

## **Environmental Impact Assessment Ordinance (Cap. 499), Section 5(7)**

### **Environmental Impact Assessment Study Brief No. ESB-176/2008**

**Project Title : North East New Territories New Development Areas**  
( hereinafter referred as “the Project” )

**Name of Applicant : Civil Engineering and Development Department**  
( hereinafter referred as “the Applicant” )

#### **1. BACKGROUND**

- 1.1 An application (No. ESB-176/2007) for an Environmental Impact Assessment (EIA) study brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 28 November 2007 with a project profile (No. PP-337/2007) (hereinafter referred as “the Project Profile”).
- 1.2 The Applicant is going to conduct a planning and engineering feasibility study for the North East New Territories (NENT) New Development Areas (NDAs) at Kwu Tung North (KTN), Fanling North (FLN) and Ping Che/Ta Kwu Ling (PC/TKL). The Project comprises all developments within the KTN, FLN and PC/TKL NDAs and the associated engineering infrastructure works to serve the NDAs. The locations of the NDAs are shown in Appendix A and their total areas are about 800 ha.
- 1.3 The KTN and FLN NDAs comprise residential development with associated employment and community facilities and they are planned to accommodate a total population of about 185,000 and to create about 18,500 jobs upon full development. The PC/TKL NDA comprises mainly rural industrial uses and open storage areas providing a total of approximately 2,500 job opportunities upon full development.
- 1.4 The Project is a designated project under Item 1 of Schedule 3 of the EIAO, which specifies “Engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100,000”.
- 1.5 The Project also includes the following designated projects under Items A.1, C.11, F.2 and F.3 of Part 1, Schedule 2 of the EIAO :-
  - (i) Fanling Bypass (primary distributor) with total length of about 9.5 km (Item A.1);
  - (ii) district distributor roads in KTN and FLN NDAs including the realigned Castle Peak Road (Item A.1);
  - (iii) public dumping areas of not less than 2 ha (Item C.11);
  - (iv) extension and upgrading of Shek Wu Hui Sewage Treatment Works (STW) (Item F.2);
  - (v) construction of new sewage pumping stations (Item F.3);

- (vi) upgrading of existing sewage pumping stations (Item F.3 of Part I of Schedule 2 of the EIAO); and
  - (vii) any individual project(s) that fall under Schedule 2 of the EIAO to be identified under section 2.1(x) of this study brief.
- 1.6 In accordance with section 5(1)(a) of the EIAO, a person who is planning a designated project shall apply to the Director of Environmental Protection (hereinafter referred as “the Director”) for an environmental impact assessment study brief to proceed with an environmental impact assessment study for the project.
- 1.7 Pursuant to section 5(7)(a) of the EIAO, the Director issues this EIA study brief to the Applicant to carry out an EIA study.
- 1.8 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 developments proposed under the Project and related works 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 and associated works, and their related staged implementation;
  - (ii) the conditions and requirements for mitigating environmental nuisances associated with introducing the Project as new development areas in the existing environs close to an embayed area with known pollution problems;
  - (iii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
  - (iv) the acceptability of residual impacts after the staged as well as the full implementation of the Project, the associated works and the related proposed mitigation measures are implemented.

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

- 2.1 The objectives of the EIA study are as follows:
- (i) to describe the Project and associated works together with the requirements and environmental benefits for carrying out the Project and associated works;
  - (ii) to identify and describe elements of the community and environment likely to be affected by the Project and associated works and/or likely to cause adverse impacts on the sensitive uses at the Project, including both the natural and man-made environment and associated environmental constraints;
  - (iii) to provide information on the consideration of alternatives to avoid or minimize the potential adverse environmental impacts on the sensitive uses at the Project and adjacent areas that may be subject to the adverse

- environmental impacts of the Project and associated works; to compare the environmental benefits and dis-benefits of each of different options; to provide justifications and constraints for selecting the preferred option(s); and to describe the part environmental factors played in the selection;
- (iv) to identify and assess air quality impact, noise impact, water quality impact, waste management, land contamination, hazard to life, ecological impact, fisheries impact, landscape and visual impact, impacts on sites of cultural heritage, quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
  - (v) to identify the negative impacts and propose measures to avoid or provision of mitigation measures to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
  - (vi) to investigate the feasibility, practicability, effectiveness and implications of the proposed impact avoidance and/or mitigation measures;
  - (vii) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable avoidance or mitigation measures) and the cumulative effects expected to arise during the construction and operation of the Project and associated works in relation to the sensitive receivers and potential affected uses;
  - (viii) to identify, assess and specify methods, measures and standards to be included in the detailed design, construction and operation of the Project and associated works which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to the acceptable levels;
  - (ix) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as provision of any necessary modification;
  - (x) to identify any individual project(s) that fall under Schedule 2 of the EIAO; to ascertain whether the EIA study has 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; and
  - (xi) to design and specify environmental monitoring and audit requirements to ensure effective implementation of the recommended environmental protection and pollution control measures.

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

#### **3.1 The Purpose**

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

## 3.2 The Scope

- 3.2.1 The scope of this EIA study shall cover the Project mentioned in section 1.2 and 1.5 of this study brief and alternative development proposal(s) that may be recommended in the course of the EIA study. The EIA study shall cover the combined impacts of the entire Project and the cumulative impacts of the existing, committed and planned developments in the vicinity of the NDAs and associated infrastructure works in accordance with section 3.4 of the TM.
- 3.2.2 The EIA study shall address the likely key issues described below together with any other key issues identified during the course of the EIA study:
- (i) the objective comparison of the environmental benefits and dis-benefits of different development scenarios with or without the Project, with a view to deriving the preferred development options and landuse plans such as Preliminary Outline Development Plan (PODP) and Recommended Outline Development Plan (RODP) for the NDAs that would avoid adverse environmental impacts and industrial/residential interfacing problems to the maximum practicable extent. Particular attention shall be given to the acceptability of the overall environmental performance of the Project at all stages throughout implementation and the cumulative effects due to interfacing planned, committed and existing projects in the vicinity of the Project;
  - (ii) considerations on the use of clean fuels, low emission/mass transport system and renewable energy to minimize emissions from the NDAs. Potential air quality impact on air sensitive uses due to air pollutant emission sources identified according to section 3.4.4.3(iii) of this study brief during implementation of the Project;
  - (iii) the potential noise impact during construction and operational from fixed noise sources, road traffic and helicopter on noise sensitive receivers identified in section 3.4.5.2(iii) of this study brief. Consideration should be given to adopt alternative alignment and design such as tunnel or suppress design for the new roads under the Project including the Fanling Bypass in order to minimize the noise impact on identified sensitive receivers and the use of mitigation measures such as noise barriers;
  - (iv) the potential construction and operation water quality impacts caused by the Project and associated works, in particular:
    - (a) industrial effluent and domestic sewage discharge from the proposed developments and the works associated with the sewerage system under the Project;
    - (b) increased effluent discharge from the expanded and/or upgraded Shek Wu Hui STW;
    - (c) discharge from stormwater drainage system to the nearby watercourses and channels including but not limited to Ng Tung River (River Indus), Sheung Yue River (River Beas) and Shenzhen River; and
    - (d) any other discharge during construction and operation of the Project

that would cause increases in pollution loadings in nearby watercourses and channels.

- (v) the sewerage and sewage treatment implications on the existing Shek Wu Hui STW and the existing and new sewage pumping stations to cope with additional discharges from increases in population and industrial developments from the NDAs, taking into account the capacity requirements for the existing, committed and planned developments within NENT area;
- (vi) the potential impacts from public dumping areas, waste disposal facility and waste disposal activities of various types of waste including demolition and excavated materials, refuse, chemical, industrial and special wastes to be generated from the Project;
- (vii) the potential land contamination associated with the historical land uses which have the potential to cause or have caused land contamination such as vehicle repair workshops, metal scrap yards, oil/chemical storage areas with a view to recommending soil remediation measures if necessary;
- (viii) the potential hazard to life from existing potentially hazardous installations including Sheung Shui Water Treatment Works due to the transportation, storage and use of chlorine for water treatment and from the use of explosive for construction under the Project;
- (ix) the potential landfill gas hazard to the sensitive receivers of the NDAs located within the consultation zone of the closed Ma Tso Lung Landfill.
- (x) the potential impact arising from the Project on ecological sensitive areas within and in close proximity to the NDAs including Long Valley, Ho Sheung Heung Egretty and ecological compensatory measures of the "Main Drainage Channels for Sheung Shui, Fanling and Hinderland". The ecological assessment shall be carried out based on field surveys of at least 9 months covering both wet and dry seasons. Consideration should be given to adopt alternative alignment and design such as tunnel or suppress design for the new roads under the Project including the Fanling Bypass in order to avoid and minimize potential ecological impact such as fragmentation of important habitats. Potential impact on birds due to collision on transparent or semi-transparent noise barriers, if any, shall be addressed in the EIA study. Mitigation measures including ecological corridors between fragmented habitats, if unavoidable, shall be considered. The potential fisheries impacts, in particular the fishing and aquaculture activities at Kwu Tung North and Fanling North shall be considered;
- (xi) the potential landscape and visual impacts caused by the Project during construction and operation stages shall be considered. The glare impacts from the Project on the sensitive areas including the Long Valley would also need to be addressed;
- (xii) the potential impacts from the Project on sites of cultural heritage within and in close proximity to the NDAs and the associated infrastructure such as the Hau Kui Shek Ancestral Hall at Ho Sheung Heung, Liu Man Shek Tong Ancestral Hall at Sheung Shui Heung, Kun Lung Gate Tower at Lung Yeuk

