Project Profile for the Development of a Grease Trap Waste Treatment Facility and Minor Modifications and Enhancement Works at North Lantau Transfer Station

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Environmental Protection Department
The Government of the Hong Kong Special Administrative Region

ARUP

Environmental Protection Department

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Project Profile

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1 Introduction

1.1 Project Background

1.1.1.1 North Lantau Transfer Station (NLTS) is located at Sham Shui Kok Drive, Siu Ho Wan on Lantau Island and has a contractual capacity of 1,200 tonnes per day (tpd). NLTS is currently been providing waste transfer for waste catchments including North Lantau, Tung Chung, Kwai Tsing, and Tsuen Wan areas etc.

1.1.1.2 NLTS is currently operating under a follow-on contract (FOC) which would expire in 2023 subject to an optional extension of one year. At the end of the FOC, a second follow-on-contract will commence to provide continuous service. NLTS is currently handling about 590 tpd of municipal solid waste.

1.2 Existing Operation at NLTS

1.2.1.1 During its operation hours (07:30 to 23:30), Refuse Collection Vehicles (RCVs) entering NLTS drive across the weighbridge before entering the tipping hall. RCVs then tip their loaded waste into the tipping pits and leave NLTS after passing through the vehicle washing facility.

1.2.1.2 The waste is compacted into purposely built containers by compactor units. Wastewater, mainly consisting of leachate from both RCVs and waste compaction is collected and conveyed to the on-site wastewater treatment plant (WWTP) for treatment prior to discharge of the treated wastewater to the public sewerage system.

1.2.1.3 The waste handling operation is accommodated within the waste transfer building which is negatively pressurised to prevent the release of odourous air. The foul air is diverted to a deodourisation system before discharge to the atmosphere.

1.2.1.4 The laden containers are loaded onto a dedicated marine vessel and be transferred to the West New Territories (WENT) Landfill. This method of transporting waste in bulk can reduce the traffic of RCVs on road and the associated environmental nuisance.

1.2.1.5 There is currently no treatment facility for Grease Trap Waste (GTW) in NLTS.

1.3 Need for a Grease Trap Waste Treatment Facility in NLTS

1.3.1.1 Grease traps are installed at restaurants and food processing premises to separate oil and grease from effluent, thereby reducing the amount of oil and grease conveyed to government sewage treatment works and reducing the risk of potential blockages in sewage pipes resulting from fat deposits. The liquid collected in the grease traps is known as GTW and is collected by GTW collectors, who pump it into tankers for

transportation. Without grease trap waste treatment facilities (GTWTF), the GTW would be disposed at landfills. When collected and properly treated at GTWTFs, the grease and oil can be separated from the water, producing clean water and concentrated or recycled fats which can then be usefully used as replacements for fossil oils, such as blending into biodiesel. The recovery and treatment of GTW therefore plays a role in resource recovery and reduction of waste disposal at landfills.

1.3.1.2 GTW is currently delivered to the GTWTF at West Kowloon Transfer Station (WKTS), which is currently the only government owned GTWTF in Hong Kong. The throughput of the WKTS GTWTF operation has reached its capacity and the quantity of GTW is expected to increase. It is therefore necessary to develop a second GTWTF in Hong Kong. More details on the new GTWTF in NLTS are given in **Section 2**.

1.3.1.3 Other than a new GTWTF, the Project Proponent will also implement minor modifications and enhancement works for the existing facilities in NLTS, which would not increase the design capacity of the existing facilities in NLTS, and are intended to reduce the associated environmental impacts, and enhance its operational efficiency, reliability, resilience and readiness towards extreme weather (see **Section 2.6**).

1.4 Identification of Designated Projects

1.4.1.1 Under Schedule 2, Part I, Category G.2 of the EIAO, a refuse transfer station is classified as a Designated Project. As the existing NLTS was commissioned before the implementation of the EIAO (i.e. April 1998), it is classified as an exempted Designated Project. As the proposed GTWTF is a physical addition which are likely to violate the guidelines or criteria in the EIAO-TM without mitigation measures in place, it is considered as a material change. The purpose of this Project Profile is to satisfy EPD that the impact of the material change to the exempted Designated Project (NLTS) and the mitigation measures described in this Project Profile meet the requirements of the Technical Memorandum of EIA Process.

1.4.1.2 This Project Profile assesses the potential impacts of the proposed GTWTF and the minor modifications and enhancement works at NLTS, demonstrates that the works would not cause adverse environmental impacts, and supports the Application for Direct Approval of Environmental Permit.

