

Hong Kong Housing Authority

Agreement No. CB20120293

**Planning and Engineering Study  
for the Public Housing Site and  
Yuen Long Industrial Estate  
Extension at Wang Chau**

**Inception Report**

December 2012

**IMPORTANT – CONFIDENTIALITY**

This project and study shall be kept confidential and any information contained in and/or related to the project/study shall not be disclosed to any person not involved in the project/study.

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# 1 INTRODUCTION

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## 1.1 Project Background

As stated in the Chief Executive's 2011-12 Policy Address, the Administration is committed to expanding the land resources and increasing housing land supply. To meet this policy objective, the Planning Department (PlanD) has carried out a comprehensive review of the areas zoned "Green Belt" (GB) on the Outline Zoning Plans (OZPs) focusing on sites which are no longer green or spoiled. A number of "GB" and "Open Storage" (OS) sites in Wang Chau, Yuen Long were identified as having potential for public housing development.

Subsequently, the Innovation and Technology Commission (ITC) and the Hong Kong Science and Technology Parks Corporation (HKSTP) advised of the need to expand the Yuen Long Industrial Estate (YLIE), in addition to the existing three Industrial Estates (IEs) at Tai Po, Tseung Kwan O and Yuen Long. It was requested to use a portion of the Wang Chau potential housing site for this purpose.

After due consideration, an agreement was reached between the Housing Department (HD) and ITC to share the 34.4 hectares (ha) site (the Site), tentatively with the northerly portion, around 16 ha in size, to be allocated for the YLIE extension (YLIEE), while the remaining 18.4 ha in the south would be developed for public housing use (**Figure 1**). It was further agreed that no Potential Hazardous Installations (PHIs) would be located at the YLIEE so as to minimize the potential adverse impact on the neighbouring public housing development.

Ove Arup & Partners Hong Kong Limited (Arup) was commissioned by Hong Kong Housing Authority (HKHA) under entrustments from the Government of the Hong Kong Special Administrative Region (HKSAR) & Hong Kong Science and Technology Parks Corporation (HKSTP) to conduct the Planning and Engineering Study for Public Housing Site and YLIEE at Wang Chau (the Study), which will examine the feasibility on developing public housing and YLIEE at Wang Chau by conducting planning, engineering and environmental assessments to formulate proposal for the public housing development and YLIEE, and the implementation strategies and programme for the public housing development. The consultancy is commenced on 31 July 2012 and is scheduled for a period of 36 months.

## 1.2 Objectives of the Assignment

The overall objective of the Study is to examine the feasibility of public housing development and YLIEE at Wang Chau, taking into account the environmental, planning, urban design, traffic and transport, geotechnical, foundation, landscaping, sewerage, drainage, water supply and other engineering/infrastructure matters, air ventilation, socio-economic, financial, provision of Government/Institutional and Community (G/IC) facilities, open space, recreation and retail facilities; formulate and evaluate different development options as well as identify the preferred option; recommend optimal and practicable development schemes with parameters; propose necessary infrastructure upgrading works with schematic design; and prepare an implementation programme.

The Study will form the basis for implementation of the public housing development and YLIEE under the rezoning and Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) processes.

Specifically, the objectives of the Study are set out as follows:

- (a) identify opportunities, constraints and key issues confronting the public housing project and YLIEE, and highlight the problems that might affect their overall development;
- (b) formulate development options and carry out preliminary feasibility assessments to derive practicable development parameters and schemes for the public housing project and YLIEE;
- (c) formulate land use proposals and delineate development boundaries for the public housing development, YLIEE and other associated infrastructures and facilities;
- (d) evaluate the development options against a set of clearly defined principles, objectives and associated performance criteria as agreed with the Director's Representative (DR);
- (e) confirm the feasibility of the public housing project and YLIEE and associated infrastructures and facilities by undertaking a series of technical assessments including traffic and transport, sewerage, drainage, water supply, utilities, geotechnical, slope stability and site formation works, foundation, urban design, landscape and visual, air ventilation, natural terrain landslide hazard, hazard potential of industrial installation, land contamination, ecology and cultural heritage etc;
- (f) confirm the environmental acceptability of the public housing development and YLIEE as well as the associated infrastructure works by conducting comprehensive environmental studies which shall include (i) Environmental Assessment Study (EAS) for confirming the environmental acceptability of the proposed developments, particularly the proposed housing development which is subject to environmental impact from the existing and planned developments and environment in the vicinity, (ii) Land Contamination and Remediation Assessment with carrying out the necessary site investigation (SI) and laboratory testing (LT) for the assessment; and (iii) Environmental Impact Assessment (EIA) to meet the TM-EIAO requirements for confirming the environmental acceptability of the impact arising from the proposed developments, particularly YLIEE on the existing developments and proposed developments, including the proposed housing development, in the vicinity; whereas the EIA shall include, inter alia, cultural heritage impact assessment and ecological impact assessment; the EIA shall be carried out for, but not limited to, the following designated projects:
  - (i) this planning and engineering study for the Site under Schedule 3 of EIAO;
  - (ii) YLIEE under Schedule 2 of EIAO; and
  - (iii) any other facilities, works and projects identified in the Study for supporting the public housing development and/or YLIEE and falling within Schedule 2 or 3 of EIAO.
- (g) formulate a strategy for public consultation/engagement and undertake the public consultation/engagement accordingly; explore good development concepts from the community, and gauge public feedback through the public consultation/engagement activities;
- (h) recommend practicable and cost effective measures to mitigate the constraints and problems identified, including but not limited to environmental mitigation, geotechnical works, slope works, site formation works, natural terrain hazard mitigation works, road and infrastructural works required for the proposed public housing development and YLIEE, as well as innovative approaches to deal with the interface problem between public housing and YLIEE;

- (i) provide recommendations on site formation works, natural terrain hazard mitigation works, slope works, road works and other infrastructure works, G/IC facilities as well as alternative mitigation measures to suit the proposed schemes with schematic design to be shown on plans and sections in enough details to demonstrate their feasibility to the satisfaction of the relevant departments and authorities;
- (j) carry out preliminary design of the engineering works to cope with the development of the Site with preparation of schematic layout plans and preliminary engineering study to facilitate detailed design of these engineering works to proceed after this Study;
- (k) carry out SI and LT where necessary and conduct preliminary engineering study, geotechnical assessment, natural terrain hazard study and the necessary mitigation measures for the proposed development and the required infrastructure so that the detailed design can be proceeded immediately after this Study;
- (l) facilitate timely implementation of the sites and infrastructure developments by recommending a suitable implementation programme/framework including implementation packages, land requirement and rehousing;
- (m) examine and advise the financial implications of the site developments, including land resumption and clearance costs, as well as infrastructure costs;
- (n) facilitate rezoning of the sites for public housing use and IE use;
- (o) provide support to fulfill the requirement of EIAO for implementation of the engineering feasibility study and designated projects under EIAO and to prepare all necessary reports, documents and materials for the EIAO process and associated public consultation and presentations.

### 1.3 The Study Area

The public housing site and YLIE Extension at Wang Chau are zoned GB and OS on the Ping Shan OZP No. S/YL-PS/14. It is currently occupied by OS, vehicle parks, farmland, fallow land, grassland, rural residential dwellings and temporary structures.

The Study Area is bounded by Shan Pui River to the east, Wang Tat Road and Long Tin Road to the south, covering Kai Shan in the west, and Ng Uk Tsuen in the north as indicated in **Figure 1**. The boundaries for feasibility assessments may not be confined to the Study Area and may need to extend to take account of the relevant conditions/impacts outside the Study Area for the satisfactory completion of the Study. The exact boundary and coverage of the sites for the public housing development and YLIEE and the associated infrastructures/facilities for the developments will be reviewed and defined in the Study.

### 1.4 The Study Assignment

The Study is divided into two phases, namely Phase 1- Technical Feasibility Study Stage and Phase 2 - Public Consultation, Rezoning and EIAO Stage. Phase 2 Study will have two options, namely Phase 2A - Public Consultation, Rezoning and EIAO Stage for both public housing site and YLIEE site and Phase 2B – Public Consultation, Rezoning and EIAO Stage for public housing site only.

Phase 2A Study covers the services for the overall development option that both public housing site and YLIEE site will proceed for further study at a later stage of or after Phase 1 Study. Phase 2B Study is for the overall development option that only public housing

development will proceed for further study at a later stage of or after Phase 1 Study, i.e. study for YLIEE will not be further pursued.

The assignment of the Study will include the following main tasks at each phase:

### **Phase 1 -Technical Feasibility Study Stage**

- (a) Task 1 – prepare an inception report for the Study;
- (b) Task 2 – establish a baseline profile of the Study Area and its relationship with the adjoining areas and conduct a review of the issues that affect the sites; Task 3 – establish guiding principles and formulate initial options for the public housing project and YLIEE with reference to the baseline profile under Task 2 above and target industry sectors;
- (c) Task 4 – carry out preliminary feasibility assessments of various aspects to demonstrate the feasibility of the initial development options;
- (d) Task 5 – evaluate the initial development options against the pre-determined criteria and derive a preferred development option for the public housing project and the YLIEE;
- (e) Task 6 – update/undertake planning and technical assessments as well as EAS and EIA to confirm the feasibility of the preferred development option;
- (f) Task 7 – conduct a financial assessment/appraisal of the development, comprising separately for the housing development and YLIEE; and to give an recommendation on whether each portion of the project is viable;
- (g) Task 8 – prepare the Preliminary Outline Development Plan (PODP) together with the Preliminary Urban Design and Landscape Plan (PUDLP) and Preliminary Master Layout Plan (PMLP) for the proposed developments with recommended plot ratio, population, height restriction, block no. and storeys etc.;

### **Phase 2A or Phase 2B- Public Consultation, Rezoning and EIAO Stage**

- (h) Task 9 - conduct a public consultation/engagement on the PODP;
- (i) Task 10 – refine relevant assessments conducted in Phase 1 in the light of the outcome of the public consultation/engagement giving rise to a revised development options and prepare the Recommended Outline Development Plan (RODP) together with the Recommended Urban Design and Landscape Plan (RUDLP) and Recommended Master Layout Plan (RMLP) for the proposed developments;
- (j) Task 11 – examine the implementation mechanism, approaches and framework for the implementation of the proposed developments, provide details of land requirement to assess the broad cost and revenue for the developments, associated infrastructure/facilities and land acquisition and prepare outline development programme;
- (k) Task 12 – facilitate rezoning of the sites for public housing use, IE use and other associated uses (for Phase 2A or 2B Study where applicable);
- (l) Task 13 – advise and assist the Employer to fulfill the requirement of EIAO for implementation of the engineering feasibility study and designated projects under EIAO;
- (m) Provide the required technical input for Government to prepare the project definition statement(s) and technical feasibility statement(s) to create Category C and/or B items



for individual associated/infrastructural projects for implementing the developments;  
conduct preliminary environmental review of non-designated projects;

- (n) Task 14 – prepare a Final Report, Executive Summary for the Study.

## 1.5 Purpose of this Report

This report forms the inception for the study assignment. It describes the approach and methodology to be applied, the programme, management and staffing in order to achieve the tasks required by the Brief. According to Clause 5.2 of the Brief, the Inception Report consists of the following elements:

- an understanding and appreciation of the study objectives;
- discussion of key issues to be addressed;
- description of the proposed approach and methodology for undertaking the key elements of the Assignments, including various technical assessments and public consultations/engagement workshops;
- a work programme highlighting the schedule of work, including dates of reports submission, meeting dates of the Study Steering Group, Study Working Group as well as other relevant meetings; and
- study team and management structure including specialist/sub-consultants and the respective responsibilities of each of the key personnel.

## 1.6 Structure of this Report

The structure of this Inception Report is as follows:

- |           |   |
|-----------|---|
| Section 1 | Introduces the project background, objectives and the main tasks of the Study.                                  |
| Section 2 | Outlines the understanding and appreciation of the objectives of the Study.                                     |
| Section 3 | Identifies the key issues and problems that need to be further addressed during the Study.                      |
| Section 4 | Provides a general description of the proposed approach and methodology for preparing the Study.                |
| Section 5 | Describes the work programme of all major tasks including dates of report submission and dates of key meetings. |
| Section 6 | Presents the organisation of the Study Team and the responsibilities of key staff.                              |

## 1.7 Nomenclature and Abbreviations

The following section lists out the abbreviated titles of Government bureaux, departments, offices, statutory bodies and public organizations mentioned in this report:

ACE	Advisory Council on the Environment
AFCD	Agriculture, Fisheries and Conservation Department
AMO	Antiquities and Monuments Office

BD	Building Department
CEDD	Civil Engineering and Development Department
DC	District Council
DSD	Drainage Services Department
EMSD	Electrical and Mechanical Service Department
EPD	Environmental Protection Department
ETWB	Environmental, Transport and Works Bureau
GEO	Geotechnical Engineering Office
GFS	Government Flying Services
GIU	Geotechnical Information Unit
HD	Housing Department
HKHA	Hong Kong Housing Authority
HKO	Hong Kong Observatory
HKSTP	Hong Kong Science and Technology Parks Corporation
HPLB	Housing, Planning and Lands Bureau
HyD	Highways Department
ICU	Independent Checking Unit
IUCN	International Union for Conservation of Nature
ITC	Innovation and Technology Commission
MD	Marine Department
MTRCL	Mass Transit Railway Corporation Limited
PFC	Public Fill Committee
PRC	People's Republic of China
PRDEZ	Pearl River Delta Economic Zone
PlanD	Planning Department
TD	Transport Department
TPB	Town Planning Board
USEPA	United States Environmental Protection Agency
WSD	Water Supplies Department

The following section lists out the meaning of abbreviation for expressions adopted in this report:

AADT	Annual Average Daily Traffic
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ANL	Acceptable Noise Level
AP-42	Compilation of Air Pollution Emission Factors
API	Aerial Photograph Interpretation
AQMS	Air Quality Monitoring Station
AQO	Air Quality Objective
ASR	Air Sensitive Receiver
AVA	Air Ventilation Assessment
BDTM	Base District Traffic Model
BHIA	Built Heritage Impact Assessment
C&D	Construction and Demolition
CA	Conservation Area
CALINE4	California Line Source Dispersion Model Version 4
CAP	Contamination Assessment Plan
CAR	Contamination Assessment Report
CDWE	Comprehensive Development with Wetland Enhancement
CHIA	Cultural Heritage Impact Assessment
CRN	Calculation of Railway Noise
CRTN	Calculation of Road Traffic Noise
CTS3	Comprehensive Transport Study
DMP	Drainage Master Plan
DR	Director's Representative
EAP	Emergency Access Point
EAS	Environmental Assessment Study
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
ERA	Estimated Risk Assessment
ESMG	Environmental Study Management Group
FDW	Fugitive Dust Model
GB	Green Belt
GI	Ground Investigation
G/IC	Government/Institution and Community
GIS	Geographic Information System

HK2030	Hong Kong 2030 Planning Vision and Strategy
HKPSG	Hong Kong Planning Standards and Guidelines
IE	Industrial Estate
IF	Influencing Factor
IR	Industrial/Residential
IRR	Internal Rate of Return
LCA	Landscape Character Area
LR	Landscape Resources
LT	Laboratory Testing
LVR	Local Spatial Average Velocity Ratio
MLP	Master Layout Plan
MOD	Money-of-the day
MPM	Monthly Progress Meeting
NCO	Noise Control Ordinance
NPV	Net Present Value
NSR	Noise Sensitive Receiver
NTHAS	Natural Terrain Hazard Assessment Study
NTHPS	Natural Terrain Hazard Planning Study
NTHRS	Natural Terrain Hazard Review Study
NTHS	Natural Terrain Hazard Study
ODP	Outline Development Plan
OLM	Ozone Limiting Method
OS	Open Storage
OZP	Outline Zoning Plan
PBU	Port Back Up
PHI	Potential Hazardous Installation
PME	Powered Mechanical Equipment
PMLP	Preliminary Master Layout Plan
PNAP	Practice Note for Authorized Persons, Registered Structural Engineers and Register Geotechnical Engineers
PODP	Preliminary Outline Development Plan
PRH	Public Rental Housing
PUDLP	Preliminary Urban Design and Landscape Plan

QA/QC	Quality Assurance/ Quality Control
QPME	Quality Powered Mechanical Equipment
RAP	Remediation Action Plan
RBRGs	Risk-Based Remediation Goals
RMLP	Recommended Master Layout Plan
RODP	Recommended Outline Development Plan
RR	Remediation Report
RUDLP	Recommended Urban Design and Landscape Plan
SAB	Single Aspect Block
SI	Site Investigation
SMP	Sewerage Master Plan
SP	Specified Processes
SPL	Sound Power Level
SS	Suspended Solid
SSG	Study Steering Group
SVR	Site Spatial Average Velocity Ratio
SWG	Study Working Group
TM-DA	Technical Memorandum on Noise from Construction Work in Designated Areas
TM-DSS	Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems Inland and Coastal Waters
TM-GW	Technical Memorandum on Noise from Construction Work other than Percussive Piling
TM-PP	Technical Memorandum on Noise from Percussive Piling
TM-Places	Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites
TM-EIAO	Technical Memorandum on Environmental Impact Assessment Ordinance
TMB	Temporary Benchmark
TTIA	Traffic and Transport Impact Assessment
ULSD	Ultra Low Sulphur Diesel
WBA	Wetland Buffer Area
WCA	Wetland Conservation Area
WCZ	Water Control Zone

WPCO	Water Pollution Control Ordinance
VR	Velocity Ratio
VSR	Visually Sensitive Receiver
YLIE	Yuen Long Industrial Estate
YLIEE	Yuen Long Industrial Estate Extension
YLSWT	Yuen Long Sewage Treatment Works

## 2 UNDERSTANDING AND APPRECIATION OF THE STUDY OBJECTIVES

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The specific objectives of the Study are described in S.1 above. The following highlights our understanding and appreciation of the study objectives:

***Wang Chau in the Context of Territorial Land Use Demand*** – The intended development in Wang Chau is a positive response to the future needs of Hong Kong. Territorial land-use demand and aspirations identified in Hong Kong 2030 Planning Vision and Strategy (HK 2030), Policy Address 2011-2012 and the Enhancing Land Supply Study etc. have revealed the eminent need of land resources to meet both housing demand and the need of economic development. At the same time, recent public sentiments calling for more housing sites have become apparent. To expand the land resources, the use of disturbed GB areas in the New Territories for housing development has been investigated. A subsequent land use review by PlanD identified and evaluated the potential sites for housing development. At the same time, the needs to revitalise and re-position industrial estates in Hong Kong, together with the need of employment in Northwest New Territories, point to the extension of the YLIE.

***Planning for Housing Development*** – Yuen Long District Council (DC) members generally supported the timely resumption of the Home Ownership Scheme and the provision of more Public Rental Housing (PRH) flats, with some suggesting that more public housing sites should be planned for their district<sup>1</sup>. Therefore, the suitable type(s) and amount of housing for the Study Site should be carefully considered to meeting the aspiration of local people.

***Planning for Industrial Estate Expansion*** – While the future tenants of YLIEE remains an unknown, the Study should plan with the anticipated types of industries so that the proposed plan will serve the intended function of the extension and be compatible with the existing residential uses and proposed public housing. It should be derived with due consideration of both the current mix of existing IE and future trends based on relevant studies and advice from HKSTP.

***Formulation of Optimal & Feasible Scheme*** – To meet the territorial development objective above, the feasibility of developing public housing and industrial estate extension at Wang Chau should be carefully examined and sound engineering solutions should be formulated. Particular attention should be paid to the complex geology underneath the Wang Chau site, which may have direct impact on its development potential. Supporting infrastructure upgrading works, together with an implementation programme, will also be proposed to facilitate the subsequent detailed engineering design.

***Compliance with Rezoning and EIAO Requirements*** – With the preliminary recommended option, the associated technical assessments and corresponding mitigation measures, the Study will proceed with rezoning request for the proposed land uses of Wang Chau. A majority of the Study Site is currently used for temporary OS and port back up (PBU) uses. Through integrated planning, the Study will tackle the potential interface problems. In parallel, the project will go through the EIAO process to meet the TM-EIAO requirements and to confirm environmental acceptability.

The successful fulfilment of the processes hinges on both the assessments and proposed mitigation/ improvement measures, together with the familiarity of the requirements of these processes.

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<sup>1</sup> Minutes of The 3rd Meeting of Yuen Long District Council in 2011. ([http://www.districtcouncils.gov.hk/archive/yl\\_d/english/agenda\\_and\\_minute/DC/2011/Minutes/YLDC\(2011\)\\_3rd\\_Summary\(Eng\).doc](http://www.districtcouncils.gov.hk/archive/yl_d/english/agenda_and_minute/DC/2011/Minutes/YLDC(2011)_3rd_Summary(Eng).doc), accessed at 15:20 on 3 Sept 2012)

***Assessing Financial Viability and Formulating Implementation Strategies of the Proposal***

– The financial viability of the proposed YLIEE and public housing development should be assessed to inform its implementation strategy. Based on the study findings, the implementation programmes and cost estimates for the proposed scheme will be prepared.



