

Environmental Impact Assessment Ordinance (Cap. 499), Section 5(7)**Environmental Impact Assessment Study Brief No. ESB - 131/2005**

**Project Title: Proposed Comprehensive Development at Wo Shang Wai, Yuen Long
(hereafter known as the Project)**

**Name of Applicant: Profit Point Enterprises Limited
(hereinafter known as the “Applicant”)**

1. BACKGROUND

- 1.1 An application (No. ESB-131/2005) for an Environmental Impact Assessment (EIA) study brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the captioned Applicant on 5 August 2005 with a project profile (No. PP-257/2005).
- 1.2 The Applicant proposes to develop the site into two major uses: residential development and associated infrastructure and wetland restoration. The project site occupies about 21 ha site area. The proposed domestic Gross Floor Area on the Project is about 82,960m² (with a maximum height of 6 storeys including car park). The location plan of the Project showing the approximate project boundary is given as Figure 1.
- 1.3 The following elements of the Project addressed in this Project Profile are classified as Designated Projects under the *Environmental Impact Assessment Ordinance (Cap. 499) (EIAO)*.
- proposed residential development, other than New Territories exempted houses within Deep Bay Buffer Zone 2 (item *P1 of Part I of Schedule 2 of EIAO*)
 - an activity for the reuse of treated sewage effluent from a treatment plant (item *F.4 of Part I of Schedule 2 of EIAO*)
 - engineering feasibility study of urban development projects with a study area covering more than 20 ha (item *1 of Schedule 3 of EIAO*)
- 1.4 Pursuant to section 5(7)(a) of the EIAO, the Director of Environmental Protection (the Director) issues this EIA study brief to the Applicant to carry out an EIA study.
- 1.5 The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities taking place concurrently. This information will contribute to decisions by the Director on:
- (i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
 - (ii) the conditions and requirements for the detailed design, construction and

operation of the Project to mitigate against adverse environmental consequences wherever practicable; and

- (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

2. OBJECTIVES OF THE EIA STUDY

2.1 The objectives of the EIA study are as follows:

- (i) to describe the Project and associated works together with the requirements for carrying out the Project;
- (ii) to identify and describe 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;
- (iii) to identify and quantify all environmental sensitive receivers, emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
- (iv) to identify and quantify any potential losses or damage to flora, fauna and wildlife habitats;
- (v) to identify any negative impacts on sites of cultural heritage and to propose measures to mitigate these impacts;
- (vi) to identify and quantify any potential landscape and visual impacts and to propose measures to mitigate these impacts;
- (vii) to propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (viii) to identify, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;
- (ix) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and reducing them to acceptable levels;
- (x) to investigate the extent of 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;
- (xi) to identify, within the study area, any individual project(s) that fall under Schedule 2 and/or Schedule 3 of the EIA Ordinance; to ascertain whether the findings of this EIA study have adequately addressed the environmental impacts of those projects; and where necessary, to identify the outstanding issues that need to be addressed in any further detailed EIA study; and
- (xii) to design and specify the environmental monitoring and audit requirements, if required, to ensure the implementation and the effectiveness of the environmental

protection and pollution control measures adopted.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

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

The Scope

3.2 The scope of this EIA study shall cover the Project and associated works mentioned in section 1.2 above. The EIA study shall cover the combined impacts of all the Project and the cumulative impacts of the existing, committed and planned developments in the vicinity of the Project in accordance with the requirements laid down in section 3.4 of the TM. The environmental impacts of on-site and off-site works and facilities associated with the Project shall be addressed. The EIA study shall address the likely key issues described below, together with any issues identified during the course of the EIA study:

- (i) noise impacts arising from construction and operation of the Project to the nearby village areas;
- (ii) dust impact arising from construction of the Project to the nearby air sensitive receivers (ASRs) and odor impact from the existing and planned sewage treatment plants to the development and nearby ASRs;
- (iii) landscape and visual impacts during construction and operation of the Project;
- (iv) the potential water quality impacts caused by site formation, pond draining and filling, drainage diversion, and any other works activities during construction; the potential water quality impacts caused by the operation of the Project;
- (v) potential impacts on historical buildings/architectures and monuments;
- (vi) terrestrial and aquatic ecological impacts, in particular the potential impacts of disturbance and fragmentation to the adjacent recognized sites of conservation importance including, for example, the Mai Po Nature Reserve, Mai Po Inner Deep Bay Ramsar Site, Mai Po Village Site of Special Scientific Interest (SSSI), Mai Po Marshes SSSI, Inner Deep Bay SSSI, Wetland Conservation Area and Wetland Buffer Area (both were defined under Town Planning Board Guidelines TPB PG-No. 12B) and important habitats such as fishponds and egrettries, due to the construction and operation of the Project;
- (vii) fisheries impacts during construction and operation of the Project;
- (viii) collection and disposal of potentially contaminated dredged spoil arising from the Project; and

- (ix) the short term and long term management of the proposed wetland restoration within the project area including trust and financial arrangement.

Consideration of Alternatives

3.3 The Need of the Project

The Applicant shall study and review the need of the Project as mentioned in sub-section 1.2 above, and provide information to justify the need. The Applicant shall explain clearly the purpose and objectives of the Project and describe the scenarios with and without the Project.

