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

Environmental Impact Assessment Study Brief No. ESB-153/2006

Project Title : Wan Chai Development Phase II and Central-Wan Chai Bypass
(hereinafter referred as "the Project")

Name of Applicant : Civil Engineering and Development Department
(hereinafter referred as "the Applicant")

1. BACKGROUND

The Application

1.1 An application (No. ESB-153/2006) for an Environmental Impact Assessment (EIA) study brief under section 5(1)(a) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by the Applicant on 9 August 2006 with a project profile (No. PP-296/2006) (hereinafter referred as "the Project Profile").

1.2 The proposed Project is an engineering feasibility study in Wan Chai North and is demarcated by Gloucester Road and Victoria Park Road to the south, Fenwick Pier Street to the west and Tong Shui Road Interchange to the east. The location plan of the Project area[1] is shown in Figure 1.

1.3 The Project is a designated project in accordance with Item 1 of Schedule 3 of the EIAO, which specifies an "*engineering feasibility study of urban development projects with a study area covering more than 20 ha or involving a total population of more than 100 000*". In accordance with section 5(1)(a) of the EIAO, a person who is planning a designated project shall apply to the Director for an environmental impact assessment study brief to proceed with an environmental impact assessment study for the project. The Project also includes various individual designated projects defined under Schedule 2 of the EIAO, including at least the following (i) to (vi) identified by the Applicant in the Project Profile (No. PP-296/2006):

(i) Central-Wanchai Bypass (the CWB) including its road tunnel, slip roads (Items A.1 and A.7 of Part I of Schedule 2 of the EIAO)
(ii) Road P2 and other roads which are classified as primary/district distributor roads (Item A.1 of Part I of Schedule 2 of the EIAO)
(iii) Reclamation works including associated dredging works (Item C.1 of Part I of Schedule 2 of the EIAO)
(iv) Temporary typhoon shelter (Item C.5 of Part I, Schedule 2 of the EIAO)
(v) Wan Chai East Sewage Outfall (Items F.5 and F.6 of Part I of Schedule 2 of the EIAO)
(vi) Dredging for the Cross-harbour Water Mains from Wan Chai to Tsim Sha Tsui (Item C.12 of Part I of Schedule 2 of the EIAO); and

any other individual project(s) that fall under Schedule 2 of the EIAO to be identified under section 2.1(i) below.

[1] The Project area might not be the same as the assessment areas for each of the individual environmental issues or media in this EIA study. The assessment areas shall be defined in accordance with the assessment requirements in the relevant subsections under Section 3.4 of this Study Brief.

1.4 Pursuant to section 5(7)(a) of the EIAO, the Director of Environmental Protection (hereinafter referred as "the Director") issues this EIA study brief to the Applicant to carry out an EIA study.

Purpose of this 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 developments proposed under the Project and related works that take place concurrently. This information will contribute to decisions by the Director on:

(i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project and associated works, and any related phased implementation;

(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 staged as well as the full implementation of the Project, the associated works and the related proposed mitigation measures.

Previous Related Studies and Project History

1.6 In June 1999, the Government commissioned the "Wan Chai Development Phase II Comprehensive Feasibility Study" (WDIICFS), which was completed in August 2001. An EIA Report on the WDIICFS was approved under the Environmental Impact Assessment Ordinance (EIAO) in 2001 (EIAO Register No. AEIAR-042/2001). In parallel with the WDIICFS, the Government also completed the EIA study for the Central-Wan Chai Bypass and Island Eastern Corridor Link (CWB&IECL) (EIAO Register No. AEIAR-041/2001) which was also approved under the EIAO in August 2001.

1.7 Nevertheless, as pointed out in the Project Profile (No. PP-296/2006), later in March 2004, the Government commissioned a planning and engineering review of Wan Chai Development Phase II (the WDII Review). Under the WDII Review, a Preferred Scheme was derived. The Preferred Scheme proposes major changes in various project elements which were assessed in the previously approved EIA reports for the WDIICFS and CWB&IECL including the reclamation layout/size, road alignment/elevation, length of road tunnel, locations of tunnel portals/ventilation buildings, etc.

1.8 Apart from the two EIA reports for the WDIICFS and CWB&IECL mentioned in section 1.6 above, there are also previous EIAO submissions, either associated with projects within the current Project boundary or that contain information relevant to the previous or current development schemes for the Project. A list of relevant project profiles, EIA study briefs, approved EIA reports is included as Appendix A. As stated in sections 3.3.4 and 3.4.3 below, this EIA study shall also take into account these relevant EIAO submissions and capture, summarize and/or update relevant information from these previous submissions to facilitate the Director's decision stated in section 1.5 above.

2. OBJECTIVES OF THE EIA STUDY

2.1 The objectives of the EIA study are as follows:

(i) to describe the Project and associated works together with the requirements and environmental benefits for carrying out the Project and associated works; and to identify, within the scope of the EIA study as defined in section 3.2 below, any individual project(s) that fall under Schedule 2 of the EIAO;

(ii) to identify and describe elements of the community and environment likely to be affected by the Project and associated works and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment and associated environmental constraints;

(iii) to provide information on the consideration of alternatives/options for different development schemes and construction methods;

(iv) to identify and assess air quality impact, noise impact, water quality impact, sewerage impact, waste management implications, land contamination, landscape and visual impact, marine ecological impact, cultural heritage impact and determine the significance of the impacts on sensitive receivers and potential affected uses;

(v) to propose measures to avoid or minimize pollution, environmental disturbance, nuisance and adverse impacts during construction and operation of the Project;

(vi) to investigate the feasibility, practicability, effectiveness and implications of the proposed impact avoidance or mitigation measures;

(vii) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable avoidance or mitigation measures) and the cumulative effects expected to arise during the construction and operation of the Project and associated works in relation to the sensitive receivers and potential affected uses;

(viii) to identify, assess and specify methods, measures and standards to be included in the detailed design, construction and operation of the Project and associated works which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to the acceptable levels;

(ix) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as provision of any necessary modification;

(x) to ascertain whether the EIA study has adequately addressed the environmental impacts of those Schedule 2 designated projects as described in item (i) above; and, where necessary, to identify the outstanding issues that need to be addressed in any further detailed EIA study; and

(xi) to design and specify environmental monitoring and audit requirements to ensure effective implementation of the recommended environmental protection and pollution control measures.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The Purpose

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

3.2 The Scope

3.2.1 The scope of this EIA study shall cover (i) the developments proposed by the Applicant within the boundary of the Project area as shown in Figure 1, including the relevant and representative land use plan(s) (to include any draft/final Outline Zoning Plans, draft/final Preliminary Outline Development Plan and/or draft/final Recommended Outline Development Plan); (ii) representative alternative development proposal(s) that may be recommended in the course of the EIA study; and (iii) other works associated with the Project.

3.2.2 In accordance with section 3.4 of the TM, the EIA study shall cover the combined impacts of the Project and associated works, and the cumulative construction and operation impacts of the existing, committed and planned developments in the vicinity of the Project. The scope shall include at least the Central Reclamation Phase III (CRIII) project, the Hong Kong Convention and Exhibition Centre Atrium Link Extension project, potential future railway projects to include the Shatin Central Link (SCL) and North Hong Kong Island Line (NIL), and other relevant project elements considered in the previously approved EIA reports for WDIICFS and CWB&IECL and would still be intended for future implementation, based on the best available information.

3.2.3 The EIA study shall address the likely key issues described below together with any other key issues identified during the course of the EIA study:

(i) the objective comparison of the environmental benefits and dis-benefits of different development scenarios with and without the Project, comprising among others, road alignment/design, construction methods, size/layout of reclamation[2], land use proposals within the Project area, with a view to deriving a preferred option that would avoid or minimise the adverse environmental impact to the maximum practicable extent;

(ii) the air quality impact, including impact from the construction and operation of the Project and associated works: in particular the air quality impacts on existing and planned air sensitive uses within/near the Project area from existing and future air pollutant emission sources, including air emissions from open roads, portals and ventilation buildings/shafts of road tunnels and potential future railway stations/tunnels;

(iii) the noise impact, including construction noise impact and operational noise impacts, from road traffic and fixed noise sources, such as from ventilation

[2] Any proposed reclamation should be considered in the context of the Protection of the Harbour Ordinance (Cap. 531), giving due consideration to the judgment of the Court of Final Appeal of 9 January 2004.

buildings/shafts of roads/railways tunnels, existing/reprovisioned salt water pumping station(s) on noise sensitive uses, in particular existing, planned and committed residential developments in the area where the Central-Wan Chai Bypass connects the Island Eastern Corridor in North Point area;

(iv) the water quality impact (including any hydrodynamic impact) on beneficial uses, such as seawater intakes for flushing and cooling purposes and water recreation activities, caused by the Project and associated works both during construction and operation stages, in particular reclamation works, dredging operation, change in shoreline, construction, operation and decommissioning of the temporary typhoon shelter and other marine structures, stormwater and sewerage works;

(v) the potential impacts due to various types of wastes arisings, such as excavated materials from construction works, dredged sediments; contaminated soil if identified; floating refuse; chemical waste; any other construction and demolition materials/waste to be generated from the construction and operation of the Project and associated works; and any related potential biogas problem if reclamation proceeds with sediment left in place;

(vi) the potential landscape and visual impacts caused by the construction and operation of the proposed development, such as elevated road structures, ventilation buildings, administration building of the Central-Wan Chai Bypass along the waterfront of the Victoria Harbour, tall and/or major developments on the reclaimed land and waterfront if any, existing/reprovisioned salt water pumping stations within the Project area; and waterfront promenade;

(vii) the potential ecological impact on important marine ecological habitats/ species in particular coral, if any, within and in the vicinity the Project area. The assessment shall be based on a desktop review, and, if found necessary from the review, additional field survey(s);

(viii) the potential cultural heritage impacts on marine archaeological site, if any, within the Project area. The assessment shall be based on a desktop review, and, if found necessary from the review, additional field survey(s); and

(ix) the potential cumulative environmental impacts of the Project and associated works, through interaction or in combination with other concurrent existing, committed and planned developments in the vicinity of the Project, such as Central Reclamation Phase III (CRIII) project, the Hong Kong Convention and Exhibition Centre Atrium Link Extension project and other project elements considered in the previously approved EIA reports for WDIICFS and CWB&IECL and would still be intended for future implementation such as the Wan Chai East Sewage Outfall, and the Cross-harbour Water Main from Wan Chai to Tsim Sha Tsui. Particular attention shall focus on those impacts identified to have a direct bearing on the environmental acceptability of the Project.

