



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

Environmental Impact Assessment Study Brief No. ESB-286/2015

**Project Title: Additional Gas-fired Generation Units Project
(hereinafter known as the "Project")**

**Name of Applicant: Castle Peak Power Company Limited (CAPCO)
(hereafter known as the "Applicant")**

1. BACKGROUND

- 1.1 An application (No. ESB-286/2015) 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 22 April 2015 with a project profile (No. PP-524/2015) (the Project Profile).
- 1.2 It is stated in the project profile that the purpose of CAPCO's current proposal is to consider the installation of up to two additional gas-fired generation units by CAPCO at Black Point Power Station (BPPS) (hereafter referred to as "the Project"). However, any formal decision by CLP Power Hong Kong Limited (CLP)/CAPCO to proceed with building any additional gas-fired generation capacity requires further analysis as such investment decision is dependent upon a host of factors including the rate of demand growth, environmental requirements, technical feasibility, economic merits of the project and HKSAR Government approval. Accordingly, the submission of and content described in the Project Profile does not amount to commitment by or on behalf of CLP and/or CAPCO to proceed with the Project.
- 1.3 The scope of the Project involves the construction and operation of up to two 600 MW class additional gas-fired generation units at the existing BPPS, which comprises the following:
- (i) Site clearance and preparation (e.g. demolishing and/or relocating existing buildings/structures, re-routing or diversion of some underground services) within the BPPS site to provide space for the installation of additional gas-fired generation units.
 - (ii) Installation and operation of up to two 600 MW additional gas-fired generation units, which will include gas turbines, steam turbines, generators, heat recovery steam generators, generator step-up transformers, unit auxiliary transformers, exhaust stacks, selective catalytic reduction facilities, and associated equipment and facilities for fuel, power, service water, cooling water uptake and discharge, etc.
 - (iii) Installation works including construction of gas headers (above-ground pipework) and seawater systems (underground pipework) and other general land-based construction works.
 - (iv) If a second gas-fired generation unit is installed, minor marine dredging works close to the existing cooling water system to enhance the cooling water system.

The location of the Project is within the existing boundaries of the BPPS site as indicated in

Figure 1 of this EIA Study Brief.

- 1.4 The Project is a designated project by virtue of Item D.1 of Schedule 2 of the EIAO, which specifies “*public utility electricity power plant*”. If a second gas-fired generation unit is installed and thus marine dredging works close to the existing cooling water system are required, the project also comprises a designated project by virtue of Item C.12(b) of Schedule 2 of the EIAO, which specifies “*a dredging operation which is less than 100 m from a seawater intake point*”..
- 1.5 Pursuant to section 5(7)(a) of the EIAO, the Director of Environmental Protection (the Director) issues this EIA study brief to the Applicant to carry out an EIA study.
- 1.6 The purpose of this EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and associated works that will take place concurrently. This information will contribute to decisions by the Director on:
 - (i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the Project;
 - (ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
 - (iii) the acceptability of residual impacts after the proposed mitigation measures are implemented.

2. OBJECTIVES OF THE EIA STUDY

- 2.1 The objectives of the EIA study are as follows:
 - (i) to describe the Project and associated works together with the requirements and environmental benefits for carrying out the Project;
 - (ii) to identify and describe elements of community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including both the natural and man-made environment and the associated environmental constraints;
 - (iii) to identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses;
 - (iv) to identify and quantify any potential losses or damage to flora, fauna and natural habitats;
 - (v) to identify any negative impacts on sites of cultural heritage and to propose measures to mitigate these impacts;
 - (vi) to propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;

- (vii) to investigate the feasibility, effectiveness and implications of the proposed mitigation measures;
- (viii) to identify, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;
- (ix) to identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these residual environmental impacts and cumulative effects and reduce them to acceptable levels;
- (x) to design and specify environmental monitoring and audit requirements; and
- (xi) To identify any additional studies necessary to implement the mitigation measures or monitoring and proposals recommended in the EIA report.

3. DETAILED REQUIREMENTS OF THE EIA STUDY

3.1 The Purpose

The purpose of this Study Brief is to set out the purposes and objectives of the EIA study, the scope of environmental issues which shall be addressed, the requirements that the EIA study shall need to fulfil, and the necessary procedural and reporting requirements. The Applicant shall demonstrate in the EIA report whether the criteria in the relevant sections of the Technical Memorandum on the Environmental Impact Assessment Process of the Environmental Impact Assessment Ordinance (hereinafter referred to as “the TM”) are complied with.

3.2 The Scope

3.2.1 The scope of this EIA study shall cover the Project and associated works mentioned in sub-section 1.3 above. For the purpose of assessing whether the environmental impacts shall comply with the criteria of the TM, the EIA study shall address the key issues described below, together with any other key issues identified during the course of the EIA study:

- (i) potential air quality impact on air sensitive receivers due to construction and operation of the Project and associated works;
- (ii) potential hazard to human life impact due to the Project associated with the transport and use of natural gas and transport, storage and use of other non-fuel gas dangerous goods;
- (iii) potential noise impact on sensitive receivers due to the Project and associated works, including impact from construction equipment during construction and operational noise impact;
- (iv) potential water quality impact due to the Project and associated works including impacts arising from cooling water discharges and marine dredging works on relevant water system(s) including the Deep Bay Water Control Zone and North Western

- Water Control Zone and relevant water sensitive receivers during construction and operation of the Project;
- (v) potential waste management implications arising from the construction and operation of the Project, including handling and disposal of construction and demolition materials, chemical waste and general refuse;
 - (vi) potential land contamination arising from the Project;
 - (vii) potential ecological impact during construction and operation of the Project, and associated works including impacts arising from cooling water discharges and marine dredging works, if any;
 - (viii) potential impacts on fisheries arising from cooling water discharges and marine dredging works, if any, and other associated works during the construction and operation of the Project;
 - (ix) potential landscape and visual impacts due to the construction and operation of the Project
 - (x) the potential cultural heritage impact due to the marine dredging works, if any, of the Project;
 - (xi) potential health impacts on human due to the operation of the Project; and
 - (xii) potential cumulative environmental impacts of the Project, through interaction or in combination with other existing, committed and planned projects in the vicinity of the Project, and that those impacts may have a bearing on the environmental acceptability of the Project.

3.3 Description of the Project

3.3.1 Purpose(s) and Objectives of the Project

The Applicant shall provide information on the purpose(s) and objectives of the Project, and describe the benefit of the Project and scenarios with and without the Project.

3.3.2 Details of the Project

The Applicant shall indicate the nature and status of project decision(s) for which the EIA study is undertaken. The Applicant shall describe the design, size, construction methods, the nature and methods of production or other major activities involved in operation of the project, using diagrams, plans and/or maps as necessary. The estimated duration of the construction phase and operational phase of the Project together with the programme within these phases shall be given. The land taken by the Project site(s), construction sites, and any associated access arrangements, auxiliary facilities and landscaping areas shall be shown on a scaled map. The uses to which the Project will be put shall be described and the different land use areas shall be demarcated as appropriate.

3.3.3 Background and History of the Project

The Applicant shall provide information on the site location and site history of the Project, any related projects, and the consideration of the different practicable siting and layout

options of the proposed additional gas-fired units at available locations including the existing three power stations owned by the Applicant, namely BBPS, Castle Peak Power Station and Penny's Bay Power Station. The key reasons for selecting the proposed siting and layout of the Project and the part environmental factors played in the selection shall be described. The main environmental impacts of the different practicable siting and layout options shall be compared with those of the proposed Project and with the likely future environmental conditions in the absence of the Project.

3.4 Technical Requirements

3.4.1 The Applicant shall conduct the EIA study to address the environmental aspects of the activities as described in section 3.2 above. The assessment shall be based on the best and latest information available during the course of the EIA study. The EIA report shall include the construction and operational programme as well as approaches and methodologies for assessing environmental impacts of the Project. The EIA report shall provide the time frame, staged implementation programme, and works programmes of the Project and other concurrent projects, for assessing the cumulative environmental impacts from the Project and interacting projects as identified in the EIA study.

