
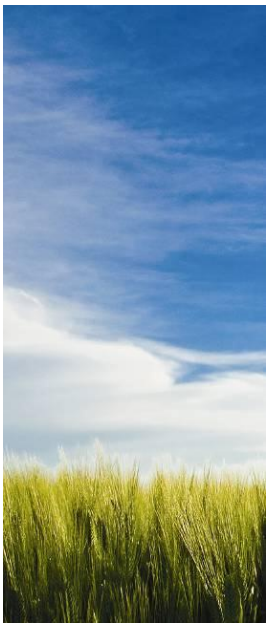


# Development of Organic Waste Treatment Facilities, Phase 2
# 發展第二期有機資源回收中心

## Environmental Impact Assessment – Executive Summary
## 環境影響評估報告－行政摘要

August 2013
二零一三年八月

Environmental Protection Department
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# 1. Introduction

The Government has carried out a number of waste management studies and projects focused on organic waste in recent years, including:

- "Organic Waste Generation and Management Study – Major Generators of Food Waste and Yard Waste";
- "Pilot Plant Development of Biodegradable Waste Treatment Facilities – Investigation"; and
- "Pilot Composting Facility at the Kowloon Bay Waste Recycling Centre".

In 2008, building on these studies, the Environmental Protection Department (EPD) initiated a Feasibility Study and Environmental Impact Assessment (EIA) for an Organic Waste Treatment Facility (OWTF) at Siu Ho Wan, Lantau[1]. The plant was designed to receive and treat 200 tonnes per day of source separated organic waste (mostly food waste).

Following the Government's review of the Policy Framework action agenda in 2011, a decision was taken to further address Hong Kong's waste issues through a comprehensive waste management strategy. This included the implementation of a Project to investigate the feasibility for providing an additional OWTF at Sha Ling, North District to receive and process 300 tonnes per day of source separated food waste generated from the commercial and industrial (C&I) sectors.

The May 2013 Environment Bureau Planning Strategy Report, 'Hong Kong: Blueprint for Sustainable Use of Resources 2013-2022' notes that further development of landfill sites is highly constrained by issues of land availability, the high opportunity costs of developing land, and planning constraints/local opposition. The Report states that waste related technologies that generate energy will be adopted and identifies OWTF as one of the options for implementation.

The Organic Waste Treatment Facilities, Phase 2 (hereafter as the 'Project') is proposed to be constructed and operated in Sha Ling, North District (see **Figure 1**). The purpose of this Project is to identify and adopt proven biological treatment technologies to recover reusable materials and energy, such as compost, heat, electricity and biogas from source-separated organic waste.

The Project is a Designated Project under the Environmental Impact Assessment Ordinance (EIAO):

- Item G.4 of Part I, Schedule 2 of the EIAO: *"A waste disposal facility (excluding any refuse collection point), or waste disposal activities, for (a) refuse; or (b) chemical, industrial or special wastes"*.

An Environmental Impact Assessment (EIA) study was conducted in accordance with EIA Study Brief (No. ESB-226/2011) to provide information on the nature and extent of environmental impacts arising from the construction and operation of the proposed Project and related activities taking place concurrently.

This Executive Summary presents the key findings of the Environmental Impact Assessment (EIA) for the Project as required under the EIAO.

[1] Identified as the Organic Waste Treatment Facility - Phase 1

# 2. Project Description

## 2.1 Need for the Project

The Hong Kong Government recognises a pressing need to pursue more sustainable alternatives to present waste treatment and disposal practices in Hong Kong. Continuation of the current disposal system in Hong Kong is not considered to be a sustainable option as a result of diminishing landfill capacity, and in light of social, economic and environmental issues. According to the Environment Bureau's recently published Planning Strategy Report, 'Hong Kong: Blueprint for Sustainable Use of Resources 2013-2022', Hong Kong's three major landfill facilities are expected to reach capacity by 2015 (South East New Territories Landfill (SENT)), 2017 (North East New Territories Landfill (NENT)) and 2019 (West New Territories Landfill (WENT)). Further expansion of existing facilities or the development of new landfill sites is highly constrained by issues of land availability, the high opportunity costs of developing land, and planning constraints/local opposition.

In December 2005, EPD published 'A Policy Framework for the Management of Municipal Solid Waste in Hong Kong (2005-2014)' (Policy Framework), setting out policy tools and initiatives to be implemented for the sustainable management of municipal solid waste (MSW) in Hong Kong. The Policy Framework targeted an increase in recovery rates to 50%, and reduction in the total amount of MSW disposed of in landfills to less than 25% by 2014. Achieving these targets requires reduced reliance on landfill through the application of new waste treatment technologies. An Advisory Group on Waste Management Facilities was subsequently set up to investigate the most appropriate treatment and disposal solutions. The Group recommended the development of OWTFs as part of an integrated strategy for recovering organic wastes from the C&I Sector. Investment in the OWTFs is also a Key Action highlighted in the Government's Hong Kong Blueprint for Sustainable Use of Resources 2013-2022 published in May 2013.

The OWTFs are to be developed in two phases, with Phase 1 located at Siu Ho Wan in Northern Lantau Island, and Phase 2 (this Project) at Sha Ling, Northern New Territories, on the site of the former Sha Ling Livestock Waste Composting Plant (SLCP). The two phases of OWTF facilities are planned to use anaerobic digestion with composting to treat a combined 500 tonnes of organic waste daily, 300 tonnes of which will be treated at this Project. The OWTF projects will reduce the volume of material requiring disposal, and together could reduce the quantity of C&I waste requiring landfill by more than 15%, at present rates.

This Project is important, not only to mitigate the depletion of available landfill space, but also in order to conserve resources through the recovery of compost and biogas that would be otherwise unused. Compost (or other soil improvement products) can be used as a sustainable input for landscaping, farming and horticulture, while biogas is a source of renewable energy. The Project will therefore represent a valuable contributor to Hong Kong Government's climate change and energy security objectives.

