

1 INTRODUCTION

1.1 Background

1.1.1.1 Integrated Waste Management Facilities (IWMF) is one of the comprehensive waste management measures set out in the “Policy Framework for the Management of Municipal Solid Waste (2005-2014)”. The Government plans to develop the IWMF with incineration as the core technology to achieve substantial bulk reduction for unavoidable waste and to recover energy in the treatment process for gainful uses.

1.1.1.2 The Project is to construct and operate a modern IWMF for managing municipal solid waste (MSW) under a design-build-operate (DBO) contract arrangement. The IWMF comprises: (a) an advanced thermal incineration plant with design capacity of 3,000 tonnes per day (tpd) and (b) a mechanical sorting and recycling plant with design capacity of 200 tpd. The non-recyclables sorted from the mechanical plant will be sent to the thermal incineration plant for further treatment. Under any conditions, the total MSW feeding to the thermal incineration plant and the mechanical plant will not exceed 3,000 tpd.

1.1.1.3 Two potential sites have been identified for the development of the IWMF, including Tsang Tsui Ash Lagoons site in Tuen Mun (TTAL site) and an artificial island near Shek Kwu Chau (SKC) and their locations are shown in **Figures 1.1** and **1.2** respectively. Based on the two potential sites, the following elements of the Project are classified as Designated Projects under the Environmental Impact Assessment Ordinance (EIAO):

Tsang Tsui Ash Lagoons Site

- An incinerator with an installed capacity of more than 50 tonnes per day (under Item G.3 of Part I, Schedule 2 of the EIAO)
- A waste disposal facility for refuse (under Item G.4 of Part I, Schedule 2 of the EIAO)
- A waste disposal facility for pulverized fuel ash, furnace bottom ash or gypsum (under Item G.6 of Part I, Schedule 2 of the EIAO)
- Public utility electricity power plant (under Item D.1 of Part I, Schedule 2 of the EIAO)
- An activity for the reuse of treated sewage effluent from a treatment plant (under Item F.4 of Part I, Schedule 2 of the EIAO)
- Decommissioning of a waste disposal facility for pulverized fuel ash, furnace bottom ash or gypsum (under Item 8 of Part II, Schedule 2 of the EIAO)

Artificial Island near Shek Kwu Chau

- An incinerator with an installed capacity of more than 50 tonnes per day (under Item G.3 of Part I, Schedule 2 of the EIAO)
- A waste disposal facility for refuse (under Item G.4 of Part I, Schedule 2 of the EIAO)
- A waste disposal facility for pulverized fuel ash or furnace bottom ash (under Item G.6 of Part I, Schedule 2 of the EIAO)
- Public utility electricity power plant (under Item D.1 of Part I, Schedule 2 of the EIAO)
- Reclamation works (including associated dredging works) of more than 5 ha in size (under Item C.1 of Part I, Schedule 2 of the EIAO)
- A dredging operation exceeding 500,000m³ (under Item C.12 of Part I, Schedule 2 of the EIAO)

- An activity for the reuse of treated sewage effluent from a treatment plant (under Item F.4 of Part 1, Schedule 2 of the EIAO)

1.1.1.4 Environmental Protection Department (EPD) commissioned AECOM Asia Co. Ltd. (AECOM) to carry out the engineering investigation and environmental studies for the development of the first IWMF at the two potential sites in November 2008.

1.1.1.5 This EIA Report was prepared in accordance with the EIA Study Brief No. ESB-184/2008. 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 at the two potential sites. The information will contribute to decisions by the Director of Environmental Protection on:

- the overall acceptability of any adverse environmental consequences that is to arise as a result of the Project and the associated activities of the Project;
- the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences; and
- the acceptability of residual impacts after the proposed mitigation measures are implemented.

1.2 Assessment Scenarios

1.2.1 Introduction

1.2.1.1 Based on the two potential sites, the following 3 assessment scenarios have been examined in the EIA study:

- (a) developing a 3,000 tpd the IWMF at the TTAL site alone;
- (b) developing a 3,000 tpd the IWMF at the artificial island near SKC alone; and
- (c) developing a 3,000 tpd the IWMF at each of the two potential sites (co-exist scenario).

1.2.1.2 Because of the vast distance between the two sites (over 25 km), most of the potential environmental impacts associated with the individual site would not have cumulative effect under Scenario (c), the co-exist scenario. It is only expected that Scenario (c) would likely give rise to potential cumulative air quality and health impacts associated with aerial emissions from the two IWMFs during the operation phase. Therefore, separate sections presenting the potential cumulative air quality and health impacts associated with aerial emissions from the two IWMFs during the operation phase under the co-exist scenario have been provided in **Section 3c** and **Section 9c** respectively. For the other potential environmental aspects, significant changes in the level of impacts specifically associated with the co-existence of the two IWMFs are not anticipated and are discussed below.

