

**Environmental Impact Assessment Ordinance (Cap. 499), Section 5(7)**  
**Environmental Impact Assessment Study Brief No. ESB-170/2007**

**Project Title: Upgrading of Remaining Sections of Kam Tin Road and Lam Kam Road**  
**(hereinafter known as the "Project")**

**Name of Applicant: Highways Department**  
**(hereinafter known as the "Applicant")**

**1. BACKGROUND**

1.1 An application (No. ESB-170/2007) for an Environmental Impact Assessment (EIA) study brief under section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 12 September 2007 with a project profile (No. PP-327/2007) (the Project Profile).

1.2 The Project is to upgrade the existing unimproved sections of Kam Tin Road and Lam Kam Road from a substandard single two-line carriageway into a standard 7.3m wide carriageway, with the associated improvement of pedestrian facilities, public transport laybys and right-turning lanes at major junctions.

The location of the Project is shown in Figure 1 and the scope of works is described as follows:

- (i) Upgrading of about 5.2km road sections into 7.3m wide single two-lane carriageways;
- (ii) Provision of right-turning lanes at approaches to major accesses;
- (iii) Provision of laybys at suitable locations (including the existing bus stops) to accommodate the activities of buses and mini-buses;
- (iv) Provision of appropriate crossing facilities with refuge islands to meet pedestrian crossing demands; and
- (v) Associated slope and drainage works, traffic aids and street lighting modification, landscaping works and environmental mitigation measures if required.

1.3 The Project is a designated project (DP) under item Q.1 of Part 1, Schedule 2 of the EIAO: *"All projects including new access roads, railways, sewers, sewage treatment facilities, earthworks, dredging works and other building works partly or wholly in an existing or gazetted proposed country park or special area, a conservation area, an existing or gazetted proposed marine park or marine reserve, a site of cultural heritage, and a site of special scientific interest."*

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 that take place concurrently. This information will contribute to decisions by the Director on:

- (i) The overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
- (ii) The conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; 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 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 natural and man-made environment and the associated environmental constraints;
- (iii) to provide information on the consideration of alternatives to avoid and minimize potential environmental impacts to environmentally sensitive areas and other sensitive uses; to compare the environmental benefits and dis-benefits of each of different options; to provide reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection of preferred option(s);
- (iv) to identify and quantify all environmental sensitive receivers, emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
- (v) to identify and quantify any potential losses or damage to flora, fauna and natural habitats;
- (vi) to identify and quantify any potential landscape and visual impacts and to propose measures to mitigate these impacts;
- (vii) to identify any negative impacts on sites of cultural heritage and propose measures to mitigate these impacts;
- (viii) to propose provision of mitigation measures so as to minimize pollution, environmental disturbance & nuisance during construction & operation of Project;
- (ix) to investigate the feasibility, practicability, effectiveness and

implications of the proposed mitigation measures;

- (x) to identify, within the study area, any individual project(s) that fall under Schedule 2 and/or Schedule 3 of the EIAO; to ascertain whether the findings of this EIA study have adequately addressed the environmental impacts of those projects; and where necessary, to identify the outstanding issues that need to be addressed in any further detailed EIA study;
- (xi) 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;
- (xii) 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 cumulative effects and reduce them to acceptable levels;
- (xiii) 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
- (xiv) to design and specify 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**

The purpose of this study brief is to scope the key issues of the EIA study. The Applicant has to demonstrate in the EIA report that the criteria in the relevant sections of the *Technical Memorandum on the Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance* (hereinafter referred to as “the TM”) are complied with.

#### **3.2 The Scope**

- 3.2.1 The scope of this EIA study shall cover the Project mentioned in section 1.2 above. The applicant shall review and consider the previous relevant studies including the environmental study for ‘Improvement to Kam Tin Road Stage 2’ and identify issues, public opinion and study findings as being of relevance to the Project. The EIA study shall address the key issues described below, together with any other key issues identified during the course of the EIA study and the cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed, planned and known potential developments in the vicinity of the Project:

- (i) the potential noise and air quality impacts 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 roads and developments in the assessment area of the Project;
- (ii) potential water quality impact on the relevant water system(s) from construction and operation of the Project;
- (iii) waste arising as a result of the construction activities of the Project and potential land contamination from land to be resumed for the Project;
- (iv) potential ecological impact on the ecological sensitive areas along or near the Project, in particular the areas zoned “Conservation Area” on outline zoning plans, from construction and operation of the Project;
- (v) potential landscape and visual impacts from construction and operation of the Project; and
- (vi) potential impacts on sites of cultural heritage from construction and operation of the Project.

### **3.3 Consideration of Alternatives**

#### **3.3.1 Purpose and Objective of the Project**

The Applicant shall provide information on the purpose and objectives of the Project.

#### **3.3.2 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.

#### **3.3.3 Selection of Preferred Construction Method(s) and Sequence(s) of Works**

Taking into consideration of the findings in section 3.3.2 above, the Applicant shall recommend/justify the adoption of the preferred construction method(s) and sequence(s) of works that will avoid or minimize adverse environmental effects arising from the Project, and adequately 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 all environmental aspects as described in sub-sections 3.1, 3.2 and 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 programme and methodologies for the Project. The Applicant shall clearly state in the EIA report the time frame and work programmes of the Project and other concurrent projects, and assess the cumulative environmental impacts from the Project with all interacting projects.