3.4.2 The EIA study shall follow the technical requirements specified below and in the Appendices of this EIA study brief.

3.4.3 Air Quality Impact

3.4.3.1 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.

3.4.3.2 The assessment area for air quality impact assessment shall be defined by a distance of 15 kilometers from the boundary of the Project site, with consideration to be extended to include major existing, planned and committed air pollutant emission sources that may have a bearing on the environmental acceptability of the Project. The assessment shall include the existing, committed and planned sensitive receivers within the assessment area as well as areas where the air quality may be significantly affected by the project. The assessment shall also take into account the impacts of emission sources from nearby concurrent projects, if any.

3.4.3.4 The air quality impact assessment shall follow the detailed technical requirements given in Section I of Appendix A.

3.4.4 Hazard to Human Life

3.4.4.1 The Applicant shall follow the criteria for evaluating hazard to human life impact as stated in section 2 of Annex 4 of the TM.

3.4.4.2 The assessment shall include, but not be limited to, the hazards due to the transport and use of natural gas, and transport, storage and use of other non-fuel gas dangerous goods.

3.4.4.3 The hazard to human life assessment shall follow the detailed technical requirements given in Appendix B.

3.4.5 Noise Impact

- 3.4.5.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing noise impact as stated in Annexes 5 and 13 of the TM respectively.
- 3.4.5.2 Assessment shall include construction noise and operation noise impact assessment of the existing, committed and planned NSRs earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans, Layout Plans and other relevant published land use plans, including plans and drawings published by the Lands Department and any land use and development applications approved by the Town Planning Board, in the vicinity of the project.
- 3.4.5.3 The Applicant shall propose the assessment area for agreement of the Director before commencing the assessment. The assessment area for the noise impact assessment shall generally include areas within 300 metres from the boundary of the Project and the works of the Project.
- 3.4.5.4 If NSRs are identified within the assessment area, quantitative noise impact assessment shall be carried out. The Applicant shall propose methodology for agreement of the Director, with reference to Section 4.4.2 of the TM, prior to the commencement of the assessment.
- 3.4.6 Water Quality Impact**
- 3.4.6.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing water pollution as stated in Annexes 6 and 14 of the TM respectively.
- 3.4.6.2 The assessment area for the water quality impact assessment shall cover the Deep Bay Water Control Zone and North Western Water Control Zone as designated under the Water Pollution Control Ordinance (Cap. 358) and the water sensitive receivers in the vicinity of the Project. The assessment area could be extended to include other areas such as stream courses, existing and new drainage system; and the associated water system(s) in the vicinity if they are found also being affected by the project during the EIA study and have a bearing on the environmental acceptability of the Project.
- 3.4.6.3 The water quality impact assessment shall follow the detailed technical requirements given in Appendix C.
- 3.4.7 Waste Management Implications**
- 3.4.7.1 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.
- 3.4.7.2 The assessment of the waste management implications shall follow the detailed technical requirements given in Appendix D1.
- 3.4.8 Land Contamination**
- 3.4.8.1 The Applicant shall follow the guidelines for evaluating and assessing potential land contamination issues as stated in sections 3.1 and 3.2 of Annex 19 of the TM.
- 3.4.8.2 The assessment of the potential land contamination issues shall follow the detailed requirements given in Appendix D2.
- 3.4.9 Ecological Impact**

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

3.4.9.2 The assessment area for the purpose of terrestrial ecological impact assessment shall include areas within 500 meters distance from the boundary of the Project site and the areas likely to be impacted by the Project. For marine ecological impact assessment, the assessment area shall be the same as the assessment area for Water Quality Impact Assessment described in Section 3.4.6.2 of this EIA Study Brief or the areas likely to be impacted by the Project.

3.4.9.3 The ecological impact assessment (terrestrial and marine) shall follow the detailed technical requirements given in Appendix E.

3.4.10 **Fisheries Impact**

3.4.10.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing fisheries impact as stated in Annexes 9 and 17 of the TM respectively.

3.4.10.2 The assessment area for fisheries impact shall include areas within 500 meters distance from the boundaries of the Project site (including its associated works). The assessment area shall be extended to include other areas to if they are found also being impacted by the construction or operation of the Project during the course of the EIA study.

3.4.10.3 The fisheries impact assessment shall follow the detailed technical requirements given in Appendix F.

3.4.11 **Landscape and Visual Impacts**

3.4.11.1 The Applicant shall follow the criteria and guidelines as stated in section 1 of Annex 10 and Annex 18 of the TM respectively, the EIAO Guidance Note No. 8/2010 on “Preparation of Landscape and Visual Impact Assessment under the Environmental Impact Assessment Ordinance” and the report of “Landscape Value Mapping of Hong Kong” for evaluating and assessing the landscape and visual impacts.

3.4.11.2 The assessment area for landscape impact assessment shall include areas within a 500 meters distance from the boundary of the Project site. The assessment area for the visual impact assessment shall be defined by the visual envelope of the Project.

3.4.11.3 The landscape and visual impact assessments shall follow the detailed technical requirements given in Appendix G.

3.4.12 **Impact on Cultural Heritage**

3.4.12.1 The Applicant shall follow the criteria and guidelines for evaluating and assessing the cultural heritage impact as stated in section 2 of Annex 10 and section 2 of Annex 19 of the TM respectively.

3.4.12.2 If the project will involve marine dredging/excavation works, cultural heritage impact assessment (marine archaeological investigation) shall be carried out which shall follow the detailed technical requirements given in Appendix H.

3.4.13 **Health Impact**

3.4.13.1 The health impact assessment shall be conducted to assess the potential health impact on human in relation to toxic air pollutants (TAP) from the air emissions and associated activities arising from the operation of the Project in accordance with the technical requirements given in Section II of Appendix A.

3.4.13.2 The health impact assessment shall be based on established practices in countries around the world. A literature search shall be carried out to determine the best approach and methodology for the health impact assessment, including any codes of practices, guidelines, etc. applied locally in Hong Kong and elsewhere in the world. The approach and methodology to be adopted shall be agreed by the Director prior to the commencement of assessment.

3.4.14 **Environmental Monitoring and Audit (EM&A) Requirements**

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

3.4.14.2 Subject to the confirmation of the EIA study findings, the Applicant shall comply with the requirements as stipulated in Annex 21 of the TM.

3.4.14.3 The Applicant shall prepare a Project Implementation Schedule (in the form of a checklist as shown in Appendix I) containing the EIA study recommendations and mitigation measures with reference to the implementation programme.

3.5 **Presentation of Summary Information**

3.5.1 Summary of Environmental Outcomes

The EIA report shall contain a summary of key environmental outcomes arising from the EIA study, including estimated population protected from various environmental impacts, environmentally sensitive areas protected, environmentally friendly options considered and incorporated in the preferred option, environmental designs recommended, key environmental problems avoided, compensation areas included and the environmental benefits of environmental protection measures recommended.

3.5.2 Summary of Environmental Impacts

To facilitate effective retrieval of pertinent key information, the EIA report shall contain a summary table of environmental impacts showing the assessment points, results of impact predictions, relevant standards or criteria, extents of exceedances predicted, impact avoidance measures considered, mitigation measures proposed and residual impacts (after mitigation). This summary shall cover each individual impact and shall also form an essential part of the executive summary of the EIA report.

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

The EIA report shall contain a summary including the assessment methodologies and key assessment assumptions adopted in the EIA study, the limitations of these assessment(s)

methodologies/assumptions, if any, plus relevant prior agreement(s) with the Director or other Authorities on individual environmental media assessment components. The proposed use of any alternative assessment tool(s) or assumption(s) have to be justified by the Applicant, with supporting documents based on cogent, scientific and objectively derived reason(s) before seeking the Director's agreement. The supporting documents shall be provided in the EIA report.