3.4 Consideration of Alternative Layout Options and Building Height Profiles

The Applicant shall consider alternative layout options and building height profiles (below 6 storeys including car park) for the Project, provide justification regarding how the proposed layout option and building height profiles are arrived at, including the descriptions of the environmental factors considered in the option selection. A comparison of the environmental benefits and dis-benefits of alternative layout options and building height profiles shall be made with a view to recommending the preferred option to avoid/minimize adverse environmental effects to the maximum practicable extent. In particular, consideration shall be given to avoid or minimize the disturbance to the adjacent recognized sites of conservation importance and important habitats during the construction and operation of the Project.

3.5 Consideration of Alternative Construction Methods and Sequences of Works

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

3.6 Selection of Preferred Scenario

Taking into consideration of the findings in sub-section 3.4 and 3.5 above, the Applicant shall recommend/justify the adoption of the preferred scenario will avoid or minimize adverse environmental effects arising from the Project, and adequately describe the part that environmental factors played in arriving at the final selection.

Technical Requirements

3.7 The Applicant shall conduct the EIA study to address all environmental aspects of the works and activities as described in the scope set out above.

3.8 The EIA study shall take into consideration and compare clearly and objectively the environmental impacts of different development options considered in the study. In formulating the preferred development option, the Applicant shall seek to avoid adverse

environmental effects to the maximum practice extent. It is important to describe adequately in the report the part environmental factors played in the selection of the preferred option(s).

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

3.9.1 Air Quality Impact

3.9.1.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing air quality impact as stated in section 1 of Annex 4 and Annex 12 of the TM respectively. The assessment shall be based on the best available information at the time of the assessment.

3.9.1.2 The study area for air quality impact assessment shall generally be defined by a distance of 500 m from the boundary of the project site (including the access road) as shown in Figure 1, yet it may be extended depending on the circumstances and the scale of the project. In particular, the assessment for the operational stage shall take into account the impacts of major emission sources such as the existing and planned sewage treatment plants, San Tin Highways and Castle Peak Road, whereas the assessment for the constructional stage shall take into account the impacts of major emission sources from other concurrent construction projects.

3.9.1.3 The Applicant shall assess the air pollutant concentrations with reference to the Guidelines for Local-Scale Air Quality Assessment Using Models given in Appendices 1 to 3 or other methodology as agreed by the Director.

3.9.1.4 The air quality impact assessment shall include the following:

(i) Background and Analysis of Activities

- (a) Provide background information relating to air quality issues relevant to the project.
- (b) Give an account, where appropriate, of the consideration/ measures that had been taken into consideration in the planning of the project to abate the air pollution impact. That is, the Applicant should 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.

(ii) Identification of ASRs and Examination of Emission/Dispersion Characteristics

- (a) Identify and describe representative existing and planned/ committed air sensitive receivers (ASRs) that would likely be affected by the project, including those earmarked on the relevant Outline Zoning Plans,

Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans. The Applicant shall select the assessment points of the identified ASRs such that they represent the worst impact point of these ASRs. A map showing the location and description including the name of the buildings, their uses and height of the selected assessment points shall be given. The separation distances of these ASRs from the nearest emission sources shall also be given. For phased development, the Applicant should review the development programme, and where appropriate, to include occupiers of early phases as ASRs if they may be affected by works of later phases.

- (b) Provide an exhaustive list of air pollutant emission sources, including any nearby emission sources which are likely to have impact on the project based on the analysis of the constructional and operational activities of the project in 3.9.1.4 i above. Examples of constructional stage emission sources include stock piling, blasting, concrete batching and vehicular movements on unpaved haul roads on site, etc. Examples of operational stage emission sources include exhaust emissions from sewage treatment works and vehicles, etc. Confirmation of the validity of the assumptions and the magnitude of the activities (e.g. volume of construction materials handled etc.) shall be obtained from the relevant government department/authorities and documented.

(iii) Constructional Phase Air Quality Impact

- (a) The Applicant shall follow the requirements of the Air Pollution Control (Construction Dust) Regulation to ensure constructional dust impacts are controlled within the relevant standards as stipulated in section 1 of Annex 4 of the TM. An audit and monitoring program during constructional stage shall be devised to verify the effectiveness of the control measures and to ensure that the construction dust levels be brought under proper control.
- (b) If the Applicant anticipates a significant construction dust impact that will likely cause exceedance of the recommended limits in the TM at the ASRs despite incorporation of the dust control measures stated in 3.9.1.4 iii a above, a quantitative assessment shall be carried out to evaluate the constructional dust impact at the identified ASRs. The Applicant shall follow the methodology set out in subsection 3.9.1.4 v below when carrying out the quantitative assessment.

(iv) Operational Phase Air Quality Impact

The Applicant shall assess the expected air pollutant impacts at the identified ASRs based on an assumed reasonably worst-case scenario under normal operating conditions. If the assessment indicates likely exceedances of the recommended limits in the TM at the development and the nearby ASRs, a quantitative impact evaluation following the methodology in 3.9.1.4 v below shall be carried out.

(v) Quantitative Assessment Methodology

- (a) The Applicant shall conduct the quantitative assessment with reference to relevant sections of the modeling guidelines stated in 3.9.1.3 above or any other methodology as agreed with the Director. The specific methodology must be documented in such level of details (preferably with tables and diagrams) to allow the readers of the assessment report to grasp how the model is set up to simulate the situation at hand without referring to the model input files. Detailed calculations of the pollutant emission rates and a map showing all the road links for input to the modeling 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 modeling details shall be sought.
- (b) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for choosing these parameters for the assessment of the impact of the project
- (c) The Applicant shall calculate the cumulative air pollutant concentrations at the identified ASRs and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table and pollution contours, to be evaluated against the relevant air quality standards and examination of the land use implications of these impacts. Plans of suitable scale should be used for presentation of pollution contour to allow proper determination of buffer distance requirements.

