

**ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE (CAP. 499)**  
**SECTION 5(7)**

**ENVIRONMENTAL IMPACT ASSESSMENT STUDY BRIEF NO. ESB-219/2011**

**PROJECT TITLE: TUEN MUN WESTERN BYPASS**  
**(hereinafter known as the “Project”)**

**NAME OF APPLICANT: HIGHWAYS DEPARTMENT**  
**(hereinafter known as the “Applicant”)**

**1. BACKGROUND**

- 1.1 An application (No. ESB-219/2011) for an Environmental Impact Assessment (EIA) Study Brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 19 January 2011 with a Project Profile (No. PP-429/2011) (hereinafter referred as the “Project Profile”).
- 1.2 The scope of the Project is to construct and operate a dual two-lane highway of about 8.2km in length connecting Kong Sham Western Highway in the north and the proposed Tuen Mun – Chek Lap Kok Link (TMCLKL) in the south, with a middle connection to Tsing Tin Road and Tuen Mun Road as shown in Appendix A of this EIA Study Brief. The Project is mainly divided into the following two sections:

Southern Section –

- (i) a toll plaza near Lung Mun Road and about 4.8km land tunnel continuing from TM-CLKL running through Castle Peak and emerging to the east of the junction of Tsing Tin Road and Tsun Wen Road; and
- (ii) a roundabout at the junction of Tsing Tin Road and Tsun Wen Road, and modification of existing slip roads from / to Tsing Tin Road.

Northern Section –

- (iii) about 3.4km viaduct bifurcating from the existing Tsing Tin Road viaduct, running parallel to the existing West Rail, to connect with Kong Sham Western Highway near Yick Yuen.
- 1.3 The Project consists of the following designated projects under Part I, Schedule 2 of the EIAO:
- (i) Item A.1 – “A road which is an expressway, trunk road, primary distributor road or district distributor road including new roads, and major extensions or improvements to existing roads”;
  - (ii) Item A.7 – “A road or railway tunnel more than 800m in length between portals”;
  - (iii) Item A.8 – “A road or railway bridge more than 100m in length between abutments”; and

- (iv) Item Q.1 – “*All projects including new access roads, railways, sewers, sewage treatment facilities, earthworks, dredging works and other building works partly or wholly in a site of special scientific interest*”.
- 1.4 Pursuant to section 5(7)(a) of the EIAO, the Director of Environmental Protection (the Director) issues this EIA Study Brief to the Applicant to carry out an EIA study.
- 1.5 The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities taking place concurrently. This information will contribute to decisions by the Director on:
- (i) the acceptability of adverse environmental consequences that are likely to arise as a result of the Project;
  - (ii) the conditions and requirements for the design, construction and operation of the Project to mitigate against adverse environmental consequences; and
  - (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

## **2. OBJECTIVES OF THE EIA STUDY**

2.1 The objectives of the EIA study are as follows:

- (i) to describe the Project and associated works together with the requirements and environmental benefits for carrying out the Project;
- (ii) to identify and describe elements of community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including the natural and man-made environment and the associated environmental constraints;
- (iii) to provide information on the consideration of alternatives/options for the alignments(s) and built-forms of the Project to avoid and minimise the potential environmental impacts to environmentally sensitive areas and other sensitive uses; to compare the environmental benefits and dis-benefits of each of the different options; to provide reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection of the preferred option(s);
- (iv) to identify and assess air quality impact, noise impact, water quality impact, waste management implication, hazard to life, landfill gas hazard, ecological impact, cultural heritage impact, and landscape and visual impacts; and determine the significance of impacts on sensitive receivers and potential affected uses;
- (v) to propose the provision of infrastructure or mitigation measures so as to minimise pollution, environmental disturbance and nuisance during the construction and operation of the Project;
- (vi) to investigate the feasibility, practicability, effectiveness and implications of the proposed mitigation measures;
- (vii) to identify, predict and evaluate the residual environmental impacts (i.e. after

practicable mitigation) and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;

- (viii) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and reduce them to acceptable levels;
- (ix) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures, and to identify constraints associated with the mitigation measures recommended in the EIA study as well as the provision of any necessary modification; and
- (x) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

### **3. DETAILED REQUIREMENTS OF THE EIA STUDY**

#### **3.1 The Purpose**

- 3.1.1 The purpose of this EIA Study Brief is to scope the key issues of the EIA study and to specify the environmental issues that are required to be reviewed and assessed in the EIA report. The Applicant has to demonstrate in the EIA report that the criteria in the relevant sections of the Technical Memorandum on Environmental Impact Assessment Process of the EIAO (hereinafter referred to as the "TM") are fully complied with.

#### **3.2 The Scope**

- 3.2.1 The scope of this EIA study shall cover the Project and associated works proposed in the Project Profile (No. PP-429/2011) and mentioned in section 1.2 of this EIA Study Brief. The EIA study shall address the likely key issues described below, together with any other key issues identified during the course of the EIA study:

- (i) the potential air quality impact from the construction and operation of the Project to sensitive receivers along or near the Project, taking into account the cumulative impact from the operation of existing and planned/committed roads in the vicinity of the Project, in particular TMCLKL and major existing and planned/committed air pollutant emission sources within the North West New Territories (NWNT);
- (ii) the potential noise impact from the construction and operation of the Project to sensitive receivers along or near the Project;
- (iii) the potential water quality impact from the construction and operation of the Project on the relevant water system(s), such as the gazetted beaches in Tuen Mun;
- (iv) the potential waste management issues and impacts arising as a result of the construction activities of the Project and the potential land contamination from land to be resumed for the Project;
- (v) the potential hazard to life from the construction and operation of the Project;

- (vi) the potential landfill gas hazard on site during the construction and operation of the Project as the Project falls within the consultation zone of the restored Pillar Point Valley Landfill; and
- (vii) the potential ecological impact from the construction and operation of the Project to the ecological sensitive areas;
- (viii) the potential cultural heritage impact from the construction and operation of the Project;
- (ix) the potential landscape and visual impacts from the construction and operation of the Project; and
- (x) the potential cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed and planned developments in the vicinity of the Project, and that those impacts may have a bearing on the environmental acceptability of the Project. Consideration shall be given to account for impacts from likely concurrent projects, in particular TMCLKL.

### **3.3 Consideration of Alternatives**

#### **3.3.1 Need of the Project**

The Applicant shall provide information on the need of the Project, including the purpose and objectives of the Project, and describe the scenarios with and without the Project.

#### **3.3.2 Consideration of Different Alignment Options and Built-forms**

In addition to the proposed alignment option mentioned in section 1.2 above, the Applicant shall consider other feasible alignment options for the Project, provide justification regarding how the proposed scheme is arrived at, including the descriptions of the environmental factors considered in the option selection. Alternative built-forms (such as changing the proposed viaduct sections to tunnels) and design of the highway shall be reviewed and investigated. A comparison of the environmental benefits and dis-benefits of possible alignment options and alternative built-forms and design shall be made with a view to recommending the preferred option to avoid/minimise adverse environmental effects to the maximum practicable extent. In particular, considerations shall be given to avoid or minimise the disturbance to sites of special scientific interest and cultural and heritage resources, and to avoid or minimise adverse environmental impacts.

#### **3.3.3 Consideration of Alternative Construction Methods and Sequences of Works**

Taking into consideration the combined effect with respect to the severity and duration of the construction impacts to the affected sensitive receivers, the EIA study shall explore alternative construction methods and sequences of works for the Project, with a view to shortening the construction period and avoiding prolonged adverse environmental impacts to the maximum practicable extent. A comparison of the environmental benefits and dis-benefits of applying different construction methods and sequence of works shall be made.

### 3.3.4 Selection of Preferred Option(s)

The Applicant shall, taking into consideration of the findings in sections 3.3.2 and 3.3.3 above, recommend and justify the adoption of the preferred alignment, construction method(s) and sequence(s) of works that will avoid or minimise adverse environmental effects arising from the Project, and describe the part that environmental factors played in arriving at the final selection

## 3.4 **Technical Requirements**

The Applicant shall conduct the EIA study to address the environmental aspects of the Project as described in sections 3.1 to 3.3 above. The assessment shall be based on the best and latest information available during the course of the EIA study. The Applicant shall include in the EIA report details of the construction and operational programme and methodologies for the Project. The Applicant shall clearly state in the EIA report the time frame and works programmes of the Project and other concurrent projects, and assess the cumulative environmental impacts from the Project and the interacting projects as identified in the EIA study, including any phased implementation of the Project and the associated works.

The EIA study shall include the following technical requirements on specific impacts.

### 3.4.1 **Air Quality Impact**

3.4.1.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing air quality impact as stated in section 1 of Annex 4 and Annex 12 of the TM respectively.

3.4.1.2 The study area for the air quality impact assessment shall generally be defined by a distance of 500 metres from the boundary of the Project site, yet it shall be extended to include major existing, planned/committed emission sources that may have a bearing on the environmental acceptability of the Project. Such assessment shall be based on the best available information at the time of the assessment.

3.4.1.3 The assessment of the air quality impact arising from the construction and operation of the Project shall follow the detailed technical requirements given in Appendix B of this EIA Study Brief.

3.4.1.4 The Applicant shall assess the air pollutant concentrations with reference to the relevant sections of “Guidelines for Local-Scale Air Quality Assessment Using Models” given in Appendices B-1 to B-3 attached to this EIA Study Brief. The Applicant shall also note that the PATH model may be used for estimating the cumulative background air quality by taking into account the major air pollutant emission sources in Hong Kong and nearby regions.

### 3.4.2 **Noise Impact**

3.4.2.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing noise impact as stated in Annexes 5 and 13 of the TM.

3.4.2.2 The study area for the noise impact assessment shall generally include areas within 300 metres from the Project boundary as shown in Appendix A of this EIA Study Brief or other Project alignments as identified in the EIA study. The assessment area can be

reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the outer Project limit, provides acoustic shielding to those receivers at distances further away from the Project. The assessment area shall be expanded to include NSRs at distances over 300m from the Project, which are affected by the construction and operation of the Project.

3.4.2.3 The noise impact assessment for the construction and operation of the Project shall follow the detailed technical requirements given in Appendix C of this EIA Study Brief.

### **3.4.3 Water Quality Impact**

3.4.3.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water pollution as stated in Annexes 6 and 14 of the TM.

3.4.3.2 The study area for the water quality impact assessment shall include areas within 300 metres from the Project boundary and shall cover the North Western Water Control Zone as designated under the Water Pollution Control Ordinance (Cap. 358) and the water sensitive receivers in the vicinity of the Project. The study area shall be extended to include other areas if they are found also being impacted during the course of the EIA study and have a bearing on the environmental acceptability of the Project.

3.4.3.3 The water quality impact assessment for the construction and operation of the Project shall follow the detailed technical requirements given in Appendix D of this EIA Study Brief.

### **3.4.4 Waste Management**

3.4.4.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing waste management implications as stated in Annexes 7 and 15 of the TM.

3.4.4.2 The assessment of the waste management implications arising from the Project shall follow the detailed technical requirements given in Appendix E of this EIA Study Brief.

### **3.4.5 Hazard to Life**

3.4.5.1 The Applicant shall follow the criteria for evaluating hazard to life as stated in Annex 4 of the TM.

3.4.5.2 The hazard assessment for the Project shall follow the detailed technical requirements given in Appendix F of this EIA Study Brief.

### **3.4.6 Landfill Gas Hazard**

3.4.6.1 The Applicant shall follow the guidelines for evaluating and assessing landfill gas hazard as stated respectively in Annexes 7 and 19 of the TM and the Landfill Gas Hazard Assessment Guidance Note issued by the Director.

3.4.6.2 The landfill gas hazard assessment for the construction and operation of the Project shall follow the detailed technical requirements given in Appendix G of this EIA Study Brief.

### **3.4.7 Ecological Impact**

- 3.4.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing ecological impact as stated in Annexes 8 and 16 of the TM.
- 3.4.7.2 The study area for the terrestrial ecological impact assessment shall include areas within 500 metres from the site boundary of the works areas or the area likely to be impacted by the Project.
- 3.4.7.3 The assessment of the ecological impact arising from the construction and operation of the Project shall follow the detailed technical requirements given in Appendix H of this EIA Study Brief.

### **3.4.8 Cultural Heritage Impact**

- 3.4.8.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing cultural heritage impact as stated in Annexes 10 and 19 of the TM.
- 3.4.8.2 The cultural heritage impact assessment shall include an archaeological impact assessment and a built heritage impact assessment.
- 3.4.8.3 The assessment of the cultural heritage impact arising from the construction and operation of the Project shall follow the detailed technical requirements given in Appendix I of this EIA Study Brief. Guidelines for Cultural Heritage Impact Assessment (Appendix I-1), Guidelines for Archaeological Reports (Appendix I-2) and Guidelines for Handling of Archaeological Finds and Archives (Appendix I-3) shall also be followed to conduct the cultural heritage impact assessment.

