

Environmental Impact Assessment Ordinance (Cap. 499) Section 5 (7)**Environmental Impact Assessment Study Brief No. ESB-203/2009****Project Title: Trunk Road T2
(hereinafter known as the “Project”)****Name of Applicant: Civil Engineering and Development Department
(hereinafter known as the “Applicant”)****1. BACKGROUND**

- 1.1 An application (No.ESB-203/2009) for an Environmental Impact Assessment (EIA) study brief under section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 24 March 2009 with a project profile (No.PP-379/2009) (hereinafter referred as “the Project Profile”).
- 1.2 The Applicant proposes to construct and operate Trunk Road T2, a dual two-lane trunk road connecting the Central Kowloon Route (CKR) and Tseung Kwan O-Lam Tin Tunnel (TKO-LT Tunnel). Trunk Road T2, together with the proposed CKR and TKO-LT Tunnel, will form Route 6 in the strategic road network to provide an east-west express link between West Kowloon and Tseung Kwan O. The indicative alignment of the Project, as shown in the Project Profile, is reproduced in Figure 1 of this Study Brief. The construction and operation of the Project will comprise:
 - a) a dual two-lane trunk road of approximately 3.6 kilometre (km) long and about 2.6 km of the trunk road in the form of a tunnel;
 - b) dredging for the installation of immersed tube tunnel and other marine works mentioned in (c) below;
 - c) temporary reclamation for construction of the landfalls of the tunnel, temporary relocation of existing breakwaters of Kwun Tong Typhoon Shelter, and reconstruction of sewage submarine outfall at the Kwun Tong Preliminary Treatment Works;
 - d) ventilation and administration buildings and traffic control and surveillance system; and
 - e) the associated civil, electrical, mechanical, landscaping and environmental protection and mitigation works.
- 1.3 The Project consists of designated project elements including Items A.1, A.7 and F.6 Part I under Schedule 2 of the EIAO. The Project may also include changes to associated roads and other facilities that constitute material change(s) to exempted project(s) including relocation of existing breakwaters, and other designated project(s), e.g. dredging, temporary reclamation, to be identified under Section 2.1(ii) below.
- 1.4 Pursuant to section 5(7)(a) of the EIAO, the Director of Environmental Protection (the Director) issues this Environmental Impact Assessment (EIA) study brief to the Applicant to carry out an EIA study.

- 1.5 The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities taking place concurrently. This information will contribute to decisions by the Director on:
- (i) the overall acceptability of adverse environmental consequences that are likely to arise as a result of the Project and associated works;
 - (ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
 - (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.
- 1.6 Part of the Project site falls within the south apron area of the former Kai Tak Airport. The Applicant shall liaise with the relevant parties regarding the progress of the decommissioning of the south apron of the former Kai Tak Airport (which is under the control of the Environmental Permit No. EP-285/2008) to confirm the former airport area along the alignment of the Project is decommissioned / remediated before the commencement of the construction of the Project.

2. OBJECTIVES OF THE EIA STUDY

- 2.1 The objectives of the EIA study are as follows:
- (i) to describe the Project, associated works, and option(s) of alignment together with the requirements for carrying out the Project;
 - (ii) to identify any individual designated project element(s) under Schedule 2 of the EIAO and / or any work elements under this Project that constitute material change(s) to exempted project(s) under the EIAO; to ascertain whether the EIA Study has adequately addressed the environmental impacts of these projects; and when necessary, to identify the outstanding issues that need to be addressed in any further EIA study;
 - (iii) to identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment and the associated environmental constraints;
 - (iv) to present the consideration of alternative(s) to avoid or minimize the potential environmental impacts on sensitive receivers; to compare the environmental benefits and dis-benefits of the option(s) (including project alignment, built forms, construction / tunnelling methods, ventilation building / tunnel portal (if any) location) ; to provide justifications and constraints for selecting the preferred option(s) and to describe the part environmental factors played in the selection;
 - (v) to identify and assess air quality impacts, noise impacts, water quality impacts, waste management implications, landscape and visual impacts, marine ecological impacts, fisheries impacts and marine archaeology impacts; 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 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 measures) and the cumulative effects expected to arise during the construction and operation of the Project in relation to the sensitive receivers and potential affected uses;
 - (viii) to identify, assesses and specify methods, measures and standards, to be included in the detailed design, construction and operational stages of the Project which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to acceptable levels;
 - (ix) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and
 - (x) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The Purpose

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 the Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance (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 proposed in the Project Profile (No. PP-379/2009) and shall include the major elements mentioned in Section 1.2 of this Study Brief. The EIA study shall clearly present the scope of the Project, including at least the scope of the new trunk road and the associated works, any dredging / filling works, any sewage outfall reconstruction works, any breakwater relocation works, any reclamation works¹ including temporary reclamation under the Project.

3.2.2 The EIA study shall provide information and address the key issues described below, together with any other key issues identified during the course of the EIA study. The EIA study shall address the cumulative environmental impacts of the Project including interaction or in combination with other existing, committed, planned and known potential developments in the vicinity of the Project, including at least the “TKO-LT Tunnel”, “CKR”, “Kai Tak Development” (including “Dredging for the Cruise Terminal at Kai Tak Runway”), “Shatin to Central Link” and “Installation of Submarine Gas Pipelines from Ma Tau Kok to North Point for Former Kai Tak Airport Development”:

- (i) the potential air quality impacts, including, at least, construction dust, vehicular emissions from open roads, tunnel portal (if applicable) and tunnel ventilation systems on the sensitive receivers during construction and operation of the Project;

¹ Any proposed reclamation should be considered in the context of the Protection of Harbour Ordinance (Cap. 531), giving due consideration to the judgement of the Court of Final Appeal of 9 January 2004 and the judgement of Court of First Instance of 20 March 2008.

- (ii) the potential noise impacts, including traffic noise, fixed noise sources, construction noise, ground borne noise, if applicable, on sensitive receivers during the construction and operation of the Project;
- (iii) the potential water quality impact during construction and operation of the Project, in particular impacts from the proposed marine works, including any dredging, filling, temporary reclamation, sewage outfall reconstruction, breakwater relocation, immersed tube tunnel and the associated on-site or off-site casting yard /dry dock casting yard and mooring site, and marine barging points/facilities (if any); and from the extraction of groundwater, construction site runoff, etc. on the existing and planned water sensitive receivers;
- (iv) the potential impacts of various types of waste arising, including the dredged marine sediment during dredging, reclamation and other marine works; the excavated materials from the tunnel construction; and other types of wastes to be generated from the Project;
- (v) the potential visual and landscape impact caused by the construction and operation of the Project including the elevated/at-grade roads and associated noise mitigation measures and the above ground structures such as ventilation buildings, administration building and portals if any;
- (vi) the potential impacts on the marine archaeological resources during the construction of the Project; and
- (vii) the potential marine ecological and fisheries impacts arising from the construction of the Project.

3.3 Description of Alignment Options and Construction Methods Considered

3.3.1 The Background Information of the Project

The Application shall provide information on the background for the construction and operation of this Project and provide plan(s) of at least 1:5000 to clearly present the scope of the project, the project boundary and the associated works areas / works site location. The Applicant shall explain clearly the purpose and objectives of the Project, shall include a description of the potential environmental benefits of the Project, and describe the scenarios with and without the Project.