Tau shall be assessed;

- (xiii) the potential cumulative environmental impacts of the Project and associated infrastructure works, through interaction or in combination with other concurrent existing, committed and planned developments in the vicinity of the Project, and that those impacts may have a direct bearing on the environmental acceptability of the Project. Considerations shall be given to account for impacts from likely concurrent projects, in particular, Planning Study on Liantang/Heung Yuen Wai Cross-boundary Control Point and its associated Connecting Roads in Hong Kong, Land Use Planning for the Closed Area, Retrofitting of Noise Barriers on Fanling Highway, Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling, Development of a Poultry Slaughtering and Processing Plant at a site in Sheung Shui, and other drainage and sewerage projects by the Drainage Services Department.

### **3.3 Consideration of Alternative Options and Construction Methods**

#### The Need of Project

- 3.3.1 The Applicant shall report on or provide information related to the need and justification for the Project as described in the Project Profile and outlined in section 1.2 of this study brief. The Applicant shall explain clearly the purpose and objectives of the Project and describe the scenarios with and without the Project.

#### Consideration of Different Development Options and Landuse Plans

- 3.3.2 In deriving the preferred development option(s) and landuse plans for the NDAs, the Applicant shall consider and present information on identified feasible alternatives taking into account the relevant findings of those options addressed in previous studies as well as any alternative development proposals identified during the course of the EIA study. A comparison of the environmental benefits and dis-benefits of possible development options, in respect of landuse, road alignments, clean fuels, low emission transport system, renewable energy if any, built form, design, construction methods, sequence of works and staged implementation, shall be made on the sensitive areas within the assessment areas. The comparison shall assist informed-decisions to be made on the recommended preferred options, which shall in principle, avoid or minimize adverse environmental impacts to the maximum practicable extent. The EIA report shall focus on and describe adequately the part that environmental factors played in arriving at the preferred development option(s) for the Project.

### **3.4 Technical Requirements**

- 3.4.1 The Applicant shall conduct the EIA study to address all environmental aspects of the Project and associated works as described in sections 3.1, 3.2 and 3.3 of this study brief. The assessment shall be based on the best available information at the time of the assessment.
- 3.4.2 The Applicant shall include in the EIA report details of the construction programme

and methodologies. The Applicant shall clearly state in the EIA report the time frame and work programmes of the Project and associated works and other concurrent projects, and assess the cumulative environmental impacts from the Project with all interacting projects, including staged implementation of the Project.

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

### **3.4.4 Air Quality Impact**

- 3.4.4.1 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.

- 3.4.4.2 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 B1 to B3, or other methodology as agreed by the Director.

- 3.4.4.3 The air quality impact assessment shall include the following:

(i) Determination of Assessment Area

The area for air quality impact assessment shall generally be defined by a distance of 500 metres expanded from the boundary of the NDAs and associated infrastructure works. The assessment shall include but not limited to the existing, planned and committed sensitive receivers within the assessment area. Such assessment shall be based on the best available information at the time of the assessment. Subject to the agreement of the Director, the assessment area could be extended to include major emission sources that may have bearing on determining the environmental acceptability of the Project.

(ii) Background and Analysis of Activities

- (a) Provide background information relating to air quality issues relevant to the Project, including the existing odour sources leading to the prevailing odour strength that has the potential to adversely affect the proposed new developments of the Project and associated works, description of the types of activities of the Project and associated works that may affect air quality during the construction and operation 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 air pollution impact, including the odour nuisance. The Applicant shall consider alternative construction methods, alternative development programmes and alternative modes of operation to minimize the odour, construction and operation air quality impacts on the staged implementation of the Project.
- (c) Present the background air quality in the assessment area for the purpose of evaluating the cumulative constructional and operational air quality

impacts due to the Project and associated works.

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

- (a) Identify and describe the representative existing, committed and planned ASRs likely be affected by the potential adverse environmental impacts caused by emission sources identified in section 3.4.4.3(iii)(b) of this study brief as arising from the Project within the assessment area (section 3.4.4.3(i) of this study brief), both on-site and off-site, including those earmarked on the relevant PODP and RODP of the NDAs, Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans and any alternative development proposal(s) identified or recommended in the course of this EIA study. The Applicant shall select assessment points of the identified ASRs that would represent the worst impact point of these ASRs. A map clearly showing the locations and descriptions, such as names of buildings, uses and heights of the selected assessment points shall be included. The separation distances of these ASRs from the nearest emission sources shall also be given. For staged implementation of the Project, the Applicant should review the development programme, and where appropriate, to avoid or reduce adverse air quality impacting on existing occupiers and occupiers of early implementation packages to the maximum extent practicable.
- (b) Provide a list of air pollutant emission sources, including any nearby emissions which are likely to have impact related to the Project and related studies based on the analysis of construction and operation activities in section 3.4.4.3(ii)(a) of this study brief. Examples of constructional stage emission sources include stockpiling, blasting, concrete batching, material handling and vehicular movements on unpaved haul roads on site, etc. Examples of operational stage emission sources include odour emissions from the Shek Wu Hui STW and sewage pumping stations; stack emissions, if any, from industrial premises. Confirmation of the validity of the assumptions (e.g. volume of construction material handled, etc.) and the magnitude of the activities shall be obtained from the relevant government department / authorities and documented.

The Applicant shall identify chimneys and obtain relevant chimney emission data in the study area by carrying out a survey for assessing the cumulative air quality impact of air pollutants through chimneys. The Applicant shall ensure and confirm that the chimney emission data used in their assessment have been validated and updated by their own survey. If there are any errors subsequently found in their chimney emission data used, the Applicant shall be fully responsible and the submission might be invalidated.

- (c) The emissions from any associated works of the Project, and from any concurrent projects, identified as relevant during the course of the EIA study, shall be taken into account as contributing towards the overall cumulative air quality impact. The impacts as affecting the existing,



planned and committed air sensitive receivers within the assessment area (section 3.4.4.3(i) of this study brief) shall be assessed, based on the best information available at the time of assessment

(iv) Construction Air Quality Impact

- (a) The Applicant shall follow the requirements stipulated under the Air Pollution Control (Construction Dust) Regulation to ensure that construction dust impacts are controlled within the relevant standards as stipulated in section 1 of Annex 4 of the TM. A monitoring and audit programme for the construction phase shall be devised to verify the effectiveness of the control measures proposed so as 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 section 3.4.4.3(vi) of this study brief when carrying out the quantitative assessment.

(v) Operational Air Quality Impact

- (a) The Applicant shall calculate the expected air pollutant concentrations at the identified ASRs based on an assumed reasonable worst-case scenario. The evaluation shall be based on the strength of the emission sources identified in section 3.4.4.3(iii)(b) of this study brief. The Applicant shall follow section 3.4.4.3(vi) of this study brief 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 road vehicles 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 with the Director prior to the commencement of the assessment (with reference to section 4.4.2(c) of the TM). All the traffic flow data and assumptions that will be 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.

(vi) Quantitative Assessment Methodology

- (a) The Applicant shall conduct the quantitative assessment with reference to relevant sections of the modeling guidelines stated in section 3.4.4.2 of this study brief 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 modelling 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 selecting such parameters for assessing the impact from the Project and associated works.
- (c) The Applicant shall calculate the cumulative air quality impact at the ASRs identified under section 3.4.4.3(iii) of this study brief and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table(s) and pollution contours, to be evaluated against the relevant air quality standards and on any implications they may have on the land use. Plans of a suitable scale should be used to present pollution contours to allow buffer distance requirements to be determined accurately.
- (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.

(vii) Mitigation Measures for Non-compliance

The Applicant shall propose remedies and mitigating measures where the predicted air quality impact exceeds the criteria set in section 1 of Annex 4 in the TM. These measures and any constraints on future land use planning shall be agreed with the relevant government departments/authorities and be clearly 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. The Applicant shall also justify the assumptions adopted in the assessment for effectiveness of the proposed mitigation measures.

(v) Submission of Model Files

All input and output file(s) of the model run(s) shall be submitted to the Director in electronic format together with submission of the EIA report.