2 Basic Information

2.1 Project Title

2.1.1.1 Development of a Grease Trap Waste Treatment Facility and Minor Modifications and Enhancement Works at North Lantau Transfer Station (hereinafter referred to as the "Project").

2.2 Name of Project Proponent

2.2.1.1 Environmental Infrastructure Division of Environmental Protection Department.

2.3 Name and Telephone Number of Contact Persons

2.3.1.1 All enquiries regarding the Project can be addressed to:

Name	**Mr. FONG Hiu Kwan, Andrew**
Post	Senior Environmental Protection Officer (Waste Transfer & Development)5, Environmental Protection Department
Address	4th floor, East Wing, Island West Transfer Station, 88 Victoria Road, Kennedy Town, Hong Kong
Telephone	2872 1887
Fax	2872 0501

2.4 Location of Project

2.4.1.1 **Figure 2.1a and Figure 2.1b** show the existing and future layout plans for NLTS. The Project is within the boundary of NLTS which will remain unchanged.

2.5 Purpose and Nature of the Project

2.5.1.1 The GTWTF at WKTS is currently the only facility of its kind for proper treatment of GTW in Hong Kong. However, the throughput of this facility has been approaching its capacity since 2018.

2.5.1.2 Together with the projected GTW generation in Hong Kong, it is proposed to establish a new GTWTF at NLTS, which would offer an opportunity to reduce the increasing burden on WKTS's GTWTF and provide resilience of the GTWTF network by providing two facilities, such that one can receive GTW when the other has downtime for maintenance or emergencies.

2.5.1.3 The Project will also recover useful fat products from GTW to facilitate resources recovering.

2.6 Project Description

2.6.1 Sources of GTW

2.6.1.1 Various types of food-related oil and grease waste are generated daily in Hong Kong, including used cooking oil, oil and grease separated from water in grease traps, and unused cooking oil abandoned for reasons such as spoilage.

2.6.2 Reference Design for the Project

2.6.2.1 The GTWTF will be designed to meet specified criteria and requirements of EPD. The descriptions below show the anticipated broad design and process steps of a GTWTF considering the GTWTF at WKTS and potential enhancements. A simple process flow diagram of the GTWTF is shown in **Figure 2.2**.

Design Capacity & Operational Hours

2.6.2.2 The design throughput of the Project is 300tpd of GTW.

2.6.2.3 The Project would receive deliveries of GTW between 07:30 and 20:00[1] daily, while the treatment of GTW in the GTWTF is a 24-hour operation.

GTW Delivery & Reception

2.6.2.4 After passing through the new weighbridge in NLTS, GTW collection vehicles would enter the dedicated GTW reception area which will be fully enclosed during loading and unloading, and have a negative pressurise system and a deodourisation system to prevent adverse odour emanating to the atmosphere. Roller shutters would be opened and then closed as swiftly as practicable to minimise potential odour diffusion. A hose pipe will be connected to each tanker of the GTW collection vehicle for GTW discharge, and the reference design has allowed for 2 GTW collection vehicles to discharge GTW concurrently.

2.6.2.5 After discharging the GTW, the GTW collection vehicles would proceed to the new exit weighbridge, and be washed at the vehicle wash before leaving NLTS.

2.6.2.6 It is estimated to have 37 additional truck trips per day on a normal day to deliver GTW, which is about 19% of the existing RCV traffic. The peak GTW traffic demand (for both GTW discharge and collection of recycled products) would be 5 GTW collection vehicles per hour.

2.6.2.7 The reception area will also be used for tankers to collect the by-products (e.g. concentrated fats and recycled fats) from the Project. This multiple use maximises

[1] NLTS is open from 07:30 to 23:30, however the majority of deliveries occur before 20:00. Therefore, for conservative assessment of emissions from vehicles it is assumed that all vehicle movements are undertaken before 20:00.

logistical and space efficiency, and minimises the footprint of the proposed GTWTF building.

2.6.2.8 The production of recycled fats is considered as the worst-case scenario which the assessment in the subsequent sections is based on.

GTW Treatment

2.6.2.9 The GTW received would be pumped through screens to remove large debris and finer particles. Screened GTW would then pass through grit trap tanks and the grit would settle at the bottom of the tanks and be removed periodically.

2.6.2.10 The preliminarily treated GTW would be transferred to the decantation tanks for separation of the oil emulsion layer and water emulsion layer. The oil emulsion layer would be transferred to the Dissolved Air Floatation (DAF) system. The separated water emulsion would be transferred to wastewater collection tank for further treatment at the new WWTP.

2.6.2.11 The oil emulsion layer will undergo next stage treatment to separate out the oil emulsion fraction as a useful product (i.e. concentrated fats and recycled fats) by removing more water from the emulsion. The fat products will be stored on site temporarily in the fats storage tanks, from where fat products collector(s) would collect it by pumping it into a tanker vehicle.