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 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 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. The assessment for the construction stage shall take into account the impacts of major emission sources from other construction projects.

3.4.1.3 The Applicant shall assess the air pollutant concentrations with reference to relevant sections of the Guidelines for Local-Scale Air Quality Assessment Using Models given in Appendices A1 to A3, or other methodology as agreed by the Director.

3.4.1.4 The air quality impact assessment shall include the following:

- (i) Background and Analysis of Activities
  - (a) Provide background information relating to air quality issues relevant to the Project, e.g. description of activities of the Project that may affect air quality during both constructional and operational stages.
  - (b) Give an account, where appropriate, of the consideration/measures that had been taken into consideration in the planning of the Project to abate the air pollution impact. That is, the Applicant shall consider alternative construction methods/phasing programmes and alternative modes of operation to minimize the constructional and operational air quality impact respectively
  - (c) Present the background air quality levels in the study area for the purpose of evaluating cumulative air quality impacts during constructional and operational stages.
- (ii) Identification of Air Sensitive Receivers (ASRs) and Examination of Emission/Dispersion Characteristics

- (a) Identify and describe representative existing and planned/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 Lands Department. The Applicant shall select the assessment points of the identified ASRs such that they represent the worst impact point of these ASRs. A map showing the location and description including the name of buildings, their uses and height of selected assessment points shall be given. Separation distances of these ASRs from the nearest emission sources shall also be given.
  - (b) Provide 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 operation activities of the Project in subsection 3.4.1.4(i) above. Examples of constructional stage emission sources include stockpiling, material handling and vehicular movements on unpaved haul roads on site, etc. Examples of operational stage emission sources include exhaust emissions from vehicles and vent shafts. Confirmation of the validity of the assumptions and the magnitude of the activities (e.g. volume of construction materials handled, etc.) shall be obtained from the relevant government department/authorities and documented.
- (iii) Constructional Phase Air Quality Impact
- (a) The Applicant shall follow the requirements of the Air Pollution Control (Construction Dust) Regulation to ensure constructional dust impacts are controlled within the relevant standards as stipulated in section 1 of Annex 4 of the TM. A construction phase audit and monitoring program during constructional stage shall be devised to verify the effectiveness of the control measures to ensure proper construction dust control.
  - (b) If the Applicant anticipates a significant construction dust impact that will likely cause exceedance of the recommended limits in the TM at the ASRs despite incorporation of dust control measures, 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 subsection 3.4.1.4(v) below when carrying out the quantitative assessment.
- (iv) Operational Phase Air Quality Impact
- (a) The Applicant shall calculate the expected air pollutant concentrations at the identified ASRs based on the assumed reasonably worst-case scenario. The evaluation shall be based on the strength of the emission sources identified in subsection 3.4.1.4(ii)(b) above. The Applicant shall follow subsection 3.4.1.4(v) below when carrying out the quantitative assessment.
  - (b) 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 Fleet Average Emission Factors used in the assessment shall be agreed with the Director. If necessary, the Fleet Average Emission Factors shall be determined by a motor vehicle emission model such as EMFAC-HK model to be agreed by the Director. All the traffic flow data and assumptions that used in the assessment shall be clearly and properly documented in the EIA report.

- (c) If 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 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.
  
- (v) Quantitative Assessment Methodology
  - (a) The Applicant shall conduct the quantitative assessment with reference to relevant sections of the modeling guidelines stated in section 3.4.1.3 or any other methodology as agreed with the Director. The specific methodology must be documented in such level of details (preferably with tables and diagrams) to allow the readers of the EIA report to grasp how the model has been set up to simulate the situation at hand without referring to the model input files. Detailed calculation of the pollutant emission rates for input to the model and a map showing all the road links shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submissions for review. In case of doubt, prior agreement between the Applicant and the Director on specific modeling details shall be sought.
  - (b) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for choosing these parameters for the assessment of the impact of the Project.
  - (c) The Applicant shall calculate the cumulative air pollutant concentrations 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 and pollution contours, to be evaluated against the relevant air quality standards and examination of the land use implications of these impacts. Plans of suitable scale shall be used to present pollution contour to allow buffer distance requirements to be determined properly.
  - (d) If there are any direct technical noise remedies recommended in the study, the air quality implication due to these 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 (if applicable), be they noise barriers, road enclosures and their portals, and affected ASRs on contour maps for easy reference.

(vi) Mitigating 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 that the resultant impacts after incorporation of the proposed mitigating measures will comply with the criteria stipulated in section 1 of Annex 4 in the TM.

(vii) Submission of model files

All input and output file(s) of the model run(s) shall be submitted to the Director in electronic format.”

### 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, respectively.

3.4.2.2 The noise impact assessment shall include the following:

(i) Determination of Study Area

The study area for the noise impact assessment shall generally include all areas within a distance of 300m from the boundary of the Project as shown in Figure 1 or other Project alignments as identified in the EIA. Subject to the agreement of the Director, the assessment area could 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. Subject to the agreement of the Director, the assessment area shall be expanded to include NSRs at distances over 300m from the Project which would be affected by the construction and operation of the Project. The assessment area for the construction noise impact assessment shall also cover areas within 300m of any works sites proposed under the Project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide all background information relevant to the Project, including relevant previous or current studies. Unless required for determining the planning standards, such as those for planning of fixed noise sources (e.g. ventilation

systems of traffic noise enclosures), no existing noise levels are particularly required.