### **3.4.5 Noise Impact**

3.4.5.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing both the construction and operational noise impacts arising from the Project and associated works, including their staged implementation, as stated in Annexes 5 and 13 of the TM respectively.

3.4.5.2 The noise impact assessment shall include the following :

(i) Determination of Assessment Area

The area for noise impact assessment shall generally include all areas within 300 metres from the boundary of the NDAs and associated infrastructure works. 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 300 metres from the boundary of assessment area, provides acoustic shielding to those receivers at further distance behind. Similarly, subject to the agreement of the Director, the assessment area shall be expanded to include NSRs at distance greater than 300 metres from the assessment area boundaries which are noise sensitive if they may be affected by the implementation of the Project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide all background information relevant to the Project and associated works, including relevant previous or current studies. Unless required for determining the planning standards, such as those for planning of fixed noise sources, no existing noise levels are required except as set out below.

(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 PODP and RODP of the NDAs, Outline Zoning Plans, Outline Development Plans, Recommended Outline Development Plan, Layout Plans and other relevant published landuse plans, including any alternative development proposal(s) identified or recommended in the course of the EIA study. The 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 can use the relevant planning parameters to work out representative site layouts for operational noise assessment purpose. However, such assumptions together with any constraints identified, such as setback of building, building orientation, extended podium, shall be agreed with the relevant responsible parties including Planning Department and Lands Department in accordance with section 6.3 of Annex 13 of the TM.

(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 such as for tunneling and other construction works, and traffic flow/fixed plant equipment, as appropriate, for operational noise assessment. Confirmation on the validity of the inventory shall be obtained from the relevant government departments/authorities and documented.

(v) Construction Noise Assessment

- (a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and any other relevant 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 day time, i.e. 7 a.m. to 7 p.m., on weekdays other than general holidays in accordance with the methodology stipulated in sections 5.3 and 5.4 of Annex 13 of the TM. The criteria in Table 1B of Annex 5 of the TM shall be adopted in the assessment.
- (c) To minimize the construction noise impact, alternative construction methods to replace percussive piling shall be proposed as far as practicable. In case blasting works will be involved, it should 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 associated with the removal of debris and rocks should be fully assessed and adequate mitigation measures should be recommended to reduce the noise impact as appropriate.
- (d) If tunneling works will be involved, noise impact (including air-borne noise and ground-borne noise) associated with the operation of powered mechanical equipment, in particular tunnel boring machine or equivalent, shall be assessed. If tunnel boring machine is used and it is likely that

ground-borne noise will affect NSRs, the criteria and assessment methodology shall be agreed with the Director (with reference to section 4.4.2(c) of the TM) prior to the commencement of the assessment.

- (e) 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 task) to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance shall be given.
- (f) The Applicant shall formulate a reasonable construction programme as far as practicable such that no work will be required in the 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 the relevant technical memoranda issued under the NCO. Regardless of the results of the construction noise impact assessment for restricted hours, the Noise Control Authority will process the 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 the EIA report.

(vi) Operational Noise Assessment

(a) Fixed Noise Sources

(a1) Assessment of Fixed Source Noise Levels

The Applicant shall identify any fixed noise sources within the assessment area, including at least any permanent and temporary industrial noise sources, pumping stations, electrical substation, bus terminus, railway station, railway depot, sewage treatment plant, open car/lorry park, refuse transfer station, public filling barging point, public dumping site, public cargo working area, concrete batching plants, construction material handling facilities, fire station, ambulance depot, helicopter pads, and calculate the expected noise using standard acoustics principles. Calculations for the expected noise shall be based on assumed plant inventories and utilization schedule for the reasonable worst case scenario. The Applicant shall calculate the noise levels taking into account correction of tonality, impulsiveness and intermittence in accordance with the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites issued under the Noise Control Ordinance.

(a2) Presentation of Noise Levels

The Applicant shall present the noise levels in Leq (30 min) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale.

A quantitative assessment at the NSRs for the fixed noise source(s) shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM. For noise matters not fully listed in Table 1A of Annex 5 of the TM, the criteria and assessment methodology shall be agreed with the Director (with reference to section 4.4.2(c) of the TM) prior to the commencement of the assessment.

(a3) Proposals for Noise Mitigation Measures

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

(b) Road Traffic Noise

(b1) Calculation of Noise Levels

The Applicant shall analyze the scope of the proposed road alignment(s) to identify appropriate new and existing 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 the change of nature of road, change of alignment and change of traffic capacity or traffic composition, and change of traffic flow pattern in the associated road networks, shall be assessed. The traffic noise impact shall be considered significant if the traffic noise level with all of the road projects is greater than that without all of the road projects at the design year by 1.0 dB(A) or more. Figures showing extents of new roads, existing roads and the associated road networks shall be provided in the EIA report.

The Applicant shall calculate the 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 the peak hour traffic flow in respect of the maximum traffic projection within a 15 years period upon commencement of operation of the proposed road works. The Applicant shall calculate traffic noise levels in respect of each road section and the overall noise levels from combined road sections (both new and existing) at NSRs.

The EIA report shall contain sample calculations and input parameters for 10 assessment points as requested by the Director. Furthermore, the Applicant shall provide the input data set of the traffic noise model in the format of electronic files in the EIA study. 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 information on road segments, barriers and noise sensitive receivers. The data structure of the above file shall be agreed with the Director. CD-ROM(s) containing the above data shall be attached to the EIA report.

(b2) Presentation of Noise Levels

The Applicant shall present the prevailing and future traffic noise levels in  $L_{10}$  (1hour) 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 proposed 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 Project 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 of the TM.

3-dimensional electronic visualizations of the road traffic noise predictions of the EIA report, including impacts with and without the Project, and the mitigated and unmitigated impacts shall be presented. The Applicant shall follow the requirements set out in section 5.8 of this study brief when producing the electronic visualizations.

(b3) 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 exceeds the criteria set in Table 1A of Annex 5 in the TM by 1 dB(A) or more with significant noise contribution from road traffic caused by the Project. The direct mitigation measures listed under section 6.1 of 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. The feasibility, practicability, programming and effectiveness

of the recommended mitigation measures shall be assessed in accordance with section 4.4.2(k) of the TM. Specific reasons for not adopting certain direct mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for the NSRs as far as possible should be clearly and specifically quantified and laid down.

The total number of dwellings, classrooms and other noise sensitive element that will benefit from and be protected by the provision of direct mitigation measures should be provided. In order to clearly present the extents/locations of the recommended noise mitigation measures, plans prepared from 1:1,000 or 1:2,000 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 above the criteria with the implementation of all recommended direct mitigation measures shall be quantified. The Applicant shall provide in the EIA report the information of the recommended noise mitigation measures (such as barrier types, nominal dimensions at different cross-sections, extents/locations, lengths, mPD levels of barriers) in electronic format as agreed by the Director.

In case where a number of the 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 under the Executive Council directive "Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads", the associated costs and any implications for such implementation. For the purpose of determining the 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 new road together with 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, all in  $L_{10}(1hr)$ );
- (2) the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road were commenced; and
- (3) the contribution from the new road to the increase in the predicted overall noise level must be at least 1.0 dB(A).

(c) Helicopter Noise Impacts

- (c1) The Applicant shall carry out assessment of the noise impacts arising from the operation of the existing helicopter pads and related off site facilities with respect to the criteria set in Table 1A of Annex 5 of the TM. The impact shall cover helicopter operation at the helicopter pads



and during its approach and departure from the helicopter pads. Where applicable, noise contours should be provided to facilitate appreciation of the extent of the potential noise impacts. The Applicant shall evaluate the reasonable worst-case scenarios in terms of flight types, flight paths, flight frequency and flight hours. For noise matters not fully listed in Table 1A of Annex 5 of the TM, the criteria and assessment methodology shall be agreed with the Director (with reference to section 4.4.2(c) of the TM) prior to the commencement of the assessment.

- (c2) The Applicant shall propose direct mitigation measures in all situations where the noise level exceedances are predicted following the principle of section 6 of Annex 13 of the TM such as alternative land use arrangement. The total number of noise sensitive receivers that will benefit from and be protected by the provision of direct mitigation measures should be provided. The total number of other noise sensitive receivers that will still be exposed to noise above the criteria with the implementation of all recommended direct mitigation measures shall be quantified.

(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 / Landuses

For planned noise sensitive uses which will still be affected even with all practicable direct mitigation measures in place, the Applicant shall propose, evaluate and confirm the practicality of additional measures including building setback 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 study to assess the development potential of concerned sites which shall be made known to the relevant parties.