Wastewater Treatment

2.6.2.12 The wastewater generated from the GTW treatment process would be conveyed to a new WWTP to be accommodated within the GTWTF Building. This new WWTP would consist of two main treatment stages, an upflow anaerobic sludge blanket (UASB) digestion system as pre-treatment followed by activated sludge process. The WWTP will treat the wastewater to meet the discharge requirements specified in the license under Water Pollution Control Ordinance (WPCO) prior to discharge to the public sewerage system. Small amount of biogas (largely consisting of methane) would be generated from the UASB system and would be collected and flared to remove the methane. The flare may be used for heat recovery as much as reasonably practicable. The heat recovered would be used within NLTS for water heating for building services to reduce the power consumption.

Sludge Handling & Odour Control

2.6.2.13 The sludge generated from both the UASB system and activated sludge process would be routed to the sludge collection tank and undergo a gravity sludge thickening process. The thickened sludge would then be transferred to a filter press for further dewatering to meet the landfill disposal requirements prior to disposal. The dewatered sludge would be collected for disposal periodically. The supernatant from sludge thickener and filter press will be routed back to the wastewater treatment.

2.6.2.14 To avoid the potential odour impact during operation, all the plant and equipment (including the reception area) will be accommodated within the GTWTF building where negative pressure would be maintained to avoid escape of odourous air. The odourous air from the processing areas will be extracted and diverted to a deodourisation system, which consists of a wet chemical scrubber system and activated carbon filters, before being discharged to the atmosphere.

2.6.2.15 The tentative locations of the flare stack and the deodourisation system exhaust are shown in **Figure 2.3a and Figure 2.3b**.

Construction of GTWTF

2.6.2.16 Construction works for the GTWTF Building would be conducted at the existing landscaped area adjacent to the existing tipping hall. As all the construction works are within the boundary of NLTS, substantial site formation work is not required, the civil works required for the implementation of the Project would be relatively minor.

2.6.2.17 The construction and installation of the plant and equipment for GTW delivery, reception, treatment, wastewater treatment, sludge treatment, deodourisation system, control and maintenance room would be carried out after the completion of the civil work and superstructure works.

Minor Modifications and Enhancement Works at NLTS

2.6.2.18 A summary of the minor modifications and enhancement works for NLTS is given in **Table 2.1** below:

Table 2.1 – Summary of Minor Modifications and Enhancement Works for NLTS

Minor Modifications and Enhancement Works	**Environmental Impacts / Benefits**
Slight increase in the footprint of the waste transfer building & replacement of aged plant and equipment and associated facilities but without increase in design capacity	• No adverse impacts as majority of waste tipping activities would remain within the modified building which would continue to maintain negative pressure as the existing one.
Demolish the existing DG Store and relocate the DG Store within NLTS	• All the relevant safety and design requirements would be complied and hence no adverse environmental impacts
Provision of on-shore power for low-emission marine vessels (such as diesel-electric) and replacement of existing diesel vessels	• The engines for marine vessels would be stopped during loading / unloading of containers. This would significantly reduce the emissions (by around 60%) from marine vessels and hence improve the neighbouring air quality.
Provision of an additional stage of deodourisation for the waste transfer building	• With the additional stage of deodourisation utilising activated carbon filters, any odour emanating from the waste transfer building would be further reduced and hence improve the neighbouring air quality.

2.7 Proposed Addition, Modification and Alterations

2.7.1.1 The key construction works required for the implementation of the Project are summarised below:

- Construction of new GTWTF Building to house the following components;
  - Installation of GTW delivery and reception facility;
  - Installation of GTW treatment process plant including the fats product storage area;
  - Installation of a new WWTP;
  - Installation of a sludge dewatering plant and equipment;
  - Installation of a deodourisation system; and
  - Installation of civil and Mechanical, Electrical and Plumbing (MEP) systems;

- Modifications and enhancement works for existing facilities in NLTS, including the following components;
  - Modifications of the existing superstructure of the waste transfer building to slightly increase its building footprint;
  - Replacement and optimisation of the aged plant and equipment and associated facilities;
  - Procurement and deployment of low-emission marine vessels (such as diesel-electric vessels);
  - Provision of on-shore power station for marine vessels;
  - Provision of an additional stage of deodourisation unit for the waste transfer building;
  - Associated mechanical and electrical / landscaping / civil works for the above; and
  - Installation of landscaping elements.