## 3 IDENTIFICATION OF KEY ISSUES

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### 3.1 Land Use Planning

#### 3.1.1 Land Use Interface Issues

The Study Site is located at the fringe of a built-up area, featured with semi-rural character and surrounded by a mix of land uses, including villages, Long Ping Estate, YLIE, “Conservation Area” (CA), Graded Historic Buildings, rail lines and roads etc. Some of the existing uses are incompatible with the proposed development, resulting in interface issues that require further assessments in the Study.

Although YLIEE site is intended for non-polluting industries, there would be interface issues between YLIEE site and the proposed public housing development to its south, the neighbouring villages to its north and east and a CA namely Kai Shan to its west as they are all close to YLIEE site.

Kai Shan is in fact adjacent to both the proposed YLIEE and public housing development. The interface issues between Kai Shan and the two developments would be significant given Kai Shan’s naturalistic nature with conservation values.

To ensure compatibility, interface amongst various land uses, in particular industrial, residential and CA, should be carefully addressed to minimise any interface issues affecting the daily lives of the local community. There may also be interface issues due to the different implementation programmes of the YLIEE and the public housing site, such as construction impact from YLIEE after occupation of the public housing site.

#### 3.1.2 Integration with Neighbouring Areas

To a certain extent, the Study Site is isolated as it is basically bounded by the hilly terrain of Kai Shan to the west and by Long Ping Road and Fuk Hi Road to the east and south. Therefore, it is necessary to investigate the linkage and connectivity of the Study Site with its adjoining areas in terms of physical and transport linkages as well as social and economic linkages so as to achieve an integrated community. Special urban design interventions are required to enable spatial, social and visual integration of the Study Site with its surroundings.

#### 3.1.3 Optimization on the Use of Land Resources

According to HKSTP’s Annual Report 2010/2011, the occupancy rate of YLIE reached as high as 99% in 2011, reflecting strong demand on industrial land in Yuen Long District. There is also a strong desire for more public housing in the society. The Study Site is no doubt valuable land resources capable to help ease the above demands. It is therefore crucial to use the Study Site in an optimum and sustainable manner.

The Study Site is relatively long and narrow and irregular in shape. An efficient layout for the proposed development should be ensured so as to optimise the use of the land. During the layout design process, optimisation of industrial lot sizes and public housing production as well as creation of a green and people-oriented living environment on the public housing site should be taken into account in a comprehensive manner.

### 3.1.4 Geometry of the Study Site

The potential public housing site has 18.4 hectares of land but a considerable portion of it is long and narrow in shape. There is an elongated strip of land at the southern portion of the site that is likely to pose planning and design constraints over the future development. The land is embedded by hilly terrains on one side and Long Ping Road on the other so traffic noise nuisance from the road may be a potential environmental issue. Similarly, the YLIEE site is narrow and irregular in shape. Creative land-use disposition, building form, noise mitigation measures and landscape features will be adopted to overcome these physical constraints and to fully utilize the site development potential.

### 3.1.5 Landscape Design

At present there is a lack of valuable amenity green space (parks, recreation grounds) within the vicinity of the site; existing spaces are fragmented and do not sit within an integrated landscape design framework. A strategic landscape design approach which considers the wider setting and overall accessibility to the external realm will assist in addressing these issues through provision of appropriate types and scales of landscape spaces as part of a wider 'green network'.

The receiving landscape has been degraded through current land uses, in particular the OS functions. The key factors influencing this are the clearance of vegetation (trees and shrubs), formation of access routes, channelization of the Shan Pui River and encroachment into Kai Shan CA by informal burial plots. An opportunity exists to address these impacts through landscape restoration and replacement of lost vegetation in order to increase the amount of green space and protect existing resources. This would greatly enhance the visual integrity, natural character and landscape synergy of the proposed development.

The landscape design will require careful resolution of the interfaces between land use types, in particular between residential and industrial uses. The provision of buffer zones at strategic locations will provide a mechanism for optimising the compatibility of these neighbouring uses whilst integrating the proposed development into the landscape setting. In addition, provision of a buffer landscape between the proposed landuses and CA boundary would respect and enhance the compatibility of development with the CA, whilst providing additional local recreational space.

The treatment and quality of landscape and streetscape within the CA varies significantly, especially in relation to the industrial use, which has a negative influence on the overall character of the district. Landscape treatments to streetscape, such as materials, tree and amenity planting should be consistent across these uses in order to maintain a high quality approach to external spaces.

In line with the Governments Greening Masterplan Proposals for Hong Kong, the Study Site should integrate with the wider landscape and streetscape greening objectives for Yuen Long (currently under consultation). The landscape master plans will consider the location and connectivity between existing local neighbourhoods (villages and Long Ping Estate), municipal parks, squares, trails and green spaces.

High ground to the west of the study area, predominantly designated as CA, including the peak of Kai Shan Hill and associated ridges provide vantage points for panoramic views across the site. These important visual elements will be examined.

The orientation and disposition of the future developments on the Study Site will need to be carefully considered so that clear vistas and view corridors can be maintained and so that the existing developments will not suffer from significant detrimental visual impact. It is

important that landscape mitigation measures in landscape master plans fully address stakeholder concerns and integrate seamlessly with the landscape design proposals.

## 3.2 Traffic & Transport

*Road and infrastructural works* - The development site is located to the north of Long Ping Road, to the west of Fuk Hi Street and adjacent to the YLIE and Long Ping Estate. Vehicular access to the development site is from Long Ping Road or Fuk Hi Road which are both of single 2 carriageway configuration. A critical review of the lane configuration and traffic arrangement along these two roads should be carried out in meeting the demands of the potential developments in the future. Options to enhance the connectivity of the development site should be explored, such as additional road connection and access points with suitable widening works.

*Road junctions* – The following junctions are identified as critical to future development in the area;

- Junction of Long Yip Street / Po Yip Street,
- Junction of Fuk Hi Street / Long Ping Road,
- Junction of Fuk Hi Street / Wang Lok Street,
- Junction of Long Ping Road / Fung Chi Road,
- Junction of Fung Chi Road / Wang Tat Road, and
- Junction of Wang Lok Street / Long Yip Street.

These junctions created bottleneck between the strategic road network to the east and the development site. Due consideration should be paid to ensure the connectivity of the development site with other part of the strategic road network. Improvement measures should be explored to enhance the junction performance. Alternatively, the feasibility of providing a new road connecting Shui Pin Wai Interchange and the development will be explored. The new road will serve as a second road connection to the development offering an alternative route to circumvent the congested network in Yuen Long.

*Connectivity of the development site to MTR Long Ping Station* – The development site is relatively remote and only narrowly overlapped with the catchment area of MTR Long Ping Station. In meeting the green transport strategy, means have to be explored to enhance the pedestrian connectivity of the proposed development with the Long Ping Station so as to encourage residents to use railway services, thus reduce car usage and the traffic impact of the proposed development. The feasibility of providing an elevated pedestrian link from the southern end of the proposed housing site to Long Ping Station will be explored.

*Public transport service* - The development area is currently served by limited mini-bus services and bus services in the adjacent public transport terminus in Long Ping Estate. For the rest of the study area, locals have to rely on the shuttle services serving the YLIE. The walking distance varies depending on the location. Additional public transport service will definitely be required to serve the proposed public housing development and YLIEE. Extending the current public transport services at Long Ping Estate is considered as one of the cost effective options.

## 3.3 Engineering

### 3.3.1 Geotechnical

#### 3.3.1.1 Geology

The superficial geology of the Site is expected to comprise terraced alluvium and debris flow deposits. A thin layer of fill may overlay these deposits in some areas of the site, depending on the current land use.

The solid geology of the Site is expected to be complex due to the presence of major regional structural features, foliated meta-sandstones and siltstones, phyllites and schists, and underlying marble subcrop in this area.

The Site falls within Scheduled Area No. 2, recognised as an area of complex geology where karst features such as an uneven upper surface and dissolution cavities are known to occur within the marble. The site is also located within the influence zone of the northeast-trending Lo Wu-Tuen Mun fault and fold belt which contains a series of faults, folds and shear zones, including at least four major northeast-trending faults, namely the Lau Fau Shan Fault, Yuen Tau Shan Fault, Ma Tso Lung Fault and the San Tin Fault. The San Tin Fault is a major structural thrust fault that influences the whole area giving rise to a strongly developed foliation and structure within the bedrock.

#### 3.3.1.2 Foundation Conditions

The presence of palaeokarst in the Yuen Long area has caused significant problems for foundation design and construction for previous new developments. Such problems include an anomalously deep rockhead, with rock locally in excess of 150m below ground level. A steeply inclined and irregular rockhead profile makes the construction of end-bearing piles very difficult. In addition, cavities within the marble may be infilled with weak and highly compressible material at considerable depth. The on-going dissolution and collapse of the marble rockmass results in thick superficial deposits comprising collapse material and weak cavity-fill. Such conditions are problematic for driven pile construction as piles have to penetrate very deep to pass through the cavities and weak material.

Dependent on the findings of the site specific ground investigation (GI), the plan for redevelopment may need to be revised to avoid localised areas of deep rockhead or cavities. The foundation designers may also need to consider the use of unconventional techniques.

A review of foundation performance will be required by Building Department (BD)/ Geotechnical Engineering Office (GEO). This will include assessment of the ground conditions experienced during pile driving, pile installation or foundation construction; pile driving or construction records; and pile loading tests which must be submitted to BD/GEO for approval prior to commencement of superstructure works.

#### 3.3.1.3 Existing Man-Made Features

The following registered man-made features have been identified within the proposed public housing development site and YLIEE areas: 13 nos. cut slopes, 1 no. retaining wall and 1 no. fill slope. Further registered features are located within the surrounding Study Area. Depending on the current condition of these features, and the layout of the proposed development and infrastructure on these features, some may need upgrading to meet the current geotechnical standards.

### 3.3.2 Natural Terrain Hazards

A number of natural terrain hillside catchments overlook the proposed Site, meaning that, in accordance with GEO Report 138, a Natural Terrain Hazard Assessment will be required. An initial review of landslide records and aerial photographs covering this area suggests that recent landslide activity has been relatively high. A number of 'large' landslides are recorded in the Large Landslide Database. These features comprise sizeable failures with scarp widths >20 m and may be related to adversely orientated foliations within the saprolite and rock mass. In addition to landslide hazard, an initial review has identified boulder fall hazard at the Site. It is anticipated that natural terrain hazard mitigation works will be required. However, a detailed assessment of the natural terrain hazards affecting the Site will be required to determine the nature and extent of any such works.

The location of any natural terrain hazard mitigation measures may be constrained by the presence of a large number of graves and urns within the Study Area. If the construction of mitigation measures is severely restricted by the presence of graves, this may result in some 'no build' areas within the proposed development site.

### 3.3.3 Site Formation

The existing surface appears to be fairly uniform, with the level around + 5.0mPD. It is anticipated that extensive site formation works will not be required in order to create a suitable platform for the development.

There are a large number of graves and urns within the Study Area. These may limit the extent of usable land for site formation.

### 3.3.4 Ground Investigation and Laboratory Testing

A preliminary review of the available GI records held by the Geotechnical Information Unit (GIU) and by Arup suggests there is insufficient existing GI data to develop a suitably detailed ground model for this study.

The brief requires that GI works and LT be undertaken. The key constraint on the GI and LT is the tight programme for completion and reporting.

GI should also be undertaken for environmental purposes as part of a land contamination assessment. The sampling plan for environmental GI will differ from geological GI as it will be based on a hotspot approach (subject to EPD approval) whereby the locations of boreholes are selected in areas that are considered to have the potential for land contamination. Close communication between geotechnical and environmental team would be maintained to explore the possibility of combining the geological GI with environmental GI under the same Hong Kong Housing Authority (HKHA) term contract works.

Given the time required to undertake the desk study review necessary to develop a suitable scope for the GI, followed by the time taken to make arrangements for access and gain approval from Independent Checking Unit (ICU), it is anticipated that GI works will commence at the earliest in December 2012 if the HKHA term contact is utilised. However, this programme assumes no significant problems gaining permission to access the Site or with Contractor availability. Given the site is located within Scheduled Area No. 2, the timescale for approval from ICU may be longer than usual- another potential sources of delay. Furthermore, for the environmental GI, seeking approval from the Environmental Protection Department (EPD) for the Contamination Assessment Plan (CAP) prior to the commencement of works may cause delay to the project.

The brief notes that the GI and LT works are to be executed by the Employer's GI term contractor, subject to availability of appropriate resources, facilities and agreement by the DR. If the HKHA term contract cannot be used, and the GI needs to be procured through an open tender, the commencement of GI works will be significantly delayed.

Depending on the scope and programme for completion of the GI works, it may not be possible to incorporate all data from the GI and LT into the TR3 deliverables if the GI and LT reports have not been received well ahead of the deliverable deadline. However, any additional data can be incorporated in later revisions.

Another key constraint on the GI is land status and the confidential nature of this project. GI works will need to be confined to government land during this phase of GI. As such, it may not be possible to gain information on the ground profile at key locations within the site. A detailed review of the land status records will be required to ensure that suitable exploratory hole locations can be accessed practically without using routes via private lots also. The presence of any squatters, graves and illegal cultivation on Government land may result in protracted negotiations to ensure the necessary land allocations required to undertake GI works. This will be investigated during the site walkover survey.

The complex geology in this area may also pose constraints on the GI required for this site. BD PNAP APP-61 makes a number of recommendations for GI within Schedule Area No. 2 which means that more extensive, deeper investigation may be required for this site as compared to other locations in Hong Kong.

The complex geology in this area may also pose constraints on the GI required for this site. Section 2.4.2 of GEO Publication No. 1/2006; GEO Technical Guidance Note No. 26 (TGBN 26); BD PNAP APP-61; and ETWB TC 4/2004 make a number of recommendations relevant to undertaking GI for sites underlain by marble. These include more intensive and extensive, deeper investigation which may be required in areas of the site where marble is identified. The ground investigation programme will need to be flexible so that it can be adapted dependent on the conditions encountered.

As the GI will be planned and is likely to be partially completed before a preferred development option has been determined, the GI can only be designed to develop a preliminary ground model for the site in general. It may not provide adequate data for individual structures that form part of the preferred development option. In any case, a phased approach to GI is always preferred, especially for complex ground conditions such as those anticipated at this site. Further GI will be required during detailed design.

### 3.3.5 Drainage

According to Drainage Services Department (DSD) Flooding Blackspots Plan as at March 2012, there is no flooding blackspots as identified in the vicinity of the proposed site. DSD appointed consultants to conduct the Review of Drainage Master Plan (DMP) in Yuen Long and North Districts – Feasibility Study Final Report Agreement No. CE46/2007 (DS), the findings and recommendations from the DMP Review Final Report will be reviewed and addressed.

### 3.3.6 Sewerage

The Yuen Long and Kam Tin areas fall within the sewerage networks in the Deep Bay catchment where the discharge should meet the “No net increase in pollution loads to Deep Bay” requirement. The Yuen Long & Kam Tin Sewerage Master Plan (SMP) provides collection, treatment, and disposal of wastewater from Yuen Long, Tin Shui Wai, Kam Tin, San Tin and Ngau Tam Mei. Wastewater from Yuen Long and Kam Tin areas is exported and

disposal of at Urmston Road via the North West New Territories Effluent Tunnel. According to the sewerage catchment plan for existing and future catchments, the proposed site falls within the Yuen Long Sewerage Catchment. The EPD's Feasibility Study Report of the Provision of Sewerage to Unsewered Areas/Villages in Northwest New Territories 2008 will be reviewed to identify the assumption of population, the daily sewage flows allowed for the proposed site in the Yuen Long Sewage Treatment Works and obtain from EPD and DSD the updated Yuen Long Sewage Treatment Works capacity, any spare capacity remaining and programme. Updated information about future population, developments and projected sewage flow will also be collected from PlanD, CEDD and relevant departments.

### 3.3.7 Water Supply and Utilities

The understanding of the existing and proposed utility arrangement for the proposed site is required in order to identify constraints and proposed mitigation measures to support the proposed site development.

## 3.4 Environmental

### 3.4.1 Noise

The key environmental issue is the problem of Industrial/Residential (IR) interface. The existing industrial noise sources in the vicinity of the Study site are mainly from the industrial facilities inside the YLIE and other rural industrial operations, such as OS and car stripping/repair workshops that contribute to the overall ambient noise levels. The YLIEE will be a future noise source. All these sources will affect the nearby existing noise sensitive receivers (such as Ng Uk Tsuen next to the north of YLIEE) and the proposed public housing development site. Clean industry and noise tolerant buildings or green buffer in between the YLIEE and these receivers should always be considered priority approach to planning. Any operation noise from the industrial/ fixed sources in YLIEE also needs to be controlled under the Noise Control Ordinance (NCO). Recommendation on any restricted use of YLIEE will be made, where appropriate. Assessment will be conducted for both scenarios with and without YLIEE to facilitate either the Phase 2A or Phase 2B Study.

The potential public housing site and YLIEE will induce additional road traffic along nearby existing road networks such as Long Tin Road, Long Ping Road, Fuk Hi Street, Wang Lok Street, etc. Internal roads will also be planned. Road traffic noise on the proposed public housing development shall comply with the standard as stipulated in the Hong Kong Planning Standards and Guidelines (HKPSG). This should be achieved through optimised development layout and design (such as setback and self screening) as well as provision of mitigation measures (such as noise barrier).

The West Rail runs on viaduct section between Long Ping Station and Tin Shui Wai Station and is located close to the southern end of the proposed public housing development site. Potential railway noise impacts (i.e. rolling noise) are anticipated. Subject to the train noise source term and specific train operation including headways, train speed, etc., the at-source mitigation measures, the minimum setback distance required etc. will be determined to meet the requirements of NCO and HKPSG.

### 3.4.2 Air Quality

Chimney emission is another problem of IR interface. There are a number of chimneys inside the existing YLIE, though some might no longer be used. Amongst them, four are

Specified Processes (SP) from which toxic pollutants e.g. HCl, NH<sub>3</sub>, Styrene and H<sub>2</sub>S are also emitted.

The new Air Quality Objectives (AQO), which are to be implemented in 2014, will be adopted for assessment in this Study. The new AQO is more stringent. A review of the latest PATH model results for Year 2015, 2020 and 2030 (Jun 2012 version provided by EPD) indicates that the future 8 hour averaged ozone (O<sub>3</sub>) background concentrations in the study area would exceed the number of exceedances allowed in the new AQO limit. Although O<sub>3</sub> is a regional problem, as the Project is to plan for new sensitive developments, the O<sub>3</sub> level might also be considered by the EPD as potential constraints and hence will have to be addressed early in the study. There are also some exceedances of the background daily PM10 and PM2.5 concentrations. Although the new AQO has allowed 9 number of exceedances, there will be only little margin remaining for daily PM10 and PM2.5 from the contribution of local emission sources from chimneys and road traffic. They are all critical pollutant parameters in determining the environmental acceptability of the site. It also implies that the emission contributed by this Project e.g. from induced traffic, new roads, possible chimneys inside YLIEE, must be minimised.

### 3.4.3 Water Quality

Three natural streams are identified at Kai Shan. Runoffs from Kai Shan catchment are currently collected by these natural streams. The existing discharge points of north, east and south streams are located at the drainage nullah at the west of YLIE, box culverts at Fuk Hi Street and box culverts at Long Ping Road respectively. Water quality impact and the associated aquatic ecological impact may be arisen if stream diversion were proposed. Potential change of hydraulic regime and groundwater tables may lead to side effect as a result of stream diversion.

During construction phase, site runoffs will be a key issue to the nearby water quality sensitive receivers. Construction runoff may cause physical, biological and chemical effects. The physical effects include potential blockage of drainage channels and increase of Suspended Solid (SS) levels in the Deep Bay Water Control Zone (WCZ). Runoff containing significant amounts of concrete and cement-derived material may cause primary chemical effects such as increasing turbidity and discoloration, elevation in pH, and accretion of solids. A number of secondary effects may also result in toxic effects to water biota due to elevated pH values, and reduced decay rates of faecal micro-organisms and photosynthetic rate due to the decreased light penetration.

Additional sewage loading to Deep Bay catchment is anticipated from the development during operational phase. In addition to the provisions of the Technical Memorandum on Environmental Impact Assessment Ordinance (TM-EIAO), the 'No Net Increase in Pollution Loads Requirement' shall also be met to provide protection to the inland and marine water quality of the Deep Bay WCZ. The pollutions entering into Deep Bay have already exceeded the assimilative capacity of the water body. Increasing pollution loads to the water body is environmentally undesirable. In accordance with Town Planning Board (TPB) Guideline No.12B, the pollution loads of concern should be offset by equivalent reduction of current loads for new discharge into Deep Bay. As such, sewage compensation, either on-site or off-site, will be required.