3.3 Consideration of Alternatives and Review of Pervious WDIICFS/CWB&IECL Assessment

The Need of Project

3.3.1 The Applicant shall report on or provide information related to the need and justification for the Project as described in the Project Profile (No. PP-296/2006) and outlined in sections 1.2 and 1.3 above. The Applicant shall explain clearly the purpose and objectives of the Project and describe the scenarios with and without the Project.

Consideration of Different Development Options including Need of Reclamation and Alternative Designs/Construction Methods

3.3.2 The Applicant shall consider and present information on identified feasible alternatives and the proposed development option(s) as presented in the Project Profile (No. PP-296/2006), taking into account any relevant studies relating to the proposed reclamation, the relevant findings of those options addressed in previous studies as well as any studies conducted to reflect the latest changes and developments identified during the course of this EIA study. The Applicant shall provide information on the consideration of alternatives/options for:

Central-Wan Chai Bypass (CWB)

- road alignment/elevation/connections/capacity design (including "deep tunnel", "shallow tunnel" and elevated option; and alignment of any slip road encroaching the Victoria Park);
- tunnel portal locations (including the option of extending the tunnel and portal eastward to location near Tin Chiu Street/North Point Ferry Piers to minimize environmental impacts to residential developments e.g. City Gardens, Provident Centre and Harbour Height Tower);
- locations and designs of the ventilation building and administration building;
- operational designs/mode/environmental mitigation measures, such as noise barriers/enclosures/low noise road surfacing.;

Wan Chai Development Phase II (WDII) Reclamation

- size of reclamation (including "no reclamation" option taking into consideration of avoiding/minimizing possible environmental impacts, such as marine ecological and cultural heritage impacts, on the foreshore and seabed) and any relevant studies relating to the proposed reclamation;
- shoreline design/configurations;
- project or reclamation designs to prevent floating refuse accumulation in potential embayed waters with poor water circulation characteristics e.g. consideration of (i) avoiding/minimizing "dead-end" space/ "right-angle" corner/ embayed waters; (ii) design/facilities to minimize refuse accumulation and to increase the current flow rate at the potential "hot-spots" of floating refuse;

Development Scheme

- proposed land uses in the promenade/waterfront areas (such as uses for arts and culture; water park; water recreation; heritage; and leisure and recreation);
- any building proposed within the Project area and the related building height restriction at the project area, in particular in the North Point environs (taking into account of the visual impacts to the exiting and planned residential developments);

- landscape and visual design to beautify the waterfront areas including the greening measures;
- connection between the waterfront areas with the hinterland, such as by means of suspension bridge or elevated walkway/platform; and
- interactions with and impacts on other projects including those mentioned in section 3.2.2 above such as alignments and related ventilation buildings and shafts of potential future railway stations/tunnels;

Construction Details

- construction methods, sequences of works, phased implementation of the Project;
- work site location(s) and duration;
- methods for transportation of fill materials and construction and demolition materials, such as by barge or by truck;
- temporary re-provision of the loss of mooring spaces and the need for temporary marine structures against wave action at/near the Causeway Bay Typhoon Shelter and the related decommissioning of temporary structures and reinstatement of the permanent facilities;
- air and noise mitigation proposals; and
- comparison of cut and cover methods, drill and blast methods, Tunnel Boring Machine (TBM) methods, immersed tube tunnel methods and the methods for the casting of the immersed tube.

Alternatives and options shall be thoroughly explored to avoid or minimize the potential adverse environmental impacts on the sensitive uses within and close to the Project area. In particular, the tunnel portal and ventilation buildings shall be considered locating away from residential developments as far as practicable, and various tunneling methods shall also be considered to reduce the environmental impacts.

3.3.3 A comparison of the environmental benefits and dis-benefits of possible CWB and development options/alternatives, including options/alternatives for CWB alignments, reclamation limits and waterfront promenade proposals, as mentioned in section 3.3.2 above. The comparison shall assist informed-decisions to be made on the recommended preferred options, which shall in principle, avoid or minimize adverse environmental impacts to the maximum practicable extent. The EIA report shall focus on and describe adequately the part that environmental factors played in arriving at the preferred development option(s) for the Project.

Review of Previous WDIICFS and CWB&IECL EIAs

3.3.4 The EIA study shall review the two approved EIA reports for the WDIICFS and CWB&IECL (EIAO Register Nos. AEIAR-042/2001 and AEIAR-041/2001 respectively) and confirm whether the project details and the previous EIA findings, impact predictions and recommendations are still valid for the relevant project elements which were considered in these two previously approved EIA reports and would still be intended for future implementation, based on the best available information. Such elements include: (i) the Wan Chai East Sewage Outfall; (ii) the Cross-Harbour Water Mains from Wan Chai to Tsim Sha Tsui; and (iii) the western tunnel portal and ventilation building/facilities of the Central-Wan Chai Bypass in Central District. If necessary, additional environmental assessments shall be conducted to determine the environmental acceptability and recommend environmental mitigation measures where appropriate for the previously considered

project elements which would still be intended for future implementation.

3.4 Technical Requirements

3.4.1 The Applicant shall conduct the EIA study to address all environmental aspects of the Project and associated works as described in sections 3.1, 3.2 and 3.3 above. The assessment shall be based on the best and latest information available during the course of the EIA study.

3.4.2 The Applicant shall include in the EIA report details of the construction programme and methodologies. The Applicant shall clearly state in the EIA report the time frame and work programmes of the Project and associated works and other concurrent projects, and assess the cumulative environmental impacts from the Project and associated works with all interacting projects as identified in the EIA study, including any phased implementation of the Project and associated works.

Use of Relevant Findings of Approved EIA Reports and Relevant Studies

3.4.3 The Applicant shall review previously approved EIA reports and other EIAO submissions as listed in Appendix A which are relevant to the Project. The Applicant shall extract the relevant information for the purpose of this EIA Study. The Applicant shall also review the validity of the extracted information and provide necessary updating as appropriate.

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

3.4.5 Air Quality Impact

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

3.4.5.2 The Applicant shall assess air pollutants concentrations with reference to the relevant sections of the guidelines in Appendices B-1 to B-3 in this EIA study brief, or other methodology to be agreed by the Director (with reference to section 4.4.2(c) of the TM) prior to commencement of the assessment(s). The Applicant shall identify and assess air impacts arising from the construction and operation of the Project and associated works, including those arising from any phased implementation of the Project and cumulative impacts with other projects such as the Central Reclamation Phase III, the Hong Kong Convention and Exhibition Centre Atrium Link Extension and the potential future railway projects, i.e. SCL and NIL, on the air sensitive receivers: in particular residential developments in North Point area and fresh air intakes of commercial buildings and railway stations, near the tunnel portals and ventilation buildings/shafts of the road projects.

3.4.5.3 The air quality impact assessment shall include the following:

(i) Determination of Assessment Area

The area for air quality impact assessment shall generally be defined by a distance of 500 metres expanded from the boundary of the scope of the EIA

study as defined in sections 1.2 and 3.2. If warranted, the Director could require the assessment area to be further extended to include major emission sources and/or air sensitive receiver(s) (ASRs) that may have bearing on determining the environmental acceptability of the Project.

(ii) Background and Analysis of Activities

(a) Provide background information relating to air quality issues relevant to the Project, e.g. description of the types of activities of the Project that may affect air quality during both construction and operation stages.

(b) Present background air quality levels in the assessment area for the purpose of evaluating cumulative air quality impacts.

(c) Consider alternative construction and methods/phasing programs and alternative modes of operation to minimize the constructional and operational air quality impact.

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

(a) Identify and describe the representative existing, planned and committed ASRs likely to be affected by the potential adverse environmental impacts caused by emission sources identified in section 3.4.5.3(iii)(b) below as arising from the Project and associated works within the assessment area (as defined in section 3.4.5.3(i) above), both on-site and off-site, including those earmarked on the relevant Preliminary Outline Development Plans, Outline Zoning Plans, Outline Development Plans, Recommended Outline Development Plan, Layout Plans and other relevant published land use plans and any alternative development proposal(s) identified or recommended in the course of this EIA study. The Applicant shall select assessment points of the identified ASRs that would represent the worst impact point of these ASRs. A map clearly showing the locations and descriptions, such as names of buildings, uses and heights of the selected assessment points shall be included. The separation distances of these ASRs from the nearest emission sources shall also be given. For any phased implementation of development or associated works, the Applicant shall review the development programme, and where appropriate, to avoid or reduce adverse air quality impact on existing occupiers and occupiers of early implementation packages to the maximum extent practicable.

(b) Identify and present a list of air pollutant emission sources, including any emission sources likely to impact on the Project and the associated works, based on results of the analysis conducted under section 3.4.5.3(ii)(a) above. Activities that shall give rise to construction stage emission sources (dust) will at least include stock piling, concrete batching (if any), and vehicle movements on unpaved haul roads within the Project area. Potential operational stage emission sources shall take into account at least

- vehicular emissions from open roads, tunnel portals and ventilation

shafts/buildings;

- potential odour sources identified within the Project area and in the vicinity of and traversing the Project in particular for air sensitive uses which are proposed close to these sources;

Confirmation regarding the validity of the assumptions adopted and the magnitude of the activities (e.g. volume of construction material handled, traffic mix and volume on a road etc.) shall be obtained from the relevant government departments/authorities and documented in the EIA report in accordance with section 3.4.14 below.