3 Outline of Planning and Proposed Implementation Programme

3.1 Planning and Implementation

3.1.1.1 The Project Proponent has engaged a Consultant to assist the application for approval for direct application of Environmental Permit for the Project and the Project will be carried out by a qualified Contractor to be appointed.

3.1.1.2 The Contractor will be responsible for the detailed design, construction and operation of the Project.

3.2 Tentative Programme

3.2.1.1 The construction works of the Project will tentatively commence in early 2024 for target completion in 2027.

3.3 Potential Interfaces with Other Projects

3.3.1.1 Several concurrent projects have been identified and their potential cumulative impacts are discussed below.

Proposed Development of Columbarium at Siu Ho Wan

3.3.1.2 The Proposed Development of the Columbarium at Siu Ho Wan adjoins the southern boundary of NLTS. Its construction would commence in 2023 for target completion in 2027, and hence would overlap with the construction of the Project. Once this columbarium commences operation, it would become a neighbouring sensitive receiver for the Project.

Proposed Comprehensive Residential and Commercial Development atop Siu Ho Wan Depot

3.3.1.3 The Proposed Comprehensive Residential Development atop Siu Ho Wan Depot is located more than 500m southwest of the Project. Its construction would commence in 2024 for target completion in 2040, and hence would overlap with the construction of the Project. Once this development commences operation, it would become a sensitive receiver for the Project. However, given the large separation distance, adverse cumulative environmental are not anticipated.

Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works

3.3.1.4 The Proposed Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works is located more than 500m southwest of the Project. Its construction has commenced in 2021, and hence would overlap with the construction of the Project. Once this

development commences operation, it would become a sensitive receiver for the Project. However, given the large separation distance, adverse cumulative environmental are not anticipated.

Road P1 (Tai Ho - Sunny Bay Section)

3.3.1.5 This project would run along the northern coast of Lantau from Tai Ho to Sunny Bay. However, it is still during its investigation stage and its implementation timeframe is still yet to be determined. The subsequent EIA for Road P1 would therefore take into account any cumulative impacts from the Project and other concurrent projects to be identified at that time.

4 Approved EIA Reports / Direct EP Applications

4.1.1.1 An Initial Environmental Impact Assessment (IEIA) for "North Lantau Refuse Transfer Station Consultancy Study Initial Environmental Impact Assessment Report" (Register No. EIA-060/BC) was prepared to evaluate the environmental impact associated with construction and operation of NLTS. The IEIA concluded that, by implementing mitigation measures such as proper ventilation, odour scrubbing system, no night-time work, pre-treatment of discharge and regular monitoring, adverse environmental impact would not be anticipated. This IEIA addressed the impacts associated with the construction and operation of the refuse transfer functions at NLTS, but at that time did not consider a future GTWTF.

4.1.1.2 Other than the above IEIA for NLTS, the Project Profile for the "Development of Grease Trap Waste Treatment Facility at West Kowloon Transfer Station" (DIR-133/2005) also assessed the environmental impacts caused by the construction and operation activities associated with the GTWTF in WKTS. According to that project profile, the environmental impacts would not be insurmountable provided that good practices or mitigation measures are suitably implemented.

5 Air Quality Impact

5.1 Emission Sources in the Vicinity

5.1.1.1 The Project is located at Sham Shui Kok along the northern coast of Lantau and North Lantau Highway is approximately 100m to the south. The air quality in the vicinity is influenced by the following.

- Vehicle emissions from the surrounding road networks;
- Emissions from nearby facilities (such as O·PARK1); and
- Waste transfer and treatment within existing NLTS (sources include exhaust of the deodourisation systems, RCVs and marine vessel)。

5.2 Air Sensitive Receivers

5.2.1.1 Representative Air Sensitive Receivers (ASRs) within the 500m assessment area that may be affected by the Project have been reviewed. These existing and planned ASRs are listed in **Table 5.1** and shown in **Figure 5.1**.

Table 5.1 - Existing and Planned ASRs within 500m from the Project

ASR(s)	Location of ASR(s)	Existing/ Planned	Distance (m) [1]	Land Use
A1	O·PARK1 Office	Existing	370	GIC
A2	KMB Siu Ho Wan Depot	Existing	220	Industrial
A3	Citybus Siu Ho Wan Depot	Existing	270	Industrial
A4	Siu Ho Wan Vehicle Pound	Existing	310	Industrial
P1 - P6	Proposed Development of Columbarium at Siu Ho Wan	Planned	< 10	GIC

[1] Approximate distance between ASR & Project boundary

5.3 Potential Impacts Caused by the Project

5.3.1 Construction Phase

Gaseous Emissions

5.3.1.1 The construction of the Project would require the operation of mechanical machinery such as excavators, mobile cranes. The Contractor will be required to comply with the requirements in the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation. The requirements stipulated in the Air Pollution Control (Fuel Restriction) Regulation (using liquid fuel with a sulphur content of less than 0.005% by weight) should also be followed by the Contractor.

