:

- Implement the EIA recommendations and requirements;
- Provide assistance to Environmental Team (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

3.1.4 The ET should be led and managed by the ET Leader. The ET Leader should be independent party from the Contractor and should have at least 7 years of experience in conducting EM&A for infrastructure projects. The ET should monitor the mitigation measures implemented by the Contractor on regular basis to ensure the compliance with the intended aims of the measures. The duties and responsibilities of the ET are:

- 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 Independent Environmental Checker (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

3.1.5 The Engineer or ER is responsible for overseeing the construction works and for ensuring that the works are undertaken by the Contractor in accordance with the specification and contractual requirements. The duties and responsibilities of the Engineer or ER with respect to EM&A include:

- 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 and Action Plans in the event of any exceedance; and
- Adhere to the procedures for carrying out complaint investigations.

Independent Environmental Checker

3.1.6 The IEC should be an independent party from the Contractor and the Environmental Team and possess at least 7 years of experience in EM&A. The duties and responsibilities of the IEC are:

- 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.

3.1.7 Sufficient and suitably qualified professional and technical staff should 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.

4 AIR QUALITY IMPACT

4.1 Introduction

4.1.1 As identified in the EIA Report, the Project would not cause any adverse air quality impacts during operation phase. Separate EIA studies would be carried for proposed HSK Station, proposed EFTS, container storage area, RTS and the new HSK STW and the required operational EM&A requirements for these facilities would be recommended in the individual EIA Reports. This section presents the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impact during the construction phase of the Project and the requirements of the commissioning tests for deodorising units of the SPSs.

4.1.2 The objectives of the air quality monitoring shall be:

- to identify the extent of construction dust impact on sensitive receivers;
- to determine the effectiveness of mitigation measures to control fugitive dust emission from activities during the construction phase;
- to audit the compliance of the Contractor with regard to dust control, contract conditions and the relevant dust impact criteria;
- to recommend further mitigation measures if found to be necessary; and
- to comply with Action and Limit (A/L) Levels for air quality as defined in this Manual.

4.2 Air Quality Parameters

4.2.1 The major dusty construction activities of the Project would likely be site formation work, excavation work, loading/unloading activities, and demolition of existing buildings which would generate insignificant amount of small size particulates, hence, no significant Respirable Suspended Particulates (RSP) or Fine Suspended Particulates (FSP) impacts would be anticipated. Monitoring of 24-hour RSP and 24-hour FSP levels are not proposed. Therefore, only 1-hour Total Suspended Particulates (TSP) is recommended to be monitored and audited at the proposed monitoring locations.

4.2.2 The criterion against which ambient air quality monitoring to be assessed are:

- 1-hour TSP limit of 500 μg m^{-3}

4.2.3 This level should not be exceeded at Air Sensitive Receivers (ASRs).

4.2.4 Monitoring and audit of the TSP levels shall be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely action shall be undertaken to rectify such situation.

4.2.5 1-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels should be measured by following the standard method as set out in High Volume Sampling Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA (hereinafter referred to as “HVS method”). Upon approval of EPD and IEC, an alternative sampling method of using direct reading methods which are capable of producing comparable results as that by the high volume sampling method can be used to indicate short event impacts.

4.2.6 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, other local atmospheric factors affecting or affected by site conditions and work progress of the concerned site etc. shall be recorded in details. A sample data record sheet is shown in **Appendix 4.1**.

4.3 Monitoring Equipment

4.3.1 High volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hour TSP monitoring:

- 0.6 - 1.7 m3 per minute (20 - 60 standard cubic feet per minute) adjustable flow range;
- equipped with a timing / control device with ± 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with ± 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm^2;
- 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;
- easy to change the filter; and
- capable of operating continuously for 24-hour period.

4.3.2 The ET shall be responsible for the provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with appropriate calibration kit is available for carrying out the baseline, regular impacts 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, in accordance with requirements stated in the manufacturers operating manual. All the equipment, calibration kit, filter papers, etc., shall be clearly labelled.

4.3.3 Initial calibration of the dust monitoring equipment shall be conducted upon installation and prior to commissioning at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference by the concerned parties such as the IEC. All the data shall be converted into standard temperature and pressure condition.

4.3.4 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 on the data sheet as shown in **Appendix 4.1**.

4.3.5 If the ET Leader proposes to use a direct reading dust meter to measure 1-hour TSP levels, he shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that of the HVS before it may be used for the 1-hour sampling. The instrument shall also be calibrated regularly, and the 1-hour sampling shall be determined periodically by HVS to check the validity and accuracy of the results measured by direct reading method.

4.3.6 Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the ER and the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:

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

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

4.4 Laboratory Measurement / Analysis

4.4.1 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 shall be HOKLAS accredited or other internationally accredited laboratory.

4.4.2 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 verified by the IEC and approved by the EPD. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the IEC and EPD.

4.4.3 The IEC shall conduct regular audit of the measurement performed by the laboratory so as to ensure the accuracy of measurement results. The ET shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his/her reference.

4.4.4 Filter paper of size 8"x10" 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-hour and be pre-weighed before use for the sampling.

4.4.5 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 a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.

4.4.6 All the collected samples shall be kept in a good condition for 6 months before disposal.

4.5 Monitoring Locations

4.5.1 The selected monitoring locations are the worst potentially affected air sensitive receivers located in the vicinity of construction sites of the Project. The proposed air quality monitoring locations during construction phase are listed in **Table 4.1** below and shown in **Figures 4.1**.

Table 4.1 Proposed Construction Dust Monitoring Stations

Monitoring Station ID	EIA ID	Location	Phases of the Project	Monitoring Period(1)
Existing Air Sensitive Receivers				
AM1	A204	Kam Cheong Garden	Advance Works, Stage 1 Works and Stage 2 Works	Year 2024 - 2031
AM2	A208	Oaklands Court		Year 2024 - 2031
AM3	A209	Ling Liang Church Primary School		Year 2024 - 2031
AM4	A310	Tin Ha Road Playground		Year 2024 - 2031
AM5	A415	Tin Sum Tsuen	Stage 2 Works and Stage 3 Works	Year 2026 - 2035
AM6	A410	Galore Garden		Year 2026 - 2035
AM7	A414	Shek Po Tusen	Advance Works and Stage 3 Works	Year 2024 - 2029 Year 2031 - 2035
AM8	A813	Block H, Tin Shing Court	Advance Works, Stage 2 Works, Stage 3 Works and Stage 4 Works	Year 2024 - 2038
AM9	A702	San Uk Tsuen	Stage 3 Works	Year 2031 - 2035
AM10	A802	Kiu Tau Wai	Stage 3 Works and Stage 4 Works	Year 2031 - 2038
AM11	A703	Sha Chau Lei Tsuen		Year 2031 - 2038
AM12	A704	Ha Tsuen Shi		Year 2031 - 2038
AM13	A708	Sik Kong Wai		Year 2031 - 2038
AM14	A601	Tseung Kong Wai	Advance Works, Stage 2 Works, Stage 3 Works and Stage 4 Works	Year 2026 - 2038
AM15	A1101	Lo Uk Tsuen	Stage 3 Works and Stage 4 Works	Year 2031 - 2038
AM16	A1103	Block 8, Locwood Court		Year 2031 - 2038
AM17	A1106	Shui Lung House, Tin Shui Estate		Year 2031 - 2038
AM18	A1303	Sha Kong Wai Tsai		Year 2031 - 2038
AM19	A1305	Ngau Hom Tsuen		Year 2031 - 2038
AM20	A1302	Wing Jan School		Year 2031 - 2038
AM21	A1002	Fung Kong Tsuen	Advance Works, Stage 2 Works, Stage 3 Works and Stage 4 Works	Year 2026 - 2038
Planned Development				
AM22	P240	Planned Village Resite at Site 4-20	Advance Works and Stage 2 Works	Occupied date – Year 2031
AM23	P1032	Planned Port Back-up, Storage and Workshop at Site 3-6	Advance Works and Stage 2 Works	Occupied date – Year 2031
AM24	P1501	Planned Port Back-up, Storage and Workshop at Site 3-8	Advance Works and Stage 2 Works	Occupied date – Year 2031
AM25	P606	Planned Port Back-up, Storage and Workshop at Site 3-14	Stage 3 Works	Occupied date – Year 2035

Note: (1) The monitoring period is subject to the construction programme of the relevant contracts in the Construction Stage.

4.5.2 The status and locations of the air quality sensitive receivers 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.

4.5.3 When alternative monitoring locations are proposed, the following criteria, as far as practicable, shall be followed:

i. at the site boundary or such locations close to the major dust emission source;

ii. close to the air sensitive receivers as defined in the EIAO-TM;

iii. proper position/sitting and orientation of the monitoring equipment; and

iv. take into account the prevailing meteorological conditions.

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

i. a horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;

ii. two samplers shall be placed less than 2 m apart;

iii. 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;

iv. a minimum of 2 m of separation from walls, parapets and penthouses is required for rooftop samplers;

v. a minimum of 2 m of separation from any supporting structure, measured horizontally is required;

vi. no furnace or incinerator flue is nearby;

vii. airflow around the sampler is unrestricted;

viii. the sampler is more than 20 m from the dripline;

ix. any wire fence and gate, to protect the sampler, shall not cause any obstruction during monitoring;

x. permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and

xi. a secured supply of electricity is needed to operate the samplers.

4.6 Baseline Monitoring

4.6.1 Baseline monitoring shall be carried out to determine the ambient 1-hour TSP levels at the monitoring locations prior to the commencement of the Project. During the baseline monitoring, there shall not be any construction or dust generating activities in the vicinity of the monitoring stations. The baseline monitoring will provide data for the determination of the appropriate Action levels with the Limit levels set against statutory or otherwise agreed limits.

4.6.2 Before commencing the baseline monitoring, the ET shall inform the IEC of the baseline monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.

4.6.3 TSP baseline monitoring should be carried out at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works. 1-hour TSP sampling shall be done at least three times per day at each monitoring station when the highest dust impacts are expected. During the baseline monitoring, there should not be any construction or dust generating activities in the vicinity of the monitoring stations. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources should also be recorded throughout the baseline monitoring period. A summary of baseline monitoring is presented in **Table 4.2**.

4.6.4 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET Leader shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring location shall be agreed with IEC and approved by EPD.

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

4.6.6 If the ET Leader considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the baseline levels. The revised baseline levels, in turn, the air quality criteria, shall be agreed with the IEC and EPD.

4.7 Impact Monitoring

4.7.1 The ET shall carry out impact monitoring during construction phase of the Project. For 1-hour TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs. In case of non-compliance with the air criteria, more frequent monitoring, as specified in the Action Plan in the following section, should be conducted. This additional monitoring should be continued until the excessive dust emission or the deterioration in the air quality is rectified. The impact monitoring programme is summarised in **Table 4.2**.

4.7.2 The monthly schedule of the compliance and impact monitoring programme should be drawn up by the ET one month prior to the commencement of the scheduled construction period. Before commencing the 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 impact monitoring results.

Table 4.2 Summary of Construction Dust Monitoring Programme

Monitoring Period	Duration	Sampling Parameter	Frequency
Baseline Monitoring	Consecutive days of at least 2 weeks before commencement of major construction works	1-hour TSP	3 times per day
Impact Monitoring	Throughout the construction phase	1-hour TSP	3 times in every 6 days when documented and valid complaint was received

4.8 Event and Action Plan

4.8.1 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 4.3** shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance of the air quality criteria occur, action in accordance with the Action Plan in **Table 4.4** shall be carried out.

Table 4.3 Action and Limit Levels for Air Quality (Dust)

Parameter	Action Level (1)	Limit Level
TSP (1 hour average)	BL <= 384 μgm^{-3}, AL = (BL * 1.3 + LL)/2 BL > 384 μgm^{-3}, AL = LL	500 μgm^{-3}

Note: (1) BL = Baseline level, AL = Action level, LL = Limit level.

Table 4.4 Event and Action Plan for Air Quality (Dust)

Event	Action			
	ET	IEC	ER	Contractor
Action level being exceeded by one sampling	1. Identify source, investigate the causes of complaint and propose remedial measures; 2. Inform Contractor, IEC and ER; 3. Repeat measurement to confirm finding; and 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; and 3. Review and advise the ET and ER on the effectiveness of the proposed remedial measures.	1. Notify Contractor.	1. Identify source(s), investigate the causes of exceedance and propose remedial measures; 2. Implement remedial measures; and 3. Amend working methods agreed with the ER as appropriate.
Action level being exceeded by two or more consecutive sampling	1. Identify source; 2. Inform Contractor, IEC and ER; 3. Advise the Contractor and ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with Contractor, IEC and ER; and 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET, ER and Contractor on possible remedial measures; 4. Advise the ET and ER on the effectiveness of the proposed remedial measures; and 5. Supervise Implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented by the Contractor; and 4. 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. Identify source and investigate the causes of exceedance; 2. Submit proposals for remedial measures to the ER with a copy to ET and IEC within three working days of notification; 3. Implement the agreed proposals; and 4. Amend proposal as appropriate.