(vi) Mitigating measures for non-compliance

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

(vii) Submission of model files

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

3.9.2 Noise Impacts

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

3.9.2.2 The noise impact assessment shall include the following:

(i) Determination of Assessment Area

The “Assessment Area” for the noise impact assessment shall include all areas within 300m from the boundary of the Project (including the access road) as shown in Figure 1. Subject to the agreement of the Director, the assessment area could be reduced accordingly if the first layer of noise sensitive receivers, closer than 300m from the boundary of the Project (including the access road) as shown in Figure 1, provides acoustic shielding to those receivers at further distance behind. Subject to the agreement of the Director, the area shall be expanded to include NSRs at larger distance, which would be affected by the construction and operation of the Project.

(ii) Provision of Background Information and Existing Noise Levels

The Applicant shall provide all background information relevant to the Project, e.g. relevant previous or current studies. Unless involved in the planning standards, no existing noise levels are particular required.

(iii) Identification of Noise Sensitive Receivers

(a) The Applicant shall refer to Annex 13 of the TM when identifying the noise sensitive receivers (NSRs). The NSRs shall include all existing NSRs and all planned/committed noise sensitive developments and uses earmarked on the relevant Outline Zoning Plans (OZP), Outline Development Plans and Layout Plans and other relevant published land use plans.

(b) The Applicant shall select assessment points to represent all identified NSRs for carrying out quantitative noise assessment described below. The assessment points shall be agreed with the Director prior to the quantitative noise assessment. A map showing the location and description such as name of building, use, and floors of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant should use the relevant planning parameters to work out site layouts for operational noise assessment purpose.

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

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

(v) Construction Noise Assessment

- (a) The Applicant shall carry out assessment of noise impact from all construction (excluding percussive piling) works of all the concurrent projects in the area 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.
 - (b) To minimise the construction noise impact, alternative construction methods to replace percussive piling shall be proposed as far as practicable.
 - (c) If the unmitigated construction noise levels are found exceeding the relevant criteria, the Applicant shall propose practicable direct mitigation measures (including movable barriers, enclosures, quieter alternative methods, re-scheduling and restricting hours of operation of noisy task) to minimise the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance shall be given.
 - (d) In case the Applicant would like to evaluate whether construction works in restricted hours as defined under the Noise Control Ordinance (NCO) are feasible or not in the context of programming construction works, reference should be made to the relevant technical memoranda issued under the NCO. Regardless of the results of the construction noise impact assessment for restricted hours, the Noise Control Authority will process the Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant technical memoranda issued under the NCO, and the contemporary conditions/situations. This aspect should be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.
- (vi) Operational Noise Assessment
- (a) Road Traffic Noise

The Applicant shall assess any adverse traffic noise impact on the development of the Project. The following assessment requirements shall be followed.
 - (a1) Calculation of Noise Levels

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

The EIA shall contain sample calculations as considered necessary and requested by the Director, and drawings of appropriate scale to show the

road segments, topographic barriers (if any) and assessment points input into the traffic noise model. The Applicant shall provide input data sets of traffic noise prediction model adopted in the EIA study.

The data shall be in electronic text file (ASCII format) containing road segments, barriers (if any) and NSRs' 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 future noise levels in L_{10} (1 hour) at the NSRs on tables and plans of suitable scale for the scenarios for the Project.

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

(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 noise mitigation measures in all situations where the predicted traffic noise level exceeds the criteria set in Table 1A of Annex 5 in the TM. Specific reasons for not adopting certain noise mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for the NSRs as far as possible should be clearly quantified and laid down.

The total number of dwellings and other noise sensitive element that will be benefited by the provision of noise mitigation measures should be provided. In order to clearly present the extents/locations of the recommended noise mitigation measures, plans prepared from 1:1,000 or 1:2,000 survey maps showing the mitigation measures (e.g. barriers) shall be included in the EIA report. The total number of dwellings and other noise sensitive elements that will still be exposed to noise above the criteria with the implementation of all recommended noise mitigation measures shall be quantified.

(b) Fixed Noise Sources

- (b1) The Applicant shall identify any fixed noise sources within the "Assessment Area", including all activities within the residential development, any sewage collection, sewage treatment plant, pumping stations, any pump houses, electricity sub-station etc. The Applicant

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

- (b2) The Applicant shall present the noise levels in $L_{eq}(30min)$ or other unit(s) as agreed by the Director, at the NSRs at various representative floor levels (in m P.D.) on tables and plans of suitable scale.
- (b3) 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.
- (b4) The Applicant shall propose direct mitigation measures within the project limits 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 technical remedies.

(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 technical remedies 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 study to assess the development potential of concerned sites which shall be made known to the relevant parties.

3.9.3 Water Quality Impact

3.9.3.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water quality impact during the construction and operation phases as stated in Annexes 6 and 14 of the TM respectively.

3.9.3.2 The Applicant shall conduct the following detailed water quality assessment.

Water Quality Impact Assessment

3.9.3.3 The Study Area for the water quality impact assessment shall cover all relevant sensitive

receivers in Wo Shang Wai and the surrounding areas, in particular the fishponds surrounding the study area and in the larger Deep Bay Catchment Area of the Deep Bay Water Control Zone (WCZ), the Ramsar Site, and Mai Po Nature Reserve. This study area could be extended to cover other areas if they are found also being impacted during the course of EIA study and have a bearing on the environmental acceptability of the Project.