3.3.2 Consideration of Alternative Option(s) for Alignment and Built-form(s), Ventilation Building(s) and Portal

In addition to the proposed alignment and location set out in the Project Profile, the Applicant shall describe the considerations given, when exploring various feasible alternative option(s) for alignment, built-form, ventilation building and portal (if any) locations and design of road to avoid and minimize adverse environmental impacts, taking into account previous studies, any lessons learned from other similar projects. A comparison of the environmental benefits and dis-benefits of feasible alternative option(s) shall be presented to assist informed-decisions to be made on the recommended preferred option to avoid or minimize the adverse environmental effects to the maximum practicable extent.

Operational consideration(s) and other constraint(s) affecting the selection of the preferred option shall also be stated. The consideration(s) given in the design and location of the ventilation buildings and portal (if any) shall also be provided to justify the selection of the preferred option.

3.3.3 Consideration of Alternative Construction Methods and Sequences of Works

Taking into consideration the potential cumulative effects during the construction period and the extent and level of the construction impacts on affected sensitive receivers, the EIA study shall describe considerations given, when exploring various feasible alternative construction methods (including at least the use of cut and cover, drill and blast, Tunnel Boring Machine, immersed tube tunnel) and sequences of works, work sites / works area locations for the Project, to avoid prolonged adverse environmental impacts to the maximum practicable extent.

A comparison of the environmental benefits and dis-benefits of applying different construction methods, sequence of works, and works areas/work sites (if any) locations shall be made and presented in the EIA report.

3.3.4 Selection of Preferred Options

Taking into consideration of the findings from Sections 3.3.2 and 3.3.3 above, the Applicant shall provide the recommendations and justifications for the preferred option that will avoid or minimize adverse environmental effects arising from the construction and operation of the Project, and shall adequately describe the part that environmental factors played in arriving at the final selection.

3.3.4 Description of the Project

The Applicant shall describe the Project in detail, including at least the Project alignment, location, design of ventilation buildings/administration building, the extent of the dredging and temporary reclamation, the alignment of the “reconstructed” section of the sewage submarine outfall and the “relocated” breakwater, the construction programme, the work areas / works site requirements and their locations, the requirement for dry dock casting yard / mooring site (if applicable) for the immersed tube tunnel construction, the form of construction and construction method for various work element of the Project. The information should aim at providing sufficient details to facilitate the assessment of various environmental impacts.

3.4 **Technical Requirements**

3.4.1 The Applicant shall conduct the EIA study to address the environmental aspect of the activities as described in Sections 3.1, 3.2 and 3.3 above. The assessment shall be based on the best and latest information available during the course of the EIA Study.

3.4.2 The Applicant shall clearly state in the EIA report the time frame and work programmes of the Project and other concurrent projects, including, at least those mentioned in Section 3.2.2, and assess the cumulative environmental impacts from the Project with all interacting projects, including any staged implementation of the Project.

3.4.3 The Applicant shall review previously approved studies and EIA reports which are relevant to the Project and extract relevant information for the purpose of this EIA Study, including at least the following:

- (i) Kai Tak Development EIA (EIAO Register No. AEIAR-130/2009)
- (ii) Decommissioning of Former Kai Tak Airport Other than North Apron (EIAO Register No. AEIAR- 114/2007)
- (iii) Dredging Works for Proposed Cruise Terminal at Kai Tak (EIAO Register No. AEIAR – 115/2007)
- (iv) Kai Tak Airport North Apron Decommissioning EIA Report (EIAO Register No. AEIAR –002/1998)

- (v) Comprehensive Feasibility Study for the Refined Scheme of South East Kowloon Development (EIAO Register NO. AEIAR-044/2001)
- (vi) Further Development of Tseung Kwan O Feasibility Study (EIAO Register No. AEIAR -092/2005)

3.4.4 The EIA study shall meet the following technical requirements on specific impacts:

3.4.5 Air Quality Impact

3.4.5.1 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.

3.4.5.2 The Applicant shall assess the air pollutant concentrations in accordance with the Guidelines for Local-Scale Air Quality Assessment Using Models given in Appendices A-1 to A-3 of this Study Brief, or other methodology as agreed by the Director (with reference to S4.4.2(c) of TM) prior to the commencement of the assessment.

3.4.5.3 The air quality impact assessment shall include the following:

(i) Determination of Assessment Area

The assessment area for air quality impact assessment shall generally be defined by a distance of 500 metres from the boundary of the Project and from any work sites proposed under the Project, which shall be extended to include major existing and planned/committed air pollutant emission sources including tunnel portal/ventilation building(s) of CKR and TKO-LTT, industrial uses in Kwun Tong and Kowloon Bay Area, that may have a bearing on 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, such as description of the types of activities of the Project that may affect air quality during both construction and operation stages.

(b) Give an account, where appropriate, of the works/measures that had been taken into consideration in the planning of the Project to abate the air pollution impact. That is, the Applicant shall consider alternative construction methods/phasing programmes and alternative modes of operation to minimize the constructional and operational air quality impact respectively.

(c) Present the background air quality levels in the assessment area for the purpose of evaluating the cumulative constructional and operational air quality impacts due to the Project.

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

(a) Identify and describe representative existing and planned/committed ASRs that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department. In identifying planned ASRs, reference shall also be made to the Recommended Outline Development Plan for Kai Tak Development. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map showing the location and description

including the name of buildings, their use and height of the selected assessment points shall be given. Separation distances of these ASRs from the nearest emission sources shall also be given.

- (b) Identify and present a list of air pollutant emission sources, including any nearby emission sources which are likely to have impact related to the Project based on the analysis of the constructional and operational activities in sub-section 3.4.5.3(ii) above. Example of construction stage emission sources include stock piling, blasting, concrete batching and vehicular movements on unpaved haul roads within the Project site etc. Example of potential operational stage emission sources include vehicular emissions from open roads, ventilation buildings, portal (if any).

Confirmation regarding the validity of the assumptions adopted and the magnitude of the activities (e.g. volume of construction material handled, traffic mix and volume on a road) shall be obtained from the relevant government departments / authorities and documented.

- c) 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.

(iv) Construction Phase 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 that the Project and, if applicable, the Project together with concurrent projects within the assessment area of the air quality assessment, will give rise to significant construction dust impacts likely to exceed the recommended limits in the TM at the ASRs despite the incorporation of the dust control measures proposed in accordance with sub-section 3.4.5.3(iv)(a) above, a quantitative assessment should be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in sub-section 3.4.5.3(vi) below when carrying out the quantitative assessment.

(v) Operational Phase 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 under normal operating conditions. The evaluation shall be based on the strength of the emission sources identified in sub-section 3.4.5.3(iii)(b) above. The Applicant shall follow sub-section 3.4.5.3(vi) below when carrying out the quantitative assessment.
- (b) The air pollution impacts of future road traffic shall be calculated based on the highest emission strength from the road within the next 15 years upon commencement of operation of the Project. 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. The traffic flow data and assumptions that are used in the assessment shall be clearly and properly documented in the EIA report.

- (c) For the vehicular tunnel and any full enclosures proposed in the Project, it is the responsibility of the Applicant to ensure that the air quality inside these proposed structures comply with EPD's "*Practice Note on Control of Air Pollution in Vehicle Tunnels*". When assessing air quality impact due to emissions from the tunnel / 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 the tunnel / full enclosures; and such assumptions shall be clearly and properly documented in the EIA report.