### 3.4.4 Land Contamination

A large portion of the proposed public housing development site and YLIEE is currently occupied by different types of industrial uses including motor vehicle/equipment depots, petrol filling stations, metal workshops, waste recycling workshops, OS areas, container



yards and carparks etc. A large quantity of contaminated soil within the Study site is anticipated and thus the soil will have to be remediated in accordance with EPD's Practice Guide for Investigation and Remediation of Contaminated Land.

In addition, as a large portion of site area falls within the private land lots or under short term tenancy and the majority of the land is currently occupied by OS and vehicle repairing workshops which are all in operation, grant for site access is very unlikely. This will not only hinder the site appraisal works for preparation of the CAP, but also affect the programme of subsequent SI works. Even the SI work is allowed, the SI results obtained may not be able to truly reflect the actual land condition after land resumption. Two typical examples are presented as below.

- Even the sampling results are found to comply with Risk-Based Remediation Goals (RBRGs), potential of land contamination cannot be ruled out as the industrial activities within the site are still in operation and subject to change after land resumption.
- If sampling results are found to exceed RBRGs, the actual extent of land contamination after land resumption may not be identical to the current condition as the size and scale of industrial activities may be expanded within the site. The extent of contamination zone may be changed.

Re-appraisal of these sites would therefore be required after the land resumption. Detailed site inspection would be required at later stage to ascertain the extent of land contamination based on the up-to-date site condition.

### 3.4.5 Hazard

The Study site does not fall into consultation zone of any PHIs. As confirmed by HKSTP, there will also be no PHIs planned at the existing YLIE and future YLIEE, and the proposed Harvest Fatty Acid Methyl Ester and Edible Oil Plant Development at YLIE (ESB-225/2011 under EIA register) will no longer proceed. A review on the potential hazards, if any, to the potential housing site arising from existing and potential future dangerous goods storage/processing at YLIE and the proposed future extension will be conducted. If required and subject to further agreement with EPD, a hazard assessment will be carried out.

### 3.4.6 Landscape & Visual

The quality of the existing landscape within the study area has seen significant erosion as a result of the OS functions, influence from adjacent industrial uses and development of informal burial grounds within the hillside to the west and formation of access/circulation routes. Despite these issues, there is a great deal of landscape potential within the wider context, most notably provided by the escarpment of Kai Shan to the west and Chu Wong Ling to the east. Further to the north beyond the villages of Shing Uk Tsuen, Tai Tseng Wai and Ng Uk Tsuen lies the extensive and internationally important Hong Kong Wetland Park Special Area. The majority of the proposed industrial estate extension area is currently designated as OS. Whilst this land may lend itself to development for industrial purposes, comprehensive landscape integration and aesthetic design measures would be required to deal with the increased footprint of industrial land uses (built form and external functions).

Numerous trees existing within the study area and development works may have impact on this highly valuable resource. Tree survey information will be required to fully understand the nature, quality and extent of tree planting so that any impact on these resources can be fully quantified and measures identified to protect planting or compensate any potential losses.

The proposed residential development sits predominantly on land zoned as GB containing car parking, mixed agricultural land and scattered rural settlements. Development of this land would impact on the existing character, landscape resources and further encroach onto the adjacent CA. The key potential visual receptors around the site mainly comprise views from existing residential estates including the Long Ping Estate and villages such as Tai Tseng Wai, Ng Uk Tsuen, Fuk Hing Tsuen, Chung Sam Wai, Sai Tau Wai and Yeung Uk San Tsuen. In addition, the visibility of the development from key infrastructure routes and access/circulation roads needs to be considered such as the West Rail, Long Ping Road, Fuk Hi Street and Fuk Wang Street.

High ground to the west of the study area, predominantly designated as CA, including the peak of Kai Shan (100m APD) and associated ridges provide opportunities for panoramic views across the site from publicly accessible areas. The visibility to the site and interrelationship with this area is a key consideration of the landscape and visual assessment. In addition, the hillside of Chu Wong Ling also provides opportunities to over look the site from elevated points.

There are numerous other concurrent projects in the vicinity, mainly designed to unlock the development potential of the area balanced with the preservation and enhancement of the rich ecological resources present in the wider setting. Close liaison will be required with the relevant bodies, authorities, agencies and consultancies concerned with these projects to fully understand the constraints that these may pose to the landscape elements of this study.

### 3.4.7 Ecology

The Study site is located adjacent to the existing YLIE and Long Ping Estate, and is currently exposed to continuous human disturbance. The footprint of the site is not situated within any site of conservation importance. There is little literature about the ecological conditions of the site available. The ecological profile will be established through the desktop review and ecological surveys.

There are several areas of conservation interest in the proximity of the site and described below:

#### ***Wetland Conservation Area***

Deep Bay Area consists mainly of fishpond and is important to the wetland dependent species due to its integrity. To protect this large area of fishpond area, Wetland Conservation Area (WCA) is designated to protect and conserve the ecosystem in the area from development as development is not allowed unless it is related to the conservation of the area or critical to the public.

WCA is approximately 500m from the Study site, and falls within the Study Area at the northern part and is situated immediately north to the Study Area. As the site is located at a distance from the WCA and the surroundings are developed, there is no significant additional impact anticipated from the Project.

#### ***Wetland Buffer Area***

Wetland Buffer Area (WBA) is the buffer area (approximately 500m in width) of WCA and is located immediately next to the site boundary to the north. The designation of the WBA is to protect the ecological integrity of the fishpond and wetland within the WCA and protect the WCA from the negative impacts arising from the developments.

As the surroundings of the site, which are within WBA, are developed for many years, no significant additional ecological impact is anticipated due to the Project.

### ***Conservation Area***

The area to the immediate west of the Study site is zoned as CA in the Approved Ping Shan OZP no. S/YL-PS/14. This zone is intended to protect and retain the existing natural landscape, ecological or topographical features of the area for conservation, educational and research purposes. There is a general presumption against development in this zone. In general, only developments that are needed to support the conservation of the existing natural landscape or scenic quality of the area or are essential infrastructure project with overriding public interest may be permitted.

#### ***Watercourses at Kai Shan***

Kai Shan is situated to the west of the Study site and there are a number of watercourses on this hill. Given the limited development on Kai Shan, the uphill sections of the watercourses are believed to have limited human disturbance. These sections are also protected from development as they fall within the zone of CA. A section of a watercourse flows towards the northern part of the Study site and is occupied by agricultural land (based on desktop review of aerial photos). This lower section is believed to be disturbed and polluted due to its proximity to the agricultural land.

#### ***Confluence of Kam Tin River and Shan Pui River***

Kam Tin River and Shan Pui River are under the influence of tidal actions and the confluence of these two rivers provides intertidal mudflat habitat to the foraging birds during periods of low tide. This area, located at the proximity of the fishponds area in Deep Bay, attracts a diversity of wetland dependent bird species. The riparian vegetation, dominated by true mangrove and their associates, along the rivers also provides habitat for roosting birds.

Given that the confluence of these two rivers is located more than 1000m from the site and they are separated by the existing YLIE, no significant ecological impacts are anticipated due to the Project.

#### ***Nam Sang Wai***

Nam Shan Wai consists mainly of fishpond area and other wetland habitats (such as reedbed). Due to its proximity to the Deep Bay fishpond area and the confluence of the Kam Tin River and Shan Pui River, it is also an ecologically important area for wetland dependent species.

Nam Shan Wai is located more than 1000m from the site and is separated by the existing YLIE, no significant ecological impacts are anticipated due to the Project.

### **3.4.8 Fisheries**

Based on a preliminary check of the basemap, there are no ponds found within the Study site, but there are ponds found in the area to the west of the Study site and in the northern and northwestern part of the Study Area. The latter ponds are all located within WCA or WBA. The ponds within the Study Area should be protected from indirect impacts (such as pollution) on the aquaculture activities, if any.

### **3.4.9 Cultural Heritage**

#### **3.4.9.1 Archaeology**

The Study Area contains no known sites of archaeological interests. A large part of the landform within the Study Area however, has limited disturbance and thus archaeological

potential may exist. Historical villages, dating back to the Ming/Qing Dynasty are located in the general vicinity of the Study Area, such as Sheung Cheung Wai Site of Archaeological Interest and may be indicative of historical use of the area.

### 3.4.9.2 Built Heritage

The Study Area contains a number of historical villages, including Shing Uk Tsuen, Ng Uk Tsuen, Tai Tseng Wai, Tung Tau Wai, Fuk Hing Tsuen, Chung Sum Wai, Sai Tau, Yeung Uk Tsuen, Lam Uk Tsuen, Fung Chi Tsuen and Shui Tin Tsuen. A declared monument and some graded historic buildings are also found. They are listed in **Table 3.1** below.

**Table 3.1** Declared monument and graded historic buildings identified in the study area

Description	Declared monument / Graded buildings
The I-Shing Kung	Declared monument
Yu Yuen at Tung Tau Wai	Grade 2
No. 38 Fuk Hing Tsuen	Grade 3
No. 40 Fuk Hing Tsuen	Grade 3
No. 41 Fuk Hing Tsuen	Grade 3
Nos. 4 and 7A and lot WCL132 in DD123 at Sai Tau Wai	Grade 3
The entrance gate of Tai Tseng Ng Uk Tsuen	Grade 2
No. 39 Shing Uk Tsuen	Grade 3
No. 40 Shing Uk Tsuen	Grade 3
No. 41 Shing Uk Tsuen	Grade 3
No. 42 Shing Uk Tsuen	Grade 3
No. 43 Shing Uk Tsuen	Grade 3
The Tin Hau Temple at Fung Chi Tsuen	Grade 1
Lung Wah Yuen at No. 83 Fung Chi Tsuen	Grade 3

The historical villages and surrounding area are also likely to contain ungraded historical buildings and structures, and parts of the Study Area, especially at Kai Shan are also known to contain burial areas with numerous grave groupings.

## 3.5 Air Ventilation

Analyses of wind data collected at Waglan Island by Hong Kong Observatory (HKO) have clearly demonstrated that, on a probabilistic basis, annual prevailing and strong non-typhoon winds approaching Hong Kong occur mainly from the north-east quadrant and, to a lesser extent, the south-west. On a seasonal basis, winds approaching Hong Kong from south-easterly to south-westerly directions are typically associated with the warmer summer months from June to August, whereas strong winds from the north-east quadrant are likely to occur during autumn, winter and spring. Winds from the north-west are typically the weakest non-typhoon winds affecting Hong Kong.

The proposed development site is surrounded by complex terrains. Mai Po Natural Reserve and Lut Chau are located to the north of the site. Due to the relatively open exposure, winds approaching from the north are unlikely to be significantly interrupted. Kai Shan is located immediately to the west of the proposed development. Moreover, Tin Shui Wai and Yuen Long are located to the west and the south of the proposed development site, respectively. There are a number of residential buildings with heights less than 120 m. Due to the close proximity to these high rise residential buildings and Kai Shan, southerly and westerly winds to the proposed development site are likely to be moderated. To the east of the site are Long

Ping Estate and Tung Tau Industrial Area with building heights ranging from approximately 50 m to 100 m. Winds from the east are also likely to be moderated by these buildings.

Tai Lam Country Park and Lau Fau Shan are significant topographies located to the south and west of the proposed development site respectively. These topographies have peak elevations of over 300 mPD and are likely to have diminishing effects on the southerly and westerly winds approaching the site.

### 3.6 Land Resumption, Clearance and Re-housing

Since the Study site mainly consists of open storage areas and private lands, land resumption, clearance, re-housing and/or reprovisioning of the affected lots, short term tenancies, Short Term Waivers, Modification of Tenancy Permits, Government Land Licences, temporary and permanent land allocations, structures and cultural and religious features will be inevitable for the proposed development and associated infrastructures/facilities. While the land resumption cost of the private lots will be based on the standard compensation rate in accordance with the Lands Department Compensation Zonal Plan, any potential difficulties in the land resumption process and implication on the land resumption cost will be highlighted in the financial assessment.

### 3.7 Socio-Economics

#### 3.7.1 Housing Mix in the Surrounding Area

The proportion of public housing (public rental housing and subsidized sale flats) in Yuen Long new town is significantly lower than Tin Shui Wai new town (58% lower) and is 35% lower than the average of all new towns in Hong Kong. By comparison, the proportion of private housing in Yuen Long is substantially higher.

**Table 3.2** Proportion of housing type in new towns

Areas/ New Towns	Public Rental Housing	Subsidized Sale Flats	Private Permanent Housing	Others	Total
Yuen Long	14%	8%	77%	1%	100%
Tin Shui Wai	59%	21%	20%	0%	100%
All New Towns	35%	22%	42%	1%	100%

Source: 2011 Population Census

#### 3.7.2 Demand for Public Housing

The current demand for PRH in Hong Kong has remained strong. The applicants on the HKHA waiting list for a PRH unit has increased by over 100% from 91,000 in 2004/05 to 189,000 in 2011/12 but only around 11% of the applicants were allocated the PRH units. The average waiting time between 2004 and 2012 is two years (**Table 3.3**). HKHA has been striving to achieve its target of maintaining the average waiting time at three years by increasing housing production and encouraging upward mobility among existing tenants. The development of public housing in the Study Site will help the HKHA to achieve the targeted waiting time.

**Table 3.3** Application for PRH unit (2004-2012)

	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012
No. of Live Applicants on	91,000	97,000	107,000	112,000	114,000	129,000	152,000	189,000

	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012
the Waiting List								
Average Waiting Time (Years)	1.8	2.0	1.8	1.9	1.8	2.0	2.0	2.6

Source: Hong Kong Housing Authority

### 3.7.3 Future Development Industrial Estate Development in Hong Kong

It is important that the proposed and future development of industrial estates and related industry accounts for the YLIEE development. This is to ensure that the new development will integrate with the existing facilities in Hong Kong to create synergies and complementary clusters rather than competing with them directly.

Hong Kong Science Park Phase 3 Development commenced in 2011 and is expected to be completed by 2015 providing technology-driven infrastructure for start-ups and support services for technological start-ups.

In addition, according to The Planning and Development Study on North East New Territories, the northern portion of Ping Che/Ta Kwu Ling will be reserved for high value added non polluting special industries. This includes testing and certification services, innovation and technology and environmental industries<sup>2</sup>.

## 3.8 Community Engagement

The proposed development on the Study Site is in close proximity to Kai Shan CA. On the other hand, the proposed high-rise public housing development will likely be visible from Kai Shan as well as the neighbouring villages and Long Ping Estate. Any proposed development may arouse scepticism from local people on its potential environmental and visual impacts. The future development will also bring in new residents and workforces, which may raise the locals' concerns on crowdedness of the vicinity. A well-planned community engagement programme, targeting local people and other key stakeholders in Yuen Long District should be formulated to facilitate consensus building within the community.

It is noted that the community engagement is also intended to facilitate the subsequent rezoning of the Study Site for public housing use, industrial estate use and other associated uses. However, public objections and resentment may not be eliminated significantly in the ensuing rezoning process. The public may make use of the public consultation mechanism in the rezoning process to raise their objections again. In other words, the dual purposes of the community engagement exercises may not be fully achieved.

## 3.9 EIAO process

An EIA will be conducted to meet the TM-EIAO requirements and to confirm the feasibility of the designated projects including but not limited to: i) the planning and engineering study for the Site under Schedule 3 of the EIAO; ii) YLIEE under Schedule 2 of EIAO; and iii) any

<sup>2</sup> Source: Stage Two Public Engagement Digest November 2009 of North East New Territories New Development Areas Planning and Engineering Study

other supporting facilities, works and projects identified in the Study that fall within Schedule 2 of EIAO.

## 4 STUDY APPROACH AND METHODOLOGY

### 4.1 Study Framework

The Study will be conducted in two stages – “Technical Feasibility Study Stage” and “Community Engagement, Rezoning and EIAO Stage”. In Stage 1, a Preliminary Recommended Option will be derived based on findings from Baseline Review, Preliminary Feasibility Study and Technical Assessments. In Stage 2, community engagement will be conducted to collect public views on the Preliminary Recommended Option. The views together with updates of previous studies will be used for formulation of a Recommended Option.

In Stage 1, **Baseline Review** on both the planning context and technical aspects will be conducted and key issues will be consolidated. The planning context includes review of relevant policy objectives and strategic planning studies and examination of development opportunities and constraints like site conditions, existing and planned land uses, existing and planned public and private developments, provision/ re-provision of welfare and G/IC facilities etc. Technical aspects include environment, geology, drainage, sewerage, air ventilation etc. Ecological and cultural heritage baseline will identify “no-go” areas of the Study Site and/ or portion of the Study Area.

Guiding principles for the planning of the Study Site will be established based on results from Baseline Review. These principles will cover such aspects as land uses, urban design, building mass, economic development, environment and other technical constraints etc. Based on these principles, **Initial Development Options** on future land uses and development density of the Study Site will be formulated. **Preliminary Feasibility Study** will be carried out and the options will be evaluated against a set of pre-determined criteria for formulation of a **Preferred Option**.

**Technical Assessments** will be conducted to confirm the feasibility of the Preferred Option. During the process, the Preferred Option may be refined and concerned assessments will be updated accordingly.

Taking into account the views and comments from the Study Steering Group, the Preferred Option will be refined to formulate a **Preliminary Recommended Option**. The Preliminary Recommended Option will be presented in forms of PODP, PUDLP and PMLP. An action plan and implementation programme will be prepared for the option. A financial assessment/ appraisal will be conducted to demonstrate the viability of the proposed public housing development and YLIEE.

In Stage 2, community engagement activities will be launched to solicit public views on the Preliminary Recommended Option. EIA and rezoning processes will also be commenced. Taking into account the views and comments from relevant parties during Stage 1 and 2 studies, community engagement, rezoning and EIAO processes and other updated findings from previous studies, a **Recommended Option** in forms of RODP, RUDLP and RMLP will be derived. Implementation and Costing Report, documents for preparation of Project Definition Statement and Technical Feasibility Statement, Final Report and Final Executive Summary will also be produced at the final stage of the Study.



## 4.2 Land Use Planning & Urban Design

### 4.2.1 Land Use Planning & Urban Design

In recognition of the complexity of the Study Site and importance of formulating a pragmatic and feasible scheme, an “Integrated Planning” approach will be adopted to streamline the planning, design and assessment processes which are iterative by nature. Planning and design schemes will be developed with broad engineering assessments being conducted in parallel. By the same token, engineering solutions will be formulated with due regard to potential public reactions. A fully integrated design-led approach will also be employed to provide innovative solutions in dealing with the complexity of the Study Site.

With regard to the issues related to land use planning and urban design, the following procedures will be carried out:

- Establish a baseline profile of the Study Area and its relationship with the adjoining areas and conduct a review of issues that would affect the site e.g. provision of welfare and community, G/IC, open space, recreational and retail facilities, building height, visual impact and landscape etc. The principal development constraints and opportunities within and around the Study Area will also be reviewed.
- Establish guiding principles and formulate initial options for public housing site and YLIEE with specific attention to industrial lot sizes, optimal public housing development layout, desirable development intensity etc.
- Carry out preliminary feasibility assessments on such aspects as urban design to demonstrate the feasibility of the Initial Development Options.
- Evaluate the Initial Development Options against the pre-determined criteria and derived a Preferred Development Option for the proposed development.
- Update/ undertake planning assessments among others to confirm the feasibility of the Preferred Development Option.
- Prepare PODP, PUDLP and PMLP for the Preliminary Recommended Option.
- Conduct community engagement on the Preliminary Recommended Option.
- Refine relevant assessments conducted in Phase 1 in light of the outcome of the community engagement for formulation of RODP, RUDLP and RMLP for a Recommended Option.
- Examine the implementation mechanism, approaches and framework for the implementation of the proposed development and provide details of land requirement and outline development programme.
- Facilitate rezoning for public housing use, industrial extension use and other associated uses.
- Prepare Final Report and Executive Summary for the Study.

## 4.3 Transport and Traffic Impact Assessment

The Transport and Traffic Impact Assessment (TTIA) will form the major part of the assessment in addressing the transport/traffic issues and formulating the corresponding solutions and recommendations. The assessment shall include impact of the land use proposals on pedestrian traffic within the area of influence. Other aspects, including the

impact on vehicular traffic within the area of influence, shall also be assessed where appropriate. All committed and planned transport proposals and development proposals, which are likely to have a bearing on the land use proposals or may create cumulative traffic impact, will be taken account. The tasks of the TTIA include:

- Review available traffic data for traffic forecast;
- Conduct traffic surveys and collect the relevant information for validating the transport models;
- Forecast traffic and pedestrian flow and pattern generated and attracted by the public housing development proposal and YLIEE within the area of influence;
- Assess the performance of affected road network and junctions for the without development options and various development options, if applicable;
- Consolidate the operation performance of the junctions and road network to derive appropriate mitigation measures where appropriate;
- Anticipate the demand for public transport services and formulate strategy on public transport service to service the proposed development;
- Conduct assessment for the construction period and devise suitable temporary traffic management measures to alleviate the impact;
- Carry out preliminary schematic design of the proposed improvement scheme and measures.