3.9.3.4 The Applicant shall identify and analyze all physical, chemical and biological disruptions of water system(s) arising during the construction and operation of the Project (including the impacts arising from emergency discharge from sewage pumping stations and sewer bursting discharge). The Applicant shall address the following:

General

- (i) collection and review of background information on the existing water system(s) and the respective catchment(s);
- (ii) characterization of water and sediment quality of the natural/artificial water courses and manmade fishponds based on existing information or site surveys/ tests as appropriate;
- (iii) identification and analysis of all existing and planned future activities and beneficial uses related to the water system(s) and identification of all water sensitive receivers including inshore water protection/recreation areas, in particular the fishponds surrounding the study area, the Mai Po Inner Deep Bay Ramsar Site and Mai Po Nature Reserve;
- (iv) identification of pertinent water quality objectives and establishment of other appropriate water quality and sediment criteria or standards for the water system(s) and all sensitive receivers affected by the Project;
- (v) identification of any alteration of natural/artificial water course, manmade fishponds, wetlands, change of water courses/drainage channel, change of water holding/flow regimes; change of ground water levels, change of catchment types or areas;
- (vi) identification, analysis and quantification of all existing and likely future water and sediment pollution sources, including point discharges and non-point sources to surface water runoff, storm water effluent and pond water discharges. Field investigation and laboratory tests shall be conducted as appropriate;
- (vii) establishment and provision of an emission inventory on the quantities and characteristics of all these pollution sources;

Impact Predictions

- (viii) prediction and quantification by mathematical modelling or other technique approved by the Director, of the impacts on the water system(s) and the sensitive receivers due to those alterations and changes identified in (v) and the pollution sources identified in (vi) above. Possible impacts include changes in hydrology,

flow regime, sediment erosion or deposition, water and sediment quality and the effects on the aquatic organism due to such changes. The prediction shall take into account and include different construction stages or sequences, different operation stages. Cumulative impacts due to other related concurrent and planned project(s), activities or pollution sources within a boundary around the Study Area to be agreed by the Director shall also be predicted and quantified;

- (ix) assessment and evaluation of water quality impacts on the sensitive receivers due to the operation of the Project and the wetland restorations. Among other receivers, the impact on the operation of the wetland habitats on or near the northern part of Wo Shang Wai, the Mai Po Inner Deep Bay Ramsar Site, Mai Po Nature Reserve and the Deep Bay Wetland Conservation Area/Buffer Area shall be included.

Waste Water Pollution

- (x) analysis on the adequacy of existing and planned future sewerage infrastructure to receive point discharges of waste water identified in (vi) above;
- (xi) analysis on the provision and adequacy of existing and planned future facilities to reduce pollution arising from the non-point sources identified in (vi) above;
- (xii) identification and quantification of the residual pollution load from the proposed treatment facilities for treating all point/non-point sources of waste water;
- (xiii) identification of the alignment, volume and possible pollutants contained in pond water and storm water discharges;
- (xiv) analysis on the characteristics of sewage nature;
- (xv) identification and quantification of the pond water, stormwater, treated effluent discharge and other point/non-point sources pollution loads to the wetlands in the study site, the Mai Po Inner Deep Bay Ramsar Site, Mai Po Nature Reserve and the other surrounding water courses/bodies;
- (xvi) evaluation and quantification of residual impacts on the water system(s) and the sensitive receivers with regard to the appropriate water and sediment quality criteria, standards and guidelines; and
- (xvii) analysis and assessment of the impacts due to additional sewage discharge from the Project to the existing/planning sewerage system and sewage treatment works in North West New territories ;
- (xviii) assessment on the impacts of using ozone or chlorine as disinfectants in the Project, in particular on the potential of generation of carcinogenic and toxic organic chlorides; and
- (xix) identification and assessment of the residual impacts of any fertilizer, pesticides and/or herbicides (if applied) on the drainage channel, groundwater, or other inland water courses/bodies.

Dredging and Pond Draining and Filling

- (xx) identification and quantification of all dredging, pond draining and filling, site leveling, sediment/ mud transportation and disposal activities and requirements. Potential fill source, if required and dumping ground to be involved shall also be identified. Field investigation, sampling and laboratory tests to characterize the pond water quality and 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 method to be used shall be subject to the approval of the Director. The categories of sediments which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance shall be identified by both chemical and biological tests, and their quantities estimated. If the presence of any seriously contaminated sediment which requires special treatment or disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility;
- (xxi) prediction, quantification and assessment of impacts on the physical regime, water and sediment quality of the water systems(s) and the nearby sensitive receivers due to the activities identified in section (xx) above. The prediction and quantification of impacts caused by sediment re-suspension and contaminants release shall be carried out by mathematical modelling or other techniques approved by the Director;
- (xxii) identification and evaluation of the best practicable dredging and pond filling methods to minimize dredging and dumping requirements and demand for fill sources based on the criterion that existing pond mud/stream sediment shall be left in place and not be disturbed as far as possible;
- (xxiii) evaluation of the impacts due to release of the interstitial water and associated contaminants to the water column, if wick drain installation is employed to speed up consolidation of mud;
- (xxiv) prediction and quantification of cumulative impacts due to other dredging, filling or dumping activities within a boundary around the study area to be agreed by the Director; and
- (xxv) among other sensitive receivers, impact on the habitats and ecological mitigation measures of the nearby Mai Po Inner Deep Bay Ramsar Site, Wetland Conservation Area, Wetland Buffer Area, Mai Po Nature Reserve and the fishponds surrounding the study area shall be addressed.