(ix) Consideration of Mitigation Measures

In accordance with section 6 of Annex 13 of the TM, where the predicted noise impacts exceed the applicable noise criteria, direct mitigation measures as shown below shall be considered and evaluated in an appropriate manner:

- (a) alternative landuse arrangement
- (b) alternative siting
- (c) screening by noise tolerant buildings
- (d) setback of buildings
- (e) decking over
- (f) extended podium

- (g) building orientation
- (h) treatment of source
- (i) alternative alignment
- (j) noise barrier/enclosure
- (k) special building design
- (l) architectural features/balcony
- (m) open-textured road surfacing

### **3.4.6 Water Quality Impact**

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

3.4.6.2 The water quality impact assessment shall cover the following, but not limited to, major areas of concern:

- (i) Construction impact due to the proposed development and the works associated with upgrading of sewerage system including Shek Wu Hui STW, sewer mains and pumping stations;
- (ii) Operational impact arising from upgrading of Shek Wu Hui STW being proposed;
- (iii) Potential impact for ingress of water pollutants to Deep Bay inland waters from storm water drainage system and surface runoff; and
- (iv) Potential for increased risks of flooding resulting from hydrological changes.

3.4.6.3 The assessment area for this water quality impact assessment shall cover the Deep Bay Water Control Zone as designated under the Water Pollution Control Ordinance (WPCO). The assessment area could be extended to include other areas such as stream courses and the associated water system, existing and planned drainage system if they are found also being impacted during the course of the EIA study and have a bearing on the environmental acceptability of the Project.

3.4.6.4 The Applicant shall identify and analyse physical, chemical and biological disruptions of marine and/or inland water, coastal water, existing and new drainage system(s) during the construction and operation of the Project.

3.4.6.5 The Applicant shall address water quality impacts due to the construction and operational stages of the Project. Essentially the assessment shall address the following:

- (i) Collect and review of background information on the affected existing and planned water system(s), their respective catchments and sensitive receivers which might be affected by the Project;
- (ii) Characterize water quality of the water system(s), their respective catchment and sensitive receivers which might be affected by the Project based on existing best available information or through appropriate site survey and tests;

- (iii) Identify and analyse physical, chemical and biological disruptions of marine and/or inland water, coastal water, existing and planned drainage system arising from the proposed developments and associated works. In particular, the assessment shall evaluate the extent of potential impact from the Project to the existing drainage regime in the Long Valley and Inner Deep Bay;
- (iv) Identify and analyze relevant existing and planned future activities, beneficial uses and sensitive receivers related to the affected water system(s). The Applicant shall refer to, *inter alia*, those developments and uses specified in the relevant PODP and RODP of the NDAs, Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published landuse plans;
- (v) Identify pertinent water quality objectives and establishment of other appropriate water quality criteria or standards for the water system(s) and all the sensitive receivers as mentioned in sections 3.4.6.5(i), (ii) and (iii) of this study brief, including ecological sensitive receivers for the assessments covered in section 3.4.14 of this study brief;
- (vi) Identify any alternation of water courses, natural streams, change of drainage system, change of flow regimes, change of ground water levels, change of catchment types of areas;
- (vii) Report on the adequacy of the existing sewerage and sewage treatment facilities for the handling, treatment and disposal of wastewater arising from the Project as required in section 3.4.7 of this study brief;
- (viii) Subject to the assessment findings and recommendations from the Sewerage and Sewage Treatment Implications under section 3.4.7 of this study brief, the Applicants shall identify and quantify the water quality impacts due to such findings and recommendations. The water quality concerns could include, but not limited to, possible sewage overflow or emergency bypass due to capacity constraints of the sewerage system, emergencies arising from the Project;
- (ix) Identify and quantify existing and likely future water pollution sources including point discharges and non-point sources to surface water runoff. An emission inventory on the quantities and characteristics of these existing and likely future pollution sources in the assessment area shall also be provided. Field investigation and laboratory test, as appropriate, shall be conducted to fill relevant information gaps;
- (x) Predict and quantify the impacts on the identified water systems and sensitive receivers due to sewage derived from the implementation of the Project including the cumulative impacts to Inner Deep Bay. All effluent generated shall require appropriate collection, treatment and disposal to ensure that there is no net increase in pollution load to Deep Bay, especially due to the increased effluent discharges from the expanded/upgraded Shek Wu Hui STW being proposed; details including design, locations, implementation and management schedules and performance monitoring and audit schemes of all planned mitigation measures to achieve the requirements of no net increase in

pollution load;

- (xi) Possible impacts include change in hydrology, flow regime, water quality and the effects on the aquatic organisms due to such changes. The prediction shall also take into account and include likely different construction stages or sequences, different operational stage;
- (xii) Should dredging be required, the Applicant shall evaluate and quantify the possible impacts arising from the dredging works by appropriate techniques agreed by the Director;
- (xiii) Assess the cumulative impacts due to other related concurrent and planned projects, activities or pollution sources along the identified water system(s) and sensitive receivers that may have a bearing on the environmental acceptability of the Project;
- (xiv) Propose effective infrastructure upgrading or provision, water pollution prevention and mitigation measures to be implemented during the construction and operational stages so as to reduce the water quality impacts to within acceptable levels of standards. No net increase of pollution load to Deep Bay should be ensured. Requirements to be incorporated in the project contract document shall also be proposed;
- (xv) Analyze the provision and adequacy of the existing and planned future facilities to reduce pollution arising from the storm water drainage system and surface water runoff during construction and operation of the Project; establish a storm water pollution control plan to minimize the potential water quality impact. The plan shall incorporate details such as locations, sizes and types of measures/installations and the best management practices; and
- (xvi) Evaluate and quantify residual impacts on the affected water system(s) and the sensitive receivers with regard to the appropriate water quality criteria, standards or guidelines.

### **3.4.7 Sewerage and Sewage Treatment Implications**

3.4.7.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing impacts of the Project and associated works on the public sewerage, sewage treatment and disposal facilities as stated in section 6.5 in Annex 14 of the TM.

3.4.7.2 The Applicant shall study and assess the impacts of the sewage discharge from the Project and associated works on the sewerage system of the Project and associated works. The assessment shall include the following :

- (i) investigate and review the existing, committed and planned sewerage networks and sewage treatment and disposal facilities in NENT area;
- (ii) assess the sewerage system of the Project, including sewage treatment and disposal facilities, taking into account the projected flows and loads from the Project;

- (iii) assess the impact of the Project on the existing, committed and planned sewerage system and sewage treatment and disposal facilities in NENT area;
- (iv) prepare a Sewerage Master Plan for the Project using the latest version of the computerized analysis technique “INFOWORKS” or equivalent computer software agreed by the Director;
- (v) identify sewerage upgrading works required for the NENT area sewerage network, sewage treatment and disposal facilities;
- (vi) recommend interim upgrading of sewage treatment and disposal facilities and sewerage network as appropriate and prepare programme and cost estimate for such interim works; and
- (vii) recommend permanent upgrading to the sewage treatment and disposal facilities and sewerage network, and develop a prioritized programme for implementation and prepare cost estimates.

### **3.4.8 Waste Management Implications**

3.4.8.1 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.

3.4.8.2 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 and operation activities of the Project and associated works, based on the sequence and duration of these activities.

(ii) Proposal for Waste Management

- (a) Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site re-use and recycling shall be fully evaluated. Measures which can be taken in the planning and design stages (e.g. by modifying the design approach) and in the construction stage for maximizing waste reduction shall be separately considered.
- (b) After considering all 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 the result of the assessment in (c) below.
- (c) The impact caused by handling (including labeling, packaging and storage), collection, and reuse/disposal of wastes shall be addressed in detail and appropriate mitigation measures shall be proposed. This

assessment shall cover the following areas :

- potential hazard;
- air and odour emissions;
- noise;
- wastewater discharge; and
- public transport.

### **3.4.9 Land Contamination Impact**

- 3.4.9.1 The Applicant shall follow the guidelines for evaluating and assessing potential land contamination issues as stated in sections 3.1 and 3.2 in Annex 19 of the TM.
- 3.4.9.2 The assessment area for land contamination impact shall include the NDAs and associated infrastructure works, and any alternative development proposals identified in the course of EIA study. If the land contamination impact of a certain part of the assessment area has been adequately assessed in any approved EIA reports in the EIAO Register or any contamination assessment reports / remediation action plans approved by the Director in accordance with the relevant Practice Note for Professional Persons or guidelines issued by the EPD, the Applicant shall make reference to such reports and confirm with the Director whether the information and findings of such reports are still relevant and valid for the EIA study.
- 3.4.9.3 The Applicant shall provide a clear and detailed account of the present land use (including description of the activities, chemicals and hazardous substances handled with clear indication of their storage and location by reference to a site map) and the relevant land use history in relation to possible land contamination (including accident records, change of land use(s) and the like).
- 3.4.9.4 During the course of the EIA study, the Applicant shall submit a contamination assessment plan (CAP) to the Director for agreement prior to conducting the contamination impact assessment of the relevant land or site(s) suspected to contain land contaminant(s) that shall require remediation. The CAP shall include proposals with details on representative sampling and analysis required to determine the nature and the extent of the contamination of the relevant land or site(s).
- 3.4.9.5 Based on the CAP agreed with the Director, the Applicant shall conduct a land contamination impact assessment. If land contamination is confirmed, a remedial action plan (RAP) shall be prepared to formulate necessary remedial measures.
- 3.4.9.6 If there is / are potential contaminated site(s) inaccessible for preparing sampling and analysis during the course of the EIA study as required under section 3.4.9.4 of this study brief, e.g. due to site access problem, the Applicant's CAP shall include:
- (i) a review of the available information;
  - (ii) an initial contamination evaluation of this/these site(s) and possible remediation methods;
  - (iii) a confirmation of whether the contamination problem at this/these site(s)

would be surmountable;

- (iv) a sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s); and
- (v) a schedule of submission of revised CAP (if necessary), CAR and RAP upon this/these site(s) is/are accessible.

