

ENVIRONMENTAL PROTECTION DEPARTMENT

Integrated Waste Management Facilities

Project Profile

March 2008

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1. PURPOSE OF PROJECT PROFILE

This project profile sets out the scope of the environmental issues associated with the construction and operation of the proposed Phase 1 of Integrated Waste Management Facilities (IWMF) at either the Tsang Tsui Ash Lagoons site or the Shek Kwu Chau site for the application of an Environmental Impact Assessment (EIA) study brief.

2. BASIC INFORMATION

2.1. Project Title

2.1.1 Development of the Integrated Waste Management Facilities Phase 1 (hereinafter named as the Project).

2.2. Purpose and Nature of the Project

Background

- 2.2.1 Hong Kong is facing a serious and imminent waste problem. Despite our efforts and progress made in waste reduction and recycling, there remains substantial unavoidable waste that needs to be disposed of properly. Our three strategic landfills would approach their capacities one by one in the early to mid 2010s. To address the waste problem in a holistic manner, the Administration published *A Policy Framework for the Management of Municipal Solid Waste (2005-2014)* (the Policy Framework) in December 2005. The Policy Framework sets out a comprehensive waste management strategy that encompasses initiatives on waste avoidance at source, waste recovery and recycling and bulk reduction of waste.
- 2.2.2 As set out in the Policy Framework, the IWMF with incineration as the core technology would be developed to substantially reduce the volume of unavoidable waste, thereby extending the life span of the existing landfills and their extension. Having regard to the size of the overall waste problem, the IWMF is planned to be developed in phases.
- 2.2.3 A comprehensive site search exercise has been carried out to identify potential sites in Hong Kong suitable for the development of the Phase 1 of IWMF. The result of this exercise concluded that the sites at (i) Tsang Tsui Ash Lagoons and (ii) Shek Kwu Chau are suitable for consideration. The locations of these two potential sites are shown in **Figure 1.1**. It is intended that detailed engineering and EIA studies for both sites would be carried out to ascertain their ultimate suitability and to assist in the decision on the final choice of site.

Purpose and Nature

- 2.2.4 This Project comprises the construction and operation of the first phase of IWMF which would have a total treatment capacity for 3,000 tonnes per day (tpd) of mixed municipal solid waste (MSW). It would comprise (a) a thermal incineration plant of about 2,800 tpd capacity and (b) a sorting and recycling plant of a demonstration scale of about 200 tpd capacity. This Project would reduce the volume of MSW requiring landfill disposal substantially, recover energy for electricity generation and recover recyclable materials from the mixed MSW.

2.3. Name of Project Proponent

2.3.1 Environmental Protection Department (EPD).

2.4. Location and Scale of the Project

2.4.1 The Project will cover studies of two potential sites for the development of the Phase 1 of IWMF at one of the sites. The first site is located at the existing ash lagoon area in Tsang Tsui near Nim Wan, Tuen Mun, overlooking the Deep Bay. The site, comprising the East, Middle and West Lagoons, is granted to CLP Power Company Limited (CLP) in 1988 under two licences issued by the Lands Department mainly for the storage of pulverised fuel ash (PFA). The Project site will occupy an area of approximately 10 hectares (ha) in the Middle Lagoon which has been used as the 'water collection and conservation system' of CLP's power plant since 1997. Other industrial facilities in the vicinity of the site area include the Black Point Power Station to the south-west, and the WENT Landfill and its associated waste reception facilities to the east. A location plan of this potential site is shown in **Figure 1.2**.

2.4.2 The second potential site is to be formed by reclamation at the south-western coast of Shek Kwu Chau, an island located to the southwest of Cheung Chau and to the south of Chi Ma Wan Peninsula, Lantau Island. The site will cover approximately 10 ha of reclaimed land. Shek Kwu Chau has been granted to the Society for the Aid and Rehabilitation of Drug Addicts (SARDA) for use as a rehabilitation centre, with a current residential population of about 200. There are no other residential, commercial or industrial facilities on the island. A location plan of the site is given in **Figure 1.3**.

2.5. Number and Types of Designated Projects Covered by the Project Profile

2.5.1 The following elements of the Project addressed in this Project Profile are classified as Designation Projects under the Environmental Impact Assessment Ordinance (EIAO) CAP. 499.

For both the Tsang Tsui Ash Lagoons and Shek Kwu Chau sites:

- An incinerator with an installed capacity of more than 50 tonnes per day (under Schedule 2, Part I, Item G.3 of the EIAO)
- A waste disposal facility for refuse (under Schedule 2, Part I, Item G.4 of the EIAO)
- A waste disposal facility for pulverised fuel ash or furnace bottom ash (under Schedule 2, Part I, Item G.6 of the EIAO)
- Public utility electricity power plant (under Schedule 2, Part I, Item D.1 of the EIAO).

For the Shek Kwu Chau site:

- Reclamation works (including associated dredging works) of more than 5 ha in size (under Schedule 2, Part I, Item C.1 of the EIAO)
- A dredging operation exceeding 500,000 m³ (under Schedule 2, Part I, Item C.12 of the EIAO).

2.6. Name and Telephone Number of Contact Person

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3. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

3.1. Project Planning and Implementation

3.1.1 The Project Proponent will employ consultancy firm to conduct the engineering and EIA studies for the proposed Project.

3.1.2 The Project is planned to be implemented through a Design, Build and Operate (DBO) contract. The Contractor will be selected through a competitive tendering exercise. Under the contract, the Contractor will be responsible for:

- i) detailed design for the formation of the Project site
- ii) detailed design of all facilities of the Project
- iii) construction works for the forming of the Project site
- iv) construction, provision and installation of all the facilities
- v) testing and commissioning of all the facilities
- vi) operation and maintenance of the facilities
- vii) monitoring of operation

3.2. Project Programme

3.2.1 The Project implementation programme is shown in **Table 3.1** below.

Table 3. 1 – Project Implementation Programme

Activity Description	Indicative Milestones
Commencement of Engineering/EIA Studies	Dec. 2008
Completion of Engineering/ EIA Studies	Oct. 2010
Tendering for the DBO Contract	Dec. 2010
Award of Contract	Nov. 2011
Commencement of Operation	2014

3.3. Interfacing with Other Projects

Tsang Tsui Ash Lagoons

- 3.3.1 The Project will be located in part of the Ash Lagoons which is now occupied by CLP for uses relating to the operation of the Black Point and Castle Peak Power Stations. The Government would liaise with CLP on the land issue.
- 3.3.2 The planned Sludge Treatment Facilities (STF) would be located in the East Lagoon adjoining this Project site. The planned WENT Landfill Extension will be located also in the vicinity of the area. Presently EIA studies for these two planned projects are being carried out and are not completed yet.
- 3.3.3 There were tentative proposals for regional roadworks and other infrastructures near the Project site (e.g. the Hong Kong-Zhuhai-Macao Bridge project). All these proposals are subject to review and have not obtained any firm commitment for their implementation.