(vi) Quantitative Assessment Methodology

- (a) The Applicant shall apply the general principles enunciated in the modelling guidelines in Appendices A-1 to A-3 while making allowance for the specific characteristics of the Project. This 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 air pollutant emission rates for input to the modelling and a map showing 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 submission. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details should be sought.
- (b) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentration) to be evaluated and provide explanation for choosing these parameters for the assessment of the impact of the Project.
- (c) The Applicant shall calculate the cumulative air quality impact at the ASRs identified under sub-section 3.4.5.3(iii)(a) and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table and pollution contours, to be evaluated against the relevant air quality standards and on any effect they may have on the land use implications. Plans of a suitable scale should be used to present pollution contour to allow buffer distance requirements to be determined properly.
- (d) If there are any direct noise mitigation measures recommended in the study, the air quality implication due to these measures shall be assessed. For instance, if barriers that may affect the dispersion of air pollutants are proposed, then the implications of such measures 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 mitigation measures (where applicable), be they barriers, road enclosures and their portals, and affected ASRs on the 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 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.

(viii) Submission of Model Files

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

3.4.6 Noise Impact

3.4.6.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing both the construction and operational noise impacts arising from the Project, as stated in Annexes 5 and 13 of the TM, respectively.

3.4.6.2 The noise impact assessment shall include the following:

(i) Determination of Assessment Area

The assessment area for the noise impact assessment shall generally include areas within a distance of 300 metres from the boundary of the Project. Subject to the agreement of the Director, the assessment area could be reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the outer Project boundary, 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 300m from the boundary of the Project if they may be affected by the construction and operation of the Project. The assessment area for the construction noise impact assessment shall also cover areas within 300m of any work sites proposed under the Project.

(ii) Provision of Background Information and Existing Noise Levels

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

(iii) Identification of Noise Sensitive Receivers

(a) The Applicant shall refer to Annex 13 of the TM when identifying the representative NSRs. The NSRs shall include existing NSRs and planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans, Outline Development Plans, Layout Plans and other relevant published land use plans. In identifying planned NSRs, reference shall also be made to the Recommended Outline Development Plan for Kai Tak Development. Photographs of the representative existing NSRs shall be appended to the EIA report.

(b) The Applicant shall select assessment points to represent the 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 and may be varied subject to the best and latest information available during the course of the EIA study. 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 purposes. However, such assumptions together with any site specific constraints identified, such as setback of building, building orientation, extended podium, shall be considered practicable, feasible and agreeable for implementation by relevant 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 assumed for assessing construction noise associated with, for example tunnelling and other construction works, and traffic flow / fixed plant equipment such as tunnel ventilation systems for operational noise assessment. Confirmation of the validity of the inventory shall be obtained from the relevant government departments/authorities and documented in the EIA report.

(v) Construction Noise Assessment

- (a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and other relevant concurrent projects in the vicinity 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 paragraphs 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 minimise 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 shall be carried out, as far as practicable, outside the sensitive hours of 7 p.m. to 7 a.m. on Monday to Saturday and any time on a general holiday, including Sunday. For blasting that must be carried out during the above-mentioned sensitive hours, the noise impact associated with the removal of debris and rocks shall be fully assessed and adequate mitigation measures shall be recommended to reduce the noise impact as appropriate.
- (d) For tunnelling, 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 equipment such as a tunnelling boring machine is used and it is likely that the ground-borne noise will affect NSRs, the criteria and assessment methodology/model for assessing ground-borne noise impact shall be agreed with the Director prior to obtaining the empirical parameters required in the ground-borne noise model, with reference to Section 4.4.2(c) of the TM, and documented in the EIA report. Cumulative impacts with other projects shall be covered if appropriate. Site measurements at appropriate locations may be required in order to obtain the empirical input parameters required in the ground-borne noise model.
- (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 construction methods, re-scheduling and restricting hours of operation of noisy tasks) to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance at the affected NSRs 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 shall 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) Road Traffic Noise

(a1) Calculation of Noise Levels

The Applicant shall analyse the scope of the proposed road alignment(s) to identify the road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO and other road sections for the purpose of traffic noise impact assessment. In determining whether the traffic noise impact due to a road improvement project/ work is considered significant, detailed information with respect to factors including at least change of nature of road, change of alignment and change of traffic capacity or traffic composition shall be assessed. The traffic noise impact shall be considered significant if the traffic noise level with the road project is greater than that without the road project at the design year by 1.0 dB(A) or more. Figures showing extents of the road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO and other road sections shall be provided in the EIA report.

The Applicant shall calculate expected road traffic noise using methods described in the U.K. Department of Transport's "*Calculation of Road Traffic Noise*" (1988). Calculations of future road traffic noise shall be based on peak hour traffic flow in respect of maximum traffic projection within a 15 years period upon commencement of operation of the Project. The Applicant shall calculate traffic noise levels in respect of each road section and the overall noise levels from combined road sections (road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO and other road sections) at NSRs.

The EIA report shall contain sample calculations and input parameters for at least 10 assessment points as requested by the Director. Furthermore, the Applicant shall provide the input data set of the traffic noise model in the format of electronic files in the EIA. The Applicant shall prepare and provide drawings (i.e., road-plots of the traffic noise model) of appropriate scale to show the road segments, topographic barriers, and assessment points of sensitive receivers input into the traffic noise model.

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

- (1) unmitigated scenario at assessment year;
- (2) mitigated scenario at assessment year; and
- (3) prevailing scenario for indirect technical remedies eligibility assessment;

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

(a2) Presentation of Noise Levels

The Applicant shall present the prevailing and future noise levels in L10 (1 hour) at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale.

A quantitative assessment at the NSRs for the road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO shall be carried out and compared against the criteria set out in Table 1A of Annex 5 of the TM. The potential noise impact of road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO shall be quantified by estimating the total number of dwellings, classrooms and other noise sensitive elements that will be exposed to noise levels exceeding the criteria set in Table 1A of Annex 5 in the TM.

(a3) Proposals for Noise Mitigation Measures

After rounding of the predicted noise levels according to the U.K. Department of Transport's "*Calculation of Road Traffic Noise*" (1988), the Applicant shall propose direct mitigation measures in all situations where the predicted traffic noise level due to the road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO, exceeds the criteria 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, Annex 13 of the TM, including the option of alternative land use arrangement, shall be thoroughly explored and evaluated with a view to reducing the noise level at the NSRs concerned to the level meeting the relevant noise criteria. Also, the feasibility, practicability, programming and effectiveness of the recommended mitigation measures should be assessed in accordance with section 4.4.2(k) of the TM. Specific reasons for not adopting certain direct mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for NSRs as far as possible shall be clearly and specifically quantified and laid down in the EIA report.

Sections of barriers proposed to protect existing NSRs shall be differentiated clearly from those proposed for the protection of future or planned NSRs as the latter is only required to be constructed before the occupation of the planned NSRs. To facilitate the phased implementation of the barriers under this principle, a barrier inventory showing intended NSRs (i.e. existing NSRs as distinct from planned NSRs) to be protected by different barrier sections to achieve different extent of noise reduction (to be quantified in terms of how many dB(A)) should be provided.

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

The total number of dwellings, classrooms and other noise sensitive elements that will still be exposed to noise levels above the criteria with the implementation of all recommended direct mitigation measures shall be quantified.