### **3.4.10 Hazard to Life**

3.4.10.1 The Applicant shall follow the criteria for evaluating hazard to life as stated in Annexes 4 and 22 of the TM.

3.4.10.2 The Applicant shall carry out hazard assessment to evaluate risks due to transport, storage and use of chlorine associated with the operations at Sheung Shui Water Treatment Works during the implementation of the Project. The hazard assessment shall include the following:

- (i) Identify hazardous scenarios associated with the transport, storage and use of chlorine and then determine a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA);
- (ii) Execute a QRA of the set of hazardous scenarios determined in (i), expressing population risks in both individual and societal terms;
- (iii) Compare individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM; and
- (iv) Identify and assess practicable and cost-effective risk mitigation measures.

The methodology of hazard assessment shall be agreed and approved by the Director.

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

- (i) Identify hazardous scenarios associated with the transport, storage and use of explosives and then determine a set of relevant scenarios to be included in a QRA;
- (ii) Execute a QRA of the set of hazardous scenarios determined in (i), expressing population risks in both individual and societal terms;
- (iii) Compare individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM; and
- (iv) Identify and assess practicable and cost-effective risk mitigation measures.

The methodology of hazard assessment shall be agreed and approved by the Director.

### **3.4.11 Landfill Gas Hazards Assessment**

3.4.11.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing landfill gas hazards as stated in section 1.1(f) in Annex 7 and section 3.3 in Annex 19 of the TM respectively. In particular, the landfill gas hazards assessment shall be carried out in accordance with the “Landfill Gas Hazard Assessment Guidance Note” (1997) issued by the Director. The landfill gas hazards assessment shall entail two main components which are qualitative risk assessment and landfill gas precautionary / protection design. Specifically, the assessment shall include the following technical tasks:

- (i) Review of background information (including landfill gas monitoring data, if any) and studies related to the relevant landfills, in particular closed Ma Tso Lung Landfill;
- (ii) Identification of the nature and extent of the sources, including the likely concentrations and / or amounts of hazardous emissions which might have the potential for impacts on the Project;
- (iii) Identification of possible pathways through the ground, underground cavities, utilities or groundwater, and the nature of these pathways through which hazardous emissions must traverse if they were to reach the Project;
- (iv) Identification of the potential receivers associated with the Project which are sensitive to the impacts of the hazardous emissions;
- (v) Qualitative assessment on the degrees of risk which the hazardous emissions may pose to the target for each of the source-pathway-target combinations;
- (vi) Design of suitable level of precautionary measures and contingency plan for the Project and the types of protection measures for their safe operations, if needed; and
- (vii) Identification of monitoring requirement for assessing the adequacy and performance of the implemented protection measures.

### **3.4.12 Impact on Sites of Cultural Heritage**

3.4.12.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing the impacts on sites of cultural heritage as stated in Annexes 10 and 19 of the TM and Criteria for Cultural Heritage Impact Assessment in Appendix C.

3.4.12.2 The assessment area shall be 100 metres expanded from the boundary of the NDAs and associated infrastructure works. The cultural heritage impact assessment shall include archaeological impact assessment and built heritage impact assessment.

#### **3.4.12.3 Archaeological Impact Assessment**

The Applicant shall engage qualified archaeologist(s) to review the archaeological potential of the all proposed developments under the Project taking the results of previous archaeological investigations and other background of the site into account. In case the existing information is inadequate or where the Project or associated works has not been adequately studied before, the archaeologist(s) shall conduct the investigations to assemble data.



The archaeologists shall obtain licences from the Antiquities Authority prior to commence of archaeological field investigations. Details of the archaeological impact assessment shall be agreed with the Antiquities Authority or the Director prior to the commencement of the assessment (with reference to Section 4.4.2(c) of the TM).

Based on existing and collected data, the Applicant shall evaluate whether the proposed development(s) associated with the Project and associated works is (are) acceptable from archaeological preservation point of view. In case adverse impact on archaeological resources cannot be avoided, appropriate mitigation measures should be designed.

The Applicant shall draw necessary reference to relevant sections of the Criteria for Cultural Heritage Assessment at Appendix C.

#### 3.4.12.3 Built Heritage Impact Assessment

The Applicant shall conduct a built heritage impact assessment (BHIA), taking the results of previous BHIA and other background of the site into account, to identify known and unknown heritage items within the assessment area that may be affected by the Project and its associated works to assess the direct and indirect impacts on heritage items. Due consideration should be given to the built heritage aspect in the early planning stage. Opportunity should be given throughout this EIA study so that the identified built heritage could be well integrated into future development. The possible impact on the built heritage items identified by the previous BHIA should be avoided / minimized. Appropriate mitigation measures should be recommended in the BHIA.

The Applicant shall draw necessary reference to relevant sections of the Criteria for Cultural Heritage Assessment at Appendix C.

### **3.4.13 Landscape and Visual Impact**

- 3.4.13.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM and EIAO Guidance Note No. 8/2002 on “*Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance*” for evaluating and assessing landscape and visual impacts of the Project and associated infrastructure and works, such as noise barriers and above ground structures, during both construction and operational stages, and possible glare light during night time. The assessment shall take into account all existing, committed and planned land uses and sensitive receivers.
- 3.4.13.2 The area for the landscape impact assessment shall include all areas within 500 metres expanded from the boundary of the NDAs and associated infrastructure works. The area for the visual impact assessment shall be defined by the visual envelope from the NDAs and associated infrastructure works. The defined visual envelope must be shown on a plan in the EIA report.
- 3.4.13.3 In the landscape impact assessment, the Applicant shall describe, appraise, analyze and evaluate the existing and planned landscape resources and character

within the assessment area. 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. A tree survey shall be carried out and the impacts on existing trees shall be addressed. Tree survey information shall be included in the EIA report. 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 and associated works with the existing and planned landscape settings. The landscape impact assessment shall quantify the potential landscape impacts as far as possible, so as to illustrate the significance of such impacts arising from the Project and associated works. Clear mapping of all landscape impact is required.

3.4.13.4 The Applicant shall assess the visual impacts of the Project and associated works. Clear illustrations including mapping of visual impact is required. The assessment shall adopt a systematic methodology and include the following:

- (i) Identification and plotting of visual envelope of the NDAs and associated infrastructure works;
- (ii) Identification of the key groups of sensitive receivers within the visual envelope with regard to views from ground level, sea 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;
- (iv) Description of the severity of visual impacts in terms of nature, distance and number of sensitive receivers. The visual impact of the Project and associated works with and without mitigation measures shall be assessed.
- (v) Clear evaluations and explanations with supportive arguments of all factors considered in arriving the significance thresholds of visual impact.

3.4.13.5 The Applicant shall review relevant PODP and RODP of the NDAs, Layout Plans, Outline Zoning Plans, other relevant published landuse plans, planning briefs and studies which may identify areas of high landscape value, open space, amenity area and green belt designations. Any guidelines on landscape strategies, landscape frameworks, urban design concepts, building height profiles, special design areas, landmarks, designated view corridors, 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 the 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.

3.4.13.6 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(s), design(s) 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 the adverse effects identified above, including provision of a landscape design.

3.4.13.7 The mitigation measures shall include consideration of at least the following: preservation of vegetation, transplanting, provision of screen planting, re-vegetation of disturbed land, compensatory planting, provisioning/re-provisioning of amenity areas and open spaces, avoidance or minimization of noise barriers, design of structures, provision of finishes to structures, colour scheme and texture of material used, any measures to mitigate the impact on existing, committed and planned land uses, creation of view corridors, and ridgeline preservations. The relevant responsible 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 and associated works. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.

3.4.13.8 Annotated illustration materials such as colour perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points, and computer-generated photomontages shall be adopted to fully illustrate the landscape and visual impacts of the Project and associated works to the satisfaction of the Director. In particular, the landscape and visual impacts of the Project with and without mitigation measures from representative viewpoints, particularly from views of the most severely affected visually sensitive receivers (i.e. worst case scenarios) shall also be properly illustrated in existing and planned setting at four stages (existing condition, Day 1 with no mitigation measures, Day 1 with mitigation measures and Year 10 with mitigation measures) by computer-generated photomontage so as to demonstrate the effectiveness of the proposed mitigation measures. All computer graphics shall be compatible with Microstation DGN file format. 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.