### **3.4.9 Landscape and Visual Impacts**

- 3.4.9.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing landscape and visual impacts as stated in Annexes 10 and 18 of the TM, and the EIAO Guidance Note No. 8/2010 "Preparation of Landscape and Visual Impact Assessment under the EIAO".
- 3.4.9.2 The study area for the landscape impact assessment shall include landscape character areas and landscape resources within 500 metres from Project boundary while the study area for the visual impact assessment shall be defined by the visual envelope of the Project. The extent of the defined visual envelope shall be shown on a plan and documented in the EIA report.
- 3.4.9.3 The landscape and visual impact assessment for the construction and operation of the Project shall follow the detailed technical requirements given in Appendix J of this EIA Study Brief.

### **3.4.10 Summary of Environmental Outcomes**

- 3.4.10.1 The EIA report shall contain a summary of the key environmental outcomes arising from the EIA study, including estimated population protected from various environmental impacts, environmentally sensitive areas protected, environmentally friendly options considered and incorporated in the preferred option, environmental designs recommended, key environmental problems avoided and environmental benefits of the environmental protection measures recommended.

### **3.4.11 Environmental Monitoring and Audit (EM&A) Requirements**

- 3.4.11.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A activities during the construction and operational phases of the Project and, if affirmative, to define the scope of EM&A requirements for the Project in the EIA study.
- 3.4.11.2 Subject to the confirmation of the EIA study findings, the Applicant shall comply with the requirements as stipulated in Annex 21 of the TM. The Applicant shall also propose real-time reporting of monitoring data for the Project through a dedicated internet website.
- 3.4.11.3 The Applicant shall prepare a project implementation schedule (in the form of a checklist as shown in Appendix K of this EIA Study Brief) containing all the EIA study recommendations and mitigation measures with reference to the implementation programme of the Project.

## **4. DURATION OF VALIDITY**

- 4.1 The Applicant shall notify the Director of the commencement of the EIA study. If the EIA study does not commence within 36 months after the date of issue of this EIA Study Brief, the Applicant shall apply to the Director for a fresh EIA study brief before commencement of the EIA study.

## **5. REPORTING REQUIREMENTS**

- 5.1 In preparing the EIA report, the Applicant shall refer to Annex 11 of the TM for the contents of an EIA report. The Applicant shall also refer to Annex 20 of the TM, which stipulates the guidelines for the review of an EIA report.
- 5.2 The Applicant shall supply the Director with hard and electronic copies of the EIA report and the executive summary in accordance with the requirements given in Appendix L of this EIA Study Brief. The Applicant shall, upon request, make additional copies of the above documents available to the public, subject to payment by the interested parties of full costs of printing.

## **6. OTHER PROCEDURAL REQUIREMENTS**

- 6.1 If there is any change in the name of Applicant for this EIA Study Brief during the course of the EIA study, the Applicant must notify the Director immediately.
- 6.2 If there is any key change in the scope of the Project mentioned in section 1.2 of this EIA Study Brief and in Project Profile (No. PP-429/2011), the Applicant must seek confirmation from the Director in writing on whether or not the scope of issues covered by this EIA Study Brief can still cover the key changes, and the additional issues, if any, that the EIA study must also address. If the changes to the Project fundamentally alter the key scope of this EIA Study Brief, the Applicant shall apply to the Director for a fresh EIA study brief.



## 7. LIST OF APPENDICES

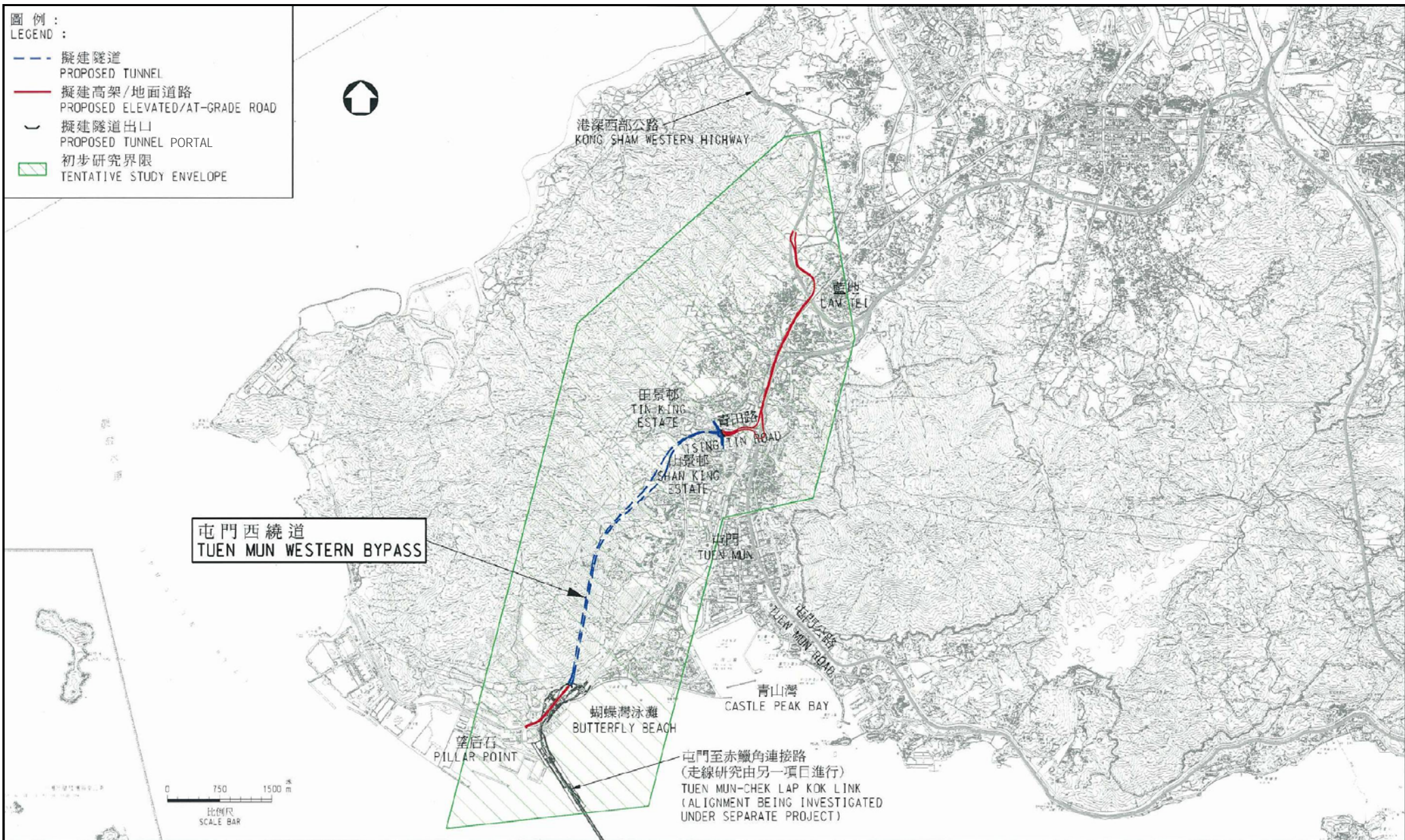
7.1 This EIA Study Brief includes the following appendices:

- Appendix A – Project Location Plan
- Appendix B – Requirements for Air Quality Impact Assessment
- Appendix B-1 – Guidelines on Choice of Models and Model Parameters in Air Quality Assessment
- Appendix B-2 – Guidelines on Assessing the ‘TOTAL’ Air Quality Impacts
- Appendix B-3 – Guidelines on the Use of Alternative Computer Models in Air Quality Assessment
- Appendix C – Requirements for Noise Impact Assessment
- Appendix D – Requirements for Water Quality Impact Assessment
- Appendix E – Requirements for Assessment of Waste Management Implications
- Appendix F – Requirements for Hazard Assessment
- Appendix G – Requirements for Landfill Gas Hazard Assessment
- Appendix H – Requirements for Ecological Impact Assessment
- Appendix I – Requirements for Cultural Heritage Impact Assessment
- Appendix I-1 – Guidelines for Cultural Heritage Impact Assessment
- Appendix I-2 – Guidelines for Archaeological Reports
- Appendix I-3 – Guidelines for Handling of Archaeological Finds and Archives
- Appendix J – Requirements for Landscape and Visual Impact Assessment
- Appendix K – Implementation Schedule of Recommended Mitigation Measures
- Appendix L – Requirements for EIA Report Documents

--- END OF EIA STUDY BRIEF ---

February 2011  
Environmental Assessment Division  
Environmental Protection Department

- 圖例：  
LEGEND：
- 擬建隧道  
PROPOSED TUNNEL
  - 擬建高架/地面道路  
PROPOSED ELEVATED/AT-GRADE ROAD
  - ⌒ 擬建隧道出口  
PROPOSED TUNNEL PORTAL
  - ▭ 初步研究界限  
TENTATIVE STUDY ENVELOPE



**Project Title: Tuen Mun Western Bypass**  
 (This figure is prepared based on Drawing No. HZM6825TH-SK0048 of Project Profile No. PP-429/2011)  
 工程項目名稱：屯門西繞道 (本圖是根據工程項目簡介PP-429/2011 圖則編號: HZM6825TH-SK0048編製)

**EIA Study Brief No. : ESB-219/2011**  
 環評研究概要編號：

**Appendix A: Project Location Plan**  
 附錄A：工程項目位置圖



**Appendix B****Requirements for Air Quality Impact Assessment**

The air quality impact assessment shall include the following:

1. Background and Analysis of Activities

- (i) Provision of background information relating to air quality issues relevant to the Project, e.g. description of the types of activities of the Project that may affect air quality during both construction and operational stages.
- (ii) Provision of an account, where appropriate, of the consideration/measures that have been taken into consideration in the planning of the Project to abate the air pollution impact. The Applicant shall consider alternative construction methods, phasing programmes and alternative modes of operation to minimise the construction and operational air quality impact respectively.
- (iii) Presentation of background air quality levels in the study area for the purpose of evaluating cumulative air quality impacts during construction and operational stages of the Project. If PATH model is used to estimate the background air quality, details for the estimation of the emission sources to be adopted in the model runs should be clearly presented.

2. Identification of Air Sensitive Receivers (ASRs) and Examination of Emission/Dispersion Characteristics

- (i) Identification and description of existing, planned and committed ASRs that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department and any land use and development applications approved by the Town Planning Board. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map clearly showing the location and description such as name of buildings, their uses and height of the selected assessment points shall be given. The separation distances of these ASRs from the nearest emission sources shall also be given.
- (ii) Provision of a list of air pollutant emission sources, including any nearby emission sources which are likely to have impact related to the Project based on the analysis of the construction and operational activities in section 1 above. Examples of construction stage emission sources include stock piling, blasting, concrete batching, material handling and vehicular movements on unpaved haul roads on site. Examples of operational stage emission sources include vehicular emissions from open roads, ventilation buildings and portals. Confirmation regarding the validity of assumptions and the magnitude of activities (e.g. volume of construction material to be handled, traffic mix and volume on a road) shall be obtained from the relevant government departments/authorities and documented.
- (iii) Identification of chimneys and obtainment of relevant chimney emission data in the study area by carrying out a survey for assessing the cumulative air quality



impact of air pollutants through chimneys. The Applicant shall ensure and confirm that the chimney emission data used in their assessment are validated and updated by their own survey. If there are any errors subsequently found in their chimney emission data used, the Applicant shall be fully responsible and the submission may be invalidated.

- (iv) The emissions from any concurrent projects identified as relevant during the course of the EIA study shall be taken into account as contributing towards the overall cumulative air quality impact. The impacts at the existing, committed and planned ASRs within the study area shall be assessed, based on the best information available at the time of assessment.

### 3. Construction Phase Air Quality Impact

- (i) The Applicant shall follow the requirements stipulated under the Air Pollution Control (Construction Dust) Regulation to ensure that construction dust impacts are controlled within the relevant standards as stipulated in section 1 of Annex 4 of the TM.
- (ii) If the Applicant anticipates that the Project will give rise to significant construction dust impacts likely to exceed recommended limits in the TM at the ASRs despite the incorporation of the dust control measures proposed, a quantitative assessment shall be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in section 5 below when carrying out the quantitative assessment.
- (iii) A monitoring and audit programme for the construction phase of the Project shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper construction dust control.