3.5.4 Documentation of Public Concerns

The EIA report shall contain a summary of the main concerns of the general public, special interest groups and the relevant statutory or advisory bodies received from and identified by the Applicant during the course of the EIA study, and describe how the relevant concerns have been taken into account.

4. **DURATION OF VALIDITY**

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

5. **REPORT REQUIREMENTS**

- 5.1 In preparing the EIA report, the Applicant shall refer to Annex 11 of the TM for the contents of an EIA report. The Applicant shall also refer to Annex 20 of the TM, which stipulates the guidelines for the review of an EIA report.
- 5.2 The Applicant shall supply the Director with hard and electronic copies of the EIA report and the executive summary in accordance with the requirements given in Appendix J of this EIA study brief. 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.

6. **OTHER PROCEDURAL REQUIREMENTS**

- 6.1 If there is any change in the name of Applicant for this EIA study brief during the course of the EIA study, the Applicant must notify the Director immediately.
- 6.2 If there is any key change in the scope of the Project mentioned in sub-section 1.3 of this EIA study brief and in Project Profile (No. PP-524/2015), the Applicant must seek confirmation from the Director in writing on whether or not the scope of issues covered by this EIA study brief can still cover the key changes, and the additional issues, if any, that the EIA study must also address. If the changes to the Project fundamentally alter the key scope of the EIA study brief, the Applicant shall apply to the Director for a fresh EIA study brief.

7. **LIST OF APPENDICES**

- 7.1 This EIA study brief includes the following appendices:

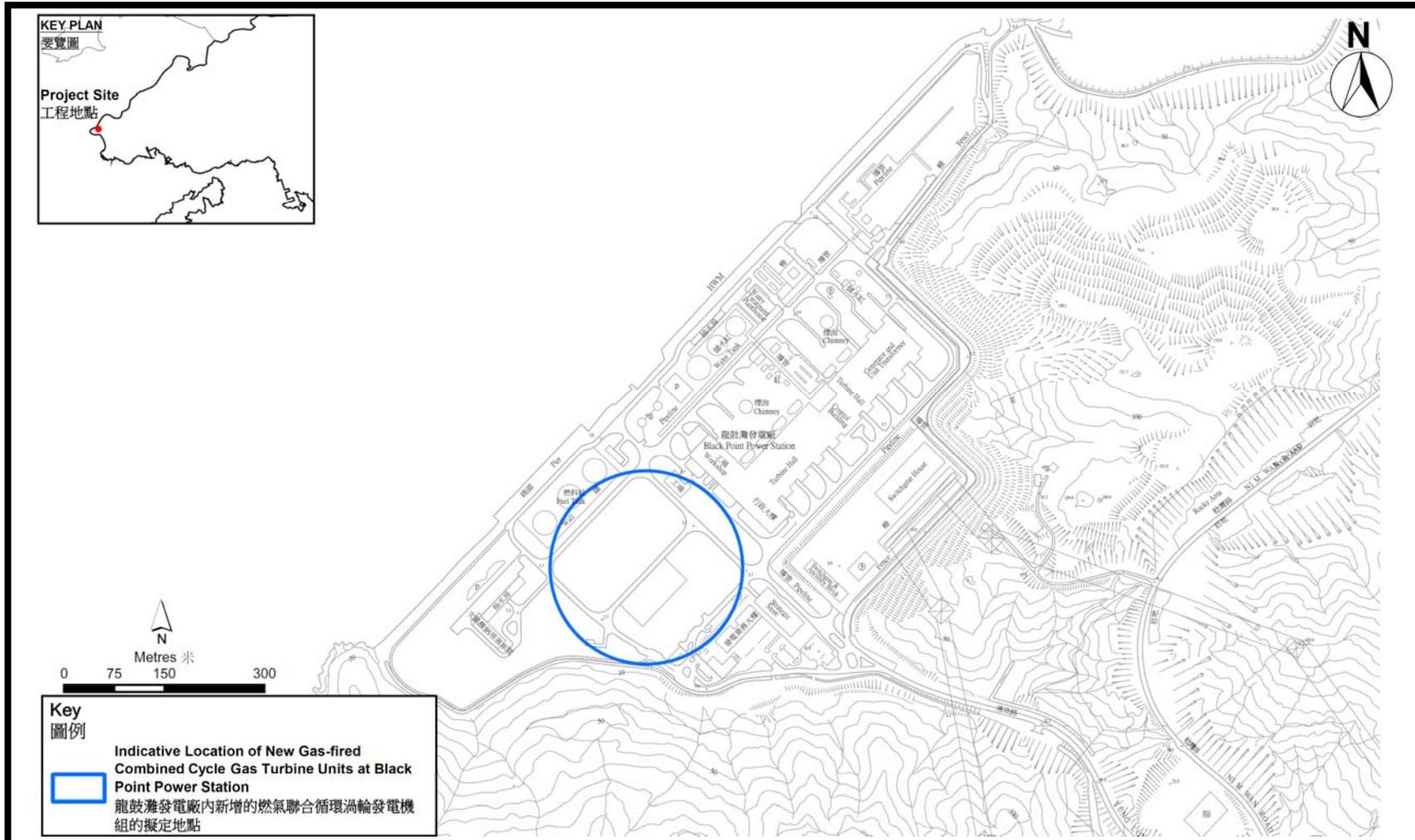
Figure 1 – Project Location Plan

Appendix A – Requirements for Air Quality Impact Assessment, and Health Impact

Assessment of Toxic Air Pollutants
Appendix A-1 – Air Quality Modelling Guidelines
Appendix B – Requirements for Assessment of Hazard to Human Life
Appendix C – Water Quality Impact Assessment Requirements
Appendix C-1 – Hydrodynamic and Water Quality Modelling Requirements
Appendix D1 – Requirements for Assessment of Waste Management Implications
Appendix D2 – Requirements for Assessment of Land Contamination
Appendix E – Requirements for Ecological Impact Assessment (Terrestrial and Marine)
Appendix F – Requirements for Fisheries Impact Assessment
Appendix G – Requirements for Landscape and Visual Impact Assessments
Appendix H - Requirements for Cultural Heritage Impact Assessment (Marine
Archaeological Investigation)
Appendix H-1 – Guidelines for Marine Archaeological Investigation (MAI)
Appendix I – Implementation Schedule
Appendix J – Requirements for EIA Report Documents

--- END OF EIA STUDY BRIEF ---

June 2015
Environmental Assessment Division
Environmental Protection Department



Additional Gas-fired Generation Units Project (新增燃氣發電機組工程)
Location Plan of the Project - 工程項目的位置圖

This figure was prepared based on Figure 2.2 of the Project Profile (No.: PP-524/2015)

本圖是根據工程項目簡介(編號：PP-524/2015) 圖 2.2 編制

Figure 1 附圖 1

EIA Study Brief No.
ESB-286/2015

環評研究概要編號
ESB-286/2015



Appendix A**Requirements for Air Quality Impact Assessment, and Health Impact Assessment of Toxic Air Pollutants****I Requirements for Air Quality Impact Assessment**

The air quality impact assessment shall include the following:

1. Background and Analysis of Activities
 - (a) Provision of 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 construction and operation stages of the Project.
 - (b) Giving an account, where appropriate, of the consideration/measures that had been taken into consideration in the planning of the Project to abate the air pollution impact. The Applicant shall consider alternative construction methods/phasing programmes, and alternative operation modes to minimize the air quality impact during construction and operation stages of the Project.
 - (c) Presentation of background air quality levels in the assessment area for the purpose of evaluating cumulative air quality impacts during construction and operation stages of the Project. If PATH (Pollutants in the Atmosphere and their Transport over Hong Kong) model is used to estimate the background air quality, details for the estimation of the emission sources to be adopted in the model runs should be clearly presented.
2. Identification of Air Sensitive Receivers (ASRs) and Examination of Emission / Dispersion Characteristics
 - (i) Identification and description of existing, planned and committed ASRs that would likely be affected by the Project, including those earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans and other relevant published land use plans, including plans and drawings published by Lands Department and any land use and development applications approved by the Town Planning Board. The Applicant shall select the assessment points of the identified ASRs that represent the worst impact point of these ASRs. A map clearly showing the location and description such as name of buildings, their uses and height of the selected assessment points shall be given. The separation distances of these ASRs from the nearest emission sources of the Project shall also be given.
 - (ii) Provision of a list of air pollution emission sources, which are related to the Project based on the analysis of the construction and operational activities in section 1 above. Examples of construction stage emission sources include stock piling, vehicular movements on unpaved haul roads on site, etc. Examples of operational stage emission sources include exhaust emissions from chimneys and vehicles, etc. Confirmation regarding the validity of the assumptions adopted and the magnitude of the activities (e.g. volume of construction material handled, etc.) shall be obtained from the relevant government departments / authorities and documented.