(iii) Identification of Noise Sensitive Receivers

- (a) The Applicant shall refer to Annex 13 of the TM when identifying the NSRs. The NSRs shall include all existing NSRs and all planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department and any land use and development applications approved by the Town Planning Board. Photographs of all existing NSRs shall be appended to the EIA report.
- (b) The Applicant shall select assessment points to represent all identified NSRs for carrying out quantitative noise assessment described below. The assessment points shall be agreed with the Director prior to the quantitative noise assessment. A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant planning parameters to work out representative site layouts for noise assessment purpose. Such assumptions together with any constraints identified, such as setback of building, building orientation and extended podium, shall be agreed with the relevant responsible parties including Planning Department and Lands Department.

(iv) Provision of an Emission Inventory of the Noise Sources

The Applicant shall provide an inventory of noise sources including representative construction equipment for construction noise assessment. Confirmation of the validity of the inventory shall be obtained from the relevant government departments/authorities and documented in the EIA report.

(v) Construction Noise Assessment

- (a) 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.
- (b) The Applicant shall carry out assessment of noise impact from construction (excluding percussive piling) of the Project during daytime, i.e. 7am to 7pm, on weekdays other than general holidays in accordance with methodology in paragraphs 5.3 and 5.4 of Annex 13 of the TM. The criteria in Table 1B of Annex 5 of TM shall be adopted in the assessment. 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.

- (c) To minimize the construction noise impact, alternative construction methods to replace percussive piling shall be proposed as far as practicable.
  - (d) 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, re-scheduling and restricting hours of operation of noisy tasks) to minimize 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.
  - (e) 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 should be made to relevant technical memoranda issued under the NCO. In case the Applicant considers that there is an unavoidable need to conduct certain type of construction works during the restricted hours, detailed justifications should be provided with the assessment of the degree and duration of the noise impact. 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 should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in EIA report.
- (vi) Operational Noise Assessment
- (a) Road Traffic Noise
    - (a1) Calculation of Noise Levels

The Applicant shall analyse the scope of the proposed road alignment(s) to identify road sections within the meaning of Item A.1 of Schedule 2 of EIAO and other 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 at least change of nature of road, change of alignment and change of traffic capacity or traffic composition 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 1.0 dB(A) or more. Figures showing extents of the road sections (both existing and new 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 at the design year, i.e., the 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 Item A.1 of Schedule 2 of EIAO and other road sections) at NSRs. The EIA report shall contain sample calculations and input parameters for at least 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) the scenario without the road project at the design year;
- (2) unmitigated scenario after completion of the modification work at the design year;
- (3) mitigated scenario after the modification work at the design 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. The data structure of the above file shall be agreed with the Director. CD-ROM(s) containing the above data shall be attached in the EIA report.

#### (a2) Presentation of Noise Levels

The Applicant shall present the prevailing and future noise levels in L10 (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 the 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 in Table 1A of Annex 5 in the TM.

#### (a3) 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 all situations where the predicted traffic noise level due to the road sections within the meaning of Item A.1 of Schedule 2 of 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 thoroughly 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 should 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 benefitted 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 all recommended direct mitigation measures shall be quantified. The Applicant shall provide, in the EIA report information of recommended noise mitigation measures (including at least barrier types, nominal dimensions at different cross-sections, extents/locations, lengths, mPD levels of barriers) in the format as agreed by the Director (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 education institutions and places of public worship, all in L10(1hr) );

(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).

(vii) Assessment of Side Effects and Constraints

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

(viii) Evaluation of Constraints on Planned Noise Sensitive Developments/Land uses

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.

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.

### **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 EIA report shall cover the following :

- (i) The water quality impacts of the site run-off generated during the construction stage, including but not limited to 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 operation stage; and
- (iii) The water quality impacts on the water gathering ground, river courses and drainages around the work sites.

3.4.3.3 The Assessment Area shall include areas within 300m from the Project boundary, and shall cover relevant sensitive receivers that have a bearing on the environmental acceptability of the Project.

3.4.3.4 The physical, chemical and biological disruptions of the water system(s) within the study area arising during the construction and operation of the Project shall be identified.

3.4.3.5 The water quality impact assessment shall address the following:

- (i) Identification of pertinent water quality objectives and water quality criteria or standards for the water system(s);
- (ii) 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;
- (iii) Proposal of effective and practicable water pollution prevention and mitigation measures to be implemented during the construction and operation stages so as to reduce storm water and non-point source pollution. Requirements to be incorporated in the Project contract document shall also be proposed; and
- (iv) Evaluation of residual impacts (if any) on the water system(s).

#### **3.4.4 Waste Management Implications**

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 respectively.

3.4.4.2 The assessment of waste management implications shall cover the following:

- (i) Analysis of Activities and Waste Generation

The Applicant shall identify the quantity, quality and timing of the waste arising as a result of the construction activities of the Project, based on the sequence and duration of these activities.