Event	Action			
	ET	IEC	ER	Contractor
Limit level being exceeded by one sampling	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform Contractor, IEC, ER, and EPD; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; and 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Check monitoring data submitted by ET; 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; and 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Identify source(s) and investigate the causes of exceedance; 2. Take immediate action to avoid further exceedance; 3. Submit proposals for remedial measures to ER with a copy to ET and IEC within three working days of notification; 4. Implement the agreed proposals; and 5. Amend proposal if appropriate.
Limit level being exceeded by two or more consecutive sampling	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; and 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET; 2. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 4. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. In consultation with the ET and IEC, agree with the Contractor on the remedial measures to be implemented; 3. Supervise the implementation of remedial measures; and 4. 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. Identify source(s) and investigate the causes of exceedance; 2. Take immediate action to avoid further exceedance; 3. Submit proposals for remedial measures to the ER with a copy to the IEC and ET within three working days of notification; 4. Implement the agreed proposals; 5. Revise and resubmit proposals if problem still not under control; and 6. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

4.9 Performance Compliance Test

4.9.1 Performance compliance tests for the deodorising units of the four SPSs (DP9) are recommended to determine whether the odour removal efficiency meet the requirements as stated in the EIA Report. Odour sampling is proposed at the intake and exhaust locations for olfactometric analysis at the commissioning stage.

4.10 Mitigation Measures

Construction Phase

4.10.1 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.

4.10.2 Recommended mitigation measures to minimise the adverse impacts on air quality during construction phases of the Project including all DPs are detailed in **Section 4.10.3** below.

4.10.3 To ensure compliance with the guideline level and AQO at the ASRs, the Air Pollution Control (Construction Dust) Regulation should be implemented and good site practices should be incorporated in the contract clauses to minimise construction dust impact. A number of dust suppression measures are proposed to be implemented as follows:

- Watering once time per hour on active works areas and exposed areas so as to achieve a dust removal efficiency of 91.7%.
- When there are open excavation and spoil handling works, hoarding of 3 m high should be provided along the construction site boundary adjacent to the non-construction areas such as residential, educational institutes or recreation area in use so as to minimise the dust impact.
- Use of frequent watering for particularly dusty construction areas and areas close to ASRs.
- Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines.
- Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs.
- Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations.
- Establishment and use of vehicle wheel and body washing facilities at the exit points of the site.
- Provision of wind shield and dust extraction units or similar dust mitigation measures at the loading area, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons/ periods.
- Provision of not less than 2.4 m high hoarding from ground level along site boundary where adjoins roads, streets or other accessible to the public except for a site entrance or exit. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period.
- Imposition of speed controls for vehicles on site haul roads.
- Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs.
- 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.

4.10.4 For the work site of the Work Contract nearest to the ASRs at Site 3-6, Site 3-8, Site 3-14, Site 4-20, and existing ASRs at Oaklands Court (A208), Ling Liang Church Primary School (A209, Tin Ha Road Playground (A310) and San Uk Tsuen (A702), it is recommended to reduce the active construction works area to one-third of monthly average work of the respective Work Contract so as to alleviate adverse dust impact.

Operation Phase

4.10.5 All facilities and areas with potential odour emission such as wet well, inlet chamber and screen chamber of the four SPSs are proposed to be covered and the exhausted air would be conveyed to a deodouriser (at least 90% of odour removal efficiency) for treatment before discharge to the environment. The ventilation system would also maintain a slight negative pressure within the facilities. The exhaust outlet of the deodouriser shall also be located away from the nearby air sensitive receivers as far as practicable. The screening wastes are proposed to be removed regularly (at least twice a week) from the four SPSs and would be properly packed and handled within the SPS structures and transported to designated landfill for disposal immediately after collection from the SPSs.

4.10.6 Regarding the odour impact due to the existing chicken farm, portion of Site 3-1 (“OU”, “PBU+SWU”), it is proposed that air sensitive uses at Site 3-1 should not be located at these exceedance zone or the fresh air intake of the building located at least 6 mAG

5 NOISE IMPACT

5.1 Introduction

5.1.1 The EIA has predicted the potential construction noise impact, operation phase road traffic noise impact, railway noise impact and fixed plant noise impact from this Project.

5.1.2 Construction noise mitigation measures would be required to reduce noise levels to the stipulated standard. A noise monitoring and audit programme should be undertaken to confirm such mitigation measures would be implemented properly.

5.1.3 Mitigation measures of noise barriers would need to be implemented along the roadworks within the Project area. Road traffic noise levels should be monitored at representative NSRs, which are in the vicinity of the recommended direct mitigation measures, during the first year after road opening. The purpose of the monitoring is to ascertain that the recommended mitigation measures are effective in reducing the noise levels.

5.1.4 For fixed plant noise impact, the Contractor should carry out a noise commissioning test for planned fixed noise sources before operation of the relevant fixed plant noise sources, in order to ensure compliance of the operation airborne noise levels with the TM's stipulated noise standard.

5.1.5 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of construction noise impacts and operational traffic noise are presented.

5.2 Monitoring Parameters for Construction Noise

5.2.1 The construction noise levels should be measured in terms of the 30-minute A-weighted equivalent continuous sound pressure level ($L_{eq\ (30\text{-}min)}$). $L_{eq(30\text{-}min)}$ should be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays.

5.2.2 Supplementary information for data auditing and statistical results such as L_{10} and L_{90} should also be obtained for reference. Sample noise field data sheets are shown in **Appendix 5.1** of this Manual for reference. The ET Leader may modify the data record sheet for this EM&A programme but the format of which should be agreed by the IEC.

5.3 Monitoring Equipment for Construction Noise

5.3.1 As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (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 shall be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0 dB.

5.3.2 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5 m/s or wind with gusts exceeding 10 m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

5.3.3 The ET is responsible for the provision 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. The equipment installation location shall be proposed by the ET Leader and agreed with the IEC and EPD.

5.4 Monitoring Locations for Construction Noise

5.4.1 **Figures 5.1** and **5.2** show the construction noise monitoring stations. The details of proposed noise monitoring stations are summarised in **Table 5.1** below.

Table 5.1 Proposed Noise Monitoring Stations during Construction Phase

Monitoring Station ID	EIA ID	Location	Impact Monitoring Period (1)
CM1	ETCW02	No. 739, Oaklands Court	Q2 2023 – Q3 2031
CM2	ESFW01	No. 332, Chung Uk Tsuen	Q2 2024 – Q3 2031
CM3	ESFW02	Village house, Nai Wai	Q2 2023 – Q3 2031
CM4	ECUT01	No. 16, Chung Uk Tsuen	Q2 2024 – Q3 2031
CM5	ELFS02	No. 3H, San Hing Tsuen	Q1 2031 – Q4 2035
CM6	ELFS03	No. 310, Sha Kong Wai	Q1 2031 – Q2 2037
CM7	ELFS04	Wing Jan School/Wing Jan Lutheran Church	Q1 2031 – Q2 2032
CM8	ETSW05	Shui Fung House, Tin Shui Estate	Q1 2031 – Q4 2038
CM9	ETSW08	VTC Youth College (Tin Shui Wai)	Q1 2031 – Q4 3028
CM10	ETSW11	YLPMSAA Tang Siu Tong Secondary School	Q4 2031 – Q3 2037
CM11	E53902	No. 125, Lee Fong Yuen	Q2 2024 – Q3 2031
CM12	ETST05b	No. 143, Tin Sum, (West Façade)	Q1 2026 – Q3 2031
CM13	ESLUT01	No. 46A, San Lee Uk Tsuen	Q1 2019 – Q3 2028
CM14	ESLUT03	No. 62, San Lee Uk Tsuen	Q1 2019 – Q3 2035
CM15	ESLUT04	No. 254, San Lee Uk Tsuen	Q1 2019 – Q3 2035
CM16	E52505	Hung Yan House, Hung Fuk Estate	Q1 2019 – Q4 2029
CM17	EHUT04	No. 85A, Kiu Tau Wai	Q1 2032 – Q4 2033
CM18	ESPT06	No. 201, Shek Po Tsuen	Q1 2032 – Q3 2035
CM19	ESST07	No, 60, San Sang Tsuen	Q3 3027 – Q3 2035
CM20	ESCL03	No. 45, Sha Chau Lei Tsuen	Q2 2031 – Q3 2035
CM21	EHTS01	No. 1B, San Uk Tsuen	Q1 2031 – Q3 2035
CM22	ELUT01	Block 11, Yan Wu Garden	Q1 2031 – Q1 2034
CM23	ESKT02	No. 151, Sik Kong Wai	Q4 2031 – Q3 2033
CM24	ETKW01	No.108C, Tseung Kong Wai	Q3 2028 – Q3 2035
CM25	ETTT01	Block A Luxor Garden, Tung Tau Tsuen	Q1 2031 – Q4 2038
CM26	EFKT01	No.61, Fung Kong Tsuen	Q3 2022 – Q2 2034
CM27	40305	Planned Residential Development in Site 4-3	Q2 2033 – Q3 2034
CM28	42001	Planned Residential Development in Site 4-20	Q1 2026 – Q3 2031
CM29	42251	Planned Residential Development in Site 4-22	Q2 2024 – Q3 2031
CM30	21801	Planned Residential Development in Site 2-18	Q1 2031 – Q4 2036
CM31	52408	Planned Residential Development in Site 5-24	Q2 2024 – Q3 2035
CM32	52151	Planned School in Site 5-21	Q1 2031 – Q4 2035

Note: (1) The monitoring period is subject to the construction programme of the relevant contracts in the Construction Stage.

5.4.2 The status and locations of noise sensitive receivers (NSRs) may change after issuing this Manual. If such cases exist, the ET shall propose updated monitoring locations and seek approval from the IEC and agreement from EPD of the proposal.

5.4.3 When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:

i. at locations close to the major site activities which are likely to have noise impacts;

ii. close to the NSRs; and

iii. for monitoring locations located in the vicinity of the sensitive receivers, care shall be taken to cause minimal disturbance to the occupants during monitoring.

5.4.4 The construction noise monitoring station shall normally be at a point 1 m from the exterior of the sensitive receivers building façade and be a position 1.2 m above the ground. If there is a problem with access to the normal monitoring position, an alternative position shall 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.

5.5 Baseline Monitoring for Construction Noise

5.5.1 Baseline noise monitoring shall be carried out daily in all of the identified monitoring stations for at least 2 weeks prior to the commissioning of the construction works. A schedule of the baseline monitoring shall be submitted to the IEC for approval before the monitoring starts.

5.5.2 During the baseline monitoring, there shall not be any construction activities in the vicinity of the monitoring stations.

5.5.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD and in consultation with the IEC to agree on an appropriate set of data to be used as a baseline reference.

5.6 Impact Monitoring for Construction Noise

5.6.1 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.

5.6.2 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.

5.6.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan in **Table 5.3** 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.

5.7 Event and Action Plan for Construction Noise

5.7.1 The Action and Limit levels for construction noise are defined in **Table 5.2**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 5.3** shall be carried out.

Table 5.2 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 (CNP) issued by the Noise Control Authority have to be followed.
- * 70 dB(A) and 65 dB(A) for schools during normal teaching periods and school examination periods, respectively.

Table 5.3 Event and Action Plan for Construction Noise

Event	Action			
	ET	IEC	ER	Contractor
Action Level	1. Notify IEC and Contractor; 2. Carry out investigation; 3. Report the results of investigation to the IEC, ER and Contractor; 4. Discuss with the Contractor and formulate remedial measures; and 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; and 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; and 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC; and 2. Implement noise mitigation proposals.
Limit Level	1. Identify source; 2. Inform IEC, ER, EPD and Contractor; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 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; and 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; and 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; and 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

5.8 Noise Parameters for Operational Traffic Noise

5.8.1 The ET should also 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 $L_{10\ (1\text{-}hr)}$. During the traffic noise measurement, traffic count should also be undertaken concurrently. Supplementary information for data auditing and statistical results such as L_{eq} and L_{90} should also be obtained for reference.

5.8.2 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5 m/s or wind with gusts exceeding 10 m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

5.9 Monitoring Locations for Operational Traffic Noise

5.9.1 Those most affected NSRs identified in the EIA Report are selected as the noise monitoring locations in this EM&A Manual. The traffic noise monitoring locations during operational phase are listed in **Table 5.4** and shown in **Figure 5.3** and **Figure 5.4**. In addition, noise monitoring shall be carried out for one year following construction. 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 5.4 Traffic Noise Monitoring Locations

Monitoring Station ID	EIA ID	Location	Noise Barrier Location
OM1	E2-OC_R01	Sha Kong Wai	VB2, Tin Wah Road / Lau Fau Shan Road
OM2	E2-IA_R01	Fung Kong Tsuen	VB5, Proposed Road D1
OM3	E1-IA_R01	Tseung Kong Wai	VB7, VB8 & VB9, Proposed Road D3
OM4	E1-IF_R02	Ha Tsuen Shi	VB26, Proposed Road L1
OM5	E1-OB_21	Lions Clubs International Ho Tak Sum Primary School	VB21 & VB24, Proposed Road D2/ Ping Ha Road
OM6	E4-OA_R01	Tsing Cheun Wai	VB39 & VB40, Proposed Road P1

5.9.2 The status and locations of NSRs may change after issuing this manual. In this event, the ET Leader shall propose updated monitoring locations and seek approval from IEC and agreement from EPD of the proposal.