### 4. Operational Phase Air Quality Impact

- (i) The Applicant shall calculate the expected air pollutant concentrations at the identified ASRs based on an assumed reasonably worst-case scenario. The evaluation shall be based on the strength of the emission sources identified in section 2 above. The Applicant shall follow the methodology set out in section 5 below when carrying out the assessment.
- (ii) The air pollution impacts of future road traffic shall be calculated based on the highest emission strength from the road within the next 15 years upon commencement of operation of the proposed road. The Applicant shall demonstrate that the selected year of assessment represents the highest emission scenario given the combination of vehicular emission factors and traffic flow for the selected year. The Applicant shall propose any Fleet Average Emission Factors used in the assessment. If necessary, the Fleet Average Emission Factors shall be determined by a motor vehicle emission model such as EMFAC-HK model and documented in the EIA report. The traffic flow data and assumptions, such as the exhaust technology fractions, vehicle age/population distribution, traffic forecast and speed fractions, that are used in the assessment shall be presented in the form of both summary table(s) and graph(s).

- (iii) If vehicle tunnels and/or full enclosures are proposed in the Project, it is the responsibility of the Applicant to ensure that the air quality inside these proposed structures shall comply with EPD's "Practice Note on Control of Air Pollution in Vehicle Tunnels". When assessing air quality impact due to emissions from tunnels/full enclosures, the Applicant shall ensure prior agreement with the relevant ventilation design engineer over the amount and the types/kinds of pollutants emitted from these full enclosures; and such assumptions shall be clearly and properly documented in the EIA report.
- (iv) A monitoring and audit programme for the operational phase of the Project shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper control of operational air quality impacts.

## 5. Quantitative Assessment Methodology

- (i) The Applicant shall conduct the quantitative assessment by applying the general principles enunciated in the modelling guidelines in Appendices B-1 to B-3 while making allowance for the specific characteristic of the Project. Calculation of the pollutant emission rates for input to the model and a map showing the road links shall be presented in the EIA report. The Applicant shall ensure consistency between the text description and the model files at every stage of submissions for review.
- (ii) The Applicant shall identify the key/representative air pollution parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for selecting these parameters for assessing the impact of the Project. Ozone Limiting Method (OLM) or Discrete Parcel Method (DPM) or other appropriate method shall be used to estimate the conversion ratio of NO<sub>x</sub> to NO<sub>2</sub> if NO<sub>2</sub> has been identified as a key/representative air pollutant.
- (iii) The Applicant shall calculate the cumulative air quality impact at the identified ASRs and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table(s) and pollution contours, to be evaluated against the relevant air quality standards and on any effect they may have on the land use implications. Plans of a suitable scale shall be used to present pollution contours to allow buffer distance requirements to be determined properly.
- (iv) If there are any direct technical noise remedies recommended in the study, the air quality implication due to these technical remedies shall be assessed. For instance, if barriers that may affect dispersion of air pollutants are proposed, then the implications of such remedies on air quality impact shall be assessed. If noise enclosure is proposed, then portal emissions of the enclosed road section and air quality inside the enclosed road section shall also be addressed. The Applicant shall highlight clearly the locations and types of agreed noise mitigating measures (where applicable), be they noise barriers, road enclosures and their portals, and affected ASR's, on contour maps for reference.

6. Mitigation Measures for Non-compliance

The Applicant shall propose remedies and mitigating measures where the predicted air quality impact exceeds the criteria set in section 1 of Annex 4 in the TM. These measures and any constraints on future land use planning shall be agreed with the relevant government departments/authorities and documented in the EIA report. The Applicant shall demonstrate quantitatively whether the residual impacts after incorporation of the proposed mitigating measures will comply with the criteria stipulated in section 1 of Annex 4 in the TM.

7. Submission of Model Files

Input and output file(s) of model run(s) including those files for generating the pollution contours and emission calculations work sheets shall be submitted to the Director in electronic format together with the submission of the EIA report.

**Appendix B-1****Guidelines on Choice of Models and Model Parameters in Air Quality Assessment**

*[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]*

**1. Introduction**

- 1.1 To expedite the review process by the Authority and to assist project proponents or environmental consultants with the conduct of air quality modelling exercise which are frequently called for as part of environmental impact assessment studies, this paper describes the usage and requirements of a few commonly used air quality models.

**2. Choice of Models**

- 2.1 The models which have been most commonly used in air quality impact assessments, due partly to their ease of use and partly to the quick turn-around time for results, are of Gaussian type and designed for use in simple terrain under uniform wind flow. There are circumstances when these models are not suitable for ambient concentration estimates and other types of models such as physical, numerical or mesoscale models will have to be used. In situations where topographic, terrain or obstruction effects are minimal between source and receptor, the following Gaussian models can be used to estimate the near-field impacts of a number of source types including dust, traffic and industrial emissions.

<u>Model</u>	<u>Applications</u>
FDM	for evaluating fugitive and open dust source impacts (point, line and area sources)
CALINE4	for evaluating mobile traffic emission impacts (line sources)
ISCST3	for evaluating industrial chimney releases as well as area and volumetric sources (point, area and volume sources); line sources can be approximated by a number of volume sources.

These frequently used models are also referred to as Schedule 1 models (see attached list).

- 2.2 Note that both FDM and CALINE4 have a height limit on elevated sources (20m and 10m, respectively). Source of elevation above these limits will have to be modelled using the ISCST3 model or suitable alternative models. In using the latter, reference should be made to the “Guidelines on the Use of Alternative Computer Models in Air Quality Assessment” in Appendix B-3.
- 2.3 The models can be used to estimate both short-term (hourly and daily average) and long-term (annual average) ambient concentrations of air pollutants. The model results, obtained using appropriate model parameters (refer to section 3) and assumptions, allow direct comparison with the relevant air quality standards such as the Air Quality Objectives (AQOs) for the relevant pollutant and time averaging period.

### 3 Model Input Requirements

#### 3.1 Meteorological Data

3.1.1 At least 1 year of recent meteorological data (including wind speed, wind direction, stability class, ambient temperature and mixing height) from a weather station either closest to or having similar characteristics as the study site should be used to determine the highest short-term (hourly, daily) and long-term (annual) impacts at identified air sensitive receivers in that period. The amount of valid data for the period should be no less than 90 percent.

3.1.2 Alternatively, the meteorological conditions as listed below can be used to examine the worst-case short-term impacts:

Day time:	stability class D; wind speed 1 m/s (at 10m height); worst-case wind angle; mixing height 500m
Night time:	stability class F; wind speed 1 m/s (at 10m height); worst-case wind angle; mixing height 500m

This is a common practice with using the CALINE4 model due to its inability to handle lengthy data set.

3.1.3 For situations where, for example, (i) the model (such as CALINE4) does not allow easy handling of one full year of meteorological data; or (ii) model run time is a concern, the followings can be adopted in order to determine the daily and annual average impacts:

- (i) perform a frequency occurrence analysis of one year of meteorological data to determine the actual wind speed (to the nearest unit of m/s), wind direction (to the nearest 10°) and stability (classes A to F) combinations and their frequency of occurrence;
- (ii) determine the short term hourly impact under all of the identified wind speed, wind direction and stability combinations; and
- (iii) apply the frequency data with the short term results to determine the long term (daily /annual) impacts.

Apart from the above, any alternative approach that will capture the worst possible impact values (both short term and long term) may also be considered.

3.1.4 Note that the anemometer height (relative to a datum same for the sources and receptors) at which wind speed measurements were taken at a selected station should be correctly entered in the model. These measuring positions can vary greatly from station to station and the vertical wind profile employed in the model can be grossly distorted from the real case if incorrect anemometer height is used. This will lead to unreliable concentration estimates.

3.1.5 An additional parameter, namely, the standard deviation of wind direction,  $\sigma_{\theta}$ , needs to be provided as input to the CALINE4 model. Typical values of  $\sigma_{\theta}$  range from 12° for rural areas to 24° for highly urbanised areas under 'D' class stability. For semi-rural such as new development areas, 18° is more appropriate under the same stability condition. The following reference can be consulted for typical ranges of standard deviation of wind direction under different stability categories and surface roughness conditions.



*Ref.(1): Guideline On Air Quality Models (Revised), EPA-450/2-78-027R, United States Environmental Protection Agency, July 1986.*

### 3.2 Emission Sources

All the identified sources relevant to a process plant or a study site should be entered in the model and the emission estimated based on emission factors compiled in the AP-42 (Ref. 2) or other suitable references. The relevant sections of AP-42 and any parameters or assumptions used in deriving the emission rates (in units g/s, g/s/m or g/s/m<sup>2</sup>) as required by the model should be clearly stated for verification. The physical dimensions, location, release height and any other emission characteristics such as efflux conditions and emission pattern of the sources input to the model should also correspond to site data.

If the emission of a source varies with wind speed, the wind speed-dependent factor should be entered.

*Ref.(2): Compilation of Air Pollutant Emission Factors, AP-42, 5th Edition, United States Environmental Protection Agency, January 1995.*

### 3.3 Urban/Rural Classification

Emission sources may be located in a variety of settings. For modelling purposes these are classed as either rural or urban so as to reflect the enhanced mixing that occurs over urban areas due to the presence of buildings and urban heat effects. The selection of either rural or urban dispersion coefficients in a specific application should follow a land use classification procedure. If the land use types including industrial, commercial and residential uses account for 50% or more of an area within 3km radius from the source, the site is classified as urban; otherwise, it is classed as rural.

### 3.4 Surface Roughness Height

This parameter is closely related to the land use characteristics of a study area and associated with the roughness element height. As a first approximation, the surface roughness can be estimated as 3 to 10 percent of the average height of physical structures. Typical values used for urban and new development areas are 370 cm and 100 cm, respectively.

### 3.5 Receptors

These include discrete receptors representing all the identified air sensitive receivers at their appropriate locations and elevations and any other discrete or grid receptors for supplementary information. A receptor grid, whether Cartesian or Polar, may be used to generate results for contour outputs.

### 3.6 Particle Size Classes

In evaluating the impacts of dust-emitting activities, suitable dust size categories relevant to the dust sources concerned with reasonable breakdown in TSP (< 30  $\mu$ m) and RSP (< 10  $\mu$ m) compositions should be used.

### 3.7 NO<sub>2</sub> to NO<sub>x</sub> Ratio

The conversion of NO<sub>x</sub> to NO<sub>2</sub> is a result of a series of complex photochemical reactions and has implications on the prediction of near field impacts of traffic emissions. Until further data are available, three approaches are currently acceptable in the determination of NO<sub>2</sub>:

- (i) Ambient Ratio Method (ARM) - assuming 20% of NO<sub>x</sub> to be NO<sub>2</sub>; or
- (ii) Discrete Parcel Method (DPM, available in the CALINE4 model); or
- (iii) Ozone Limiting Method (OLM) - assuming the tailpipe NO<sub>2</sub> emission to be 7.5% of NO<sub>x</sub> and the background ozone concentration to be in the range of 57 to 68  $\mu$ g/m<sup>3</sup> depending on the land use type (see also the Environmental Protection Department (EPD) reference paper "Guidelines on Assessing the 'TOTAL' Air Quality Impacts" in [Appendix B-2](#)).

### 3.8 Odour Impact

In assessing odour impacts, a much shorter time-averaging period of 5 seconds is required due to the shorter exposure period tolerable by human receptors. Conversion of model computed hourly average results to 5-second values is therefore necessary to enable comparison against recommended standard. The hourly concentration is first converted to 3-minute average value according to a power law relationship which is stability dependent (Ref. 3) and a result of the statistical nature of atmospheric turbulence. Another conversion factor (10 for unstable conditions and 5 for neutral to stable conditions) is then applied to convert the 3-minute average to 5-second average (Ref. 4). In summary, to convert the hourly results to 5-second averages, the following factors can be applied:

<u>Stability Category</u>	<u>1-hour to 5-sec Conversion Factor</u>
A & B	45
C	27
D	9
E & F	8

Under 'D' class stability, the 5-second concentration is approximately 10 times the hourly average result. Note, however, that the combined use of such conversion factors together with the ISCST results may not be suitable for assessing the extreme close-up impacts of odour sources.

*Ref.(3): Richard A. Duffee, Martha A. O'Brien and Ned Ostojic, 'Odor Modeling – Why and How', Recent Developments and Current Practices in Odor Regulations, Controls and Technology, Air & Waste Management Association, 1991.*

*Ref.(4): A.W.C. Keddie, 'Dispersion of Odours', Odour Control – A Concise Guide, Warren Spring Laboratory, 1980.*

### 3.9 Plume Rise Options

The ISCST3 model provides by default a list of the U.S. regulatory options for concentration calculations. These are all applicable to the Hong Kong situations except for the 'Final Plume Rise' option. As the distance between sources and receptors are generally fairly close, the non-regulatory option of 'Gradual Plume Rise' should be used instead to give more accurate estimate of near-field impacts due to plume emission.