The Applicant shall provide, in the EIA report information of recommended noise mitigation measures (including at least barrier types, nominal dimensions at different cross-sections, extents/locations, lengths, mPD levels of barriers) in the format as agreed by the Director (including electronic format).

In case where a number of NSRs cannot be protected by the recommended direct

mitigation measures, the Applicant shall identify and estimate the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect technical remedies, the associated costs and any implications for such implementation. For the purpose of determining eligibility of the affected premises for indirect technical remedies, reference shall be made to the following set of three criteria:

- (1) the predicted overall noise level at the NSR from the road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO 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 L10(1hr));
- (2) the predicted overall noise level at the NSR is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road were commenced; and
- (3) the contribution from the road sections within the meaning of Items A.1 and A.7 of Schedule 2 of the EIAO to the increase in predicted overall noise level at the NSR must be at least 1.0dB(A).

(b) Fixed Noise Sources

(b1) Assessment of Fixed Source Noise Levels

The Applicant shall assess the noise impacts from the operation of tunnel ventilation systems and other fixed noise sources identified in sub-section 3.4.6.2 (iv) above and calculate the expected noise level at the NSRs using standard acoustics principles. Calculations for the expected noise level 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 intermittency 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 NCO.

(b2) Presentation of Noise Levels

The Applicant shall present the noise levels in $L_{eq(30min)}$ 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.

(b3) Proposals for Noise Mitigation Measures

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

(vii) Assessment of Side Effects and Constraints

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

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

For planned noise sensitive uses which will still be affected even with all practicable direct mitigation measures in place, the Applicant shall propose, evaluate and confirm the practicality of additional measures within the planned noise sensitive uses and shall

make recommendations on how these noise sensitive uses will be designed for the information of relevant parties.

The Applicant shall take into account agreed environmental requirements / constraints identified by the EIA study to assess the development potential of concerned sites which shall be made known to the relevant parties.

3.4.7 Water Quality Impact

3.4.7.1 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.

3.4.7.2 The EIA report shall cover the following:

- (a) The water quality impacts associated with marine works, for example, dredging, backfilling, temporary reclamation, relocation of temporary breakwater, reconstruction of sewage submarine outfall, any dry dock casting yard, any mooring site and transportation of immersed tube sections within Hong Kong Special Administrative Region (HKSAR) for the construction of the Project;
- (b) The water quality impacts of other construction works, including at least construction site run-off, effluents generated from dewatering associated with piling activities, grouting, concrete washing and dewatering of spoil from any type of tunnel construction operations;
- (c) The water quality impacts of the road runoff containing oil/grease and suspended solids during the operational stage; and
- (d) The water quality impacts and the proposed monitoring and audit programme on the water quality at the seawater intakes of the seawater pumping stations of the Water Supplies Department and seawater intakes of cooling systems, if applicable.

3.4.7.3 The assessment area shall include the Victoria Harbour Water Control Zone (WCZ), the Eastern Buffer WCZ and the Western Buffer WCZ as declared under the Water Pollution Control Ordinance, any areas within a distance of 300m from either side and along the full length of the project boundary and from any Project related work sites. This study area may be extended to include other areas if they are found being impacted during the course of the EIA and have a bearing on the environmental acceptability of the Project.

3.4.7.4 The Applicant shall identify and analyse the physical, chemical and biological disruptions of marine water and coastal water arising from the construction and operation of the Project.

3.4.7.5 The Applicant shall predict, quantify and assess any water quality impacts arising from the Project on the water system(s) and the sensitive receivers by appropriate mathematical modelling and/or other techniques proposed by the Applicant and approved by the EPD. The mathematical modelling requirements are set out in Appendix B to this Study Brief. Possible impacts shall include but not limited to changes in hydrology, flow regime, sediment erosion and deposition pattern, water and sediment quality due to any dredging of marine sediment, backfilling activities, the construction of the immersed tube tunnel and other marine works, and the consequential effects on aquatic organisms due to such changes in affected water bodies including Victoria Harbour WCZ, the Eastern Buffer WCZ and the Western Buffer WCZ, and the waterbodies associated with the dry dock casting yard, if any.

- 3.4.7.6 The Applicant shall take into account and include likely different construction method(s), construction stages or sequences, and different operational stages of the Project in the assessment. The assessment shall have regard to the frequency, duration, volume and flow rate of discharges and their pollutant and sediment loading. The assessment shall address the following:
- (a) Collection and review of background information on the existing and planned water system(s) and sensitive receivers which may be affected by the Project during construction and operation;
 - (b) Characterization of water and sediment quality of the water system(s) and sensitive receivers which may be affected by the Project during construction and operation based on existing information or appropriate site surveys and tests;
 - (c) Identification and analysis of the existing and planned future activities and beneficial uses related to the water system(s) and identification of the water sensitive receivers. The Applicant shall refer to, *inter alia*, those developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans, the Recommended Outline Development Plan for Kai Tak Development;
 - (d) Identification of pertinent water and sediment quality objectives and establishment of other appropriate water and sediment quality criteria or standards for the water system(s) and the sensitive receivers in (a) and (c) above;
 - (e) Review of the construction sequences and methods, and operation of the Project to identify any alteration of existing shoreline, bathymetry and flow regimes;
 - (f) Identification and quantification of existing and likely future water and sediment pollution sources and loading. An emission inventory on the quantities and characteristics of these existing and likely future pollution sources in the study area shall also be provided. Field investigation and laboratory tests, as appropriate, shall be conducted to fill relevant information gaps;
 - (g) Identification and quantification of dredging, sediment/mud transportation, filling, disposal activities and requirements. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The potential for the release of contaminants during dredging shall be addressed using the chemical testing results derived from sediment and marine water samples collected on site and relevant historic data. Appropriate laboratory tests including elutriate tests and sediment pore water (interstitial water) analyses shall be performed on the sediment samples to simulate and quantify the degree of mobilization of various contaminants such as metals, ammonia, trace organic contaminants (including PCBs, PAHs, TBT and chlorinated pesticides) into the water column during dredging. The ranges of parameters to be analysed; the number, location, depth of sediment, type and methods of sampling; sample preservation; and chemical laboratory test methods to be used shall be subject to the approval of EPD. The Applicant shall also assess the pattern of the sediment deposition and the potential increase in turbidity and suspended solid levels in the water column and at the sensitive receivers due to the disturbance of sediments during dredging;
 - (h) Review of the designs and constructions methods and operation of the dry dock casting yard and concrete batching plant if any. Details including but are not limited to location of dredging and backfilling and their working rates, volumes and characteristics of marine sediment and fill materials to be dredged and

backfilled respectively, equipment to be used should also be provided. The Applicant shall devise assessment methodology for EPD agreement. Water quality modelling assessment shall be required if major marine work is involved;

- (i) Prediction and quantification of impacts on the water system(s) and the sensitive receivers likely to be affected by the alterations and changes identified in (e) above and the pollution sources identified in (f) above. The Applicant shall assess both the local and global effects on erosion, resuspension, sediment dispersion and water quality due to any dredging of marine sediment, backfilling activities, the construction of the immersed tube tunnel and other marine works. The location, nature, extent and rate of such works shall be clearly identified and evaluated. The assessment shall also take into account the additional pollution loading and oxygen demand exerted by sediment disturbed during construction stage;
- (j) If contaminated groundwater arising is anticipated during the construction stage, the potential impacts shall be evaluated and properly addressed.
- (k) Assessment of the cumulative impacts due to other related concurrent and planned projects, activities or pollution sources along the identified water system(s) and water sensitive receivers, that may have a bearing on the environmental acceptability of the Project, through mathematical modelling. This shall include the potential cumulative construction and operational water quality impact arising from, *inter alia*, the project components highlighted in Section 3.2.2 above; and
- (l) The Applicant shall devise mitigation measures to avoid or minimize the impacts identified above, in particular suitable mud dredging and disposal methods shall be recommended to mitigate any adverse impacts. The residual impacts on the water system(s) and the sensitive receivers with regard to the relevant water and sediment quality objectives, criteria, standards or guidelines shall be assessed and quantified using appropriate mathematical models as set out in Appendix B of this Study Brief.