5.9.3 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria in that they should be:

- At locations close to the major site activities which are likely to have noise impacts;
- Close to the NSRs; 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.

5.9.4 The monitoring station shall normally be at a point 1 m from the exterior of the sensitive receiver building facade and be at a position 1.2 m 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 before commencement of monitoring.

5.10 Monitoring Requirement for Operational Traffic Noise

5.10.1 Traffic noise monitoring shall be carried out at all the designated traffic noise monitoring stations. The following is an initial guide on the traffic noise monitoring requirements during the operational phase:

- One set of measurements at the morning traffic peak hour on normal weekdays;
- One set of measurements at the evening traffic peak hour on normal weekdays;
- A concurrent census of traffic flow and percentage heavy vehicle shall be conducted for the Project roads and the existing road network in the vicinity of each measuring point;
- Average vehicle speed estimated for Project road and the existing road network in the vicinity of each measuring points; and
- The two sets of monitoring data should be obtained within the first year of operation.

5.10.2 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 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.

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

5.10.4 Each set of measurements shall include three measurements of 30 minutes. The parameters L_{10}, L_{eq}, L_{90} and L_{max} will be recorded for data auditing and reference.

5.11 Event and Action Plan for Traffic Noise

5.11.1 For 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 case discrepancies are observed, explanation shall be given to justify the discrepancies.

5.12 Commissioning Test for Fixed Plant Noise

5.12.1 Fixed noise commissioning test shall be carried out at planned facilities including SPS, DCS, ESS, chiller plants/cooling tower at the planned hospital and condenser/transformer at planned fire station to determine the maximum allowable sound power level as stated in the EIA Report. The SWL criteria shall be implemented by Contractor before operation of the Project, in order to ensure of the compliance of the operational airborne noise levels with the TM's stipulated noise standard. There are separate EIA studies for the proposed HSK Station, RTS, new HSK STW and the Port Back-Up facilities, the relevant monitoring requirement would be proposed in its individual EIA Report.

5.12.2 For the Sports Ground / Sports Complex, upon any rehearsal and main event, the organiser should appoint an appropriate person to monitor the noise situation by sound level meter at the most affected NSRs. That person should provide feedback to the organiser for immediate action, such as adjustment of the speaker output level, whenever necessary. Noise measurement should be conducted at least hourly during the event, of which the results should be recorded properly and submitted to the venue operator subsequently. The venue operator will provide the recorded measurements for reference to EPD when requested for any necessary follow up investigation.

5.12.3 The ET should prepare and deposit a commissioning test plan for the fixed plant noise to EPD, at least 6 months before the operation of the planned fixed plants. The plan should contain locations, measurement schedules, methodology of noise measurement including noise measurement procedures and data analysis of measured noise level. The commissioning test should be certified by the ET Leader and verified by IEC before deposit with EPD.

5.13 Mitigation Measures

Construction Phase

5.13.1 To alleviate the construction noise impact on the affected NSRs, adoption of quiet powered mechanical equipment (PME), adoption of noise barriers or enclosure for particular items of plant and recommendation on workfront management are proposed for the Project (including all DPs) during construction phase. It is anticipated that a movable noise barrier with a cantilevered upper portion located within 5 m from any static or mobile plant can provide 5 dB(A) noise reduction for mobile plant and 10 dB(A) noise reduction for static plant. The barrier material shall have a surface mass of not less than 14 kg/m^2 on skid footing with 25 mm thick internal sound absorptive lining to achieve the maximum screening effect.

5.13.2 In addition, the good site practices listed below should be adopted by all the Contractors to further ameliorate the noise impacts:

- Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program.
- Silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction program.
- Mobile plant, if any, should be sited as far away from NSRs as possible.
- Machines and plant (such as trucks) that may be in intermittent use should be shut down between works periods or should be throttled down to a minimum.

- Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs.

- Material stockpiles and other structures should be effectively utilised, wherever practicable, in screening noise from on-site construction activities.

5.13.3 The Contractor should have proper workfront management as proposed in **Table 4.19 of the EIA Report** during construction activities operated at the critical work areas.

5.13.4 The Contractor shall also have proper grouping of PMEs for following NSRs during critical construction activities as presented in **Table 4.23** and **Appendix 4.6.6 of the EIA Report**:

- Wing Jan School/Wing Jan Lutheran Church
- VTC Youth College (Tin Shui Wai)
- YLPMSAA Tang Siu Tong Secondary School
- No. 62, San Lee Uk Tsuen
- No. 60, San Sang Tsuen
- No. 1B, San Uk Tsuen
- Planned School in Site 1-3
- Planned School in Site 1-15
- Planned Residential Development in Site 4-20
- Planned Residential Development in Site 4-22
- Planned School in Site 5-21

5.13.5 In addition, proper grouping of PME for the planned school in Site 1-15 (as presented in **Appendix 4.6.9 of the EIA Report**) and maintain the recommended minimum separation (as presented in **Appendix 4.6.8 of the EIA Report**) between the following schools and the critical works areas during examination periods should also be implemented.

- Wing Jan School/Wing Jan Lutheran Church
- VTC Youth College (Tin Shui Wai)
- YLPMSAA Tang Siu Tong Secondary School
- Planned School in Site 1-3
- Planned School in Site 5-21

5.13.6 The Contractors should liaise with the school representative(s) of following schools to obtain the examination schedule so as to avoid noisy construction activities during school examination period.

- Wing Jan School/Wing Jan Lutheran Church
- VTC Youth College (Tin Shui Wai)

- YLPMSAA Tang Siu Tong Secondary School
- Planned School in Site 1-3
- Planned School in Site 1-15
- Planned School in Site 5-21

5.13.7 If the above measures are not sufficient to restore the construction noise quality to acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader to identify further mitigation measures. They shall be proposed to ER for approval, and the contractor shall then implement these additional mitigation measures.

5.13.8 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.

5.13.9 The implementation schedule for the recommended mitigation measures is presented in **Appendix 2.2**.

Operation Phase

Traffic Noise

5.13.10 Direct noise mitigation measures including low noise road surfacing and noise barriers, and special building designs have been proposed to alleviate the traffic noise impact. **Table 5.5** and **Table 5.6** summarise the proposed noise mitigation measures. **Table 5.8** summarises the special building design for the concerned sites.

Table 5.5 List of Proposed Noise Mitigation Measures (Low-Noise Road Surfacing)

ID	Road	Length, m
LNS1	Not used	-
LNS2	Tin Wah Road	350
LNS3	Proposed Roundabout at Junction J2	210
LNS4	Proposed Road D1	500
LNS5	Proposed Road near Site2-26	280
LNS6	Proposed Road D1	400
LNS7	Proposed Road D1	640
LNS8	Proposed Road D1 (Depressed Section)	120
LNS9	Proposed Road L1	670
LNS10	Proposed Road P1	560
LNS11	Proposed Road L5	440
LNS12	Proposed Road D2	280
LNS13	Proposed Road D2 (Depressed Section)	180
LNS14	Proposed Road D2	1260
LNS15	Proposed Road L3	390
LNS16	Proposed Road D2	370
LNS17	Proposed Roundabout at Junction J8	190
LNS18	Ping Ha Road	110
LNS19	Not used	-

ID	Road	Length, m
LNS20	Kiu Fat Street	280
LNS22	Proposed Road near Site 5-13	730
LNS23	Hung Chi Road / Proposed Road L5	340
LNS24	Not used	-
LNS25	Not used	-
LNS26	Not used	-
LNS27	Proposed Road near Site 4-24	140
LNS28	Not used	-
LNS29	Proposed Road L2	670
LNS30	Proposed Road near Site 4-29	270
LNS31	Not used	-
LNS32	Proposed Road P1	790
LNS33	Proposed Road P1	380
LNS34	Proposed Road P1	610
LNS35	Proposed Road D8	480
LNS36	Proposed Road near Site 4-33	210
-	Hung Chi Road	350
-	Hung Shui Kiu Tin Sum Road (East Section and South of San Lee Uk Tsuen)	480

Table 5.6 List of Proposed Noise Mitigation Measures (Barriers and Enclosure)

Noise Barrier ID	Location	Barrier Type	Height, mAG	Length, m
CB1	Proposed Road D2	Cantilever	6+4.2 m at 45 degree	50
CB2	Not used	-	-	-
CB3a	Proposed Road P1	Cantilever	5.5+2.5 m at 45 degree	80
CB3b	Proposed Road P1	Cantilever	5.5+2.5 m at 45 degree	130
CB4	Not used	-	-	-
CB5	Proposed Road D2, near Site 1-22	Cantilever	6+4.2 m at 45 degree	130
VB2	Tin Wah Road / Lau Fau Shan Road	Vertical	5	140
VB3	Proposed Road D1	Vertical	3	120
VB4	Proposed Road D2	Vertical	5	140
VB5	Proposed Road D1	Vertical	5	90
VB6	Proposed Road D1	Vertical	5	150
VB7	Proposed Road D3	Vertical	4	60
VB8	Proposed Road D3	Vertical	4	50
VB9	Proposed Road D3	Vertical	4	50
VB10	Proposed Road D2	Vertical	4	180

Noise Barrier ID	Location	Barrier Type	Height, mAG	Length, m
VB11	Not used	-	-	-
VB12	Proposed Road D2	Vertical	6	110
VB13	Not used	-	-	-
VB14	Not used	-	-	-
VB15	Proposed Road D2	Vertical	5	30
VB16	Proposed Road D2	Vertical	5	60
VB17	Proposed Road D2	Vertical	5	20
VB18	Proposed Road D2	Vertical	4	60
VB19	Not used	-	-	-
VB20	Proposed Road L3	Vertical	7	110
VB21	Proposed Road D2/ Ping Ha Road	Vertical	7	50
VB22	Not used	-	-	-
VB23	Proposed Road D2/ Ping Ha Road	Vertical	7	130
VB24	Ping Ha Road	Vertical	7	160
VB25	Not used	-	-	-
VB26	Proposed Road L1	Vertical	5	70
VB27	Not used	-	-	-
VB28	Hung Tin Road	Vertical	5	90
VB29	Hung Tin Road	Vertical	7	80
VB30	Not used	-	-	-
VB31	Hung Tin Road	Vertical	7	60
VB32	Not used	-	-	-
VB33	Not used	-	-	-
VB34	Not used	-	-	-
VB35	Proposed Road D5	Vertical	5	80
VB36	Proposed Road D5	Vertical	5	70
VB37	Proposed Road D5	Vertical	3	70
VB38	Proposed Road D5	Vertical	3	80
VB39	Proposed Road P1	Vertical	3	100
VB40	Proposed Road P1	Vertical	3	130
VB41	Proposed Road D2	Vertical	5	130
VB42	Not used	-	-	-

Table 5.7 Details of Proposed Boundary Wall for Planned Education Institutes

Boundary Wall ID	Location	Barrier Type	Height, mAG	Length, m
VB1	Boundary Wall at Site 2-9	Vertical	3	65
VB43	Boundary wall at Site 4-36	Vertical	3	60
VB44	Boundary wall at Site 4-36	Vertical	3	120
VB45	Boundary wall at Site 4-33	Vertical	3	200
VB46	Boundary wall at Site 5-34	Vertical	3	150
VB47	Boundary wall at Site 5-34	Vertical	3	160

Table 5.8 Proposed Additional Mitigation Measures at Planned Sites

Site Ref. No.	Use	Proposed Additional Mitigation Measures	Applied to	Figure Reference
1-2	Residential	Acoustic Windows	1 - 17/F	Figure 4.7.19
1-15	Educational	Blank Façade	1 edge of 1 building	Figure 4.7.21
1-22	Educational	Noise Insulated Windows and Air Conditioning	1 school	Figure 4.7.21
2-26	Educational	Blank Façade	1 edge of 1 building	Figure 4.7.20
4-1	Staff Quarters	Acoustic Windows	1 - 25/F	Figure 4.7.25
		Blank Façade	1 edge of 2 buildings	
4-5	Residential	Acoustic Windows	20 - 42/F	Figure 4.7.25
4-24	Residential	Acoustic Windows	1 - 20/F	Figure 4.7.26
4-26	Residential	Acoustic Windows	3 - 11/F	Figure 4.7.26
4-28	Residential	Acoustic Windows	1 - 2/F	Figure 4.7.26
4-33	Educational	Noise Insulated Windows and Air Conditioning	1 school	Figure 4.7.27
5-7b	Residential/ Commercial	Acoustic Windows	1 - 9/F	Figure 4.7.22
5-14	Educational	Noise Insulated Windows and Air Conditioning	2 schools	Figure 4.7.23
5-16	Residential	Acoustic Windows	3 - 22/F	Figure 4.7.21
5-17	Residential	Acoustic Windows	4 - 29/F	Figure 4.7.22
5-21	Educational	Noise Insulated Windows and Air Conditioning	1 school	Figure 4.7.23
5-22	Residential	Acoustic Balcony	1 - 21/F	Figure 4.7.24
5-28	Residential Home for the Elderly	Noise Insulated Windows and Air Conditioning	1 Residential Home for the Elderly	Figure 4.7.24
5-32	Residential/ Commercial	Acoustic Windows	1 - 28/F	Figure 4.7.24
		Acoustic Balcony	1 - 9/F	
5-34	Educational	Blank Façade	1 edge of 1 building	Figure 4.7.24
		Noise Insulated Windows and Air Conditioning	1 school	
5-37	Educational	Noise Insulated Windows and Air Conditioning	1 school	Figure 4.7.24

Note: For Site 5-28, the need of additional measures would be subject to whether the LNRS can apply on Hung Shui Kiu Tin Sam Road (East Section).