Shek Kwu Chau

- 3.3.4 At present there is no proposed project that are planned to be constructed in proximity to the island, so no interfacing with other project is anticipated.

4. POSSIBLE IMPACTS ON THE ENVIRONMENT

4.1. General Description of the Project

- 4.1.1. The infrastructure for this Project would comprise (i) a thermal incineration plant, (ii) a sorting and recycling plant, and (iii) ancillary and supporting facilities. More details of these components are given below.

Thermal Incineration Plant

- 4.1.2 This plant would incinerate mixed MSW, recover energy and generate electricity for gainful uses. Advanced incineration based on “mass burn” design would be adopted. Typical schematic flow diagram of such incineration process is shown in **Figure 1.4**.
- 4.1.3 The plant would comprise the following elements the majority of which would be installed inside enclosed superstructures, odourous air would be fed into the high temperature incineration furnace for deodorization:
- Waste reception, storage and feeding system
 - Mass burn incinerator (combustion chamber)
 - Waste heat recovery (boiler), turbine generation and cooling systems
 - Boiler feedwater treatment system
 - Flue gas treatment system
 - Flue gas discharge system with stack
 - Fly ash storage and treatment system
 - Residues and bottom ash storage and handling system
 - Bulky waste storage and handling system
 - Reagent reception and storage system
 - Process control and monitoring system

Sorting and Recycling plant

4.1.4 The treatment capacity of this plant would be of a demonstration scale, which aims to investigate recovery of recyclables and resources from the mixed MSW and the stabilization of the residue for subsequent disposal.

4.1.5 The sorting and recycling plant typically would comprise the following components:

- Waste reception provisions
- Mechanical sorting and shredding systems for recyclables recovery
- Biological treatment systems based on anaerobic digestion and composting processes
- Biogas storage system
- Biogas electricity generation system

4.1.6 It is anticipated that all the above components, except the tanks for anaerobic digestion and the biogas storage systems, would be installed in enclosed superstructures with deodorisation provisions.

Ancillary and Supporting Facilities

4.1.7 These facilities would serve the operations of both the thermal incineration plant and the sorting and recycling plant. They would include the followings:

- Weighbridge
- Security system
- Administration building
- Visitor and education centre
- Vehicle and container washing facilities
- Maintenance workshop and utility yard
- Fuel storage tanks
- Drainage and sewerage system
- Water supply and waste water treatment systems
- Berthing for marine vessels that transport MSW to the site
- refuse container storage facilities

Project Construction Phase

4.1.8. The Project would require the forming of about 10 ha of land and the associated roads and drains, followed by foundation works, superstructures building and installation of plants and equipments for the various systems mentioned in paragraphs 4.1.3 to 4.1.7 above. It would also involve construction work outside the site for the installation and connection of utilities. Brief descriptions of these works for the two potential sites are given below.

Tsang Tsui Ash Lagoons

4.1.9 Currently land has been largely formed by PFA that was filled to this site in the previous years. It is anticipated that only relatively small scale of excavation, filling and levelling work is needed for the necessary site formation. As the existing berths of the WENT landfill is intended to be used for this Project, no construction of berth is anticipated.

4.1.10 Regarding utilities, the main requirement would be the connection of electricity cable for

which relatively minor trench excavation and filling on land would be carried out. As for construction of various facilities of the Project, the works would include foundation works, building of super-structures, installation of plants and equipments, building of access roads, utilities, sewer and drains.

Shek Kwu Chau

- 4.1.11 Reclamation is needed to form the 10 ha land as well as the berths for future marine vessel operations. This would likely involve dredging of soft marine mud, forming of sea wall and berth by concrete blocks, armour rock and sand filling, followed by filling of sand and suitable material to the designed ground level.
- 4.1.12 For electricity transmission, it is anticipated that submarine cable of a few kilometre length would need to be installed to connect the site to a receiving point at an nearby island. For this, marine dredging, cable laying and subsequent filling works would likely be required.

Project Operation Phase

- 4.1.13 It is planned that containers of mixed MSW from various existing Refuse Transfer Stations in Hong Kong would be delivered to the site by marine vessels. The containers would be unloaded at the berth and delivered to the waste reception halls of either the thermal incineration plant or the sorting and recycling plant.
- 4.1.14 At the waste reception hall of the thermal incineration plant, mixed MSW from the containers would be unloaded into a storage pit, where the bulky items will be sorted out and shredded. The waste is then transferred by overhead cranes into the combustion chamber for burning. The residue (ash) will be collected at the bottom of the combustion chamber and passes to the ash storage pit through a water-quenched ash extractor and magnetic separator for ferrous metal recovery. These ash, commonly know as bottom ash, would be delivered to the landfill for final disposal or reuse as appropriate.
- 4.1.15 The hot flue gases from the combustion chamber would flow through the boiler, releasing thermal energy which turns the water in the boiler tubes into steam. The steam produced would be used to drive the turbine to generate electricity. The cooled flue gases would be treated by gas cleaning equipments such as scrubbers, activated carbon powder injection and fabric filter systems. The cleaned flue gases would then be released to the atmosphere via the stack. A relatively smaller amount of ash would be collected from the boiler and gas cleaning equipments. The ash would be stabilized with cement or other suitable material before final disposal.
- 4.1.16 As regards the containers of waste delivered to the waste reception hall of the sorting and recycling plant, they would be unloaded into a storage pit where the bulky items will be sorted out and shredded. The waste would then be treated by further mechanical sorting systems such as magnetic separator and trommels for separation of recyclable metals, recyclable plastics, inert material and organic matters. The recyclables would be collected, stored for delivery to other recycling sites. The organic matters would be further treated by biological processes while the inert materials would be delivered to the landfill for disposal.
- 4.1.17 The separated organic fraction of the waste would be treated by biological processes for stabilization and possible recovery of resources. The biological processes would include

anaerobic digestion and composting. In the anaerobic digestion process, the organic materials would be degraded by microbial activity in the absence of oxygen to produce biogas. The biogas would be collected and used to generate heat and electricity. The anaerobic digestion process would also produce organic residues that could be further treated by dewatering and composting into soil conditioner.