1.2.2 Noise Impact

1.2.2.1 The potential noise impacts arising from both construction and operation phases of the IWMF would be localized within the close proximity of the respective project site. Cumulative noise impacts from the two project sites, which are located at more than 25km apart, at any particular noise sensitive receivers are not expected under the co-exist scenario.

1.2.2.2 Under the co-exist scenario, about 3,000 tpd MSW would be delivered to the IWMF at the artificial island near SKC by marine vessels from the existing refuse transfer stations

(RTSs), including Island East Transfer Station, Island West Transfer Station and West Kowloon Transfer Station. No land transport would be involved for the transportation of MSW from the RTSs to the IWMF at the artificial island near SKC. Whereas, about 3,000 tpd of the MSW being delivered to the WENT Landfill or its extensions would be diverted to the IWMF at the TTAL site. Currently, MSW is delivered either directly to the WENT Landfill by land transport or to the berth of WENT Landfill by marine transport and then transported from the berth to the WENT Landfill by land transport. This transportation arrangement would remain the same, except that the designation of 3,000 tpd MSW would be the TTAL site instead of the WENT Landfill or its extensions. The transportation arrangement of MSW for the TTAL site and the artificial island near SKC is not expected to cause cumulative noise impacts.

1.2.3 Water Quality Impact

- 1.2.3.1 As no marine works would be required for the construction of the IWMF at the TTAL site, the potential water quality impact arising from the construction phase of the Project would be limited to construction site runoff and drainage, wastewater generated from general construction activities and sewage from the workforce. These potential water quality impacts can be effectively avoided or mitigated with implementation of the recommended mitigation measures and site practices as outlined in ProPECC PN 1/94. No water quality impact due to the construction of the IWMF at the TTAL site would be expected in far field.
- 1.2.3.2 The water quality impact arising from the marine works for construction of the IWMF at the artificial island near SKC has been quantitatively assessed using the sediment dispersion model (see **Section 5b**). The model results indicated that the water quality impact generated from the reclamation and dredging works under mitigated scenario would be localized (ie. within a couple of hundred metres) and minor, and would unlikely contribute any significant water quality impact in far field. No offsite water quality impact would be expected from the construction of the IWMF at the artificial island near SKC.
- 1.2.3.3 Taking into consideration the vast distance between the two sites (over 25 km), no cumulative water quality impact during the construction phase of the IWMFs would be expected under the co-exist scenario.
- 1.2.3.4 During the operation phase of the IWMF at both sites, wastewater will be generated from the proposed incineration plants and mechanical treatment plants at each site. On-site wastewater treatment plants will be provided. All generated wastewater will be discharged to the on-site wastewater treatment plants for treatment. The treated effluent from the wastewater treatment plants will be reused inside the IWMF sites. There would be no treated effluent discharged to the coastal waters of Deep Bay Water Control Zone (WCZ) from the IWMF at the TTAL site and Southern WCZ from the IWMF at the artificial island near SKC. No offsite impact would be expected.
- 1.2.3.5 Potable water to the IWMF at both sites would be produced from on-site desalination plants. Saline water would be discharged from the proposed desalination plants in a low discharge rate during the operation of the IWMF at both sites. The discharge of saline water has been quantitatively assessed to be minor (the influence zone would be confined within a hundred metres) and acceptable (see **Sections 5a & 5b**). Adverse far field impacts on water quality due to the proposed saline water discharge would not be expected for both sites.
- 1.2.3.6 Therefore, considering the vast distance between the two sites (over 25 km), no cumulative water quality impact during the operation phase of the IWMFs would be expected under the co-exist scenario.

1.2.4 Waste Management Implication

- 1.2.4.1 Waste types generated by the construction activities at the two sites for the IWMF development will include dredged marine sediment, C&D materials (from site formation, foundation works and construction of access road), general refuse from the workforce and chemical wastes from the maintenance of construction plants and equipment. The amount of wastes will be the sum of the wastes generated from the two sites. Provided that the wastes are handled, transported and disposed of using approved methods and that the recommended good site practices are strictly followed, cumulative waste management implication would not be expected during the construction phase of the IWMFs under the co-exist scenario.
- 1.2.4.2 During operation phase, waste types generated will include incineration by-products and mechanical treatment by-products. The amount of wastes during the operation phase of the IWMFs under the co-exist scenario would be the sum of wastes generated at the two sites. Provided that the incineration by-products of the IWMFs comply with the proposed Incineration Residue Pollution Control Limits and leachability criteria as recommended in this EIA report prior to disposal of at landfills, the residual cumulative impact arising from the disposal of the incineration by-products is considered to be minimal and thus acceptable. Besides, the disposal of incineration ash would be reduced by reusing for different applications, such as landfill cover, road base material, etc. With the implementation of the contamination preventive measures, land contamination problems during the operation phase of the two IWMFs are not expected.