Land requirements associated with road widening proposals and junction improvement scheme is envisaged to be the key constraints in developing access arrangement. In view of this, more effective access arrangements should be explored in order to facilitate traffic from the east and west to access the subject development. Suitable traffic management schemes would be explored to segregate heavy movements of industrial traffic from resident traffic with due consideration on road and pedestrian safety.

Congested road junctions along the access roads should be reviewed. Opportunity to widen the problem junctions, which is constrained by the columns of West Rail bridge structure and the nullah along the access routes, should be explored. Besides, alternatives connecting the proposed development and strategic road network should be investigated together with the strategy to divert traffic away from the congested junctions.

A two-tiers transport model is proposed to produce traffic forecast in the study area. The upper tier consists of the Arup in-house Comprehensive Transport Study (CTS3) compatible transport model and the lower tier is a local area transport model. Junctions and local road details are inserted into the local area traffic model to ensure its suitability for the use in traffic impact assessment. The upper tier transport model will consider regional development, infrastructure development and the socio-economic factor to produce traffic pattern and traffic volume. The local area traffic model will then take the developed traffic pattern and traffic volume to produce traffic forecast in the study area.

Availability and suitability of the Base District Traffic Model (BDTM) for the use in this study will be reviewed. Due consideration will be paid to evaluate the inclusion of proposed development in the developed BDTM. If the proposed development is included, update to the traffic model should be made, otherwise, traffic demand for the proposed development should be inserted into the traffic model. In either case, traffic demand will be estimated in accordance with the derived development options.

In view of the different arrival patterns of resident traffic and employment traffic of the public housing development and YLIEE respectively, suitable public transport strategy should be identified. The likely impact on adjacent public transport services will be investigated in order to minimise the potential impact of the new transport services on the existing public transport routes serving Long Ping Estate. Alternatively, network expansion of the existing services could be explored.

## 4.4 Engineering Assessments

### 4.4.1 Geotechnical Feasibility/Assessment Study

In consultation with GEO, and with due reference to Appendix 1.34 of the current Project Administration Handbook for Civil Engineering Works, the geotechnical feasibility of the development and infrastructure will be assessed. This assessment will aim to identify all potentially significant geotechnical constraints on the proposed development. Solutions to these issues will be recommended and a schematic design for the various geotechnical elements developed. This assessment will identify all required geotechnical studies, investigations and works required for the development and infrastructure whether they are within or outside the Study Area.

#### 4.4.1.1 Desk Study

During the initial stages of the geotechnical feasibility/assessment study, a desk study and site walkover survey will be undertaken. The desk study will draw on a range of relevant existing data including topographical maps (both current and historical), geological maps and memoirs, aerial photographs, all available existing GI data, GEO slopes records, and any relevant BD and GEO records and existing engineering study reports for existing developments in adjacent sites. This will allow the development of a preliminary ground model which will allow a better understanding of the prevailing topographical, geological, geomorphological and geotechnical conditions and the ground related constraints on the development of the site.

A key element of the desk study process is a detailed aerial photograph interpretation (API). Aerial photographs will be used to review the historical development of the site, as well as in the natural hazard assessment. Observations with regard to geomorphology, distribution of regolith and terrain types, drainage channel characteristics, landslide hazard morphology, erosion features, photo-lineaments, vegetation, landform process, evidence of hill fires and the presence of man-made features, as well as any anthropological features and the development history will all be recorded. Such details may provide valuable information for the design of site formation and natural terrain hazard mitigation works for the proposed development.

The scope for GI works will be developed in parallel with the desk study, drawing on any available existing GI and LT data reviewed, in addition to the other sources of desk study data. The preliminary ground model will inform the initial development of the options for the site, and will be used in the design of GI works to inform the schematic design of geotechnical works including natural terrain hazard mitigation measures. The extent of GI will be heavily constrained by access requirements as discussed in the section above.

#### 4.4.1.2 Existing Slopes

The Geotechnical Feasibility/Assessment will include a review of the stability of man-made slope features which may affect or be affected by the proposed development and associated

infrastructure. Due reference will be made to Environmental, Transport and Works Bureau (ETWB) TC(W) No. 29/2002 for the geotechnical control of slopes and retaining walls. The requirement for any slope upgrading or modification works will be identified.

Natural terrain hazards such as landslides will be covered by a separate natural terrain hazard assessment study, as described in S4.4.2 below.

#### 4.4.1.3 Foundations

The Geotechnical Feasibility/Assessment will also review the suitability of ground conditions for foundation purposes, making due reference to ETWB TC(W) No. 4/2004 for the geotechnical control for foundation works in Scheduled Area No. 2. Once the GI data is available, marble site zoning can be undertaken in accordance with GEO Report 29 on the Classification and Zoning of Marble Sites. This will help to identify any areas of adverse foundation conditions. This can be used to inform the layout of the preferred development option. Adjusting the location of significant structures to avoid areas of adverse ground may be the most economical means of dealing with serious problems posed by cavities and very deep rockhead.

#### 4.4.1.4 Blasting

It is not anticipated at this stage that any blasting will be required for this project. However, this will be further reviewed under the Geotechnical Feasibility/Assessment study and if it is determined that blasting will be required; a blasting assessment will be undertaken. This will identify the key potential hazards and sensitive receivers, and the major constraints relevant to the transport, storage and use of explosives for any proposed blasting works, and identify the scope and extent of investigations and geotechnical studies required to reduce uncertainties and risks, and to demonstrate the practicability of satisfying any constraints identified.

#### 4.4.1.5 Site Formation

Site formation design, analysis, quantities and plans will be covered under the Site Formation Assessment, as described in S4.4.3, below.

### 4.4.2 Natural Terrain Hazard Study

A phased approach to the natural terrain hazard study (NTHS) will be undertaken, as described below:

#### I) Natural Terrain Hazard Planning Study (NTHPS)

This initial phase of study will include a desk based review of the site topography and geomorphology of the natural slopes adjacent to the site. NTHS screening will be undertaken in accordance with the methodology set out in GEO Report 138. This will allow determination of any zones of the site which meet the 'alert' or 'in principle objection' criteria. The results of this screening process will provide key information for the initial planning process and identify areas which require further study.

#### II) Natural Terrain Hazard Review Study (NTHRS)

The second phase of this study will build on the first phase, with natural terrain and man-made slope hazards reviewed initially via desk study and using detailed API. Information on and evidence of drainage channels, colluvium, rock outcrop, extent of boulder fields, slope

angles and morphology, vegetation, ground water and past landslide or boulder fall events will all be reviewed.

A preliminary field reconnaissance survey will be undertaken to supplement the desk study and API, and assist with the development of a preliminary Engineering Geology model. The character, size, frequency and likely location of natural terrain hazards affecting the proposed development and associated infrastructure will be determined. This will allow the development of initial design event scenarios which need to determine an outline design and estimate broad costs for any mitigation measures. The design events will be developed based on assumptions about the nature and layout of the proposed development. The constraints on the site development options, including feasibility of the proposed public housing, will be reviewed and layouts further reviewed based on the findings of the NTHRS. The preliminary ground model will also be used to plan any GI required for completion of the study.

### **III) Natural Terrain Hazard Assessment Study (NTHAS)**

GI for the Natural Terrain Hazard Study will be undertaken along side geotechnical investigations for the rest of the Study Area, subject to the various potential constraints described in Section 4.4.4, below. A boulder survey may be incorporated into the GI, depending on the findings of the NTHRS.

Detailed field mapping will be undertaken to further investigate key evidence of natural hazards identified by the NTHRS. Data from the GI and field mapping will be used to further develop the preliminary ground model from the NTHRS. The design events will be reviewed and refined based on the additional information gained, and any required analysis such as debris mobility modelling, and the layout of the preferred development option. This will allow development of schematic design and cost estimates for any natural terrain mitigation measures for the preferred development option.

## **4.4.3 Site Formation Assessment**

### **4.4.3.1 Desk Study**

The desk study undertaken as part of the Geotechnical Feasibility/Assessment study will cover the collection, review and interpretation of relevant information in respect of geotechnical and other physical conditions pertinent to the site formation for the developments and associated infrastructure.

### **4.4.3.2 Site Formation Design**

A comprehensive review of site formation requirements will be conducted using a Geographic Information System (GIS) database and 3D model. Taking into account the findings of the Drainage and Sewerage Impact Assessment, the shape, size and site formation level for the platforms will be designed to achieve a balance of cut and fill in order to minimise the volume of fill material imported and/or reduce the creation of unnecessary Construction and Demolition (C&D) material. The proposed new platforms shall follow the existing ground profile as far as practical.

The site formation assessment will also determine the most suitable formation techniques, with particular reference made to the engineering infrastructure provisions and upgrading works requirements as well as the findings of the Drainage and Sewerage Impact Assessment studies under this Study, whether within or outside the Study Area.

The schematic site formation design will be developed with input from across the project team taking into account all geotechnical, traffic and environmental constraints, land-use proposals, drainage, sewerage and other infrastructure. Requirements associated with contaminated soil, and optimum utilisation of imported fill and stockpile material will also be incorporated. The schematic design will include details of haul routes, retaining walls and slopes works required to cater for the final formation levels of the development. Site formation plans, contour lines and sections will be prepared, along with an earthwork inventory for each site formation phase.

#### 4.4.3.3 Sources of Fill

Whilst the volume of imported fill will be minimised during site formation design, it is likely that it will be necessary to import some fill to the site for site formation. As such, an assessment of potential sources of fill will be undertaken in consultation with Public Fill Committee (PFC), EPD and Marine Department (MD). The feasibility and cost of using the following sources will be considered: marine and land borrow areas; public filling by land and barge; formation of fill banks; fill from Government contracts; fill from outside Hong Kong. Aspects that will be assessed for each of these potential sources of fill include transportation mode and haulage route; traffic and environmental impacts of haulage; location of the stockpiling areas; suitability and availability of the sources of fill to meet the final development programme of the preferred development option; restoration measures required for borrow areas. Recommendations on the most appropriate sources of fill shall be made based on these considerations.

#### 4.4.3.4 Disposal of C&D Waste

Whilst the volume of C&D waste will be minimised during site formation design, it is likely that it will be necessary to export some C&D waste from the site during site formation. As such, an assessment of potential disposal sites for C&D waste will be undertaken in consultation the PFC and EPD. The suitability of the grounds and traffic and environmental impacts of haulage will be considered in order to identify a suitable dumping ground. For the preferred disposal site, the schematic design will include restoration measures, transportation mode and optimum haul route, taking into consideration the requirements of minimising the nuisance caused by the spoil moving/dumping activities to the environment.

### 4.4.4 Ground Investigation and Laboratory Testing

As described in Section 4.4.1.1, a desk study and site walkover survey will be undertaken during the initial stages of the study. This will incorporate a review of all existing available GI and LT data for the Study Area. The preliminary ground model developed from the desk study and API will be used to determine requirements for GI and LT. Upon the commencement of the Study, the available GI and LT results (if any) will be reviewed and the scope of GI and LT required to be carried out by the Employer's GI term contractor for the development and infrastructure will be identified. The scope will be determined with input from various members of the project team to ensure that the information required to support the development of the schematic design is obtained, subject to the various constraints described above. Where possible, the contaminated land investigation will be combined with the GI under the same HKHA term contract works to ensure the whole investigation process is managed as efficiently as possible.

The GI and LT will be undertaken using the Employer's GI term contracts, with Arup undertaking the role of 'supervision in chief' for the works orders issued. As such, Arup will be responsible for administration, design, supervision and overseeing implementation of the

GI and LT works. Measures will be taken to ensure all Building Ordinance (and subsidiary regulations and contract specifications) are complied with.

Once the requirements for GI have been determined, a GI proposal including a GI plans and works schedule will be prepared and submitted to the ICU of HD for approval. Approvals from other regulatory authorities will also be sought, along with records of utilities at the site. Assistance in obtaining land access permission and excavation permits will also be provided. This includes liaison with private land owners and tenants of Government land and Government authorities. This liaison will however be constrained by the confidential nature of the project, as discussed above.

Once the GI and LT works have been completed, the draft and final reports will be checked to ensure quality, accuracy and completeness. All completed GI will be incorporated into the ground model for the site and used for schematic design as part of the technical assessments. Recommendations for further GI required for detailed design will also be proposed.

#### 4.4.5 Drainage Impact Assessment

In carrying out input for drainage to support the proposed development, the following tasks will be undertaken:

- Obtain and examine the Review of DMP in Yuen Long and North Districts – Feasibility Study Final Report Agreement No. CE46/2007 (DS);
- Obtain and examine the existing and proposed drainage for the proposed site and its surroundings;
- Carry out a site inspection of existing drainage features, culverts etc and prepare a preliminary schematic design based on drainage records and site observations;
- Determine the capacity of the existing and proposed drainage system immediately downstream of the proposed site;
- Estimate the surface runoff based on the proposed paved area;
- Assess the effect of the proposed development on the existing and proposed drainage system; and
- Prepare a preliminary schematic design showing the major proposed drainage works including measures to deal with surface runoff of the site and the discharge point to the existing drainage system.

#### 4.4.6 Sewerage Impact Assessment

In carrying out input for sewerage to support the proposed development, the following tasks will be undertaken:

- Obtain and examine the Yuen Long SMP Review Report and the Feasibility Study Report of the Provision of Sewerage to Unsewered Areas/Villages in Northwest New Territories;
- Identify the assumption of population, daily sewage flows, etc. allowed for the proposed site in the Yuen Long Sewage Treatment Works and obtain from EPD and DSD the updated Yuen Long Sewage Treatment Works capacity, any spare capacity remaining and programme.

- Collect updated information about future population, developments and projected sewage flow from PlanD, CEDD and relevant departments.;
- Obtain and examine the existing and proposed sewerage for the proposed site and its surroundings;
- Carry out a site inspection and prepare a preliminary schematic design based on sewerage records and site observations;
- Determine the capacity of the existing sewerage system and any proposed sewers immediately downstream of the proposed site;
- Estimate the sewage flow based on the proposed development schedule and determine the sewerage discharge connection proposal to any existing and proposed public sewerage system in the area;
- Assess the impact of the developments and associated works on the existing, committed and planned sewerage system and sewage treatment and disposal facilities in Yuen Long, and where necessary to recommend and undertake measures to mitigate these impacts; and;
- Prepare a preliminary schematic design with proposed mitigation measures if any.

The sewerage and sewage implications of the Project will also be included as part of the EIA to meet the requirements set out in the EIA Study Brief and TM-EIAO.

#### **4.4.7 Waterworks Impact Assessment**

The following tasks for waterworks impact assessment will be undertaken:

- Gather information from Water Supplies Department (WSD) regarding the freshwater and saltwater record plans, supply zone information and any reserved capacity for freshwater and saltwater supply to the proposed site;
- Prepare water demand assessment based on the development schedule of the proposed site and following the WSD Departmental Instruction No. 1309;
- Liaise and agree with WSD on location of water main connection and the associated sizes; and
- Prepare a preliminary water main layout plan showing the major proposed waterworks and the location of proposed water main connection.

#### **4.4.8 Assessment on Other Engineering Infrastructure and Utilities**

The following tasks for assessment on utilities will be undertaken:

- Gather information from utility undertakings and government departments regarding the existing utility information, lead-in arrangement and service provision;
- Liaise and agree with utility undertakings on location of utility lead-in arrangement and service provision; and
- Prepare a preliminary utility layout plan showing the major proposed utility and the location of proposed utility connection.



## 4.5 Environment Assessment

### 4.5.1 Noise

The landuse in the vicinity of the Study site is a mixture of urban and rural areas. Existing noise sources are road traffic from Long Tin Road, Long Ping Road, Fuk Hi Street and Wang Lok Street, train from West Rail Line, helicopter traffic and industrial operation inside YLIE. The baseline condition will be established by means of desktop study and site survey.

The desktop study undertaken will cover the collection and review of environmental legislation and guidelines, relevant information on the concurrent projects in vicinity of the Study site, topographic maps, aerial photos, relevant OZP, Outline Development Plans (ODPs) and Layout Plans, the current and future operating information for West Rail such as train types, headway, deck types, speed profile, etc.

All legislation and guidelines that are relevant to the noise assessment will be identified and reviewed, including but not limited to the following:

- TM on Noise from Percussive Piling (TM-PP);
- TM on Noise from Construction Work other than Percussive Piling (TM-GW);
- TM on Noise from Construction Work in Designated Areas (TM-DA);
- Technical Memorandum on Noise from Places other than Domestic Premises, Public Places or Construction Sites (TM-Places);
- Criteria and guidelines for evaluating and assessing noise impact as specified in Annexes 5 and 13 of the TM-EIAO;
- EIAO Guidance Note No. 12/2010 Road Traffic Noise Impact Assessment Under the EIAO

The baseline review study will also cover a review of all possible concurrent projects in vicinity of the Study site that may have cumulative impacts. Information available from the public domains (e.g. approved reports, study brief, project profile etc) will be collated. The project proponents of the concurrent projects will be approached to verify the best available information for assessment. As most of the projects are on-going and their implementation programmes and design layouts are subject to changes, details of the concurrent projects will be continually reviewed and discussed with the respective project proponents during the course of this Study. A list of the tentative concurrent projects identified at this stage is given below:

- Housing Sites in Yuen Long South, Civil Engineering and Development Department (CEDD)
- Proposed Comprehensive Development with Wetland Enhancement (CDWE) at Nam Sang Wai and Lut Chau, Nam Sang Wai Development Co. Limited; Kleener Investment Limited; Community Wetland Park Foundation Limited; and Lut Chau Nature Reserve Foundation Limited
- Effluent Polishing Scheme at Yuen Long Sewage Treatment Works, DSD
- Construction of Cycle Tracks and the associated Supporting Facilities at Nam Sang Wai, Yuen Long, CEDD
- Proposed Comprehensive Residential Development at West Rail Long Ping Station (North) Site, MTRCL

- Proposed Comprehensive Residential and Commercial Development at Government Land in Tin Shui Wai Area 115, HKHS
- Proposed Development at Government Land in Tin Shui Wai Area 112 (Site B), HKHS
- Proposed Comprehensive Residential Development at a site to the south of West Rail Long Ping Station at Ping Shun Street, Mass Transit Railway Corporation Limited (MTRCL)
- PWP No. 4370DS Village Sewerage at Wang Chau of Yuen Long, DSD
- Agreement No. CE 4/2011 (HY) Improvements to Pedestrian Environment in Yuen Long Town - Feasibility Study, Highways Department (HyD)
- New HOS Development at Tung Tau, Yuen Long, HD
- Public Housing Development at the Former Yuen Long Estate Site, HD

Noise Sensitive Receivers (NSRs) including existing uses (e.g. Long Ping Estate, Yeung Uk Tsuen, Ka Fuk Court, Rose Garden, Chun Yick Garden, Tai Tseng Wai, Shui Tin Tsuen, etc), committed and planned uses within 300m from the boundary of the Study site will also be identified at baseline review stage. The committed and planned NSRs will be mainly based on the relevant OZP, ODP and Layout Plans.

Site survey will be undertaken to identify and verify the existing NSRs and existing industrial noise sources including those inside YLIE and scattered workshops on YLIEE. An emission inventory of noise sources will be compiled. Noise measurements will be conducted to establish the prevailing background noise levels and the Area Sensitive Rating will be determined in accordance with TM-Places. All these findings will be incorporated into the Baseline Review Report.

#### 4.5.1.1 Construction Noise

Potential noise impact during construction phase would be due to the operation of powered mechanical equipment (PME). Construction noise assessment will be conducted in accordance with the TM-EIAO. The construction methodology for site formation and superstructure within Study site and any other associated infrastructure works such as road improvement work will be established which will identify the construction plant inventory (both types and quantities), and construction schedule and duration for each of the works. Based on the sound power levels of the PME items, construction noise levels at NSRs will be predicted according to the methodology given in the TM-GW.

Noise mitigation measures such as movable noise barrier, enclosure, Quality Powered Mechanical Equipment (QPME) will be proposed so that the construction noise impacts from this Project will comply with the noise standards for daytime construction activities in Table 1B of the TM-EIAO, Annex 5. Duration of the noise exceedance will be presented if the mitigated noise levels still exceed the criteria.

Cumulative impacts due to other concurrent projects such as construction of cycle track along Fuk Shun Street during construction will be assessed.

#### 4.5.1.2 Road Traffic Noise

Road traffic noise calculation will be based on the method of UK Department of Transport "Calculation of Road Traffic Noise (CRTN)". The maximum peak hour traffic flow within a 15 years period upon commencement of the Project will be adopted. The traffic forecast used

in EIA will be prepared and submitted to TD for endorsement. The unmitigated, mitigated and the prevailing scenarios if required for indirect technical remedies eligibility assessment will be conducted. The calculated noise levels (in  $L_{10}$  at 1 hour) at the NSRs will be checked for compliance against TM-EIAO requirements.