## 2.2 Project Location and Scale

The Project is located at Sha Ling in the North District, within the Frontier Closed Area (see **Figure 1**). The Site has an area of around 2.5 hectares, of which roughly 1.5 hectares has been previously developed. The former SLCP currently occupies the site; although this facility was decommissioned in 2010.

## 2.3 Layout and Facilities

The preliminary design includes the following main elements listed in **Table 2.1** and shown in **Figure 2**:

Table 2.1: Main Project Facilities and Systems

| Aspect | System / facility |
|---|---|
| Main structure | • Waste reception and preparation areas<br>• Administration area<br>• Environmental Education Centre<br>• Pre-treatment system |
| Composting | • Composting tunnels<br>• Maturation, treatment / storage area |
| Anaerobic Digestion | • Buffer Tank<br>• Digesters<br>• Separator/ Dewatering Unit<br>• Hygieneisation Unit |
| Biogas Use | • Gas Cleaning<br>• Gas Holders<br>• Compressors<br>• Flare stack<br>• Combined Heat and Power Unit<br>• Boiler<br>• Heat exchangers |
| Water and waste water systems | • Water supply system<br>• Wastewater Treatment Plant<br>• Effluent retention tank<br>• Drainage system |
| Emissions/Odour Treatment | • CHP Exhaust treatment system<br>• Odour treatment system<br>• Chimney |
| Ancillary Facilities | • Weighbridge<br>• Vehicle Washing Facilities<br>• Maintenance Workshop and Utility Area<br>• Continuous Emission Monitoring System<br>• Power Supply System<br>• Instrumentation, Control and Monitoring System<br>• Security / registration |

The preliminary design is based on the best available information. The assessment adopts a conservative approach wherever possible in terms of the design options presented.

## 2.4 Consideration of Alternatives

### 2.4.1 Site Selection

In 2006, EPD conducted a site selection study in conjunction with PlanD to identify appropriate facilities for treating organic wastes. A long list of 33 alternative sites was produced by compiling the feasible sites proposed by EPD after preliminary screening, and feasible sites as recommended by PlanD. The Specific Site Selection stage evaluated the revised long listed sites by applying a scoring system to generate a shortlist comprising the most feasible sites for development of large scale OWTFs (using various biological treatment processes). A ranking system was also developed to prioritize the suitability of sites under evaluation.

The assessment was undertaken by EPD to determine which of the sites would be appropriate for the development of large-scale OWTF, based on the following criteria:

- Environmental impact (Air, Noise, Visual and Landscape, Water Quality and Drainage, and Ecology);
- Engineering feasibility (e.g. accessibility, site constraints, time availability, etc.);
- Financial viability (e.g. capital cost and operational cost);
- Operability (e.g. proximity to users/producers, waste disposal and wastewater treatment, etc.); and
- Social issues (e.g. compatible with broad planning intention for site and surrounding landuse, etc.).

A score from 1 to 5 representing the suitability (from low to high) for OWTF development against the respective criteria for composting, Anaerobic Digestion and a combination of both technologies were awarded for each site. The highest scoring four sites were recommended for further assessment, as follows:

- Siu Ho Wan, North Lantau
- Sha Ling Livestock Waste Composting Plant (SLCP), Sheung Shui;
- EcoPark Phase II, Tuen Mun; and
- Tseung Kwan O Area 137, Tseung Kwan O.

A summary of the results of the evaluation is provided in **Table 2.2** below.

Table 2.2: Summary of Assessment Results for Site Selection

| Potential Site | Environmental | Engineering Feasibility | Financial | Operability | Social Issues |
|---|---|---|---|---|---|
| Siu Ho Wan | *** | *** | *** | *** | *** |
| Sha Ling Livestock Waste Composting Plant | ** | ** | * | ** | ** |
| EcoPark Phase II | ** | * | ** | * | * |
| TKO Area 137 | * | * | ** | * | * |

Source: EPD (2010) Pilot Plant Development of Biodegradable Waste Treatment Facilities (BWTF) – Investigation Final Report

Note: * Less Preferable, ** Preferable, *** Highly Preferable

Results of the assessment indicated that the Siu Ho Wan site is the most suitable for the development of OWTF, followed by the SLCP site. These two sites are considered more favourable in view of their relatively low environmental impacts, high engineering feasibility and operability, and less social issues.

The Siu Ho Wan site was chosen for the development of OWTF Phase 1 and the former Sha Ling Livestock Waste Composting Plant (SLCP) site was selected for the OWTF 2. The EIA Report for the Phase 1 project was approved by the Director of Environmental Protection on 24 February 2010, and the preparation works for the project are underway.

As shown in **Table 2.2** above, from the remaining sites, both the EcoPark Phase 2 and Sha Ling sites were found to be 'preferable' in terms of environmental impact. However, initial consultation with PlanD suggested that the development of large scale OWTF would not qualify as one of the twelve approved categories of recycling process activities assessed under the EIA designated for the EcoPark (Phase II) site. The Tseung Kwan O Area 137 site was considered to be 'less preferable' in terms of environmental impact in the assessment (due to potential water quality issues), and despite having a large enough available area, uncertainties about the site in terms of its availability and suitability of its neighbouring land

uses, let to this site being recommended only as a 'fall-back' option for the development of large-scale OWTF.

The Sha Ling site is remote and does not have a large population nearby (and associated air, noise and visual sensitive receivers). The site was used previously as a composting plant and does not encroach into any environmental sensitive areas. From a rigorous consideration of alternative layout (see **Section 2.4.2**), the OWTF 2 could be constructed within the previously developed area of SLCP to avoid felling of large number of trees. The visual envelop is mostly confined by the ridgeline of nearby hills with few visual sensitive receivers. Hence, there are no major environmental constraints for the development of OWTF 2 at Sha Ling. In addition, the SLCP site falls within an area zoned "Government, Institution or Community (G/IC)" on the Outline Zoning Plan (OZP) and PlanD has no in principal objection to the development of OWTF at Sha Ling.