5.13.11 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.

5.13.12 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 traffic noise levels so as to minimise the scale/extent of the proposed noise mitigation measures.

Railway Noise

5.13.13 For the new development in the OZP, the future development proponents should conduct a stand-alone Railway Noise Impact Assessment to assess the potential noise impacts from rail operations on future occupants, and implement the mitigation measures as presented in **Section 4.8.11 – 4.8.15 of the EIA Report** or other specific designed noise mitigation measures at their respective development sites to the satisfaction of EPD, to ensure full compliance with the statutory noise limits. The above development requirements shall be imposed through relevant Planning Briefs or Land Lease conditions to be fulfilled by the future development proponents.

Fixed Plant Noise

5.13.14 The maximum allowable sound power levels for the planned fixed plant noise sources including the four planned SPSs (DP9) as presented in **Section 4.9 of the EIA Report** should be achieved such that the nearest NSRs can be in compliance with the TM noise criteria. Provision of enclosures on the noisy sewage facilities and acoustic silencers for the ventilation shaft of the four planned SPSs is recommended to alleviate the fixed plant noise impact. The following tentative noise mitigation measures are recommended for the planned fixed plant noise sources which are located near to the existing and planned NSRs:

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

5.13.15 The feasibility, practicability, programming and effectiveness of the above mitigation measures have been reviewed by engineer.

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

5.13.17 The implementation schedule for the recommended mitigation measures is presented in **Appendix 2.2**.

6 WATER QUALITY IMPACT

6.1 Introduction

6.1.1 As identified in the EIA Report, the key water quality impacts caused by the Project would be associated with the land-based construction activities. To ensure no adverse water quality impact to the nearby watercourses due to the discharges from construction activities, water quality monitoring is recommended during the construction phase. It is also recommended that regular site inspections should be undertaken to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented. The water quality monitoring and audit programme should be suitably adjusted according to the phased implementation of the Project.

6.1.2 No water quality monitoring and audit programme specific to the operational phase is proposed for the Project.

6.1.3 This section describes the requirement of water quality monitoring during construction of the Project.

6.2 Water Quality Parameters

6.2.1 Dissolved oxygen (DO), turbidity, suspended solids (SS) level and pH should be monitored at designated water quality monitoring stations in the watercourses.

6.2.2 The levels of DO, turbidity and pH should be measured *in-situ* whereas SS should be determined by laboratory analysis.

6.3 Monitoring Locations

6.3.1 Water quality monitoring is proposed in the major watercourses in the Project area including TSW Main Channel, Hang Hau Tsuen Channel, upstream tributaries of Shan Pui River and Tuen Mun River and small watercourses along Deep Bay. The proposed water quality monitoring stations in the watercourses are listed in **Table 6.1** and shown in **Figure 6.1**.

Table 6.1 Proposed Water Quality Monitoring Stations

Fresh Water System	Station	Description	Easting	Northing
TSW Main Channel and its tributaries	U1	Upstream Stations	815936	834150
	U2		816240	834009
	U3		816137	832945
	U4		816092	832459
	U5		816067	832292
	U6		817701	832513
	TS1	Gradient Stations	816815	832297
	TS2		817277	833356
	TSR1		817687	833812
	ST		816938	833266
	SW		816304	834321
	HT		816866	834314
	LUT		817595	834737
	D2	Impact Station	817533	836078
Hang Hau Tsuen Channel	LFS	Gradient Station	816504	835862
	D1	Impact Station	816187	836064

Fresh Water System	Station	Description	Easting	Northing
Tuen Mun River	D3	Impact Station	816437	831500
Small Watercourses along Deep Bay	DB	Gradient Station	816091	834976
	D4	Impact Station	815874	835223
Upstream / Tributaries of Shan Pui River	U7	Upstream Station	818712	831733
	D5	Impact Station	818857	832139
	D6	Impact Station	818889	832005

6.3.2 TSW Main Channel and its tributaries are a large river system which spread across the majority of the Project area. Six monitoring stations (namely U1 to U6 respectively) should be set in the tributaries of TSW Main Channel upstream of the works area as control stations, and one impact monitoring station (namely D2) should be set in the main TSW Main Channel downstream of the works area as shown in **Figure 6.1**. Seven gradient stations (namely TS1, TS2, TSR1, ST, SW, HT and LUT respectively) should also be set within the Project area to assist in the identification of the potential sources of any impact at Station D2.

6.3.3 Hang Hau Tsuen Channel is a relatively small storm water system at the northern Project area. One impact station (namely D1) should be set in the watercourse downstream of the Project works and one gradient station (namely LFS) should be set within the Project works area to assist in the identification of the sources of any impact at Station D1 as shown in **Figure 6.1**. Since the most upstream sections of Hang Hau Tsuen and its side branch to the north will be removed under the Project and are located within the Project works areas. No upstream control station can be identified for Hang Hau Tsuen Channel.

6.3.4 Only a very small tributary of Tuen Mun River is located within the Project area as shown in **Figure 6.1**. Thus, only one impact station (namely D3) should be set in this tributary downstream of the Project works. Since the upstream section of this tributary will be removed under this Project and is also within the Project works area, no upstream control station can be identified for the Tuen Mun River.

6.3.5 Two proposed sites for service reservoirs are located in the northern and southern Project area respectively as shown in **Figure 6.1**. Watercourses along Deep Bay and some small tributaries of TSW Main Channel are located downstream of the northern reservoir as shown in **Figure 6.1**. Two monitoring stations (namely D4 and DB) are proposed at these watercourses. Station D4 is located downstream of the Project area in a watercourse running into the Deep Bay as shown in **Figure 6.1** and thus this station would serve as an impact station. Station DB is located downstream of the reservoir but also at the upstream of other construction works areas within the Project area as shown in **Figure 6.1**. Hence Station DB would serve as a gradient station to assist in the identification of the sources of any impact upon the TSW Main Channel and its tributaries further downstream. For the reservoir in the south near the tributaries of Shan Pui River, two impact stations (namely D5 and D6) should be set in the tributaries downstream of the reservoir and one monitoring station (namely U7) upstream of the reservoir as a control station as shown in **Figure 6.1**.

6.3.6 Sampling should be taken at three water depths, namely, 1 m below water surface, mid-depth and 1 m above river bed. If the sampling water depth is less than 6 m, the mid-depth may be omitted. For water depth that is less than 3 m, only the mid-depth station will be monitored.

6.3.7 The exact locations may be reviewed when the detailed design of the construction sites are available at the later stage of the Project. The status and locations of water quality monitoring stations and the works activities may change after issuing this Manual. If such cases exist, the ET Leader should propose with justification for changes to monitoring locations or other requirements of the EM&A programme, and seek approval from the IE(C) and EPD.

6.3.8 When alternative monitoring locations are proposed, they shall be chosen based on the following criteria:

a) at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA Report, which are likely to have water quality impacts;

b) close to the sensitive receptors which are directly or likely to be affected;

c) for monitoring locations located in the vicinity of the sensitive receptors, care shall be taken to cause minimal disturbance during monitoring;

d) two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations shall be located, as far as is practicable, both upstream and downstream of the works area.

6.4 Baseline Monitoring

6.4.1 Baseline conditions in the watercourses should be established and agreed with EPD prior to the commencement of construction works. The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed monitoring stations. The baseline conditions should normally be established by measuring the water quality parameters specified in **Section 6.2**.

6.4.2 The baseline monitoring should be taken at all 22 designated monitoring stations in the five watercourses, three days per week, for at least 4 weeks prior to the commencement of construction works. There should not be any construction activities in the vicinity of the stations during the baseline monitoring. The interval between 2 sets of monitoring should not be less than 36 hours.

6.4.3 Baseline monitoring schedule should be submitted to EPD at least 4 weeks prior to the commencement of baseline monitoring. EPD should also be notified immediately for any changes in schedule.

6.4.4 The baseline monitoring report should be submitted to EPD at least 4 weeks before the commencement of the construction works for agreement. The baseline monitoring report should be certified by the IEC before submission to EPD.

6.5 Impact Monitoring

6.5.1 During the construction phase of the Project, impact monitoring should be undertaken at all 22 designated monitoring stations three days per week with sampling / measurement at the designated monitoring stations in the five watercourses. Upon completion of the construction phase, the monitoring exercise at the designated monitoring locations should be continued for four weeks in the same manner as the impact monitoring. The interval between two sets of monitoring should not be less than 36 hours except where there are exceedances of Action and/or Limit Levels, in which case the monitoring frequency will be increased.

6.5.2 The water quality monitoring schedule should be submitted to EPD at least 1 week before the first day of the monitoring month. EPD should be notified immediately of any changes in schedule. If the monitoring data collected at the designated stations indicate that the Action or Limit Levels as shown in **Table 6.3** are exceeded, appropriate actions should be taken in accordance with the Event and Action Plan in **Table 6.4**.

6.6 Site Audits

6.6.1 Implementation of regular site audits aim to ensure that the recommended mitigation measures are properly undertaken during proposed construction works. It can also provide an effective control of any malpractices and therefore achieve continual improvement of environmental performance on site.

6.6.2 Site audits should be carried out by the ET and should be based on the mitigation measures for water pollution control recommended in the implementation schedule as presented in **Appendix 2.2**. In the event that the recommended mitigation measures are not fully or properly implemented, deficiency should be recorded and reported to the site management. Suitable actions are to be carried out to:

- investigate the problems and the causes;
- issue action notes to the Contractor who is responsible for the works;
- implement remedial and corrective actions immediately;
- re-inspect the site conditions upon completion of the remedial and corrective actions; and
- record the event and discuss with the Contractor for preventive actions.

6.7 Field Log

6.7.1 Other relevant data should also be recorded, such as: monitoring location / position, time, water depth, weather conditions and any special phenomena underway near the monitoring station. A sample data record sheet is shown in **Appendix 6.1** for reference.

6.8 Monitoring Equipment

Dissolved Oxygen and Temperature Measuring Equipment

6.8.1 The instrument should be a portable and weatherproof DO measuring instrument complete with cable and sensor, and use a DC power source. The equipment 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.

Turbidity Measurement Instrument

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

pH Measurement Instrument

6.8.3 The instrument should consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It should be readable to 0.1 pH in a range of 0 to 14. Standard buffer solutions of at least pH 7 and pH 10 should be used for calibration of the instrument before and after use.

Sampler

6.8.4 A water sampler is required. 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).

Water Depth Detector

6.8.5 A portable, battery-operated echo sounder would be used for the determination of water depth at each designated monitoring station. If echo sounder is not applicable due to low water depth, various sized stainless steel rules would be used to determine the water depth.

Sample Containers and Storage

6.8.6 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 delivered to the laboratory and analysed as soon as possible after collection. Sufficient volume of samples should be collected to achieve the detection limit stated in **Table 6.2**.

Calibration of In-Situ Instruments

6.8.7 The DO meter and turbidimeter should be checked and calibrated before use. DO meter and turbidimeter should be certified by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re-calibrated at three monthly intervals 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 should be carried out before measurement at each monitoring location.

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

6.9 Laboratory Measurement / Analysis

6.9.1 Analysis of suspended solids (SS) should be carried out in a HOKLAS or other international accredited laboratory. Sufficient water samples should be collected at the monitoring stations for carrying out the laboratory determinations. The determination work should start within 24 hours after collection of the water samples. The analyses should follow the American Public Health Association (APHA) Standard Methods for the Examination of Water and Wastewater or an equivalent method subject to the approval of EPD. Analytical methods and detection limits for SS are present in **Table 6.2**.

Table 6.2 Analytical Methods to be Applied to Water Quality Samples

Parameters	Analytical Method	Detection Limit
Suspended Solids	APHA 2540D *	1 mg/L

* APHA American Public Health Association Standard Methods for the Examination of Water and Wastewater.