Where necessary, noise mitigation measures such as building setback and building orientation for planned NSRs, noise barrier / enclosure along Long Tin Road, Long Ping Road, Fuk Hi Street, Wang Lok Street, etc will be proposed to minimise noise impact during operation of the Project. For the planned public housing development, mitigation measures will be proposed such that the noise criterion is achieved. The implementation agent for the proposed noise mitigation measures will be agreed with relevant parties along with the EIA report during the Phase 2 of the Study.

#### 4.5.1.3 Fixed Noise

For fixed noise assessment, the TM-EIAO has specified the following requirements for development planning, applicable to whichever is more stringent.

- 5 dB(A) below the appropriate Acceptable Noise Level (ANL) in TM-Places; or
- the prevailing noise levels (for quiet areas with level more than 5 dB(A) below the ANL).

The noise assessment for industrial/fixed noise sources will include the following general procedures:

- Identify and locate representative NSRs that may be affected by the noise sources;
- Determine the noise criteria for both daytime and nighttime;
- Determine the sound power levels (SWLs) of existing fixed noise sources by site measurement or from recognised sources of reference, where appropriate;
- Use standard acoustic principle for attenuation and directivity;
- Determine the maximum SWLs of the planned fixed noise sources;
- Evaluate the noise assessment results for both development options with and without YLIEE to determine the noise impact on the existing and planned sensitive receivers; and
- Establish the noise mitigation requirements for the proposed development with and without YLIEE for compliance under TM-EIAO.

Noise measurements will be conducted to establish the prevailing noise levels in the vicinity of the Study site. The representative locations will be identified by site surveys and they would include the existing residential/education premises on the east and south of the Study site as well as the village type residential premises on the north and west of the Study site and the southern public housing development site of the Project. The noise measurements will cover day, evening and night time periods during typical days.

The Area Sensitivity Rating at the NSRs will be determined in accordance with the TM-Places. The Area Sensitivity Rating depends on the type of area containing the NSR. When determining the type of area containing the NSR, reference will be made to relevant land use plans including the OZPs and information in the Statutory Planning Portal of the TPB. In accordance with TM-Places, NSR will be assigned an Area Sensitivity Rating of "C" if it is within 100 m of YLIE zone, or an Area Sensitivity Rating of "B" if it is between 100 m and 250 m from such a zone. If YLIEE is pursued, this needs to be taken into account in determining the Area Sensitivity Ratings. In addition, Long Tin Road is considered as an

Influencing Factor (IF) since the Annual Average Daily Traffic (AADT) is greater than 30,000 vehicles according to “The Annual Traffic Census 2010” by Transport Department (TD). The Area Sensitivity Rating adopted shall also take into account the degree to which the NSR is affected by this IF. The appropriate Area Sensitivity Rating will be studied in details in the forthcoming Baseline Review Report (TR-1).

Site visit will be conducted to identify the existing major fixed noise sources in the vicinity of the site. They will include representative locations on the west of the YLIE adjacent to the Study site and industrial/fixed noise sources on the north and south of the Study site as well as on the northern portion of the Study site (for the scenario if YLIEE is not pursued). The types of sources may include noisy fans, louveres, MVAC plant, machines, workshops, depots, repairing facilities, heavy loading/unloading activities that all constitute noise emissions to the outdoor environment. Noise measurements will be carried out on day, evening and night time periods during typical days as appropriate to establish a detailed noise emission inventory including SWLs for each noisy activity/source. The locations taken for measurements should not be influenced by other noisy activities as far as possible and where access is permitted and possible without undue safety concerns. Where necessary, reference will be made to other plants of similar mode, nature and scale to determine the SWLs of existing fixed noise sources. Site observation and noise measurements will be carried out for 3-5 days to observe the typical worst operating time for each identified noisy activity. Where possible, enquires directly made to premise owners/employee will be carried out to obtain the information on the mode of the business operations, the daily operating hours, types of activities undertaken at the industrial premises, and the worst case operating time for each identified activity as far as practicable. The observed worst case operating time (or as advised by the owner/employee) for each identified activity in each workshop/industrial premises will be adopted in the assessment to reflect a more realistic worst case situation. SWL assessment will be based on a standard sample period of 30 mins for analysis. For stationary fixed plants such as chiller, a continuous operating time of 30 mins will be assumed. Identification of any night time operation will be based on site observation and confirmation by the premise operators. Where information is not available, night time operation will be assumed for conservative assessment. The fixed noise levels will be predicted at representative NSRs in accordance with standard acoustic principles.

For assessment of the impacts from the planned YLIEE, based on the target industry sectors provided by HKSTP, the potential noise sources and corresponding SWLs will be made reference to the industrial premises of similar nature and types in the existing YLIE. Cumulative impacts from any planned fixed noise sources proposed by the concurrent projects will also be assessed.

#### 4.5.1.4 Rail Noise

The Area Sensitivity Rating at the NSRs will be determined in accordance with the TM-Places as described in S4.5.1.3. Previously approved West Rail -West Kowloon to Tuen Mun Centre EIA Report (EIA-149/BC) will be reviewed. Information request for future operating characteristics such as train types, headway, deck types, speed profile, etc will be made to MTRCL.

Train noise assessment depends on a number of factors including but not limited to the noise source term, the operational information and the noise mitigation measures. As far as the West Rail train unit is concerned, the approved EIA Report for West Rail (i.e. “West Rail - Final Assessment Report West Kowloon to Tuen Mun Centre - EIA - Vol. 1, Technical Annexes, & Environmental Monitoring and Audit Manual” ref: EIA-149/BC) has adopted the noise source term of  $L_{max}$  of 82.5 dB(A) at a distance of 25m and at a speed of 135km/h. However, this source term was measured from at-grade ballast track whereas the track section

near to the Study site is running on a viaduct. Hence, together with the fact that the West Rail has been operating for more than a decade, it would be essential to conduct additional noise measurements to establish the in-situ noise source term of West Rail train units running on viaduct.

In order to achieve this, a crane would likely be required for lifting a series of microphones at various heights above the viaduct. This series of microphones, probably consists of 4-5 microphones, would be used to collect simultaneous train noise levels for both in-bound and outbound train movements. These simultaneous train noise measurements would then be analysed to establish the train noise source terms at different vertical directivities (i.e. from 0 degree to 60 degree from the horizon), within and outside the noise screening zones of the parapet along the viaduct.

Depending on further discussion with EPD, the land owners and stakeholders (including MTRCL), the noise measurements may be conducted at Leung Choy Building Phase 2, a vacant land near Shui Tin Tsuen, or the MTRCL's Yick Yuen Emergency Access Point (EAP). Leung Choy Building Phase 2 is more than 400m from the site and is one of the few high-rise buildings in the vicinity closer to West Rail viaduct. However, it is relatively closer to the Long Ping Station and hence the train speed profile and track curvature may be less alike to that near to the Study site. It is also not possible to have a series of microphones at different vertical levels. The vacant land near to Shui Tin Tsuen is a GB according to OZP S/YL-PS/14. Ambient noise levels are generally low enough for train noise measurements. However, the access road to this vacant land would constrain the use of a crane for lifting up microphones. The MTRCL's Yick Yuen EAP would also have lower background noise levels for train noise measurements and the viaduct is relatively straight. However, it is further away from the Study site.

Since the crane shall be capable of lifting the microphones to approximately > 30m in height, it is likely to be a long vehicle and hence the feasibility of transporting such a long vehicle to the possible measurement locations are still yet to be studied and verified. Further discussion with EPD, other authorities (including TD and Police) and the stakeholders (MTRCL for access to Yick Yuen EAP) would be made to agree on the measurement locations for train noise source terms. Based on the initial observations at this stage, the MTRCL Yick Yuen EAP may represent a more promising location for measurement.

Once the train noise source terms at different vertical directivities are established, they would be adopted into the train noise prediction model to be constructed according to "Calculation of Railway Noise (CRN, 1995)" by the U.K. Department of Transport. For each of the NSRs to be considered, the geometrical relation between track segment would be checked to determine whether the receiver at a particular height is within or beyond the screening zone projected by the viaduct parapet. The train noise source term at the respective vertical directivity would then be adopted.

The MTRCL would also be approached to collate their latest operational information such as speed profiles, headway (for different time periods), trackform design, and the existing and committed noise mitigation measures in the vicinity of the proposed development. Appropriate correction factors in accordance with CRN would be applied to adjust for any difference with those collated at the measurement location. The noise contribution from each track segment would then be aggregated to produce the overall train noise levels at the receivers and compared with the statutory requirements.

In case the statutory criteria are exceeded, mitigation measures such as Single Aspect Block (SAB), building orientation, building setback, noise tolerant building, etc. would be recommended. Where practicable, the use of at-source mitigation measures such as enhanced

parapet and semi-noise enclosures on viaduct would also be discussed and agreed with MTRCL.

The detailed assessment approach will be proposed to EPD for agreement.

#### 4.5.1.5 Helicopter Noise

Helicopter flying over the Study site was observed. In accordance with the Civil Aviation Ordinance, CAP 448C, Air Navigation (Hong Kong) Order 1995, Schedule 14, Section II. 5 Low Flying, except with the permission in writing from the Chief Executive and in accordance with any conditions therein specified a helicopter should not fly over a congested area of a city, town or settlement below a height of 1,500 feet (about 450m) above the highest fixed object within 2,000 feet (about 610m) of the helicopter.

As advised by Government Flying Services (GFS), there is no helipad within the vicinity of the Study site. The observed helicopters flyover was training event with a fixed flight route conducted by People's Liberation Army. On site noise measurements will be conducted to assess the potential impacts from the helicopter.

#### 4.5.2 Air Quality

The major air pollution sources are vehicular emission from nearby roads including Long Tin Road, Long Ping Road, Fuk Hi Street and Wang Lok Street, the chimney emission from YLIE and other existing nearby industrial buildings, as well as any planned chimneys within YLIEE. The baseline condition will be established by means of desktop study and site survey.

The desktop study undertaken will cover the collection and review of environmental legislation and guidelines, relevant information on the concurrent projects in vicinity of the Study site, topographic maps, aerial photos, relevant OZP, ODP and Layout Plans, etc.

All legislation and guidelines that are relevant to the air quality assessment will be identified and reviewed, including but not limited to the following:

- Criteria and guidelines for evaluating and assessing air quality impact as specified in Section 1 of Annexes 4 and 12 of the TM-EIAO.
- Air Pollution Control Ordinance;
- Air Pollution Control (Construction Dust) Regulation; and
- HKPSG.

In addition, according to the Brief, the new AQOs will be adopted in this Study.

The baseline review study will also cover a review of all possible concurrent projects in vicinity of the Study site that may have cumulative impacts. A list of the tentative concurrent projects identified at this stage is given in S4.5.1.

Air Sensitive Receivers (ASRs) including existing, committed and planned uses such as residential use, educational use, library, hospital, commercial areas, active sport grounds etc. within 500m from the boundary of the Study site will be identified by desktop study and site survey at baseline review stage. Major existing ASRs will include, but not limited to, Shing Uk Tsuen, Ng Uk Tsuen, Fuk Hing Garden, Wang Chau Lam Uk Tsuen, Wang Chau Yeung Uk Tsuen, Yuen Long Long Ping Estate, Long Ping Estate Commercial Complex, YLIE, Wang Chau Public School, Tung Koon Primary School, Umah International Primary School, Tung Wah Group of Hospitals Lo Kon Ting Memorial College and Pok Oi Hospital Tang Pui King Memorial College etc. The committed and planned ASRs will be mainly based on the

relevant OZP, ODP and Layout Plans. A table will be prepared to list out all identified representative ASRs with a figure showing their locations.

Site survey will be undertaken to identify all chimneys within the existing YLIE and 500m from the boundary of the Study site. The chimney information, including fuel consumption rate, stack height, gas exhaust velocity, exhaust temperature and the internal diameter of the stack will be collected from the respective operators where available. References will also be made to any approved EIA Studies and specified process licences (SP Licence) in the vicinity of the study areas. An emission inventory of chimneys will be compiled. All these findings will be incorporated into the Baseline Review Report.

#### 4.5.2.1 Construction Dust

Potential air quality impact in construction phase would be due to dust generation during construction from various pollution sources, including construction activities, material handling, transportation and removal, stockpiling, and wind erosion. The requirements stipulated under the Air Pollutant Control (Construction Dust) Regulation will be followed and construction dust impacts are controlled within the relevant standards specified in Section 1 of Annex 4 of the TM-EIAO.

Considerations would be given to all at-grade temporary works areas (e.g. for excavation, stockpiling, concrete batching plant etc.) for different development phasing. Concurrent projects will be identified in the course of the study and any existing/planned dust emission sources in the vicinity will also be taken into consideration.

Fugitive dust impact assessments will be carried out based on conservative assumptions of general construction activities which include the following:

- Heavy construction activities including site clearance, ground excavation, construction of the associated facilities, haul road etc;
- Wind erosion of all active open sites;
- Loading/unloading from trucks at barging facilities and stockpiles;

The prediction of dust emissions will be based on typical values and emission factors from United States Environmental Protection Agency (USEPA) Compilation of Air Pollution Emission Factors (AP-42), 5th Edition. The table below lists out the references of the calculations of dust emission factors for different dust generating activities. Detailed descriptions are also discussed in the following sections.

**Table 4.1** References of dust emission factors for different activities

Operating Sites	Activities	Equations and Assumptions	Reference
All construction and excavation sites	Heavy construction activities including land clearance, ground excavation, cut and fill operations, construction of the facilities, haul road, etc	$E = 1.2 \text{ tons/acre/month}$ of activity or $= 2.69\text{Mg/hectare/month}$ of activity	USEPA AP42, S.13.2.3.3
All construction sites	Wind Erosion	$E = 0.85 \text{ Mg/hectare/yr}$ (24 hour emission)	USEPA AP42, S.11.9, Table 11.9.4

Operating Sites	Activities	Equations and Assumptions	Reference
Barging facilities and/or any stockpiles	Loading/Unloading at barging facilities and any stockpile	$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} (kg / megagram)$ <p>k is particle size multiplier U is average wind speed M is material moisture content</p>	USEPA AP42, S13.2.4

Dust impact assessment will be undertaken using the EPD approved air dispersion model - Fugitive Dust Model (FDM) to determine construction phase air quality impacts on ASRs. It is a well-known Gaussian Plume model designed for computing air dispersion for fugitive dust sources. Modelling parameters including dust emission factors, particles size distributions, surface roughness, etc. are made reference to EPD's "Guideline on choice of models and model parameters" and USEPA AP-42. The density of dust is assumed to be 2.5g/m<sup>3</sup>. The most recent 5-year annual average TSP concentrations (2007-2011) recorded at Yuen Long Air Quality Monitoring Station (AQMS) will be adopted as the background TSP concentrations. Table 4.2 below summarises the modelling parameters to be adopted in the construction dust assessment.

**Table 4.2** Modelling parameters

Parameters	Input	Remark
Particle size distribution	1.25 µm = 7% 3.75 µm = 20% 7.5 µm = 20% 12.5 µm = 18% 22.5 µm = 35%	Reference from S13.2.4.3 of USEPAAP-42
Background Concentration	5-year annual average (2007-2011) from Yuen Long AQMS	-
Modeling mode	Flatted terrain	-
Meteorological data	Data recorded in 2010 Wetland Park Weather Station and mixing height data at King's Park Weather Station in Year 2010	The percentage of valid meteorological data recorded at HKO's Wetland Park Weather station in 2011 is less than 90%. The 2010 data, which shows more than 90% of validity, will be adopted.

1-hour, 24-hour average and annual TSP concentrations will be calculated. Construction activities will generally not be taken place on the entire work sites at the same time, but to be undertaken at moving multiple work fronts spread across the work sites. The hourly percentage of active area on each work sites will be estimated based on engineering information such as the construction method, construction programme and number of operating plants.

For short-term 1-hour and 24-hour assessment, construction activities and plants will neither be taken place on the entire work site/work area at the same time nor be concentrated in certain areas of the site close to ASRs at any time during construction period. A conservative "Two Tiers" assessment approach will therefore be adopted. An initial screening test, namely "Tier 1 Screening Test" will be undertaken. The Tier 1 screening test is conservative and represents the worst case situation, whereby all the worksites will be assumed to be active (i.e. 100%).



The purpose of the Tier 1 screening test is to identify the potentially affected areas where construction dust may accumulate. The hot spot areas identified in the Tier 1 assessment will be subsequently assessed by a more focused Tier 2 test, for which it is assumed that the hourly active works areas (estimated based on engineering information) for the nearby construction sites are positioned closest to the potentially worst affected ASRs, while the active areas for all other construction sites located relatively further away from the ASRs remain at 100% as per Tier 1. Thus, the Tier 2 assessment is also very conservative as it assumes that all works activities with the associated plants in the nearby construction sites will be undertaken in the closest proximity to the potentially affected ASRs at the same time.

For the long-term annual concentration assessment, as mentioned above all the active construction activities will likely be moving work fronts spreading across the whole works site. On this basis, it is assumed that the dust emissions will be distributed across the whole area of each site to reasonably represent this mode of construction works over the yearly period. The site activity is assumed at 6% on an annual basis for the entire work site (i.e. a correction factor of 0.06 will be applied to the total dust emission rate for prediction of annual concentration).

The cumulative air quality impacts of the proposed developments will be assessed and evaluated, with results analysed and presented as summary tables and pollution contours for comparison with the prevailing AQOs or TM-EIAO standards. Where necessary, mitigation measures such as good site practices and sufficient watering facilities will be recommended to ensure compliance with the legislative requirements.

#### 4.5.2.2 Operational Air Quality

The air pollution impacts shall be calculated based on the highest emission strength from road within the next 15 years upon commencement of operation of the Project. The selected assessment year is to represent the highest emission scenario, given the combination of emission factors and traffic flow for the selected year. This shall be further agreed with EPD during the course of the Study. The traffic forecast used in EIA will be prepared and submitted to TD for endorsement.

##### Future Background Air Quality

The cumulative operational air quality is a combination of the emission impact at local scale and background air quality impact from other concurrent and regional sources. The Pollutants in the Atmosphere and the Transport over Hong Kong (PATH) model – a regional pollutant dispersion model developed by EPD – will be used to quantify the future background concentrations for the assessment year, taking into account the future control strategy for various sectors such as power plants, motor vehicles, industry etc. The emission inventory for PATH includes extensive sources from both Pearl River Delta Economic Zone (PRDEZ) and HKSAR.

The PATH emission inventory has been recently updated and the model has been run by EPD for Year 2015, 2020 and 2030. However, the data is yet to be formally published. It is also understood that the inventory would be subject to refinement and the final set of PATH data can only be released by EPD in October 2012 the earliest. The latest emission inventory will be obtained from EPD and used in this Study. Based on the current information, the target completion year of the Project is 2021/2022. Considering that the territory wide emission inventory for 2020 would not vary significantly to that of 2021/2022, the established PATH model for Year 2020 is considered acceptable to assess the background air quality impact for 2021/2022. Should the worst assessment year occur at another year such as 2036/2037, separate agreement with EPD on the emission inventory will be required.

### Vehicular Emission from Planned Road Traffic

NO<sub>2</sub>, RSP and FSP are the major pollutants from vehicular emissions. The vehicular tailpipe emission will be calculated by EMFAC-HK v2.1 model, which will take in account the latest implementation programme of the vehicle emission standard, vehicle technology fraction, vehicle population data, vehicle kilometre travelled, speed fraction etc. Although SO<sub>2</sub> is not a major pollutant from vehicular emissions, it will also be included for cumulative assessment. Since the EMFAC-HK cannot be used for calculation of SO<sub>2</sub> emission, an alternative method is therefore proposed.

The SO<sub>2</sub> emission factor will be based on the assumption that 98% of the sulphur in the fuel is emitted as SO<sub>2</sub>. This is also the assumption used in the USEPA PART5 program for calculating emissions from motor vehicles. Using this assumption, the emission factor is calculated from the following equation:

$$Ef_{SO_2} \text{ [g/km]} = 1.96 \times (S_f/100) \times (D_f \times 1000) \times (E_f/100)$$

Where

1.96 = Factor to account for fraction emitted (98% of sulphur content in fuel) and weight ratio of SO<sub>2</sub> to S (2.0)

S<sub>f</sub> = Fuel sulphur content (weight percentage)

D<sub>f</sub> = Density of fuel (0.73 kg/L for gasoline; 0.845 kg/L for diesel fuel)

E<sub>f</sub> = Vehicle fuel efficiency (in L/100 km)

The vehicle fuel efficiencies for different types of vehicle can be extracted from the Electrical and Mechanical Service Department (EMSD) Primary Indicator Values, and they are listed in **Table 4.3**. References shall be made to the EMSD's websites.