- (iii) Identification of other sources as well as any concurrent projects which are likely to have a significant impact to the assessment area during the course of the EIA study for incorporation into the assessment of the overall cumulative air quality impact. The impact as affecting the existing, committed and planned ASRs within the assessment area shall be assessed, based on the best information available at the time of assessment.

3. Construction Phase Air Quality Impact

- (i) 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.
- (ii) If the Applicant anticipates that the Project will give rise to significant construction dust impacts likely to exceed recommended limits in the TM at the ASRs within 500m from the project boundary despite the incorporation of the dust control measures proposed, a quantitative assessment should be carried out to evaluate the construction dust impact at the identified ASRs. The Applicant shall follow the methodology set out in section 5 below when carrying out the quantitative assessment.
- (iii) A monitoring and audit programme for the construction phase of the Project shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper construction dust control.

4. Operational Phase Air Quality Impact

- (i) The Applicant shall quantify the expected air pollutant impacts due to the Project at the identified ASRs within 15km from the project boundary as well as areas where the air quality may be significantly affected by the Project based on an assumed reasonably worst-case scenario under normal operating conditions.
- (ii) The Applicant shall describe operation scenarios of power generation to supply electricity when the new gas-fired generation units are in place. The applicant shall also demonstrate if there is any reduction of cumulative air quality impact during normal operation of the Project and quantify the improvement accordingly.
- (iii) The Applicant shall follow the methodology set out in section 5 below when carrying out the quantitative assessment.
- (iv) A monitoring and audit programme for the operational phase of the Project shall be devised to verify the effectiveness of the control measures proposed so as to ensure proper control of operational air quality impacts.

5. Quantitative Assessment Methodology

- (i) The Applicant shall conduct the quantitative assessment by applying the general principles enunciated in the modelling guidelines in Appendix A-1 while making allowance for the specific characteristic of the Project. This specific methodology must 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.

- (ii) For the purpose of assessing the compliance with the criteria as stated in section 1 of Annex 4 of the TM, the Applicant shall identify the key/representative air pollution parameters (types of pollutants and averaging time concentrations) to be evaluated and provide explanation for selecting these parameters for assessing the impact of the Project.
- (iii) Calculation of the relevant pollution emission rates for input into the model, a summary table of the emission rates and a map showing the emission sources shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submissions for review. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details should be sought.
- (iv) For on-road vehicle emissions, the Applicant may use the EMFAC-HK model to determine the Fleet Average Emission Factors, taking into account vehicle fleet mix and traffic speed, or other models as agreed by the Director. The traffic flow data and assumptions, such as the exhaust technology fractions, vehicle age/population distribution, traffic forecast and speed fractions, that are used in the assessment shall be presented in the form of both summary table(s) and graph(s).
- (v) For estimating the future background air quality, the Applicant may use EPD's PATH model or results, taking into consideration the major air pollutant emission sources projected for Hong Kong and nearby region, or other models as agreed by the Director. Details of the adopted emission sources should be presented.
- (vi) Ozone Limiting Method (OLM) or Discrete Parcel Method (DPM) or other method to be agreed with the Director shall be used to estimate the conversion ratio of NO_x to NO₂ if NO₂ has been identified as a key air pollutant.
- (vii) The Applicant shall calculate the overall cumulative air quality impact at the ASRs identified under section 2 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 effect they may have on the land use implications. Plans of a suitable scale should be used to present pollution contours to allow buffer distance requirements to be determined properly.
- (viii) The Applicant shall identify the key non-criteria toxic air pollutant(s) emitted by the Project for a health impact assessment with reference to relevant local and/or overseas studies/guidelines in the power generation sector.

6. Mitigation Measures for Air Quality Impact

Consideration for Mitigation Measures

- (i) Where the predicted air quality impact exceeds the criteria set in section 1 of Annex 4 in the TM, the Applicant shall consider mitigation measures to reduce the air quality impact on the identified ASRs. The feasibility, practicability, programming and effectiveness of the recommended mitigation measures shall be assessed and documented in the EIA report. Specific reasons for not adopting certain workable mitigation measures to reduce the air quality to a level meeting the criteria in the TM or

to maximise the protection of the ASRs as far as possible should be clearly substantiated and documented in the EIA report.

Evaluation of Residual Air Quality Impact

- (ii) Upon consideration of mitigation measures, if the mitigated air quality impact still exceeds the relevant criteria in section 1 of Annex 4 of TM, the Applicant shall identify, predict, evaluate the residual air quality impact in accordance with Section 4.4.3 of the TM and estimate the total number of existing dwellings, classrooms and other air sensitive elements that will be exposed to residual air quality impacts exceeding the criteria set in section 1 of Annex 4 in the TM.

7. Submission of Emission Calculation Details and Model Files

Input and output file(s) of model run(s) including those files for generating the pollution contours and emission calculation work sheets shall be submitted to the Director in electronic format together with the submission of the EIA report.

II Requirements for Health Impact Assessment of Toxic Air Pollutants

1. The health impact assessment regarding Toxic Air Pollutants (TAP) from the air emissions and associated activities arising from the operation of the Project shall include the following key steps:
 - (i) identification of key components of TAP from the air emissions and associated activities during the operation of the Project for health impact assessment;
 - (ii) an assessment of the likelihood and consequences of exposure to the identified key components of TAP emissions;
 - (iv) identification of means by which the health impact could be reduced; and
 - (v) recommendation of reasonably practicable measures, if any, to reduce the health impact during the operation of the Project.
2. The environmental health impact assessment on TAP shall include pathways by which the TAP may enter the human body, including inhalation, direct dermal contact as well as consumption of food and water which may be contaminated by the TAP emitted from the Project and relevant existing, committed and planned sources.

Appendix A-1**Air Quality Modelling Guidelines**

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

The air quality modelling guidelines shall include the following guidelines as published on the website of the Environmental Protection Department:

(http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/guide_aqa_model.html):

- i) Guidelines on Choice of Models and Model Parameters;
- ii) Guidelines on Assessing the “Total” Air Quality Impact (Revised);
- iii) Guidelines on the Use of Alternative Computer Models in Air Quality Assessment (Revised);
- iv) Guidelines on the Estimation of PM_{2.5} for Air Quality Assessment in Hong Kong; and
- v) Guidelines on the Estimation of 10-minute Average SO₂ Concentration for Air Quality Assessment in Hong Kong.

Appendix B**Requirements for Assessment of Hazard to Human Life****1. Natural Gas**

The Applicant shall carry out hazard assessment to evaluate the risk to off-site population of the Project due to the transport and use of natural gas. The hazard assessment shall include:

- (i) identify hazardous scenarios associated with the transport and use of natural gas with a view to determining a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA);
- (ii) execute a QRA of the set of hazardous scenarios determined in item 1(i) above, expressing population risks in both individual and societal terms;
- (iii) compare individual and societal risks with the criteria for evaluating hazard to life stipulated in section 2 of Annex 4 of the TM; and
- (iv) identify and assess practicable and cost-effective risk mitigation measures.