- 4.1.18 In the composting process, the organic residue would be stabilized through bacterial activity in the presence of oxygen. Depending on the extent of contamination, the stabilised residue would be reused as soil conditioner or be disposed of at the landfill.

4.2. Key Environmental Issues at the Construction Phase

Air Quality

Tsang Tsui Ash Lagoons

- 4.2.1 The main potential air quality impacts during the construction phase would be elevated dust levels associated with the site formation and general construction activities. As the WENT Landfill site office, the nearest Air Sensitive Receivers (ASRs) is located at quite a distance of 500 m away, with the implementation of dust control and suppression measures as stipulated in the *Air Pollution Control (Construction Dust) Regulation*, adverse dust impact is not expected.

The operation of diesel-powered construction equipment may also emit gaseous pollutants. However due to the separation distances between the site and the ASRs and that only limited number of such equipment would be used, it is expected that the impacts would be minimal and well within the relevant standards.

Shek Kwu Chau

- 4.2.2 The main potential air quality impacts during the construction phase would be elevated dust levels associated with the site reclamation and general construction activities. The nearest ASR would be some residential structures of Shek Kwu Chau Treatment and Rehabilitation Centre at some 130 m away from the site boundary. With the implementation of dust control and suppression measures as stipulated in the *Air Pollution Control (Construction Dust) Regulation*, no adverse impact is expected.

The operation of diesel-powered construction equipment may also emit gaseous pollutants. However due to the separation distances between the site and the ASRs and that only limited number of such equipment would be used, it is expected that the impacts would be minimal and well within the relevant standards

Human Health

Tsang Tsui Ash Lagoons

- 4.2.3 It is anticipated that the PFA at the Ash Lagoons might need to be excavated during site formation, therefore the potential health risk induced by possible radon emissions from the PFA during the construction needs to be evaluated. Based on literature review, the radon health risk and radiological hazard from potential radon emissions from PFA to

members of the public and workers staying outdoor at the site are expected to be of insignificant level. Moreover, offsite radon impact through migration of any radon flux from the PFA lagoons to the ASRs should not be significant.

Shek Kwu Chau

- 4.2.4 The construction of the Project would unlikely give rise to major potential hazard to life or risk to human health.

Waste Management

Tsang Tsui Ash Lagoons

- 4.2.5 The construction activities of the Project would generate construction and demolition (C&D) material, general refuse by the workforce and chemical waste derived from the maintenance of construction plant and equipment. Provided that these wastes are handled, transported and disposed of using approved methods and that good site practices are strictly followed, adverse environmental impacts would not be expected.

Shek Kwu Chau

- 4.2.6 For the Shek Kwu Chau site, there would be impact associated with the handling and dumping of marine sediment arising from the dredging works described in paragraphs 4.1.11 and 4.1.12. The management and disposal of the dredged material would follow the procedures and requirements specified in ETWBTC 34/2002 and the Dumping at Sea Ordinance (Cap.466). No adverse environmental impact is expected.
- 4.2.7 The construction activities would also generate C&D material, general refuse by the workforce and chemical waste derived from the maintenance of construction plant and equipment. Provided that these wastes are handled, transported and disposed of using approved methods and that good site practices are strictly followed, adverse environmental impacts would not be expected

Water Quality

Tsang Tsui Ash Lagoons

- 4.2.8 The potential sources of water quality impact during the construction phase of the Project consists of site runoff and drainage; debris, refuse and liquid spillages from general construction activities; and sewage effluent from the construction workforce. The water quality impact could be minimized through proper planning and implementation of control measures to reduce site runoff and to provide appropriate on-site treatment prior to discharge. Proper site management and good housekeeping practices would also be required to ensure that construction waste and material would not enter the nearby stream and coastal waters. Sewage arising from the construction workforce would require appropriate treatment through provision of portable toilets. Through implementation of these control and mitigation measures, it is expected that the construction works for the Project would not result in unacceptable impacts on water quality.

Shek Kwu Chau

- 4.2.9 The configuration and design of reclamation for the Project might affect the patterns of current in the nearby marine area and consequently the water quality. During the construction phase, the dredging, reclamation and filling works for site formation and submarine cable laying would have the potential to cause considerable impact on the marine water quality and also the nearby water sensitive receivers. These impacts would need to be evaluated. Appropriate reclamation design and mitigation measures such as provision of silt curtains or control of dredging and filling operations would need to be identified. With the implemented of these measures, it is expected that the residual water quality impact would be acceptable.
- 4.2.10 Other potential sources of water quality impact during the construction phase of the Project include site runoff and drainage; debris, refuse and liquid spillages from general construction activities; and sewage effluent from the construction workforce. Similar to the case for the Ash Lagoons site as depicted in paragraph 4.2.8 above, with implementation of proper site runoff control and treatment; good housekeeping practices; provision of sewage treatment, it is expected that the construction works would not result in unacceptable water quality impact.

Ecology

Tsang Tsui Ash Lagoons

- 4.2.11 The Ash Lagoons provide nesting and breeding ground for a few identified bird species most of which are generally widespread within Hong Kong. There is no 'Protected Areas' within 500 m of the site. The nearest ones are the Sha Chau and Lung Kwu Chau Marine Park and a Site of Special Scientific Interest (SSSI) at Sheung Pak Nai, all at a few km away. Hence the major direct potential impact on terrestrial ecology due to the construction work would be the loss of the habitats and associated fauna falling within the footprint of the Project site at the Middle Lagoon. There could also be indirect impacts to habitats and associated fauna adjacent to the site due to increased noise levels and human activities. Mitigation measures would be required to minimize potential indirect impacts to the surrounding habitats and associated fauna.
- 4.2.12 As no marine or river related works would be carried out, the construction would not result in any loss of aquatic habitat. With the implementation of appropriate measures to mitigate impacts associated with wastewater and site runoffs as depicted in paragraph 4.2.8 above, minimal residual impacts to the marine ecology and fisheries are anticipated.