- (ii) Proposal for Waste Management
  - (a) Prior to considering disposal options for various wastes, opportunities for reducing waste generation, on-site/off-site re-use and recycling shall be evaluated. Measures which can be taken in planning and design stages e.g. by modifying design approach and in construction stage to maximize waste reduction shall be separately considered.
  - (b) After considering the opportunities for reducing waste generation and maximizing re-use, the types and quantities of the wastes required to be disposed of as a consequence shall be estimated and the disposal options for each type of waste shall be described in detail. The disposal method recommended for each type of waste shall take into account of the result of the assessment in (c) below.
  - (c) The impact caused by handling (including labelling, packaging & storage),

collection, and 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.

(iii) Land Contamination

- (a) The Applicant shall identify all land lots/sites within the study area boundary which, due to their past or present land uses, are potential contaminated sites. A detailed account of the present activities and past land history in relation to possible land contamination shall be provided.
- (b) 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.

### **3.4.5 Ecological Impact**

- 3.4.5.1 The Applicant shall follow the criteria and guidelines stated in Annexes 8 and 16 of the TM for evaluating and assessing the ecological impact.
- 3.4.5.2 The Applicant shall consider alternative alignment to prevent locating the Project near the existing conservation areas and other ecological sensitive areas.
- 3.4.5.3 The assessment area for the purpose of terrestrial ecological assessment shall include all areas within 500 metres from the Project site boundary and the areas likely to be impacted by the Project. For aquatic ecology, the assessment area shall be the same as the water quality impact assessment area described in section 3.4.3.3.
- 3.4.5.4 In the ecological impact assessment, the Applicant shall examine the flora, fauna and other components of the ecological habitats within the assessment area, including those highlighted in section 3.2.1 above. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project and associated works shall avoid impacts on conservation areas and other ecological sensitive areas. The assessment shall identify and quantify as far as possible the potential ecological impact arising from the construction and operation of the Project and associated works.

3.4.5.5 The assessment shall include the following major tasks:

- (i) review the findings of relevant studies/surveys and collate all available information on the ecological characters of the assessment area;
- (ii) carry out any necessary field surveys, the duration of which shall be at least four months (covering the wet season), and investigations to verify the information collected, fill the information gaps identified and fulfill the objectives of the EIA study;
- (iii) evaluate the information collected from subsections 3.4.5.5(i) and (ii) above, and determine whether further ecological surveys are required;
- (iv) establish an ecological profile of the assessment area based on the data of relevant previous studies/surveys and results of additional ecological field surveys, and describe the characteristics of each habitat found. Major information to be provided shall include:
  - (a) description of the physical environment;
  - (b) habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the assessment area;
  - (c) ecological characteristics of each habitat type such as size, vegetation type, species present, dominant species found, species diversity, community structure, seasonal patterns, 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; and
  - (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) investigate and describe 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
  - natural stream courses and rivers

- vertebrates (e.g. avifauna, mammals including bats, fish, herpetofauna)
  - macroinvertebrates (e.g. butterflies, odonates, crustaceans)
  - any other habitats and wildlife groups identified as having special conservation interests by the EIA study;
- (vi) describe all recognized sites of conservation importance in the vicinity of the Project and assess whether these sites will be affected by the Project and associated works;
- (vii) using suitable methodology to identify and quantify as far as possible any direct, indirect, on-site, off-site, primary, secondary and cumulative ecological impacts on the wildlife groups and habitats, reduction of species abundance/diversity, loss of feeding grounds, reduction of ecological carrying capacity, habitat fragmentation; and in particular the following:
- (a) ecological impacts of potential loss of areas of conservation interest such as conservation areas; and
  - (b) cumulative impacts due to other planned and committed development projects at or near the Project site area.
- (viii) evaluate the significance and acceptability of the ecological impacts identified using well defined criteria;
- (ix) recommend all possible alternatives (such as modification of layout, different alignment, reduced size and extent of built form and/or using other construction methods) and practicable mitigation measures to avoid, minimize and/or compensate for the adverse ecological impacts identified, evaluate the feasibility and effectiveness of the recommended mitigation measures and define the scope, type, location, implementation arrangement, subsequent management and maintenance of such measures. If off-site mitigation is considered necessary, the guidelines and requirements laid down in Annex 16 of the TM should be followed;
- (x) determine and quantify as far as possible the residual ecological impacts after implementation of the proposed mitigation measures;
- (xi) evaluate the severity and acceptability of the residual ecological impacts using well-defined criteria; and
- (xii) review the need for and recommend any ecological monitoring programme required.

### 3.4.6 Landscape and Visual Impact

- 3.4.6.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM and the EIAO Guidance Notes No.8/2002 "*Preparation of Landscape and Visual Impact Assessment under EIAO*" for evaluating and assessing landscape and visual impacts of the Project. Landscape and visual impacts during both construction and operation stages within the study area shall be assessed.
- 3.4.6.2 The study area for landscape impact assessment shall include areas within 100m from the Project while the study area for visual impact assessment shall be defined by the visual envelope of the Project. The defined visual envelope must be shown on a plan in the EIA report.
- 3.4.6.3 The Applicant shall review relevant plan(s) and/or studies which may identify areas of high landscape value and recommend country park, scenic protection area, conservation area, open space, amenity area and green belt designations. Any guidelines on landscape strategies, landscape frameworks, urban design concepts, special design areas, open space networks, landscape links 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 so as to assess whether the project can fit into surrounding setting. Any conflict with statutory town plan(s) and any published land use plans should be highlighted and appropriate follow-up action should be recommended.
- 3.4.6.4 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 landscape and visual impact significance as required under the TM and EIAO Guidance Note No.8/2002 "*Preparation of Landscape and Visual Impact Assessment under EIAO*". 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 impacts as far as possible, so as to illustrate the significance of such impacts arising from the Project. Clear mapping of the landscape impact is required. A 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.
- 3.4.6.5 The Applicant shall assess the visual impacts of the Project. Clear illustrations including mapping of visual impact is required. The assessment shall include:
- (i) identification and plotting of visual envelope of the Project;