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, based on the sequence and duration of these activities. The Applicant shall adopt appropriate design, general layout, construction methods and programme to minimize the generation of public fill/inert construction and demolition (C&D) materials and maximize the use of public fill/inert C&D materials for other construction works.

(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 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 methods/options for each type of waste shall be described in detail. The disposal methods/options recommended for each type of waste shall take into account of the result of the assessment in (c) below; and
- (c) The impact caused by handling (including labelling, packaging & storage), collection, transportation 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.
- (iii) Dredging/ Excavation, Filling and Dumping
- a) The Applicant shall identify and quantify as far as practicable of all dredging/excavation, fill extraction, filling, reclamation, sediment/mud transportation and disposal activities and requirements. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests and document in the EIA report for consideration. The categories of sediment/mud which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any serious contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility. The Applicant shall provide supporting document, such as agreement by the relevant facilities management authorities, to demonstrate the viability of any treatment/disposal plan.
- b) The Applicant shall identify and evaluate the practical dredging/excavation methods to minimize dredging/excavation and dumping requirements and demand for fill sources based on the criterion that existing sediment / mud shall be left in place and not to be disturbed as far as practicable.

3.4.9 Landscape and Visual Impact

- 3.4.9.1 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 any above ground structures, such as the ventilation buildings, administration building, tunnel portal (if any), elevated / at grade roads and any noise barriers proposed in the EIA study, and work sites/areas associated with the Project during both construction and operation stages.
- 3.4.9.2 The assessment area for the landscape impact assessment shall include areas within 100 metres from the boundary of the Project and the proposed off-site work sites (if any). The assessment area for the visual impact assessment shall be defined by the

visual envelope of the Project. The defined visual envelope shall be shown on a plan and documented in the EIA report.

- 3.4.9.3 The Applicant shall review relevant Outline Development Plans, Outline Zoning Plans, Layout Plans, Recommended Outline Development Plan for Kai Tak Development, planning briefs and studies which may identify areas of high landscape value and visually sensitive areas. Any guidelines and reports on landscape strategies, landscape framework, urban and landscape design concept, building height profiles, designated view corridors, special design areas, landmarks, open space network, streetscape and landscape links that may affect the appreciation of the Project should also be reviewed. The aim is to gain an insight to the future outlook of the area affected so as to assess whether the project can fit into surrounding setting. Any conflict with published land use plan(s) should be highlighted and appropriate follow-up action should be recommended.
- 3.4.9.4 The Applicant shall describe, appraise, analyze and evaluate the existing and planned landscape resource and character of 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. Tree survey information should be included. The assessment shall be particularly focused on the sensitivity of the landscape framework and its ability to accommodate change. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape settings. The landscape impact assessment shall quantify the potential landscape impacts as far as possible, so as to illustrate the significance of such impacts arising from the Project. Clear mapping of the landscape impact is required.
- 3.4.9.5 The Applicant shall assess the visual impacts of the Project. For above ground structures of the Project, clear illustrations including mapping of visual impact is required. The assessment shall include the following:
- (i) Identification and plotting of visual envelop of the Project within the assessment area;
 - (ii) Identification of the key groups of sensitive receivers within the visual envelope and their views at both ground level and elevated vantage points;
 - (iii) Description of the visual compatibility of the Project with the surrounding, and the 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 the sensitivity of receivers and the magnitude of changes. Propose mitigation measures specific to the Project to address the visual impacts. The visual impacts of the Project with and without mitigation measures shall also be included; and
 - (v) Clear evaluations and explanation with supportive arguments of all relevant factors considered in arriving the significance thresholds of visual impact.
- 3.4.9.6 The Applicant shall evaluate the merits of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. In addition, alternative alignment, design of Project-related structures 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 should also include consideration of potential enhancement of existing landscape. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design.

- 3.4.9.7 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/reprovisioning of amenity areas and open spaces, avoidance and minimization of noise barriers, alternative designs of structures, provision of finishes to structures, colour scheme and texture of material used and any measures to mitigate the impact on existing land use. 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. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.
- 3.4.9.8 Annotated illustration materials such as coloured perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points, and computer-generated photomontage shall be adopted to illustrate the landscape and visual impacts of the Project. In particular, the landscape and visual impacts of the Project with and without mitigation measures shall also be properly illustrated in existing and planned setting by computer-generated photomontage so as to demonstrate the effectiveness of the proposed mitigation measures.

3.4.10 Impact on Cultural Heritage

- 3.4.10.1 The Applicant shall engage a qualified marine archaeologist to conduct a marine archaeological review based on the best available information to identify whether there is any possible existence of sites or objects of cultural heritage within the seabed that will be affected by the marine works of the Project, whether the identified issues can be mitigated and whether there is a need for more detailed investigation. The review should take into account the results of previous marine archaeological investigations, the dredging history and other diving records. The need for more detailed investigation and the programme for investigation should be agreed with the Antiquities and Monuments Office. If marine archaeological potential is identified and the need for further investigation is confirmed, a marine archaeological investigation shall be carried out to ascertain the marine archaeological value of the affected seabed area. The guidelines for the MAI are set out in the Appendix C of this Study Brief. If significant archaeological remains are discovered, appropriate mitigation measures shall be designed for implementation.

3.4.11 Marine Ecology Impact

- 3.4.11.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing ecological impacts as set out on Annexes 8 and 16 of the TM respectively.
- 3.4.11.2 The assessment area shall be the same as the water quality impact assessment or the area likely to be impacted by the Project.
- 3.4.11.3 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. The assessment shall identify and quantify as far as possible the potential ecological impacts associated with the Project including both directly by physical disturbance and indirectly by changes of water quality.
- 3.4.11.4 The assessment shall include the following:
- (i) review the findings of relevant studies and collate all the best available information regarding the ecological characters of the assessment area;
 - (ii) evaluate the information collected and identify any information gap relating to the