(c) The emissions from any associated works of the Project, and from any concurrent projects, identified as relevant during the course of the EIA study, shall be taken into account as contributing towards the overall cumulative air quality impact. The impacts as affecting the existing, planned and committed air sensitive receivers within the assessment area (as defined in section 3.4.5.3(i) above) shall be assessed, based on the best information available at the time of assessment

(iv) Construction Air Quality Impact

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

(b) If the Applicant anticipates that the Project will give rise to significant construction dust impacts likely to exceed the recommended limits in the TM at the ASRs despite the incorporation of the dust control measures proposed in accordance with section 3.4.5.3(iv)(a) above, a quantitative assessment shall be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in section 3.4.5.3(vi) below when carrying out the quantitative assessment.

(v) Operational Air Quality Impact

(a) The Applicant shall calculate the expected air pollutant concentrations at the identified ASRs based on an assumed reasonable worst-case scenario under normal operating conditions. The evaluation shall be based on the strength of the emission sources identified in section 3.4.5.3(iii)(b) above. The Applicant shall follow section 3.4.5.3(vi) below when carrying out the quantitative assessment.

(b) The air pollution impacts of future road traffic shall be calculated based on the highest emission strength from road vehicles within the next 15 years upon commencement of operation of the proposed road. The Applicant shall demonstrate that the selected year of assessment represents the highest emission scenario given the combination of

vehicular emission factors and traffic flow for the selected year. The fleet average emission factors used in the assessment shall be agreed with the Director. If necessary, the fleet average emission factors shall be determined by a motor vehicle emission model such as EMFAC-HK model to be agreed with the Director prior to the commencement of the assessment (with reference to section 4.4.2(c) of the TM). All the traffic flow data and assumptions that used in the assessment shall be clearly and properly documented in the EIA report in accordance with section 3.4.14 below.

(c) If vehicular tunnels and/or full enclosures are to be proposed, it is the responsibility of the Applicant to ensure that the air quality inside these proposed structures shall comply with EPD's "Practice Note on Control of Air Pollution in Vehicle Tunnels". When assessing air quality impact due to emissions from tunnels/full enclosures, the Applicant shall ensure prior agreement with the relevant tunnel ventilation design engineer over the amount and the types/kinds of pollutants emitted from these tunnel/full enclosures; and such assumptions shall be clearly and properly documented in the EIA report in accordance with section 3.4.14 below.

(d) For odour impact assessment for the identified potential source(s) at the nearby ASRs, the Applicant shall specify clearly the assumptions used for determining the reasonable worst case scenario and justify the assumptions adopted in the assessment. Such assumptions shall be clearly and properly documented in the EIA report in accordance with section 3.4.14 below. The Applicant shall also include an assessment on the odour generation mechanism with a view to reasonably determine the existing and future emission strength of the odour source(s). The assessment methodology of the odour assessment shall be agreed by the Director (with reference to section 4.4.2(c) of the TM) prior to the commencement of the assessment.

(vi) Quantitative Assessment Methodology

(a) The Applicant shall apply the general principles enunciated in the modelling guidelines in Appendices B-1 to B-3 while making allowance for the specific characteristics of the Project. This specific methodology shall be documented in such level of details, preferably assisted with tables and diagrams, to allow the readers of the EIA report to grasp how the model has been set up to simulate the situation under study without referring to the model input files. Detailed calculations of air pollutants emission rates and a map showing all the emission sources for input to the modelling shall be presented in the EIA report. The Applicant shall ensure consistency between the text description and the model files at every stage of submissions for review. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details shall be sought.

(b) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for selecting such parameters for

assessing the impact from the Project and associated works.

(c) The Applicant shall calculate the overall cumulative air quality impact at the ASRs identified under section 3.4.5.3 (iii) above and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table(s) and pollution contours, to be evaluated against the relevant air quality standards and on any implications they may have on the land use. Plans of a suitable scale shall be used to present pollution contours to allow buffer distance requirements to be determined accurately.

(d) If any direct noise mitigation measures would be recommended under the Project, the associated air quality implication of these measures shall be assessed. For instance, if barriers are recommended to mitigate excessive traffic noise, they may affect dispersion of air pollutants, then the implications of such traffic noise remedies on air quality impact shall be assessed. If tunnel or noise enclosures are proposed, then portal emissions of the tunnel/enclosed road sections and air quality inside the tunnel/enclosed road sections shall also be addressed. The Applicant shall highlight clearly the locations and types of agreed noise mitigating measures (where applicable), be they barriers, tunnel/road enclosure and their portals, and affected ASRs, on the contour maps for easy reference.

(vii) Mitigation Measures for Non-compliance

The Applicant shall propose remedies and mitigating measures where the predicted air quality impact exceeds the criteria set in section 1 of Annex 4 in the TM. These measures, their operation, maintenance and responsibility, 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.

(viii) Submission of Model Files

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

3.4.6 Noise Impact

3.4.6.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing noise impacts as stated in Annexes 5 and 13 of the TM respectively. The Applicant shall identify and assess noise impacts arising from the construction and operation of the Project and associated works, including those arising from any phased implementation of the Project and cumulative impacts with other projects including the Central Reclamation Phase III, Hong Kong Convention and Exhibition Centre Atrium Link Extension and the potential future railway projects i.e. SCL and NIL, on the noise sensitive receivers in particular residential developments in North Point area.

3.4.6.2 The noise impact assessment shall include the following :

(i) Determination of Assessment Area

The area for noise impact assessment shall generally include all areas within 300m from the boundary of the scope of the EIA study as defined in sections 1.2 and 3.2. Subject to the agreement of the Director, the assessment area could be reduced accordingly if the first layer of noise sensitive receivers (NSRs), closer than 300m from the boundary of the Project, provides acoustic shielding to those receivers at further distance behind. Similarly, subject to the agreement of the Director, the assessment area shall be expanded to include NSRs at distance greater than 300m from the boundaries of Project which are noise sensitive if they may be affected by the construction and operation of the Project.

(ii) Provision of Background Information and Existing Noise Levels

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

(iii) Identification of Noise Sensitive Receivers

(a) The Applicant shall refer to Annex 13 of the TM when identifying the NSRs in the assessment area as determined in section 3.4.6.2(i) above. The NSRs shall include existing NSRs and planned/ committed noise sensitive developments and uses earmarked on the relevant Preliminary Outline Development Plans, Outline Zoning Plans, Outline Development Plans, Recommended Outline Development Plan, Layout Plans and other relevant published land use plans, including any alternative development proposal(s) identified or recommended in the course of the EIA study. The photographs showing the façade of existing NSRs identified within the assessment area with direct line of sight to the identified noise sources shall be appended to the EIA report.

(b) The Applicant shall select assessment points to represent the identified NSRs for carrying out quantitative noise assessment described below. The assessment points shall be agreed with the Director prior to the quantitative noise assessment. A map showing the location and description such as name of building, use, and floor of each and every selected assessment point shall be given. For planned noise sensitive land uses without committed site layouts, the Applicant can use the relevant planning parameters to work out representative site layouts for operational noise assessment purpose. However, such assumptions together with any constraints identified, such as setback of building, building orientation, extended podium, shall be agreed with the relevant responsible parties including Planning Department and Lands Department in accordance with section 6.3 of Annex 13 of the TM and properly documented in the EIA report in accordance with section 3.4.14 of this study brief.

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

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

(v) Construction Noise Assessment

(a) The assessment shall cover the cumulative noise impacts due to the construction works of the Project and any other relevant concurrent projects identified during the course of the EIA study.

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

(c) To minimize the construction noise impact, alternative construction methods to replace percussive piling shall be proposed as far as practicable.

(d) If tunneling works will be involved, noise impact (including air-borne noise and ground-borne noise) associated with the operation of powered mechanical equipment, in particular tunnel boring machine or equivalent, shall be assessed. If tunnel boring machine is used and it is likely that ground-borne noise will affect NSRs, the criteria and assessment methodology shall be agreed with the Director (with reference to section 4.4.2(c) of the TM) prior to the commencement of the assessment.

(e) If the unmitigated construction noise levels are found exceeding the relevant criteria, the Applicant shall propose practicable direct mitigation measures (including movable barriers, enclosures, quieter alternative methods, re-scheduling and restricting hours of operation of noisy task) to minimize the impact. If the mitigated noise levels still exceed the relevant criteria, the duration of the noise exceedance shall be given.

(f) The Applicant shall formulate a reasonable construction programme as far as practicable such that no work will be required in the restricted hours as defined under the Noise Control Ordinance (NCO). In case the Applicant needs to evaluate whether construction works in restricted hours as defined under the NCO are feasible or not in the context of programming construction works, reference shall be made to the relevant technical memoranda issued under the NCO. Regardless of the results of the construction noise impact assessment for restricted hours, the Noise Control Authority will process the Construction Noise Permit (CNP) application, if necessary, based on the NCO, the relevant

technical memoranda issued under the NCO, and the contemporary conditions/situations. This aspect, if applicable, shall be explicitly stated in the noise chapter and the conclusions and recommendations chapter in the EIA report.

(vi) Operational Noise Assessment

(a) Road Traffic Noise

(a1) Calculation of Noise Levels

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

The Applicant shall calculate the expected road traffic noise using methods described in the U.K. Department of Transport's "Calculation of Road Traffic Noise" (1988). Calculations of future road traffic noise shall be based on the peak hour traffic flow in respect of the maximum traffic projection within a 15 years period upon commencement of operation of the proposed road works. The Applicant shall calculate traffic noise levels in respect of each road section and the overall noise levels from combined road sections (both new and existing) at NSRs.

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

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

1. unmitigated scenario at the assessment year;

2. mitigated scenario at the assessment year; and

3. prevailing scenario for indirect technical remedies eligibility assessment.