However, the 'Final Plume Rise' option may still be used for assessing the impacts of distant sources.

### 3.10 Portal Emissions

These include traffic emissions from tunnel portals and any other similar openings and are generally modelled as volume sources according to the PIARC 91 (or more up-to-date version) recommendations (Ref. 5, section III.2). For emissions arising from underpasses or any horizontal openings of the like, these are treated as area or point sources depending on the source physical dimensions. In all these situations, the ISCST3 model or more sophisticated models will have to be used instead of the CALINE4 model. In the case of portal emissions with significant horizontal exit velocity which cannot be handled by the ISCST3 model, the impacts may be estimated by the TOP model (Ref. 6) or any other suitable models subject to prior agreement with EPD. The EPD's "Guidelines on the Use of Alternative Computer Models in Air Quality Assessment" should also be referred to in Appendix B-3.

*Ref.(5): XIXth World Road Congress Report, Permanent International Association of Road Congresses (PIARC), 1991.*

*Ref.(6): N. Ukegunchi, H. Okamoto and Y. Ide "Prediction of vehicular emission pollution around a tunnel mouth", Proceedings 4th International Clean Air Congress, pp. 205-207, Tokyo, 1977.*

### 3.11 Background Concentrations

Background concentrations are required to account for far-field sources which cannot be estimated by the model. These values, to be used in conjunction with model results for assessing the total impacts, should be based on long term average of monitoring data at location representative of the study site. Please make reference to the paper "Guidelines on Assessing the 'TOTAL' Air Quality Impacts" in Appendix B-2 for further information.

### 3.12 Output

The highest short-term and long-term averages of pollutant concentrations at prescribed receptor locations are output by the model and to be compared against the relevant air quality standards specified for the relevant pollutant. Contours of pollutant concentration are also required for indicating the general impacts of emissions over a study area.

Copies of model files in electronic format should also be provided for EPD's reference.

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**Schedule 1**

**Air Quality Models Generally Accepted by  
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**Industrial Source Complex Dispersion Model - Short Term Version 3 (ISCST3)** or the latest version developed by U.S. Environmental Protection Agency

**California Line Source Dispersion Model Version 4 (CALINE4)** or the latest version developed by Department of Transportation, State of California, U.S.A.

**Fugitive Dust Model (FDM)** or the latest version developed by U.S. Environmental Protection Agency

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EPD is continually reviewing the latest development in air quality models and will update this Schedule accordingly.

**Appendix B-2****Guidelines on Assessing the 'TOTAL' Air Quality Impacts**

*[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]*

**1. Total Impacts - 3 Major Contributions**

- 1.1 In evaluating the air quality impacts of a proposed project upon air sensitive receivers, contributions from three classes of emission sources depending on their distance from the site should be considered. These are:

Primary contributions:	project induced
Secondary contributions:	pollutant-emitting activities in the immediate neighbourhood
Other contributions:	pollution not accounted for by the previous two (Background contributions)

**2. Nature of Emissions****2.1 Primary contributions**

In most cases, the project-induced emissions are fairly well defined and quite often (but not necessarily) the major contributor to local air quality impacts. Examples include those due to traffic network, building or road construction projects.

**2.2 Secondary contributions**

Within the immediate neighbourhood of the project site, there are usually pollutant emitting activities contributing further to local air quality impacts. For most local scale projects, any emission sources in an area within 500m radius of the project site with notable impacts should be identified and included in an air quality assessment to cover the short-range contributions. In the exceptional cases where there is one or more significant sources nearby, the study area may have to be extended or alternative estimation approach employed to ensure these impacts are reasonably accounted for.

**2.3 Background contributions**

The above two types of emission contributions should account for, to a great extent, the air quality impacts upon local air sensitive receivers, which are often amenable to estimation by the 'Gaussian Dispersion' type of models. However, a background air quality level should be prescribed to indicate the baseline air quality in the region of the project site, which would account for any pollution not covered by the two preceding contributions. The emission sources contributing to the background air quality would be located further afield and not easy to identify. In addition, the transport mechanism by which pollutants are carried over long distances (ranging from 1km up to tens or hundreds of kms) is rather complex and cannot be adequately estimated by the 'Gaussian' type of models.

### 3 Background Air Quality - Estimation Approach

#### 3.1 The approach

In view of the difficulties in estimating background air quality using the air quality models currently available, an alternative approach based on monitored data is suggested. The essence of this approach is to adopt the long-term (5-year) averages of the most recent monitored air quality data obtained by EPD. These background data would be reviewed yearly or biennially depending on the availability of the monitored data. The approach is a first attempt to provide a reasonable estimate of the background air quality level for use in conjunction with EIA air quality assessment to address the cumulative impacts upon a locality. This approach may be replaced or supplemented by superior modelling efforts such as that entailed in PATH (Pollutants in the Atmosphere and their Transport over Hong Kong), a comprehensive territory-wide air quality modelling system currently being developed for Hong Kong. Notwithstanding this, the present approach is based on measured data and their long term regional averages; the background values so derived should therefore be indicative of the present background air quality. In the absence of any other meaningful way to estimate a background air quality for the future, this present background estimate should also be applied to future projects as a first attempt at a comprehensive estimate until a better approach is formulated.

#### 3.2 Categorisation

The monitored air quality data, by 'district-averaging' are further divided into three categories, viz, Urban, Industrial and Rural/New Development. The background pollutant concentrations to be adopted for a project site would depend on the geographical constituency to which the site belongs. The categorization of these constituencies is given in section 3.4. The monitoring stations suggested for the 'district-averaging' (arithmetic means) to derive averages for the three background air quality categories are listed as follows:

Urban: Kwun Tong, Sham Shui Po, Tsim Sha Tsui and Central/Western  
 Industrial: Kwun Tong, Tsuen Wan and Kwai Chung  
 Rural/New Development: Sha Tin, Tai Po, Junk Bay, Hong Kong South and Yuen Long

The averaging would make use of data from the above stations wherever available. The majority of the monitoring stations are located some 20m above ground.

#### 3.3 Background pollutant values

Based on the above approach, background values for the 3 categories have been obtained for a few major air pollutants as follows:

<b>POLLUTANT</b>	<b>URBAN</b>	<b>INDUSTRIAL</b>	<b>RURAL / NEW DEVELOPMENT</b>
Nitrogen Dioxide (NO <sub>2</sub> )	59	57	39
Sulphur Dioxide (SO <sub>2</sub> )	21	26	13
Ozone (O <sub>3</sub> )	62	68	57
Total Suspended Particulates (TSP)	98	96	87
Respirable Suspended Particulates (RSP)	60	58	51

All units are in micrograms per cubic metre. The above values are derived from 1992 to 1996 annual averages with the exception of ozone which represent annual average of daily hourly maximum values for year 1996.

In cases where suitable air quality monitoring data representative of the study site such as those obtained from a nearby monitoring station or on-site sampling are not available for the prescription of background air pollution levels, the above tabulated values can be adopted instead. Strictly speaking, the suggested values are only appropriate for long term assessment. However, as an interim measure and until a better approach is formulated, the same values can also be used for short term assessment. This implies that the short term background values will be somewhat under-estimated, which compensates for the fact that some of the monitoring data are inherently influenced by secondary sources because of the monitoring station location.

Indeed, if good quality on-site sampling data which cover at least one year period are available, these can be used to derive both the long term (annual) and short term (daily / hourly) background values, the latter are usually applied on an hour to hour, day to day basis.

### 3.4 Site categories

The categories to which the 19 geographical constituencies belong are listed as follows:

<b>DISTRICT</b>	<b>AIR QUALITY CATEGORY</b>
Islands	Rural / New Development
Southern	Rural / New Development
Eastern	Urban
Wan Chai	Urban
Central & Western	Urban
Sai Kung	Rural / New Development
Kwun Tong	Industrial
Wong Tai Sin	Urban
Kowloon City	Urban
Yau Tsim	Urban
Mong Kok	Urban
Sham Shui Po	Urban
Kwai Tsing	Industrial
Sha Tin	Rural / New Development
Tsuen Wan	Industrial
Tuen Mun	Rural / New Development
Tai Po	Rural / New Development
Yuen Long	Rural / New Development
Northern	Rural / New Development

### 3.5 Provisions for 'double-counting'

The current approach is, by no means, a rigorous treatment of background air quality but aims to provide an as-realistic-as-possible approximation based on limited field data. 'Double-counting' of 'secondary contributions' may be apparent through the use of such 'monitoring-based' background data as some of the monitoring stations are of close proximity to existing emission sources. 'Primary contributions' due to a proposed project

(which is yet to be realized) will not be double-counted by such an approach. In order to avoid over-estimation of background pollutant concentrations, an adjustment to the values given in section 3.3 is possible and optional by multiplying the following factor:

$$(1.0 - E_{\text{Secondary contributions}}/E_{\text{Territory}})$$

where E stands for emission.

The significance of this factor is to eliminate the fractional contribution to background pollutant level of emissions due to ‘secondary contributions’ out of those from the entire territory. In most cases, this fractional contribution to background pollutant levels by the secondary contributions is minimal.

#### **4 Conclusions**

- 4.1 The above described approach to estimating the total air quality impacts of a proposed project, in particular the background pollutant concentrations for air quality assessment, should be adopted with immediate effect. Use of short term monitoring data to prescribe the background concentrations is no longer acceptable.



**Appendix B-3****Guidelines on the Use of Alternative Computer Models in Air Quality Assessment**

*[The information contained in this Appendix is only meant to assist the Applicant in performing the air quality assessment. The Applicant must exercise professional judgment in applying this general information for the Project.]*

**1. Background**

- 1.1 In Hong Kong, a number of Gaussian plume models are commonly employed in regulatory applications such as application for specified process licences and environmental impact assessments (EIAs). These frequently used models (as listed in Schedule 1 attached; hereafter referred to as Schedule 1 models) have no regulatory status but form the basic set of tools for local-scale air quality assessment in Hong Kong.
- 1.2 However, no single model is sufficient to cover all situations encountered in regulatory applications. In order to ensure that the best model available is used for each regulatory application and that a model is not arbitrarily applied, the project proponent (and/or its environmental consultants) should assess the capabilities of various models available and adopt one that is most suitable for the project concerned.
- 1.3 Examples of situations where the use of an alternative model is warranted include:
  - (i) the complexity of the situation to be modelled far exceeds the capability of the Schedule 1 models; and
  - (ii) the performance of an alternative model is comparable or better than the Schedule 1 models.
- 1.4 This paper outlines the demonstration / submission required in order to support the use of an alternative air quality model for regulatory applications for Hong Kong.

**2. Required Demonstration / Submission**

- 2.1 Any model that is proposed for air quality applications and not listed amongst the Schedule 1 models will be considered by EPD on a case-by-case basis. In such cases, the proponent will have to provide the followings for EPD's review:
  - (i) Technical details of the proposed model; and
  - (ii) Performance evaluation of the proposed model.

Based on the above information, EPD will determine the acceptability of the proposed model for a specific or general application. The onus of providing adequate supporting materials rests entirely with the proponent.

- 2.2 To provide technical details of the proposed model, the proponent should submit documents containing at least the following information :
  - (i) mathematical formulation and data requirements of the model;

- (ii) any previous performance evaluation of the model; and
  - (iii) a complete set of model input and output file(s) in commonly used electronic format.
- 2.3 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the situation under consideration. In cases where no Schedule 1 model is found applicable, the proponent must demonstrate that the proposed model passes the screening test as set out in USEPA Document “Protocol for Determining the Best Performing Model” (Ref. 1).
- Ref.(1): William M. Cox, ‘Protocol for Determining the Best Performing Model’; Publication No. EPA-454/R-92-025; U.S. Environmental Protection Agency, Research Triangle Park, NC.*
- 2.4 For cases where a Schedule 1 model is applicable to the project under consideration but an alternative model is proposed for use instead, the proponent must demonstrate either that:
- (i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or
  - (ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document “Protocol for Determining the Best Performing Model” (Ref. 1).
- 2.5 Should EPD find the information on technical details alone sufficient to indicate the acceptability of the proposed model, information on further performance evaluation as specified in sections 2.3 and 2.4 above would not be necessary.
- 2.6 If the proposed model is an older version of one of the Schedule 1 models or was previously included in Schedule 1, the technical documents mentioned in section 2.2 are normally not required. However, a performance demonstration of equivalence as stated in section 2.4 (i) would become necessary.
- 2.7 If EPD is already in possession of some of the documents that describe the technical details of the proposed model, submission of the same by the proponent is not necessary. The proponent may check with EPD to avoid sending in duplicate information.

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EPD is continually reviewing the latest development in air quality models and will update this Schedule accordingly.