2. Other Non-Fuel Gas Dangerous Goods

The Applicant shall carry out hazard assessment to evaluate the risk during construction and operation stages of the Project due to other dangerous goods (such as hydrogen, carbon dioxide and petroleum products, etc.) defined in Dangerous Goods Ordinance (Cap. 295) but not covered by the Gas Safety Ordinance (Cap. 5). The hazard assessment shall include the following:

- (i) identify hazardous scenarios associated with the transport, storage and use of other dangerous goods of the Project, and then determine a set of relevant scenarios to be included in a QRA;
- (ii) execute a QRA of the set of hazardous scenarios determined in item 2(i), expressing population risks in both individual and societal terms;
- (iii) compare individual and societal risks with the criteria for evaluating hazard to life stipulated in section 2 of Annex 4 of the TM; and
- (iv) identify and assess practicable and cost-effective risk mitigation measures.

3. The methodology to be used in the hazard assessment shall be consistent with previous studies having similar issues.

Appendix C**Water Quality Impact Assessment Requirements**

1. The Applicant shall identify and analyse physical, chemical and biological disruptions of the water system(s) arising from the construction and operation of the Project.
2. The Applicant shall predict, quantify and assess any water quality impacts arising from the construction and operation of the Project by appropriate mathematical modelling and/or other techniques proposed by the Applicant and approved by the Director. The mathematical modelling requirements are set out in Appendix C-1. Possible impacts due to the dredging, fill extraction, backfilling, transportation and disposal of dredged materials, other marine works activities, effluent discharge, thermal/cooling water and biocide discharge, overflow of sewage pumping stations and site runoff shall include changes in hydrology, flow and thermal regime, sediment erosion and deposition patterns, morphological change of seabed profile, water and sediment quality, marine and freshwater organisms/community. The prediction shall include possible different construction stages or sequences of the Project. Affected sensitive receivers shall be identified by the assessment tool with indications of degree of severity.
3. The assessment shall include, but not limited to the following:
 - (i) the water quality impacts arising from marine dredging works, if any, including change in suspended solids and dissolved oxygen concentration, sediment plume dispersion, and any impacts which may be resulted in changing of water quality; and
 - (ii) the water quality impacts arising from cooling water discharges.
4. The Applicant shall address water quality impacts due to the construction phase and operational phase of the Project. Essentially, the assessment shall address the following :
 - (i) Collect and review background information on affected existing and planned water systems, their respective catchments and sensitive receivers which might be affected by the Project;
 - (ii) Characterize water quality of the water systems and sensitive receivers, which might be affected by the Project based on existing best available information or through appropriate site survey and tests;
 - (iii) Identify and analyse relevant existing and planned future activities, beneficial uses and water sensitive receivers related to the affected water system(s). The Applicant should refer to, *inter alia*, those developments and uses earmarked on the relevant Outline Zoning Plans, Development Permission Area Plans, Outline Development Plans and Layout Plans, and any other relevant published landuse plans;
 - (iv) Identify pertinent water quality objectives and establish other appropriate water quality criteria or standards for the water system(s) and the sensitive receivers identified in (i), (ii) & (iii) above;

- (v) Review the specific construction methods and configurations, and operation of the Project to identify and predict the likely water quality impacts arising from the Project;
- (vi) Identify any alternation of any water courses, natural streams, ponds, wetlands, change of water holding/flow regimes, change of catchment types or areas, erosion or sedimentation due to the Project and any other hydrological changes in the assessment area;
- (vii) Identify and quantify existing and likely future water pollution sources, including point discharges and non-point sources to surface water runoff, sewage from workforce and polluted discharge generated from the Project, contaminant release from works on marine sediment and sediment release or re-suspension from works into water bodies.
- (viii) Provide an emission inventory on the quantities and characteristics of these existing and future pollution sources in the assessment area. Field investigation and laboratory test, shall be conducted as appropriate to fill relevant information gaps;
- (ix) Predict and quantify the impacts on the water system(s) and their sensitive receivers due to those alternations and changes identified in (v) above and the pollution sources identified in (vii) above. The prediction shall take into account and include possible different construction and operation stages of the Project.
- (x) Assess the cumulative impacts due to other related concurrent and planned projects, activities or pollution sources within the assessment area that may have a bearing on the environmental acceptability of the Project;
- (xi) Analyze the provision and adequacy of existing and planned future facilities to reduce pollution arising from the point and non-point sources identified in (vii) above. Effluent generated from the Project shall require appropriate collection, treatment and disposal to ensure that there is no net increase in pollution load to Deep Bay;
- (xii) Develop effective infrastructure upgrading or provision, contingency plan, water pollution prevention and mitigation measures to be implemented during construction and operation stages, including emergency sewage discharge, so as to reduce the water quality impacts to within standards. Effluent generated from the Project shall require appropriate collection, treatment and disposal to ensure that there is no net increase in pollution load to Deep Bay Requirements to be incorporated in the project contract document shall also be proposed.
- (xiii) Investigate and develop best management practices to reduce storm water and non-point source pollution as appropriate; and
- (xiv) Evaluate and quantify residual impacts on water system(s) and the sensitive receivers with regard to the appropriate water quality objectives, criteria, standards or guidelines.

Waste Water and Non-point Sources Pollution

- (i) Proposal for upgrading or providing any effective infrastructure, water pollution prevention and mitigation measures to be implemented during the construction and operation stages so as to handle any wastewater generated including *inter alia* wastewater discharge from site clearance and preparation for the installation of the additional gas-fired generation units and to reduce the water quality impacts to within standards. Requirements to be incorporated in the Project contract document shall also be proposed;
- (ii) Investigation of and proposal for, as appropriate, best management practices to reduce storm water and non-point source pollution; and
- (iii) Evaluation and quantification of residual impacts on the water systems(s) and the sensitive receivers with regard to appropriate water and sediment quality objectives, criteria, standards or guidelines;

Fuel Spillage

- (i) Assessment of the risk to environmental sensitive receivers due to significant accidental fuel spillage. The assessment shall include the followings :
 - a) Identification of fuel spillage scenarios associated with the operation of the Project, in particular the accidental spillage associated with storage, transfer and trans-shipment of fuel during the operation of the Project and the impact on environmental sensitive receivers by taking reference to results of the mathematical models as set out in Appendix C-1;
 - b) Prediction and quantification of the impacts on the sensitive receivers due to fuel spillage scenarios identified in (a). The prediction shall take into account and include different likely operation stages; and
 - c) Derivation of emergency contingency plan for the operation phase of the Project with an aim to avoid and contain the spread and to remove accidental spillage in short notice and to prevent and/or to minimise the quantities of contaminants from reaching the environmental sensitive receivers in a shortest practical time; and

Appendix C-1**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 shall 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 and Validation

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

Criteria

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

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

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

use other models subject to agreement with EPD.