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

(a2) Presentation of Noise Levels

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

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

(a3) Proposals for Noise Mitigation Measures

The Applicant shall propose, in accordance with Section 6 in Annex 13 of the TM, direct technical remedies in all situations where predicted traffic noise level due to the road sections within the meaning of Item A.1 of Schedule 2 of EIAO, exceeds the criteria in Table 1A of Annex 5 in the TM by 1 dB(A) or more, and, under section 4.4.3 of the TM, noise from the road sections within the meaning of Item A.1 of Schedule 2 of EIAO has significant contribution to the cumulative environmental impacts which would exceed the criteria when considered in conjunction with the existing or potential impacts from other projects. The direct mitigation measures listed under Section 6.1 of Annex 13 of the TM, including the option of alternative land use arrangement, shall be thoroughly explored and evaluated with a view to reducing the noise level at the NSRs concerned to the level meeting the relevant noise criteria. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed in accordance with section 4.4.2(k) of the TM. Specific reasons for not adopting certain direct mitigation measures in the design to reduce the traffic noise to a level meeting the criteria in the TM or to maximize the protection for the NSRs as far as practicable shall be clearly and specifically quantified and laid down.

Sections of any noise barrier proposed to protect existing NSRs shall be differentiated clearly from those proposed for the protection of future or planned NSRs as the latter is only required to be constructed before the occupation of the planned NSRs. To facilitate

any phased implementation of the barrier under this principle, a barrier inventory showing intended NSRs (i.e. existing NSRs as distinct from planned NSRs) to be protected by different barrier sections to achieve different extent of noise reduction (to be quantified in terms of how many dB(A)) shall be provided.

The total number of dwellings, classrooms and other noise sensitive element that will benefit from and be protected by the provision of direct mitigation measures shall be provided. In order to clearly present the extents/locations of the recommended noise mitigation measures, plans prepared from 1:1,000 or 1:2,000 survey maps showing the mitigation measures (e.g. enclosures/barriers, low noise road surfacing) shall be included in the EIA report.

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

In case where a number of the NSRs cannot be protected by the recommended direct mitigation measures, the Applicant shall identify and estimate the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect technical remedies under the Executive Council directive "Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads", the associated costs and any implications for such implementation. For the purpose of determining the eligibility of the affected premises for indirect technical remedies, reference shall be made to the following set of three criteria :

(1) the predicted overall noise level at the NSR from the new road together with other traffic noise in the vicinity must be above a specified noise level (e.g. 70 dB(A) for domestic premises and 65 dB(A) for education institutions, all in L_{10}(1hr));

(2) the predicted overall noise level is at least 1.0 dB(A) more than the prevailing traffic noise level, i.e. the total traffic noise level existing before the works to construct the road were commenced; and

(3) the contribution from the new road to the increase in the predicted overall noise level must be at least 1.0 dB(A).

(b) Fixed Noise Sources

(b1) Assessment of Fixed Noise Levels

The Applicant shall identify any fixed noise sources within the "Assessment Area", including at least any permanent and temporary

industrial noise sources, e.g. ventilation buildings/facilities, pumping stations, electrical substation, bus terminus, sewage screening/ treatment plant, open car/lorry park, public filling barging point, concrete batching plants, construction material handling facilities, fire station, ambulance depot, and calculate the expected noise using standard acoustics principles. Calculations for the expected noise shall be based on assumed plant inventories and utilization schedule for the reasonable worst case scenario. Such assumptions shall be clearly and properly documented in the EIA report in accordance with section 3.4.14 below. The Applicant shall calculate the noise levels taking into account correction of tonality, impulsiveness and intermittence in accordance with the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites issued under the Noise Control Ordinance.

(b2) Presentation of Noise Levels

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

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

(b3) Proposals for Noise Mitigation Measures

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

(c) Helicopter Noise

(c1) For the proposed helipad re-provision, based on the approved EIA report for the WDIICFS and in the current Draft Wan Chai OZP (No. S/H25/1), helipad use is planned at the existing pier located near the northern end of Expo Drive East. The planned helipad project will be more than 300m away from the nearest existing residential development. The Applicant shall review the EIAO status of the helipad project against the latest/recommended land uses in the vicinity and confirm the validity of the previous EIA findings and recommendations. The Applicant shall liaise with the proponent/ operator of the helipad project on the latest operation parameters (such as flight types, flight paths, flight frequency, flight hours and commercial/ government use). The Applicant shall review and confirm whether the previous EIA findings and recommendations on

helicopter noise are still valid. If valid, the findings and recommendations shall be captured/summarised in this EIA study.

(c2) If the review in (c1) identifies the need, the Applicant shall carry out assessment of the noise impacts arising from the operation of the proposed helipad and related off site facilities with respect to the criteria set in Table 1A of Annex 5 of the TM. The impact shall cover helicopter operation at the helipad and during its approach and departure from the helipad. The Applicant shall evaluate the reasonable worst-case scenarios in terms of flight types, flight paths, flight frequency and flight hours. For noise matters not fully listed in Table 1A of Annex 5 of the TM, the criteria and assessment methodology shall be agreed with the Director (with reference to section 4.4.2(c) of the TM) prior to the commencement of the assessment.

(c3) If the assessment required in (c2) above is conducted, the Applicant shall propose direct mitigation measures in all situations where the noise level exceedances are predicted following the principle of Section 6 of Annex 13 of the TM such as alternative land use arrangement, alternative siting or treatment at source. The total number of noise sensitive receivers that will benefit by and be protected by the provision of direct mitigation measures shall be provided. The total number of other noise sensitive receivers that will still be exposed to noise above the criteria with the implementation of all recommended direct mitigation measures shall be quantified.

(vii) Assessment of Side Effects and Constraints

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

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

For planned noise sensitive uses which will still be affected even with all practicable direct mitigation measures in place, the Applicant shall propose, evaluate and confirm the practicality of additional measures including building setback within the planned noise sensitive uses and shall make recommendations on how these noise sensitive uses will be designed for the information of relevant parties.

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

(ix) Consideration of Mitigation Measures

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

(a) alternative land use arrangement
(b) alternative siting
(c) screening by noise tolerant buildings
(d) setback of buildings
(e) decking over
(f) extended podium
(g) building orientation
(h) treatment of source
(i) alternative alignment
(j) noise barrier/enclosure
(k) special building design
(l) architectural features/balcony
(m) open-textured road surfacing

3.4.7 Water Quality Impact

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

3.4.7.2 The "assessment area" for the water quality assessment shall include the areas within and 300m extended beyond the boundary of the scope of EIA study as described in section 3.2.1 above, plus the Victoria Harbour Water Control Zone (WCZ), the Eastern Buffer WCZ and the Western Buffer WCZ as declared under the Water Pollution Control Ordinance. This assessment area shall include other areas such as existing and new drainage system and any associated water system(s) affected by the construction and operation of the Project and associated works, including any phased implementation.

3.4.7.3 The water quality impact assessment shall include the following major areas of concern:

(a) The water quality impacts on Victoria Harbour and water sensitive receivers affected by the construction and operation of the proposed developments and associated works. These impacts shall include at least elevation in suspended solids; release of organic and inorganic contaminants and nutrients, depletion of dissolved oxygen, rise in water temperature resulting from works/structures/activities to include:

- dredging of marine sediment;
- filling or dumping activities;
- permanent/temporary reclamation works and removal of temporary reclamation;
- construction, operation and decommissioning of the proposed temporary typhoon shelter;
- the reinstatement works of the affected area at the Causeway Bay Typhoon Shelter;
- the immersed road tunnel and the associated works;
- sewerage works including the reprovision of the Wan Chai East Sewage Screening Plant Outfall and the abandonment of the Wan Chai West Sewage Screening Plant Outfall;
- construction of the cross-harbour water mains;

- reprovisioning of affected facilities including drainage outfalls, cooling water intakes, salt water pumping station(s) of the Water Supplies Department (WSD);
- construction of the waterfront promenade;
- drainage diversion works and urban runoff / stormwater discharges;
- spent cooling water discharges;
- construction site runoff; and
- non-point source discharge.

(b) The possible nuisance to existing and planned future water sensitive receivers due to introducing developments/reclamation/structures/works in existing, temporary and future embayed areas, such as Causeway Bay Typhoon Shelter, temporary typhoon shelter and ex-Public Cargo Working Area in Wan Chai.

(c) The suitability of the predicted water quality for the water recreation/sports facilities if such facilities are proposed.

(d) The influence of changes in shoreline configurations to hydrodynamic regime and water quality in Victoria Harbour due to change of land form resulting from the phased and full implementation of the Project (e.g., permanent/ temporary reclamation, temporary typhoon shelter) and seabed levels arising from construction and operation of the CWB, its slip roads, and any works associated with construction/demolition/re-construction of seawalls/ breakwaters/temporary typhoon shelter and other marine structures.

3.4.7.4 The Applicant shall identify and analyse physical, chemical and biological disruptions of marine water, coastal water, and drainage system arising from the construction and operation of the proposed developments and associated works.

3.4.7.5 The Applicant shall predict, quantify and assess any water quality impacts arising from the proposed developments and associated works on the receiving water system(s) and the water sensitive receivers. Possible impacts shall include but not be limited to changes in hydrology, flow regime, sediment erosion and deposition pattern; change in water quality due to any proposed works including those mentioned in section 3.4.7.3 above, and the consequential effects on flora and fauna due to such changes in the affected water bodies.

3.4.7.6 The Applicant shall take into account water quality impacts resulting from different construction stages or sequences, and different operational phased implementation of the Project where applicable in the assessment (such as construction/operation/ demolition of the temporary typhoon shelter and the reprovision of the Wan Chai East Sewage Screening Plant Outfall and the abandonment of the Wan Chai West Sewage Screening Plant Outfall). The assessment shall have regard to the frequency, duration, volume and flow rate of discharges and their pollutant and sediment loading. Essentially, the assessment shall address the following :

<u>Characterisation of environmental conditions, sensitive receivers, sources of impacts</u>

(a) Collection and review of background information on the affected existing and planned water systems their respective catchments and water sensitive receivers which might be affected by the Project and associated works during

construction and operation.