**Appendix C****Requirements for Noise Impact Assessment**

The noise impact assessment shall include the following:

1. Provision of Background Information and Existing Noise Levels

- (i) The Applicant shall provide background information relevant to the Project, e.g. relevant previous or current studies. Unless required for determining the planning standards, e.g. those for planning of fixed noise sources (e.g. ventilation systems of traffic noise enclosures), no existing noise levels are particularly required.

2. Identification of Noise Sensitive Receivers

- (i) The Applicant shall refer to Annex 13 of the TM when identifying the NSRs. The NSRs shall include existing NSRs and planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department and any land use and development applications approved by the Town Planning Board. Photographs of existing NSRs shall be appended to the EIA report.
- (ii) The Applicant shall select assessment points to represent the identified NSRs for carrying out quantitative noise assessment described below. A map showing the location and description such as name of building, use, and number of floors of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant shall use the relevant planning parameters to work out representative site layouts for noise assessment purpose.

3. Provision of an Emission Inventory of the Noise Sources

- (i) The Applicant shall provide an inventory of noise sources including representative construction equipment for construction noise assessment, and traffic flow/fixed plant equipment (e.g. ventilation systems of traffic noise enclosures), as appropriate, for operational noise assessment. Confirmation of the validity of the inventory shall be obtained from the relevant government departments/authorities and documented in the EIA report.

4. Construction Noise Assessment

- (i) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and other concurrent projects identified during the course of the EIA study.
- (ii) The Applicant shall carry out assessment of noise impact from construction (excluding percussive piling) of the Project during daytime, i.e. 7 a.m. to 7 p.m., on weekdays other than general holidays in accordance with the methodology in sections 5.3 and 5.4 of Annex 13 of the TM. The criteria in Table 1B of Annex 5

of the TM shall be adopted in the assessment.

- (iii) To minimise the construction noise impact, alternative construction methods to replace percussive piling shall be proposed as far as practicable. In case blasting works is involved, it shall be carried out, as far as practicable, outside the sensitive hours of 7 p.m. to 7 a.m. on Monday to Saturday and any time on a general holiday, including Sunday. For blasting that must be carried out during the above-mentioned sensitive hours, the noise impact from the removal of debris and rocks shall be fully assessed and adequate mitigation measures shall be recommended to reduce the noise impact.
- (iv) If the unmitigated construction noise levels are found exceeding the relevant criteria, the Applicant shall propose practicable direct mitigation measures (including movable barriers, enclosures, quieter alternative methods, rescheduling and restricting hours of operation of noisy tasks) to minimise the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance at the affected NSR shall be given.
- (v) The Applicant shall, as far as practicable, formulate a reasonable construction programme so that no work will be required in restricted hours as defined under the Noise Control Ordinance (NCO). In case the Applicant needs to evaluate whether construction works in restricted hours as defined under the NCO are feasible or not in the context of programming construction works, reference shall be made to relevant technical memoranda issued under the NCO. Regardless of the results of construction noise impact assessment for restricted hours, the Noise Control Authority will process Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary conditions/situations. This aspect shall be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.

## 5. Operational Noise Assessment

- (a) Road Traffic Noise
- (ai) Calculation of Noise Levels

The Applicant shall analyse the scope of the proposed road alignment(s) to identify road sections for the purpose of traffic noise impact assessment. In determining whether the traffic noise impact due to a road improvement project/work is considered significant, detailed information with respect to factors including change of nature of road, change of alignment and change of traffic capacity or traffic composition etc. shall be assessed. The traffic noise impact shall be considered significant if the traffic noise level with the road project is greater than that without the road project at the design year by 1 dB(A) or more. Figures showing extents of the road sections (both existing and new/altered road sections) shall be provided in the EIA report.

The Applicant shall calculate expected road traffic noise using methods described in the U.K. Department of Transport's "Calculation of Road Traffic Noise" (1988). Calculations of future road traffic noise shall be based on peak hour traffic flow in respect of maximum traffic projection within a 15 years period upon

commencement of operation of the Project. The Applicant shall calculate traffic noise levels in respect of each road section and the overall noise levels from combined road sections (road sections within the meaning of Items A.1, A.7 and A.8 under Part I, Schedule 2 of the EIAO and other road sections) at the NSRs. The EIA report shall contain sample calculations and input parameters for 10 assessment points as requested by the Director.

The Applicant shall provide the input data set of the traffic noise model in the format of electronic files in the EIA. The Applicant shall prepare and provide drawings (i.e., road-plots of the traffic noise model) of appropriate scale to show the road segments, topographic barriers, and assessment points of sensitive receivers input into the traffic noise model.

The Applicant shall provide input data sets of traffic noise prediction model adopted in the EIA study as requested by the Director for the following scenarios:

- (1) scenario without the road projects at the design year;
- (2) unmitigated scenario at assessment year;
- (3) mitigated scenario at assessment year; and
- (4) prevailing scenario for indirect technical remedies eligibility assessment.

The data shall be in electronic text file (ASCII format) containing road segments, barriers and noise sensitive receivers information. CD-ROM(s) containing the above data shall be attached in the EIA report.

(aii) Presentation of Noise Levels

The Applicant shall present the prevailing and future noise levels in  $L_{10}$  (1 hour) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale.

A quantitative assessment at the NSRs for the road alignments shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM. The potential noise impact of road alignments shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive elements that will be exposed to noise levels exceeding the criteria set out in Table 1A of Annex 5 in the TM.

(aiii) Proposals for Noise Mitigation Measures

After rounding of the predicted noise levels according to the U.K. Department of Transport's "Calculation of Road Traffic Noise" (1988), the Applicant shall propose direct mitigation measures in situations where the predicted traffic noise level due to the road sections within the meaning of Items A.1, A.7 and A.8 under Part I, Schedule 2 of the EIAO, exceeds the criteria in Table 1A of Annex 5 in the TM by 1 dB(A) or more; or, for situations where the overall traffic noise level at the NSRs with the road project exceeds the criteria in Table 1A of Annex 5 in the TM by 1 dB(A) or more and at the same time is greater than that without the road project at the design year by 1.0 dB(A) or more. The direct mitigation measures listed under section 6.1, Annex 13 of the TM, including the option of alternative land use arrangement, shall be explored and evaluated with a view to reducing the noise level at the NSRs concerned to the level meeting the relevant noise criteria. Also, the feasibility, practicability, programming and effectiveness of the

recommended mitigation measures shall be assessed in accordance with section 4.4.2(k) of the TM. Specific reasons for not adopting certain direct mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for NSRs as far as possible shall be clearly and specifically quantified and laid down in the EIA report. Sections of barriers proposed to protect existing NSRs shall be differentiated clearly from those proposed for the protection of future or planned NSRs as the latter is only required to be constructed before the occupation of the planned NSRs. To facilitate the phased implementation of the barriers under this principle, a barrier inventory showing intended NSRs (i.e. existing NSRs as distinct from planned NSRs) to be protected by different barrier sections to achieve different extent of noise reduction (to be quantified in terms of how many dB(A)) should be provided.

The total number of dwellings, classrooms and other noise sensitive elements that will be benefited from, and be protected by the provision of direct mitigation measures shall be provided. In order to clearly present the extents/locations of recommended noise mitigation measures, plans prepared from 1:1000 or 1:2000 survey maps showing the mitigation measures (e.g. enclosures/barriers, low noise road surfacing) shall be included in the EIA report.

The total number of dwellings, classrooms and other noise sensitive elements that will still be exposed to noise levels above the criteria with the implementation of recommended direct mitigation measures shall be quantified. The Applicant shall provide, in the EIA report information of recommended noise mitigation measures (such as barrier types, nominal dimensions at different cross-sections, extents/locations, lengths and mPD levels of barriers) in an appropriate format (including electronic format).

In case where a number of NSRs cannot be protected by the recommended direct mitigation measures, the Applicant shall identify and estimate the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect technical remedies, the associated costs and any implications for such implementation. For the purpose of determining eligibility of the affected premises for indirect technical remedies, reference shall be made to the following set of three criteria:

- (1) the predicted overall noise level at the NSR from the road sections and other traffic noise in the vicinity must be above a specified noise level (e.g. 70 dB(A) for domestic premises and 65 dB(A) for educational institutions and places of public worship, all in  $L_{10}$  (1hour));
- (2) the predicted overall noise level at the NSR is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the commencement of works to construct the road; and
- (3) the contribution from the road sections to the increase in predicted overall noise level from the new road at the NSR must be at least 1.0dB(A).

(b) Fixed Noise Sources

If the Project will cause any fixed noise sources, such as the ventilation systems of

enclosed road sections, the following assessment shall be followed.

(bi) Assessment of Fixed Source Noise Levels

The Applicant shall calculate the expected noise using standard acoustics principles. Calculations for the expected noise shall be based on assumed plant inventories and utilization schedule for the worst-case scenario. The Applicant shall calculate noise levels taking into account correction of tonality, impulsiveness and intermittency in accordance with Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites issued under the NCO.

(bii) Presentation of Noise Levels

The Applicant shall present the existing and future noise levels in  $L_{eq}$  (30 min) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale. A quantitative assessment at the NSRs for the fixed noise source(s) shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM.

(biii) Proposals for Noise Mitigation Measures

The Applicant shall propose direct technical remedies within the Project limits in situations where the predicted noise level exceeds the criteria set out in Table 1A of Annex 5 of the TM to protect the affected NSRs.

6. Assessment of Side Effects and Constraints

- (i) The Applicant shall identify, assess and propose means to minimise any side effects and to resolve any potential constraints due to the inclusion of any recommended direct mitigation measures.

7. Evaluation of Constraints on Planned Noise Sensitive Developments/Land Uses

- (i) For planned noise sensitive uses which will still be affected even with practicable direct mitigation measures in place, the Applicant shall propose, evaluate and confirm the practicability of additional measures within the planned noise sensitive uses and shall make recommendations on how these noise sensitive uses will be designed for the information of relevant parties.
- (ii) The Applicant shall take into account agreed environmental requirements/constraints identified by the EIA study to assess the development potential of concerned sites which shall be made known to the relevant parties.



**Appendix D****Requirements for Water Quality Impact Assessment**

The water quality impact assessment shall include the following:

1. The Applicant shall identify and analyse the physical, chemical and biological disruptions of the water system(s) within the study area arising from the construction and operation of the Project.
2. The Applicant shall predict and assess any water quality impacts arising from the construction and operation of the Project including, but not limited to the following:
  - (i) the water quality impacts of the site run-off generated during the construction stage such as the effluents generated from dewatering associated with piling activities, grouting and concrete washing;
  - (ii) the water quality impacts of the road runoff containing oil/grease and suspended solids during the operational stage; and
  - (iii) the water quality impacts on the beaches, seawater intake points, river courses and drainages around the work sites.
3. The water quality impact assessment shall address the following:

**General**

- (i) Collection and review of background information on the existing water system(s) and water sensitive receivers which might be affected by the Project.
- (ii) Characterization of water quality of the water systems and water sensitive receivers which might be affected by the Project and associated works during construction based on existing best available information or site surveys/tests as appropriate.
- (iii) Identification and analysis of relevant existing and planned activities, beneficial uses and water sensitive receivers related to the affected water system(s). The Applicant shall refer to, *inter alia*, those developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans.
- (iv) Identification of pertinent water and sediment quality objectives, criteria and standards for the water system(s) and the sensitive receivers.
- (v) Review the specific construction methods and configurations, and operation of the Project to identify and predict the likely water quality impacts arising from the Project.
- (vi) Identification, analysis and quantification of existing and likely future water pollution sources, including point and non-point discharges to surface water runoff, sewage from workforce and polluted discharge generated from the Project. An emission inventory on the quantities and characteristics of these existing and future pollution sources in the assessment area shall also be provided. Field

investigation and laboratory tests, as appropriate, shall be conducted to fill in any relevant information gaps.

- (vii) Identification of the location of the water table within the Project boundary and its distance to the proposed tunnel alignment.
- (viii) Prediction and quantification of impacts on the water system(s) and the sensitive receivers due to those alterations and changes identified in (v) and (vii) above and the pollution sources identified in (vi) above. Possible impacts include changes in hydrology, flow regime, sediment erosion or deposition, water and sediment quality and change of ground water levels due to such changes. The prediction shall include possible different construction stages or sequences.
- (ix) Prediction of potential water quality impact on the water systems and the sensitive receivers if the tunnel alignment falls within the phreatic zone, which is right under the water table and are permanently saturated with groundwater, during the stage of tunnel construction.