Potential Problem of Biogas on Reclamation (Pond Filling)

- (xxvi) Investigation of the potential biogas problem arising from leaving pond mud in place, including:
 - (a) a proposal on collection and analysis of representative samples in various depths for the agreement of the Director;

- (b) carrying out the actual sampling and testing as agreed by the Director; and
- (c) a proposal, with justifications, on monitoring, mitigation and precautionary measures on the Project, if found necessary.

Mitigation

- (xxvii) proposal of effective infrastructure upgrading or provision, water pollution prevention and mitigation measures to be implemented during the construction, operation stages so as to reduce the water and sediment quality impacts to within acceptable levels of standards. Best management practices to reduce pond water, storm water, pesticides and herbicides and non-point source pollution shall be investigated and proposed as appropriate;
- (xxviii) formulate the mitigation measures to offset the residual pollution load identified in section (xii) above in order to achieve the requirement of no net increase of pollution load to Deep Bay from the Project; and
- (xxix) provide adequate monitoring programme to assess the effectiveness of the proposed offsetting measures identified in section (xxviii).

3.9.4 Sewerage and Sewage Treatment Implications

- 3.9.4.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing impacts on the downstream public sewerage, sewage treatment and disposal facilities as stated in section 6.5 in Annex 14 of the TM.
- 3.9.4.2 The Applicant shall investigate and determine the need and the feasibility of having central pre-treatment facilities and/or a separate sewage treatment plant within the study area.
- 3.9.4.3 The Applicant shall study and assess the need and impacts of discharging sewage to the existing/planning sewerage systems in North West New Territories. The assessment shall include the following:
 - (i) investigate and review the adequacy of the existing/planned sewerage and treatment facilities for absorbing part or all of the sewage discharge from the Project within the scope of EIA study as defined in section 3.2 above. The Applicant shall confirm in the EIA report that whether the existing/planning sewerage systems and sewage treatment works in North West New Territories will provide adequate capacity for the Project. The appropriate treatment level of interim discharge, if required, shall be assessed;
 - (ii) the assessment should take into account any additional sewage flows and flow projections from other existing/planned developments to be connected to the existing/planning sewerage systems and sewage treatment works in North West New Territories. The water quality impacts arising from the interim and ultimate effluent discharge, if any, shall be assessed in accordance with section 3.5.3 above.

- (iii) based on the above items (i) and (ii), if the existing/planned sewerage layout or capacities cannot cope with the maximum discharges, the Applicant shall propose an optimal and cost-effective upgrading works to improve the existing/planned sewerage and sewage treatment facilities or to provide new sewerage and sewage treatment facilities to receive and transport the sewage arising during the construction and operation of the Project. Any proposed sewerage system and/or on-site sewage treatment facility should be designed to meet the current government standards and requirements. Computerised analysis techniques such as HYDRO WORKS/INFORWORKS may be used in the preliminary design if necessary.
- (iv) identify and quantify the water quality and ecological impacts due to the emergency discharge from on-site sewage treatment plant/pumping stations and sewer bursting discharge, and to propose measures to mitigate these impacts;
- (v) identify the appropriate alignment and layouts of the new sewerage to connect to the existing/planned/future sewerage system in North West New Territories; investigate and assess the technical feasibility of connection (e.g. technical feasibility and details for direct connection to public sewer and sewage pumping station);
- (vi) set out the design, operation and maintenance requirements and identify the party responsible for the construction and maintenance of any proposed sewerage and sewage treatment facilities, such as pumping station(s) and central pre-treatment facilities for food catering effluent (if recommended), including electrical and mechanical components to eliminate the problem of septicity incurred in long rising main(s) during low flows and to facilitate maintenance. The above shall be agreed by DSD and EPD (Twin rising mains for each pumping station should be provided to make sure that the proposed sewage rising mains are maintainable without shutting down and discharging untreated sewage into the natural stream/drainage channel directly).

3.9.5 Waste Management Implications

3.9.5.1 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.

3.9.5.2 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 operational activities, based on the sequence and duration of these activities.

(ii) Proposal for Waste Management

- (a) Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation and on-site or off-site re-use

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 maximising waste reduction shall be separately considered.

(b) Having taken into account all the opportunities for reducing waste generation and maximising reuse, the types and quantities of the wastes required to be disposed of as a consequence including potentially contaminated materials shall be estimated and the disposal options for each type of waste described in detail. The disposal method recommended for each type of wastes shall take into account the result of the assessment in (c) below.

(c) The impact caused by handling (including labelling, packaging & storage), collection, and disposal of wastes shall be addressed in detail and appropriate mitigation measures proposed including the prevention of flytipping during construction. This assessment shall cover but not limited to the following areas :

- potential hazard;
- air and odour emission;
- noise;
- wastewater discharge; and

- public transport.

(iii) Land Contamination

(a) The Application shall identify all land lots/sites within the Project boundary which, due to their past or present land uses, are potentially contaminated sites. A detailed account for the present activities and past land use history in relation to possible land contamination shall be provided.

(b) The list of potential contaminants which are anticipated to be found in these potentially contaminated sites shall be provided and the possible remediation options shall be discussed.

3.9.6 Ecological Impact (Terrestrial and Aquatic)

3.9.6.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing ecological impact as stated in Annexes 8 and 16 of the TM respectively during the construction and operational phases. The assessment shall include the ecological survey of the "Assessment Area" as defined in section 3.9.6.2 below

3.9.6.2 The "Assessment Area" for the purpose of terrestrial ecological assessment shall include all areas within 500m distance from the boundary of the Project (including the access road) as shown in Figure 1, or the area likely to be impacted by the Project.