Model Details – Simulation

1. The water quality modelling results shall be qualitatively explainable, and any identifiable trend and variations in water quality shall be reproduced by the model. The water quality model shall be able to simulate and take account of the interaction of dissolved oxygen, phytoplankton, organic and inorganic nitrogen, phosphorus, silicate, BOD, temperature, suspended solids, contaminants release of dredged and disposed material, air-water exchange, *E. coli* and benthic processes. It shall also simulate salinity. Salinity results simulated by hydrodynamic models and water quality models shall be demonstrated to be consistent.
2. The sediment transport module for assessing impacts of sediment loss due to marine works shall include the processes of settling, deposition and re-erosion. The values of the modelling parameters shall be agreed with EPD. Contaminants release and DO depletion during dredging and dumping shall be simulated by the model.
3. The 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. It shall also take into account possible heat recirculation from the thermal plume to the cooling water intake. 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 will not be affected by the project. 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 operational phase of the project. Where appropriate, the assessment shall also include maintenance dredging. Scenarios to be assessed shall cover the baseline condition and scenarios with various different options proposed by the Applicant in order to quantify the environmental impacts and improvements that will be brought about by these options. Corresponding pollution load, bathymetry and coastline shall be adopted in the model set up.
2. Hydrodynamic, water quality, 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. For assessing temporary discharges via the emergency outfall, the Applicant shall estimate discharge loading, pattern and duration. The worst case scenario shall include discharge

near slack water of neap tide. A period of at least 15 days spring-neap cycle in wet season, but long enough for recovery of the receiving water, shall be simulated. Detailed methodology shall be agreed with EPD.

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

Appendix D1**Requirements for Assessment of Waste Management Implications**

The assessment of waste management implications shall cover the following:

1. Analysis of Activities and Waste Generation

- (i) The Applicant shall identify the quantity, quality and timing of the waste arising as a result of the construction and operation activities of the Project based on the sequence and duration of these activities, e.g. any dredging/excavated sediment/mud, construction and demolition materials (C&DM) and other wastes which will be generated during construction and operational stages. The Applicant shall adopt appropriate design, general layout, construction methods and programme to minimize the generation of public fill/inert C&DM and maximize the use of public fill/inert C&DM for other construction works.

2. Proposal for Waste Management

- (i) 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 planning and design stages e.g. by modifying the design approach and in the construction stage for maximizing waste reduction shall be separately considered.
- (ii) After considering the opportunities for reducing waste generation and maximizing re-use, the types and quantities of the wastes required to be disposed of as a consequence shall be estimated and the disposal methods/options for each type of wastes shall be described in detail. The disposal methods/options recommended for each type of wastes shall take into account of the result of the assessment in (iv) below.
- (iii) The EIA report shall also state clearly the transportation routings and the frequency of the trucks/vessels involved, any barging point or conveyor system to be used, the stockpiling areas and the disposal outlets for the wastes identified.
- (iv) The impact caused by handling (including stockpiling, labelling, packaging and storage), collection, transportation and re-use/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;
 - ecology; and
 - public transport.

3. Dredging/Excavation and Dumping

- (i) The Applicant shall identify and estimate dredging/excavation, dredged/excavated sediment/mud transportation and disposal activities and requirements. Potential dumping ground to be involved shall also be identified. Appropriate field

investigation, sampling and chemical and biological laboratory tests to characterize the sediment/mud concerned shall be conducted. The ranges of parameters to be analyzed; the number, type and methods of sampling; sample preservation; chemical and biological laboratory test methods to be used shall be agreed with the Director (with reference to Section 4.4.2(c) of the TM) prior to the commencement of the tests and documented in the EIA report for consideration. The categories of sediment/mud which are to be disposed of in accordance with 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 contamination of sediment/mud which requires special treatment/disposal is confirmed, the Applicant shall identify the appropriate treatment and/or disposal arrangement and demonstrate its feasibility. The Applicant shall provide supporting document, such as agreement by the relevant facilities management authorities, to demonstrate the viability of treatment/disposal plan.

- (ii) The Applicant shall identify and evaluate the practical dredging/excavation methods to minimize dredging/excavation and dumping requirements based on the criterion that existing sediment/mud shall be left in place and not to be disturbed as far as possible.

Appendix D2**Requirements for Assessment of Land Contamination**

1. If any contaminated land uses as stated in Sections 3.1 and 3.2 of Annex 19 in the TM within the Project area and, if any, the boundaries of associated areas (e.g. work areas) of the Project is identified, the Applicant shall carry out the land contamination assessment as detailed from sub-section (i) to (vi) below and propose measures to avoid disposal:
 - (i) The Applicant shall follow the guidelines for evaluating and assessing potential land contamination issues as stated in Sections 3.1 and 3.2 of Annex 19 of the TM.
 - (ii) The Applicant shall identify the potential land contamination site(s) within the Project area and, if any, the boundaries of associated areas (e.g. work areas) of the Project.
 - (iii) 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 layout plan) and a complete past land use history, in chronological order, in relation to possible land contamination (including accident records, change of land use(s) and the like).
 - (iv) During the course of the EIA study, the Applicant shall submit a Contamination Assessment Plan (CAP) to the Director for endorsement prior to conducting an actual contamination impact assessment of the relevant land or site(s). 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). Alternatively, the Applicant may refer to other previously agreed and still relevant and valid CAP(s) for the concerned site(s).
 - (v) Based on the endorsed CAP, the Applicant shall conduct a land contamination impact assessment and submit a Contamination Assessment Report (CAR) to the Director for endorsement. If land contamination is confirmed, a Remedial Action Plan (RAP) shall be prepared to formulate viable remedial measures with supporting documents, such as agreement by the relevant facilities management authorities, shall be submitted to the Director for approval. The Applicant shall then clean up the contaminated land or site(s) according to the approved RAP, and a Remediation Report (RR) to demonstrate adequate clean-up should be prepared and submitted to the Director for endorsement prior to the commencement of any development or redevelopment works within the site. The CAP, CAR, RAP shall be documented in the EIA report.
 - (vi) If there is/are potential contaminated site(s) inaccessible for preparing sampling and analysis during the course of the EIA study, e.g. due to site access problem, the Applicant's CAP shall include:
 - (a) a review of the available and relevant information;
 - (b) an initial contamination evaluation of this/these site(s) and possible remediation methods;
 - (c) a confirmation of whether the contamination problem at this/these site(s) would be surmountable;
 - (d) a sampling and analysis proposal which shall aim at determining the nature and

- the extent of the contamination of this/these site(s); and
- (e) where appropriate, a schedule of submission of revised CAP or supplementary CAP, CAR, RAP and RR upon this/these site(s) is/are accessible.

Appendix E**Requirements for Ecological Impact Assessment (Terrestrial and Marine)**

1. In the ecological impact assessment, the Applicant shall examine the flora, fauna and other components of the ecological habitats within the assessment area. The aim shall be to protect, maintain or rehabilitate the natural environment. In particular, the Project shall avoid as far as possible impacts on recognized sites of conservation importance (e.g. Sites of Special Scientific Interest, Country Park, conservation areas) and other ecological sensitive areas (e.g. marine mammals habitats, mangrove stands, sandy shore/mudflats, natural streams and other wetlands, fung shui woods and secondary woodlands). The assessment shall identify and quantify as far as possible the potential ecological impacts associated with the Project, both directly by physical disturbance and indirectly by potential impacts such as changes of water quality and hydrodynamic regime to the natural environment and the associated wildlife groups and habitats / species arising from the Project including its construction phases as well as the subsequent management and maintenance of the proposals.
2. The assessment shall include the following major tasks:
 - (i) review the findings of relevant studies / surveys and collate the available information regarding the ecological characters of the assessment area;
 - (ii) evaluate the information collected, identify any information gap relating to the assessment of potential ecological impacts to terrestrial and aquatic environment, and determine the ecological field surveys and investigations that are needed for a comprehensive assessment as required under the following sections;
 - (iii) carry out any necessary ecological field surveys with a duration of a least 6 months, and investigations to verify the information collected, fill in the information gaps as identified under sub-section (ii) above, if any, and to fulfil the objectives of the EIA study. The field surveys shall include but not be limited to flora, fauna and any other habitats/species of conservation importance, and shall include subtidal and intertidal survey, benthic community survey, underwater dive survey for coral communities and marine mammal surveys employing suitable method (e.g. shore-based theodolite tracking);
 - (iv) establish the general ecological profile of the assessment area based on information collected in the tasks mentioned in sub-section (i) to (iii) above, and describe the characteristics of each habitat found; the data set should be comprehensive and representative covering the variations of the wet and dry seasons, and is up to date and valid for the purpose of this assessment. Major information to be provided shall include :
 - (a) description of the physical environment, including all recognized sites of conservation importance and assessment of whether these sites will be affected by the Project or not;
 - (b) habitat maps of suitable scale (1:1000 to 1:5000) showing the types and locations of habitats and species of conservation interest in the assessment area;
 - (c) ecological characteristics of each habitat type such as size, vegetation and/or substrate type, species present, dominant species found, species richness and abundance of major taxa groups, seasonal patterns, inter-dependence of the habitats and species, and presence of any features of ecological importance;