5.3.1.2 The use of exempted non-road mobile machinery in the construction site should be avoided as far as possible. On-site electricity should also be provided to minimize air emissions from diesel generators / equipment as far as possible.

5.3.1.3 With the implementation of the above good practice and measures, adverse impacts are not anticipated.

Fugitive Dust

5.3.1.4 As discussed in **Section 1**, as the works area is located within the boundary of NLTS, substantial site formation works such as slope works, heavy construction activities would not be required. Only site clearance, foundations, superstructure, installation of process plant & equipment and building services with associated ancillaries etc would be required. Limited fugitive dust emission would be generated from all these activities.

5.3.1.5 Hence, with general good construction site practices such as those stated in the Air Pollution Control (Construction Dust) Regulation properly implemented by the Contractor, any dust impacts on neighbouring ASRs would be limited.

5.3.1.6 General good construction site practices such as those stated in the Air Pollution Control (Construction Dust) Regulation would be implemented during site formation works for the columbarium development. In addition, liaison with the contractor of the Proposed Columbarium at Siu Ho Wan would be conducted such that construction works for the two projects would be coordinated to avoid heavy construction works at the two sites from taking place concurrently. Besides, as discussed in **Section 3.3**, the Proposed Comprehensive Residential and Commercial Development atop Siu Ho Wan Depot and Siu Ho Wan Station and Siu Ho Wan Depot Replanning Works are located at more than 500m southwest of the Project. Hence adverse cumulative impact is not anticipated.

Odour

5.3.1.7 No odorous sources are anticipated due to the construction of the Project, and hence adverse odour impact is not anticipated.

5.3.2 Operational Phase

Gaseous and Particulate Emissions from the GTWTF

5.3.2.1 The operation of the GTWTF will slightly increase the traffic flow (with an additional 37 truck trips per day on a normal working day to deliver GTW which is about 19% increase compared to existing traffic). This would increase the vehicular emissions, with NO_2, RSP and FSP as the key air pollutants.

5.3.2.2 Anaerobic treatment of wastewater at the new WWTP of the Project will generate small amount of biogas, largely consisting of methane. The biogas will be directly flared by the biogas flaring system to prevent emission of methane. Although methane is destroyed, some pollutants will be generated during the flaring process, including criteria pollutants (e.g. Nitrogen Dioxide (NO_2), respirable suspended particulates

(RSP), fine suspended particulates (FSP), sulphur dioxide (SO_2)), and non-criteria pollutants (e.g. Hydrochloric Acid (HCl), Hydrogen Fluoride (HF), and Formaldehyde) formed from halogenated organic compounds in the biogas and are commonly found in after the combustion of biogas.

5.3.2.3 The flare will be located on the north-western edge of the GTWTF Building, which provides the largest possible separation distance from the planned columbarium. The proposed location of the flare is shown in **Figure 2.3a**.

Gaseous Emissions and Particulate Emissions from Existing Facilities in NLTS

5.3.2.4 The existing emission sources from NLTS include emissions from RCVs, marine vessel transporting waste to WENT Landfill. As the modification and enhancement works for existing NLTS would not increase its maximum capacity of waste handling, the maximum number of RCVs, tractors and marine vessel trips would remain unchanged. Furthermore, the enhancement works will include the deployment of low-emission marine vessels and provision of on-shore power which would reduce the emission from marine vessels. Hence, there would be no additional air quality impacts arising from the operation of the existing facilities in NLTS. In fact, as shown in **Table 5.3**. the provision of on-shore power would reduce the emission loading.

5.3.2.5 Gaseous and particulate emissions are generated from tractors, marine vessel, RCVs, etc. during waste reception and transfer activities. The key pollutants include NO_2, FSP and RSP.

5.3.2.6 The waste reception activities such as waste tipping and loading that generate the most particulates are contained within the waste transfer building.

Gaseous and Particulate Emissions from Other Sources

5.3.2.7 Other existing sources within 500m of the Project include vehicle emissions from surrounding roads (including North Lantau Highway, Cheung Tung Road and Sham Shui Kok Drive) and emissions from chimneys at O·PARK 1.

Odour Emissions from the proposed GTWTF

5.3.2.8 The building envelope of the proposed GTWTF will be designed to minimise odour propagation, including full enclosure, rapid-roll shutters that would be opened as vehicles enter and immediately closed once the vehicle is inside, and double-doors for personnel entrance doors, negative pressure and a deodourisation system. In terms of operation and housekeeping requirements, the roller shutters will always be closed except when GTW collection vehicles enter or exit the proposed GTWTF building. This practice will minimise odour impact.