- assessment of potential ecological impacts to the aquatic environment;
- (iii) carry out necessary ecological field surveys including at least marine benthic, intertidal and dive surveys and investigations to verify the information gaps identified in (ii) above and fulfill the objectives of the EIA study. The survey area should cover the works area, the nearby marine waters and the proposed temporary sewage submarine outfall of the Kwun Tong Preliminary Treatment Works;
 - (iv) establish the general ecological profile and describe the characteristics of each habitat found; major information to be provided shall include:
 - (a) description of the physical environment;
 - (b) habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats/species in the assessment area with special attention to those with conservation interests, including at least the following:
 - coral communities (including all hard corals, octocorals and black corals);
 - marine benthic communities and intertidal habitat; and
 - any other habitats/species identified as having special conservation interest by this EIA study;
 - (c) ecological characteristics of each habitat type such as substrate, size, species present, dominant species found, species diversity and abundance, community structure, seasonal patterns and inter-dependence of the habitats and species and presence of any features of ecological importance (e.g. corals);
 - (d) representative colour photos of each habitat type and any important ecological features identified;
 - (e) species found that are rare, endangered and/or listed under local legislation, international conventions for conservation of habitats or Red Data books;
 - (v) describe all recognized sites of conservation importance including at least coral communities, marine benthic communities and intertidal habitat in the proposed dredging area and its vicinity and assess whether these sites will be potentially affected by the Project;
 - (vi) using suitable methodology and considering also other concurrent and planned projects to identify and quantify as far as possible any direct, indirect (e.g. changes in water quality, hydrodynamic properties, flow requires, sedimentation rates and patterns, hydrology, etc.), on-site, off-site, primary, secondary and cumulative ecological impacts (e.g. the concurrent dredging and/or reclamation of the subject T2 trunk road project, Kai Tak development and any other nearby projects to be identified in the future EIA) such as destruction of habitats, reduction of species abundance/ diversity, reduction of ecological carrying capacity and habitat fragmentation; and in particular the following:
 - (a) removal or disruption of potentially valuable benthic communities;
 - (b) deterioration or disturbance to sensitive marine ecological habitats/species, such as coral communities;
 - (c) deterioration of environmental quality (e.g. water quality) resulting from the Project and the subsequent impacts to the marine ecological resources and habitats.
 - (vii) demonstrate that the ecological impacts due to the Project are avoided to the maximum practicable extent;
 - (viii) evaluate the significance and acceptability of the ecological impacts identified using well-defined criteria;

- (ix) recommend all possible alternatives (such as modifications of dredging area, rate and methods) and practicable mitigation measures to avoid, minimize and/or compensate for the adverse ecological impacts identified;
- (x) 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;
- (xi) determine and quantify as far as possible the residual ecological impacts after implementation of the proposed mitigation measures;
- (xii) evaluate the severity and acceptability of the residual ecological impacts using well-defined criteria; and
- (xiii) review the need for and recommend any ecological monitoring programme required.

3.4.12 Fisheries Impact

- 3.4.12.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in the Main text, Annex 9 and Annex 17 of the TM.
- 3.4.12.2 The assessment area for fisheries impact shall be the same as that of the water quality impact assessment and include any areas likely to be impacted by the Project.
- 3.4.12.3 The assessment shall cover any potential impact on both capture and culture fisheries, arising from the Project.
- 3.4.12.4 The applicant shall conduct a review of existing information regarding the assessment area including previous studies. 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.
- 3.4.12.5 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 of 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 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.

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

- 3.4.13.1 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 shall be provided in the EIA report. 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 the related supporting documents shall be provided in the form of an Appendix to the EIA study report.

3.4.14 Impacts Summary

- 3.4.14.1 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.

3.4.15 Summary of Environmental Outcomes

- 3.4.15.1 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.

3.4.16 Environmental Monitoring and Audit (EM&A) Requirements

- 3.4.16.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A activities during the construction and operation phases of the Project and, if affirmative, to define the scope of the EM&A requirements for the Project.
- 3.4.16.2 Subject to the confirmation of the EIA study findings, the Applicant shall comply with the requirements as stipulated in Annex 21 of the TM.
- 3.7.16.3 The Applicant shall prepare a project implementation schedule (in the form of a checklist) containing the EIA study recommendations and mitigation measures with reference to the Project implementation programme.

4. DURATION OF VALIDITY

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

5. REPORT REQUIREMENTS

- 5.1 In preparing the EIA report, the Applicant shall refer to Annex 11 of the TM for the contents of an EIA report. The Applicant shall also refer to Annex 20 of the TM, which stipulates the guidelines for the review of an EIA report.
- 5.2 The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:
- (i) 50 copies of the EIA report in English and 80 copies of the executive summary (each bilingual in both English and Chinese) as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.
 - (ii) when necessary, addendum to the EIA report and the executive summary submitted in 5.2 (i) above as required under section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.
 - (iii) 20 copies of the EIA report in English and 50 copies of the executive summary (each bilingual in both English and Chinese) with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.
- 5.3 The Applicant shall, upon request, make additional copies of 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 Report 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 Report 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.

6. OTHER PROCEDURAL REQUIREMENTS

- 6.1 If there is any change in the name of Applicant for this EIA study brief during the course of the EIA study, the Applicant must notify the Director immediately.

- 6.2 If there is any key change in the scope of the Project mentioned in Section 1.2 of this EIA study brief and in Project Profile (No. PP-379/2009), the Applicant must seek confirmation from the Director in writing on whether or not the scope of issues covered by this EIA study brief can still cover the key changes, and the additional issues, if any, that the EIA study must also address. If the changes to the Project fundamentally alter the key scope of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief.

--- END OF EIA STUDY BRIEF ---

April 2009
Environmental Assessment Division,
Environmental Protection Department

Appendix A-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 exercises which are frequently called for as part of environmental impact assessment studies, this paper describes the usage and requirements of a few commonly used air quality models.

2. Choice of models

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

Model	
FDM	Applications 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'.

2.3 The models can be used to estimate both short-term (hourly and daily average) and long-term (annual average) ambient concentrations of air pollutants. The model results, obtained using appropriate model parameters (refer to Section 3) and assumptions, allow direct comparison with the relevant air quality standards such as the Air Quality Objectives (AQOs) for the relevant pollutant and time averaging period.

3. Model input requirements**3.1 Meteorological Data**

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

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

- Day time: stability class D; wind speed 1 m/s (at 10m height); worst-case wind angle; mixing height 500 m
- Night time: stability class F; wind speed 1 m/s (at 10m height); worst case wind angle; mixing height 500 m
- This is a common practice with using the CALINE4 model due to its inability to handle lengthy data set.

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

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

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

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

3.1.5 An additional parameter, namely, the standard deviation of wind direction, σ_θ , needs to be provided as input to the CALINE4 model. Typical values of σ_θ 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/m²) as required by the model should be clearly stated for verification. The physical dimensions, location, release height and any other emission characteristics such as efflux conditions and emission pattern of the sources input to the model should also correspond to site data.

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

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

3.3 Urban/Rural Classification

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

3.4 Surface Roughness Height

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

3.5 Receptors

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

3.6 Particle Size Classes

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

3.7 NO₂ to NO_x Ratio

The conversion of NO_x to NO₂ 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 NO₂:

- (a) Ambient Ratio Method (ARM) - assuming 20% of NO_x to be NO₂; or
- (b) Discrete Parcel Method (DPM, available in the CALINE4 model); or
- (c) Ozone Limiting Method (OLM) - assuming the tailpipe NO₂ emission to be 7.5% of NO_x and the background ozone concentration to be in the range of 57 to 68 µg/m³ depending on the land use type (see also EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts').