### 2.4.2 Optimisation of Layout

Different layouts of the facilities have been drawn up and considered. The layout of the facilities on the OWTF 2 Project site has been optimised to maximise environmental benefits. In order to minimise the footprint of the OWTF 2 project, the original concept design was reworked to occupy a smaller area. This was achieved by reducing the number of digestion tanks from 5 to 3, changing the road layout, and altering the configuration of key structures. In this way, the OWTF 2 site occupies the same area as the former SLCP facility, minimising disturbance around the site, including vegetated areas. These design changes have led to a reduction in the number of trees proposed to be felled from 153 trees in the original preliminary layout to around 14 trees in the latest amendment (a 91% reduction).

Other design optimisations included the inclusion of green roofs, vertical greening, and landscape screening to minimise visual impacts, reduce stormwater runoff, and increase amenity value for those working at the site.

### 2.4.3 Alternative Organic Waste Treatment Options

As part of the Project alternative organic waste treatment technologies were appraised in order to determine the most suitable option for adoption.[2] These alternative organic waste treatment technologies included:

- Incineration;
- Pyrolysis/gasification;
- Anaerobic digestion;
- Composting;
- Conversion to solid biofuel
- Conversion to liquid biofuel; and
- Conversion to animal/fish feed.

From the above options, Anaerobic Digestion with biogas generation and composting of digestate was selected as the preferred treatment option. This option was found to be the most suitable for the high moisture content biodegradable organic waste in Hong Kong. It also has the greatest potential

[2] Working Paper 1 - Technology Evaluation and Key Elements of the OWTF

environmental benefits in terms of diverting waste from landfill, and recovery of energy and resources from waste through production of compost / soil improvement products and renewable energy from biogas.

Composting is recommended to take place in enclosed tunnels provided with mechanical aeration. This will allow effective control of the process and minimise impacts on air quality (dust and odour), noise and impacts associated with vermin.

Two potential biogas use options have been identified. They are: Option A - onsite generation of electricity and heat for use in on-site processes and facilities, with export of surplus electricity to the CLP network; and Option B - export of biogas directly to the Towngas grid via a connection to the existing NENT Landfill gas pipeline. With Option B there are two sub-options of biogas export:Option B(i) - with no onsite power production; and Option B(ii) - with onsite power generation. The environmental performance between the options is considered to be similar across the options. However, minor environmental benefits for Landscape and Air Quality impacts may be achieved for Options B (i) and B (ii) over Option A. Either of the options may be adopted for the Project and the chosen biogas utilisation option will be confirmed at later stage of the Project. However, both cases are considered in the EIA with the worst case scenario assumed for each assessment, as a conservative approach.

## 2.5 Implementation Programme

It is anticipated that the construction works of the proposed OWTF 2 will commence in mid-2015 and be fully completed by 2017. The construction stages and provisional project program are shown in **Table 2.3**.

Table 2.3: Indicative Milestones for Key Project Stages

| Description | Tentative Date |
|---|---|
| Tender Phase | 2014 |
| Construction Start | 2015 |
| Construction End | 2017 |
| Operation Start | 2017 |

# 3. Summary of the Environmental Impact Assessment

## 3.1 Air Quality Impact

Potential air quality impacts associated with the construction and operational phase of the proposed Project have been assessed in the EIA report. Representative Air Sensitive Receivers (ASRs) within 500 m of the subject site have been identified and the worst case impacts on these receivers assessed. Suitable mitigation measures, where necessary, have been recommended to protect the sensitive receivers and to achieve compliance with legislative criteria and guidelines.

With the Government's on-going and planned programmes to tackle various air pollution issues in Hong Kong, it is anticipated that the future background air quality will improve. To predict the future background air pollutant concentration, the Pollutants in the Atmosphere and the Transport over Hong Kong (PATH) model, has been used. PATH background concentrations of the relevant pollutants for year 2020 and TSP background level recorded in EPD's Air Quality Monitoring Station have been adopted.

### 3.1.1 Construction Phase

Dust generated from construction activities is the primary concern during the construction phase. The air quality model Fugitive Dust Model (FDM) was used to predict the air pollutant concentrations due to open dust source impacts. With the implementation of the recommended mitigation measures as well as relevant best practices stipulated in the *Air Pollution Control (Construction Dust) Regulation*, it has been assessed (see Table 3.1) that there would be no exceedance of the hourly, daily or annual Total Suspended Particulates criteria at any of the ASRs.

Table 3.1: Construction dust modelling results summary

| Pollutant | Averaging Period | Current Criteria (μg/m$^3$) | Maximum concentration range for all ASR (μg/m$^3$) |
|---|---|---|---|
| Total Suspended Particulate (TSP) | 1 hour | 500 | 86 to 421 |
| | 24 hour | 260 | 70 to 128 |
| | Annual | 80 | 68 to 79 |

Mitigation measures for dust control and relevant best practices as stipulated in the *Air Pollution Control (Construction Dust) Regulation* were recommended to reduce dust impacts during construction phase. The dust control measures are highlighted as:

- Watering eight times per day, or once every 1.5 hours, at all active works areas in order to achieve a dust suppression efficiency of 87.5%; and
- All the stockpiles should be at least 80% covered with impervious sheeting to reduce windblown dust.

### 3.1.2 Operation Phase

The major sources of air pollution during the operation phase include, but are not limited to: emissions from the burning of generated biogas in a combined heat and power (CHP) plant; emissions from an odour treatment unit, which is used to treat odorous emissions, and; emissions from flaring, under equipment outages emergency.