- (d) representative colour photos of each habitat type and any important ecological features identified; and
 - (e) species found that are rare, endangered and/or listed under local legislation, international conventions for conservation of wildlife / habitats or red data books.
- (v) investigate and describe the existing wildlife uses of various habitats with special attention to those wildlife groups and habitats with conservation interest, including but not limited to the following:
- (a) coastal / marine waters;
 - (b) subtidal shore / coral and benthic communities;
 - (c) mangroves/ seagrass beds;
 - (d) sandy shore / inter-tidal mudflat;
 - (e) woodlands and plantations;
 - (f) wetlands including wet agricultural land, watercourses and associated riparian habitats;
 - (g) linkages of habitats within the assessment area;
 - (h) avifauna including raptors, woodland and wetland dependent migratory bird species;
 - (i) mammals (e.g. Chinese White Dolphin)
 - (j) horseshoe crabs;
 - (k) herpetofauna;
 - (l) insects (e.g. butterflies and dragonflies);
 - (m) watercourse associated species (e.g. fish and crustaceans); and
 - (n) any other habitats / species identified as having special conservation interest by this EIA study.
- (vi) describe recognized site of conservation importance in the assessment area, if any, and assess whether these site will be affected by the Project or not.
- (vii) using suitable methodology, and considering also any works activities from other projects reasonably likely to occur at the time, identify and quantify as far as possible any direct (e.g. loss of habitats due to various elements such as excavation works and other associated works (e.g. entrainment and impingement caused by the cooling water system) of the Project), indirect (e.g. changes in water qualities, hydrodynamics properties, hydrology, accidental discharge of untreated sewage, noise and other disturbance generated by the construction and operational activities etc), on-site, off-site, primary, secondary and cumulative ecological impacts on the wildlife groups and habitats identified such as destruction of habitats, reduction of species abundance/diversity, loss of feeding and breeding grounds, reduction of ecological carrying capacity and habitat fragmentation, in particular the following:
- (a) loss of habitats such as woodlands, wetlands and agricultural land;
 - (b) disturbance to animals and plants;
 - (c) impacts due to habitat fragmentation and isolation;
 - (d) impacts to intertidal, subtidal, benthic communities and marine mammals due to possible marine works such as dredging operation;
 - (e) impacts to Chinese White Dolphins due to possible changes in marine traffic volume during construction, in particular behavioural changes and increased risk of vessel collision;
 - (f) impacts to marine fauna due to possible increase in seawater intake and cooling water discharge during operation, in particular entrainment, impingement and

- water temperature increase;
 - (g) impacts due to potential changes in water quality, hydrodynamics properties and hydrology on wetlands and riparian habitats during the construction and operation (if applicable, and decommissioning) stages of the Project;
 - (h) impacts due to increase in human activities and disturbance during the construction and operation (if applicable, and decommissioning) stages of the Project such as increase in light intensity;
 - (i) cumulative impacts due to other planned and committed concurrent development projects at or near the Project area.
- (viii) evaluate ecological impact based on the best and latest information available during the course of the EIA study, using quantitative approach as far as practicable and covering construction and operational phases of the Project as well as the subsequent management and maintenance requirement of the Project;
- (ix) recommend possible alternatives, such as layer, design and alignment of the Project and modification / change of construction methods, and practicable mitigation measures to avoid, minimize and/or compensate for the adverse ecological impacts identified during construction and operation of the Project;
- (x) evaluate feasibility and effectiveness of the recommended mitigation measures and definition of the scope, type, location, implementation arrangement, resources requirement, subsequent management and maintenance of such measures;
- (xi) determine and quantify as far as possible of the residual ecological impacts after implementation of the proposed mitigation measures;
- (xii) evaluate the severity and acceptability of the residual ecological impacts using well-defined criteria in Annex 8 of the TM and determine if off-site mitigation measures are necessary to mitigate the residual impacts and if affirmative, guidelines and requirements laid down in Annex 16 of the TM should be followed; and
- (xiii) review the need for and recommend any ecological monitoring programme required.

Appendix F**Requirements for Fisheries Impact Assessment**

1. Existing information regarding the assessment area shall be reviewed. Based on the review results, the study shall identify data gap and determine if there is any need for field surveys. If field surveys are considered necessary, the study shall recommend appropriate methodology, duration and timing for the field surveys.
2. The fisheries impact assessment shall cover any potential short-term and long-term impacts on culture and capture fisheries during the construction and operation phases of the Project.
3. The fisheries impact assessment shall provide the following information:-
 - (i) Description of the physical environmental background;
 - (ii) Description and quantification of existing culture and capture fisheries activities;
 - (iii) Description and quantification of existing fisheries resources (e.g. major fisheries products and stocks);
 - (iv) Identification of parameters (e.g. water quality parameters) and areas of fisheries importance which are potentially affected by the Project;
 - (v) Identification and quantification of any direct/indirect impacts and on-site/off-site impacts to fisheries, such as impacts to any nearby fishing grounds, spawning and nursery ground, as well as Fish Culture Zones and areas of oyster production, disturbance of fisheries resources arising from changes in water quality, hydrological disruptions such as draw-down of water table, restriction on pond culture related activities, and disruption of fishing and aquaculture activities;
 - (vi) Evaluation of impacts and making proposals for any practicable alternatives or mitigation measures with details on justification, description of scope and programme, feasibility as well as manpower and financial implications including those related to subsequent management and maintenance requirements of the proposals; and
 - (vii) Review the need for monitoring during the construction and operational phases of the Project and, if necessary, propose a monitoring and audit programme.

Appendix G**Requirements for Landscape and Visual Impact Assessments**

1. The Applicant shall review relevant outline development plan(s), outline zoning plan(s), layout plan(s) or planning briefs and studies which may identify areas of high landscape value, e.g. green belt and woodland areas with sensitive landscape designations and visually sensitive areas/receivers. Any guidelines on landscape strategy, landscape framework, urban design concept, building height profiles, designed view corridors, open space network and landscape link that may affect the appreciation of the Project shall also be reviewed. The aim is to gain an insight to the future outlook of the area affected so as to assess whether the Project can fit into the surrounding setting. Any conflict with statutory town plan(s) shall be highlighted and appropriate follow-up action shall be recommended.
2. The Applicant shall describe, appraise, analyze and evaluate the existing and planned landscape resources and character of the assessment area. e.g. vegetation, woodland, streams and topography, etc. A system shall be derived for judging landscape impact significance as required under the TM and EIAO Guidance Note No. 8/2010. Annotated oblique aerial photographs and plans of suitable scale showing the baseline landscape resources and landscape character areas and mapping of impact assessment shall be extensively used to present the findings of impact assessment. Descriptive text shall provide a concise and reasoned judgment from a landscape and visual point of view. The assessment shall be particularly focused on the sensitivity and magnitude of change of the landscape resources and character. An evaluation matrix shall be derived for judging impact significance. The Applicant shall identify the degree of compatibility of the Project with the existing and planned landscape settings. The landscape impact assessment shall quantify potential landscape impact as far as possible, so as to illustrate the significance of such impact arising from the Project. Clear mapping of the landscape impact is required. A broad brush tree survey to identify dominant tree species, maturity, rarity and any plant species of conservation interest, etc. should be conducted within the assessment area to provide baseline information on the landscape resources and landscape character areas and the impacts on existing trees shall be summarized. Cumulative landscape and visual impacts of the Project with other existing, committed and planned developments in the assessment area shall be assessed.
3. The Applicant shall assess the visual impacts of the proposed Project. Clear illustration including mapping of visual impact is required. The assessment shall adopt a systematic methodology and include the following:
 - (i) Identification and plotting of visual envelope of the Project;
 - (ii) Identification of the key groups of existing and planned sensitive receivers within the visual envelope and their views at both ground level and elevated vantage points. Among other receivers, sensitive receivers shall include, but not limited to, nearby residents and villagers. Both long distance view and short distance view shall be covered in the assessment;
 - (iii) The assessment shall take into account the factors affecting the sensitivity of receivers (including value and quality of existing views, availability and amenity alternative views, type and estimated number of receiver population, duration of view and degree of visibility) and the magnitude of change of view (including compatibility of the project with the surrounding landscape and planned setting, duration of impacts under