(b) Characterization of water and sediment quality of the water systems and water sensitive receivers which might be affected by the Project and associated works during construction and operation based on existing information or site survey and tests as appropriate. If water recreation/sport facilities will be provided or if sediment treatment by application of chemicals will be adopted, seawater samples shall be collected or relevant and valid existing information shall be used to establish baseline water quality;

(c) Identification and analysis of relevant existing and planned future activities and beneficial uses related to the affected water system(s) and identification of all water sensitive receivers within the assessment area, including typhoon shelter, seawater intakes for flushing and cooling and any proposed water recreation/beneficial use(s). The Applicant shall refer to, *inter alia*, those developments and uses earmarked on the relevant Outline Zoning Plans, Preliminary Outline Development Plans, Recommended Outline Development Plan and Layout Plans; and land uses and implementation programmes to be recommended under the Project;

(d) Identification of pertinent water and sediment quality objectives and establishment of other appropriate water and sediment quality criteria or standards for the water system(s) and all of the sensitive receivers identified in items (a) to (c) above, including any ecological sensitive receivers for the assessments covered in section 3.4.12. The Applicant shall make reference to the Water Quality Objectives (for Recreation and Related Uses) in Victoria Harbour Water Control Zone as set out in Appendix D.

(e) Identification of any alteration of water courses, drainage systems, temporary/ permanent change in shoreline or bathymetry change of hydrodynamic regimes, change of catchment types or areas (e.g., any proposed permanent/temporary reclamation, any change of seabed level due to the CWB, its associated slip roads/road network, the construction and decommissioning works of the temporary typhoon shelter and the reinstatement of the affected area at the Causeway Bay Typhoon Shelter).

(f) Identification and quantification of existing and likely future water and sediment pollution sources, including at least pollution flow and load in existing storm drains, culverts, nullahs and outfalls discharged into the Causeway Bay Typhoon Shelter, ex-public cargo working area or Victoria Harbour within the assessment area, existing/proposed submarine sewage outfalls within the assessment area, point discharges and non-point sources within the assessment area to surface water runoff, sewage or polluted discharge generated from the Project. An emission inventory on the quantities and characteristics of all these existing and likely future pollution sources in the assessment area shall also be provided. Field investigation and laboratory tests, as appropriate, shall be conducted to fill any information gaps.

Impact Prediction

(g) Prediction and quantification by mathematical modelling or other technique agreed by the Director, of the impacts on the water system, the existing and

planned stormwater outfalls, the sensitive receivers and beneficial uses (e.g. water based recreation uses) due to those alterations and changes identified in (e) and the pollution sources identified in (f). Existing and likely future pollution reduction due to the Harbour Area Treatment Scheme (HATS) and other drainage/sewerage improvement, interception, diversion and/or treatment of the polluted flows in the stormwater outfalls, diversion/extension of stormwater outfalls within the Causeway Bay Typhoon Shelter to discharge outside of the typhoon shelter, and drainage/sewerage mis-connection rectification to be agreed by the Director shall be estimated and taken into account in the impact prediction. The mathematical modelling requirements are set out in Appendix C of this Study Brief. The prediction shall take into account and include likely different construction stages or sequences (including different coastline configurations at various stages, temporary reclamation, temporary typhoon shelter, temporary diversion of stormwater and sewage), and different operational stages.

(h) Assessment of the cumulative impacts due to other related, concurrent and/or planned project elements, including the Central Reclamation Phase III, Hong Kong Convention and Exhibition Centre Atrium Link Extension, Harbour Area Treatment Scheme (HATS) Stage 2A, Laying of Western Cross Harbour Main and Associated Land Mains from West Kowloon to Sai Ying Pun, Western Harbour Submarine Gas Pipeline and Associated Stations, activities or pollution sources within a boundary around the Project area to be agreed by the Director prior to commence of the assessment, that may have a bearing on the environmental acceptability of the Project. This shall include the potential cumulative construction and operational water quality impact arising from, *inter alia*, the associated works of the Project, the activities and planned projects to be agreed by the Director when the programme of the Project and associated works can be confirmed by the Applicant.

Mitigation

(i) Identification of mitigation measures to avoid or minimize the impacts identified. The residual impacts on the water system(s) and the water sensitive receivers with regard to the appropriate water and sediment quality criteria, standards and guidelines shall be assessed and quantified.

(j) Investigation and proposal on the best management practices to reduce storm water and non-point source pollution as appropriate. Attention shall be made to the water pollution control and mitigation measures recommended in ProPECC (Professional Persons Environmental Consultative Committee) Practice Notes No. 1/94 on construction site drainage.

3.4.7.7 In particular, the assessment of the water quality impacts in relation to dredging/ filling/dumping and stormwater pollution shall cover the following specific issues:

(I) Dredging, Filling and Dumping

(a) Identification and quantification of dredging, filling, sediment/mud transportation and, disposal activities and requirements. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The potential for

the release of contaminants during dredging shall be addressed using the chemical testing results derived from sediment and marine water samples collected on site and relevant historic data. Relevant and valid existing information shall be used or appropriate laboratory tests such as elutriate tests in accordance with the United States of Army Corps of Engineers (USACE) method and sediment pore water (interstitial water) analyses shall be performed on the sediment samples to simulate and quantify the degree of mobilization of various contaminants such as metals, oxygen demands, ammonia, nutrients, trace organic contaminants (including Polychlorinated Biphenyls (PCBs), Polycyclic Aromatic Hydrocarbons (PAHs), Tributyltin (TBT) and chlorinated pesticides) into the water column during dredging. The ranges of parameters to be analyzed; the number, location, depth of sediment, type and methods of sampling; sample preservation; and chemical laboratory test methods to be used shall be subject to the agreement of the Director. The Applicant shall also assess the pattern of the sediment deposition and the potential increase in turbidity and suspended solid levels in the water column and at the sensitive receivers due to the disturbance of sediments during dredging, filling and dumping.

(b) Prediction, quantification and assessment of impacts on the hydrodynamic regime, water and sediment quality of the water system(s) and the sensitive receivers due to the activities identified above. The prediction and quantification of impacts caused by, among others, sediment re-suspension and contaminant release shall be carried out by mathematical modelling (see modelling requirements set out in Appendix C of this Study Brief) or other techniques to be agreed by the Director.

(c) Recommendation of appropriate mitigation measures to avoid or minimize the impacts identified above, in particular suitable mud dredging and filling methods shall be recommended to mitigate any adverse impacts. The residual impacts on the water system(s) and the sensitive receivers with regard to the relevant water and sediment quality objectives, criteria, standards or guidelines shall be assessed and quantified by mathematical models as set out in Appendix C of this Study Brief or other techniques to be agreed by the Director.

(d) Identification and evaluation of the best practicable dredging and filling methods to minimize marine mud disturbance and dumping requirements and demand for fill sources based on the criterion that the existing marine mud shall be left in place and not to be disturbed as far as possible.

(e) Evaluation of the impacts due to release of the interstitial water and associated contaminants to the water column and ground water if wick drain installation is used to speed up consolidation of mud.

(f) Predication and quantification of cumulative impacts due to other dredging, filling or dumping activities within a boundary around the Project area to be agreed by the Director prior to commence of the assessment.

(II) Stormwater Pollution

(g) Analysis on the provision and adequacy of the existing and planned future facilities to reduce pollution arising from the polluted stormwater drainage system and surface water run-off identified in section 3.4.7.6(f) above. Analysis on the water quality impact shall also be addressed.

3.4.8 Sewerage Impact and Sewage Treatment Implications

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

3.4.8.2 The Applicant shall study and assess the impacts of the sewage discharge from the Project and associated works on the sewerage system of the Project area and shall identify any practicable measure to resolve the impacts, if any.

3.4.9 Waste Management Implications

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

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

(i) Analysis of Activities and Waste Generation

The Applicant shall identify the quantity, quality and timing of the waste arising as a result of the construction and operation activities of the Project and associated works, based on the sequence and duration of these activities including any dredged marine sediment, construction and demolition materials, floating refuse and other wastes which would be generated during operation stage.

(ii) Proposal for Waste Management

(a) Prior to considering the disposal options for various types of wastes, opportunities for reducing waste generation, on-site or off-site re-use and recycling shall be fully evaluated. Measures which can be taken in the planning and design stages (e.g. by modifying the design approach) and in the construction stage for maximizing waste reduction shall be separately considered. The Applicant shall consider alternative project designs/measures to avoid/minimize floating refuse accumulation/entrapment and measures/proposals for the potential floating refuse problem, e.g. streamlining the shoreline design; measures to improve the tidal flushing capacity; alternative seawall design to facilitate floating refuse collection; and regular collection of the floating refuse along the shoreline. Regarding the potential trapping of floating refuse along the shoreline of the Project, the Applicant shall estimate as far as practicable the amount of floating refuse to be found/trapped along the shoreline of the Project in construction stage and after the completion of the Project. The Applicant shall develop an effective plan/design to avoid/minimize the trapping of floating refuse. If floating refuse problem is identified and needs to be dealt with, the Applicant shall propose appropriate measures to deal with this floating refuse in a proper and acceptable manner e.g. to collect, recycle, reuse, store, transport and dispose of.

(b) After considering all practicable opportunities for reducing waste generation and maximizing re-use, the types and quantities of the wastes required to be disposed of as a consequence shall be estimated and the disposal options for each type of waste shall be described in detail. The disposal method recommended for each type of waste shall take into account the result of the assessment in (c) below.

(c) The impact caused by handling (including labeling, packaging and storage), collection, and reuse/disposal of wastes shall be addressed in detail and appropriate mitigation measures shall be proposed. This assessment shall cover the following areas:

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

(iii) Dredging, Filling and Dumping

Identification and quantification as far as practicable of all dredging, fill extraction, filling, reclamation, mud/sediment transportation and disposal activities and requirements shall be conducted. Potential fill source and dumping ground to be involved shall also be identified. Field investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted as appropriate. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests. The categories of sediments which are to be disposed of in accordance with a permit granted under the Dumping at Sea Ordinance (DASO) shall be identified by both chemical and biological tests and their quantities shall be estimated. If the presence of any seriously contaminated sediment which requires special treatment/disposal is confirmed, the Applicant shall identify the most appropriate treatment and/or disposal arrangement and demonstrate its feasibility.