5.3.2.9 The wastewater extracted from the GTW will be treated at the proposed WWTP within the GTWTF building. The odourous gas including the WWTP and sludge dewatering

facilities, will be extracted and conveyed to the deodourisation system for treatment before discharge to the atmosphere. The major odorous pollutants from these odour sources are hydrogen sulphide (H_2S) and ammonia (NH_3), with reference to the odour study report for West Kowloon Transfer Station which has similar nature as the Project.

5.3.2.10 All foul gas extracted from the enclosed odour sources and the GTWTF building will be treated by a two-stage deodourisation system using a wet chemical scrubber (with H_2S and NH_3 removal efficiencies of 98% and 90% respectively) and activated carbon filter (with H_2S and NH_3 removal efficiencies of 90% and 80% respectively) to remove odour. The location of exhaust outlets for the deodourisation system is shown in **Figure 2.3b**.

5.3.2.11 Continuous monitoring of air flow, H_2S and NH_3 concentrations at the exhaust outlet of the deodourisation system will be required to be undertaken, with penalties for any non-compliances. This monitoring allows the Contractor to identify any potential issues in advance and implement measures accordingly. The emission limits are shown in **Section 5.4.4**.

Odour from Existing Facilities in NLTS

5.3.2.12 As discussed in **Section 1**, the capacity of waste handling and the capacity of existing WWTP in NLTS will remain unchanged after the modifications and enhancement works. The existing deodourisation system would be upgraded to a 2-stage deodourisation system using a wet chemical scrubber (with H_2S and NH_3 removal efficiencies of 98% and 90% respectively) and activated carbon filter (with H_2S and NH_3 removal efficiencies of 90% and 80% respectively). All the odourous air within the tipping hall, compaction hall and the existing WWTP will be connected to the upgraded deodourisation system in the existing waste transfer building and emitted through dedicated exhaust outlet after treatment, as shown in **Figure 2.2.**

5.4 Evaluation of Impact

5.4.1.1 The proposed GTWTF are to be housed within a stand-alone building designed with good odour control features such as maintained at negative pressures and 2-stage deodourisation system and the relative small amount of biogas flared. The Project will also involve upgrading the existing deodourisation system of the NLTS waste transfer building to a 2-stage deodourisation system for foul air treatment; to provide onshore power for marine vessels; and to upgrade the existing marine vessels to lower-emission fleet and these will bring improvement in air emissions. Considering these, adverse impacts during the operational phase is not anticipated. Having said that, as the proposed columbarium at Siu Ho Wan under planning is in its vicinity, further assessment has been carried out to reassure the Project would not worsen the air quality impact in the nearby existing and planned ASRs.

5.4.2 Air Quality Assessment – Criteria Pollutants

5.4.2.1 Criteria pollutants are those pollutants which are monitored for the Air Quality Objectives (AQOs) under the Air Pollution Control Ordinance (APCO). (Cap.311). SO_2, RSP, FSP and NO_2 are the key criteria air pollutants of concern from the Project.

5.4.2.2 Two scenarios have been assessed, one considering the existing operation (Base Case scenario) and one considering the implementation of the Project (With Project scenario). The results were then compared to show the impact of the Project, both on the emissions within NLTS boundary (**Table 5.2**) and on the air quality at the existing and planned ASRs.

Assessment Criteria

5.4.2.3 Concentrations of criteria pollutants under the Base Case and With Project scenarios have been compared. The assessment criterion is that the With Project scenario should not lead to worsening of the air quality impact as compared to the operation of the Base Case Scenario.

Assessment Methodology and Assumptions

5.4.2.4 The assessment of the air impact is undertaken using air dispersion modelling to predict the changes in NO_2, SO_2, FSP and RSP resulting from the Project (i.e. as described in **Section 2**).

5.4.2.5 The potential emission sources under the existing operation and those emission sources induced by the Project are identified and listed in **Table 5.2**. The key changes between Base Case and With Project scenarios are that the existing diesel marine vessels will be replaced by new low-emission models (such as diesel-electric) and will operate using on-shore power when berthing, and the With Project Scenario will introduce the GTWTF flaring system and GTW collection vehicles.