3.9.6.3 In the ecological impact assessment, the Applicant shall examine the flora, fauna and

other components of the ecological habitats within the “Assessment Area”. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project shall avoid impacts on recognized sites of conservation importance and other ecological sensitive areas. The assessment shall identify and quantify as far as possible the potential ecological impacts associated with the Project.

3.9.6.4 The assessment shall include the following major tasks:

- (i) review and incorporate the findings of relevant studies and collate all the available information regarding the ecological characters of the “Assessment Area”;
- (ii) identify any information gap relating to the assessment of potential ecological impacts to the terrestrial and aquatic environment;
- (iii) carry out any necessary field surveys, the duration of which shall be at least 12 months covering the winter migratory bird season from October to March and the ardeid breeding season from March to August, and investigations to fill in the information gap, if any, and to fulfil the objectives of the EIA study;
- (iv) establish the general ecological profile and describe the characteristics of each habitat found within the study boundary, committed ecological measures including those under the EIA Ordinance or the Town Planning Ordinance (such as the restoration of fishponds) should be taken into consideration; major information to be provided shall include:
 - (a) description of the physical environment;
 - (b) habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats in the “Assessment Area”;
 - (c) ecological characteristics of each habitat type such as size, vegetation type, species present, dominant species found, species diversity, community structure, inter-dependence of the habitats and species, and presence of any features of ecological importance;
 - (d) representative colour photographs of each habitat type and any important ecological features identified; and
 - (e) species found that are rare, endangered and/or listed under local legislation or international conventions for conservation of wildlife/habitats or red data books;
- (v) investigate and describe the existing wildlife uses of various habitats with special attention to:
 - (a) wetlands including fish ponds, wet agricultural land and marsh;
 - (b) roosting, breeding and feeding sites for wetland birds;
 - (c) natural stream courses and man made drainage channels; and
 - (d) any other habitats identified as having special conservation interests by this study.
- (vi) describe all recognized sites of conservation importance in particular the Wetland Conservation Area, Wetland Buffer Area, Mai Po Inner Deep Bay Ramsar Site,

Mai Po Nature Reserve, Mai Po Village SSSI, Mai Po Marshes SSSI and Inner Deep Bay SSSI in the Project site and its vicinity, and assess whether these sites will be affected by the Project or not;

- (vii) investigate the impact of residential buildings in the project area on the bird's flight path taking into account of daily and seasonal patterns;
- (viii) using suitable methodology, identify and quantify as far as possible any direct, indirect, on-site, off-site, primary, secondary and cumulative ecological impacts such as destruction of habitats, reduction of species abundance/diversity, loss of feeding grounds, reduction of ecological carrying capacity, loss in ecological linkage and function, habitat fragmentation and other possible disturbances caused by the Project and the activities of the residents;
- (ix) evaluate the significance and acceptability of the ecological impacts identified using well-defined criteria;
- (x) recommend all possible alternatives (such as modifications of layout and design) and practicable mitigation measures to avoid, minimize and/or compensate for the adverse ecological impacts identified;
- (xi) evaluate the feasibility and effectiveness of the recommended mitigation measures and define the scope, type, location, implementation arrangement, subsequent management, resources requirement and maintenance of such measures;
- (xii) determine and quantify as far as possible the residual ecological impacts after implementation of the proposed mitigation measures;
- (xiii) evaluate the severity and acceptability of the residual ecological impacts using well-defined criteria. If off-site mitigation measures are considered necessary to mitigate the residual impacts, the guidelines and requirements laid down in the TM shall be followed;
- (xiv) review the need for and recommend any ecological monitoring programme required; and
- (xv) propose a management package for the wetland restoration in the project area with particular attention to :
 - (a) the proposed design and layout of the restored wetland and rationales for such proposed design;
 - (b) the habitat management plan and specification of resources requirement for its implementation;
 - (c) the long-term trust management system with management guidelines;
 - (d) the financial arrangement to sustain the management of the restored wetland;
 - (e) the management agents and their responsibility; and
 - (f) a contingency plan for the management of the restored wetland before the

well establishment of trust management.

3.9.7 Fisheries Impacts

3.9.7.1 Fisheries Impact Assessment shall follow the criteria and guidelines as specified in Annexes 9 and 17 of the TM respectively. The "Assessment Area" for the purpose of the fisheries impact assessment shall include the area within the boundary of the Project (including the access road) as shown in Figure 1, and especially the adjacent areas of potential impact. The assessment shall review and collate existing information to provide adequate and accurate data for prediction and evaluation of impacts of the Project on fisheries. The assessment shall include the following:

- (i) description of the physical environmental background;
- (ii) description and quantification as far as possible of the existing pond culture activities, with special attention on fishponds in the vicinity and around Mai Po;
- (iii) description and quantification as far as possible of the existing pond culture resources;
- (iv) identification of parameters (eg. water quality parameters) and area that are important to pond culture activities;
- (v) identification and quantification as far as possible of any direct/indirect and on-site/off-site impacts to pond culture, including permanent loss and temporary occupation of fishponds and those impacts on pond culture activities due to sewer bursting and emergency discharge from sewage pumping stations;
- (vi) evaluation of impacts on pond culture activities during construction and operation stages in areas around Wo Shang Wai, Mai Po and other affected areas; and
- (vii) evaluation of cumulative impacts of loss of fishponds in the North West New Territories.
- (viii) identify practical mitigation measures to avoid/minimize the potential impacts on the pond culture activities;
- (ix) identify and present an adequate package of measures fully compensate all the losses due to the Project with details on justification, description of scope and programme feasibility as well as staff and financial implications including those related to subsequent management and maintenance requirements of the proposals. Among others measures, the need to reinstate temporarily occupied and permanently lost fishponds should be covered; and
- (x) determine the need, if necessary, make appropriate recommendation for a monitoring and audit programme during construction and operation phases of the Project.