- (ii) identification of the key groups of sensitive receivers within the visual envelope with regard to views from 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 of the adjacent areas; and
- (iv) description of the severity of visual impacts in terms of nature, distance and number of sensitive receivers.

3.4.6.6 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 would 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 minimize adverse effects identified above, including provision of a landscape design.

3.4.6.7 The mitigation measures shall include preservation of vegetation and natural landscape resources, transplanting of trees, provision of screen planting, re-vegetation of disturbed land, woodland restoration, compensatory planting, provisioning / reprovisioning of amenity areas and open spaces, 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 operation phase of the Project. A practical programme and funding proposal for the implementation of the recommended measures shall be provided. Presentation of photomontages of the Project in the existing and planned setting illustrating the effectiveness of the proposed mitigation measures shall be included.

3.4.6.8 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 illustrate the landscape and visual impacts of the Project. In particular, the landscape and visual impacts of the Project with and without mitigation measures shall also be properly illustrated in existing and planned setting 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 or as agreed with the Director. The Applicant shall record the technical details such as system set-up, software, data files and function in preparing the illustration, which may need to be submitted for verification of the accuracy of the illustrations.

### **3.4.7 Impact on Cultural Heritage**

- 3.4.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing the cultural heritage impacts as stated in Annexes 10 and 19 of the TM respectively, *Guidelines for Archaeological Impact Assessment (AIA)* in Appendix B1 to conduct an AIA, *Guidelines for Archaeological Reports* in Appendix B2 and *Guidelines for Handling of Archaeological Finds and Archives* in Appendix B3.
- 3.4.7.2 The Applicant shall engage a qualified archaeologist to conduct the AIA. 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).
- 3.4.7.3 The Applicant shall identify all the archaeological sites that might be adversely affected by construction of the Project. Special attention shall be paid to the Pat Heung Sheung Tsuen Archaeological Site. A plan of proper scale showing the location of the proposed works and all archaeological sites identified is required. A check list including all affected archaeological sites, impacts identified, recommended mitigation measures as well as the implementation agent and period shall also be included in the EIA study.
- 3.4.7.4 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 design of the Project) and practicable monitoring and mitigation measures to avoid or keep the adverse impact on the archaeological sites to the minimum.

### **3.4.8 Summary of Environmental Outcomes**

The EIA report shall contain a summary of key environmental outcomes arising from the EIA study, including the population and environmentally sensitive areas protected, environmentally friendly designs recommended, key environmental problems avoided, compensation areas included and the environmental benefits of environmental protection measures recommended.

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

- 3.4.9.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A activities during the construction and operation phases of the Project and, if affirmative to define the scope of EM&A requirements for the Project in the EIA study.
- 3.4.9.2 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, wherever practicable, for the Project through a dedicated internet website.

3.4.9.3 The Applicant shall prepare a Project Implementation Schedule (in the form of a checklist as shown in Appendix C to this EIA study brief) containing the EIA study recommendations and mitigation measures with reference to the implementation programme. The Project Implementation Schedule shall include the explicit agreement reached between the Applicant and relevant parties on the responsibility for funding, implementation, management and maintenance of mitigation measures. Alternatively, the Project Implementation Schedule shall include an undertaking from the Applicant to assume the responsibility of those mitigation measures until an agreement is reached between the Applicant and relevant parties on the funding, implementation, management and maintenance of mitigation measures.

#### **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 the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief before commencement of the EIA study.

#### **5. REPORT 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 the following number of copies of the EIA report and the executive summary:

- (i) 50 copies of the EIA report in English and 80 copies of the executive summary each bilingual in both English and Chinese) 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 sub-section 5.2 (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 in English and 50 copies of the executive summary (each bilingual in both English and Chinese) 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.

5.3 The Applicant shall, upon request, make additional copies of above documents available to the public, subject to payment by the interested parties of full costs of printing.

5.4 In addition, to facilitate public inspection of EIA report via EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), unless

otherwise agreed by the Director. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and executive summary shall be included in the beginning of the document. Hyperlinks to figures, drawings and tables in the EIA report and 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 unless otherwise agreed by the Director.