6.9.2 The testing of SS should be HOKLAS accredited (or if not, approved by EPD) and comprehensive quality assurance and control procedures in place in order to ensure quality and consistency in results.

6.9.3 Detailed testing methods, pre-treatment procedures, instruments use, Quality Assurance / Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per batch, etc.), detection limit and accuracy should be submitted to EPD for approval prior to the commencement of monitoring programme. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. The QA/QC should be in accordance with the requirements of HOKLAS or international accredited scheme. The QA/QC results should be reported. The testing methods and related proposal should be checked and certified by IEC before submission to EPD for approval.

6.9.4 Additional duplicate samples may be required by EPD for inter-laboratory calibration. Remaining samples after analysis should be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to EPD. In any circumstance, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should prepare to demonstrate the programme to EPD or his representatives when requested.

6.10 Event and Action Plan

6.10.1 The water quality criteria, namely action and limit levels, are shown in **Table 6.3**. These criteria should be applied to ensure that any deterioration of water quality is readily detected and timely action is taken to rectify the situation. Should the monitoring results of the water quality parameters at any designated impact monitoring station exceed the water quality criteria, the actions in accordance with the Event and Action Plan summarised in **Table 6.4** should be carried out.

6.10.2 The ET Leader should assess the potential impacts on the water sensitive receivers based on the monitoring data. The performance of the environmental management system (i.e. of the overall EM&A programme) should be reviewed by the ET Leader on a quarterly basis. The findings of this review should be included in the quarterly EM&A summary reports, together with any recommendations to improve the performance of the EM&A programme.

Table 6.3 Action and Limit Levels for Water Quality Impact Stations (D1, D2 and D3)

Parameters	Action Level	Limit Level
DO in mg/L	Surface, middle, bottom DO ≤ 5 %-ile of baseline data	Surface, middle DO ≤ 4 mg/L and 1%-ile of baseline data for surface and middle layer Bottom DO ≤ 2 mg/L and 1%-ile of baseline data for bottom layer
SS in mg/L	Depth-average SS ≥ 95 %-ile of baseline data	Depth-average SS ≥ 99 %-ile of baseline
Turbidity in NTU	Depth-average SS ≥ 95 %-ile of baseline data	Depth-average SS ≥ 99 %-ile of baseline
pH	Beyond the range 6.6 to 8.4	Beyond the range of 6.5 to 8.5

Notes:
(1) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
(2) For SS and turbidity, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.

6.11 Mitigation Measures

6.11.1 Mitigation measures for water quality control have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures.

6.11.2 Recommended mitigation measures to minimise the adverse impacts on water quality during the construction activities are listed in the implementation schedule given in **Appendix 2.2.**

6.11.3 In the event of complaints or non-compliance / area of improvement being observed, the ET and the Contractor should review the effectiveness of these mitigation measures, design alternative or additional mitigation measures as appropriate and propose to the IEC for approval and implement these alternative or additional measures.

Table 6.4 Event and Action Plan for Water Quality

Event	ET Leader	IEC	ER	Contractor
Action level being exceeded by one sampling day	• Repeat *in-situ* measurement to confirm findings; • Identify source(s) of impact; • Inform IEC and Contractor; • Check monitoring data, all plant, equipment and Contractor's working methods; • Discuss mitigation measures with IEC and Contractor; • Repeat measurement on next day of exceedance.	• Discuss with ET and Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC on the proposed mitigation measures; • Make agreement on the mitigation measures to be implemented;	• Inform the ER and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; • Consider changes of working methods; • Discuss with ET and IEC and propose mitigation measures to IEC and ER; • Implement the agreed mitigation measures.
Action level being exceeded by more than one consecutive sampling days	• Repeat *in-situ* measurement to confirm findings; • Identify source(s) of impact; • Inform IEC and Contractor; • Check monitoring data, all plant, equipment and Contractor's working methods; • Discuss mitigation measures with IEC and Contractor; • Ensure mitigation measures are implemented; • Prepare to increase the monitoring frequency to daily; • Repeat measurement on next day of exceedance.	• Discuss with ET and Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC on the proposed mitigation measures; • Make agreement on the mitigation measures to be implemented; • Assess the effectiveness of the implemented mitigation measures.	• Inform the Engineer and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; • Consider changes of working methods; • Discuss with ET and IEC and propose mitigation measures to IEC and ER within 3 working days; • Implement the agreed mitigation measures.

Event	ET Leader	IEC	ER	Contractor
Limit level being exceeded by one sampling day	• Repeat *in-situ* measurement to confirm findings; • Identify source(s) of impact; • Inform IEC, contractor and EPD; • Check monitoring data, all plant, equipment and Contractor's working methods; • Discuss mitigation measures with IEC, ER and Contractor; • Ensure mitigation measures are implemented; • Increase the monitoring frequency to daily until no exceedance of Limit level.	• Discuss with ET and Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC, ET and Contractor on the proposed mitigation measures; • Request Contractor to critically review the working methods; • Make agreement on the mitigation measures to be implemented; • Assess the effectiveness of the implemented mitigation measures.	• Inform the Engineer and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; • Consider changes of working methods; • Discuss with ET , IEC and ER and propose mitigation measures to IEC and ER within 3 working days; • Implement the agreed mitigation measures.
Limit level being exceeded by more than one consecutive sampling days	• Repeat *in-situ* measurement to confirm findings; • Identify source(s) of impact; • Inform IEC, contractor and EPD; • Check monitoring data, all plant, equipment and Contractor's working methods; • Discuss mitigation measures with IEC, ER and Contractor; • Ensure mitigation measures are implemented; • Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	• Discuss with ET and Contractor on the mitigation measures; • Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly; • Assess the effectiveness of the implemented mitigation measures.	• Discuss with IEC, ET and Contractor on the proposed mitigation measures; • Request Contractor to critically review the working methods; • Make agreement on the mitigation measures to be implemented; • Assess the effectiveness of the implemented mitigation measures; • Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of Limit level.	• Inform the ER and confirm notification of the non-compliance in writing; • Rectify unacceptable practice; • Check all plant and equipment; • Consider changes of working methods; • Discuss with ET , IEC and ER and propose mitigation measures to IEC and ER within 3 working days; • Implement the agreed mitigation measures; • As directed by the Engineer, to slow down or to stop all or part of the marine work or construction activities.

7 SEWERAGE AND SEWAGE TREATMENT IMPLICATIONS

7.1 Introduction

7.1.1 An assessment of potential impacts due to the sewage arising from the proposed Project has been assessed in Chapter 6 of the EIA Report.

7.2 Sewerage and Sewage Treatment Implications during Construction Phase

7.2.1 The sewage generated during the construction stage from the on-site workforce 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.

7.3 Mitigation Measures

7.3.1 The implementation schedule of the relevant construction-related mitigation measures is presented in **Appendix 2.2**.

7.4 Sewerage and Sewage Treatment Implications during Operational Phase

7.4.1 The different design / mitigation measures to minimise the emergency discharges will be thoroughly considered and assessed under the separate Schedule 2 EIA study for the new HSK STW.

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8 WASTE MANAGEMENT IMPLICATIONS

8.1 Introduction

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

8.2 Mitigation Measures

8.2.1 All the proposed mitigation measures are stipulated in the EIA Report and summarised in the **Appendix 2.2**.

8.2.2 The types and quantities of waste that would be generated during the construction phase have been assessed. EM&A requirements are required for waste management during the construction phase 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.

8.2.3 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 operational phase. Recommendations have been made to ensure proper treatment and proper disposal of these wastes in the EIA Report and summarised in **Appendix 2.2**.

8.2.4 According to **Section 7.2.8 in the EIA Report**, a Construction and Demolition Material Management Plan (C&DMMP) was submitted to the Public Fill Committee (PFC) for approval in accordance with Section 4.1.3 of the Project Administrative Handbook for Civil Engineering Works (2014 Edition) published by CEDD.

8.2.5 According to **Section 7.2.9 in the EIA Report**, 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 PIS should be adopted.

8.3 EM&A Requirements

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

- Waste Collection Licence and Waste Disposal Licence under the Waste Disposal Ordinance (Cap. 354);
- Application for Registration under Section 7(5) of the Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C);

- Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap. 28);
- Effluent Discharge Licence under the Water Pollution Control Ordinance (Cap. 358); and
- Approval of Construction & Demolition Material Management Plan (C&DMMP).

8.3.2 The Contractor should refer to the relevant information and guidelines issued by the DEP when applying for the licence / permit and the ET should refer to these booklets for auditing purposes.

8.3.3 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.

9 LAND CONTAMINATION IMPACT

9.1.1 The land contamination assessment examined the potential contaminative land use within the assessment area and their potential impacts to future land use. The majority of the potentially contaminated sites could not be accessed to assess the site conditions by site walkover, at the time of reporting. For those sites that were accessible for site walkover, permission could not be obtained from the site operators to carry out the site investigation (SI) works.

9.1.2 As the identified potentially contaminated sites are still in operation and the development will only commence in stages from 2019 to 2037/38, and there may be change in land use prior to development within both the potentially contaminated and non-contaminated sites, it is recommended to conduct further works. This would include site re-appraisal, SI works as well as submission of supplementary Contamination Assessment Plan(s) (CAP(s)), Contamination Assessment Report(s) (CAR(s)) and Remediation Action Plan(s) (RAP(s)) for the Environmental Protection Department's (EPD) approval after the sites are handed over to Project Proponent for development. If contaminated soil and/or groundwater were identified, remediation should be carried out according to EPD's approved RAP(s) and Remediation Report(s) (RR(s)) which should be submitted to EPD for agreement after completion of the remediation works. No development works shall be commenced prior to EPD's agreement of the RR(s).

Construction Phase

9.1.3 Remediation works, if necessary, would be carried out based on the abovementioned future works during construction phase but prior to commencement of any other construction works. Mitigation measures as recommended in the future EPD's approved RAP(s) should be implemented during the remediation works. The EM&A requirements should be carried out in the form of regular site inspection to ensure the recommended mitigation measures are properly implemented and findings of the audit should be reported in the EM&A reports.

Operation Phase

9.1.4 As any contaminated soil / groundwater would be identified and properly treated prior to the re-development, land contamination during the operation phase is not expected. As such, EM&A during operation phase for land contamination is considered not necessary.

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10 ECOLOGICAL IMPACT

10.1 Introduction

10.1.1 The ecological impact assessment in the EIA Report has evaluated the potential ecological impacts arise from the proposed development area. All sites of conservation importance are either located outside the proposed development area or retained *in situ* under the "Green Belt" ("GB") zoning, except a small strip of "CA" comprising of 0.1 ha would be affected under the construction of slip road under DP12. Given this affected area was small and developed with no species of conservation importance recorded, the impact was negligible.

10.1.2 Mitigation measures have been proposed in the EIA to reduce the potential ecological impacts to acceptable level. Major mitigation measures were listed in the following section.

10.2 Mitigation Measures

Design Phase

10.2.1 The alignment of the two proposed slip roads from the existing KSWH connecting to the Road D3 had been adjusted to avoid loss of semi-natural/natural habitats comprising the CA and the four DBL project mitigation ponds.

10.2.2 San Sang San Tsuen egretry would be retained under the "GB" zoning (Site 3-38) and a wide "Local Open Space" ("LO") corridor at Site 3-37 to maintain the flight lines.

10.2.3 One individual of Incense Tree (*Aquilaria sinensis*) in Tung Tau Tsuen woodland would be directly impacted. Therefore it is suggested to preserve the Tung Tau Tsuen woodland *in situ* together with the Incense Tree.

Construction Phase

10.2.4 While San Sang San Tsuen egretry would be retained under the "GB" zoning (Site 3-38), construction activities adjacent to the egretry would create disturbance impact. The impact would be mitigated by (1) scheduling the site formation and construction works at Sites 3-32, 3-33, 3-37, 3-39 and 3-40 outside the breeding season of the ardeids (i.e. between March and August)

10.2.5 Due to the close distance, installation of hoarding or screening at the "I" zone and slip road would minimise disturbance impact to the "CA" at northwest of San Sang San Tsuen during the construction phase.

10.2.6 Provision of screening (e.g. hoarding) around the "GB" zoning, Site 3-2, should be provided to minimise disturbance (e.g. visual, noise, human activity) to Crested Serpent Eagle and its habitat during construction phase.

10.2.7 The revitalisation of the riverside channels at TSW Main Channel should not result in disturbance impacts to the habitats/fauna utilising the channels (e.g. foraging avifauna). In addition, the construction method and sequence of the proposed pier in the watercourses should be carefully designed so that all the construction works including any pilling and excavation would be undertaken within a dry zone and physically separated from the watercourse downstream.

10.2.8 To avoid potential injury to bat species, if any evidence of roosting bats is found in any buildings or trees that would be cleared during the construction phase, an ecologist with relevant experience should be consulted and involved to develop appropriate mitigation strategies.