(iv) Potential Biogas Problem

Investigation of the potential biogas problem shall be conducted if there is reclamation area adopting a design of leaving marine mud/sediment in place (i.e. “not fully dredged” approach). The investigation, if found necessary, shall include:

(1) a proposal on collection and analysis of representative samples at various depths or on the use of previously obtained information for the agreement of the Director;
(2) carrying out the sampling and testing or review of previously obtained information to be agreed by the Director; and
(3) a proposal, with justifications, on monitoring, mitigation and precautionary measures for the Project, if found necessary.

3.4.10 Land Contamination Impact

3.4.10.1 The Applicant shall follow the guidelines for evaluating and assessing potential land contamination issues as stated in Sections 3.1 and 3.2 in Annex 19 of the TM.

3.4.10.2 The "Assessment Area" for land contamination impact shall include the A King Shipyard at the Causeway Bay Typhoon Shelter and any other potentially contaminated sites identified in this EIA.

3.4.10.3 The Applicant shall provide a clear and detailed account of the present land use (including description of the activities, chemicals and hazardous substances handled, with clear indication of their storage and location, by reference to a site map) and the relevant land use history in relation to possible land contamination (including accident records and change of land use(s)).

3.4.10.4 During the course of the EIA study, the Applicant shall submit a contamination assessment plan (CAP) to the Director for agreement prior to conducting the contamination impact assessment of the relevant land or site(s) suspected to contain land contaminant(s) that shall require remediation. The CAP shall include proposals with details on representative sampling and analysis required to determine the nature and the extent of the contamination of the relevant land or site(s). Aternatively, the Applicant may refer to other previously agreed and still relevant and valid CAP(s) for the concerned site(s). Based on the CAP agreed with the Director, the Applicant shall conduct a land contamination impact assessment. If land contamination is confirmed, a remedial action plan (RAP) shall be prepared to formulate necessary remedial measures.

3.4.10.5 If there is/are potential contaminated site(s) inaccessible for preparing sampling and analysis during the course of the EIA study as required under section 3.4.10.4 above, e.g. due to site access problem, the Applicant's CAP shall include:

(i) a review of the available information;
(ii) an initial contamination evaluation of this/these site(s) and possible remediation methods;
(iii) a confirmation of whether the contamination problem at this/these site(s) would be surmountable;
(iv) a sampling and analysis proposal which shall aim at determining the nature and the extent of the contamination of this/these site(s) ; and
(v) a schedule of submission of revised CAP(if necessary), CAR and RAP upon this/these site(s) is/are accessible.

3.4.11 Landscape and Visual Impact

3.4.11.1 The Applicant shall follow the criteria and guidelines as stated in Annexes 10 and 18 of the TM and EIAO Guidance Note No. 8/2002 on "Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance" for evaluating and assessing landscape and visual impacts of the Project and associated infrastructure and works, such as noise barriers and above ground structures (e.g., ventilation buildings, tunnel portals, pumping stations, etc.), during both construction and operational stages. The assessment shall take into account all existing and planned land uses and sensitive receivers.

3.4.11.2 Determination of Assessment Areas

(a) The area for the landscape impact assessment shall include all areas within 100 metres extended from the boundary of the scope of the EIA study as described in section 1.2 and 3.2 above.

(b) The area for the visual impact assessment shall be defined by the visual envelope from the Project and associated works. The defined visual envelope must be shown on a plan.

3.4.11.3 In the landscape impact assessment, the Applicant shall describe, appraise, analyze and evaluate the existing and planned landscape resources and character of the assessment area. Annotated oblique aerial photographs and plans of suitable scale showing the baseline landscape character areas and landscape resources and mapping of impact assessment shall be used to present the findings of impact assessment. Tree survey information shall be included. The assessment shall be particularly focused on the sensitivity of the landscape framework and its ability to accommodate change. The Applicant shall identify the degree of compatibility of the Project and associated works with the existing and planned landscape settings. The landscape impact assessment shall quantify the potential landscape impacts as far as possible, so as to illustrate the significance of such impacts arising from the Project and associated works. Clear mapping of all landscape impact is required.

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

(i) Identification and plotting of visual envelope of the Project and associated works;

(ii) Identification of the key groups of sensitive receivers within the visual envelope with regard to views from ground level, sea level and elevated vantage points;

(iii) Description of the visual compatibility of the Project and associated works with the surrounding, both existing and planned uses, and its obstruction and interference with the key views of the adjacent areas; and

(iv) Description of the severity of visual impacts in terms of nature, distance and number of sensitive receivers. The visual impact of the Project and associated works with and without mitigation measures shall be assessed, and the effectiveness of the mitigation measures shall be demonstrated.

3.4.11.5 The Applicant shall review relevant Preliminary Outline Development Plans, Outline Zoning Plans, Outline Development Plans, Recommended Outline Development Plan, Layout Plans, other relevant published land use plans, planning briefs and studies which may identify areas of high landscape value, open space, amenity area and green belt designations. Any guidelines on landscape strategies, landscape frameworks, urban design concepts, building height profiles, special design areas, landmarks, designated view corridors, open space networks, landscape links that may affect the appreciation of the Project and associated works shall also be reviewed. Particular attention shall be paid to the landscape and visual requirements contained in the Vision and Goals for Victoria Harbour formulated by

the Town Planning Board (October 1999). The aim is to gain an insight to the future outlook of the area so as to assess whether the Project and associated works can fit into the surrounding setting. Any conflict with statutory town plan(s) and any published land use plans shall be highlighted and appropriate follow-up action shall be recommended.

3.4.11.6 The Applicant shall evaluate the merits of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. In addition, alternative alignment(s), design(s) and construction methods that would avoid or reduce the identified landscape and visual impacts shall be evaluated for comparison before adopting other mitigation or compensatory measures to alleviate the impacts. The mitigation measures proposed shall not only be concerned with damage reduction but shall also include consideration of potential enhancement of existing landscape and visual quality. The Applicant shall recommend mitigation measures to minimize the adverse effects identified above, including provision of a landscape design.

3.4.11.7 The mitigation measures shall include consideration of at least the following: preservation of vegetation and existing coastline, transplanting, provision of screen planting, re-vegetation of disturbed land, compensatory planting, provisioning/ reprovisioning of amenity areas, promenade and open spaces, avoidance or minimization of noise barriers, design of structures, provision of finishes to structures, colour scheme and texture of material used, any measures to mitigate the impact on existing and planned land uses, creation of view corridors, preservation views to ridgelines and harbour surface. The relevant responsible parties shall be identified for the on-going management and maintenance of the proposed mitigation works to ensure their effectiveness throughout the operation phase of the Project and associated works. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.

3.4.11.8 Annotated illustration materials such as colour perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points, and computer-generated photomontages shall be adopted to fully illustrate the landscape and visual impacts of the Project and associated works and the effectiveness of mitigation measures. 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.

3.4.12 Marine Ecological Impacts

3.4.12.1 The Applicant shall carry out a desktop review of the relevant available marine ecological information within the Project area, including but not limited to the previously approved EIA report for the WDIICFS and other relevant documents[3].

[3] One of such reports identified is: "Field Diving Surveys of Corals for the Environmental and Engineering Feasibility Assessment Studies (EEFS) in related to the Way Forward of the Harbour Area Treatment Scheme (HATS)" (February 2003), prepared by The Oceanway Corporation Ltd.

The desktop review shall check and update the validity of the findings of the WDIICFS EIA and the other relevant documents on the marine ecological resources present within the Project area, and reconfirm their conclusions on the value of the resources if appropriate.

3.4.12.2 If the desktop review identifies the need, field dive survey(s) of short duration(s)[4] shall be conducted to collect additional information.

3.4.12.3 Based on the desktop review and any additional information gathered from the field dive survey(s) considered necessary, the Applicant shall evaluate any potential loss of or disturbance to important marine habitats/species, in particular coral, within and in the vicinity of the Project area, as affected by the Project's marine activities or works to include dredging and permanent/temporary reclamation. If adverse marine ecological impact is anticipated to result from Project activities, mitigation measures shall be recommended.

3.4.13 Cultural Heritage Impact

3.4.13.1 The Applicant shall engage a qualified marine archaeologist to conduct a desktop review of relevant available marine archaeological information and any relevant geophysical data within the Project area, in particular the "Marine Archaeological Investigation, Wan Chai Reclamation Phase II" (May 2001)[5] (the 2001 MAI Report) prepared for the Antiquities and Monuments Office (AMO). The desktop review shall check and update the validity of the previous findings on the marine archaeological resources present within the Project area, and reconfirm their conclusions on the value of the resources if appropriate.

3.4.13.2 If the desktop review identified the need, geophysical survey(s) of short duration(s)[6] shall be carried out to collect additional information, in particular for the Project area in North Point not covered in the 2001 MAI Report. The survey, if conducted, shall aim to identify whether there is any possible existence of sites or objects of cultural heritage, for example shipwreck, on the seabed that will be affected by the Project's marine activities or works to include dredging and permanent/temporary reclamation. The data obtained shall be interpreted by a qualified marine archaeologist. If anomalies identified in the geophysical survey are considered to be of potential archaeological significance, field dive survey(s) of short duration(s)[6] shall be conducted by a qualified marine archaeologist, who shall obtain a Licence from the Antiquities Authority under the provision of the Antiquities and Monuments Ordinance (Cap. 53).

3.4.13.3 Based on the desktop review and any additional information gathered from the geophysical survey(s) and dive survey(s) considered necessary, the Applicant shall evaluate the potential marine archaeological impacts and propose mitigation measures if adverse impact is identified.

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[4] The durations of the field dive survey(s) would be a few days and the survey(s) would unlikely to need to cover specific periods of the year.

[5] Marine Archaeological Investigation, Wan Chai Reclamation Phase II (Report No. SDA8827 May 2001) was prepared by SDA Marine Limited for the Antiquities and Monuments Office (AMO) and is available at the AMO (currently at Hong Kong Heritage Discovery Centre Reference Library, Kowloon Park, Haiphong Road, Tsim Sha Tsui, Kowloon)

[6] The duration of the geophysical survey(s) and field dive survey(s) would be a few days.