3.8 Odour Impact

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

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

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

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

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

3.9 Plume Rise Options

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

3.10 Portal Emissions

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

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

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

3.11 Background Concentrations

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

3.12 Output

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

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

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 ;V 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 A-2**Guidelines on Assessing the 'TOTAL' Air Quality Impacts**

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

1. Total Impacts - 3 Major Contributions

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

Primary contributions: project induced

Secondary contributions: pollutant-emitting activities in the immediate neighbourhood

Other contributions: pollution not accounted for by the previous two (Background contributions)

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

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

2.2 Secondary contributions

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

2.3 Background contributions

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

3. Background Air Quality - Estimation Approach**3.1 The approach**

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

3.2 Categorisation

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

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

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

3.3 Background pollutant values

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

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

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

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

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

3.4 Site categories

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

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

3.5 Provisions for 'double-counting'

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

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

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.

**Modelling Section, Air Policy Group
Environmental Protection Department
March 2000**

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

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

1. Background

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

2. Required Demonstration / Submission

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

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

- 2.2 To provide technical details of the proposed model, the proponent should submit documents containing at least the following information:
 - (i) mathematical formulation and data requirements of the model;
 - (ii) any previous performance evaluation of the model; and
 - (iii) a complete set of model input and output file(s) in commonly used electronic format.
- 2.3 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the

- situation under consideration. In cases where no Schedule 1 model is found applicable, the proponent must demonstrate that the proposed model passes the screening test as set out in USEPA Document "Protocol for Determining the Best Performing Model"
- 2.4 For cases where a Schedule 1 model is applicable to the project under consideration but an alternative model is proposed for use instead, the proponent must demonstrate either that
- (i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or
 - (ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document "Protocol for Determining the Best Performing Model"
- 2.5 Should EPD find the information on technical details alone sufficient to indicate the acceptability of the proposed model, information on further performance evaluation as specified in Sections 2.3 and 2.4 above would not be necessary.
- 2.6 If the proposed model is an older version of one of the Schedule 1 models or was previously included in Schedule 1, the technical documents mentioned in Section 2.2 are normally not required. However, a performance demonstration of equivalence as stated in Section 2.4 (i) would become necessary.
- 2.7 If EPD is already in possession of some of the documents that describe the technical details of the proposed model, submission of the same by the proponent is not necessary. The proponent may check with EPD to avoid sending in duplicate information.

**Modelling Section, Air Policy Group
Environmental Protection Department
March 2000**

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

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.

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

Appendix B

Hydrodynamic and Water Quality Modelling Requirements

Modelling software general

1. The modelling software shall be fully 3-dimensional capable of accurately simulating the stratified condition, salinity transport, and effects of wind and tide on the water body within the model area.
2. The modelling software shall consist of hydrodynamic, water quality, sediment transport and particle dispersion modules. All modules shall have been proven with successful applications locally and overseas.
3. The hydrodynamic, water quality and sediment transport modules shall be strictly mass conserved at all levels.
4. The assessment and modelling tool for spill events should be quantitative with proven applications locally or overseas.

Model details – Calibration & Validation

1. The models shall be properly calibrated and validated against applicable existing and/or newly collected field data before their use in this study in the Hong Kong waters, the Pearl Estuary and the Dangan (Lema) Channel. The field data set for calibration and validation shall be agreed with EPD.
2. Tidal data shall be calibrated and validated in both frequency and time domain manner.
3. For the purpose of calibration and validation, the model shall run for not less than 15 days of real sequence of tide (excluding model spin up) in both dry and wet seasons with due consideration of the time required to establish initial conditions.
4. In general the hydrodynamic models shall be calibrated to the following criteria:

<u>Criteria</u>	<u>Level of fitness with field data</u>
tidal elevation (@)	< 8 %
maximum phase error at high water and low water	< 20 minutes
maximum current speed deviation	< 30 %
maximum phase error at peak speed	< 20 minutes
maximum direction error at peak speed	< 15 degrees
maximum salinity deviation	< 2.5 ppt

@ Root mean square of the error including the mean and fluctuating components shall meet the criteria at no less than 80% of the monitoring stations in the model domain

5. The Applicant shall be responsible for acquiring/developing and calibration of the models for use in this study themselves. They might make reference to the models developed under the Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool (Agreement No. CE 42/97). They might also propose to use other models subject to agreement with EPD.

Model details – Simulation

1. The water quality modelling results shall be qualitatively explainable, and any identifiable trend and variations in water quality shall be reproduced by the model. The water quality model shall

- be able to simulate and take account of the interaction of dissolved oxygen, phytoplankton, organic and inorganic nitrogen, phosphorus, silicate, BOD, temperature, suspended solids, contaminants release of dredged and disposed material, air-water exchange, E. coli and benthic processes. It shall also simulate salinity. Salinity results simulated by hydrodynamic models and water quality models shall be demonstrated to be consistent.
2. The sediment transport module for assessing impacts of sediment loss due to marine works shall include the processes of settling, deposition and re-erosion. The values of the modelling parameters shall be agreed with EPD. Contaminants release and DO depletion during dredging and dumping shall be simulated by the model.
 3. The models shall at least cover the Hong Kong waters, the Pearl Estuary and the Dangan Channel to incorporate all major influences on hydrodynamic and water quality. A fine grid model may be used for detailed assessment of this study. It shall either be linked to a far field model or form part of a larger model by gradual grid refinement. The coverage of the fine grid model shall be properly designed such that it is remote enough so that the boundary conditions would not be affected by the project. The model coverage area shall be agreed with EPD.
 4. In general, grid size at the area affected by the project shall be less than 400 m in open waters and less than 75 m around sensitive receivers. The grid shall also be able to reasonably represent coastal features existing and proposed in the project. The Kai Tak Approach Channel shall have at least 4 grids across it to better resolve transverse variations of the Channel. The grid schematization shall be agreed with EPD.

Modelling assessment

1. The assessment shall include the construction and operation phases of the project. Where appropriate, the assessment shall also include maintenance dredging. Scenarios to be assessed shall cover the baseline condition and scenarios with various different options proposed by the Applicant in order to quantify the environmental impacts and improvements that will be brought about by these options. Corresponding pollution load, bathymetry and coastline shall be adopted in the model set up.
2. Hydrodynamic, water quality and sediment transport modules shall be run for (with proper model spin up) at least a real sequence of 15 days spring-neap tidal cycle in both the dry season and the wet season.
3. If assessment of accidental spillage is required, potential locations, quantities and rates of spill shall be identified and quantified. The spill modelling shall cover combinations of different tides, wind and season conditions. The methodology for modelling spill and scenarios to be covered should be agreed with EPD.
4. The results shall be assessed for compliance of Water Quality Objectives. Any changes in hydrodynamic regime shall be assessed. Daily erosion / sedimentation rate shall be computed and its ecological impact shall be assessed.
5. The impact on identified sensitive receivers shall be assessed.
6. Cumulative impacts due to other projects, activities or pollution sources within a boundary to the agreement of EPD shall also be predicted and quantified.

- END -

Appendix C**Guidelines for Marine Archaeological Investigation (MAI)**
(As at August 2008)

The standard practice for MAI should consist of four separate tasks, i.e. (1) Baseline Review, (2) Geophysical Survey, (3) Establishing Archaeological Potential and (4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief.