Shek Kwu Chau

- 4.2.13 There are some faunal species of ecology interest on the existing Shek Kwu Chau island, including the Bogadek's Burrowing lizard, two previous unknown species of snake, two uncommon dragonfly species *Cercioin clamorum dyeri* and *C. melanotum* and a considerable number of butterfly species. However, as the Project would be developed on reclaimed land without encroachment onto the existing island, with implementation of appropriate mitigation measures, the impact on the terrestrial ecological habitat on the existing island should be minimal and acceptable.
- 4.2.14 The marine area at and in the vicinity of the site is a fish spawning and nursery ground. Chinese White Dolphin and Finless Porpoise have been sighted, though the area is not

their core habitat. There are also soft and hard sub-tidal habitats that are commonly found in Hong Kong. The coastline that would be affected by the site reclamation mainly comprises rocky habitats of low to medium ecological value. Hence the major direct impact on marine ecology due to the construction work would be the loss of the habitats and associated fauna falling within the footprint of the Project site.

- 4.2.15 The dredging reclamation and construction works would have the potential to impact on the marine water quality considerably thereby affecting the nearby marine ecology and fisheries. As given in paragraph 4.2.9 above, impacts on the marine water quality as well as the marine ecology arising from the construction works would need to be evaluated with appropriate mitigation measures identified and implemented to reduce the impacts to acceptable levels.

Noise

Tsang Tsui Ash Lagoons

- 4.2.16 The Project site is an industrial setting with the WENT Landfill, Black Point Power Station and the planned STF in the neighbourhood. The nearest Noise Sensitive Receivers (NSRs) is the WENT Landfill site office at 500 m away. As such, with appropriate noise mitigation measures, construction activities noise and construction vehicle traffic noise levels are expected to be insignificant and would not cause adverse impact on the NSRs.

Shek Kwu Chau

- 4.2.17 The nearest NSR is some residential structures of the rehabilitation centre about 130 m away on a slope on the south side of the island. Construction activities including use of powered mechanical equipments have the potential to generate construction noise the impact of which need to be evaluated. Yet it is expected that with implementation of appropriate mitigation measures, the construction noise levels at the NSRs should be contained to acceptable levels.

Landscape and Visual

Tsang Tsui Ash Lagoons

- 4.2.18 The site being in an industrial setting with the existing WENT landfill and the Black Point Power Station nearby has a low landscape value. The Visual Sensitive Receivers (VSRs) are limited to a few distant villages like Ha Pak Nai and Lung Kwu Sheung Tan some 2 km away. It is expected that with the implementation of appropriate mitigation measures such as good site practices, the residual landscape and visual impacts during the construction phase would be acceptable.

Shek Kwu Chau

- 4.2.19 The existing landscape of the island has relatively high baseline value. The construction for the Project will cause permanent changes to the natural coastline and landscape. However as the site is located far from any major population clusters, the VSR is largely limited to the small population of 200 persons living in the rehabilitation centre. Yet most

of this population's views to the site area are partly blocked by the existing hill on the island. As such, with implementation of mitigation measures such as landscape planting and good site practices, any landscape and visual impacts during the construction phase will be of limited extent.

Cultural Heritage

Tsang Tsui Ash Lagoons

- 4.2.20 The Tsang Tsui Archaeological Site is located to the south of the ash lagoons at a distance of over 300 m from the Project site boundary. With the implementation of appropriate mitigation measures such as good site practices, any potential impacts caused by the Project to the archaeological site and any other built heritage in the vicinity would be acceptable.

Shek Kwu Chau

- 4.2.21 There are recorded sites of archaeological interest on the island: Shek Kwu Chau Archaeological Site and Shek Kwu Chau Gravestone. As the Project would be developed on reclaimed land without encroachment onto the existing island, with implementation of appropriate mitigation measures, the potential cultural heritage impact on the existing island should be minimal and acceptable.

4.3 Key Environmental Issues at the Operational Phase

Air Quality

Tsang Tsui Ash Lagoons

- 4.3.1 Flue gas emission from the thermal incineration plant of the Project would be the major source of potential air quality impact. The air pollutants in the flue gas emission would be controlled to within the concentration limits stipulated in the *Best Practicable Means Guidance Note for Incinerators*¹. Detailed air quality impact assessment would be required to predict the concentrations of air pollutants at the ASRs and to assess compliance with the Air Quality Objectives (AQOs) and the relevant air quality criteria for non-AQO pollutants. The assessment would include cumulative impacts of the potential stack emissions from the Project and the existing and planned emission sources nearby, such as the CLP Black Point and Castle Peak Power Stations, the planned STF, and the WENT Landfill and its extension.
- 4.3.2 Fugitive emission and odour nuisance may arise from the refuse container vessels heading to and from the site, operation of the on-site wastewater treatment plant, the waste reception halls, the waste storage area, the ash handling and storage areas of the thermal incineration plant, and the mechanical and biological treatment processes of the sorting and recycling plant of the Project. Assessment of fugitive emission and odour impact would be required. Given that the above facilities would be fully enclosed, high temperature incineration would be used for deodorization, the wastewater treatment plant

¹ Guidance Note on the Best Practicable Means for Incinerators (Municipal Waste Incineration), BPM 12/1 (08), EPD/APG, February 2008.

and the sorting and recycling plant would be equipped with deodorizing units or odour filtration system, and the waste reception halls would be operated under a negative pressure to prevent odour leaking to the outdoor environment, adverse impact on the ASRs would not be expected.

Shek Kwu Chau

- 4.3.3 Flue gas emission from the thermal incineration plant of the Project would be the major source of potential air quality impact. The air pollutants in the flue gas emission would be controlled to within the concentration limits stipulated in the *Best Practicable Means Guidance Note for Incinerators*². Detailed air quality impact assessment would be required to predict the concentrations of air pollutants at the ASRs and to assess compliance with the AQOs and the relevant air quality criteria for non-AQO pollutants. Since no other emission sources exist nearby, cumulative air quality impact is not expected to be a concern.
- 4.3.4 Fugitive emission and odour nuisance may arise from the refuse container vessels heading to and from the site, operation of the on-site wastewater treatment plant, the waste reception halls, the waste storage area, the ash handling and storage areas of the thermal incineration plant, and the mechanical and biological treatment processes of the sorting and recycling plant of the Project. Assessment of fugitive emission and odour impact would be required. Given that the above facilities would be fully enclosed, high temperature incineration would be used for deodorization, the wastewater treatment plant and the sorting and recycling plant would be equipped with deodorizing units or odour filtration system, and the waste reception halls would be operated under a negative pressure to prevent odour leaking to the outdoor environment, adverse odour impact on the ASRs would not be expected.