During the operation phase, and with emission control equipment in place, all the assessed ASRs would be in compliance with the relevant current and new AQOs and other relevant criteria for all emissions modelled in this EIA. **Table 3.2** indicates **c**ompliance of the emission standards against the Air Quality Objectives (AQOs) as of January 2013 and Table 3.3 against the AQOs as of January 2014,.

Table 3.2: Summary of operation modelling results against the current AQOs

| Pollutant | Averaging Period | Current AQO (μg/m$^3$) | Maximum concentration range for all ASR (μg/m$^3$) |
|---|---|---|---|
| Nitrogen dioxide ($NO_2$) | 1 hour | 300 | 155.0 to 187.3 |
| | 24 hour | 150 | 78.4 to 92.3 |
| | Annual | 80 | 20.5 to 29.1 |
| Respirable Suspended Particulate (RSP/$PM_{10}$) | 24 hour | 180 | 121.0 to 126.9 |
| | Annual | 55 | 43.0 to 43.6 |
| Total Suspended Particulate (TSP/Dust) | 1 hour | 500(1) | 68.0 to 206.3 |
| | 24 hour | 260 | 68.0 to 89.0 |
| | Annual | 80 | 68.0 to 68.9 |
| Carbon Monoxide (CO) | 1 hour | 30,000 | 2278.1 to 2280.4 |
| | 8 hour | 10,000 | 1458.7 to 1461.3 |
| Sulphur Dioxide ($SO_2$) | 1 hour | 800 | 65.9 to 66.7 |
| | 24 hour | 350 | 27.1 to 27.9 |
| | Annual | 80 | 6.5 to 6.6 |
| Odour | 5 second | 5(2) | 0.00 to 1.59 |
| Volatile Organic Compounds (VOC) | 1 hour | 60000(3) | 2.5 to 9423.2 |
| Hydrogen Chloride (HCl) | 1 hour | 2100(3) | 0.3 to 5.8 |
| | Annual | 20(3) | 0.001 to 0.031 |
| Hydrogen Fluoride (HF) | 1 hour | 240(3) | 0.00 to 0.58 |
| | Annual | 14(3) | 0.0001 to 0.0031 |

1. EIAO-TM
2. Unit is OU/m$^3$
3. Refer to Table 3.3 of the EIA Report

Table 3.3: Summary of operation modelling results against the new AQOs

| Pollutant | Averaging Period | New AQO (μg/m$^3$) | Maximum concentration range for all ASR (μg/m$^3$) |
|---|---|---|---|
| Nitrogen dioxide ($NO_2$) | 1 hour | 200 | 155.0 to 187.3 |
| | Annual | 40 | 20.5 to 29.1 |
| Respirable Suspended Particulate (RSP/$PM_{10}$) | 24 hour | 100 | 121.0 to 126.9(4) |
| | Annual | 50 | 43.0 to 43.6 |
| Fine Suspended Particulate (FSP/$PM_{2.5}$) | 24 hour | 75 | 90.7 to 96.6(4) |
| | Annual | 35 | 32.3 to 32.8 |
| Total Suspended Particulate (TSP/Dust) | 1 hour | 500(1) | 68.0 to 206.3 |
| Carbon Monoxide (CO) | 1 hour | 30,000 | 2278.1 to 2280.4 |
| | 8 hour | 10,000 | 1458.7 to 1461.3 |
| Sulphur Dioxide ($SO_2$) | 10 minute | 500 | 161.5 to 163.3 |
| | 24 hour | 125 | 27.1 to 27.9 |

| Pollutant | Averaging Period | New AQO (μg/m$^3$) | Maximum concentration range for all ASR (μg/m$^3$) |
|---|---|---|---|
| Odour | 5 second | 5[(2)] | 0.00 to 1.59 |
| Volatile Organic Compounds (VOC) | 1 hour | 60000[(3)] | 2.5 to 9423.2 |
| Hydrogen Chloride (HCl) | 1 hour | 2100[(3)] | 0.3 to 5.8 |
| | Annual | 20[(3)] | 0.001 to 0.031 |
| Hydrogen Fluoride (HF) | 1 hour | 240[(3)] | 0.00 to 0.58 |
| | Annual | 14[(3)] | 0.0001 to 0.0031 |

1. TM-EIAO
2. Unit is OU/m$^3$
3. Refer to Table 3.3 of the EIA Report
4. Maximum predicted exceedance for all ASR is 2 per year. Maximum allowable exceedances per year is 9. Therefore, 24 hour average RSP and FSP are compliant.

Recommended mitigation measures during operation phase include an exhaust treatment system and stack for the CHP and odour treatment unit and all processes that might generate odour taking place within enclosed facilities under negative pressure. Indoor air will be collected and treated to remove odours and dust prior to venting through the flue stack. Odour treatment assumed and was assessed based on the adoption of an Ultraviolet Light-C (UV-C) and ozone treatment system with second stage active carbon filters. For the CHP, the preliminary design incorporates a combination of thermal and catalytic treatment processes to remove pollutants from the exhaust gasses from the CHP. It is proposed that both the odour treatment unit and the CHP emissions are directed to a flue to aid dispersion and minimise effects on ASRs.

## 3.2 Hazard to Life

A hazard assessment has been carried out to evaluate the biogas risk to existing, committed and planned off-site population due to the generation, transfer, storage and use of biogas during operation of the Project.

Hazardous scenarios associated with the operations of the Project have been identified and assessed. A quantitative risk assessment has been conducted to determine the impact of the identified hazardous scenarios on the surrounding existing and proposed populations during the operation phase of the Project in terms of individual and societal risks. The maximum individual risk remains below $1x10^{-5}$ per year at the site boundary and hence meets the Hong Kong Government Risk Guidelines (HKRG) requirements. For the societal risk, the potential loss of life (PLL) for the 2017 scenario and the 2017 scenario with proposed developments are $6.42 \times 10^{-6}$ per year and $8.48 \times 10^{-6}$ per year respectively. Therefore the societal risk for both scenarios are low and within the acceptable region as identified in HK EIAO Societal Risk Guideline. Therefore, the assessment concludes that the risks due to operation of the Project are acceptable under the individual and societal risk criteria set out in Annex 4 of the Environmental Impact Assessment Ordinance Technical Memorandum (EIAO-TM).