3.9.8 Impact on Cultural Heritage

- 3.9.8.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing impacts on cultural heritage as stated in section 2 of both Annexes 10 and 19 of the TM respectively.
- 3.9.8.2 The heritage impact assessment shall focus on:
- (i) identification of landscape features include sites of historical events, historical field patterns, tracks and fishponds and cultural elements such as *fung shui* woodlands and clan grave sites which will be affected by the Project;
 - (ii) evaluation of impacts on cultural heritage and proposals for any mitigation measures with detailed elaboration on scope of work.
- 3.9.8.3 Direct and indirect impacts on the nearby historic buildings and structures should also be identified. The impacts include visual impact, impacts on the *fung shui* / visual corridor of the historic buildings and structures, potential damage to historic buildings and structures through change of water-table, vibration caused by the Project. Assessment of impacts on cultural heritage shall also take full account of, and allow where appropriate, the Guidelines for Landscape and Visual Impact Assessment of Annex 18 of the TM.

3.9.9 Landscape and Visual Impact

- 3.9.9.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing landscape and visual impacts as stated in Annexes 10 and 18 of the Technical Memorandum and EIAO Guidance Note No. 8/2002.
- 3.9.9.2 The assessment area for the landscape impact assessment shall include all areas within a 500m distance from the boundary of the Project (including the access road) as shown in Figure 1. The assessment area for the visual impact assessment shall be defined by visual envelope of the proposed project and associated works. The defined visual envelope should be shown on plan.
- 3.9.9.3 The Applicant shall review relevant outline development plans, outline zoning plans, layout plans, planning briefs and studies which may identify areas of high landscape value and recommend conservation area, green belt, recreation, open space and other specified use. Any guidelines on urban design concept, landscape framework, building height profiles, designated view corridors 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 so that the Project can fit into surrounding setting. Any conflict with statutory town plan(s) and any published land use plans should be highlighted and appropriate follow-up action should be recommended.
- 3.9.9.4 The Applicant shall describe, appraise and analyse the existing landscape resources and character of the assessment area. The sensitivity of the landscape framework and its ability to accommodate change shall be particularly focused on. A system should be derived for judging impact significance. The Applicant shall identify the degree of compatibility of the Project with the existing landscape. The 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.

3.9.9.5 The Applicant shall assess the visual impacts of the Project. A system should be derived for judging the visual impact significance. Clear illustrations in support of the visual impact assessment are required. The assessment shall include the following:

- (i) identification and plotting of visual envelop of the Project;
- (ii) identification of the key groups of visually sensitive receivers (including planned sensitive receivers if any) within the visual envelope and their views at 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;

the severity of visual impacts in terms of distance, nature and number of sensitive receivers. Nighttime glare shall be considered in the assessment. The visual impacts of the Project with and without mitigation measures shall also be included so as to demonstrate the effectiveness of the proposed mitigation measures; and

- (iv) alternative layouts and building height profiles (below 6 storeys including car park) options should be examined with a view to selecting the best option to minimize any adverse visual impact.

3.9.9.6 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 of the area. In addition, alternative design 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 Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design. The mitigation measures shall include provision of screen planting and road side berms, revegetation of disturbed land, compensatory planting, provisioning of amenity areas and open spaces, provision of finishes to structures, deposition of buildings, colour scheme and texture of material used and any measures to mitigate the impact on existing and planned land use. 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. The mitigation measures proposed shall not only be concerned with damage reduction but should also include consideration of potential enhancement of existing landscape and visual quality. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.

3.9.9.7 Annotated illustration materials such as coloured perspective drawings, plans and section/elevation diagrams, annotated oblique aerial photographs, photo-retouching and computer-generated photomontage shall be adopted to fully illustrate the landscape and visual impacts of the Project to the satisfaction of the Director. 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. All computer graphics shall be compatible with Microstation DGN file format. The Applicant shall record the technical details such as system set-up, software, data files and function in preparing the illustration which may need to be submitted for verification of the accuracy of the illustrations.

3.9.10 Impacts Summary

To facilitate easy retrieval of important information, an impacts summary in the form of a table, or any other form approved by the Director, showing the assessment points, results of impact predictions, relevant standard or criteria, extent of exceedance predicted, if any, mitigation measures proposed and residual impacts, if any, after mitigation measures are implemented, etc., should be given at the end of each chapter on individual impact in the EIA report as well as the Executive Summary.

3.9.11 Summary of Environmental Outcomes

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.

3.9.12 Environmental Monitoring and Audit (EM&A) Requirements

3.9.12.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A and environmental management system (EMS) 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 in the EIA study.

3.9.12.2 Subject to the confirmation of EIA study findings, the Applicant shall comply with the requirements as stipulated in Annex 21 of the TM. The Applicant shall also propose real-time reporting of monitoring data for the Project through a dedicated internet website.