construction and operation phases, scale of development, reversibility of change, viewing distance and potential blockage of view) for evaluating of visual impacts. The visual impacts of the Project with and without mitigation measures shall also be included so as to demonstrate the effectiveness of the proposed mitigation measures;

- (iv) Clear evaluations and explanation with supportive arguments of all relevant factors considered in arriving the significance thresholds of visual impacts.
4. The Applicant shall evaluate the merit and demerit of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area. Alternative location, site layout, development options, design and construction method that would avoid or reduce the identified landscape and visuals impacts shall first be considered and 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 the existing landscape and visual quality. The Applicant shall recommend mitigation measures to mitigate the adverse impact on existing landscape resources and characters, including provision of a landscape mitigation plan.
 5. The mitigation measures shall also include the preservation of vegetation, transplanting of trees of good amenity value, provision of screen planting, re-vegetation of disturbed lands, compensatory planting, re-provisioning of amenity areas and open spaces, design of structure, provision of finishes to structure, colour scheme and texture of material used and any measures to mitigate the disturbance of the existing land use. Parties shall be identified for the on-going management and maintenance of the proposed mitigation works to ensure their effectiveness throughout the operation phase of the Project. A practical programme and funding proposal for the implementation of the recommended measures shall be provided.
 6. Annotated illustration such as coloured perspective drawings, plans and section/elevation diagrams, oblique aerial photographs, photographs taken at vantage points and computer-generated photomontage, particularly from but not limited to the most severely affected vantage points shall be adopted to illustrate the significance of the landscape and visual impacts of the Project in four stages i.e. existing conditions, unmitigated impacts at Day 1, mitigated impacts at Day 1 and residual impact at Year 10. Options of design schemes should be illustrated with photomontages to show the visual impact on the surrounding areas. True colour samples may be requested if found necessary and appropriate. Technical details in preparing the illustration, which may need to be submitted for verification of accuracy of the illustration shall be recorded. Computer graphics shall be compatible with Microstation DGN file format.

Appendix H**Requirements for Cultural Heritage Impact Assessment (Marine Archaeological Investigation)**1. Marine Archaeological Investigation (MAI)

- (i) The assessment area for the potential archaeological impact shall include areas affected by the marine and dredging works of the Project.
- (ii) The Applicant shall engage a qualified marine archaeologist to conduct a marine archaeological review based on the best available information to identify whether there is any potential existence of sites or objects of cultural heritage within the seabed that will be affected by the marine works of the Project, whether the identified issues can be mitigated and whether there is a need for more detail investigation. The review shall take into account the scope and nature of proposed marine works, the results of previous marine archaeological investigations, the dredging history and other diving records, etc.
- (iii) If marine archaeological potential is identified and the need for further investigation is confirmed, a MAI shall be carried out to ascertain the archaeological value of the affected seabed area. The guidelines for MAI are set out in Appendix H-1.
- (iv) The Applicant shall propose a programme of investigation, including the scope of works, methodology and time schedule, etc. for agreement with the Director. The MAI shall be carried out 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. If significant archaeological remains are discovered, mitigation measures shall be designed and implemented in consultation with the Antiquities and Monuments Office.

Appendix H-1**Guidelines for Marine Archaeological Investigation (MAI)**

The standard practice for MAI should consist of four separate tasks, i.e. (1) Baseline Review, (2) Geophysical Survey, (3) Establishing Archaeological Potential and (4) Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief. Marine archaeologists should make reference to the standard and guidance of the Institute for Archaeologists and English Heritage to carry out MAI.1.

Baseline Review

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

2. Geophysical Survey

- 2.1 Extensive geophysical survey of the assessment area should deploy high resolution boomer, side scan sonar, an echo sounder and high resolution multi beam sonar. The multi beam data must be presented as processed digital terrain models to facilitate the archaeological analysis. The data received from the survey would be analyzed in detail to provide:
 - a. Exact definition of the areas of greatest archaeological potential.
 - b. Assessment of the depth and nature of the seabed sediments to define which areas consist of suitable material to bury and preserve archaeological material.
 - c. Detailed examination of the boomer and side scan sonar records to map anomalies in and on the seabed which may be archaeological material.
 - d. Detailed examination of the multi beam sonar data to assess the archaeological potential of the sonar contacts.

3. Establishing Archaeological Potential

- 3.1 The data examined during Task 1 and 2 will be analyzed to provide an indication of the likely character and extent of archaeological resources within the assessment area. This would facilitate formulation of a strategy for investigation.

- 3.2 The results would be presented as a written report and charts. If there is no indication of archaeological material there would be no need for further work.
- 3.3 Charts should be presented at the most appropriate scale and show each survey contact. Its dimensions and exact location should also be shown.
4. Remote Operated Vehicle (ROV)/Visual Diver Survey/Watching Brief
 - 4.1 Subject to the outcome of Task 1, 2 and 3, accepted marine archaeological practice would be to plan a field evaluation programme to acquire more detailed data on areas identified as having archaeological potential. The areas of archaeological interest can be inspected by ROV or divers. ROV or a team of divers with both still and video cameras would be used to record all seabed features of archaeological interest.
 - 4.2 Owing to the heavy marine traffic in Hong Kong, the ROV/visual diver survey may not be feasible to achieve the target. If that is the case, an archaeological watching brief is the most appropriate way to monitor the dredging operations in areas of identified high potential to obtain physical archaeological information.
 - 4.3 A sampling strategy for an archaeological watching brief would be prepared based on the results of Task 1, 2 and 3 to focus work on the areas of greatest archaeological potential. Careful monitoring of the dredging operations would enable immediate identification and salvage of archaeological material. If archaeological material is found, the AMO should be contacted immediately to seek guidance on its significance and appropriate mitigation measures would be prepared.
 - 4.4 If Task 4 is undertaken, the results would be presented in a written report with charts.
5. Report

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

Appendix I

IMPLEMENTATION SCHEDULE

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

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

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

Appendix J**Requirements for EIA Report Documents**

1. The Applicant shall supply the Director with the following number of copies of the EIA report and the executive summary:
 - (i) 50 copies of the EIA report in English and 80 copies of the executive summary (each bilingual in both English and Chinese) as required under section 6(2) of the EIAO to be supplied at the time of application for approval of the EIA report.
 - (ii) When necessary, addendum to the EIA report and the executive summary submitted in item (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.
2. In addition, to facilitate public inspection of EIA report via EIAO Internet Website, the Applicant shall provide electronic copies of both the EIA report and executive summary prepared in HyperText Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 1.3 or later), unless otherwise agreed by the Director. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EIA report and executive summary shall be included in the beginning of the document. Hyperlinks to figures, drawings and tables in the EIA report and executive summary shall be provided in the main text from where respective references are made. Graphics in the report shall be in interlaced GIF format unless otherwise agreed by the Director.
3. 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.
4. 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. 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.