1.2.5 Ecological Impact

- 1.2.5.1 Given the vast separation of more than 25km between the two sites, no additional cumulative terrestrial ecological impacts under the co-exist scenario are expected.
- 1.2.5.2 Besides, under the co-exist scenario, no change in the planned marine traffic load would occur at the artificial island near SKC. Whereas for the TTAL site, under the worst case scenario with respect to traffic impact on marine ecology, the same amount of marine traffic currently from refuse transfer stations (RTSs) to WENT Landfill would continue to operate to distribute MSW from existing RTSs to the WENT Landfill berth, which will be subsequently transported to the IWMF at the TTAL site by road. Therefore, the only marine area under the co-exist scenario with overlapping of marine traffic routes of both the TTAL site and the artificial island near SKC for waste-carrying vessels would be the existing busy channel between Hong Kong Island and Kowloon. Outside the channel, waste-carrying vessels for the IWMF at the TTAL site would travel to the northwest direction towards Tsang Tsui, whereas the waste-carrying vessels for the IWMF at the artificial island near SKC would travel to the southwest direction towards Shek Kwu Chau. As only very slight increase in marine traffic (about 4 single trips/day) would occur at the overlapping area due to the concurrent operation of the IWMF at both sites, no adverse additional marine ecological impacts are expected to arise.

1.2.6 Fisheries Impact

- 1.2.6.1 Under the co-exist scenario, for the IWMF at the TTAL site, the same amount of marine traffic currently between the existing RTSs to WENT Landfill would continue to operate to distribute MSW from existing RTSs to the WENT Landfill berth, which will be subsequently transported to the IWMF at the TTAL site by road; and the IWMF at the artificial island near SKC would have 4 single trips/day of waste-carrying vessels which depart from the existing RTSs to the artificial island near SKC.
- 1.2.6.2 In view of the very slight increase in marine traffic (about 4 single trips/day) that would occur at the overlapping area for both marine traffic routes at the existing busy channel between Hong Kong Island and Kowloon, no adverse additional impact on fisheries are expected to arise under the co-exist scenario.

1.2.7 Landscape and Visual Impact

- 1.2.7.1 The potential landscape impact arising from the both construction and operation phases would be localized within the vicinity of the respective project site. Cumulative visual impacts from the two sites, which are located at more than 25km apart, at any particular visual sensitive receivers are not expected under the co-exist scenario.

1.2.8 Impact on Cultural Heritage

- 1.2.8.1 Based on the results of the desktop review and site surveys carried out on the identified archaeological sites in the vicinity of the TTAL site and the artificial island near SKC, additional adverse impacts associated with the co-existence of the IWMFs at the TTAL site and the artificial island near SKC are not expected.
- 1.2.8.2 The Tsang Tsui Archaeological Site, Hung Shing and Dragon Mother Temple and the two clan graves identified within the TTAL site study area have a large separation distance from the IWMF at both the TTAL site and the artificial island near SKC. Similarly, the Courtyard Complex at SARDA and four other built heritage structures in the vicinity of the artificial island near SKC also have a large separation distance from the IWMF at both the TTAL site and the artificial island near SKC. Therefore, no additional adverse impacts during the construction and operation phases are anticipated under the co-exist scenario.
- 1.2.8.3 Besides, since no marine works is required for the construction of the IWMF at the TTAL site, additional marine archaeological impact under the co-exist scenario is also not anticipated.

1.2.9 Landfill Gas Hazards Assessment

- 1.2.9.1 The IWMF at the artificial island near SKC is outside the 250m "Consultation Zone" of any landfill site and no landfill site is located in the vicinity of the artificial island near SKC. The landfill gas associated with the WENT Landfill and its extension in the proximity of the TTAL site would not affect the IWMF at the artificial island near SKC in view of the large migration path length. Correspondingly, the artificial island near SKC would not affect the landfill gas hazard assessment findings for the TTAL site. Therefore, no additional impact is identified under the co-exist scenario.