**Table 4.3** Fuel efficiencies for different vehicles types

Subgroup ID	Vehicle Type	Fuel Type	Engine Size (cc)	Gross Vehicle Weight (tonnes)	Fuel Efficiency (L/100km)
<i>Principal Group 1 – Private Car and Motorcycle</i>					
V1	Motorcycle	Petrol	--	--	4.2
V2	Private Car	Diesel	--	--	11.8
V3	Private Car	Petrol	<=1000	--	8.1
V4	Private Car	Petrol	1001-1500	--	9
V5	Private Car	Petrol	1501-2500	--	11.5
V6	Private Car	Petrol	2501-3500	--	14
V7	Private Car	Petrol	3501-4500	--	16.3
V8	Private Car	Petrol	>4500	--	17.3
<i>Principal Group 2 – Bus and Light Bus</i>					
V11	Private Bus (Double Deck)	Diesel	--	--	47
V12	Private Bus (Single Deck)	Diesel	--	--	23.9
V13	Non-franchised Public Bus (Double Deck)	Diesel	--	--	59.3
V14	Non-franchised Public Bus (Single Deck)	Diesel	--	--	24.9
V15	Private Light Bus	Diesel	--	--	16
V16	Public Light Bus	Diesel	--	--	15.4

Subgroup ID	Vehicle Type	Fuel Type	Engine Size (cc)	Gross Vehicle Weight (tonnes)	Fuel Efficiency (L/100km)
V17	Private Light Bus	LPG	--	--	29.7
V18	Public Light Bus	LPG	--	--	20.5
<i>Principal Group 3 – Taxi</i>					
V21	Taxi LPG (Urban)	LPG	--	--	14.3
V22	Taxi LPG (Lantau Island)	LPG	--	--	14.5
V23	Taxi LPG (NT)	LPG	--	--	12.6
<i>Principal Group 4 – Vehicle – Light Goods Vehicle (LGV)</i>					
V31	Light Goods Vehicle	Petrol	--	<=1.9	11.4
V32	Light Goods Vehicle	Petrol	--	>1.9	12.2
V33	Light Goods Vehicle	Diesel	--	<=2.5	11
V34	Light Goods Vehicle	Diesel	--	2.51-4	11.3
V35	Light Goods Vehicle	Diesel	--	4.01-5.5	15.6
<i>Principal Group 5 – Vehicle – Medium Goods Vehicle (MGV)</i>					
V36	Medium Goods Vehicle, Tractors	Diesel	--	5.51-24	47.9
V37	Medium Goods Vehicle, Non-tractors	Diesel	--	5.51-10	19.3
V38	Medium Goods Vehicle, Non-tractors	Diesel	--	10.01-15	25.8
V39	Medium Goods Vehicle, Non-tractors	Diesel	--	15.01-20	28.5
V40	Medium Goods Vehicle, Non-tractors	Diesel	--	20.01-24	41.5
<i>Principal Group 6 – Vehicle – Heavy Goods Vehicle (HGV)</i>					
V41	Heavy Goods Vehicle	Diesel	--	24.01-38	46.2

Note:

Referenced from EMSD Website: [http://ecib.emsd.gov.hk/en/indicator\\_trp.htm](http://ecib.emsd.gov.hk/en/indicator_trp.htm)

The USEPA approved near field air dispersion model, California Line Source Dispersion Model Version 4 (CALINE4) will be used to simulate the dispersion of pollutants from open road sections and assess the vehicular emissions impact at the identified ASRs.

Modelling parameters will be determined according to EPD's "Guidelines on Choice of Models and Model Parameters". Grid-specific composite real meteorological data extracted from EPD's PATH model will be adopted in CALINE4 model, including relevant temperature, wind speed, direction and mixing height. The stability classes will be obtained from a separate PCRAMMET model. The mixing height is capped to the minimum recorded value as per the real meteorological data. For the treatment of calm hours, the approach recommended in the "Guideline on Air Quality Models Version 05" will be adopted. The surface roughness height is closely related to the land use characteristics, and the surface roughness shall be estimated as 10 percent of the average height of physical structures within 1km study area. In consideration of future planned public housing development, surface roughness of 100cm will be assumed to represent the urbanized terrain. The wind standard deviation is estimated in accordance with the "Guideline on Air Quality Models (Revised), 1986", as summarized in **Table 4.4** below.

**Table 4.4** Summary of wind standard deviation for surface roughness of 100cm

Stability Class	Wind Standard Deviation
A	32.9
B	32.9
C	25.6
D	18.3
E	11.0
F	5.6

Ozone Limiting Method (OLM) will be adopted for conversion of NO<sub>x</sub> to NO<sub>2</sub> using the predicted O<sub>3</sub> and NO<sub>2</sub> levels from PATH model. According to EPD's Guideline on the Estimation of PM<sub>2.5</sub> for Air Quality Assessment in Hong Kong, daily and annual FSP will be assumed to be 75% of daily and 71% of annual RSP respectively. In addition, according to EPD's Guidelines on the Estimation of 10-minute average SO<sub>2</sub> concentration for Air Quality Assessment in Hong Kong, conversion factors from hourly SO<sub>2</sub> concentration to 10-min average SO<sub>2</sub> concentration will be based on the stability class-dependent multiplicative factors as given in **Table 4.5** below.

**Table 4.5** Conversion factor for 10-minute average SO<sub>2</sub> concentration

Stability Class	A	B	C	D	E	F
Conversion Factor	2.45	2.45	1.82	1.43	1.35	1.35

Owing to the constraint of the CALINE4 model in modelling elevated roads higher than 10m, the road heights of elevated road sections in excess of 10m high above local ground or water surface will be set to 10m in the model as the worst-case assumption. For barriers along roads or any proposed noise barriers as a noise mitigation measures, the line source will be modelled at the tip of the barrier and the mixing width will be limited to the actual uncovered road width in order to address the associated secondary environmental impact. The road type of the concerned section will be set to the "fill" option in CALINE4.

### Industrial Emissions

The major pollutants from chimneys are NO<sub>x</sub>, SO<sub>2</sub>, RSP and FSP. The emissions will be calculated based on the respective emission factors for boilers in accordance with the USEPA AP-42 Section 1.3 or from SP license. According to the Air Pollution Control (Fuel Restriction) (Amendment) Regulations, only liquid fuel with a sulphur content not exceeding 0.005% by weight and a viscosity not more than 6 centistokes at 40°C (such as Ultra Low Sulphur Diesel ULSD) are permitted to be used. In case the information on sulphur content of the fuel is not available from the chimney operators, 0.005% sulphur content for liquid fuel will be assumed for assessment purpose for this Project. For assessment of the impacts from the planned YLIEE, based on the target industry sectors provided by HKSTP, the potential chimney sources and corresponding fuel consumption rates will be made reference to the industrial premises of similar nature and types in the existing YLIE.

The potential air quality impact associated with the industrial emissions will be assessed by the EPD approved dispersion model, ISCST3. All these emissions will be modeled as "Point" source in the model. Where there is no available information on exit velocity and temperature, assumptions will be made with reference to EPD's Guidelines on Choice of Models and Model Parameters. Similar to CALINE4, grid-specific composite real meteorological data extracted from EPD's PATH model will be adopted in ISCST3 model.

### Cumulative Impacts

The results from PATH, CALINE and ISCST will be combined hour-by-hour to establish the cumulative air quality at the assessment year. Any cumulative impact due to concurrent

projects in the vicinity of the Project will also be taken into account. These cumulative impacts will then be compared with the new AQO to identify any exceedance.

### Odour

Reconnaissance site survey will be conducted to establish the prevailing odour conditions and verify any significant odour emission sources in the vicinity of the Study site. Potential odour sources include, but not limited to, the river channel (~350m from Study site), Yuen Long Sewage Treatment Works (YLSTW) (>1000m from Study site) and food industry etc. The survey will be undertaken during the hot and low tidal period of the day as far as possible. At least 5 minutes of observation period will be spent at each location of emission sources in order to evaluate the nuisance. Any committed/ planned odour emission sources within the Study Area will also be addressed. Should there be any potential odorous sources identified during the reconnaissance site survey or any significant odour emission sources planned within the Study Area, a qualitative or quantitative approach would be adopted as necessary.

### 4.5.3 Water Quality

All legislation and guidelines that are relevant to water quality assessment will be identified and reviewed, including but not limited to the following:

- Water Pollution Control Ordinance (WPCO) CAP 358;
- Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems Inland and Coastal Waters (TM-DSS)
- Annexes 6 and 14 of Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO), EIAO (CAP. 499),
- TPB PG-NO. 12B –TPB Guidelines For Application For Developments Within Deep Bay Area Under Section 16 Of The Town Planning Ordinance;
- No Net Increase in Pollution Loads Requirement in Deep Bay;
- Hong Kong Planning Standards and Guidelines; and
- ProPECC PN 1/94 – Practice Note for Professional Persons on “Construction Site Drainage”.

There are no available water quality monitoring data at the nullahs and streams within the Study Area. Subject to further discussion with EPD on the project scope and work activities, baseline water quality data, if identified as required, will be collated in accordance with Section 5.4, Annex 14 of TM-EIAO.

According to the common practice in other EIAs, the assessment area for water quality impact shall include all areas within a distance of 500m from the Study site boundary and the Deep Bay Water Control Zone. Strategies to comply with the “No net increase in pollution load in Deep Bay” policy will be proposed. Relevant and practical mitigation measures will be proposed to tackle the water quality impact during construction and operational phases. Since no dredging and reclamation works are anticipated, water quality modeling is not required. The assessment will be qualitative and the approach will be referred to Annex 6 – Criteria for Evaluating Water Pollution and Annex 14 – Guidelines for Assessment of Water Pollution under the TM-EIAO.

#### 4.5.4 Waste

Waste that may arise from the Project include, C&D waste, sediment, chemical waste and general refuse during construction phase, as well as municipal waste and industrial waste during operational phase. Construction and operational activities of the Project and associated works will be reviewed and analysed to identify the types, quantity and timing of the waste arising.

All legislation and guidelines that are relevant to waste management implication assessment will be identified and reviewed, including but not limited to the following:

- Criteria and guidelines for evaluating and assessing waste management implication as specified in Annexes 7 and 15 of the TM-EIAO;
- Waste Disposal Ordinance (Cap 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354);
- Dumping at Sea Ordinance (Cap 466);
- Land (Miscellaneous Provisions) Ordinance (Cap 28); and
- Public Health and Municipal Services Ordinance (Cap 132) - Public Cleansing and Prevention of Nuisances Regulation.

Types and quantities of waste generated, including excavated materials, sediment, C&D waste, chemical waste and general refuse material during the construction phase would be identified. Potential impacts from the waste management proposal with respect to potential hazards, air and odour emissions, noise, wastewater discharge and transport, will also be assessed. Waste management hierarchy including avoidance and minimization, reuse of materials, recovery and recycling and treatment and disposal, will be used to evaluate the waste management options. Opportunities for reducing waste generation, on-site or off-site re-use and recycling will also be evaluated to optimise waste reduction. The waste forecast will be incorporated in the EIA.

Municipal solid waste from households and industrial sources is anticipated to be the main waste type during the operational phase. Generation of industrial wastes is also expected from YLIEE. The nature and quantity of such waste arising from the operation of the Project will be identified and evaluated.

#### 4.5.5 Land Contamination

The Study site is currently occupied by OS, vehicle parks, farmland, fallow land, grassland, rural residential areas and temporary structures. Desktop study and site survey will be conducted to confirm and identify any past or existing landuses that may give rise to potential land contamination issues.

All legislation and guidelines that are relevant to land contamination assessment will be identified and reviewed, including but not limited to the following:

- Section 3 of Annex 19 of the TM-EIAO, Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts;
- Practice Guide for Investigation and Remediation of Contaminated Land;
- Guidance Notes for Contaminated Land Assessment and Remediation; and
- Guidance Manual for Use of RBRGs for Contaminated Land Management, EPD, 2007.

The EPD's Guidance Note for Contamination Land Assessment and Remediation provided a summary of the general steps of a contamination assessment study, which include:

- provide a clear and detailed account of the present use of the land and the relevant past land history, in relation to possible land contamination;
- identify areas of potential contamination and associated impacts, risks or hazards; and
- submit a plan to evaluate the actual contamination conditions for soil and/or groundwater, if required.

Under section 3 of Annex 19 of the TM-EIAO, consideration should be given to a number of potentially contaminating historical land uses, including oil installations, gas works, metal workshops, car repair and dismantling workshops, as having the potential to cause or have caused land contamination. A CAP will be prepared to set out the requirements for a contamination evaluation for the potential contaminated area of the Project, if identified. A Contamination Assessment Report (CAR) will be prepared following SI activities. If significant contamination is identified, a Remediation Action Plan (RAP) will be developed to deal with these areas of the Project. The RAP will follow the contents requirements as specified in the EPD's Practice Guide for Investigation and Remediation of Contaminated Land. A Remediation Report (RR) will be prepared to demonstrate adequate clean-up and submitted to EPD for endorsement prior to the commencement of any construction/development works within the Project area.

The land contamination assessment will include the following steps:

- Conduct desktop study (i.e. review of relevant study reports, geological profiles and aerial photographs etc) to provide clear and detailed account of the relevant past landuse history and present landuse within the assessment area.
- Carry out site survey to confirm the findings of desktop study and to identify any other land uses within the assessment area which may have the potential for causing soil and groundwater contamination.
- Prepare CAP to formulate a detailed SI protocol which includes the number of sampling points and their respective locations/coordinates, depth of sampling, sampling method, sample size, testing parameters & Quality Assurance/ Quality Control (QA/QC) requirement, and site supervision requirement etc. The CAP will be sent to DR for agreement and submitted to EPD for approval prior to the commencement of SI works.
- Conduct contamination assessment based on the EPD's Guidance Manual for Use of RBRGs for Contaminated Land Management. The testing results of soil and/or groundwater samples will be directly compared with RBRGs in order to evaluate the level and extent, if any, of the soil/groundwater contamination. The amount of contaminated materials will also be assessed.
- Once contamination is identified, different treatment methods for handling the contaminated materials within the shortest time frame will be examined, e.g. in-situ treatment and/or replacement of the underlying contaminated materials, etc. Other associated issues such as identification of disposal site for the contaminated materials, the transportation of the contaminated materials if they are to be disposed outside the assessment area and the impact on the nearby road networks; the requirement of land filling after removal of the contaminated materials; and the cost and timing required for handling the contaminated materials will also be examined. A CAR/ CAR & RAP will be developed to summarize the strategy for dealing with the contaminated materials of the Project. The CAR/ CAR & RAP will be submitted to DR and EPD for approval prior to the commencement of remediation works.

- After completion of the remediation works (i.e. by the future remediation contractor), a RR should be prepared to demonstrate adequate clean-up and submitted to DR and EPD for endorsement prior to the commencement of any construction/development works within the site.

It is anticipated that site construction workers may become exposed to contaminated materials and groundwater during earth moving operations and/or underground services. The main exposure routes for site construction workers are accidental direct ingestion of contaminated materials through poor hygiene and eating or smoking on site, or through direct contact with potentially toxic or harmful contaminants in excavated materials. However, given adequate protection for construction workers, no considerable residual risks are anticipated. Health and safety precautionary measures will be recommended in the EIA.

Given that any contaminated material will be identified and remediated prior to construction, potential impacts in operational phase are not expected.

#### 4.5.6 Hazard

The Study site does not fall into consultation zone of any PHIs. As confirmed by HKSTP, there will also be no PHIs planned at the existing YLIE and future YLIEE, and the proposed Harvest Fatty Acid Methyl Ester and Edible Oil Plant Development at YLIE (ESB-225/2011 under EIA register) will no longer proceed. A review on the potential hazards, if any, to the potential housing site arising from existing and potential future dangerous goods storage/processing at YLIE and the proposed future extension will be conducted. If required and subject to further agreement with EPD, a hazard assessment will be carried out.

The Curriculum Vitae (CV) of appropriate personnel will be provided to EPD at a later stage if hazard assessment is confirmed to be required.

#### 4.5.7 Landscape & Visual

The landscape & visual impact assessment will follow the criteria and guidelines as specified in Annex 10 and Annex 18 of the TM-EIAO. The assessment will set out the potential magnitude and significance of landscape and visual elements, with an assessment of all recommendations and a prediction of residual impacts, together with an assessment of the benefits and acceptability of all measures. Greening and other measures that could be applied to mitigate impacts will also be identified during construction and operational phases.

The principle stages will involve:

- Initial review of the overall site layout, development scale, form, massing and disposition of the proposed development and spatial relationship with the rural / urban landscape setting;
- Baseline study including review of the planning and development control framework, identification and mapping of key landscape resources (LR) and landscape character areas (LCA) within 500m of the site, mapping of key visual resources, identification of the visual envelope, identification and recording of views from key Visually Sensitive Receivers (VSR), production of photomontages to demonstrate the visual impacts of the development proposals within the landscape and the effect of mitigation measures, an assessment of the sensitivity of LRs, LCAs and VSRs during the construction and operational stages (Day 1 to year 10);
- Assessment of landscape and visual impacts including appraisal of the magnitude and significance of landscape and visual change as a result of the development, identification



of residual impacts, appraisal of the cumulative impact of development within the context of other approved projects within the planning area; and

- Recommendation of landscape and visual mitigation measures applicable to the construction and operational phases (Day 1 to year 10) and implementation programme.

#### 4.5.8 Ecology

All local legislations, guidelines and standards, and international conventions and guidance which governing the conservation of flora, fauna and habitat, and survey methodologies will be identified and reviewed, including but not limited to the following:

- Forests and Countryside Ordinance (Cap. 96) and its subsidiary legislation, the Forestry Regulations;
- Wild Animals Protection Ordinance (Cap. 170);
- EIAO (Cap. 499) and the associated TM Annexes 8 and 16;
- Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) and its subsidiary legislation
- Town Planning Ordinance (Cap. 131)
- Town Planning Board Guidelines for Application for Developments within Deep Bay Area under Section 16 of the Town Planning Ordinance (TPB PG-No. 12B)
- EIAO Guidance Note No. 6/2010 - Some Observations on Ecological Assessment from the EIAO Perspective;
- EIAO Guidance Note No. 7/2010 – Ecological Baseline Survey for Ecological Assessment;
- EIAO Guidance Note No. 10/2010 – Methodologies for Terrestrial and Freshwater Ecological Baseline Surveys; HKPSG Chapter 10, "Conservation";
- PELB Technical Circular 1/97 Works Branch Technical Circular 4/97,"Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures";
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species – IUCN corporate with IUCN Species Survival Commission to assess the conservation status of the flora and fauna species in a global scale in order to evaluating the risk of extinction of the species (see <http://www.iucnredlist.org>); and
- United Nations Convention on Biological Diversity. This convention requires parties to regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use. It also requires parties to promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings. The People's Republic of China (PRC) ratified the Convention on Biological Diversity on 5th January 1993. This convention came into force in Hong Kong during 2011.

Literature review will be conducted to assess the baseline conditions of the Study Area. The available literature and information will be reviewed including but not limited to the following:

- Newsletters from Agriculture, Fisheries and Conservation Department (AFCD) – Hong Kong Biodiversity;
- AFCD website;
- EPD website;
- Hong Kong Bird Watching Society website; and
- Any other available literature and information identified to be useful to the Study.

Any area or habitat of conservation importance within the Study Area will be identified through desktop study and supplemented by site visits where necessary. Where such areas or habitats might be significantly adversely impacted by the proposed development and measures to mitigate such impacts to an acceptable level are unlikely practical, such areas will be identified as “no-go areas”.

Ecological surveys which cover both dry and wet seasons will be conducted to investigate the current situation of the environment and the presence of fauna and flora within the Study Area. Surveys on vegetation, mammals, birds, herpetofauna, dragonflies, butterflies and freshwater fauna will be conducted.

The general methodologies for the proposed ecological survey are described below. The current proposed development footprint does not fall within the WBA or WCA; however, if any development is proposed within the WBA and/or WCA, ecological surveys of no less than 12 months will be conducted as in accordance to the Town Planning Board Guideline TPB PG-No. 12B. The proposed ecological survey plan will be separately submitted and agreed with AFCD.

### ***Habitat and Vegetation Survey***

Habitat map will be prepared based on aerial photos and supported by ground-truthing during the survey period. Habitat types will be identified within the Study site and Study Area. Any area of ecological importance within the Study Area and its vicinity will also be identified.

Vegetation survey will be conducted to record the plant species encountered in each habitat type and their relative abundance within the Study Area. Efforts will be made to identify any rare plant species and species protected under local regulations, or any species of conservation importance either locally or regionally. Local conservation status of floral group surveyed will mainly follow Wu and Lee (2000)<sup>3</sup>, Xing *et al.* (2000)<sup>4</sup> and the information available in AFCD (2003)<sup>5</sup>.

### ***Mammal Survey***

Mammal surveys will be conducted and cover all habitats in both the Study site and Study Area. As most mammals occur at low densities, all sightings, track, and signs of mammals (including droppings, scats, footprints, etc.) will be actively searched for. Nomenclature will follow Shek (2006)<sup>6</sup>.