Table 5.2 – Emission Sources included for the Comparative Assessment of the Base Case and With Project Scenarios

Emission Sources	Key pollutants	Modelling Scenarios	
		Base Case	With Project
Marine Vessel – Manoeuvring	NO_x, SO_2, FSP, RSP	✓	✓
Marine Vessel – Berthing	NO_x, SO_2, FSP, RSP	✓	✓
GTWTF Flaring System	NO_x, SO_2, FSP, RSP	N/A	✓
GTW Collection Vehicles	NO_x, FSP, RSP	N/A	✓

5.4.2.6 Since the handling capacity of NLTS and capacity of existing WWTP will remain unchanged after the modifications and enhancement works, emissions for RCVs transporting waste to NLTS and existing WWTP are excluded from the modelling. A summary of the emission loading for the existing and future NLTS is given in **Table 5.3** below. Emission rate for each source is summarized in **Appendix A.** It can

therefore be seen that there would be a reduction in emission once the Project is implemented, and hence there is a general improvement in air quality for all the existing ASRs in the vicinity.

Table 5.3 – Summary of Emission Loading for Criteria Pollutants

Pollutant	Emission Loading (kg/year)		Changes in Emission Loading (kg/year)
	Base Case	With Project	
NO_x	3,187	1,561	-1,626
RSP	135	69	-66
FSP	135	69	-66
SO_2	638	278	-360

Modelling Results and Summary

5.4.2.7 The model results are summarized in **Appendix A**. The results show that there will be an improvement in air quality at most of the identified ASRs after the Project is implemented, which can be attributed to the replacement of marine vessels and provision of on-shore power, while there is no change in air quality at the remaining ASRs.

5.4.3 Air Quality Assessment – Non-Criteria Pollutants

5.4.3.1 Non-criteria pollutants are air pollutants which are not covered by AQOs but may still be relevant to the Project. The source of non-criteria pollutants from the Project is the biogas flare of the new WWTP at the GTWTF.

5.4.3.2 Non-criteria pollutants generated from biogas flare of the Project include HCl, HF and Formaldehyde. A cumulative assessment has been carried out by modelling emissions from the Project and other emission sources within the 500m study area (e.g. O·PARK1).

Assessment Criteria

5.4.3.3 Concentrations of non-criteria pollutants will be compared against the criteria of recognized international / national organisations, shown in **Table 5.4**, The assessment criteria for these non-AQO air pollutants were selected based on the preferential order WHO -> USEPA IRIS -> OEHHA, where well-established international air quality guidelines (i.e. WHO) is considered first, followed by national air quality guidelines.

Table 5.4 – Criteria for Non-AQO Criteria Pollutants

Pollutants	Parameter	Criteria (µg/m^3)	Reference
HCl	1-hour	2100	Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database, California, USA (https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary)
	Annual	20	Integrated Risk Information System, USEPA (https://iris.epa.gov/static/pdfs/0396_summary.pdf)

Pollutants	Parameter	Criteria (µg/m^3)	Reference
HF	1-hour	240	Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database, California, USA (https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary)
	Annual	14	Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database, California, USA (https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary)
Formaldehyde	30-minute	100	World Health Organisation Air Quality Guidelines for Europe (https://www.euro.who.int/__data/assets/pdf_file/0005/74732/E71922.pdf)
	Annual	9	Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database, California, USA (http://www.oehha.ca.gov/tcdb/index.asp).

Assessment Methodology and Assumptions

5.4.3.4 Cumulative impacts of HCl, HF and Formaldehyde from the GTWTF flare and other emission sources (e.g. O·PARK1) within the 500m assessment area have been modelled by suitable air dispersion models. Emission rate of non-criteria pollutants for each source is summarized in **Appendix A.**

Modelling Results and Summary

5.4.3.5 The model results are summarized in **Appendix A**. The results show that cumulative concentration of non-criteria pollutants will meet respective standards and there will be no adverse air quality impacts to the identified ASRs due to the proposed Project.

5.4.4 Air Quality Assessment - Odour

5.4.4.1 The cumulative odour impacts caused by the Project sources (i.e. GTWTF including the new WWTP, sludge dewatering facilities, the existing waste transfer building at NLTS including tipping hall, compaction hall and the existing WWTP) and other emission sources within the 500m study area (e.g. O·PARK1), have been assessed.

Assessment Criteria

5.4.4.2 In accordance with Annex 4 of the EIAO Technical Memorandum, a limit of 5 odour units based on an averaging time of 5 seconds should not be exceeded at any receivers.

Assessment Methodology

5.4.4.3 Odour emission rates for each source are summarised in **Appendix A**.

Modelling Results and Summary

5.4.4.4 The maximum 5-second average odour concentrations at ASRs and contour plots are presented in **Appendix A**. The results show that odour concentration at all ASRs meet the odour criterion. Exceedance zones are predicted at 16mAG, 20mAG and 30mAG as shown on contour plots. The maximum building height of facilities within NLTS and the building height of A1 (O. Park 1 Office) is 10m and 16m respectively. It is confirmed that there is no air sensitive use, either openable window or fresh air intake of central air conditioning, within the exceedance zones at 16mAG, 20mAG and 30mAG. Thus adverse odour impact is not anticipated.