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

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

3.4.15 Impacts Summary

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

3.4.16 Summary of Environmental Outcomes

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

3.4.17 Environmental Monitoring and Audit (EM&A) Requirements

3.4.17.1 The Applicant shall identify and justify in the EIA study whether there is any need for EM&A activities during the construction and operation phases of the Project and associated works and, if affirmative, to define the scope of the EM&A requirements for the Project and associated works in the EIA study.

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

3.4.17.3 The Applicant shall prepare an implementation schedule, in the form of a checklist containing all the EIA study recommendations and mitigation measures with reference to the Project and associated works implementation programme. A stand-alone implementation schedule shall be prepared for each of the individual Schedule 2 projects as described in sections 1.3 and 2.1(i) of this EIA study brief.

4. DURATION OF VALIDITY

4.1 This EIA study brief is valid for 36 months counting from the date of its issuance. If the EIA study does not commence within this period, the Applicant shall apply to the Director for a fresh EIA study brief before commencement of the EIA study. The Applicant shall advise the Director the date of commencement of the EIA study.

5. REPORT REQUIREMENTS

5.1 In preparing the EIA report, the Applicant shall refer to Annex 11 of the TM for the contents of an EIA report. The Applicant shall also refer to Annex 20 of the TM, which stipulates the guidelines for review of an EIA report.

5.2 A stand-alone EIA report or a separate stand-alone section of the EIA report shall be prepared for each of the individual Schedule 2 EIA projects identified in sections 1.3 and 2.1(i) of this EIA study brief. Each report or section shall aim to be self-sufficient in information documentation for the Director to make decision on whether the content meets requirements of this EIA study brief and relevant provisions in the Technical Memorandum of the EIAO Process for that particular individual Schedule 2 EIA project.

5.3 The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:

(i) 50 copies of the EIA report in English and 80 copies of the executive summary (each bilingual in both English and Chinese) as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.

(ii) when necessary, addendum to the EIA report and the executive summary submitted under sub-section 5.3 (i) above as required under section 7(1) of the EIAO, to be supplied upon advice by the Director for public inspection.

(iii) 20 copies of the EIA report in English and 50 copies of the executive summary (each bilingual in both English and Chinese) with or without Addendum as required under section 7(5) of the EIAO, to be supplied upon advice by the Director for consultation with the Advisory Council on the Environment.

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

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

5.6 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.

5.7 When the EIA report and the executive summary are made available for public inspection under section 7(1) of the EIAO, the content of the electronic copies of the EIA report and the executive summary must be the same as the hard copies and the Director shall be provided with the most updated electronic copies.

5.8 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.

5.9 To facilitate public involvement in the EIA process, the applicant shall provide 3-dimensional electronic visualisations of the major findings and elements of the EIA report, including 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 can make use of or adapt from past 3-dimensional digital model(s) completed for the Project as a simplified version. 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 5.3.

6. OTHER PROCEDURAL REQUIREMENTS

6.1 If there is any change in the Applicant (as representing his or her organisation) for this EIA study brief during the course of the EIA study, the Applicant must notify the Director immediately.

6.2 If there are any key changes in the scope of the Project mentioned in sections 1.2 and 1.3 of this EIA study brief and in the Project Profile, the Applicant must seek confirmation in writing from the Director on whether or not the scope of this EIA study brief is still applicable to cover the key changes identified, and what additional issues, if any, that the EIA study must also cover to address these key changes. If the changes to the Project fundamentally alter the key scope of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief.

--- END OF EIA STUDY BRIEF ---

September 2006
Environmental Assessment Division,
Environmental Protection Department

Appendix A

List of project profiles, EIA study briefs, approved EIA reports relevant to Wan Chai Development Phase II and Central-Wan Chai Bypass

Approved EIA reports:-

(i) Wan Chai Development Phase II Comprehensive Feasibility Study (Application No. EIA-058/2001 & EIAO Register No. AEIAR-042/2001);
(ii) Central - Wan Chai Bypass and Island Eastern Corridor Link (Application No. EIA-057/2001 & EIAO Register No. AEIAR-041/2001);
(iii) Central Reclamation Phase III - Studies, Site Investigation, Design and Construction (Application No. EIA-055/2001 & EIAO Register No. AEIAR-040/2001)
(iv) Hong Kong Convention and Exhibition Centre Atrium Link Extension (Application No. EIA-120/2006 & EIAO Register No. AEIAR-100/2006)

EIA study briefs issued:-

(i) Wan Chai Reclamation Phase II - Studies, Site Investigation, Design and Construction (EIAO Register No. SB-001/BC)
(ii) Central/Wan Chai Bypass & Island Eastern Corridor Link - Environmental Impact Assessment (EIAO Register No. SB-003/BC)
(iii) Central Reclamation Phase III - Studies, Site Investigation, Design and Construction - Environmental Impact Assessment (EIAO Register No. SB-004/BC)
(iv) Hong Kong Convention and Exhibition Centre Atrium Link Extension (EIAO Register No. ESB–120/2006)

Project profiles submitted for application of EIA study brief:-

(i) Hong Kong Convention and Exhibition Centre Atrium Link Extension (EIAO Register No. PP-268/2005)

Note: The above list is provided to facilitate retrieval of information. The above list is indicative in nature and is not intended to be exhaustive. It remains the onus of the Applicant to ensure accuracy of information in the EIA report.

Appendix B-1

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

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

1. Introduction

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

2. Choice of Models

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

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

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

2.2 Note that both FDM and CALINE4 have a height limit on elevated sources (20 m and 10m, respectively). Source of elevation above these limits will have to be modelled using the ISCST3 model or suitable alternative models. In using the latter, reference should be made to the 'Guidelines on the Use of Alternative Computer Models in Air Quality Assessment' in Appendix B-3.

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

3. Model Input Requirements

3.1 Meteorological Data

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

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

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

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

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

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

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

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

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

3.1.5 An additional parameter, namely, the standard deviation of wind direction, σ_θ, needs to be provided as input to the CALINE4 model. Typical values of σ_θ range from 12^o for rural areas to 24^o for highly urbanised areas under 'D' class stability. For semi-rural such as new development areas, 18^o is more appropriate under the same stability

condition. The following reference can be consulted for typical ranges of standard deviation of wind direction under different stability categories and surface roughness conditions.

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

3.2 Emission Sources

All the identified sources relevant to a process plant or a study site should be entered in the model and the emission estimated based on emission factors compiled in the AP-42 (Ref. 2) or other suitable references. The relevant sections of AP-42 and any parameters or assumptions used in deriving the emission rates (in units g/s, g/s/m or $g/s/m^2$) 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 classified as either rural or urban so as to reflect the enhanced mixing that occurs over urban areas due to the presence of buildings and urban heat effects. The selection of either rural or urban dispersion coefficients in a specific application should follow a land use classification procedure. If the land use types including industrial, commercial and residential uses account for 50% or more of an area within 3 km radius from the source, the site is classified as urban; otherwise, it is classified as rural.

3.4 Surface Roughness Height

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

3.5 Receptors

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

3.6 Particle Size Classes

In evaluating the impacts of dust-emitting activities, suitable dust size categories

relevant to the dust sources concerned with reasonable breakdown in TSP (< 30 μm) and RSP (< 10 μm) compositions should be used.

3.7 NO_2 to NO_x Ratio

The conversion of NO_x to NO_2 is a result of a series of complex photochemical reactions and has implications on the prediction of near field impacts of traffic emissions. Until further data are available, three approaches are currently acceptable in the determination of NO_2:

(a) Ambient Ratio Method (ARM) - assuming 20% of NO_x to be NO_2; or
(b) Discrete Parcel Method (DPM, available in the CALINE4 model); or
(c) Ozone Limiting Method (OLM) - assuming the tailpipe NO_2 emission to be 7.5% of NO_x and the background ozone concentration to be in the range of 57 to 68 $\mu g/m^3$ depending on the land use type (see also the EPD reference paper 'Guidelines on Assessing the 'TOTAL' Air Quality Impacts' in Appendix B-2).

3.8 Odour Impact

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

Stability Category	1-hour to 5-sec Conversion Factor
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 Odour Regulations, Controls and Technology, Air & Waste Management Association, 1991.
Ref.(4): A.W.C. Keddie, ‘Dispersion of Odours’, Odour Control – A Concise Guide, Warren Spring Laboratory, 1980.

3.9 Plume Rise Options

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

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

3.10 Portal Emissions

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

Ref.(5): XIXth World Road Congress Report, Permanent International Association of Road Congresses (PIARC), 1991.
Ref.(6): N. Ukegunchi, H. Okamoto and Y. Ide "Prediction of vehicular emission pollution around a tunnel mouth", Proceedings 4th International Clean Air Congress, pp. 205-207, Tokyo, 1977.

3.11 Background Concentrations

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

3.12 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 the Director'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 B-2

Guidelines on Assessing the 'TOTAL' Air Quality Impacts

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

1. Total Impacts - 3 Major Contributions

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

Primary contributions:	project induced
Secondary contributions:	pollutant-emitting activities in the immediate neighbourhood
Other contributions: (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 B-3

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

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

1. Background

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

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

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

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

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

2. Required Demonstration / Submission

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

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

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

2.2 To provide technical details of the proposed model, the proponent should submit documents containing at least the following information:

(i) mathematical formulation and data requirements of the model;

(ii) any previous performance evaluation of the model; and
(iii) a complete set of model input and output file(s) in commonly used electronic format.

2.3 On performance evaluation, the required approach and extent of demonstration varies depending on whether a Schedule 1 model is already available and suitable in simulating the situation under consideration. In cases where no Schedule 1 model is found applicable, the proponent must demonstrate that the proposed model passes the screening test as set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).