10.2.9 During the demolition of the existing watercourses, the works should be undertaken in dry conditions and dry season. Also, the flow diversion works should be conducted in dry season, where possible, when the flow in the watercourse is low.

10.2.10 To minimise construction disturbance, i.e. noise and site run-off, to the DBL project mitigation ponds, provision of hoarding for proper delineation of works boundary is recommended before the commencement of the works. With implementation of proper mitigation measures stated in **Section 9.7 in the EIA Report**, the construction disturbance would be minimised.

10.2.11 In general, air and noise quality impacts to the surrounding habitats and associated wildlife arising from the construction activities could be minimised by adopting the measures as stated in **Sections 9.7.14 – 9.7.15 in EIA Report**.

10.2.12 Through night-time lighting control during construction phase, glare disturbance to wildlife would be minimised.

10.2.13 As stated in the Water Quality Impact Assessment in the EIA Report, the recommended mitigation measures included adequate storm drainage system and SPS, blue-green infrastructure, and best storm water management practices and storm water pollution control plan.

10.2.14 Good site practices as stated in **Section 9.7.18** should be adopted to avoid any pollution entering any nearby watercourses. Practices to minimise surface run-off and to reduce suspended solid levels should be undertaken during the construction phase.

10.2.15 Impermeable sheet pile cofferdam walls and silt removal facilities should be used before discharging the effluent to the watercourses. Silt curtains should also be deployed around the construction works area inside the watercourses, where practicable, to minimise the water quality impacts.

Operational Phase

10.2.16 Any temporary vegetation loss within the project boundary would be replaced by new or restored back to native shrub and woodland plantings in areas of open space.

10.2.17 The provision of screening planting at the boundary of the “Other Specified Use” sites adjacent to the Site 3-2 (i.e. Site 3-1, 3-5, 3-6, 3-7 and 3-8) will help to minimise disturbance impacts during the operational phase. Moreover, buffer planting at the boundaries of Sites 3-32, 3-33, 3-37, 3-39 and 3-40 can minimise the impact.

10.2.18 Due to the close distance, provision of buffer/screen planting at the “I” zone, slip road and "OU" sites adjacent to Site 3-2 would minimise disturbance impact to the “CA” at northwest of San Sang San Tsuen and Site 3-2 during the operational phase.

10.2.19 Buffer planting would be provided to shield vegetated area from the surrounding developed zones. Moreover, minimising the lighting along river channel and vegetated areas or incorporate wildlife-friendly lighting to avoid light spill is recommended.

10.2.20 The existing tree belt (including some tall trees) on the eastern side of the larger pond would be retained. The proposed amenity strip and additional tree planting along the new Road P1 would provide screening for the existing ponds. Other screening measures (e.g. vertical greening walls, green roof and noise barriers) are recommended to be incorporated at the buildings and roads.

10.2.21 The road networks and associated noise barriers may result in bird collision and mortality. Mitigation measures such as use of tinted materials and superimposing dark patterns or strips on the barrier, as per EPD/Highways Department requirements stated in "Guidelines on Design of Design of Noise Barriers" (2003), would be employed.

10.2.22 A Contingency Plan should be developed to minimise the potential impact of sewage discharge to Deep Bay WCZ in the event of failure of the treatment facilities (e.g. new HSK STW) during operational phase. To minimise the chance of emergency sewage discharge, standby pump would be provided to cater for emergency breakdown or maintenance of the duty pump. Backup power supply in the form of dual / ring circuit power supply or generator would be provided to secure electrical power supply.

10.3 Monitoring and Audit Requirement

Audit Requirement

10.3.1 Site audits should be undertaken monthly during the construction phase of the Project to check the proper implementation and maintenance of recommended mitigation measures.

10.3.2 Site hoardings and fences will be checked regularly by the ET. Damage sighted should be reported to the site manager and damaged site hoarding/fence should be repaired by the Contractor as soon as possible.

10.3.3 Site inspection should be carried out to ensure the site formation and construction works in Sites 3-32, 3-33, 3-37, 3-39 and 3-40 are not undertaken during the breeding season of ardeids (i.e. March – August). Site inspection should be undertaken by the ET regularly to check the implementation of standard good site practices.

Monitoring Requirement

10.3.4 A monitoring programme covering construction phase for monitoring the condition and integrity of the San Sang San Tsuen egretry and use of the site by ardeids and any other species of conservation significance should be specified during the detailed design stage of the development. No site formation and construction works would be done in Sites 3-32, 3-33, 3-37, 3-39 and 3-40 during the breeding season of ardeids (i.e. March to August).

10.3.5 During the construction phase, the San Sang San Tsuen egretry would be monitored monthly in the ardeid breeding season i.e. from March to August by qualified ecologists with at least 10 years relevant local experience to confirm if it is active during the breeding season and if the egretry is significantly disturbed (e.g. physical damage of nesting vegetation or pollution of any kind) by other construction activities out of the aforementioned Sites.

10.3.6 The Incense Tree individual is recommended to be preserved *in situ* together with Tung Tau Tsuen woodland, thus site audit should be done to ensure that the construction work does not encroach into the woodland.

10.3.7 The construction programme of the four (foot and cycle) bridges would be phased to create disturbance-free region on TSW Main Channel during the construction phase. Construction method and sequence would also be carefully designed to minimise potential disturbance impact including water quality, noise and dust to the channel. Regular site audit would be done to guarantee that the mitigation measures would be implemented correctly.

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11 FISHERIES IMPACT

11.1.1 Based on the findings from the Fisheries Impact Assessment in the EIA Report, no unacceptable fisheries impacts are expected from the Project. No specific monitoring programme for fisheries resources is required.

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12 LANDSCAPE AND VISUAL IMPACT

12.1 Introduction

12.1.1 The EIA has recommended landscape and visual mitigation measures to be undertaken during both the construction and operational phases of the Project. The design, implementation and maintenance of landscape and visual mitigation measures should be checked to ensure that they are fully realised and that any potential conflicts between the proposed landscape measure and any other works of the Project would be resolved as early as practical without affecting the implementation of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the site audit programme.

12.2 Mitigation Measures

12.2.1 The proposed mitigation measures for the landscape and visual impacts are summarised below as well as in the PIS in **Appendix 2.2**. The landscape and visual mitigation measures proposed should be incorporated in the detailed landscape and engineering design. The construction phase mitigation measures should be implemented as early as possible during construction and should be in place throughout the entire construction period. Mitigation measures for the operational phase should be implemented during the detailed design and be built as part of the construction works so that they are in place on commissioning of the Project (**Table 12.1**).

Table 12.1 Proposed Landscape and Visual Mitigation Measures

ID No.	Landscape and Visual Mitigation Measures	Mitigate Landscape Impacts	Mitigate Visual Impacts
Construction Phase			
CM1	Minimised construction area and contractor's temporary works areas The construction area and contractor's temporary works areas should be minimised. General Good Practice Measures - For areas unavoidably disturbed by the Project on a short term basis e.g. works areas, the general principle to try and restore these to their former state to suit future land use, should be adhered to.	X	X
CM2	Stripping and storing of topsoil Topsoil, where identified, should be stripped and stored for re-use in the construction of the soft landscape works, where practical. The Contract Specification shall include storage and reuse of topsoil as appropriate. On potentially contaminated sites (as per Chapter 8) where investigation results indicate soil contamination is present, the use of contaminated soils for planting is to be avoided where appropriate.	X	
CM3	Protection of existing trees Tree Protection & Preservation – Exiting trees to be retained within the Project Site should be carefully protected during construction. Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees prior to undertaking any works adjacent to all retained trees, including trees in Contractor's works areas. A detailed tree survey will be carried out for the Tree Removal Application (TRA) process which will be carried out at the later detailed design stage of the Project. The detailed tree survey will propose which trees should be retained, transplanted or felled and will include details of tree protection measures for those trees to be retained.	X	X

ID No.	Landscape and Visual Mitigation Measures	Mitigate Landscape Impacts	Mitigate Visual Impacts
CM4	Transplantation of existing trees where practical Trees unavoidably affected by the Project works should be transplanted where practical. Trees should be transplanted straight to their final receptor site and not held in a temporary nursery as far as possible. A detailed Tree Transplanting Specification shall be provided in the Contract Specification, where applicable. Sufficient time for necessary tree root and crown preparation periods shall be allowed in the project programme. A detailed transplanting proposal will be submitted to relevant government departments for approval in accordance with DEVB TCW 06/2015 and 07/2015 and final locations of transplanted trees should be agreed prior to commencement of the work. For trees associated with highways e.g. roadside planting along highways, that are unavoidably affected and should be transplanted, HyD HQ/GN/13 'Interim Guidelines for Tree Transplanting Works under Highways Department's Vegetation Maintenance Ambit' should be referred to.	X	X
CM5	Control of night-time lighting Control of night-time lighting and glare by hooding all lights. Construction day and night time lighting should be controlled to minimise glare impact to adjacent VSRs during the Construction phase.		X
CM6	Construction of decorative hoarding around construction works Erection of decorative mesh screens or construction hoardings around works areas in visually unobtrusive colours. Screen hoarding shall be erected along areas of the construction works site boundary where the works site borders publically accessible routes and/or is close to visually sensitive receivers (VSRs). It is proposed that the screening be compatible with the surrounding environment and where possible, non-reflective, recessive colours be used.		X
CM7	Reduction of construction period to practical minimum Options to reduce the construction period to practical minimum to be provided.		X
CM8	Prevention of run-off Limitation of / Ensuring no run-off into surrounding landscape and prohibit run-off from entering adjacent water bodies and waterways.	X	
CM9	Phasing of construction stage Phasing of the construction stage to reduce visual impacts.		X
CM10	Advance screen planting Advance screen planting of fast growing tree and shrub species to noise barriers and hoardings. Trees shall be capable of reaching a height >10m within 10 years.	X	X
CM11	Minimise disturbance footprints To minimise landscape and visual impacts, the footprint and elevation of such elements should be optimised to reduce topographical/ landform changes, as well as reduce land take and interference with natural terrain. Where there is a need to significantly cut into the existing landform, retaining walls should be considered as well as cut slopes, to minimise landform changes and land resumption, while also considering visual amenity. Earthworks and engineered slopes should be designed to be a visually interesting landform, compatible with the surrounding landscape and to mimic the natural contouring and terrain e.g. introduction and continuation of natural features such as spurs and ridges where appropriate, to support assimilation with the hillside setting.	X	

ID No.	Landscape and Visual Mitigation Measures	Mitigate Landscape Impacts	Mitigate Visual Impacts
CM12	Protection of existing watercourses For all the natural rivers and streams inside the development area, consideration of protection measures should be made to minimise any impacts from the construction works. Avoid affecting Watercourses – In the detailed design, consideration should be made of watercourses, to minimise any impacts e.g. at new bridge crossings, viaducts, road alignment etc. Guidelines stated should be followed. Bridges and box culverts should also be used to minimise the necessity of watercourse modification and protect the watercourses where necessary.	X	
CM13	Hydroseeding on modified slopes Hydroseeding of modified slopes should be done as soon as grading works are completed to prevent erosion and subsequent loss of landscape resources and character. Woodland tree seedlings and/ or shrubs should be planted where slope gradient and site conditions allow. In addition, landscape planting should be provided for the retaining structures associated with modified slopes where conditions allow. All slope landscaping works should comply with GEO Publication No. 1/2011- Technical Guidelines on Landscape Treatment for Slopes.	X	X
CM14	Integrate Open Space Network with existing nullah conditions For watercourses affected during construction, measures should be sought to minimise the impact with respect to the existing nullah conditions, existing shrubs and trees along the banks. Where natural streams are unavoidably affected along some of their length, they can be diverted to avoid the proposed new developments and retain the integrity of the whole stream. Detailed design of any stream diversion should follow the Guidelines in ETWB Technical Circular (Works) No. 5/2005 (Protection of natural streams/rivers from adverse impacts arising from construction works) and appropriate construction methods should be used.	X	X
Operation Phase			
OM1	Compensatory tree planting where practical Compensatory Planting – Compensatory tree planting for felled trees shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Removal Application process under ETWBTC 7/2015. Compensatory planting is proposed at the potential open areas such as open spaces, amenity areas, open areas of the streetscapes, as well as the open areas within development lots.	X	X
OM2	Sensitive design of above-ground structures All above-ground structures, including SPS, Electrical Sub-Stations, EFLS Stations, Emergency and Firemens' Accesses, etc. shall be sensitively designed in a manner that responds to the existing and planned urban context. The footprint and massing of development components and the works area should also be kept to a practical minimum and the detailed design of development components for Construction phase should follow the Sustainable Building Design Guidelines. The form, textures, finishes and colours of the proposed development components should aim to be compatible with the existing surroundings. To improve visual amenity designs should be aesthetically pleasing and treatment of structures also improve visual amenity.	X	X
OM3	Sensitive design of hardscape elements along roadsides Streetscape elements along new and existing roads (e.g. paving, signage, street furniture, lighting etc.) shall be sensitively designed in a manner that responds to the existing and planned urban context.	X	X
OM4	Reinstatement of streetscape elements All streetscape areas and hard and soft landscape areas disturbed during construction shall be reinstated to equal or better quality, to the satisfaction of the relevant Government departments.	X	X