(1) Baseline Review

- 1.1 A baseline review should be conducted to collate the existing information in order to identify the potential for archaeological resources and, if identified, their likely character, extent, quality and value.
- 1.2 The baseline review will focus on known sources of archive data. It will include:

Geotechnical Engineering Office (GEO) - the Department holds extensive seabed survey data collected from previous geological research. I would consider removing this. I did not find them a good source of recent data. The technology has improved so much that the old data is limited value and quite a lot of archive data is commercially sensitive, so GEO were unwilling to release it. I think the Black Point project showed the need for current

 - a. Geotechnical Engineering Office (GEO) – the Department holds extensive seabed survey data collected from previous geological research.
 - b. Marine Department, Hydrographic Office - the Department holds a substantial archive of hydrographic data and charts.
 - c. The Royal Naval Hydrographic Department in the UK - the Department maintains an archive of all survey data collected by naval hydrographers.
 - d. Relevant government departments should be consulted in order to obtain the information of dredging history (if any) on the proposed project area. Area for sand dredging, mud disposal and allocated marine borrow area within Hong Kong should also be considered during the review.
- 1.3 The above data sources will provide historical records and more detailed geological analysis of submarine features which may have been subsequently masked by more recent sediment deposits and accumulated debris.

(2) Geophysical Survey

- 2.1 Extensive geophysical survey of the study area should deploy high resolution boomer, side scan sonar, and an echo sounder and multi beam swath bathymetry and high resolution multi beam sonar. The multi beam data must be presented as processed digital terrain models to facilitate the archaeological analysis. The data received from the survey would be analysed in detail to provide:
 - a. Exact definition of the areas of greatest archaeological potential.
 - b. Assessment of the depth and nature of the seabed sediments to define

which areas consist of suitable material to bury and preserve archaeological material.

- c. Detailed examination of the boomer and side scan sonar records to map anomalies in and on the seabed which may be archaeological material.
- d. Detailed examination of the multi beam swath sonar data to assess the archaeological potential of the sonar contacts.

(3) Establishing Archaeological Potential

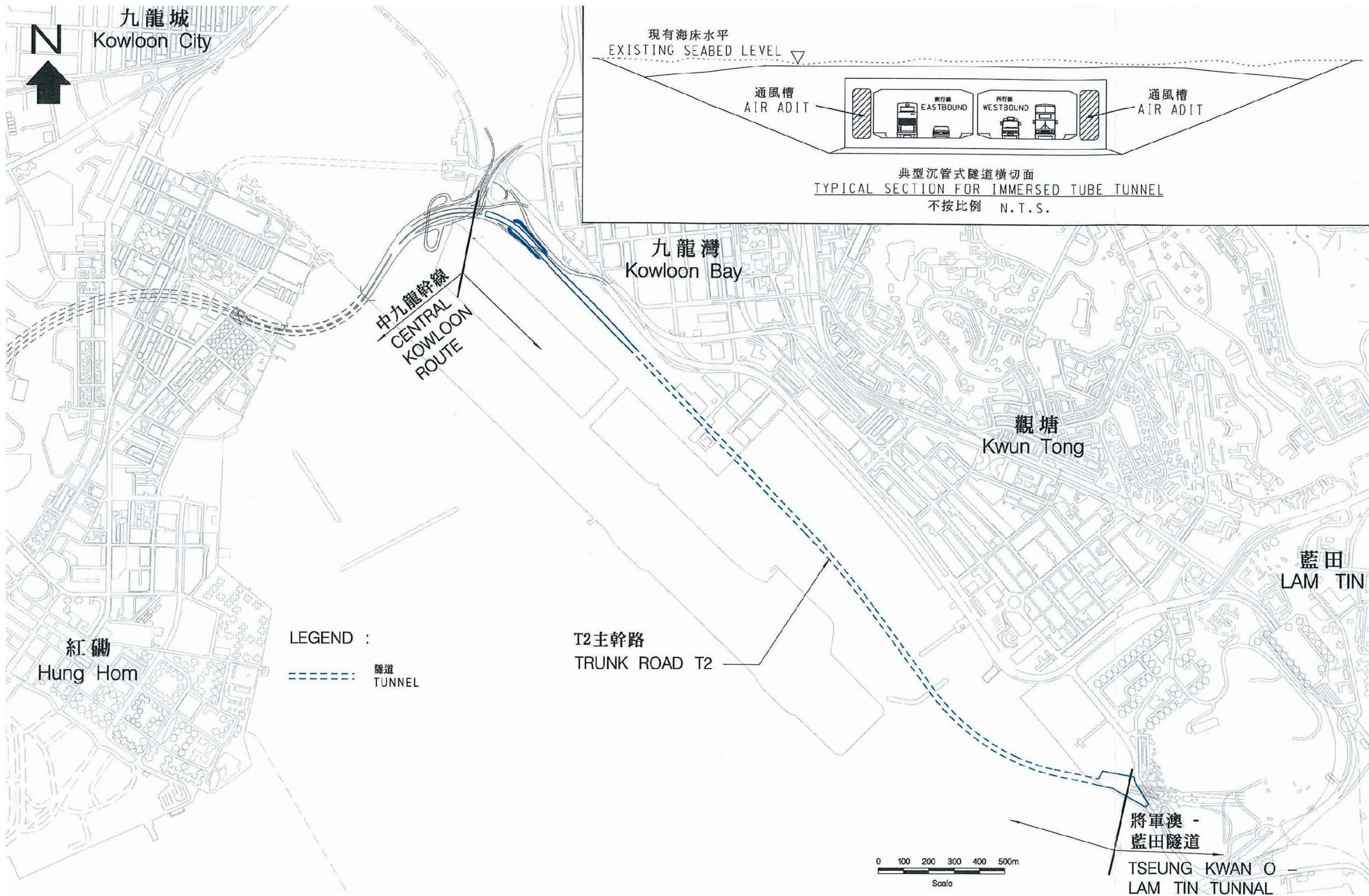
- 3.1 The data examined during Task 1 and 2 will be analysed to provide an indication of the likely character and extent of archaeological resources within the study area. This would facilitate formulation of a strategy for investigation.
- 3.2 The results would be presented as a written report and charts. If there is no indication of archaeological material there would be no need for further work.
- 3.3 Charts should be presented at 1:500 scale and show each survey contact. Its dimensions and exact location should also be shown.

(4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief

- 4.1 Subject to the outcome of Task 1, 2 and 3, accepted marine archaeological practice would be to plan a field evaluation programme to acquire more detailed data on areas identified as having archaeological potential. The areas of archaeological interest can be inspected by ROV or divers. ROV or a team of divers with both still and video cameras would be used to record all seabed features of archaeological interest.
- 4.2 Owing to the heavy marine traffic in Hong Kong, the ROV/visual diver survey may not be feasible to achieve the target. If that is the case, an archaeological watching brief is the most appropriate way to monitor the dredging operations in areas of identified high potential to obtain physical archaeological information.
- 4.3 A sampling strategy for an archaeological watching brief would be prepared based on the results of Task 1, 2 and 3 to focus work on the areas of greatest archaeological potential. Careful monitoring of the dredging operations would enable immediate identification and salvage of archaeological material. If archaeological material is found, the AMO should be contacted immediately to seek guidance on its significance and appropriate mitigation measures would be prepared.
- 4.5 If Task 4 is undertaken, the results would be presented in a written report with charts.

Report

Five copies of the final report should be submitted to the AMO for record.



PROJECT TITLE - TRUNK ROAD T2

EIA Study Brief No. : ESB-203/2009

FIGURE 1- LAYOUT PLAN - TRUNK ROAD T2