Human Health

Tsang Tsui Ash Lagoons

- 4.3.5 Potential health impacts may arise from the following sources during the operation phase of the Project:
- Aerial emissions and dispersion from the Project's stack
 - Fugitive emissions during transportation, storage and handling of the waste and ash
 - Potential accidental events such as fire in the waste storage pit, explosion in the furnace, inadvertent receipt of hazardous or clinical wastes, and potential failure of the air pollution control system.
- 4.3.6 Apart from the above, biogas that might be continuously produced in the sorting and recycling plant could be another source of potential health impact. It is anticipated that a maximum of 1000 cum of biogas would be stored in gas holding tanks on the site. Under normal operation, the biogas would be converted into electricity in the generator and any surplus biogas would be burned via an emergency flare.
- 4.3.7 In addition, possible radon emissions associated with the PFA would be another source of potential health impact. While the staff at the Project site are not anticipated to be exposed to a significant level of radon health risk, as a precaution, measures to prevent

2 *ibid.*

radon influx from the PFA to the Project buildings would be considered for incorporation in the Project.

- 4.3.8 A quantitative risk assessment would be carried out to evaluate the potential health impacts arising from the Project. The potential hazard to human life associated with the biogas generation and storage would be assessed to meet with the requirements stipulated in the *Hong Kong Government Risk Guidelines (see Annex 4, Figure 1 of the EIAO-TM)*. With proper implementation of safeguards and risk control measures, it is expected that the risk associated with potential accidental or emergency events should be acceptable.

Shek Kwu Chau

- 4.3.9 The sources of potential health impacts include aerial emissions, fugitive emissions, accidental events and biogas production, similar to those depicted in paragraphs 4.3.5 and 4.3.6 above.
- 4.3.10 A quantitative risk assessment would be carried out to evaluate the potential health impacts arising from the Project. The potential hazard to human life associated with the biogas generation and storage would be assessed to meet with the requirements stipulated in the *Hong Kong Government Risk Guidelines (see Annex 4, Figure 1 of the EIAO-TM)*. With proper implementation of safeguards and risk control measures, it is expected that the risks associated with potential accidental or emergency events should be acceptable.

Waste Management

Tsang Tsui Ash Lagoons and Shek Kwu Chau

- 4.3.11 The major solid matters and waste arising from the Project would be the combustion ash (bottom ash and fly ash) and flue gas cleaning residue generated from the thermal incineration plant. Bottom ash could be safely disposed of in landfill or recycled into construction material. Fly ash and flue gas cleaning residue would be stabilised prior to final disposal in landfill. These incineration end products would be tested in accordance with the requirements of the proposed Incineration Residue Pollution Control Limits³ prior to landfill disposal.
- 4.3.12 The Project would also sort out waste or inert material that is unsuitable for reuse or further treatment. The amount of such waste is expected to be small and they would be disposed of at the landfill.
- 4.3.13 A relative small amount of chemical waste such as lubricating oil would be generated during the operation of the Project. These would be properly collected and disposed of in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

Water Quality

Tsang Tsui Ash Lagoons and Shek Kwu Chau

³ The proposed *Incineration Residue Pollution Control Limits* are derived with reference to those adopted for the Chemical Waste Treatment Centre at Tsing Yi.

- 4.3.14 Water Quality impacts may arise from the discharge of effluents to the drainage and/or nearby water bodies. Such effluent would include that from the waste water treatment system, the cooling system and the water supply system. It is intended that all the wastewater generated from the Project would be treated at the on-site wastewater treatment plant for cleansing and landscape irrigation reuses without any effluent discharge. As regards the cooling system, either air-cooled power generation system would be adopted or the process cooling water would be properly treated and recycled. A small desalination facility would be used for water supply and this facility would discharge a small volume of concentrated saline effluent.
- 4.3.15 Apart from the effluent discharges given above, surface runoff from the site, particularly the first flush of rainstorm event would have the potential to impact on water quality. Such impact could be minimized through pollution control measures such as regular cleansing of open areas and roads. In view of the relative small amount of effluent discharge, it is envisaged that with the implementation of appropriate mitigation measures and surface water pollution control measures, the operational phase of the Project would not cause any adverse water quality impact.

Ecology

Tsang Tsui Ash Lagoons

- 4.3.16 The partial loss of habitat loss at part of the Middle Lagoon would only impact on relatively few individuals of a small number of bird species most of which are generally widespread within Hong Kong. No other direct impacts are anticipated, whereas indirect impacts to surrounding habitats and associated wildlife may arise as general disturbance levels would be increased, such as noise and visual disturbance from traffic entering and exiting the Project site. Overall there should be no insurmountable terrestrial ecological impacts.
- 4.3.17 Given that appropriate measures would be adopted to mitigate water quality impacts to acceptable levels, minimal residual impacts to the marine ecology and fisheries are anticipated.

Shek Kwu Chau

- 4.3.18 There are some faunal species of ecology interest on the existing Shek Kwu Chau island. However as the Project would be operated at the newly reclaimed site without encroachment onto the existing island, with implementation of appropriate mitigation measures, the impact on the terrestrial ecological habitat on the existing island should be acceptable.
- 4.3.19 The marine area in the vicinity of the site is a fish spawning and nursery ground. Chinese White Dolphin and Finless Porpoise have been sighted, though the area is not their core habitat. Given the limited amount of marine vessel traffic arising from the operation of the project, and that appropriate measures would be implemented to mitigate water quality impacts due to surface water and effluent discharges, the potential impacts on marine ecology and fishery are expected to be acceptable.

Noise

Tsang Tsui Ash Lagoons and Shek Kwu Chau

- 4.3.20 The Project intends to accept mixed MSW containerized and delivered to the site solely by marine transport from the refuse transfer stations (RTS). There would be little, if any additional waste collection vehicles traffic in Hong Kong or Tuen Mun. Any increase in traffic noise due to on-site and off-site vehicle movements arising from the operation of the Project is expected to be insignificant and would not cause an adverse impact on the NSRs. As regards marine traffic, it is anticipated to be one round trip of refuse container vessel per RTS per day, so noise impact arising from marine traffic should be minimal.
- 4.3.21 Although the Project will operate 24 hours a day, experiences from other operating facilities elsewhere indicate that fixed plant noise will not be significant as most of the process equipments will be located within enclosed buildings. As such, with the implementation of acoustic barriers at strategic locations and appropriate mitigation measures included in the design of the Project, the daytime and night time criteria within the *Noise Control Ordinance* should be met.