ID No.	Landscape and Visual Mitigation Measures	Mitigate Landscape Impacts	Mitigate Visual Impacts
OM5	Visual softening via soft landscape elements Attractive soft landscape in areas adjoining SPS, Electrical Sub-Stations, EFTS Stations, Emergency and Firemen's' Accesses, etc. (taking into account the necessary setbacks) so as to provide a visual softening and greening effect (e.g. provision of tree / shrub / climber planting).		X
OM6	Quality greening along roadside amenity strips Shade trees, ornamental tree / shrub / climber planting should be provided along roadside amenity strips to enhance the townscape quality. Provision of utility free planting strips for quality planting shall be adopted according to DEVB TCW 2/2012.	X	X
OM7	Design of street lighting Appropriate design of street lighting to avoid glare and light pollution to surrounding areas.		X
OM8	Sensitive and chromatic treatment of architectural facades Elegant architectural and engineering design, sensitive architectural and chromatic treatment for building facades. The form, textures, finishes and colours of the proposed development components should aim to be compatible with the existing surroundings. To improve visual amenity designs should be aesthetically pleasing and treatment of structures also improve visual amenity. For example, natural building materials such as stone and timber, should be considered for architectural features, and light earthy tone colours such as shades of green, shades of grey, shades of brown and off-white should also be considered to reduce the visibility of the development components.		X
OM9	Sensitive design of vertical landscape areas Elegant, sensitive design and generous planting of the associated landscape areas. Open Space Provision - the principles adopted in the RODP planning ensure that public open space systems are incorporated. All requirements for open space areas stipulated in the planning documents for the formulation of the Preliminary Layout Plan should be adhered to.	X	X
OM10	Sensitive design of noise barriers and enclosures The visual impact of noise barriers & enclosures will be mitigated by appropriate detailed design, including suitable combination of transparent and sound absorbent materials, appropriate colour selection of panels and supporting structures, or provision of at-grade planting of trees, shrubs and/or climbers camouflage to the barriers, as well as design of supporting structures to incorporate a high level of quality and aesthetics. A combination of transparent panels at top and solid panels at bottom would lighten the visual impact, and at the same time maintain the attractiveness by using colourful panels.		X
OM11	Tree planting at site boundaries Tree planting screens along appropriate site boundaries	X	X
OM12	Night time lighting Control of lighting glare. A balance between lighting for safety, and avoiding excessive lighting can be achieved through consideration of the following: the type of lamp (light source) used; use of directional lighting to avoid light spill into sensitive areas; height of the lighting column can affect the amount/extent of glare; and control/timing of lighting periods of some facilities, particularly those close to sites of conservation importance.		X
OM13	Green roofs and vertical greening Green roofs and vertical greening provision of green roofs and vertical greening where feasible and appropriate to mitigate visual impacts of buildings and structures	X	X
OM14	Greening of viaduct structures and noise barriers Aesthetic improvement of viaduct structures and noise barriers through greening of structure where feasible and appropriate to mitigate visual impact of viaduct and noise barrier form	X	X

12.3 Baseline Monitoring

12.3.1 The landscape and visual baseline will be determined with reference to the landscape resource maps included in the EIA Report, a detailed tree survey to be completed before the works can commence, as well as field surveys of existing conditions, detailed topographic surveys, and site visits.

12.4 Audit Requirement

12.4.1 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, by a Registered Landscape Architect (RLA). Particularly audits should be carried out during site clearance when 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 (however an extended establishment period and audit mechanism shall be considered where the transplanting of important trees are involved) 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 and reported to the ER.
- 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 in accordance with contract specification.
- The newly planted trees, shrubs and grassed areas are maintained throughout the establishment period, particularly in respect of the following:
    - regular watering, weeding and fertilising of all planting and grass reinstatement;
    - regular grass cutting for reinstated areas;
    - re-staking of plants before typhoon and rainy season;
    - regular checks for and eradication of pests, fungal infection etc.;

- pruning of dead or broken branches; and
- prompt replacement of dead plants and re-grassing of failed areas.

12.4.2 Operational phase auditing will be restricted to the 12-months establishment works of the landscaping 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.

12.4.3 The monitoring programme at different stages is shown in **Table 12.2**.

Table 12.2 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.	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 contractor's operations during the construction period.	Report on Contractor's compliance by ET	Countersignature of report by IEC	Monthly
Establishment Works	Monitoring of the planting works during the 12-months Establishment Period after completion of the construction works. Auditing period for transplanted Important Trees may lengthen.	Report on Contractor's compliance by ET	Countersignature of report by IEC	Bi-monthly
	Monitoring of important trees during the 24-month Establishment Period after completion of the construction works.	Report on Contractor's compliance by ET	Counter signature of report by IEC	Monthly

ET – Environmental Team, IEC – Independent Environmental Consultant, EP – Environmental Permit

12.5 Event and Action Plan

12.5.1 In the event of non-compliance, the responsibilities of the relevant parties are detailed in the Event/Action plan provided in **Table 12.3.**

Table 12.3 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.	-
Nonconformity 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 inspection 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 nonconformity 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 nonconformity 2. Amend working methods agreed with ER as appropriate 3. Rectify damage and undertake any necessary replacement
Repeated Nonconformity	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 6. If nonconformity stops, cease additional monitoring	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 nonconformity 2. Amend working methods agreed with ER as appropriate 3. Rectify damage and undertake any necessary replacement. Stop relevant portion of works as determined by ER until the nonconformity is abated.

ET – Environmental Team, IEC – Independent Environmental Consultant, EP – Environmental Permit

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13 IMPACT ON CULTURAL HERITAGE

13.1 Mitigation Measures

13.1.1 Based on desktop review and through Archaeological Field Survey (AFS) conducted in 2015, a total of six Sites of Archaeological Interest (SAIs) and four Archaeological Potential Areas (APAs) were identified within the assessment area. The six SAIs contained high archaeological significance. Tseung Kong Wai SAI (F1) and Tung Tau Tsuen SAI (F2) might be partially impacted by construction works, but no insurmountable impact is anticipated. The archaeological impact arising from the construction works should be assessed when the detailed design of the works is available. Preservation *in situ* is the top priority to safeguard the archaeological remains in the impacted area by amending the layout plans of the construction works. However, if the works cannot avoid disturbance to the archaeological deposit, depending on degree of direct impact, the following mitigation measures should be considered, such as archaeological surveys, archaeological watching brief, preservation by record and relocation of archaeological remains. The scope and programme of the archaeological fieldwork would be agreed with AMO.

13.1.2 Further archaeological survey is required to be conducted at APA 1 and APA 2 to ascertain the extent of any archaeological remains within the APAs if any construction works will be carried out. Based on the findings of the survey, mitigation measures could be proposed, such as preservation in situ, preservation by record, or relocation of archaeological remains, in prior agreement with the AMO. Direct impact arising from the proposed development within APA 3 should be avoided as far as possible (**Table 13.1**).

13.1.3 A total number of 21 traditional villages with archaeological potential were identified. As no development is proposed in the “V” zone, no impact is anticipated and hence no mitigation measure is required.

13.1.4 The two Declared Monuments, seven Graded Historic Buildings and 327 nil grade resources that are outside Yick Yuen Tsuen, Tin Sam San Tsuen and South of Tin Sam are to be preserved in totality on the ”V” land use, which is a beneficial impact.

13.1.5 Twelve nil grade built heritage in Yick Yuen Tsuen, Tin Sam San Tsuen and south of Tin Sam are to be directly impacted during the construction phase by site formation works. In the light of their removal is unavoidable, preservation by record (including cartographic and photographic record) prior to any construction works would be required for the directly impacted built heritage. As these nil grade resources contained no cultural heritage significance, the impact to cultural heritage caused by the proposed development to them is unavoidable yet acceptable with mitigation measures (**Table 13.2**).

Table 13.1 Mitigation Measures for Archaeological Resources

Archaeological Resource	Site / Areas	Previous Key Archaeological Findings	Preservation and Significance	Potential Impact by the Project (Revised RODP)	Mitigation Measures
Site of Archaeological Interest (SAI)/ Archaeological Potential Area (APA)/ Traditional Villages with Archaeological Potential	F1 – Tseung Kong Wai SAI	Remains from Neolithic, Ming and Qing	No apparent removal of the original deposits. High significance as archaeological deposit is known from previous surveys.	The scheduled land uses of the area include roads (Road D5 of Designated Project No. 2), "LO" (3-22), "OU(LF)" (3-20) and "GB" (3-23). There might be some destruction to the archaeological deposits by the road, "LO" and "OU" land use development.	No works that involve excavation or soil transportation is carried out in "GB", hence no mitigation measure is required. For the rest of the site falls within the road, "LO" and "OU" land use development, the archaeological impact arising from the proposed development should be assessed when the detailed design of the development is available. Preservation *in situ* is the top priority to safeguard the archaeological remains in the impacted area by amending the layout plans of the construction works. However, if the works cannot avoid disturbance to the archaeological deposit, depending on the degree of direct impact, the following mitigation measures should be considered, such as archaeological survey, archaeological watching brief, preservation by records and relocation of archaeological remains. The scope and programme of the archaeological fieldwork would be agreed with AMO.
	F2 – Tung Tau Tsuen SAI	Stone adze (Neolithic) Stone pavement and brick wall remains with celadon wares (Song) at Tung Tau Tsuen Celadon from Song to Ming	No apparent removal of the original deposits. High significance as archaeological deposit is known from previous surveys.	North half of the site falls within "DO" (2-32) and south half of the site falls within "V".	As long as no development is carried out in "V" area, no mitigation measure is required. For the northern half of the site falls within the "DO", the archaeological impact arising from the proposed development should be assessed when the detailed design of the development is available. Preservation *in situ* is the top priority to safeguard the archaeological remains in the impacted area by amending the layout plans of the construction works. However, if the works cannot avoid disturbance to the archaeological deposit, depending on the degree of direct impact, the following mitigation measures should be considered, such as archaeological survey, archaeological watching brief, preservation by

Archaeological Resource	Site / Areas	Previous Key Archaeological Findings	Preservation and Significance	Potential Impact by the Project (Revised RODP)	Mitigation Measures
					records and relocation of archaeological remains. The scope and programme of the archaeological fieldwork would be agreed with AMO.
	F3 – Hang Hau Tsuen SAI	Geometric patterned pottery (Bronze Age) Celadon (Song) Blue and White porcelain (Ming)	Some apparent modification to the local soil. High significance as archaeological deposit is known from previous surveys.	The scheduled land uses of the area include "LO" (2-5) and "E" (2-16). Refer to the AFS (**Appendix 12.2** refers), no archaeological impact is anticipated on Hang Hau Tsuen SAI within the Revised RODP.	No archaeological impact is anticipated and no mitigation measure is required.
	F4 – Sha Kong Miu (North) SAI	Hard geometric pattern pottery and coarse pottery (Bronze Age)	No apparent removal to the original deposits. High significance as archaeological deposit is known from previous surveys.	The scheduled land uses of the area include "G" (2-20). Refer to the AFS (**Appendix 12.2** refers), no archaeological impact is anticipated on Sha Kong Miu (North) SAI within the Revised RODP.	No archaeological impact is anticipated and no mitigation measure is required.