### **3.4.14 Ecological Impact**

3.4.14.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing ecological impact as stated in Annexes 8 and 16 of the TM respectively.

3.4.14.2 The assessment area for the purpose of terrestrial ecological assessment shall include all areas within 500 metres expanded from the NDAs and associated infrastructure works and the area likely to be impacted by the project.

3.4.14.3 In the ecological impact assessment, the Applicant shall examine the flora, fauna and other components of the ecological habitats within the assessment area. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project and associated works shall avoid impacts on recognized sites of conservation importance and other ecological sensitive areas. The assessment shall identify and quantify as far as possible the potential ecological

impacts arising from the construction and operation of the Project and associated works.

3.4.14.4 The assessment shall include the following:

- (i) review the findings of relevant studies/surveys including the NENT Study completed in 2003, and collate all available information on the ecological characters of the assessment area (12 months ecological survey covering a full-year seasonal variation has been undertaken in 1998/99 under the NENT Study);
- (ii) evaluate the information collected from section 3.4.14.4(i) of this study brief and identify any information gap relating to the assessment of potential ecological impacts to the aquatic and terrestrial environment; and determine whether ecological surveys are required to bridge any identified information gap for the purpose of establishing a comprehensive and updated ecological profile in accordance with section 3.4.14.4(iv) of this study brief;
- (iii) carry out necessary field surveys as determined under section 3.4.14.4(ii) of this study brief, the duration of which shall be at least 9 months covering both the wet and dry seasons including flight path surveys of birds at Ho Sheung Heung Egretty and investigations to verify the information collected, fill the information gaps identified and fulfill the objectives of the EIA study;
- (iv) establish an ecological profile of the assessment area based on 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) habitats maps of suitable scale (1:1,000 to 1:5,000) 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 and abundance, 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 birds, soft-bottom benthic habitat and any other habitats

and wildlife groups identified as having special conservation interests by this EIA study;

- (vi) describe all recognized sites of conservation importance in the proposed development site and its vicinity, including but not limited to Long Valley, Ho Sheung Heung Egrettry, and compensatory planting areas and retained meanders established under the “Main Drainage Channels for Sheung Shui, Fanling and Hinderland” project, streams/rivers at Ping Che and Ta Kwu Ling, 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 (e.g. changes in water qualities, sediment, hydrodynamics properties, sedimentation rates and patterns, hydrology), 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) habitat loss and disturbance to wildlife during construction stage; and
  - (b) deterioration of environmental quality (e.g. water quality) and the subsequent impacts to the biological communities during operation stage;
- (viii) demonstrate that the ecological impacts due to the implementation of the Project are avoided by design and landuse planning to the maximum practicable extent. The impact on birds due to collision to transparent or semi-transparent noise barriers, if any, shall be addressed in the EIA study. The overall impact due to the KTN and FLN NDAs and the new roads including Fanling Bypass as a whole on the wetland habitat such as Long Valley and the species of conservation importance within the assessment area shall be considered and addressed in the EIA study;
- (ix) evaluate the significance and acceptability of the ecological impacts identified using well-defined criteria;
- (x) recommend all practicable alternatives (such as modification of landuse plans and layout, alternative road alignments, use of tunnels and suppress roads and use of other construction methods) and practicable mitigation measures (such as ecological corridors) to avoid, minimize and/or compensate for the adverse ecological impacts identified;
- (xi) 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;
- (xii) determine and quantify as far as possible the residual ecological impacts after implementation of the proposed mitigation measures;
- (xiii) evaluate the severity and acceptability of the residual ecological impacts using well-defined criteria; and

- (xiv) review the need for and recommend any ecological monitoring programme required.

### **3.4.15 Fisheries Impact**

- 3.4.15.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the TM.
- 3.4.15.2 The area for fisheries impact assessment shall include all areas within 500 metres expanded from the boundary of the NDAs and associated infrastructure works and any areas likely to be impacted by the Project. Special attention shall be given to the potential impacts on the fishing and aquaculture activities at Kwu Tung North and Fanling North and the loss of fishing ponds.
- 3.4.15.3 The assessment shall cover any potential impact on both capture and culture fisheries, during the implementation of the Project.
- 3.4.15.4 Existing information regarding the assessment area shall be reviewed. Based on the review results, the study shall identify data gap and determine if there is any need for field surveys. If field surveys are considered necessary, the study shall recommend appropriate methodology, duration and timing for the field surveys. The proposed field survey shall be agreed with the Director of Agriculture, Fisheries and Conservation or the Director prior to the commencement of the survey.
- 3.4.15.5 The fisheries impact assessment shall include the following :
- (i) description of the physical environmental background;
  - (ii) description and quantification of existing capture and culture fisheries activities;
  - (iii) description and quantification as far as possible the existing fisheries resource;
  - (iv) identification of parameters (e.g. water quality parameters) and areas that are important to fisheries and will be affected;
  - (v) identification and quantification as far as practicable any direct/indirect and on-site/off-site impacts to fisheries;
  - (vi) evaluation of impacts and make proposals for any practical alternatives or mitigation measures with details on justification, description of scope and programme, feasibility as well as manpower and financial implications including those related to subsequent management and maintenance requirements of the proposals; and
  - (vii) review the need for monitoring during the construction and operation phases of the Project and associated works and, if necessary, propose a monitoring and audit programme.

### **3.4.16 Documentation of Key Assessment Assumptions, Limitation of Assessment Methodologies and related Prior Agreement(s) with the Director**

3.4.16.1 To facilitate efficient retrieval, a summary to include the assessment methodologies and key assessment assumptions adopted in this EIA study, the limitations of these assessment(s) methodologies/assumptions, if any, plus all relevant prior agreement(s) with the Director or other Authorities on individual environmental media assessment components. The proposed use of any alternative assessment tool(s) or assumption(s) have to be justified by the Applicant, with supporting documents based on cogent, scientific and objectively derived reason(s) before seeking the Director's agreement. This summary and all related supporting documents shall be provided in the form of an Appendix to the EIA study report.

### **3.4.17 Impacts Summary**

3.4.17.1 To facilitate effective retrieval of pertinent key information, a summary of environmental impacts in the form of a table (or in any other form approved by the Director) showing the assessment points (such as ASRs, NSRs), results of impact predictions, relevant standards or criteria, extents of exceedances predicted, impact avoidance measures considered, mitigation measures proposed and residual impacts (after mitigation) shall be provided to cover each individual impact in the EIA report. This impact summary shall form an essential part of the Executive Summary.

### **3.4.18 Summary of Environmental Outcomes**

3.4.18.1 The EIA report shall contain a summary of the 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.

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

3.4.19.1 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 associated works and, if affirmative, to define the scope of the EM&A requirements for the Project and associated works in the EIA study.

3.4.19.2 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 construction monitoring data, wherever practicable, for the Project and associated works through a dedicated internet website.

3.4.19.3 The Applicant shall prepare a Project Implementation Schedule (in the form of a checklist as shown in Appendix D to this EIA study brief) containing all the EIA

study recommendations and mitigation measures with reference to the Project and associated works implementation programme. A stand-alone implementation schedule shall be prepared for each of the individual Schedule 2 projects as described in sections 1.2, 1.5 and 2.1(x) of this study brief.