Landscape and Visual

Tsang Tsui Ash Lagoons

- 4.3.22 The site is in an industrial setting with the existing WENT landfill and the Black Point Power Station nearby. Therefore it has a low landscape value and the Visual Sensitive Receivers (VSRs) are limited to a few distant villages some 2 km away. It is expected that with the implementation of appropriate architectural designs and other measures such as landscape planting, the residual landscape and visual impacts would be acceptable.

Shek Kwu Chau

- 4.3.23 As the existing landscape of the island has relatively high baseline value and the Project would change the natural coastline and landscape permanently, careful landscape and architectural designs are needed to blend the Project with the existing natural landscape as much as possible. With these, and noting that the site is located far away from any major population clusters, it is considered that the residual landscape and visual impacts during the operational phase would be acceptable.

Cultural Heritage

Tsang Tsui Ash Lagoons

- 4.3.24 Tsang Tsui Archaeological Site is located 300 m from the Project site boundary, any potential impacts caused by the Project would be minimal. Potential cultural heritage impacts caused by the Project to the archaeological site and any other built heritage in the vicinity would be assessed.

Shek Kwu Chau

- 4.3.25 Any potential impacts caused by the Project on the Shek Kwu Chau Archaeological Site and Shek Kwu Chau Gravestone on the island would be minimal. Potential cultural

heritage impacts caused by the Project to the archaeological site and any other built heritage in the vicinity would be assessed.

5. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT AND SITE HISTORY

Tsang Tsui Ash Lagoons

- 5.1 The Tsang Tsui Ash Lagoons in Tuen Mun was formed on land reclaimed in mid 1980s near Nim Wan, and are divided by bunds into three roughly equal sized lagoons for the storage of PFA. The proposed site for the Project is located in the Middle Lagoon. Other industrial facilities in the area include the CLP Black Point Power Station to the south-west, the planned STF to be located on the East Lagoon, and the WENT Landfill and its planned extension to the further east and south side.
- 5.2 The site is situated at the mouth of Deep Bay within the Deep Bay Water Control Zone. A stream runs to the south of the Ash Lagoons and discharges into a tidal channel to the east of the Project site. The natural habitats in the vicinity of the site are mainly man made ash lagoons, wasteland, plantation, secondary woodland, grassland, shrub, stream courses and some mangrove, which are of moderate ecological importance. However, given the extensive disturbance already caused by the industrial developments in the area, further potential impacts on the landscape resources will be slight.
- 5.3 The nearest existing ASRs and NSRs in the vicinity of the proposed site is the site office at WENT Landfill at 500 m away.

Shek Kwu Chau

- 5.4 Shek Kwu Chau is an island south of the Lantau Island. The Project site is located on a proposed reclamation which would be an extension to the south-western side of the island. The island has been granted for use by the SARDA and is sparsely inhabited. The rehabilitation centre of SARDA is located at over 100 m away and is the closest ASR and NSR.

6. ENVIRONMENTAL PROTECTION MEASURES

Air Quality

Tsang Tsui Ash Lagoons and Shek Kwu Chau

- 6.1 During construction phase, good site practices, dust control and suppression measures would be implemented. Reference would be made to the dust control requirements under the *APC (Construction Dust) Regulation*.
- 6.2 The design of the combustion system and flue gas pollution control system would meet the requirements of the *Best Practical Measures Guidance Note for Incinerators*. Combustion process controls would be specified in the design requirements so as to achieve a furnace combustion zone operating at no less than 850°C with a residence time of at least 2 seconds for effective destruction of organic pollutants. Detailed air quality impact assessment would be conducted to determine the acceptability of the impacts.

- 6.3 Assessment of fugitive emission and odour impacts during operation of the Project would be carried out. Facilities that have the potential to cause fugitive emission or odour nuisance, including the on-site wastewater treatment plant, the waste reception and storage areas, the ash handling and storage areas of the thermal incineration plant, and the mechanical and biological treatment processes of the sorting and recycling plant. These facilities would be fully enclosed and equipped with deodorizing units or odour filtration system. The waste reception areas would be operated under a negative pressure to prevent odour leaking to the outdoor environment.

Human Health

Tsang Tsui Ash Lagoons

- 6.4 A quantitative risk assessment would be carried out to evaluate the potential health impacts arising from the Project. Appropriate safeguards and risk control measures would be identified and implemented to ensure that the potential risks would meet with the requirements stipulated in the *Hong Kong Government Risk Guidelines*. Arrangement and facilities for the storage and flaring of biogas produced from the sorting and recycling plant of the Project would be in strict compliance with the relevant legislation and guidelines.
- 6.5 The potential health risk induced by radon emission from PFA during the construction and operation phases of the Project would be evaluated. Measures to prevent radon influx from the PFA to the Project buildings would be considered and implemented as appropriate. Sufficient ventilation would be provided and regular maintenance would be conducted to avoid accumulation of radon.

Shek Kwu Chau

- 6.6 A quantitative risk assessment would be carried out to evaluate the potential health impacts arising from the Project. Appropriate safeguards and risk control measures would be identified and implemented to ensure that the potential risks would meet with the requirements stipulated in the *Hong Kong Government Risk Guidelines*. Arrangement and facilities for the storage and flaring of biogas produced from the sorting and recycling plant of the Project would be in strict compliance with the relevant legislation and guidelines.

Waste Management

Tsang Tsui Ash Lagoons

- 6.7 In the construction phase, the Contractor would be required to develop a Waste Management Plan prior to the commencement of construction works. Apart from good site practice, waste reduction measures and provisions to reuse/recycle materials would have to be implemented. The various types of waste produced would be handled, transported and disposed of using approving methods in compliance with statutory requirements.
- 6.8 In the operation phase, the fly ash and flue gas cleaning residue generated from the thermal incineration plant would be stabilized. These stabilized material and also the incinerator bottom ash would be tested in accordance with the requirements of the proposed Incineration Residue Pollution Control Limits prior to disposal to landfill.

6.9 The chemical waste generated from the Project, such as lubricating oil would be properly collected and disposed of in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

Shek Kwu Chau

6.10 Construction works at the Shek Kwu Chau would give rise to dredged marine sediment that needs to be handled and dumped. The management and disposal of the dredged material would follow the procedures and requirements specified in ETWBTC 34/2002 and the Dumping at Sea Ordinance (Cap.466).

6.11 In the construction phase, the Contractor would be required to develop a Waste Management Plan prior to the commencement of construction works. Apart from good site practice, waste reduction measures and provisions to reuse/recycle materials would have to be implemented. The various types of waste produced would be handled, transported and disposed of using approving methods in compliance with statutory requirements.