Archaeological Resource	Site / Areas	Previous Key Archaeological Findings	Preservation and Significance	Potential Impact by the Project (Revised RODP)	Mitigation Measures
Site of Archaeological Interest (SAI)/ Archaeological Potential Area (APA)/ Traditional Villages with Archaeological Potential	F5 – Ngau Hom Shek SAI	Double-F pottery (Bronze Age) Celadon (Song) Remains from Ming	The beach site has been mostly destroyed. High significance as archaeological deposit is known from previous surveys.	The scheduled land uses of the area include "GB" (3-2). Refer to the AFS (**Appendix 12.2** refers), no archaeological impact is anticipated on Ngau Hom Shek SAI within the Revised RODP.	No impact is anticipated as no development is proposed according to the Revised RODP.
	F6 – Fu Tei Au SAI	Stone tools and ceramics, postholes, house floors, ditches and burials of Late Neolithic and Bronze Age	High significance as archaeological deposit is known from previous surveys.	The SAI is located within the assessment area but excluded in the Revised RODP.	No impact is anticipated as no development is proposed according to the Revised RODP.
	F7 – Tsing Chuen Wai SAI	Tile sherds, celadon and white-glazed stoneware of Song dynasty	High significance as archaeological deposit is known from previous surveys.	The SAI is located outside the assessment area and is excluded in the Revised RODP	No impact is anticipated as no development is proposed according to the Revised RODP.
	APA 1 – Lau Fau Shan	Unknown	Uncertain Significance	The scheduled land uses of the area include "C" (2-1), "R3" (2-2 and 2-3), "OU" (2-35) and the local road from a	If construction works are carried out inside the APA, various mitigation measures would be proposed to verify the archaeological significance when land access is assumed, including but not limited to: • Conduct an archaeological survey to find out the extent and condition of archaeological deposits (if any), and amend the layout

Archaeological Resource	Site / Areas	Previous Key Archaeological Findings	Preservation and Significance	Potential Impact by the Project (Revised RODP)	Mitigation Measures
				section of the proposed road D1. There might be some destruction to the archaeological deposits by the "C", "OU" and "R" land use development.	plans to avoid further disturbance to significant archaeological materials; • preservation by records if the works cannot avoid the removal of the archaeological deposits after survey; or • relocation of archaeological remains. Scope of the Archaeological Survey would be agreed with the AMO.
	APA 2 – Kiu Tau Wai	Unknown	Uncertain Significance	The scheduled land uses of the area includes "GB" (5-10), "OU" (5-8) and "LO" (5-11). There might be some destruction to the archaeological deposits by the "OU" and "LO" land use development.	As long as no works that involves excavation or soil transportation is carried out in "GB", no mitigation measure is required. If construction works are carried out inside the APA, various mitigation measures would be proposed to verify the archaeological significance when land access is assumed, including but not limited to: • Conduct an archaeological survey to find out the extent and condition of archaeological deposits (if any), and amend the layout plans to avoid further disturbance to significant archaeological materials; • preservation by records if the works cannot avoid the removal of the archaeological deposits after survey; or • relocation of archaeological remains. Scope of the Archaeological Survey would be agreed with the AMO.

Archaeological Resource	Site / Areas	Previous Key Archaeological Findings	Preservation and Significance	Potential Impact by the Project (Revised RODP)	Mitigation Measures
Site of Archaeological Interest (SAI)/ Archaeological Potential Area (APA)/ Traditional Villages with Archaeological Potential	APA 3 – Hung Uk Tsuen (North)	Unknown	Uncertain Significance	The scheduled land uses of the area includes "GB" (5-12) and "A".	Direct impact arising from the proposed development to the small portion of the APA3 should be avoided as far as possible. If direct impact is unavoidable, AMO's comment on the proposed development works should be sought at the detailed design stage.
	APA 4 – Hung Uk Tsuen (South)	Unknown	Uncertain Significance	The scheduled land uses of the area includes "GB" (5-15) and "V".	As long as no works that involves excavation or soil transportation is carried out in "GB", no mitigation measure is required. Also, as no development is proposed in the "V" zones, no impact is anticipated and hence no mitigation measure is required.
Site of Archaeological Interest (SAI)/ Archaeological Potential Area (APA)/ Traditional Villages with Archaeological Potential	21 Traditional Villages	Unknown	Uncertain Significance	No development is proposed in the "V" zone.	As no development is proposed in the "V" zones, no impact is anticipated a hence no mitigation measure is required.

Table 13.2 Mitigation Measures for Built Heritage Resources

Areas	Figure Number	Existing Built Heritage	Proposed Land Use on Revised RODP	Potential Impact	Mitigation Measures
Sun Fung Wai	Figure 12.V1	12 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Chung Uk Tsuen	Figure 12.V2	25 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Kau Lee Uk Tsuen	Figure 12.V3	2 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
San Sang Tsuen	Figure 12.V4	27 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
San Lee Uk Tsuen	Figure 12.V5	3 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Tin Sam	Figure 12.V6.1 Figure 12.V6.2	1 Grade 3 Historic Building (C4 – Shrine (Tin Sam Tsuen)); 15 Nil Grade Built Heritage	"V", "R"	No direct impact is anticipated at this stage on the graded historic building and built heritage in "Village Type Development" area. Potential adverse impacts (e.g. removal) on structure of 4 heritage resources with no grade located around Hung Leong Road.	If direct impact to the historic buildings with no grade is not avoidable, photographic and cartographic records of them must be kept before demolition.

Areas	Figure Number	Existing Built Heritage	Proposed Land Use on Revised RODP	Potential Impact	Mitigation Measures
Yick Yuen Tsuen	Figure 12.V7	3 Nil Grade Built Heritage	"E" "Government" "R"	Potential adverse impacts (e.g. removal) on structure of 3 heritage resources within the works area.	If direct impact to the historic buildings with no grade is not avoidable, photographic and cartographic records of them must be kept before demolition.
Tin Sam San Tsuen	Figure 12.V8	5 Nil Grade Built Heritage	"E" "R" "DO" "LO" "Other Specified Uses" ("OU")	Potential adverse impacts (e.g. removal) on structure of 6 heritage resources within the works area.	If direct impact to the historic buildings with no grade is not avoidable, photographic and cartographic records of them must be kept before demolition.
Ha Tsuen Shi	Figure 12.V9	1 Declared Monument (A1 – Tang Ancestral Hall (Ha Tsuen)); 2 Grade 2 Historic Building (C1 – Gate Tower (Ha Tsuen Shi) and C2 – Kwan Tai Temple (Ha Tsuen Shi)); 18 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Hong Mei Tsuen	Figure 12.V10	4 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Lo Uk Tsuen	Figure 12.V11	21 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.

Areas	Figure Number	Existing Built Heritage	Proposed Land Use on Revised RODP	Potential Impact	Mitigation Measures
San Uk Tsuen	Figure 12.V12	10 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
San Wai	Figure 12.V13	1 Grade 3 Historic Building (C3 – Shi Wang Study Hall (San Wai)); 79 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Shek Po Tsuen	Figure 12.V14	1 Grade 3 Historic Building (C5 – Entrance Gate of Shek Po Wai (Shek Po Wai)); 30 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Sik Kong Wai	Figure 12.V15	25 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Sik Kong Tsuen	Figure 12.V16	27 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Tseung Kong Wai	Figure 12.V17	7 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.

Areas	Figure Number	Existing Built Heritage	Proposed Land Use on Revised RODP	Potential Impact	Mitigation Measures
Tung Tau Tsuen	Figure 12.V18	1 Declared Monument (A2 – Yeung Hau Temple (Ha Tsuen)); 1 Grade 3 Historic Building (C6 – Old Village School (Tung Tau Tsuen)) 12 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Hung Uk Tsuen	Figure 12.V19	1 Grade 3 Historic Building (C7 – Nos 76-77 Hung Uk Tsuen (demolished)) 2 Nil Grade Built Heritage	"V"	The built heritage have been demolished. No direct impact is identified at this stage.	Mitigation measure is not required.
San Hing Tsuen	Figure 12.V20	2 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Fung Kong Tsuen	Figure 12.V21	10 Nil Grade Built Heritage	"V"	The built heritage are of considerable distance from the intrusive development. No direct impact is identified at this stage.	Mitigation measure is not required.
Historic / clan graves or burial urns	---	---	"GB"	No built heritage is identified.	Mitigation measure is not required.

14 SITE ENVIRONMENTAL AUDIT

14.1 Site Inspection

14.1.1 Site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area by providing a direct mean to trigger and enforce specified environmental protection and pollution control measures. Site inspection should be undertaken regularly during the construction phase to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented for the activities associated with the Project.

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

- Regular site inspections should 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 should not be limited to the environmental conditions and the pollution control and mitigation measures within the works area, it should also review the environmental conditions of locations that are beyond the boundary of the works area but are likely to be affected directly or indirectly by the construction site activities of the Project. During the inspection, the following information should be referred to:

- The EIA Report and EM&A recommendations on environmental protection and pollution control mitigation measures;

- Ongoing results of the EM&A programme;

- Works progress and programme;

- Individual works methodology proposals (which should include the proposal on associated pollution control measures);

- Contract specifications on environmental protection and pollution prevention control;

- Relevant environmental protection and pollution control legislations; and

- Previous site inspection results undertaken by the ET and others.

14.1.3 The Contractor should keep the ER and ET Leader updated with all relevant environmental related information on the construction contract necessary for him/her 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 should follow the procedures and time-frame stipulated in the environmental site inspection, and the deficiency and remedial action reporting system to be formulated by the ET Leader, to report any remedial measures subsequent to the site inspections.

14.1.4 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 an environmental complaint, or as part of the investigation work, as specified in the Event and Action Plan for the EM&A programme.

14.2 Compliance with Legal and Contractual Requirements

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

14.2.2 To ensure that the workers are in compliance with the contractual requirements, all method statements of works should be submitted by the Contractor to the ER for approval and to the ET Leader for vetting to determine if sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Appendix 2.2**.

14.2.3 The ER and ET Leader should 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.

14.2.4 The Contractor should provide the update of the relevant documents to the ET Leader so that works checking could be carried out effectively. The document should at least include the updated Works Progress Reports, updated Works Programme, any application letters for licences / permits under the environmental protection legislations, and copies of all valid licences / permits. The site diary should also be available for the inspection by the relevant parties.

14.2.5 After reviewing the documentation, the ET Leader should advise the Contractor of any non-compliance with contractual and 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 violation of environmental protection and pollution control requirements, the ER and ET should provide further advice to the Contractor to take remedial actions to resolve the problem.

14.2.6 Upon receipt of the advice, the Contractor should undertake immediate action to remedy the situation. The ER and ET should follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

14.3 Environmental Complaints

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

i) The Contractor to log complaint and date of receipt onto the complaint database and inform the ER, ET and IEC immediately;

ii) 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;

iii) 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;

iv) 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;

v) The ER, ET and IEC to review the effectiveness of the Contractor's remedial measures and the updated situation;

vi) The ET/Contractor to undertake additional monitoring and audit to verify the situation if necessary, and oversee that circumstances leading to the complaint do not recur;

vii) If the complaint is referred by EPD, the Contractor to prepare interim report on the status of the complaint investigation and follow-up action 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

viii) 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.

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15 REPORTING

15.1 Introduction

15.1.1 Types of reports that the ET should prepare and submit include Baseline Monitoring Report, Monthly EM&A Reports and Final EM&A Review Report. In accordance with Annex 21 of the TM-EIAO, a copy of the monthly and final review EM&A Reports should be made available to the Director of Environmental Protection.

15.1.2 Reports can be provided in an electronic medium upon agreeing the format with EPD. All the monitoring data (baseline and impact) should be submitted in electronic medium. Sample data record sheets for air quality, noise, and water are presented in **Appendices 4.1, 5.1** and **6.1**.

15.2 Baseline Monitoring Report

15.2.1 The ET should prepare and submit a Baseline Environmental Monitoring report within 10 working days after completion of the baseline monitoring works. It should be first verified by the IEC before formal submission to EPD. 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.

15.2.2 The Baseline Monitoring Report should include at least the following information:

- Up to half a page of executive summary;
- Brief description of project background information;
- Drawings showing locations of the baseline monitoring stations;
- Monitoring results (in both hard and diskette copies) together with the following information:
    - Monitoring methodology
    - Name of the laboratory and types of equipment used and calibration details
    - Parameters monitored
    - Monitoring locations (and depth)
    - Monitoring date, time, frequency and duration
    - QA/QC results and detection limits
- Details of influencing factors, including:
    - Major activities, if any, being carried out in the Project site during the period
    - Weather conditions during the period
    - Other factors which might affect the monitoring results
- Determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data;
- Revisions for inclusion in the EM&A Manual; and
- Comments and conclusions.

15.3 Monthly Monitoring Reports

First Monthly EM&A Report

15.3.1 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 organisation 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 EP conditions under the EIAO, 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 area, 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 EIA 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 Report (e.g. construction methods, mitigation proposals, design changes, etc.); and
- comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for examples, any improvement in the EM&A programme) and conclusions.

Subsequent Monthly EM&A Reports

15.3.2 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 organisation 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 EP conditions under the EIAO, 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.

15.4 Final EM&A Review Reports

General

15.4.1 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.

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

Final EM&A Review Report for Construction Stage

15.4.3 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 organisation, 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;

i) 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 summarised in the updated implementation schedule;

ii) 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;

i) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

ii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

iii) A description of the actions taken in the event of non-compliance;

iv) 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;

v) A review of the validity of EIA predictions for construction stage and identification of shortcomings in EIA recommendations;

vi) Comments (for example, a review of the effectiveness and efficiency of the mitigation measures, the performance of the environmental management system, and the overall EM&A programme for construction stage); and

vii) 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).

Final EM&A Review Report for Operation Stage

15.4.4 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 organisation, 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;

i) 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 summarised in the updated implementation schedule;

ii) 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;

i) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

ii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

iii) A description of the actions taken in the event of non-compliance;

iv) 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;

v) A review of the validity of EIA predictions for operation stage and identification of shortcomings in EIA recommendations;

vi) Comments (for example, a review of the effectiveness and efficiency of the mitigation measures, the performance of the environmental management system, and the overall EM&A programme for operation stage); and

vii) 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).

15.5 Data Keeping

15.5.1 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 operational phase monitoring for construction phase EM&A and operational EM&A respectively.

15.6 Interim Notifications of Environmental Quality Limit Exceedances

15.6.1 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 15.1**.