### ***Avifauna Survey***

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<sup>3</sup> Wu, S.H. Lee, W. T-c. 2000. Pteridophytes of Hong Kong. *Memoirs of the Hong Kong Natural History Society* 23: 5-20.

<sup>4</sup>Xing, F.W., Ng, S.C., Chau, L.K.C. 2000. Gymnosperms and angiosperms of Hong Kong. *Memoirs of the Hong Kong Natural History Society* 23: 21-136.

<sup>5</sup>AFCD, Agriculture, Fisheries and Conservation Department, 2003. Hong Kong Herbarium. Available at <http://www.hkherbarium.net/Herbarium/frame.html>.

<sup>6</sup>Shek, C.T. 2006. *A Field Guide to the Terrestrial Mammals of Hong Kong*. Cosmos Books Ltd., Hong Kong.

Daytime bird surveys will be conducted and cover all habitats in both the Study site and Study Areas. All bird species seen or heard during the surveys will be recorded and enumerated. Nomenclature will follow the latest official Hong Kong Bird list available, whereas conservation status will follow Carey *et al.* (2001)<sup>7</sup> and Fellowes *et al.* (2002)<sup>8</sup>.

### ***Herpetofauna Survey***

Daytime and night-time herpetofauna surveys will be conducted during the wet season to cover the active period of this faunal group. Reptiles and amphibians will be surveyed through direct observation and active searching in all habitat types and in microhabitats (e.g. leaf litter, inside holes, under stones and logs) within the Study site and Study Area. During the surveys, all reptiles and amphibians sighted and heard will be identified and recorded. Nomenclature and status for reptiles will follow Karsen *et al.* (1998)<sup>9</sup> and AFCD (2006)<sup>10</sup> while that of amphibians will follow AFCD (2005)<sup>11</sup>.

### ***Dragonfly and Butterfly Survey***

Dragonfly and butterfly surveys will be conducted during the wet season to cover the active season of these faunal groups. Daytime survey for these faunal groups will be conducted during suitable weather when these species are active. Dragonflies and butterflies sighted will be identified and counted or relative abundances will be estimated. Nomenclature for butterflies will follow Lo and Hui (2010)<sup>12</sup>, and odonate nomenclature will follow Wilson (2004)<sup>13</sup>.

### ***Freshwater Fauna Survey***

Surveys of freshwater fauna will be conducted to determine the fish species present and freshwater invertebrate diversity. More survey effort will be paid to unpolluted and/or natural streams. Individuals will be recorded and identified and their relative abundance will also be estimated.

Based on the results of the desktop review and field surveys, assessment on the ecological impact arising from the Project will be conducted. The ecological impact assessment will follow the criteria and guidelines for evaluating and assessing ecological impact as stated in Annexes 8 and 16 of the TM-EIAO.

## **4.5.9 Fisheries**

Literature review will be conducted to assess the baseline conditions of pond fish culture activity within the Study Area with respect to the fisheries activity of Hong Kong as a whole. The available literature and information will be reviewed including but not limited to the following:

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<sup>7</sup>Carey, G.J., Chalmer, M.L., Diskin, D.A., Kennerley, P.R., Leader, P.J., Leven, M.R., Lewthwaite, R.W., Melville, D.S., Turnbull, M., Young, L. 2001. *The Avifauna of Hong Kong*. Hong Kong Bird Watching Society. Hong Kong.

<sup>8</sup>Fellowes, J. R., Lau, M. W. N., Dudgeon, D., Reels, G. T., Ades, G. W. J., Carey, G. J., Chan, B. P. L., Kendrick, R. C., Lee, K. S., Leven, M. R., Wilson, K. D. P. and Yu, Y. T. 2002. Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25:123-159.

<sup>9</sup>Karsen, S.J., Lau M.W.N. and Bogadek, A. 1998. *Hong Kong Amphibians and Reptiles*. Urban Council, Hong Kong.

<sup>10</sup>AFCD. 2006. *A Field Guide to the Venomous Land Snakes of Hong Kong*. Friends of Country Park.

<sup>11</sup>AFCD. 2005. *A Field Guide to the Amphibians of Hong Kong*. Friends of Country Park.

<sup>12</sup>Lo, P.Y.F., Hui, W.L. 2010. *Hong Kong Butterflies*. Friend of the Country Park.

<sup>13</sup>Wilson, K.D.P. 2004. *Field Guide to the Dragonflies of Hong Kong*. Cosmos Books Ltd., Hong Kong.

- AFCD annual reports;
- AFCD website;
- EPD website; and
- Any other available literature and information identified to be useful to the Study.

All fishponds within the Study Area will be visited and their status will be categorised into active, inactive or abandoned.

Active fishponds are ponds that commercial aquaculture activities are taking place. Type of aquaculture will be determined, such as fish cultivated for sale as food, fish fry cultivation, ornamental fish cultivation, bloodworm ponds, where possible. This information will also be confirmed by discussion with the fish farmers where possible.

Inactive fishponds are ponds that no evidence of commercial aquaculture activities are ongoing and with no major physical constraints to its resumption. These ponds will be checked to determine if fish stocks are present, including fish present in non-commercial quantities or species. The inactive fishponds are often used for informal fisheries activities (such as casual sport fishing). Any evidence of this activity will be recorded.

Abandoned fishponds are ponds which have physical evidence that aquaculture has not taken place for many years and/or there are physical constraints to its resumption. Conditions and the physical constraints will be recorded, including the following:

- Presence or absence of water;
- General water quality (pollution source and nature will be identified where possible);
- Presence and extent of emergent vegetation;
- Dumping and/or other inappropriate activities;
- Presence of infrastructure constraints (such as evidence that the water supply to the ponds or the configuration of ponds is affected by nearby development).

Based on the results of the desktop review and field surveys, assessment on the fisheries impact arising from the Project will be conducted. The fisheries impact assessment will follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the TM-EIAO.

## 4.5.10 Cultural Heritage

### 4.5.10.1 Archaeology

The archaeological impact assessment will be carried out based on a three-step methodology according to the requirements of the Antiquities and Monuments Office (AMO) *Guidelines for Cultural Heritage Impact Assessment*. The detailed methodology for each step is as follows:

#### I. Baseline study

A baseline study will be undertaken and includes desk-based research and field survey, if required. A comprehensive desk based research will review all existing and relevant publications and unpublished reports relevant to the identification of archaeological potential of the Study Area and delineate probable archaeological 'no-go areas'. This task will be

completed during the Baseline Review Stage and if no field survey is required will be followed by assessment and mitigation recommendations.

If the desk based review however, is insufficient to adequately assess the study area or indicates potential for archaeological deposits, an archaeological field survey will be designed and submitted to AMO for approval prior to implementation.

The survey scope, once agreed by AMO, is to be implemented by a qualified archaeologist who will apply to the Antiquity Authority for a licence to conduct archaeological research. The granting of such licence may take up to 8 weeks.

The field survey methodology, if required, will include the following four basic steps:

i. Field Scan

Field walking will be conducted to identify archaeological deposits on the surface. The scanning of the surface for archaeological material will be conducted, under ideal circumstances, in a systematic manner and will cover the entire study area. Particular attention is given to areas of land undisturbed in the recent past and to exposed areas such as riverbed cuts, erosion areas, terraces, etc. During the field scanning, concentrations of finds will be recorded, bagged and plotted on 1:1000 scale mapping and will be retained as part of the archive. Topography, surface conditions and existing impacts will be noted during the field walking.

ii. Auger Testing Programme

Auger survey will be carried within the study area in order to establish soil sequence, the presence/absence of cultural soils or deposits and their horizontal extent.

The auger tool consists of a bucket, pole and handle and is vertically drilled by hand into the surface. When the bucket is filled with soil the auger is extracted and the soil emptied from the bucket. Soils will be described and depth changes will be measured inside the hole. The depth and type of any finds recovered will also be recorded. The auger hole will be abandoned when water table, the end of the auger or rock is reached or the auger bucket fails to hold the soil. The location of each auger hole test will be marked on a 1:1000 scale map. The results of the auger tests will provide one of the criteria used to position the test pit excavations.

iii. Test Pit Excavation

Test pit excavations will be carried out to verify the archaeological potential within a study area. The choice of location for test pit excavations will depend on various factors such as desk-based information, landforms, field scan and auger test results as well as issues relating to access.

Hand digging of test pits measuring between 1 by 1 and 2 by 2 metres will be carried out in order to determine the presence/absence of archaeological deposits and their stratigraphy. The size may depend on close proximity to large trees, narrow terraces or other external factors. Hand excavation will continue until decomposing rock or sterile soils are reached and no potential for further cultural layers exists. A test pit will also be abandoned when the maximum safe working depth is reached or when, despite the use of appropriate and practicable dewatering measures, the effects of ground water prevent further excavation. In cases where sterile deposits or the maximum safe excavation limit cannot be reached, the AMO should be consulted prior to backfilling.

During excavation contexts, finds and features will be recorded, soils will be described and relevant depths measured. Artefacts will be collected, bagged and labelled by context.

Sections will be photographed and drawn and, if required, ground plans will also be photographed and/or drawn. The position of each test pit, its top and bottom levels and associated temporary benchmark (TBM) will be recorded by a qualified land surveyor and plotted on 1:1000 scale mapping. On completion of all recording and site inspection by the AMO, test pits will be backfilled.

#### iv. Reporting and Submission of Archive

A report of the findings of the archaeological survey will be compiled following the requirements as outlined in the AMO's Guidelines for Archaeological Reports. The processing of recovered archaeological material and preparation of the project archive will follow the AMO's Guidelines for Handling of Archaeological Finds and Archives.

## II. Impact Assessment

The prediction and evaluation of both direct and indirect impacts will be undertaken to identify any potential adverse affects to all identified sites of archaeological interest within the Study site. A detailed description of the works and all available plans (with their relationship to the identified resources clearly shown) should be included, to illustrate the nature and degree of potential impacts. The impact assessment will adhere to the detailed requirements of Annexes 10 and 19 of the TM-EIAO.

## III. Mitigation Recommendation

As stated in the Guidelines for Cultural Heritage Impact Assessment, "Preservation in totality must be taken as the first priority". If such preservation is not feasible, as in the case where the need for a particular development can be shown to have benefits that outweigh the significance of the site of archaeological interest, a programme of mitigation measures must be designed and submitted to the AMO for approval. The mitigation measures must be clearly listed and the party responsible for implementation and timing of the measures must also be included. Examples of mitigation measures include; rescue excavation and archaeological watching brief.

### 4.5.10.2 Built Heritage

The built heritage impact assessment (BHIA) will be carried out based on a three-step methodology according to the requirements of the Antiquities and Monuments Office (AMO) *Guidelines for Cultural Heritage Impact Assessment*. The detailed methodology for each step is as follows:

#### I. Baseline study

A baseline review study will be undertaken to identify all known heritage resources in the Study site. As stated in the study brief, a baseline desktop study will be undertaken in order to identify no-go areas. The baseline review will also include proposals for the scope and methodology of any required built heritage field survey. The purpose of the survey is to supplement the information gathered during the desk-based study and provide an inventory of heritage resources in the Study site.

#### II. Impact Assessment

The BHIA will be conducted in accordance with the following guidelines:

- Guidelines for Cultural Heritage Impact Assessment as shown in Appendix 2 of the Brief;

- Annex 19 of the TM-EIAO, Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts; and
- Guidance Note on Assessment of Impact on Sites of Cultural Heritage in Environmental Impact Assessment Studies.

### III. Mitigation Recommendation

Mitigation measures will be recommended as appropriate to ensure that no direct or indirect damage is caused to any of the identified resources. The BHIA will follow the requirements of the Guidelines for Cultural Heritage Impact Assessment.

## 4.6 Air Ventilation Assessment

Air ventilation assessment (AVA) will be conducted to assess the impact of the proposed development on the wind environment in the surrounding areas and to refine the development option with a view to minimizing the impact. The methodology will follow the Technical Guide for Air Ventilation Assessment for the Developments in Hong Kong (Annex A of HPLB and ETWB Technical Circular No. 1/06 for AVA and/or any other relevant technical documents issued by the government).

In the Option Generation, Evaluation and Preliminary Assessments, site wind availability will be conducted to determine the prevailing wind direction, and the findings will inform the expert evaluation of the preliminary feasibility assessment of the initial development options. Reference will be made to the “Urban Design guidelines”, Chapter 11 of the HKPSG. The development options will then be qualitatively evaluated against the pre-determined criteria so that the relative performance of the options could be compared and ranked.

The preferred development option will be derived taking into account the balance of different issues including planning, urban design, traffic and transport, geotechnical and engineering matters, environmental and socio-economic consideration etc. An Initial Study will then be conducted on the preferred development option. Wind tunnel testing technique will be adopted to quantitatively assess the air ventilation conditions within the development site and the assessment areas. Physical wind tunnel test models will be fabricated. The upstream boundary layer flow will be a correctly scaled model of the natural wind flow over the relevant approach terrain roughness and topography with respect to mean wind speed and turbulence intensity. Pedestrian level wind speeds will be measured at a set of nominated test point locations. The wind tunnel test results will then be quantitatively analysed to determine directional wind velocity ratios (VRs), and annual and summer overall wind VRs at each test point location. Those overall wind VRs may also be subsequently averaged spatially for site air ventilation assessment, local air ventilation assessment and specific focus or functional areas.

For the site AVA, the site spatial average velocity ratio (SVR) of all perimeter test points will be reported. This gives a hint of how the development proposal impacts on the wind environment of its immediate vicinity. For the local AVA, the local spatial average velocity ratio (LVR) of all perimeter and overall test points will be reported. This gives a hint of how the development proposal impacts on the wind environment of the local area. The following considerations on the reporting of SVR and LVR will be noted:

- In the general weak wind conditions in Hong Kong, for the AVA, the higher the values of the spatial average VR, the better the design;
- The site air ventilation assessment gives an idea of how the lower portion of the buildings on the project site may affect the immediate surroundings. When problems are

detected, it is likely that design changes may be needed for the lower portion of the development (e.g. the coverage of the podium);

- The local air ventilation assessment gives an idea of how the upper portion of the buildings on the project site may affect the surroundings. When problems are detected, it is likely that design changes may be needed for the upper portion of the development (e.g. re-orientation of blocks and adjustment to the extent of the towers);
- It is necessary to examine VR of the individual test points of SVR and/or LVR to ensure that none is way below the spatial average. When this happens, it indicates possible stagnant zones to be avoided;
- No individual VR should be obviously above the spatial average SVR and/or LVR. When this happens, it indicates wind amplification, and the possibility of wind gust and pedestrian safety concerns.

## 4.7 Land Requirement Study

The land surveying will include the study of aerial photos, 1:1000 topographical survey maps and land status plans. The current ownership information of the private lots will be searched and obtained from the Land Registry. Information of relevant development proposals will also be obtained from PlanD. A site inspection and photo-takings will be carried out to record the current land usage information and where necessary to take measurements. As a special kind of feature, graves will also be surveyed as an individual exercise. They will be surveyed and recorded by photo-taking.

A baseline description of existing land use and planned land use within the Study Area will be prepared. Such baseline information will be used to evaluate the potential impacts of the initial development options on the surrounding existing and planned land uses at the preliminary assessment stage. The results of the baseline review will be used to develop a detailed inventory of known land development and land interest during the detailed assessment stage. The private lots ownership, the land status and condition available as searched material will be analysed and a schedule of private lots including the area, location, current occupation state will be compiled. The schedule will identify the significant areas of land holding amassed by individual owners/developers or proposed developments. Furthermore, schedule of Government Land Allocation, Temporary Government Land Allocation, Short Term Tenancy, Short Term Waiver, Modification of Tenancy Permit and Government Land Licence etc. will also be furnished. The land required for implementation of the preferred development option and the implication on resumption, clearance, reprovisioning and rehousing will be worked out. The land resumption cost of private lots under the Lands Department Compensation Zonal Plan will be furnished.

Land Requirement Plan/Report will be prepared to depict the land interests either permanently or temporarily affected by the proposed developments and associated infrastructures/facilities. An enumeration and tabulation of all affected lands, structures, etc. will be devised with area of private lots to be affected (in square metres and square feet). The report will also summarize the information of land resumption and clearance of all affected lots, short term tenancies, Short Term Waivers, Modification of Tenancy Permits, Government Land Licences, temporary and permanent land allocations, structures and cultural and religious features required for the preferred development option separately for the public housing project, YLIEE as well as other associated infrastructural works. The report will also identify any need and extent of reprovisioning and rehousing that may be required for the development and infrastructure.



## 4.8 Financial Assessment Study

The financial analysis will adopt a whole of life approach and comprise a number of steps:

- Develop capital and relevant operational cost estimates for each development;
- Estimate potential revenue streams where relevant through lease and/or sale of land;
- Compile into a discounted cash flow model to estimate net benefits over the life of the development ( revenues minus costs) and assess the funding gap if necessary;
- Perform sensitivity analysis to identify the variability of each development under different scenarios.

The financial assessment results will be presented at Money-of-the day (MOD) price to reflect the estimated value on the project commencement date. Based on the construction cost estimates, an Estimated Risk Assessment (ERA) will be conducted to calculate the potential increase of construction cost. The main activities in the ERA will include 1) identifying significant risk for the project, 2) assessing the probability and extent of those risks occurring and 3) establishing appropriate value for the risks.

There are various financial evaluation methods for evaluating the project's financial viability, such as simple payback, discount payback methods, internal rate of return (IRR) and net present value (NPV). A preferred method will be adopted in consultation with the DR.

## 4.9 Community Engagement

A community engagement will be conducted after Phase 1 of the Study when a Preliminary Recommended Option of the Study Site has been derived. The community engagement will engage the public on appreciating how various planning and design considerations are taken into account in the formulation of the Preliminary Recommended Option, and involve the public in discussing the option, with a view to fostering public support. The community engagement would also aim to facilitate the subsequent rezoning of the Subject Site for public housing use, industrial estate use and other associated uses. In order to facilitate an informed community engagement exercises, useful information on the Study including the Preliminary Recommended Option shall be made available to the public and presented in layman terms by means of Community Engagement Digests, while members of the public can also send their enquiries and comments via e-mail. During community engagement, the key planning and design concepts of the proposed development will be highlighted to gain acceptability of the proposed development.

Stakeholders with local interests such as Yuen Long District Council and Rural Committees would also be engaged through attending their regular meetings or organizing community engagement activities to present the development scheme and receive feedbacks. Comments from the community and stakeholders will be reviewed with the DR in the formulation of a Recommended Option for the Study Site. Decision in response to the comments will be documented in the Community Engagement Report.

## 4.10 EIAO process

Designated projects proposed in the Study, including the planning and engineering study for the Site, YLIEE and any other supporting facilities, works and projects, which fall within Schedule 2 & 3 of EIAO will be identified during the course of study. An EIA will be conducted to confirm the feasibility of these designated projects. A project account, similar

to project profile in EIA process will be prepared and submitted to EPD during early stage of Phase 1 study such that EPD might consider providing the study requirements for the EIA.

Upon commissioning of Phase 2 study, a project profile will be formally submitted to EPD for application of study brief for the EIA. The EIA will be conducted in accordance with the EIA study brief to be issued by EPD and under TM-EIAO. The Draft EIA report and EM&A Manual will be submitted to EPD for comments. All comments received will be addressed and incorporated into the Final EIA report for formal submission under the EIAO. If the Director of EPD is satisfied that the EIA report meets the requirements of the EIA study brief and TM-EIAO, the Final EIA report together with the EM&A Manual will be arranged and made available for public inspection for a period of 30 days. The inspection of the Final EIA report by the Advisory Council on the Environment (ACE) will take 60 days in parallel with public inspection and where required, presentation of the EIA report to ACE will be made.

## 5 STUDY PROGRAMME

### 5.1 An Overview

The Study will be conducted for a period of 36 months. **Appendix A** contains the programme for the Assignment including the activities, their timing, key dates of receipt of approvals and reporting in order to achieve the deliverables on or before their deadlines stated in the Brief. The programme would be continually updated during the course of the Assignment and will be included in the Monthly Progress Reports.

### 5.2 Deliverables Submission Schedule

**Table 5.1** summarises the schedule of deliverables. In addition, the Monthly Progress Reports including an updated study programme and the Monthly Financial Report will be submitted within the first week of each month.