6.12 In the operation phase, the fly ash and flue gas cleaning residue generated would be stabilised (usually by mixing with cement on site) prior to disposal to landfill and any chemical waste generated would be dealt with in accordance with the Waste Disposal (Chemical Waste) (General) Regulation, similar to those depicted in paragraphs 6.8 and 6.9 above.

Water Quality

Tsang Tsui Ash Lagoons

6.13 During construction, control measures would be planned and implemented to reduce site discharges and surface runoff; and to provide appropriate on-site treatment to the discharges. The Contractor would be required to adopt proper site management and good housekeeping practices to ensure that construction waste and material would not enter the nearby water bodies. Appropriate facilities such as portable toilets would be provided to treat sewage arising from the construction workforce.

6.14 During operation, all the wastewater generated from the Project would be treated at the on-site wastewater treatment plant for cleansing and landscape irrigation reuses without any effluent discharge. Either air-cooled power generation system would be adopted or the process cooling water would be properly treated and recycled. The small volume of concentrated saline effluent from the small desalination facility would be properly discharged.

Shek Kwu Chau

6.15 The water quality impacts due to the reclamation design and also that arising from the dredging, reclamation and filling works during construction would be evaluated. Appropriate design and mitigation measures such as provision of silt curtains or control of dredging and filling operations would be identified and implemented to ensure acceptable residual water quality impact.

6.16 Other environmental protection measures to be incorporated during the construction phase

would include and similar to those given in paragraph 6.13 above

6.17 During operation, the environmental protection measures to be incorporated would be similar to those depicted in paragraph 6.14.

Ecology

Tsang Tsui Ash Lagoons

6.18 To minimize potential indirect impacts on the surrounding habitats and associated fauna arising from noise or human disturbances during the construction phase, appropriate mitigation measures such as use of quieter mechanical machineries and good site practices would be adopted. Measures to treat sewage arising and to control site runoff would also be implemented to minimize impacts to the aquatic ecology.

6.19 For the operation phase, impact of the Project on the aquatic ecology would be minimized via appropriate measures that mitigate water quality impacts which are depicted in paragraphs 6.14 above.

Shek Kwu Chau

6.20 The impacts of the reclamation design and construction works on water quality and marine ecology would be evaluated. Appropriate mitigation measures such as provision of silt curtains or control of dredging or filling operations would be identified and implemented to reduce such impacts to acceptable levels.

6.21 In addition, measures depicted in paragraph 6.18 would be adopted to minimize potential indirect impacts to the surrounding habitats and associated fauna arising from noise or human disturbances; to treat sewage arising and to control site runoff during the construction phase.

6.22 For the operation phase, impact of the Project on the aquatic ecology would be minimized via appropriate measures that mitigate water quality impacts which are depicted in paragraphs 6.14 above.

Landscape and Visual

Tsang Tsui Ash Lagoons and Shek Kwu Chau

6.23 For the construction phase, appropriate mitigation measures such as landscape planting and good site practices to restrict construction activities would be identified and implemented so as to minimize the residual landscape and visual impacts. The natural environmental features of the area adjoining and in the vicinity of the Project site would be restored if disturbed during construction.

6.24 The landscape and visual impacts of the architectural and landscape designs of the Project would be assessed. Careful designs would be carried out such that the Project would blend in with the surrounding landscape as much as possible.

Cultural Heritage

Tsang Tsui Ash Lagoons

6.25 A Cultural Heritage Impact Assessment would be conducted for the Tsang Tsui Archaeological Site to assess the potential impacts caused by the Project to the archaeological site and any other built heritage in the vicinity.

Shek Kwu Chau

6.26 Shek Kwu Chau Archaeological Site and Shek Kwu Chau Gravestone are recorded sites of archaeological interest on the island. A Cultural Heritage Impact Assessment would be conducted to assess the potential impacts caused by the Project to these sites.

7. USE OF PREVIOUSLY APPROVED EIA REPORTS

There are no previously approved EIA reports directly applicable to this Project.