1.3 Objectives of this EIA Study

- 1.3.1.1 According to the EIA Study Brief, the objectives of this EIA study are as follows:
- (i) to describe the Project and associated works together with the requirements for carrying out the Project;
 - (ii) to identify and describe the elements of the community and environment likely to be affected by the Project, including any loss of natural coastline, landscape, and/or to cause adverse impacts to the Project, including both the natural and man-made environment and the associated environmental constraints;
 - (iii) to consider alternatives including, but not limited to, location, designs (including updated technology to be adopted for incineration), size of reclamation, design layout and construction methods, with a view to avoiding and minimizing the potential environmental impacts; to compare the environmental benefits and dis-benefits of each of the alternatives; to provide reasons for selecting the preferred option(s) and to describe the part of environmental factors played in the selection;
 - (iv) to identify and quantify emission sources and determine the significance of impacts on sensitive receivers and potential affected uses and to propose measures to mitigate these impacts;

- (v) to identify and quantify any potential impacts from point and non-point pollution sources on the identified water systems and sensitive receivers and to propose measures to mitigate these impacts;
- (vi) to identify and quantify waste management requirements and land contamination prevention requirements, and to propose measures to mitigate or prevent impacts;
- (vii) to identify and quantify any potential losses or damage to flora, fauna and natural habitats and to propose measures to mitigate these impacts;
- (viii) to identify any negative impacts on Chinese White Dolphin and Finless Porpoise and to propose measures to mitigate these impacts;
- (ix) to identify any negative impacts on fisheries and to propose measures to mitigate these impacts;
- (x) to identify any potential landscape and visual impacts and to propose measures to mitigate these impacts;
- (xi) to identify and quantify any health impacts and to propose measures to mitigate these impacts;
- (xii) to identify any potential risks of landfill gas and to propose measures to mitigate these risks;
- (xiii) to identify any negative impacts on sites of cultural heritage and to propose measures to mitigate these impacts;
- (xiv) to compare the environmental merits and demerits of the Tsang Tsui Ash Lagoon site and/or the artificial island near Shek Kwu Chau with other possible sites;
- (xv) to propose the provision of mitigation measures to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;
- (xvi) to investigate the feasibility, practicability, effectiveness and implications of the proposed mitigation measures;
- (xvii) to identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during construction and operational phases of the Project in relation to the sensitive receivers and potential affected uses;
- (xviii) 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 any risks, environmental impacts and cumulative effects and reduce them to acceptable levels;
- (xix) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification; and
- (xx) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures.

1.4 Structure of the Report

1.4.1.1 In addition to Section 1, the remaining sections of the EIA report are set out as below:

- (i) Section 2 describes the project scope, the need for the Project and the consideration of alternatives, including technology and site selections.
- (ii) Sections 3a & 3b identify and assess the potential air quality impacts associated

with the Project at the TTAL site and the artificial island near SKC respectively. Section 3c presents the cumulative impact under the co-exist scenario.

- (iii) Sections 4a & 4b identify and assess the potential noise impacts associated with the Project at the TTAL site and the artificial island near SKC respectively.
- (iv) Sections 5a & 5b identify and assess the potential water pollution impacts associated with the Project at the TTAL site and the artificial island near SKC respectively.
- (v) Sections 6a & 6b identify and assess the potential waste management implications associated with the Project and land contamination prevention measures for the operation of the Project at the TTAL site and the artificial island near SKC respectively.
- (vi) Sections 7a & 7b identify and assess the potential ecological impacts associated with the Project at the TTAL site and the artificial island near SKC respectively.
- (vii) Sections 8a & 8b identify and assess the potential fisheries impacts associated with the Project at the TTAL site and the artificial island near SKC respectively.
- (viii) Sections 9a & 9b present the health risk assessment conducted to assess the potential health impact associated with the operation of the Project at TTAL site and artificial island near SKC respectively. Section 9c presents the cumulative impact under the co-exist scenario.
- (ix) Sections 10a & 10b identify and assess the potential landscape and visual impacts associated with the Project at the TTAL site and the artificial island near SKC respectively.
- (x) Sections 11a & 11b identify and assess the potential cultural heritages impacts associated with the construction of the Project at the TTAL site and the artificial island near SKC respectively.
- (xi) Section 12 identifies and assesses the potential landfill gas hazard associated with the Project at the TTAL site.
- (xii) Section 13 highlights the environmental monitoring and audit (EM&A) requirements for the Project. Details of the scope and approach are presented in a stand-alone EM&A Manual.
- (xiii) Section 14 summarises the implementation schedule of the proposed mitigation measures.
- (xiv) Section 15 summarises the key findings of the EIA study.

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