#### **4. DURATION OF VALIDITY**

- 4.1 This EIA study brief is valid for 36 months counting from the date of its issuance. If the EIA study does not commence within this period, the Applicant shall apply to the Director for a fresh EIA study brief before commencement of the EIA study. The Applicant shall advise the Director the date of 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 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 under section 5.2(i) of this study brief 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 the above documents available to the public, subject to payment by the interested parties of full costs of printing.
- 5.4 In addition, to facilitate the public inspection of the EIA report via the EIAO Internet Website, the applicant shall provide electronic copies of both the EIA report and the executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 1.3 or later), 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 the executive summary shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EIA report and executive summary shall be provided in the main text from where the respective references are



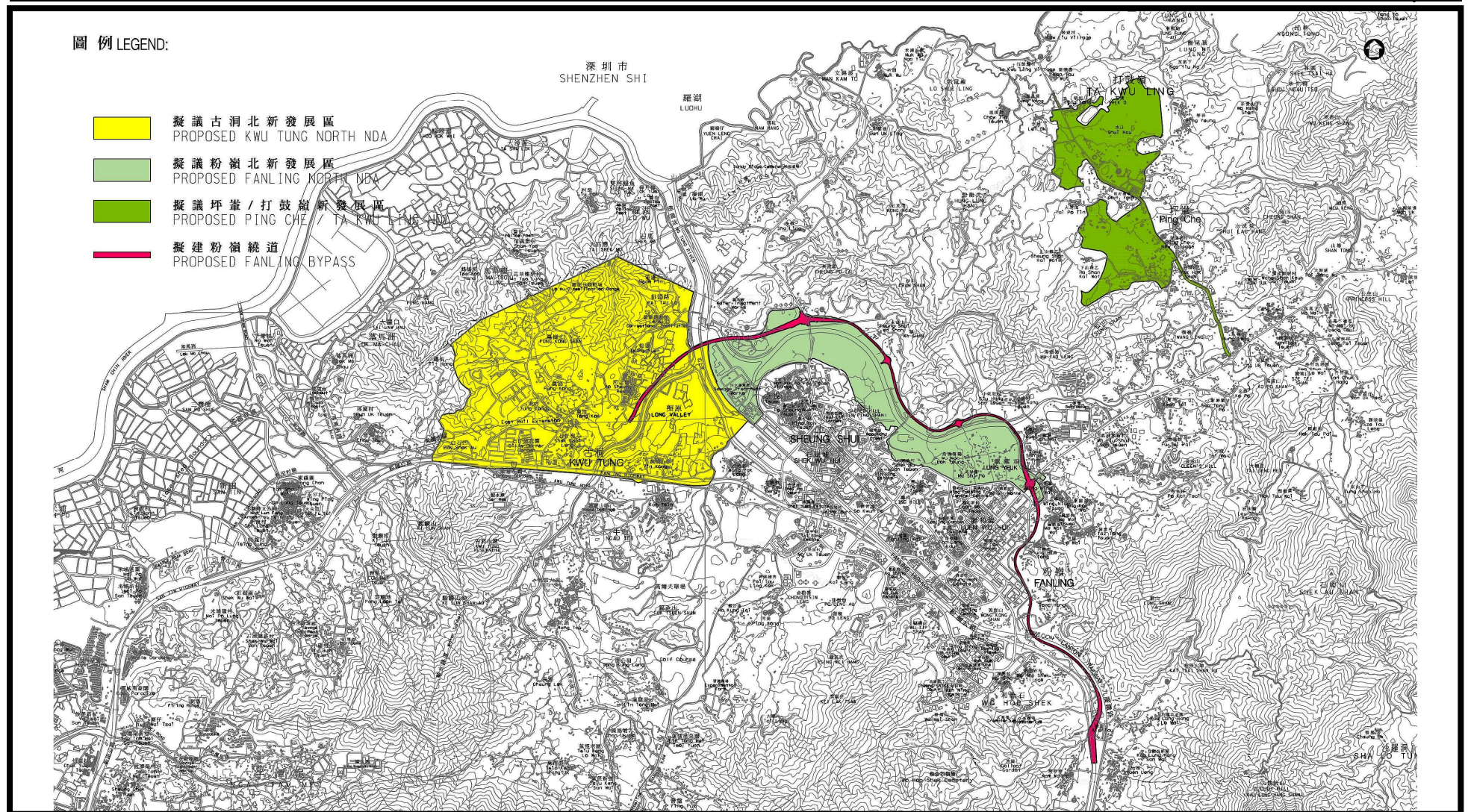
- made. All graphics in the report shall be in interlaced GIF format unless otherwise agreed by the Director.
- 5.5 The electronic copies of the EIA report and the executive summary shall be submitted to the Director at the time of application for approval of the EIA report.
- 5.6 When the EIA report 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 3-dimensional electronic visualisations of the major findings (in particular the road traffic noise prediction, water quality and landscape and visual impacts) and elements of the EIA report, including baseline environmental information, the environmental situations with or without the project, key mitigated and unmitigated environmental impacts, and key recommended environmental mitigation measures so that the public can understand the Project and the associated environmental issues. The visualizations shall be based on the EIA report and released to the public. The 3-dimensional visualizations shall be developed and constructed such that they can be accessed and viewed by the public through an internet browser at a reasonable speed and without the need for software license requirement at the client's end. The visualizations shall be deposited in 10 copies of CD-ROM, DVD±R or other suitable means agreed with the Director.

## **6. OTHER PROCEDURAL REQUIREMENTS**

- 6.1 If there is any change in the Applicant (as representing his or her organisation) for this EIA study brief during the course of the EIA study, the Applicant must notify the Director immediately.
- 6.2 If there are any key changes in the scope of the Project mentioned in section 1.2 of this study brief and in the Project Profile, the Applicant must seek confirmation in writing from the Director on whether or not the scope of this EIA study brief is still applicable to cover the key changes identified, and what additional issues, if any, that the EIA study must also cover to address these key changes. 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 ---

January 2008  
Environmental Assessment Division,  
Environmental Protection Department



Appendix A North East New Territories New Development Areas (新界東北新發展區)

附件 A

Location Plan of North East New Territories New Development Areas  
(新界東北新發展區的位置圖)

This figure was prepared based on Drawing no. NTNZ 1539 of the Project Profile (No.: PP-337/2007)

本圖是根據工程項目簡介(編號: PP-337/2007)圖 NTNZ 1539 編制

EIA Study Brief No. ESB-176/2008

環評研究概要編號 ESB-176/2008



## **Appendix B-1**

### **Guidelines on Choice of Models and Model Parameters in Air Quality Assessment**

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

#### **1. Introduction**

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

#### **2. Choice of Models**

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

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

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

- 2.2 Note that both FDM and CALINE4 have a height limit on elevated sources (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' in Appendix B-3.
- 2.3 The models can be used to estimate both short-term (hourly and daily average) and long-term (annual average) ambient concentrations of air pollutants. The model results, obtained using appropriate model parameters (refer to Section 3) and assumptions, allow direct comparison with the relevant air quality standards such as the Air Quality Objectives (AQOs) for the relevant pollutant and time averaging period.

### 3. Model Input Requirements

#### 3.1 Meteorological Data

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

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

Day time: stability class D; wind speed 1 m/s (at 10m height); worst-case wind angle; mixing height 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 CALINE4 model due to its inability to handle lengthy data set.

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

- (i) perform a frequency occurrence analysis of one year of meteorological data to determine the actual wind speed (to the nearest unit of m/s), wind direction (to the nearest 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, 5<sup>th</sup> 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 classified 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 classified as rural.

### 3.4 Surface Roughness Height

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

### 3.5 Receptors

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

### 3.6 Particle Size Classes

In evaluating the impacts of dust-emitting activities, suitable dust size categories relevant to the dust sources concerned with reasonable breakdown in TSP (< 30  $\mu$ m)

and RSP ( $< 10 \mu\text{m}$ ) compositions should be used.

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

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

- (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  $\mu\text{g}/\text{m}^3$  depending on the land use type (see also the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix B-2).

### 3.8 Odour Impact

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

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

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

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

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

### 3.9 Plume Rise Options

The ISCST3 model provides by default a list of the U.S. regulatory options for concentration calculations. These are all applicable to the Hong Kong situations except for the 'Final Plume Rise' option. As the distance between sources and receptors are generally fairly close, the non-regulatory option of 'Gradual Plume

Rise' should be used instead to give more accurate estimate of near-field impacts due to plume emission. However, the 'Final Plume Rise' option may still be used for assessing the impacts of distant sources.

### 3.10 Portal Emissions

These include traffic emissions from tunnel portals and any other similar openings and are generally modelled as volume sources according to the PIARC 91 (or more up-to-date version) recommendations (Ref. 5, section III.2). For emissions arising from underpasses or any horizontal openings of the like, these are treated as area or point sources depending on the source physical dimensions. In all these situations, the ISCST3 model or more sophisticated models will have to be used instead of the CALINE4 model. In the case of portal emissions with significant horizontal exit velocity which cannot be handled by the ISCST3 model, the impacts may be estimated by the TOP model (Ref. 6) or any other suitable models subject to prior agreement with the Director (with reference to Section 4.4.2(c) of the TM). The EPD's 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment' should also be referred to in Appendix B-3.

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

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

### 3.11 Background Concentrations

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

### 3.11 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 the Director'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

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

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

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

**Guidelines on Assessing the 'TOTAL' Air Quality Impacts**

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

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

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

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

**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
NO <sub>2</sub>	59	57	39
SO <sub>2</sub>	21	26	13
O <sub>3</sub>	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:

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

### 3.5 Provisions for 'double-counting'

The current approach is, by no means, a rigorous treatment of background air quality but aims to provide an as-realistic-as-possible approximation based on limited field data. 'Double-counting' of 'secondary contributions' may be apparent through the use of such 'monitoring-based' background data as some of the monitoring stations are of close proximity to existing emission sources. 'Primary contributions' due to a proposed project (which is yet to be realized) will not be double-counted by such an approach. In order to avoid over-estimation of background pollutant concentrations, an adjustment to the values given in Section 3.3 is possible and optional by multiplying the following factor:

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

where E stands for emission.