Figure 1.1 - Locations of Two Potential Sites for Development of IWMF Phase 1

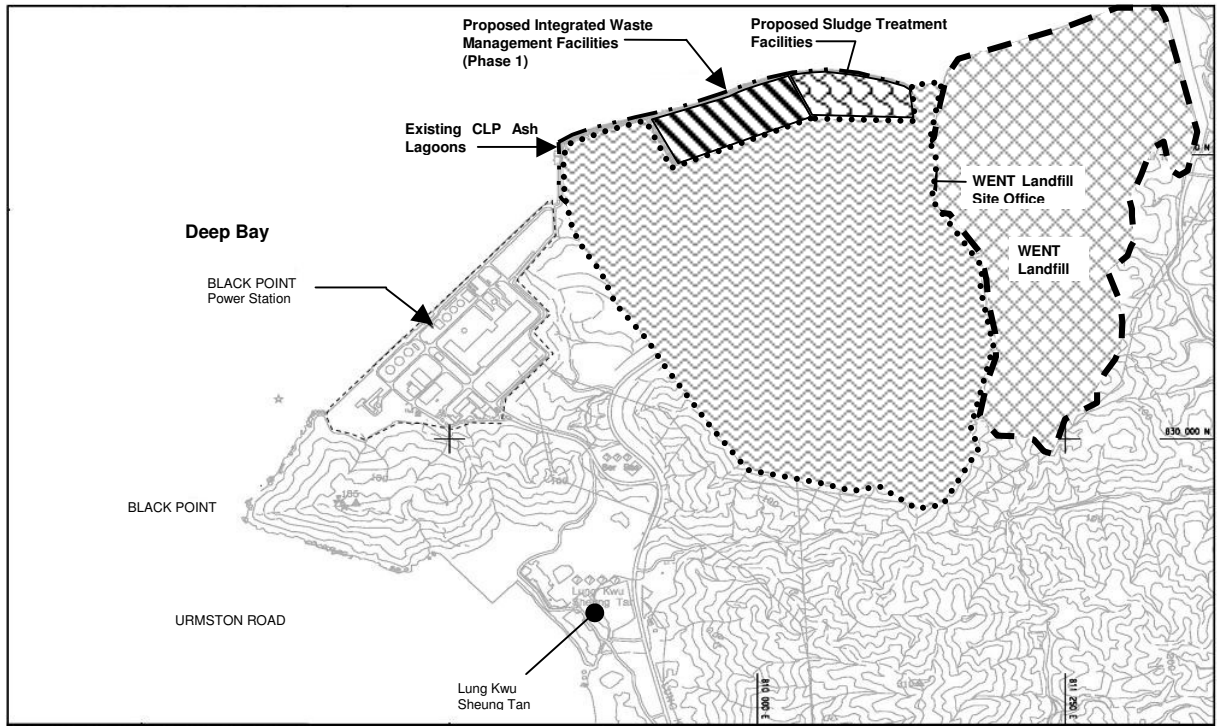


Figure 1.2 - Location Plan of IWMF Phase 1 at Tsang Tsui Ash Lagoons Site

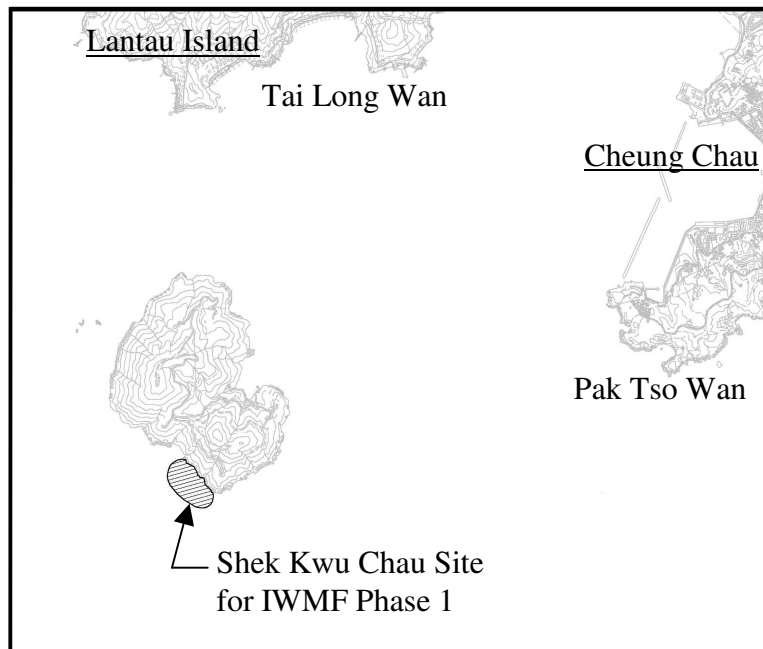


Figure 1.3 - Location Plan of IWMF Phase 1 at Shek Kwu Chau Site

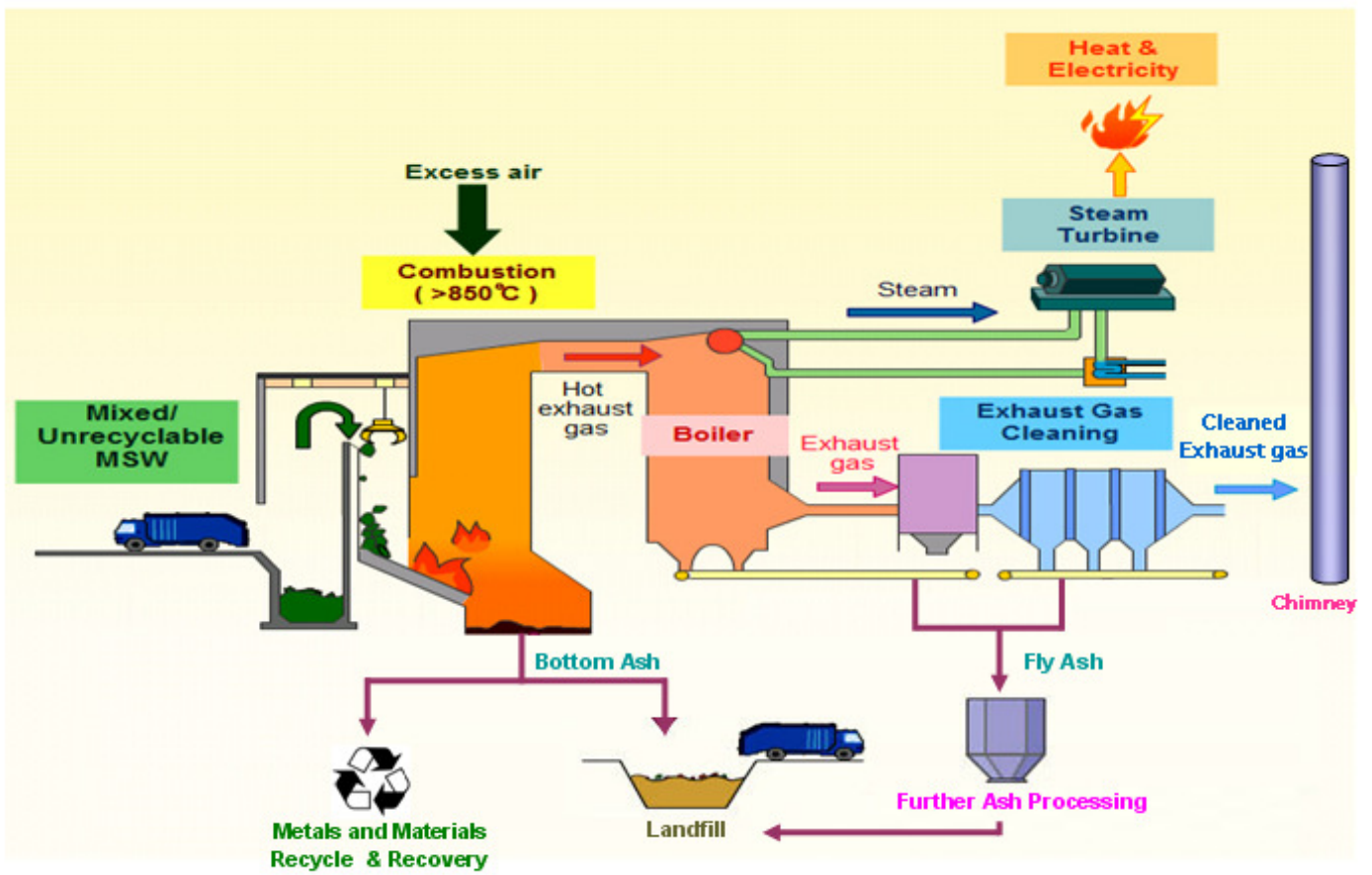


Figure 1.4 - Process Flow Diagram of an Incineration System