#### Impact Prediction

- (x) Prediction and quantification of the impacts on the water system(s) and the water sensitive receivers due to those alterations and changes identified in (v) and the pollution sources identified in (vi). The prediction shall take into account and include likely different construction stages or sequences.
- (xi) Assessment of cumulative impacts due to other projects, activities or pollution sources within a boundary around the study area shall also be predicted.

#### Mitigation

- (xii) Analysis on the provision and adequacy of existing and planned future facilities to reduce pollution arising from the point and non-point sources identified in (vi).
- (xiii) Proposal of effective and practicable water pollution prevention and mitigation measures to be implemented during the construction and operational stages so as to avoid or minimise the water quality impacts identified above. Requirements to be incorporated in the Project contract document shall also be proposed.
- (xiv) Proposal for best management practices to reduce storm water and non-point source pollution shall be investigated and proposed as appropriate.
- (xv) Evaluation and quantification of residual impacts on the water system(s) and the water sensitive receivers with regard to the appropriate water quality criteria, standards or guidelines.

**Appendix E****Requirements for Assessment of Waste Management Implications**

The assessment of waste management implications shall cover the following:

1. Analysis of Activities and Waste Generation

- (i) The Applicant shall identify the quantity, quality and timing of the wastes as a result of the construction and operational activities of the Project based on the sequence and duration of these activities, e.g. construction and demolition (C&D) materials and other wastes which will be generated during construction and operational stages. The Applicant shall adopt appropriate design, general layout, construction methods and programme to minimise the generation of public fill/inert C&D materials and maximize the use of public fill/inert C&D materials for other construction works.

2. Proposal for Waste Management

- (i) Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site re-use and recycling shall be fully evaluated. Measures that can be taken in the planning and design stages e.g. by modifying the design approach and in the construction stage for maximizing waste reduction shall be separately considered;
- (ii) After considering the opportunities for reducing waste generation and maximizing re-use, the types and quantities of wastes required to be disposed of as a consequence shall be estimated and the disposal methods/options for each type of wastes shall be described in detail. The disposal methods/options recommended for each type of wastes shall take into account the result of the assessment in (iv) below;
- (iii) The EIA report shall also state clearly the transportation routings and the frequency of the trucks/vessels involved, any barging point or conveyor system to be used, the stockpiling areas and the disposal outlets for the wastes identified; and
- (iv) The impact caused by handling (including stockpiling, labelling, packaging and storage), collection, transportation and re-use/disposal of wastes shall be addressed in detail and appropriate mitigation measures shall be proposed. This assessment shall cover the following areas:
  - potential hazard;
  - air and odour emissions;
  - noise
  - wastewater discharge; and
  - public transport.

3. Excavation, Filling and Dumping

- (i) The Applicant shall identify and quantify as far as practicable of excavation, fill extraction, filling, sediment/mud transportation and disposal activities and requirements. Potential fill source and dumping ground to be involved shall also

be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be specified in the EIA report having regard to Section 4.4.2(c) of the TM. The categories of sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any serious contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility.

- (ii) The Applicant shall identify and evaluate the practical excavation methods to minimise excavation and dumping requirements and demand for fill sources based on the criterion that existing sediment/mud shall be left in place and not to be disturbed as far as possible.

#### 4. Land Contamination

- (i) The Applicant shall identify land lots and sites within the Project boundary which, due to their past or present land uses, are potential contaminated sites. A detailed account of the present activities and past land use history in relation to possible land contamination shall be provided.
- (ii) The list of potential contaminants which are anticipated to be found in these potential contaminated sites shall be provided and the possible remediation options shall be discussed.

**Appendix F****Requirements for Hazard Assessment**

The hazard assessment shall cover the following:

1. Hazard Assessment for Explosives

1.1 If there is use of explosives for the construction activities and the storage or blasting location is in close proximity to populated areas and/or Potentially Hazardous Installation site(s), the Applicant shall carry out hazard assessment as follows:

- (i) Identification of hazardous scenarios associated with the transport, storage and use of explosives with a view to determining a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA).
- (ii) Execution of a QRA of the set of hazardous scenarios determined in (i), expressing population risks in both individual and societal terms.
- (iii) Comparison of individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM.
- (iv) Identification and assessment of practicable and cost-effective risk mitigation measures.

1.2 The methodology to be used in the hazard assessment shall be consistent with previous studies having similar issues (e.g. Central Kowloon Route).

2. Hazard Assessment for Potentially Hazardous Installation (Tuen Mun Water Treatment Works)

2.1 The Applicant shall carry out hazard assessment to evaluate potential hazard to life during construction and operational stages of the Project due to the Tuen Mun Water Treatment Works. The hazard assessment shall include the following:

- (i) Identification of hazardous scenarios associated with the on-site transport, storage and use of chlorine at the Tuen Mun Water Treatment Works with a view to determining a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA).
- (ii) Execution of a QRA of the set of hazardous scenarios determined in (i), expressing population risks in both individual and societal terms.
- (iii) Comparison of individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM.
- (iv) Identification and assessment of practicable and cost-effective risk mitigation measures.

2.2 The methodology to be used in the hazard assessment should be consistent with previous studies having similar issues (e.g. Widening of Tuen Mun Road at Tsing Tin Interchange; and Route 8 (formerly known as Route 16)).

**Appendix G****Requirements for Landfill Gas Hazard Assessment**

1. The landfill gas hazard assessment shall entail two main components, which are qualitative risk assessment and landfill gas precautionary/protection design.
2. Specifically, the assessment shall include the following tasks:
  - (i) Review of background information and studies related to the restored Pillar Point Valley Landfill.
  - (ii) Identification of the nature and extent of the sources, including the likely concentrations/amounts of hazardous emissions which might have the potential for causing impacts on the Project.
  - (iii) Identification of possible pathways through the ground, underground cavities, utilities or groundwater and the nature of these pathways through which hazardous emissions must traverse if they were to reach the facilities within the Project site.
  - (iv) Identification of the potential targets associated with the proposed facilities which are sensitive to the impacts of the hazardous emissions.
  - (v) Qualitative assessment on the degrees of risk which the hazardous emissions may pose to the target for each of the source-pathway-target combinations.
  - (vi) Design of suitable level of precautionary measures and the types of protection measures for the construction and operation of the Project.
  - (vii) Identification of monitoring requirement for assessing the adequacy and performance of the implemented protection measures.

**Appendix H****Requirements for Ecological Impact Assessment**

The ecological impact assessment shall include the following:

1. The Applicant shall examine the flora, fauna and other components of the ecological habitats within the study area. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project shall avoid or minimise impacts on recognized sites of conservation importance such as sites of special scientific interest and other ecological sensitive areas. The assessment shall identify and quantify as far as possible the potential ecological impacts arising from the construction and operation of the Project and in combination with those cumulative impacts from associated works of the Project.
2. The assessment shall include the following major tasks:
  - (i) Review and incorporation of the findings of relevant studies and collation of the available information regarding the ecological characters of the study area.
  - (ii) Evaluation of information collected and identification of any information gap relating to the assessment of potential ecological impact.
  - (iii) Carrying out of necessary ecological field surveys with a duration of at least six months covering both wet and dry seasons, and investigation to verify the information collected, fill the information gaps identified in (ii) above and fulfil the objectives of the EIA study.
  - (iv) Establishment of an ecological profile of the study area based on data of relevant previous studies/surveys and results of the ecological field surveys, and taking into consideration the seasonal variations; and description of the characteristics of each habitat found. Major information to be provided shall include:
    - (a) description of the physical environment, including recognized sites of conservation importance and ecologically sensitive areas, and assessment of whether these sites will be affected by the Project;
    - (b) habitats maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the study area;
    - (c) ecological characteristics of each habitat type such as size, vegetation type, species present, dominant species found, species diversity and abundance, community structure, seasonal patterns, ecological value, inter-dependence of the habitats and species, and presence of any features of ecological importance;
    - (d) representative colour photographs of each habitat type and any important ecological features identified;
    - (e) species found that are rare, endangered and/or listed under local legislation, international conventions for conservation of wildlife/habitats or Red Data Books;

- 
- (v) Investigation and description of the existing wildlife uses of the various habitats with special attention to those wildlife groups and habitats with conservation interests, including but not limited to the following:
- woodlands;
  - shrubland;
  - wetlands;
  - natural stream courses and rivers;
  - egrettry
  - vertebrates (e.g. avifauna, fish, mammals including bats, herpetofauna);
  - macroinvertebrates (e.g. butterflies, odonates); and
  - any other habitats and wildlife groups identified as having special conservation interest by the EIA study.
- (vi) Identification and quantification, with the use of suitable methodology, of any direct, indirect, on-site, off-site, primary, secondary and cumulative ecological impacts on the wildlife groups and habitats mentioned in (v) above, such as direct loss of habitat and potential diversion or modification of stream courses due to site clearance, slope formation/excavation and foundation construction for viaducts, disturbance to wildlife due to noise impact and vibration from piling and blasting activities during construction, disturbance to wildlife such as traffic noise and artificial lighting during operation, bird strike in case of the use of transparent noise barriers, destruction of habitats, reduction of species abundance/diversity, loss of feeding and breeding grounds, reduction of ecological carrying capacity, habitat fragmentation;
- (vii) Evaluation of the significance and acceptability of the ecological impacts by making reference to the criteria in Annex 8 of the TM;
- (viii) Recommendation of possible alternatives, such as modification of alignment, construction methods and sequences, and practicable mitigation measures to avoid, minimise and/or compensate for the adverse ecological impacts identified;
- (ix) Evaluation of the feasibility and effectiveness of the recommended mitigation measures and definition of the scope, type, location, implementation arrangement, subsequent management and maintenance of such measures;
- (x) Determination and quantification as far as possible of the residual ecological impacts after implementation of the proposed mitigation measures;
- (xi) Evaluation of the significance and acceptability of the residual ecological impacts by making reference to the criteria in Annex 8 of the TM; and
- (xii) Review of the need for and recommendation on any ecological monitoring and audit programme required.



**Appendix I****Requirements for Cultural Heritage Impact Assessment**

The Cultural Heritage Impact Assessment (CHIA) shall comprise an Archaeological Impact Assessment (AIA) and a Built Heritage Impact Assessment (BHIA) as follows:

1. Archaeological Impact Assessment (AIA):

- (i) The Applicant shall engage a qualified archaeologist to conduct the AIA in accordance with relevant sections of the “Guidelines for Cultural Heritage Impact Assessment” (Appendix I-1). If existing information is insufficient to ascertain the archaeological potential of the project area, further field investigation shall be conducted to obtain archaeological data. The archaeologist shall obtain a licence from the Antiquities Authority before undertaking field investigation under the provision of the Antiquities and Monuments Ordinance (Cap. 53).
- (ii) The Applicant shall identify the archaeological sites that might be adversely affected by the construction of the Project. A plan of proper scale showing the location of the proposed works and the archaeological sites identified is required. A checklist including the affected archaeological sites, impacts identified, recommended mitigation measures as well as the implementation agent and period shall also be included in the EIA.
- (iii) The Applicant shall assess the extent to which those archaeological sites might be directly and indirectly affected and recommend possible alternatives, such as modification of alignment and design of the Project, and practicable monitoring and mitigation measures to avoid or minimise the adverse impact on the archaeological sites.

2. Built Heritage Impact Assessment (BHIA):

- (i) The Applicant shall draw necessary reference to relevant sections of the “Guidelines for Cultural Heritage Impact Assessment” (Appendix I-1) to conduct the BHIA to identify known and unknown built heritage items within the assessment area that may be affected by the Project and its associated works and to assess the direct and indirect impacts on built heritage items. Appropriate mitigation measures shall be recommended in the BHIA.

**Appendix I-1****Guidelines for Cultural Heritage Impact Assessment**

The purpose of the guidelines is to assist the understanding of the requirements in assessing impact on archaeological and built heritage. A comprehensive Cultural Heritage Impact Assessment (CHIA) includes a baseline study, an impact assessment study associated with the appropriate mitigation measures

**1. Baseline Study****1.1 A baseline study shall be conducted:**

- (i) to compile a comprehensive inventory of heritage sites within the proposed project area, which include:
  - (a) archaeological sites (including marine archaeological sites);
  - (b) pre-1950 buildings and structures;
  - (c) selected post-1950 buildings and structures of high architectural and historical significance and interest; and
  - (d) cultural landscapes include places associated with historic event, activity, or person or exhibiting other cultural or aesthetic values, such as sacred religious sites, battlefields, a setting for buildings or structures of architectural or archaeological importance, historic field patterns, clan graves, old tracks, *fung shui* woodlands and ponds, and etc.
- (ii) to identify the direct and indirect impacts on the heritage sites at the planning stage in order to avoid causing any negative effects. The impacts include the direct loss, destruction or disturbance of an element of cultural heritage, impact on its settings or impinging on its character through inappropriate sitting or design, potential damage to the physical fabric of archaeological remains, historic buildings or historic landscapes through air pollution, change of ground water level, vibration, ecological damage, new recreation or other daily needs to be caused by the new development. The impacts listed are merely to illustrate the range of potential impacts and not intended to be exhaustive.