The risks for both scenarios are within the acceptable region and therefore no mitigation measures are necessary. Nevertheless, “Good Practices” and “recommended design measures” for the safe operation of the Project are recommended to be carried out as far as reasonably practicable. Key recommended measures are:

- Safety markings and crash barriers will be provided to the aboveground piping, digesters and the gas holder near the entrance;

- The process plant building should be provided with an adequate number of gas detectors distributed over areas of potential leak sources to provide adequate coverage; and
- A 10m high boundary wall with fire resistance should be provided in the vicinity of the digester tanks, gasholders and gas purification equipment.

## 3.3 Noise Impact

### 3.3.1 Construction Phase

The potential source of noise impact during the construction phase of the Project would be from the use of Powered Mechanical Equipment (PME) for various construction activities, including demolition and removal of the existing above ground structures of the SLCP and construction of proposed superstructure. PME likely to be used at the Project site includes breakers, cranes, lorries and other vehicles, air compressors and generators. A total of four representative noise sensitive receivers (NSRs) were identified for the construction phase assessment. The prediction results indicate that the noise impact of unmitigated construction activities from the project would cause exceedance of the relevant daytime construction noise criterion of 75 dB(A) at most of the NSRs. Mitigation measures are therefore required to alleviate the noise impacts generated during the construction phase. Recommended mitigation measures include:

- good site practise to limit noise emissions at source ;
- selection of quieter plant; and
- use of movable noise barrier, enclosure and noise insulation fabric.

With the implementation of the mitigation measures, the construction noise levels at all representative NSRs are predicted to between 63 dB(A) and 75 dB (A), which comply with the noise standards stipulated in the EIAO-TM. Significant and residual construction noise impacts are therefore not anticipated in this Project.

### 3.3.2 Operation Phase

During operation of the Project, potential noise impact from the operation of proposed fixed plant including shredders, screw pumps, mixers, power supply systems, etc. are anticipated. Noise impact from planned fixed plant can be effectively mitigated by implementing noise control measures at source during the detailed design stage. In this study quantitative impact assessment has concluded that with the adoption of the proposed maximum permissible Sound Power Levels at the proposed ventilation openings of 84 to 90 dB(A) during day-time, 80 to 84 dB(A) during evening and 79 to 81 dB(A) during night-time, the fixed plant impact noise levels at all selected NSRs comply with the relevant noise criteria. Therefore, significant fixed plant noise impact on the existing and planned NSRs is not anticipated.

## 3.4 Water Quality Impact

Water quality impact assessment has been carried out for areas within 500m of the Project site boundary and other areas in the vicinity that might be impacted by the Project. Four fish ponds and two watercourses were identified as inland water sensitive receivers.

The Project is located within the Deep Bay Water Control Zone. Effluent treatment is required prior to discharge into the water courses in the Deep Bay Area, in order to meet the criteria of “no net increase in pollution load requirement”. In practical terms this means that projects must either discharge to an existing

sewer system or be designed so that any discharge does not result in additional pollution load on Deep Bay. The project proposes to adopt on site treatment prior to transfer into the existing sewerage network.

During the construction phase, potential water quality impact could be generated from site run-off, sewage from workforce, and discharge of wastewater from various construction activities. With the implementation of the mitigation measures, no adverse water quality impact on the water sensitive receivers from the construction works for the Project is anticipated.

Sewage effluent from operation of the Project and all wastewater generated within the Project site, including dewatered digestate from digesters and other process wastewater, will be collected and treated in an on-site wastewater treatment plant to meet the standards identified in the Technical Memorandum standard for discharge to the public sewer. The effluent will be transferred to the Shek Wu Hui Sewage Treatment Works via a new sewer connection to the existing NENT sewerage network. Adverse water quality impact on the water sensitive receivers is therefore not expected..

## 3.5 Waste Management Implications

Waste types likely to be generated during the construction phase of the Project could include approximately 25,000 $m^3$ excavated materials (from site formation and foundation works) of which 4,500 $m^3$ could be reused on site, approximately 4,000 $m^3$ C&D materials (from mixture of topsoil and dead vegetative material and surplus concrete or grouting mixes), chemical waste (from maintenance of construction plant and equipment) and approximately 39 kg per day of general refuse (from the construction workforce). Provided that waste is handled, transported and disposed of using approved methods and that the good site practices are followed, adverse environmental impacts would not be expected during the construction phase.

During the operation phase of the Project, waste types to be generated could include 23 tonnes per day of wastes generated from pre-treatment processes (from pre-treatment sorting of organic waste feedstock), 15 tonnes per year of chemical wastes (from maintenance of mechanical equipment) and general refuse (from visitors and on-site staff). Provided that waste is handled, transported and disposed of using approved methods and that the good site practices are followed, adverse environmental impacts would not be anticipated during the operation phase.

Recommended mitigation measures for waste management are:

- Good site practices such as staff training in proper waste management and chemical handling procedures; providing sufficient waste disposal points; and employing licensed waste collectors.
- Waste reduction measures such as sorting demolition debris and excavated materials from demolition works to recover reusable/recyclable portions; and segregating and storing different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal.
- Preparing and implementing an Environmental Management Plan describing arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from construction activities.

Potential sources of land contamination in the operation phase have been reviewed. It is estimated that a limited amount of chemicals would be used or chemical wastes generated during the operation. Good practices and response procedures for contamination prevention have been identified. With the

implementation of recommended practices and procedures, the potential for contamination due to operation of the Project is expected to be minimal.