**Table 5.1** Schedule of deliverables

No.	Deliverables	Submission Date (Duration)		Proposed Submission Date	
		Draft	Final	Draft	Final
<b>Phase 1 Study</b>					
1	Inception Report	1 month	2 months	31 Aug 12	1 Oct 12
2	TR-1: Baseline Review	3 months	4 months	31 Oct 12	30 Nov 12
3	Project Account(s) for Environment Assessment	4 months		30 Nov 12	
4	TR-2: Option Generation, Evaluation and Preliminary Assessment Report	6 months	8 months	31 Jan 13	31 Mar 13
5	TR-3: Preferred Options and Technical Assessments including:	11 months	14 months	30 Jun 13	30 Sep 13
	TR-3a: Traffic and Transport Impact assessment				
	TR-3b: Geotechnical Feasibility/Assessment Study, Geotechnical Ground Investigation (GI) and Laboratory Tests (LT) & Site Formation Assessment				
	TR-3c: Natural Terrain Hazard Study				
	TR-3d: Drainage Impact Assessment				
	TR-3e: Sewerage Impact Assessment				
	TR-3f: Waterworks Impact Assessment				
	TR-3g: Assessment on other engineering infrastructural requirements				
	TR-3h: Environment Impact Assessment				
	TR-3i: Air Ventilation Assessment				
	TR-3j: Land Requirement Study				
	TR-3k: Tree Survey				
TR-3l: Financial Assessment					
6	TR-4: Preliminary Recommended Option, Implementation and Costing	15 months	16 months	31 Oct 13	30 Nov 13

No.	Deliverables	Submission Date (Duration)		Proposed Submission Date	
		Draft	Final	Draft	Final
Phase 2A or Phase 2B Study					
7	TR-5a: Public Consultation/ Engagement Digest	16.5 months	17 months	16 Dec 13	31 Dec 13
8	TR-5b: Public Consultation/ Engagement Report	20.5 month	21 month	16 Apr 14	30 Apr 14
9	Updated Technical Assessments after Public Consultation/ Engagement	21 month	22 months	30 Apr 14	31 May 14
10	TR-6: Recommended Option, Refined Technical Assessments Report	31 months	33 months	28 Feb 15	30 Apr 15
11	Implementation and Costing Report	33 months	35 months	30 Apr 15	30 Jun 15
12	Rezoning Report	23 months	25 months	30 Jun 14	31 Aug 14
13	Project Profile(s)	17.5 month		1 Jan 14	
14	Environmental Impact Assessments Report <sup>Note 1</sup>	22 months	23 months	31 May 14	30 Jun 14
15	Environmental Monitoring & Audit Manual, Final EIA and Executive Summary <sup>Note 1</sup>	30 months	31 months	31 Jan 15	28 Feb 15
16	Project Definition Statement and Technical Feasibility Statement	35 months		30 Jun 15	
17	Final Report (ENG & CHI)	34 months	35 months	30 May 15	30 Jun 15
18	Final Executive Summary (ENG & CHI)	35 months	35.5 months	30 Jun 15	15 Jul 15

Note 1: The programme for the EIA Report and EM&A Manual will be reviewed at appropriate time with the DR and EPD with a view to combine the submission of both documents.

### 5.3 Proposed Dates for Study Steering Group/ Working Group Meetings and Other Meetings

A Study Steering Group (SSG) is to oversee and address major issues and provide guidance to the Study Working Group and Consultants with regard to policy assumptions and other key parameters to be used in the Study, and endorse the findings and recommendation of the Study. The proposed schedule of the SSG meetings is given in the table below. Ad-hoc SSG meetings may also be required on need basis.

**Table 5.2** Proposed schedule of SSG meetings

Meetings	Dates (Tentative)	Purpose	Deliverables to be endorsed
SSG1	15 Mar 13	To review and comment on the findings of the preliminary technical assessment and the preferred development option	TR-2: Option Generation, Evaluation and Preliminary Assessment Reports
SSG2	15 Nov 13	To review and comment on the findings of technical assessment on the preferred development option and PODP, PMLP, PUDLP	TR-3: Preferred Options and Technical Assessments TR-4: Preliminary Recommended Option Implementation and Costing
SSG3	25 May 14	To review and comment on the findings of public consultation/ engagement and updated technical assessments	TR-5a: Public Consultation/ Engagement Report Updated Technical Assessments after Public Consultation/ Engagement

A Study Working Group (SWG) is to monitor the general progress of the Study, agree on the work programme, methodologies and evaluation criteria to be used in the Study. It is

anticipated that a number of SWG meetings and/or technical meetings will be required during the course of the Study and hence will be held on need basis.

During the Phase 2 study, meetings with TPB for rezoning application and meetings with ACE and Environmental Study Management Group (ESMG) for the approval of EIA submission will also be required on need basis.

## **5.4 Proposed Dates for Monthly Progress Meeting**

The Monthly Progress Meeting (MPM) will tentatively be held on a monthly basis on Friday in the first week of each month to discuss and resolve contractual, administrative, staffing, coordination and other management issues related to the Study.

## 6 STUDY TEAM AND MANAGEMENT STRUCTURE

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### 6.1 Organization Structure

The organisation will be led by a Study Management Team comprising of the Project Director, Project Manager, Project Coordinator, and QA and Risk Manager. Five study teams under the project management team have been established, including Planning and Urban Design, Environmental, Engineering and Infrastructure, Traffic and Transport, and Project Support. The experiences and involvement of the proposed team members are briefly described below and the proposed Study team organization chart is shown in **Appendix B**.

### 6.2 Responsibilities of Key Personnel

#### 6.2.1 Project Management Team

**Project Director** – [REDACTED] is a [REDACTED] with Arup and has over [REDACTED] years of experience working on a mixed of environmental design and assessment for infrastructural developments. He will provide proactive direction to the Study and be responsible for the Consultants' overall activities and directly responsible to the Director's Representative.

**Project Manager** – [REDACTED] is a [REDACTED] and [REDACTED] with extensive project management experience in planning and engineering feasibility projects. She has since been engaged in a wide spectrum of land use planning studies and infrastructure projects. [REDACTED] will be responsible for the day-to-day management and operation of the team including programming and co-ordination. She will ensure that the study deliverables are on time and of quality.

**Project Coordinator** – [REDACTED] is a [REDACTED] experienced in urban design, master planning, planning studies and project management. He will take up day-to-day coordination and liaison between team members and act as the first contact point for the Client.

**QA and Risk Manager** – [REDACTED] is a [REDACTED] and is highly experienced in preparing and implementing QA system. He will undertake internal audits to ensure work are undertaken according to quality procedures.

#### 6.2.2 Planning and Urban Design Team

**Team Leader** – [REDACTED] is a [REDACTED] and [REDACTED]. She will be responsible for the overall management and coordination of the planning team to ensure the planning vision transcends through to the urban design of the scheme. She will also lead the review of the ODP together with the Urban Design Plan, Layout Plan, Landscape Master Plan.

**Urban/ Land Use Planning** – [REDACTED] is a [REDACTED] with extensive planning experience on a range of studies and projects in Hong Kong with major focus is also on Government Strategic Planning Studies. He will be responsible for land use planning of the PODP and provide planning inputs towards the preparation of the Layout Plans.

**Statutory Submission** – [REDACTED] has undertaken development control responsibilities and involved in the statutory regulation and management of changes to land use and

development. Her responsibilities include preparing planning applications based on compliance with the relevant planning objectives, controls, standards, policies and provisions.

**Urban Design** - [REDACTED] has [REDACTED] years experience in architecture and urban design, and specializes on the relationship between urban systems and urban form. He will be responsible for preparing the Urban Design and Layout Plans.

**Landscape Design** - [REDACTED] is a [REDACTED] in Hong Kong and a [REDACTED]. She will be responsible for preparing the Landscape Master Plan.

**Air Ventilation** - [REDACTED] is a [REDACTED] and [REDACTED] involved in the AVA study in Hong Kong for HKHA's projects. He will support on air ventilation assessment.

### 6.2.3 Environmental Team

**Team Leader** - [REDACTED] has more than [REDACTED] years experience in the environmental impact assessment and has been the EIA team leaders for different infrastructure and building projects. [REDACTED] will lead the environmental team to prepare EIA and provide expert advice on environmental planning principles to integration into the urban design.

**Contamination** - [REDACTED] [REDACTED] specializes in land contamination assessment and remediation, waste management, wastewater treatment, landfill management, etc. He will support on land contamination and waste management assessment.

**Noise** - [REDACTED] is a [REDACTED] with over [REDACTED] years research and consulting experience on EIA. He will support the team on noise impact assessment.

**Air Quality** - [REDACTED] has more than [REDACTED] years experience in air quality assessments and is familiar with various air quality dispersion modeling. She will support the team on air quality impact assessment.

**Waste** - [REDACTED] specializes in environmental monitoring and audit, due diligence audit, waste management study, etc. He will support the team on waste management assessment.

**Cultural Heritage** - [REDACTED] has more than [REDACTED] years experience in Hong Kong, Singapore, the U.K. and Canada. Her built heritage experience encompasses impact assessment to historical and culturally significant structures. [REDACTED] will support on archaeological and built heritage impact assessment.

**Ecology** - [REDACTED] is an [REDACTED] with specialised knowledge and experience in wetlands and wetland birds, especially in the Deep Bay area. He will support on ecological and fisheries impact assessment.

**Landscape and Visual Impact** - [REDACTED] has over [REDACTED] years of experience in heritage landscape design and wide experience in EIA. He will support on landscape and visual impact assessment.

**Hazard** - [REDACTED] is experienced in both environmental risk analysis and modelling. He will be responsible for hazard assessment.

**Water Quality** - [REDACTED] has more than [REDACTED] years experience in various EIA, specialized in hydraulic and water quality analysis such as Hong Kong Zhuhai Macao Bridge, Cross Bay Link, Tonggu Waterway, etc. He will support the team on water quality impact assessment.

**EM&A** - [REDACTED] has over [REDACTED] year practical experience in EM&A as [REDACTED] [REDACTED] and [REDACTED] for various infrastructure projects. He will be responsible for formulating the EM&A programme for this Study.

## 6.2.4 Engineering and Infrastructure Team

**Team Leader** – [REDACTED] has over [REDACTED] years of experience and has been involved in various types of projects including site investigation, reclamation, pile study, foundation design, site formation, reclamation, slope inspection, slope stability assessment, retaining wall design, tunnel and deep basement excavation and lateral support design works. [REDACTED] will lead the engineering and infrastructure team to assess geotechnical engineering, natural terrain hazard, landform infrastructure, drainage and sewerage, utilities and facilities required to support overall land use plan derived from the Study.

**Geotechnics (Foundations)** – [REDACTED] has over [REDACTED] years of geotechnical engineering including slope engineering and natural terrain study, mitigation works, deep foundation design, pile test interpretation and site formation design. [REDACTED] will be responsible for undertaking the assessment on foundation.

**Site Investigation** – [REDACTED] has [REDACTED] year experience on in design, site supervision and management of various infrastructure and building projects in Hong Kong. He will be responsible for SI works.

**Natural Terrain Hazard** – [REDACTED] is an [REDACTED] with considerable experience in the fields of engineering geology, engineering geomorphology, hydrogeology and geotechnical engineering, etc. He will be responsible for the natural terrain hazard assessment.

**Drainage and Sewerage** – [REDACTED] has substantial experience in water & wastewater process engineering. He will be responsible for the drainage and sewerage impact assessment.

**Water and Utilities** – [REDACTED] has more than [REDACTED] years extensive experience on studies, scheme design, detailed design of various infrastructures including water supply and utility works. He will be responsible for the assessment of water works and utilities.

**Highways and Roads** – [REDACTED] has over [REDACTED] years of experiences in highway and transportation infrastructure projects. He will be responsible for preliminary schematic design of road proposals to support the development.

## 6.2.5 Traffic and Transport Team

**Team Leader** – [REDACTED] has over [REDACTED] years' experience on a variety of studies ranging from private development TIA to the largest regional traffic and modelling studies. [REDACTED] has a wide breadth of technical knowledge covering all aspects of traffic engineering, planning and transport modelling. [REDACTED] will lead the traffic and transport team to derive an overall transport strategies required to support overall land use plan and undertake the TIA required for the Study.

**Transport Planning** – [REDACTED] has over [REDACTED] years experience in developing traffic modelling, traffic forecasts & TIAs. She will provide support to derive the transport strategies.

**Traffic Engineering** – [REDACTED] has been involved in a wide variety of projects including temporary traffic management works, TIA, district and local development traffic studies, etc. He will be responsible for transport modelling and traffic impact assessment.

**Public Transport Planning** – [REDACTED] has extensive transport modelling and transport planning experience. He will be responsible for public transport planning.



**Demand Forecasting** – [REDACTED] has over [REDACTED] years of professional transport planning experience. He will provide support on traffic and transport demand forecasting.

### 6.2.6 Project Support

**PE Facilitator** – [REDACTED] possesses rich experience in formulating effective community engagement strategies, organizing and facilitating public engagement / stakeholders planning workshops in the local community. [REDACTED] will lead the community engagement and formulate community engagement strategies.

**Public Relations** – [REDACTED] is a [REDACTED] with over [REDACTED] years of experience in communications, public and media relations. She will provide support to prepare publicity materials, formulate strategies and provide inputs to the community engagement exercise.

**Professional Copywriter** – [REDACTED] is a [REDACTED] with over [REDACTED] years of experience in communications, public and media relations. She will provide support to translate and produce community engagement materials.

**Implementation** – [REDACTED] is a [REDACTED] and is particular versed in project programming, and implementation phasing strategies. He will be responsible for formulating the implementation programme and cost estimation of the land use option.

**Land Valuation & Requirement** – [REDACTED] is the [REDACTED] [REDACTED] and manages Term Consultancy for Engineering Surveying Services for Housing Authority. He will be responsible for the land requirement study and provide land valuation input.

**Finance / Costing / Property Markets** – [REDACTED] is an [REDACTED] with approximately [REDACTED] years of professional experience in economic and financial analysis of major infrastructure projects and government policy. [REDACTED] will undertake the financial assessment of the development option.

**Socio-economic** – [REDACTED] is an [REDACTED] at Arup with approximately [REDACTED] years of professional experience, primarily in socio-economic impact, economic and financial modelling. He will provide advice on the socio-economic principles for integration into overall master plan.

## **Figures**

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## **Appendix A**

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### **Study Programme**



Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau

ID	Task Name	Start	Finish	2	Qtr 3, 2012	Qtr 4, 2012	Qtr 1, 2013	Qtr 2, 2013	Qtr 3, 2013	Qtr 4, 2013	Qtr 1, 2014	Qtr 2, 2014	Qtr 3, 2014	Qtr 4, 2014	Qtr 1, 2015	Qtr 2, 2015	Qtr 3, 2015	
					Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
73	Air quality assessment	Fri 3/1/13	Sun 6/30/13															
74	Water quality assessment	Mon 4/1/13	Sun 6/30/13															
75	Land contamination assessment & Waste management implications	Sat 9/15/12	Fri 5/31/13															
76	Preparation of CAP	Sat 9/15/12	Mon 10/15/12															
77	Submission of CAP to EPD	Mon 10/15/12	Mon 10/15/12															
78	Approval of CAP	Mon 10/15/12	Thu 11/15/12															
79	Preparation of Works Order	Mon 10/15/12	Fri 11/30/12															
80	Conduct site investigation (SI) and Contamination Laboratory Testing	Sat 12/1/12	Sun 3/31/13															
81	Preparation of CAR & RAP	Fri 3/1/13	Mon 4/1/13															
82	Submission of CAR & RAP to EPD	Mon 4/1/13	Mon 4/1/13															
83	Approval of CAR & RAP	Mon 4/1/13	Fri 5/31/13															
84	Hazard assessment	Mon 4/1/13	Sun 6/30/13															
85	Landscape & visual impact assessment	Mon 4/1/13	Sun 6/30/13															
86	Ecological & Fisheries impact assessment	Mon 4/1/13	Sun 6/30/13															
87	Cultural heritage impact assessment (CHIA)	Fri 2/1/13	Sun 6/30/13															
88	Air Ventilation Assessment	Mon 4/1/13	Sun 6/30/13															
89	Land Surveying and Requirement Study	Sat 9/15/12	Sun 6/30/13															
90	Tree Survey	Sat 12/1/12	Thu 2/28/13															
91	Financial Assessment Study	Fri 3/1/13	Sun 6/30/13															
92	Submit Draft Preferred Options and Technical Assessments (TR-3)	Mon 6/30/13	Sun 6/30/13															
93	Response to Comment	Mon 7/1/13	Mon 9/30/13															
94	Submit Final Preferred Options and Technical Assessments (TR-3)	Mon 9/30/13	Mon 9/30/13															
95	<b>Task 7</b>																	
96	<b>Financial Assessment/Appraisal of the Preferred Development Option</b>	Fri 3/1/13	Sun 6/30/13															
97	<b>Task 8</b>																	
98	<b>PODP, PMLP, PUOP and Preliminary Master Layout Plan for the Proposed Development</b>	Wed 7/31/13	Thu 10/31/13															
99	Preliminary Outline Development Plan (PODP)	Wed 7/31/13	Sat 8/31/13															
100	Preliminary Master Layout Plan (PMLP)	Sat 8/31/13	Thu 10/31/13															
101	Preliminary Urban Design and Landscape Plan (PUDLP)	Sat 8/31/13	Thu 10/31/13															
102	<b>Preliminary Recommended Option, Implementation and Costing (TR-4)</b>	Mon 7/1/13	Sat 11/30/13															
103	Refine and formulate preliminary recommended option	Mon 7/1/13	Thu 8/1/13															
104	Refine development and planning parameters	Mon 7/1/13	Thu 8/1/13															
105	Recommendations on site formation, slope works, road works and other infrastructure and mitigation measures	Sat 8/31/13	Mon 10/14/13															
106	Action Plan and Implementation Programme	Mon 9/16/13	Thu 10/31/13															
107	Detailed Cost Estimates	Mon 9/16/13	Thu 10/31/13															
108	Submit Draft Preliminary Recommended Option, Implementation and Costing (TR-4)	Thu 10/31/13	Thu 10/31/13															
109	Response to Comment	Fri 11/1/13	Sat 11/30/13															
110	Submit Final Preliminary Recommended Option, Implementation and Costing (TR-4)	Sat 11/30/13	Sat 11/30/13															
111																		
112	<b>Phase 2A Study / Phase 2B Study</b>																	
113	<b>Task 9</b>																	
114	<b>Public Consultation/Engagement Digest (TR-5a)</b>	Sat 11/30/13	Tue 12/31/13															
115	Preparation of Public Consultation/Engagement Digest (TR-5a)	Sat 11/30/13	Mon 12/16/13															
116	Submit Draft Public Consultation/Engagement Digest (TR-5a)	Mon 12/16/13	Mon 12/16/13															
117	Response to Comment	Tue 12/17/13	Tue 12/31/13															
118	Submit Final Public Consultation/Engagement Digest (TR-5a)	Tue 12/31/13	Tue 12/31/13															
119	<b>Public Consultation/Engagement</b>	Mon 1/2/14	Mon 3/31/14															
120	Production of Public Engagement Materials	Thu 1/2/14	Fri 1/31/14															
121	Conduct Public Consultation	Sat 2/1/14	Mon 3/31/14															
122	<b>Public Consultation/Engagement Report (TR-5b)</b>	Tue 4/1/14	Wed 4/30/14															
123	Preparation of Public Consultation/Engagement Report (TR-5b)	Tue 4/1/14	Tue 4/15/14															
124	Submit Draft Public Consultation/Engagement Report (TR-5b)	Wed 4/16/14	Wed 4/16/14															
125	Response to Comment	Wed 4/16/14	Wed 4/30/14															
126	Submit Final Public Consultation/Engagement Report (TR-5b)	Wed 4/30/14	Wed 4/30/14															
127	<b>Updated Technical Assessments after Public Consultation/Engagement</b>	Tue 4/1/14	Sat 5/31/14															
128	Revise the development option to take account of public comments	Tue 4/1/14	Wed 4/30/14															
129	Update Technical Assessments	Tue 4/1/14	Wed 4/30/14															
130	Submit Draft Updated Technical Assessments after Public Consultation/Engagement	Wed 4/30/14	Wed 4/30/14															
131	Response to Comment	Wed 4/30/14	Sat 5/31/14															
132	Submit Final Updated Technical Assessments after Public Consultation/Engagement	Sat 5/31/14	Sat 5/31/14															
133	<b>Task 12</b>																	
134	<b>Preparation of Rezoning Report</b>	Thu 5/1/14	Tue 6/30/15															
135	Planning Statement etc.	Thu 5/1/14	Mon 6/30/14															
136	Submit Draft Rezoning Report	Mon 6/30/14	Mon 6/30/14															
137	Response to Comment	Mon 6/30/14	Sun 8/31/14															
138	Submit Final Rezoning Report	Sun 8/31/14	Sun 8/31/14															
139	Supplementary information for Rezoning	Sun 8/31/14	Tue 6/30/15															
140	<b>Task 13</b>																	
141	<b>Preparation and Submission of Project Profile</b>	Sun 12/1/13	Wed 1/1/14															
142	<b>Issue of Study Brief</b>	Fri 2/28/14	Fri 2/28/14															
143	<b>Environmental Impact Assessment Report</b>	Sat 3/1/14	Mon 6/30/14															
144	Noise assessment	Sat 3/1/14	Mon 6/30/14															



## **Appendix B**

### **Organization Chart**