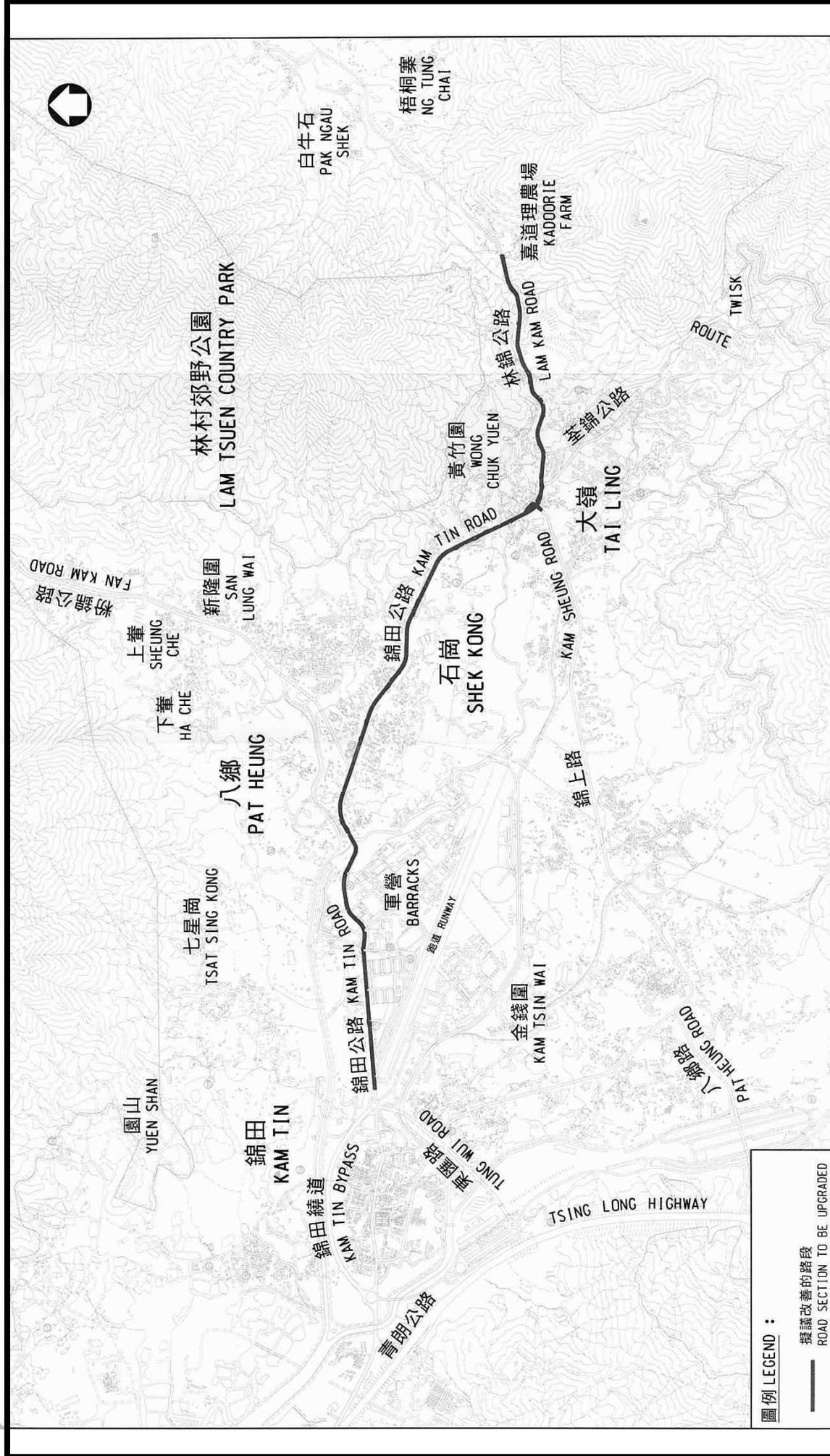
- 5.5 The electronic copies of the EIA report and the executive summary shall be submitted to the Director at the time of application for approval of the EIA report.
- 5.6 When the EIA report and the executive summary are made available for public inspection under section 7(1) of the EIAO, the content 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.
- 5.7 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 and their format shall be agreed by the Director.
- 5.8 To facilitate public involvement in the EIA process, the Applicant shall produce electronic visualisations of the major findings and elements of the EIA report, including key recommended environmental mitigation measures so that the public can understand the Project and the associated environmental issues. The visualisations shall be based on the EIA report. The visualisations shall be submitted in CD-ROM or other suitable means agreed with the Director in commonly readable formats. Unless otherwise advised or agreed by the Director, copies of the CD-ROM shall be the same as the number of EIA reports required under section 5.2 of this study brief.

## **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 sub-section 1.2 of this EIA study brief and in Project Profile (No. PP-327/2007), 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 the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief.

--- END OF EIA STUDY BRIEF ---

October 2007  
Environmental Assessment Division  
Environmental Protection Department



圖例 LEGEND :  
 擬議改善的路段  
 ROAD SECTION TO BE UPGRADED

Project Title - Upgrading of Remaining Sections of Kam Tin Road and Lam Kam Road

EIA Study Brief No. : ESB-170/2007

Figure 1 - Location Plan



## **Appendix A1**

### **Guidelines on Choice of Models and Model Parameters**

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

#### **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 exercises 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.

Model	Applications
FDM	For evaluating fugitive and open dust source impacts (point, line and area sources)
CALINE 4	For evaluating mobile traffic emission impacts (line sources)
ISCST 3	For evaluating industrial chimney releases as well as area and volumetric source (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 (20 m 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'.