## 3.6 Ecological Impact

The Project Area comprises an existing developed concrete platform and plantation habitats adjacent to some village development. In general, the area is not ecologically significant owing to the relatively low ecological value of the habitats. The 14 trees proposed to be felled include 2 individuals of *Acacia auriculiformis,* 3 individuals of *Acacia confusa* and 9 individuals of *Musa x paradisiaca*, which are all exotic tree species of low ecological value. With the limited ecological value of the habitat, the ecological significance due to the felling of 14 trees of low ecological value during construction phase is considered to be minor. Overall, the ecological impact of loss of a very small area of plantation habitat within the Project Area is therefore considered as minor.

Indirect impact on off-site habitat is also not considered to be significant due to lack of important ecological resources. No ecological impact has been identified from the operation of the Project as all potential air quality, noise and water quality impacts will be controlled to environmentally acceptable levels.

For precautionary purposes, erection of a temporary protective fence along the plantation area where trees and vegetation would be retained within the Project Area is recommended during construction phase.

## 3.7 Fisheries Impact

A review and ground truthing exercise was conducted for fisheries impact and identified no commercial fish culture resources or activities within the immediate area. With the recommended water quality control measures and good site practice in place, the Project is unlikely to have any direct or indirect impacts on existing ponds or related activities within the immediate area. Therefore, no fisheries impact arising from construction and operation of the Project is anticipated and no fisheries-specific mitigation measures are required.

## 3.8 Landscape and Visual Impact

### 3.8.1 Potential Impact on Existing Trees

There are approximately 458 trees within or in close proximity of the Project. None of the trees are registered as Old and Valuable Tree (OVT). Approximately 441 trees are proposed to be retained in-situ; approximately 14 are proposed to be felled due to unavoidable conflict with the proposed works and transplantation is considered unsuitable; the remaining 3 trees are dead and in conflict with the proposed works and are therefore proposed to be removed. Tree planting to compensate for the loss of existing trees in terms of both quality and quantity as stipulated in ETWB TC(Works) No. 3/2006 is proposed and incorporated into the landscape design within the Project site. The overall potential impact on trees is considered negligible.

### 3.8.2 Landscape and Visual Impact

Sources of landscape and visual impacts will arise from removal of vegetation and demolition and construction work associated with the proposed Project. With the implementation of mitigation measures, the anticipated landscape and visual impacts are generally insubstantial, with slight negative impact expected for some landscape resources, landscape character areas and visual sensitive receivers.

However, since the duration of the impact is only limited to the construction phase with a small area, such residual impact is therefore considered acceptable. Overall, in terms of Annex 10, Clause 1.1 (c) of the EIAO-TM, the landscape and visual impacts are acceptable with mitigation measures.

### 3.8.3 Mitigation Measures

Landscape and visual mitigation measures for construction phase are highlighted as follows:

- Existing trees are retained whenever possible and protected during construction.
- The construction site activities are carefully controlled to minimise impact such as light, noise, tree felling and eyesores.

Landscape and visual mitigation measures for operation phase are highlighted as follows:

- Amenity / compensatory planting will be utilised throughout the site
- Vertical and rooftop greening will maximise green space and soften hard structures

## 3.9 Cultural Heritage Impact

### 3.9.1 Archaeology

A desk-based review identified that the proposed site area has no archaeological potential. Some archaeological potential exists in the wider assessment area, but these areas with archaeological potential would not be impacted by the proposed Project. If associated works are proposed within the identified potential area of archaeological interest within the AA in the detailed design phase, an archaeological investigation would be required prior to commencement of works. The scope and methodology of archaeological investigation would need to be agreed with the Antiquities and Monuments Office (AMO) prior to implementation.

At this stage there is no need for mitigation as no impacts are expected.

It is noted however that if antiquities or supposed antiquities are discovered in the course of excavation works, the project proponent must arrange a temporary suspension of works in the affected area and notify AMO immediately of the discovery. Course for further action would be agreed with AMO prior to continuation of the works. Sufficient resource as well as time for conducting necessary archaeological works should be provided by the project proponent if so required.