**1.2 The baseline study shall also include a desk-top research and a field evaluation.****1.3 Desk-top Research****1.3.1 Desk-top research should be conducted to analyse, collect and collate extant information. It shall include but not limited to:**

- (i) List of declared monuments protected by the Antiquities and Monuments Ordinance (Chapter 53).
- (ii) Graded historic buildings and sites.
- (iii) Government historic sites identified by the Antiquities and Monuments Office (AMO).
- (iv) Lists and archives kept in the Reference Library of the Antiquities and Monuments Office of the Leisure and Cultural Services Department including archaeological sites, declared monuments, proposed monuments, deemed monuments and recorded historical building and structures identified by the AMO.

- (v) Publications on local historical, architectural, anthropological, archaeological and other cultural studies, such as, Journals of the Royal Asiatic Society (Hong Kong Branch), Journals of the Hong Kong Archaeological society, Antiquities and Monuments Office Monograph Series and so forth.
- (vi) Other unpublished papers, records, archival and historical documents through public libraries, archives, and the tertiary institutions, such as the Hong Kong Collection and libraries of the Department of Architecture of the University of Hong Kong and the Chinese University of Hong Kong, Public Records Office, photographic library of the Information Services Department and so forth.
- (vii) Any other unpublished archaeological investigation and excavation reports kept by the AMO.
- (viii) Historical documents in the Public Records Office, the Land Registry, District Lands Office, District Office and the Hong Kong Museum of History and so forth.
- (ix) Cartographic and pictorial documents. Old and recent maps and aerial photos searched in the Maps and Aerial Photo Library of the Lands Department.
- (x) Existing geological information (for archaeological desk-top research).
- (xi) Discussion with local informants.

#### 1.4 Field Evaluation

1.4.1 The potential value of the project area with regard the cultural heritage could be established easily where the area is well-documented. However, it does not mean that the area is devoid of interest if it lacks information. In these instances, a site visit and consultations with appropriate individuals or organisations should be conducted by those with expertise in local heritage to clarify the situation.

#### 1.4.2 Field survey on historic buildings and structures

- (i) Field scan of all the historic buildings and structures within the project area.
- (ii) Photographic recording of each historic building or structure including the exterior (the elevations of all faces of the building premises, the roof, close up for the special architectural details) and the interior (special architectural details), if possible, as well as the surroundings, the associated cultural landscape features and the associated intangible cultural heritage (if any) of each historic building or structure.
- (iii) Interview with local elders and other informants on local historical, architectural, anthropological and other cultural information related to the historic buildings and structures.
- (iv) Historical and architectural appraisal of the historic buildings and structures, their associated cultural landscape and intangible cultural elements.

#### 1.4.3 Archaeological Survey

- (i) A licence shall be obtained from the Antiquities Authority for conducting an archaeological survey. It takes at least two months to process the application.
- (ii) A detailed archaeological survey programme should be designed to assess the archaeological potential of the project area. The programme should clearly elaborate the strategy and methodology adopted, including what particular question(s) can be resolved, how the archaeological data will be collected and recorded, how the evidence will be analyzed and interpreted and how the archaeological finds and results will be organized and made available. Effective

field techniques should also be demonstrated in the programme. The programme should be submitted to the AMO for agreement prior to applying for a licence.

- (iii) The following methods of archaeological survey (but not limited to) should be applied to assess the archaeological potential of the project area:
    - (a) Definition of areas of natural land undisturbed in the recent past.
    - (b) Field scan of the natural land undisturbed in the recent past in detail with special attention paid to areas of exposed soil which were searched for artifacts.
    - (c) Conduct systematic auger survey and test pitting. The data collected from auger survey and test pitting should be able to establish the horizontal spread of cultural materials deposits.
    - (d) Excavation of test pits to establish the vertical sequence of cultural materials. The hand digging of 1 x 1 m or 1.5 x 1.5 m test pits to determine the presence or absence of deeper archaeological deposits and their cultural history.
    - (e) The quantity and location of auger holes and test pits should be agreed with AMO prior to applying for a licence.
    - (f) A qualified land surveyor should be engaged to record reduced levels and coordinates as well as setting base points and reference lines in the course of the field survey.
    - (g) Reference should be made to the standard and guidance of the Institute for Archaeologists and English Heritage when conducting geophysical survey.
- 1.4.4 If the field evaluation identifies any additional heritage sites within the study area which are of potential historic or archaeological importance and not recorded by AMO, the office should be reported as soon as possible.
- 1.5 The Report of Baseline Study
- 1.5.1 The study report should have concrete evidence to show that the process of the above desk-top and field survey has been satisfactorily completed. This should take the form of a detailed inventory of the heritage sites supported by full description of their significance. The description should contain detailed geographical, historical, archaeological, architectural, anthropological, ethnographic and other relevant data supplemented with illustrations below and photographic and cartographic records, if required.
- 1.5.2 A master layout plan showing the identified archaeological and built heritage within the study area should be provided in the report. All the identified heritage sites should be properly numbered with their locations indicated on the master layout plan.
- 1.5.3 Historic Buildings/Structures/Sites
- (i) A map in 1:1000 scale showing the boundary of each historic item.
  - (ii) Photographic records of each historic item.
  - (iii) Detailed record of each historic item including its construction year, previous and present uses, architectural characteristics, as well as legends, historic persons and events, cultural landscape features and cultural activities associated with the structure.
  - (iv) A cross-referenced checklist including the reference number of each historical

item, their photo and drawing reference, as well as the page number of the detailed recording form of each identified historical item for easy cross-checking of individual records.

#### 1.5.4 Archaeological Sites

- (i) A map showing the boundary of each archaeological site as supported and delineated by field walking, augering and test-pitting;
- (ii) Drawing of stratigraphic section of test-pits excavated which shows the cultural sequence of a site.
- (iii) Reduced levels, coordinates, base points and reference lines should be clearly defined and certified by a qualified land surveyor.
- (iv) A factual record of the environmental materials, e.g. ecofacts identified and/or collected during the archaeological works.
- (v) “Guidelines for Archaeological Reports” shall be followed ([Appendix I-2](#)).

1.5.5 A full bibliography and the source of information consulted should be provided to assist the evaluation of the quality of the evidence. To facilitate verification of the accuracy, AMO will reserve the right to examine the full details of the research materials collected under the baseline study.

#### 1.6 Finds and Archives

1.6.1 Archaeological finds and archives should be handled following “Guidelines for Handling of Archaeological Finds and Archives” ([Appendix I-3](#)).

### 2. Impact Assessment Study

#### 2.1 Identification of impact on heritage

2.1.1 The impact assessment study must be undertaken to identify the impacts on the heritage sites which will be affected by the proposed development subject to the result of desktop research and field evaluation. The prediction of impacts and an evaluation of their significance must be undertaken by expert(s) in local heritage.

2.1.2 During the assessment, both the direct impacts such as loss or damage of important features as well as indirect impacts should be clearly stated, such as adverse visual impact on built heritage, landscape change to the associated cultural landscape features of the built heritage, temporary change of access to the heritage sites during the work period, change of ground level or water level which may affect the preservation of the archaeological and built heritage in situ during the implementation stage of the project.

2.1.3 The evaluation of heritage impact assessment may be classified into five levels of significance based on type and extent of the effects concluded in the CHIA study:

- (i) Beneficial impact: the impact is beneficial if the project will enhance the preservation of the heritage site(s) such as improving the flooding problem of the historic building after the sewerage project of the area;
- (ii) Acceptable impact: if the assessment indicates that there will be no significant effects on the heritage site(s);
- (iii) Acceptable impact with mitigation measures: if there will be some adverse effects, but these can be eliminated, reduced or offset to a large extent by specific

- measures, such as conduct a follow-up Conservation Proposal or Conservation Management Plan for the affected heritage site(s) before commencement of work in order to avoid any inappropriate and unnecessary interventions to the building;
- (iv) Unacceptable impact: if the adverse effects are considered to be too excessive and are unable to mitigate practically;
  - (v) Undetermined impact: if the significant adverse effects are likely, but the extent to which they may occur or may be mitigated cannot be determined from the study. Further detailed study will be required for the specific effects in question.
- 2.1.4 Preservation in totality must be taken as the first priority as it will be a beneficial impact and will enhance the cultural and socio-economical environment if suitable measures to integrate the heritage site into the proposed project are carried out.
- 2.1.5 If, due to site constraints and other factors, only preservation in part is possible, this must be fully justified with alternative proposals or layout designs which confirm the impracticability of total preservation.
- 2.1.6 Total destruction must be taken as the very last resort in all cases and shall only be recommended with a meticulous and careful analysis balancing the interest of preserving local heritage as against that of the community as a whole. Assessment of impacts on heritage sites shall also take full account of, and follow where appropriate, section 4.3.1(c), section 2 of Annex 10, sections 2.6 to 2.9 of Annex 19 and other relevant parts of the TM.
- 2.2 Mitigation Measures
- 2.2.1 It is always a good practice to recognize the heritage site early in the planning stage and site selection process, and to avoid it, i.e. preserve it in-situ, or leaving a buffer zone around the site.
- 2.2.2 Mitigation is not only concerned with minimising adverse impact on the heritage site but also should give consideration of potential enhancement if possible (such as to improve the access to the built heritage or enhance the landscape and visual quality of built heritage).
- 2.2.3 Mitigation measures shall not be recommended or taken as de facto means to avoid preservation of heritage sites. They must be proved beyond all possibilities to be the only practical course of action. Heritage sites are to be in favour of preservation unless it can be demonstrated that there is a need for a particular development which is of paramount importance and outweighs the significance of a heritage site.
- 2.2.4 If avoidance of the heritage site is not possible, amelioration can be achieved by minimising the potential impacts and the preservation of the heritage site, such as physically relocating it. Measures like amendments of the sitting, screening and revision of the detailed design of the development are required to lessen its degree of exposure if it causes visual intrusion to the heritage site and affects the character and integrity of the heritage site.
- 2.2.5 A rescue programme, when required, may involve preservation of the historic building or structure together with the relics inside, and its historic environment through relocation, detailed cartographic and photographic survey or preservation of an archaeological site “by record”, i.e. through excavation to extract the maximum data as the very last resort.

## 2.3 The Impact Assessment Report

- 2.3.1 A detailed description and plans should be provided to elaborate on the heritage site(s) to be affected. Besides, please also refer to section 4.3.1(d), sections 2.10 to 2.14 of Annex 19 and other relevant parts of the TM, other appropriate presentation methods for mitigation proposals like elevations, landscape plan and photomontage shall be used in the report extensively for illustrating the effectiveness of the measures.
- 2.3.2 To illustrate the landscape and visual impacts on built heritage, as well as effects of the mitigation measures, choice of appropriate presentation methods is important. These methods include perspective drawings, plans and section/elevation diagrams, photographs on scaled physical models, photo-retouching and photomontage. These methods shall be used extensively to facilitate communication among the concerned parties.
- 2.3.3 The implementation programme for the agreed mitigation measures should be able to be executed and should be clearly set out in the report. Competent professionals must be engaged to design and carry out the mitigation measures.
- 2.3.4 For contents of the implementation programme, reference can be made to Annex 20 of the TM. In particular, section 6.7 of Annex 20 requires to define and list out clearly the proposed mitigation measures to be implemented, by whom, when, where, to what requirements and the various implementation responsibilities. A comprehensive plan and programme for the protection and conservation of the partially preserved heritage site, if any, during the planning and design stage of the proposed project must be addressed in details.
- 2.3.5 Supplementary information to facilitate the verification of the findings shall be provided in the report including but not limited to:
- (i) layout plan(s) in a proper scale illustrating the location of all heritage sites within the study area, the extent of the work area together with brief description of the proposed works;
  - (ii) heritage sites within the study area should be properly numbered, cross-reference to the relevant drawings and plans.
  - (iii) an impact assessment cross-referenced checklist of the heritage sites within the study area including heritage site reference, distance between the heritage site and work area, summary of the possible impact(s), impact level, summary of the proposed mitigation measure(s), as well as references of the relevant plans, drawings and photos; and
  - (iv) a full implementation programme of the mitigation measures for the affected heritage sites to be implemented with details, such as by whom, when, where, to what requirements and the various implementation responsibilities of individual parties.