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 500 m

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

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, e.g. (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 10o) 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 3 km 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 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 µgm) and RSP (< 10 µgm) 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 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>:

- (a) Ambient Ratio Method (ARM) - assuming 20% of NO<sub>x</sub> to be NO<sub>2</sub>; or
- (b) Discrete Parcel Method (DPM, available in the CALINE4 model); or
- (c) 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 µg/m<sup>3</sup> depending on the land use type (see also EPD reference paper '*Guidelines on Assessing the 'TOTAL' Air Quality Impacts*').

### 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:

Stability Category	1-hour to 5-sec Conversion Factor
A & B	45
C	27
D	9

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.

*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. Refer to EPD reference paper '*Guidelines on Assessing the 'TOTAL' Air Quality Impacts*' 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 Hong Kong Environmental Protection**  
**Department**  
**For Regulatory Applications as at 1 July 1998\***

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

**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 USEPA.

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

## **Appendix A2**

### **Guidelines on Assessing the “Total” Air Quality Impacts**

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

#### **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 categorisation 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:

POLLUTANT	URBAN	INDUSTRIAL	RURAL/NEW DEVELOPMENT
NO2	59	57	39
SO2	21	26	13
O3	62	68	57
TSP	98	96	87
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:

DISTRICT	AIR QUALITY CATEGORY
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 realised) 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 - ESecondary contributions/ETerritory) 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 A3**

### **Guidelines on the Use of Alternative Computer Models in Air Quality Assessment**

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

#### **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) complexity of situation to be modelled far exceeds capability of Schedule 1 models; and
- (ii) 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 applications. 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"

- 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"
- 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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**Schedule 1**  
**Air Quality Models Generally Accepted by Hong Kong Environmental Protection**  
**Department**  
**For Regulatory Applications as at 1 July 1998\***

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

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

## **Appendix B1**

### **Guidelines for Archaeological Impact Assessment (As at Dec 2006)**

#### **(1) Baseline Study**

1.1 A baseline study shall be conducted:

- a. to compile a comprehensive inventory of archaeological sites within the proposed project area.
- b. to identify the direct and indirect impacts on the archaeological sites at the planning stage in order to avoid causing any negative effects.

1.2 The baseline study shall also include a desk-top study and a field evaluation.

#### 1.3. Desk-top Study

1.3.1 Desk-top searches should be conducted to analyse, collect and collate extant information. They include:

- a. Search of the list of declared monuments protected by the Antiquities and Monuments Ordinance (Chapter 53).
- b. Search of the list of deemed monuments through the Antiquities and Monuments Office (AMO) of the Leisure and Cultural Services Department.
- c. Search of the list of sites of cultural heritage identified by the AMO.
- d. Search of 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.
- e. Search of 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.
- f. Search of any other unpublished archaeological investigation and excavation reports kept by the AMO.
- g. Search of 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.
- h. Search of cartographic and pictorial documents. Maps of the recent past searched in the Maps and Aerial Photo Library of the Lands Department.
- i. Study of existing Geotechnical information (for archaeological desk-top research).
- j. Discussion with local informants.

#### 1.4 Field Evaluation

1.4.1 In cases where information is inadequate, an archaeological survey should be carried out to assess the archaeological potential of the proposed project area.

- 1.4.2 Appropriate methods for pricing and valuation of the archaeological survey, including by means of a Bill of Quantities or a Schedule of Rates should be considered in preparing specifications and relevant documents for calling tenders to carry out the archaeological survey. The specifications and relevant documents should be sent to the Antiquities and Monuments Office for agreement prior to calling tenders to conduct the archaeological survey.
  - 1.4.3 A licence shall be obtained from the Antiquities Authority for conducting the archaeological survey. It takes at least two months to process the application.
  - 1.4.4 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 Antiquities and Monuments Office for agreement prior to applying for a licence.
  - 1.4.5 The following methods of archaeological survey (but not limited to) should be applied to assess the archaeological potential of the project area:
    - (i) Definition of areas of natural land undisturbed in the recent past.
    - (ii) 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.
    - (iii) 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.
    - (iv) 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.
    - (v) The exact quantity and location of auger holes and test pits should be agreed with the Antiquities and Monuments Office prior to applying for a licence.
    - (vi) A qualified 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.
  - 1.4.6 If the field evaluation identifies any additional archaeological sites within the proposed project area which are not recorded by AMO, the office should be reported as soon as possible.
- 1.5 The Report of Baseline Study
- 1.5.1 The process and findings of the above desktop research and field evaluation should be properly documented in the report. The followings, but not limited to, should be included:
    - a. A map showing the boundary of each archaeological site as supported and delineated by field walking, augering and test-pitting;
    - b. Drawing of stratigraphic section of test-pits excavated which shows the cultural sequence of a site.

- c. Reduced levels, coordinates, base points and reference lines should be clearly defined and certified by a qualified surveyor.
- d. *Guidelines for Archaeological Reports* should be followed (Appendix B2).

1.5.2 A full bibliography and the source of information consulted should be provided to assist the evaluation of the quality of the evidence. It is expected that the study and result are up to an internationally accepted academic and professional standard.

## 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 B3).

## (2) Impact Assessment

- 2.1 Archaeological impact assessment must be undertaken to identify the impacts of archaeological sites which will be affected by the proposed development subject to the result of desktop research and field evaluation. During the assessment, both the direct and indirect impacts which may affect the preservation of the archaeological sites in situ should be stated. A detailed description and plans should be provided to elaborate to what extent the archaeological sites will be affected.
- 2.2 All the assessments should be conducted by an expert in archaeology and further evaluated and endorsed by the Antiquities and Monuments Office and the Antiquities Advisory Board.