### 3.9.2 Built Heritage

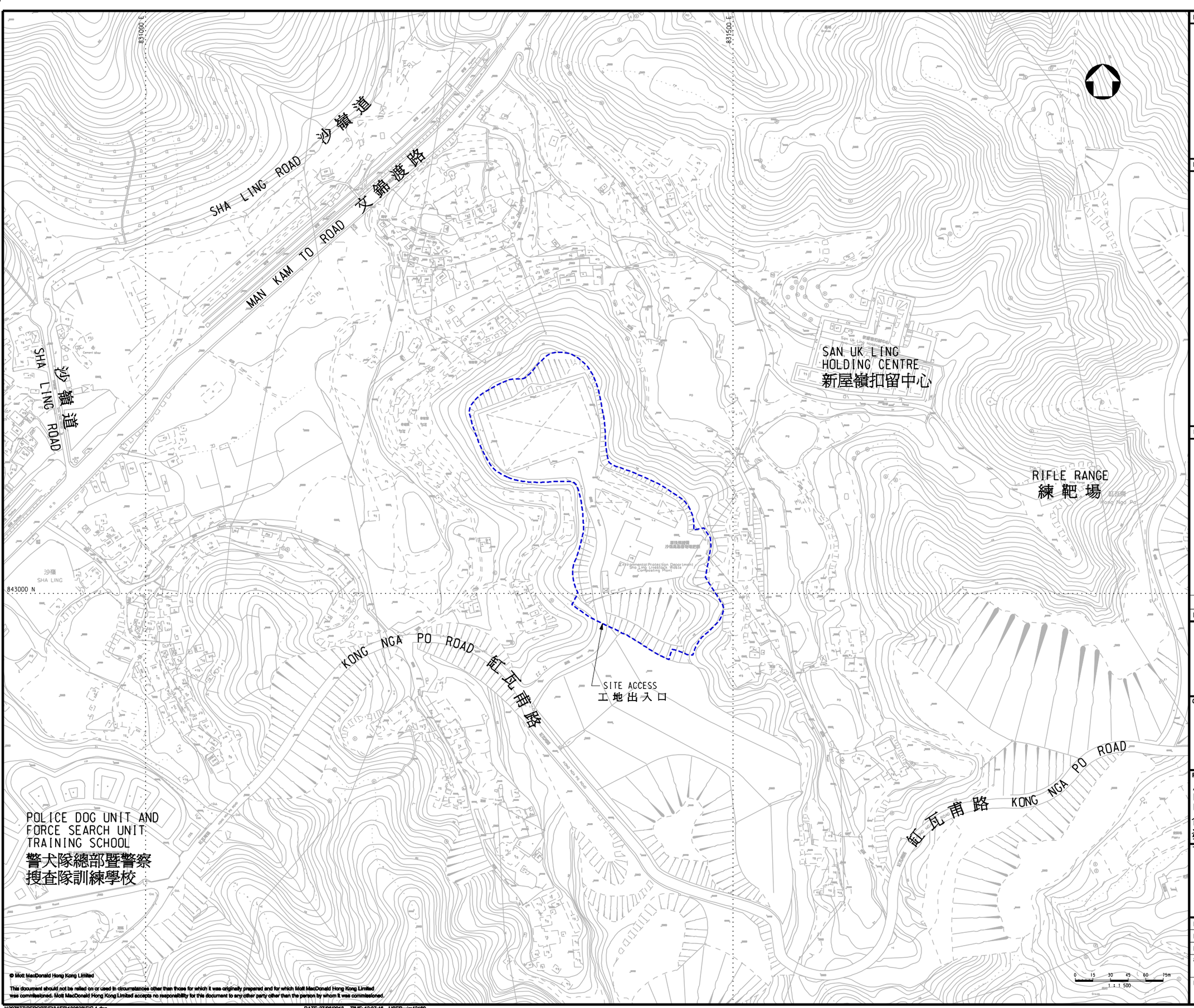
No mitigation measures have been identified to be necessary for built heritage resources during the construction and operation phases in the Built Heritage Impact Assessment. The construction and operation of the proposed OWTF 2 will not cause any insurmountable adverse impacts and no cumulative impacts will occur as a result of this Project.

# 4. Environmental Monitoring and Audit

An environmental monitoring and audit (EM&A) programme will be implemented during the construction and operation of the Project to check the effectiveness of the recommended mitigation measures and compliance with relevant statutory requirements. Details of the EM&A works have been specified in an EM&A Manual. The EM&A Manual contains details of the proposed EM&A requirements, implementation schedule of the environmental protection / mitigation measures, EM&A reporting procedures and complaint handling procedures.

# 5. Conclusion

This EIA study has identified and assessed the potential environmental impacts that may arise from construction and operation of the Project in accordance with the guidelines of the EIAO-TM and the EIA Study Brief. Based on the results of the assessments of the worst case scenario. The EIA study concludes that with implementation of the recommended mitigation measures, the potential impacts arising from the Project are considered to be environmentally acceptable and the Project would be in compliance with the environmental legislation and standards. No significant adverse residual impacts from the Project are anticipated. A comprehensive environmental monitoring and audit programme will be implemented to check the implementation of mitigation measures and environmental compliance.




Notes

Key to symbols

PROPOSED SITE AREA
擬議工地範圍

Reference drawings

| Rev | Date | Drawn | Description | Ch'k'd | App'd |
|---|---|---|---|---|---|
| P1 | JUN 13 | MING | FIRST ISSUE | HY | AFK |

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Environmental Protection Department
The Government of the Hong Kong
Special Administrative Region
香港特別行政區政府
環境保護署

Project

AGREEMENT NO. CE34/2011(EP)
DEVELOPMENT OF ORGANIC WASTE TREATMENT FACILITIES PHASE 2 - FEASIBILITY STUDY
合約編號 CE34/2011(EP)
發展第二期有機資源回收中心 － 可行性研究