**Appendix I-2****Guidelines for Archaeological Reports**1. **General**

- (i) The reports should be written in a clear, concise and logical style.
- (ii) The reports should be submitted in A4 size and accompanying drawings of convenient sizes.
- (iii) Draft reports should be submitted to AMO for comments within two months after completion of archaeological work unless otherwise approved by AMO.
- (iv) The draft reports should be revised as required by AMO and relevant parties. The revised reports should be submitted to AMO within three weeks after receiving comments from AMO and relevant parties.
- (v) At least 3 hard copies of the final reports should be submitted to AMO for record purpose.
- (vi) At least 2 digital copies of the final reports in both Microsoft Word format and Acrobat (.PDF) format without loss of data and change of appearance compared with the corresponding hard copy should be submitted to AMO. The digital copies should be saved in a convenient medium, such as compact discs with clear label on the surface and kept in protective pockets.

2. **Suggested Format of Reports**

- (i) Front page:
  - Project/Site name
  - Nature of the report  
e.g. (Draft/Final)  
Archaeological Investigation/Survey Report  
Archaeological Impact Assessment Report  
Watching Brief Report  
Rescue Excavation Report  
Post-excavation Report
  - Organization
  - Date of report
- (ii) Contents list:  
Page number of each section should be given.
- (iii) Non-technical summary (both in English and Chinese with not less than 300 words each):  
This should outline in plain, non-technical language, the principal reasons for the archaeological work, its aims and main results, and should include reference to authorship and commissioning body.
- (iv) Introduction:  
This should set out background leading to the commission of the reports. The location, area, scope and date of conducting the archaeological work must be given. The location of archaeological work should be shown on maps in appropriate scales and with proper legends.



- (v) Aims of archaeological work:  
These should reflect the aims set in the project design.
- (vi) Archaeological, historical, geological and topographical background of the site:  
Supporting aerial photos and maps (both old and present) in appropriate scales, with proper legends and with the site locations clearly marked on should be provided.
- (vii) Methodology:  
The methods used including any variation to the agreed project design should be set out clearly and explained as appropriate.
- (viii) Result:  
This should outline the findings, known and potential archaeological interests by period and/or type. Their significance and value with reference/inclusion of supporting evidence should be indicated. For impact assessment, the likely effect of the proposed development on the known or potential archaeological resource should be outlined.
- (ix) Conclusion:  
This should include summarization and interpretation of the result.
- (x) Recommendation:  
Recommendations on further work and the responsible party as well as a brief planning framework should be outlined.
- (xi) Reference and bibliography:  
A list of all primary and secondary sources used should be given. Director and members of the archaeological team and author of the report should be listed.
- (xii) Supporting illustrations:  
They should be clearly numbered and easily referenced to the text. They should be scanned and saved in TIFF or JPEG formats.
- (a) Maps  
Archaeological work locations, such as auger hole and test pit locations (with relevant coordinates certified by a qualified surveyor), should be clearly shown on maps in appropriate scales, with proper legends, grid references (in 8 digits) and captions.
- (b) Drawings of test pits, archaeological features and finds  
The below scales should be followed:
- |   |      |
|---|------|
| Cross section and profile drawings of test pits | 1:20 |
| Archaeological feature drawings                 | 1:10 |
| Finds drawings                                  | 1:1  |

If drawings of the above stated scales are not appropriate to be incorporated into the report under certain occasions, reduced copy of the drawings with the same scales are acceptable. Proper captions, legends and indication of reduced size should be given.

(c) Photos of site and finds  
All photos should be at least in 3R size with proper captions and scales. They should be clearly numbered and easily referenced to the text. They should be scanned and saved in TIFF or JPEG formats.

(xiii) Supporting data in appendices:  
These should consist of essential technical details to support the result. These may include stratigraphy record of test pits and auger holes, record of general and special finds as well as ecofacts discovered with description, quantity and context number/stratigraphical sequence, index of field archives.

(xiv) Comment and Response:  
All comments and responses from AMO and relevant parties should be attached.

### 3. Green Measures

- (i) All reports should be of single line spacing and printed on both sides of the paper.
- (ii) Excessive page margins should be avoided. A top/bottom margin of 2 cm and left/right margin of 2.5 cm are sufficient.
- (iii) Use of blank paper should be avoided as far as possible.
- (iv) Suitable font type of font size 12 should be used generally in balancing legibility and waste reduction objective.

**Appendix I-3****Guidelines for Handling of Archaeological Finds and Archives**1. General

## 1.1 Site Code

The Licensee should contact the Central Archaeological Repository (CAR) of the Antiquities and Monuments Office (AMO) about the allocation of site code before the commencement of the project to avoid duplicate of site code assignment.

2. Archaeological Finds

## 2.1 Cleaning

Every excavated finds should be properly cleaned before handing over to the CAR of the AMO.

## 2.2 Marking

- (i) All the excavated finds should be cleaned before marking object number.
- (ii) “Sandwich” technique<sup>1</sup> should be adopted for marking permanent identification number on an object.
- (iii) Every special finds should be marked with site code, context number and object number, etc.
- (iv) Representative samples collected from general finds should be marked.
- (v) For the finds which is too small, has unstable surface, or leather, textiles or wood, it should not be marked/labeled directly and should be bagged separately or attached with tags by tying. The tag should contain information about the object number, context number and site code, etc.

## 2.3 Labeling and bagging

- (i) A label should be attached on each bag.
- (ii) Information about the object number, context number, test-pit number, site code and bag number should be stated clearly on the label.
- (iii) Finds excavated within the same context should be bagged together. However, if they have been categorized according to their types, materials or characteristics, separate bagging is required.

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<sup>1</sup> *Steps for “Sandwich” technique*

1. First of all, the object should be marked in appropriate area and size that does not impact important diagnostic or aesthetic parts of the object.
2. Clean the area to be marked.
3. Apply a thin coat of clear reversible lacquer on the area. Use white lacquer if the object is dark in colour. Let the base coat dry completely.
4. Use a permanent water-based ink to write the object number on top of the base coat. Let ink dry completely.
5. Apply a top coat of clear varnish.
6. Let the marking dry completely before packing.

## 2.4 Conservation

- (i) To refit and reconstruct pottery vessels by appropriate adhesive. A heat and waterproof adhesive, e.g. product of H. Marcel Guest Ltd., is recommended.
- (ii) Any adhesives which are not reversible or will damage artefacts, e.g. the pottery vessel should not be applied on the finds.

## 2.5 Finds register

A clear finds register with information about the finds description, quantity, form, weight, dimensions and field data should be prepared for handover to the CAR.

## 3. Field Archives and Laboratory Records

3.1 Field archives include field diary, context recording sheet, special finds recording sheet, soil sample/sample recording sheet, map, survey sheet and video/visual records etc. Laboratory records also form part of the archaeological archives, which include finds processing record, conservation record, finds drawings and photos, records of typological analysis and objects card etc.

3.2 All the aforesaid archives should be handed over to the CAR after the compilation of the excavation report. Attention should be drawn to the followings:

- (i) All the field archives should be submitted together with their indexes.
- (ii) The video footage should be submitted together with a detailed script introducing the content of the video record.
- (iii) All the slides, colour/black & white negatives and digital photographs should be submitted together with their contact prints and indexes.

## 4. Handover of Finds

### 4.1 Packing

- (i) Every special finds should be protected with tissue paper, bubble sheet or P.E. foam with shock-proofed packing. No packing material other than the aforesaid items should be used.
- (ii) All the general finds should be stored in heavy duty plastic container with shock-proofed packing.
- (iii) The heavy duty plastic container, e.g. product of the Star Industrial Co., Ltd. (No. 1849 or 1852), is recommended.
- (iv) For oversized finds, prior advice on packing method should be sought from the AMO.

### 4.2 Handover procedure

- (i) The Licensee should arrange to transport the finds and archives to the CAR upon the completion of the finalized excavation report.
- (ii) Separate handover forms for finds and archives should be signed by the representatives of the Licensee and the AMO.

**Appendix J****Requirements for Landscape and Visual Impact Assessment**

1. The Applicant shall review relevant plan(s) and/or studies which may identify areas of high landscape value and recommend country park, coastal protection area, conservation area designations, green belt, open space and amenity area. Any guidelines on landscape and urban design strategies and frameworks that may affect the appreciation of the Project shall also be reviewed. The aim is to gain an insight to the future outlook of the area affected so as to assess whether the Project can fit into the surrounding setting. Any conflict with the statutory town plan(s) and any published land use plans shall be highlighted and appropriate follow-up action shall be recommended.
2. The Applicant shall describe, appraise, analyse and evaluate the existing and planned landscape resources and character of the study area. A system shall be derived for judging the landscape and visual impact significance. Annotated oblique aerial photographs and plans of suitable scale showing the baseline landscape character areas and landscape resources and mapping of impact assessment shall be extensively used to present the findings of impact assessment. Descriptive text shall provide a concise and reasoned judgment from a landscape and visual point of view. The assessment shall be particularly focused on the sensitivity of the landscape framework and its ability to accommodate change. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape settings. The landscape impact assessment shall quantify potential landscape impact as far as possible, so as to illustrate the significance of such impact arising from the Project. Clear mapping of the landscape impact is required. Tree survey shall be carried out and the impacts on existing trees shall be addressed. Cumulative landscape and visual impacts of the Project with other existing, committed and planned developments in the study area shall be assessed.
3. The Applicant shall assess the visual impact of the Project. Clear illustrations including mapping of visual impact is required. The assessment shall include the following:
  - (i) identification and plotting of visual envelope of the Project;
  - (ii) identification of the key groups of existing and planned sensitive receivers within the visual envelope with regard to views from sea level, ground level and elevated vantage points;
  - (iii) description of the visual compatibility of the Project with the surrounding and the existing and planned setting, and its obstruction and interference with the key views within the visual envelope; and
  - (iv) description of the severity of visual impact in terms of nature, distance and number of sensitive receivers. The visual impact of the Project with and without mitigation measures shall be included and illustrated so as to demonstrate the effectiveness of the proposed mitigation measures across time.
4. The Applicant shall evaluate the merits of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. In addition, alternative alignment, design and construction methods that avoid or reduce the identified landscape and visual impacts shall be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The

mitigation measures proposed shall not only be concerned with damage reduction but shall also include consideration of potential enhancement of existing landscape and visual quality. The Applicant shall recommend mitigation measures to minimise adverse effects identified above, including provision of a landscape design.

5. The mitigation measures shall include preservation of vegetation, transplanting of mature trees when tree removal is inevitable, provision of screen planting, re-vegetation of disturbed land, woodland restoration, compensatory planting using native trees, provisioning/reprovisioning of amenity areas and open spaces, avoidance or minimisation of noise barriers, design of structures, provision of finishes to structures, colour scheme and texture of material used and any measures to mitigate the impact on existing and planned land uses and sensitive receivers. Parties shall be identified for the on going management and maintenance of the proposed mitigation works to ensure their effectiveness throughout the operational phase of the Project. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.
6. Annotated illustration materials such as coloured perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points, and computer-generated photomontage shall be adopted to fully illustrate the landscape and visual impacts of the Project. The landscape and visual impacts of the Project with and without mitigation measures from representative viewpoints, particularly from views of the most severely affected visually sensitive receivers (i.e. worst-case scenario), shall be properly illustrated in existing and planned setting at four stages (existing condition, Day 1 with no mitigation measures, Day 1 with mitigation measures and Year 10 with mitigation measures) by computer-generated photomontage so as to demonstrate the effectiveness of the proposed mitigation measures. Computer graphics shall be compatible with Microstation DGN file format. The Applicant shall record the technical details in preparing the illustration, which may need to be submitted for verification of the accuracy of the illustration.



**Appendix L****Requirements for EIA Report Documents**

1. The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:
  - (i) 30 copies of the EIA report and 30 copies of the bilingual (in both English and Chinese) executive summary as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.
  - (ii) When necessary, addendum to the EIA report and the executive summary submitted in (i) above as required under section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.
  - (iii) 20 copies of the EIA report and 50 copies of the bilingual (in both English and Chinese) executive summary with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.
2. To facilitate public inspection of EIA report via EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and the executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 1.3 or later). For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and the executive summary shall be included in the beginning of the document. Hyperlinks to figures, drawings and tables in the EIA report and the executive summary shall be provided in the main text from where respective references are made. Graphics in the report shall be in interlaced GIF format.
3. The electronic copies of the EIA report and the executive summary shall be submitted to the Director at the time of application for approval of the EIA report.
4. When the EIA report and the executive summary are made available for public inspection under section 7(1) of the EIAO, the content of the electronic copies of the EIA report and the executive summary must be the same as the hard copies and the Director shall be provided with the most updated electronic copies.
5. To promote environmentally friendly and efficient dissemination of information, both hardcopies and electronic copies of future EM&A reports recommended by the EIA study shall be required.