## (3) Mitigation Measures

- 3.1 It is always a good practice to recognise the site or monument 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. Archaeological sites are to be in favour of preservation unless it can be shown that there is a need for a particular development which is of paramount importance and outweighs the significance of the archaeological feature.
- 3.2 Preservation in totality must be taken as the first priority. If avoidance of the archaeological sites is not possible, amelioration can be achieved by reduction of the potential impacts. Measures like amendments of the sitting, screening and revision of the detailed design of the development are required.
- 3.3 Proposals for mitigation measures should be worked out. Preservation of an archaeological site “by record”, i.e., through excavation to extract the maximum data should be regarded as the very last resort.
- 3.4 The programme for implementation of agreed mitigation measures should be able to be implemented. The proposed mitigation measures to be implemented, by whom, when, where, to what requirements and the various implementation responsibilities should be clearly defined and listed out. A comprehensive plan and programme for the protection and conservation of the archaeological sites must be provided in detail.

## **Appendix B2**

### **Guidelines for Archaeological Reports (As at Oct 2006)**

#### **I General**

1. All reports should be written in a clear, concise and logical style.
2. The reports should be submitted in A4 size and accompanying drawings of convenient sizes, but not exceeding A3 size unless otherwise approved by the Antiquities and Monuments Office (AMO).
3. Draft reports should be submitted to AMO for comments within two months after completion of archaeological work unless otherwise approved by AMO.
4. 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.
5. At least 3 hard copies of the final reports should be submitted to AMO for record purpose.
6. 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.

#### **II Suggested Format of Reports**

1. 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
  - Author
  - Date of report
2. Contents list  
Page number of each section should be given.
3. Non-technical summary (both in English and in Chinese)  
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.
4. 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.
5. Aims of archaeological work  
These should reflect the aims set in the project design.

6. 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.
7. Methodology  
The methods used including any variation to the agreed project design should be set out clearly and explained as appropriate.
8. 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.
9. Conclusion  
This should include summarization and interpretation of the result.
10. Recommendation  
Recommendations on further work and the responsible party as well as a brief planning framework should be outlined.
11. Reference and bibliography  
A list of all primary and secondary sources used should be given.
12. Supporting illustrations  
They should be clearly numbered and easily referenced to the text. They should be scanned and saved in TIFF or JPEG formats.
  - (i) 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 and with proper legends and captions.
  - (ii) 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.
  - (iii) 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.
13. 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 discovered with description, quantity and context number/stratigraphical sequence, index of field archives.

14. Comment and Response

All comments and responses from AMO and relevant parties should be attached.

### **III Green Measures**

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

## **Appendix B3**

### **Guidelines for Handling of Archaeological Finds and Archives (As at Oct 2006)**

#### **I General**

1. Site Code  
The Licensee should contact the Central Archaeological Repository (CAR) of the Antiquities and Monuments Office (AMO) [Contact Person: Mr. Michael TANG, Tel: 2384 5446; Email: mkstang@lcsd.gov.hk] about the allocation of site code before the commencement of the project to avoid duplicate of site code assignment.

#### **II Archaeological Finds**

2. Cleaning  
Every excavated finds should be properly cleaned before handing over to the CAR of the AMO.
3. Marking
  - All the excavated finds should be cleaned before marking object number.
  - “Sandwich” technique<sup>1</sup> should be adopted for marking permanent identification number on an object.
  - Every special finds should be marked with site code, context number and object number, etc.
  - All representative samples collected from general finds should be marked.
  - 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.
4. Labeling and bagging
  - A label should be attached on each bag.
  - Information about the object number, context number, test-pit number, site code and bag number should be stated clearly on the label.
  - 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.

5. Conservation
  - To refit and reconstruct pottery vessels by appropriate adhesive. A heat and waterproof adhesive, e.g. product of H. Marcel Guest Ltd., is recommended.
  - Any adhesives which are not reversible or will damage artefacts, e.g. the pottery vessel should not be applied on the finds.
6. 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.

### **III Field Archives and Laboratory Records**

7. Field archives include field dairy, 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.
8. 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:
  - All the field archives should be submitted together with their indexes.
  - The video footage should be submitted together with a detailed script introducing the content of the video record.
  - All the slides, colour/black & white negatives and digital photographs should be submitted together with their contact prints and indexes.

#### ***Handover of Finds***

9. Packing
  - 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.
  - All the general finds should be stored in heavy duty plastic container with shock-proofed packing.
  - The heavy duty plastic container, e.g. product of the Star Industrial Co., Ltd. (No. 1849 or 1852), is recommended.
  - For oversized finds, prior advice on packing method should be sought from the AMO.
10. Handover procedure
  - The Licensee should arrange to transport the finds and archives to the CAR upon the completion of the finalized excavation report.
  - Separate handover forms for finds and archives should be signed by the representatives of the Licensee and the AMO.

**Appendix C**

**Implementation Schedule of Recommended Mitigation Measures**

EIA Ref.	EM &A Log Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measure	Location of the measure	When to implement the measures	What requirements or standards for the measures to achieve