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

#### **4. Conclusions**

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

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

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

### **1. Background**

1.1 In Hong Kong, a number of Gaussian plume models are commonly employed in regulatory applications such as application for specified process licences and environmental impact assessments (EIAs). These frequently used models (as listed in Schedule 1 attached; hereafter referred to as Schedule 1 models) have no regulatory status but form the basic set of tools for local-scale air quality assessment in Hong Kong.

1.2 However, no single model is sufficient to cover all situations encountered in regulatory applications. In order to ensure that the best model available is used for each regulatory application and that a model is not arbitrarily applied, the project proponent (and/or its environmental consultants) should assess the capabilities of various models available and adopt one that is most suitable for the project concerned.

1.3 Examples of situations where the use of an alternative model is warranted include:

- (i) the complexity of the situation to be modelled far exceeds the capability of the Schedule 1 models; and
- (ii) the performance of an alternative model is comparable or better than the Schedule 1 models.

1.4 This paper outlines the demonstration / submission required in order to support the use of an alternative air quality model for regulatory applications for Hong Kong.

### **2. Required Demonstration / Submission**

2.1 Any model that is proposed for air quality applications and not listed amongst the Schedule 1 models will be considered by the Director on a case-by-case basis. In such cases, the proponent will have to provide the followings for the Director's review:

- (i) Technical details of the proposed model; and
- (ii) Performance evaluation of the proposed model

Based on the above information, the Director 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" (Ref. 1).
- Ref.(1): William M. Cox, 'Protocol for Determining the Best Performing Model'; Publication No. EPA-454/R-92-025; U.S. Environmental Protection Agency, Research Triangle Park, NC.*
- 2.4 For cases where a Schedule 1 model is applicable to the project under consideration but an alternative model is proposed for use instead, the proponent must demonstrate either that
- (i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or
- (ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).
- 2.5 Should the Director 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 the Director 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 the Director 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

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

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

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

## Appendix C

### Criteria for Cultural Heritage Impact Assessment

#### (1) Baseline Study

##### 1.1 A baseline study shall be conducted:

- a. to compile a comprehensive inventory of archaeological sites (including marine archaeological sites), historic buildings and structures within the proposed project area, which include:
  - (i) all sites of archaeological interest (including marine archaeological sites);
  - (ii) all pre-1950 buildings and structures;
  - (iii) selected post-1950 buildings and structures of high architectural and historical significance and interest; and
  - (iv) landscape features include sites of historical events or providing a significant historical record or a setting for buildings or monuments of architectural or archaeological importance, historic field patterns, tracks and fish ponds and cultural element such as *fung shui* woodlands and clan grave.
- b. to identify the direct and indirect impacts on the site of cultural heritage at the planning stage in order to avoid causing any negative effects. The impacts include the direct loss, destruction or disturbance of an element of cultural heritage, impact in its settings causing impinge on its character through inappropriate sitting or design, potential damage to the physical fabric of archaeological remains, historic buildings or historic landscapes through air pollution, change of ground water level, vibration, recreation pressure and ecological damage by the development. The impacts listed are merely to illustrate the range of potential impacts and not intended to be exhaustive.

##### 1.2 The baseline study shall also include a desk-top 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 The potential value of the project area with regard to the cultural heritage could be established easily where the area is well-documented. However, it does not mean that the area is devoid of interest if it lacks information. In these instances, a site visit combined with discussions with appropriate individuals or organisations should be conducted by those with expertise in the area of cultural heritage to clarify the position.

##### 1.4.2 Historic buildings and structures survey

- a. Field scan of all the historic buildings and structures within the project area.
- b. Photographic recording of each historic building or structure including the exterior (the elevations of all faces of the building premises, the roof, close up for the special architectural details) and the interior (special architectural details), if possible, as well as the surroundings of each historic building or structure.
- c. Interview with local elders and other informants on the local historical, architectural, anthropological and other cultural information related to the historic buildings and structures.
- d. Architectural appraisal of the historic buildings and structures.

##### 1.4.3 Archaeological Survey

A licence shall be obtained from the Antiquities Authority for conducting an archaeological survey. It takes at least two months to process the application.

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.

The following methods of archaeological survey (but not limited to) should be

applied to assess the archaeological potential of the project area:

- a. Definition of areas of natural land undisturbed in the recent past.
- b. Field scan of the natural land undisturbed in the recent past in detail with special attention paid to areas of exposed soil which were searched for artifacts.
- c. Conduct systematic auger survey and test pitting. The data collected from auger survey and test pitting should be able to establish the horizontal spread of cultural materials deposits.
- d. Excavation of test pits to establish the vertical sequence of cultural materials. The hand digging of 1 x 1 m or 1.5 x 1.5 m test pits to determine the presence or absence of deeper archaeological deposits and their cultural history.
- e. The 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.
- f. 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.

1.4.4 If the field evaluation identifies any additional sites of cultural heritage within the study area which are of potential historic or archaeological importance and not recorded by AMO, the office should be reported as soon as possible. The historic and archaeological value of the items will be further assessed by the AMO.

## 1.5 The Report of Baseline Study

1.5.1 The study report should have concrete evidence to show that the process of the above desk-top and field survey has been satisfactorily completed. This should take the form of a detailed inventory of the sites of cultural heritage supported by full description of their cultural significance. The description should contain detailed geographical, historical, archaeological, architectural, anthropological, ethnographic and other cultural data supplemented with illustrations below and photographic and cartographic records.

### 1.5.2 Historic Buildings and Structures

- a. A map in 1:1000 scale showing the boundary of each historic building or structure.
- b. Photographic records of each historic building or structure.
- c. Detailed record of each historic building or structure including its construction year, previous and present uses, architectural characteristics, as well as legends, historic persons and events, and cultural activities associated with the structure.

### 1.5.3 Archaeological Sites

- 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.

- 1.5.4 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 the *Guidelines for Handling of Archaeological Finds and Archives (Appendix)*.

## (2) Impact Assessment

- 2.1 Culture heritage impact assessment must be undertaken to identify the impacts of the sites of cultural heritage which will be affected by the proposed development subject to the result of desktop research and field evaluation. The prediction of impacts and an evaluation of their significance must be undertaken by an expert in cultural heritage. During the assessment, both the direct impacts such as loss or damage of important features as well as indirect impacts such as change of ground water level which may affect the preservation of the archaeological and built heritage in situ should be stated. A detailed description and plans should be provided to elaborate to what extent the site of cultural heritage will be affected.
- 2.2 Preservation in totality must be taken as the first priority. Please refer to paragraph 4.3.1(c), item 2 of Annex 10, items 2.6 to 2.9 of Annex 19 and other relevant parts of the Technical Memorandum on Environmental Impact Assessment Process for the detailed requirements of the impact assessment.

## (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. Built heritage, sites and landscapes 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 heritage feature.
- 3.2 If avoidance of the cultural heritage is not possible, amelioration can be achieved by reduction of the potential impacts and the preservation of heritage features, such as physically relocating it. Measures like amendments of the sitting, screening and revision of the detailed design of the development are required to lessen its degree of exposure if it causes visual intrusion to the cultural heritage and affecting its character.
- 3.3 All the assessments should be conducted by an expert in cultural heritage and further evaluated and endorsed by the Antiquities and Monuments Office and the Antiquities Advisory Board.
- 3.4 Besides refer to paragraph 4.3.1(d), items 2.10 to 2.14 of Annex 19 and other relevant parts of the Technical Memorandum. Proposals for mitigation measures should be accompanied with a master layout plan together with all detailed treatment, elevations,

and landscape plan. A rescue programme, when required, may involve preservation of the historic building or structure together with the relics inside, and its historic environment through relocation, detailed cartographic and photographic survey or preservation of an archaeological site “by record”, i.e. through excavation to extract the maximum data as the very last resort.

- 3.5 The programme for implementation of agreed mitigation measures should be able to be implemented. It is to be clearly stated in the EIA report, as required in Annex 20 of the Technical Memorandum. In particular, item 6.7 of Annex 20 requires to define and list out clearly the proposed mitigation measures to be implemented, by whom, when, where, to what requirements and the various implementation responsibilities. A comprehensive plan and programme for the protection and conservation of the partially preserved Site of Cultural Heritage, if any, during the planning and design stage of the proposed project must be detailed.

**Appendix D**

**IMPLEMENTATION SCHEDULE**

EIA* Ref.	EM&A Log Ref.	Environmental Protection Measures*	Location/Duration of measures/  Timing of completion of measures	Implementation  Agent	Implementation Stage **				Relevant Legislation & Guidelines
					Des	C	O	Dec	

\* All recommendations and requirements resulted during the course of EIA Process, including ACE and/or accepted public comment to the proposed project.

\*\* Des=Design; C=Construction; O=Operation; Dec=Decommissioning