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

2.4 For cases where a Schedule 1 model is applicable to the project under consideration but an alternative model is proposed for use instead, the proponent must demonstrate either that

(i) the highest and second highest concentrations predicted by the proposed model are within 2 percent of the estimates obtained from an applicable Schedule 1 model (with appropriate options chosen) for all receptors for the project under consideration; or

(ii) the proposed model has superior performance against an applicable Schedule 1 model based on the evaluation procedure set out in USEPA Document "Protocol for Determining the Best Performing Model" (Ref. 1).

2.5 Should the Director find the information on technical details alone sufficient to indicate the acceptability of the proposed model, information on further performance evaluation as specified in Sections 2.3 and 2.4 above would not be necessary.

2.6 If the proposed model is an older version of one of the Schedule 1 models or was previously included in Schedule 1, the technical documents mentioned in Section 2.2 are normally not required. However, a performance demonstration of equivalence as stated in Section 2.4 (i) would become necessary.

2.7 If the Director is already in possession of some of the documents that describe the technical details of the proposed model, submission of the same by the proponent is not necessary. The proponent may check with the Director to avoid sending in duplicate information.

Schedule 1

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

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

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

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

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

Appendix C

Hydrodynamic and Water Quality Modelling Requirements

Modelling software general

1. The modelling software shall be fully 3-dimensional capable of accurately simulating the stratified condition, salinity transport, and effects of wind and tide on the water body within the model area.

2. The modelling software shall consist of hydrodynamic, water quality, sediment transport, thermal and particle dispersion modules. All modules shall have been proven with successful applications locally and overseas.

3. The hydrodynamic, water quality, sediment transport and thermal modules shall be strictly mass conserved at all levels.

4. An initial dilution model may be used to characterize the initial mixing of the effluent discharge, and to feed the terminal level and size of the plume into the far field water quality modules where necessary. The initial dilution model shall have been proven with successful applications locally and overseas.

Model details – Calibration & Validation

1. The models shall be properly calibrated and validated before its use in this study in the Hong Kong waters, the Pearl Estuary and the Dangan (Lema) Channel, with the field data collected by:

    - Hydraulic and Water Quality Studies in Victoria Harbour (1987)
    - Port and Airport Development Strategy - Enhancement of WAHMO Mathematical Models (1990)
    - Strategic Sewage Disposal Scheme Stage II - Oceanic Outfall, Oceanographic Surveys and Modelling (1992)
    - Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool (1998)
    - Environmental Protection Department (EPD)'s routine monitoring data
    - Tidal data from Hong Kong Observatory, Macau and relevant Mainland Authorities

2. Tidal data shall be calibrated and validated in both frequency and time domain manner.

3. For the purpose of calibration and validation, the model shall run for not less than 15 days of real sequence of tide (excluding model spin up) in both dry and wet seasons with due consideration of the time required to establish initial conditions.

4. In general the hydrodynamic models shall be calibrated to the following criteria:

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

Model details – Simulation

1. The water quality modelling results shall be qualitatively explainable, and any identifiable trend and variations in water quality shall be reproduced by the model. The water quality model shall be able to simulate and take account of the interaction of dissolved oxygen, phytoplankton, organic and inorganic nitrogen, phosphorus, silicate, BOD, temperature, suspended solids, contaminants release of dredged and disposed material, air-water exchange, *E. coli* and benthic processes. It shall also simulate salinity. Salinity results simulated by hydrodynamic models and water quality models shall be demonstrated to be consistent.

2. The sediment transport module for assessing impacts of sediment loss due to marine works shall include the processes of settling, deposition and re-erosion. The values of the modelling parameters shall be agreed with EPD. Contaminants release and DO depletion during dredging and dumping shall be simulated by the model.

3. The thermal model shall be based on the flow field produced by the hydrodynamic model. It shall incorporate the physical processes of thermal / cooled water discharge and abstraction flow, buoyancy effect of the thermal plume, and surface heat exchange. Dispersion of biocides in the discharge shall also be simulated with appropriate decay rates.

4. The models shall at least cover the Hong Kong waters, the Pearl Estuary and the Dangan Channel to incorporate all major influences on hydrodynamic and water quality. A fine grid model may be used for detailed assessment of this study. It shall either be linked to a far field model or form part of a larger model by gradual grid refinement. The coverage of the fine grid model shall be properly designed such that it is remote enough so that the boundary conditions would not be affected by the waterway and the proposed disposal ground. The model coverage area shall be agreed with EPD.

5. In general, grid size at the area affected by the project shall be less than 400 m in open waters and less than 75 m around sensitive receivers. The grid shall also be able to reasonably represent coastal features existing and proposed in the project. The grid schematization shall be agreed with EPD.

Modelling assessment

1. The assessment shall include the construction and operation phases of the project. Where appropriate, the assessment shall also include maintenance dredging. Scenarios to be assessed shall cover the baseline condition and scenarios with various

different options proposed by the Applicant in order to quantify the environmental impacts and improvements that will be brought about by these options. Corresponding pollution load, bathymetry and coastline shall be adopted in the model set up.

2. Hydrodynamic, sediment transport and thermal modules, where appropriate, shall be run for (with proper model spin up) at least a real sequence of 15 days spring-neap tidal cycle in both the dry season and the wet season.

3. Water quality module shall run for a complete year incorporating monthly variations in Pearl River discharges, solar radiation, water temperature and wind velocity in the operational stage. Construction stage impacts, cooling water discharge and floating refuse and debris entrapment may be assessed by simulating typical spring-neap cycles in the dry and wet seasons.

4. The results shall be assessed for compliance of Water Quality Objectives. Any changes in hydrodynamic regime shall be assessed. Daily erosion / sedimentation rate shall be computed and its ecological impact shall be assessed.

5. The impact on all sensitive receivers shall be assessed.

6. Cumulative impacts due to other projects, activities or pollution sources within a boundary to the agreement of EPD shall also be predicted and quantified.

7. All modelling input data and results shall be submitted in digital media to EPD.

- END -

Appendix D

Table 1 : Water Quality Objectives (for Recreation and related Uses) in Victoria Harbour Water Control Zone (WCZ)

There are no bathing beach or secondary contact recreation subzones designated in Victoria Harbour WCZ. Water Quality Objectives (WQOs) applicable to a water body with bathing, secondary contact recreation or amenity use in all three phases of Victoria Harbour WCZ are shown below. The WQOs are assigned by making reference to other water control zones with similar uses.

WQO	Description	WQOs applicable to water body with assigned beneficial use		
		BU 1 : Bathing	BU 2 : Secondary Contact Recreation	BU 3 : General Amenity
Aesthetic Appearance [(a)]	(i) There should be no objectionable odours or discolouration of the water. (ii) Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substance should be absent. (iii) Mineral oil should not be visible on the surface. Surfactants should not give rise to a lasting foam. (iv) There should be no recognizable sewage-derived debris. (v) Floating, submerged or semi-submerged objects of a size likely to interfere with the movement of free vessels, or cause damage to the vessels, should be absent. (vi) The water should not contain substances which settle to form objectionable deposits.	✔	✔	✔
Dissolved Oxygen [(a)]	The level of dissolved oxygen should not fall below 4 mg per liter for 90% of the sampling occasions during the whole year; values should be calculated as the annual water column average [(d)]. In addition, the concentration of dissolved oxygen should not be less than 2 mg per litre within 2 m of the seabed for 90% of the sampling occasions during the whole year.	✔	✔	✔
Temperature [(a)]	Human activity should not cause the daily temperature range to change by more than 2.0 °C.	✔	✔	✔
Salinity [(a)]	Human activity should not cause the salinity level to change by more than 10%.	✔	✔	✔
Suspended Solids [(a)]	Human activity should neither cause the suspended solids concentration to be raised more than 30% nor give rise to accumulation of suspended solids which may adversely affect aquatic communities.	✔	✔	✔
Ammonia [(a)]	The un-ionized ammonical nitrogen level should not be more than 0.021 mg per litre, calculated as the annual average (arithmetic mean).	✔	✔	✔
Nutrients [(a)]	(i) Nutrients should not be present in quantities sufficient to cause excessive or nuisance growth of algae or other aquatic plants.	✔	✔	✔

	(ii) Without limiting the generality of objective (i) above, the level of inorganic nitrogen should not exceed 0.4 mg per litre, expressed as annual water column average [(d)].			
WQO	Description	WQOs applicable to water body with assigned beneficial use		
		BU 1 : Bathing	BU 2 : Secondary Contact Recreation	BU 3 : General Amenity
Toxic substances [(a)]	(i) Toxic substances in the water should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to interactions of toxic substances with each other. (ii) Human activity should not cause a risk to any beneficial use of the aquatic environment.	✔	✔	✔
Bacterial (E. coli.) (I) [(b)]	The level of Escherichia coli should not exceed 180 per 100mL, calculated as the geometric mean of all samples collected from March to October inclusive in one calendar year. Samples should be taken at least 3 times in a calendar month at intervals of between 3 and 14 days.	✔		
Bacterial (E. coli.) (II) [(c)]	The level of Escherichia coli should not exceed 610 per 100mL, calculated as the geometric mean of all samples collected in one calendar year.		✔	
pH [(b)]	The pH of the water should be within the range of 6.0 – 9.0 for 95% of samples. In addition, waste discharges shall not cause the natural pH range to be extended by more than 0.5 units.	✔		
Phenol [(b)]	Phenols shall not be present in such quantities as to produce a specific odour, or in concentrations greater than 0.05mg per litre as C_6H_5OH.	✔		
Turbidity [(b)]	No changes in turbidity or other factors arising from waste discharges shall reduce light transmission substantially from the normal level.	✔		

(a) WQOs assigned for general uses of marine water in Victoria Harbour WCZ.
(b) WQOs assigned for bathing use in other WCZs.
(c) WQOs assigned for secondary contact recreation use in other WCZs.
(d) Expressed normally as the arithmetic mean of at least 3 measurements at 1m below surface, mid depth and 1 m above the seabed. However, in water of a depth of 5 m or less the mean shall be that of 2 measurements (1 m below surface and 1 m above seabed), and in water of less than 3 m the 1 m below surface sample shall apply.

Water Policy Group
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