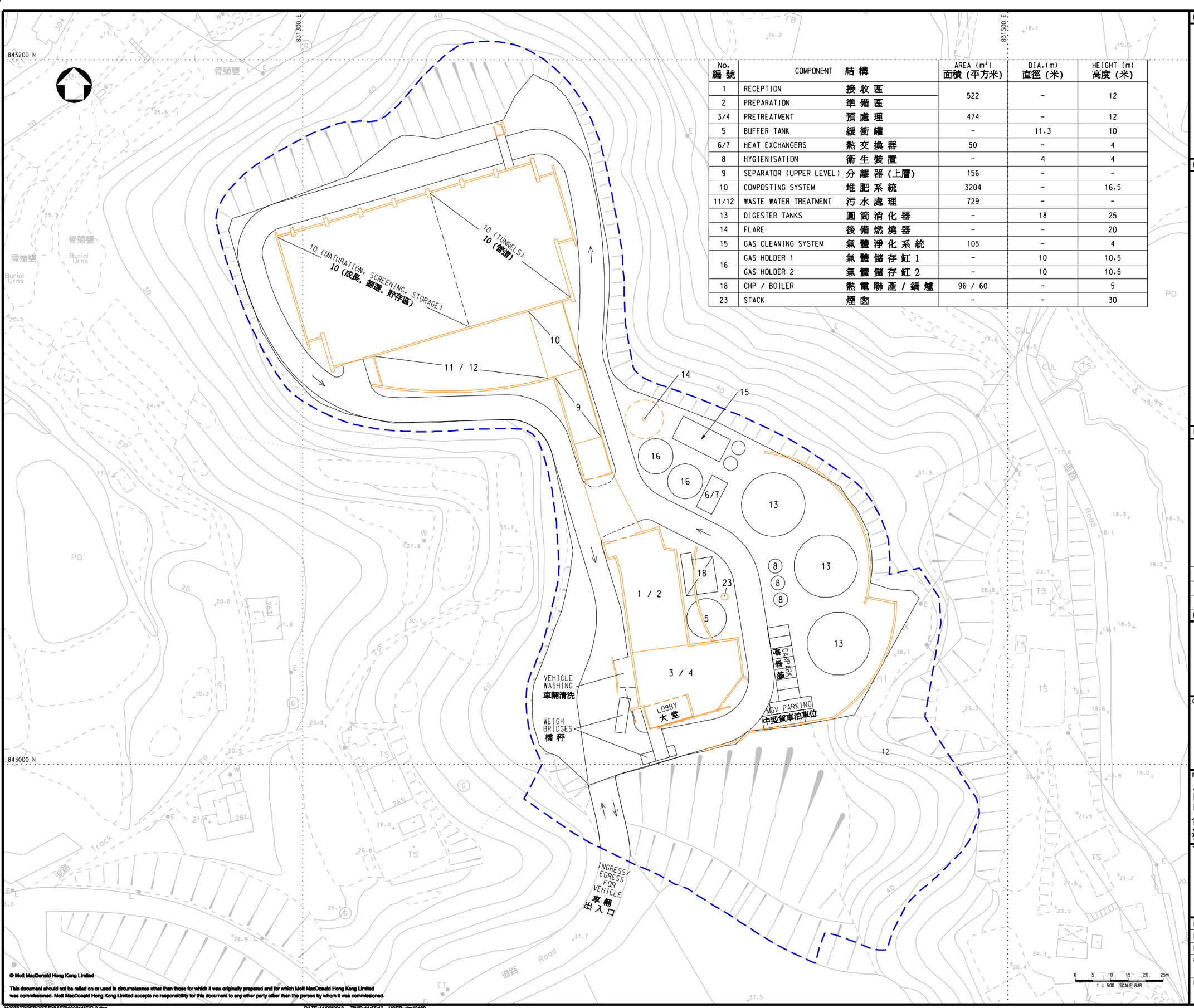
Title

# LOCATION OF THE PROJECT
# 項目位置圖

| | | | | | |
|---|---|---|---|---|---|
| Designed | HY | | Eng check | AT | |
| Drawn | MING | | Coordination | AT | |
| Dwg check | HY | | Approved | AFK | |
| Scale at A1 | 1:1500 | Status | PRE | Rev | P1 |

Drawing Number

FIGURE 1 圖一




| No. 編號 | COMPONENT | 結構 | AREA (m²) 面積 (平方米) | DIA.(m) 直徑 (米) | HEIGHT (m) 高度 (米) |
|---|---|---|---|---|---|
| 1 | RECEPTION | 接收區 | 522 | - | 12 |
| 2 | PREPARATION | 準備區 | | | |
| 3/4 | PRETREATMENT | 預處理 | 474 | - | 12 |
| 5 | BUFFER TANK | 緩衝罐 | - | 11.3 | 10 |
| 6/7 | HEAT EXCHANGERS | 熱交換器 | 50 | - | 4 |
| 8 | HYGIENISATION | 衛生裝置 | - | 4 | 4 |
| 9 | SEPARATOR (UPPER LEVEL) | 分離器 (上層) | 156 | - | - |
| 10 | COMPOSTING SYSTEM | 堆肥系統 | 3204 | - | 16.5 |
| 11/12 | WASTE WATER TREATMENT | 污水處理 | 729 | - | - |
| 13 | DIGESTER TANKS | 圓筒消化器 | - | 18 | 25 |
| 14 | FLARE | 後備燃燒器 | - | - | 20 |
| 15 | GAS CLEANING SYSTEM | 氣體淨化系統 | 105 | - | 4 |
| 16 | GAS HOLDER 1 | 氣體儲存缸 1 | - | 10 | 10.5 |
| | GAS HOLDER 2 | 氣體儲存缸 2 | - | 10 | 10.5 |
| 18 | CHP / BOILER | 熱電聯產 / 鍋爐 | 96 / 60 | - | 5 |
| 23 | STACK | 煙囪 | - | - | 30 |

**Notes**

**Key to symbols**

PROPOSED SITE AREA
擬議工地範圍

**Reference drawings**

| Rev | Date | Drawn | Description | Ch'k'd | App'd |
|---|---|---|---|---|---|
| P3 | SEP 13 | MING | GENERAL REVISION | HY | AFK |
| P2 | AUG 13 | MING | GENERAL REVISION | HY | AFK |
| P1 | JUN 13 | MING | FIRST ISSUE | HY | AFK |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The Government of the Hong Kong Special Administrative Region
香港特別行政區政府
環境保護署

Project

AGREEMENT NO. CE34/2011(EP)
DEVELOPMENT OF ORGANIC WASTE TREATMENT FACILITIES PHASE 2 - FEASIBILITY STUDY
合約編號 CE34/2011(EP)
發展第二期有機資源回收中心 — 可行性研究

Title

# PRELIMINARY SITE LAYOUT
# 初步工地平面圖

| | | | | | |
|---|---|---|---|---|---|
| Designed | HY | | Eng check | AT | |
| Drawn | MING | | Coordination | AT | |
| Dwg check | HY | | Approved | AFK | |
| Scale at A1 | 1:1500 | Status | PRE | Rev | P3 |

Drawing Number

FIGURE 2 圖二

0 5 10 15 20 25m
1 : 500 SCALE BAR



J:\297677\REPORT\ENVIES\130911\FIG 2.dgn DATE: 11/09/2013 TIME: 11:55:12 USER: yim42169