3.9.12.3 The Applicant shall prepare a Project Implementation Schedule (in the form of a checklist as shown in Appendix 3 or as approved by the Director) containing all the EIA study recommendations and mitigation measures with reference to the implementation programme. The Project Implementation Schedule shall include the explicit agreement reached between the Applicant and relevant parties on the responsibility for funding, implementation, management and maintenance of mitigation measures. Alternatively, the Project Implementation Schedule shall include an undertaking from the Applicant to assume the responsibility of all those mitigation measures until an agreement is reached between the Applicant and relevant parties on the funding, implementation, management and maintenance of mitigation measures. To facilitate issue of Environmental Permits (EPs) in future, the implementation schedules shall be grouped under individual works packages in separate DPs where applicable.

3.9.13 Monitoring and Audit Requirement of the Project

The Applicant should note the monitoring and audit requirement stipulated in paragraph 8.1 of the TM. The Proponent shall propose an environmental monitoring and audit programme in the EIA report to verify the predictions and the effectiveness of mitigation measures including audit on compliance during the operation phase of the Project.

4. DURATION OF VALIDITY

The Applicant shall notify the Director of the commencement of the EIA study. If the EIA study does not commence within 36 months after the date of issue of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief afresh 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 hard copies of the EIA report and the Executive Summary:
- (i) 50 hard copies of the EIA report in English and 80 hard 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, unless advised otherwise by the Director;
 - (ii) where necessary, addendum to each copy of the EIA report and the Executive Summary submitted in sub-section 5.2 (i) above as required under Section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.
 - (iii) 20 hard copies of the EIA report in English and 50 hard 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 make additional hard 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 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 4.0 or later), unless otherwise agreed by the Director. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA Report and 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 EIA Ordinance, the content of the electronic copies of the EIA Report and the Executive Summary must be the same as the hard copies and the Director shall be provided with the most updated electronic copies.
- 5.7 To promote environmentally friendly and efficient dissemination of information, both hardcopies and electronic copies of future EM&A reports recommended by the EIA study shall be required and their format shall be agreed by the Director.
- 5.8 To facilitate public involvement in the EIA process, the applicant shall produce 3-dimensional electronic visualisations of the major findings and elements of the EIA report, including baseline environmental information, the environmental situations with and without the Project, key mitigated and unmitigated environmental impacts, and key recommended environmental mitigation measures so that the public can understand the Project and the associated environmental issues. The visualisations shall be based on the EIA report and released to the public. The visualisations shall be submitted in CD-ROM or other suitable means agreed with the Director in commonly readable formats. Unless otherwise advised or agreed by the Director, the number of copies of CD-ROM required shall be the same as that for EIA reports under Section 5.2.

6. OTHER PROCEDURAL REQUIREMENTS

- 6.1 During the EIA study, if there is any change in the name of Applicant for this EIA study brief, the Applicant in this study brief 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-257/2005, 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 another EIA study brief afresh.

--- END OF EIA STUDY BRIEF ---

September 2005
Environmental Assessment Division,
Environmental Protection Department

Appendix 1**Guidelines on Choice of Models and Model Parameters**

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

1. Introduction

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

2. Choice of Models

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

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

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

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

3. Model Input Requirements

- 3.1 Meteorological Data

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

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

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

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

This is a common practice with using 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 the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix B-2).

3.8 Odour Impact

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

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

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

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

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

3.9 Plume Rise Options

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

3.10 Portal Emissions

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

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

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

3.11 Background Concentrations

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

3.12 Output

The highest short-term and long-term averages of pollutant concentrations at prescribed receptor locations are output by the model and to be compared against the relevant air quality standards specified for the relevant pollutant. Contours of pollutant concentration are also required for indicating the general impacts of emissions over a study area. Copies of model files in electronic format should also be provided for EPD's reference.

Schedule 1

Air Quality Models Generally Accepted by Hong Kong Environmental Protection Department for Regulatory Applications as at 1 July 1998*

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

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

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

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

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

2. Nature of Emissions

2.1 Primary contributions

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

2.2 Secondary contributions

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

2.3 Background contributions

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

3. Background Air Quality - Estimation Approach

3.1 The approach

In view of the difficulties in estimating background air quality using the air quality models

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

3.2 Categorisation

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

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

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

3.3 Background pollutant values

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

POLLUTANT	URBAN	INDUSTRIAL	RURAL / NEW DEVELOPMENT
NO ₂	59	57	39
SO ₂	21	26	13
O ₃	62	68	57
TSP	98	96	87
RSP	60	58	51

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

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

under-estimated, which compensates for the fact that some of the monitoring data are inherently influenced by secondary sources because of the monitoring station location.

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

3.4 Site categories

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

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

3.5 Provisions for 'double-counting'

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

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

where E stands for emission.

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

4. Conclusions

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

Appendix 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.
- 2.2.1 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the situation under

consideration. In cases where no Schedule 1 model is found applicable, the proponent must demonstrate that the proposed model passes the screening test as set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).

Ref.(1): William M. Cox, 'Protocol for Determining the Best Performing Model'; Publication No. EPA-454/R-92-025; U.S. Environmental Protection Agency, Research Triangle Park, NC.

- 2.2.2 For cases where a Schedule 1 model is applicable to the project under consideration but an alternative model is proposed for use instead, the proponent must demonstrate either that
- (i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or
 - (ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).
- 2.2.3 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.
- 2.2.4 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.
- 2.2.5 If EPD is already in possession of some of the documents that describe the technical details of the proposed model, submission of the same by the proponent is not necessary. The proponent may check with EPD to avoid sending in duplicate information.

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