5.4.5 Summary of Good Practices to be Incorporated in the Project

5.4.5.1 The following good practices for air quality that will be included in the specifications for the future NLTS for implementation by the Contractor of the Project.

- Replacement of the existing conventional diesel marine vessel with low-emission vessels (such as diesel-electric vessels) and provision of on-shore power supply at the berthing area to reduce gaseous emissions from marine vessel compared to existing;
- Provision of a two-stage deodourisation system using wet chemical scrubbers (with H_2S and NH_3 removal efficiencies of 98% and 90% respectively) and activated carbon filters (with H_2S and NH_3 removal efficiencies of 90% and 80% respectively) to treat odourous air prior to discharge, at both the proposed GTWTF and the existing NLTS waste transfer building as part of the modification works;
- Continuous monitoring of air flow, H_2S and NH_3 concentrations at the exhaust outlet of the respective deodourisation system and rigorous control measures to ensure the concentration and flow rate would not exceed the respective limits as shown in the **Table 5.5** below.

Table 5.5 – Emission Concentration and Flow Rate Limit for Continuous Monitoring

Source ID	Location	H_2S Emission Concentration Limit (ppb)	NH_3 Emission Concentration Limit (ppb)	Flow Rate per stack (m^3/s)
RTS1-4/ RTS5-8	NLTS Building (4 stacks)	3.61	38.5	17.3
GTW01/ GTW02	GTWTF Building (1 stack)	6.54	31.3	35.7

- Undertake routine maintenance of the ventilation and deodourisation systems to maintain good ventilation and air quality inside the waste transfer building and new GTWTF building within the NLTS site.

6 Water Quality Impact

6.1 Current Situation

6.1.1.1 NLTS is located within the North Western Water Control Zone (WCZ).

6.1.1.2 Wastewater currently generated from NLTS is collected at the existing WWTP at the waste transfer building and undergoes treatment processes by means of screening, equalisation and aerobic treatment (a sequencing batch reactor) before discharge to the public sewerage system for conveyance to Siu Ho Wan Sewage Treatment Works (SHWSTW) for further treatment.

6.2 Water Sensitive Receivers

6.2.1.1 The Brothers Marine Park, which is located 200m from NLTS, is a Water Sensitive Receiver (WSR). There are no mariculture zones, commercial fisheries, recreational beaches in close proximity of the NLTS.

6.3 Potential Impacts Caused by the Project

6.3.1 Construction Phase

6.3.1.1 Neither reclamation nor dredging works will be required for the construction of the Project. Hence, there is no concern relating to disruption of water movement or bottom sediment.

6.3.1.2 The major sources of water quality impacts that can potentially arise from the Project are land-based in nature, including construction surface run-off (including accidental chemical spillage) and sewage from site workforce. For surface run-off, since the extent of the construction works is small, adverse water quality impact is not anticipated, provided that good construction site practices and typical mitigation measures such as sedimentation tanks are implemented.

6.3.1.3 Since the total number of construction workforce of the Project and the modifications and enhancement works for NLTS will be less than 100 and the construction site will be provided with temporary sanitary facilities, there would not be adverse water quality impacts.

6.3.1.4 The construction works for concurrent projects would also implement all the necessary good site practices and typical mitigation measures to control construction run-off and sewage from workforce. Adverse cumulative impacts are therefore not anticipated.

6.3.2 Operational Phase

6.3.2.1 The wastewater generated from the proposed GTWTF (including the leachate from GTW collection vehicles, wastewater from the GTW and sewage etc.) will be treated by a new WWTP within the new GTWTF building. As there will be less than 5 additional staff for the operation of proposed GTWTF, the additional quantity of sewage from workforce is considered insignificant.

6.3.2.2 The design capacity of the new WWTP is 400m^3/day. The wastewater will be treated (described in paragraph 2.6.2.11) and then discharged to the sewer system, and subsequently conveyed to SHWSTW for further treatment.

6.3.2.3 The additional wastewater from the proposed GTWTF is not anticipated to overload the sewer system and will not lead to the exceedance in capacity of SHWSTW.

6.3.2.4 The Contractor shall ensure full compliance with the discharge requirements as specified in the license under Water Pollution Control Ordinance (WPCO). The effluent quality shall be monitored periodically to check for compliance with the requirements as specified in the Technical Memorandum Standards For Effluents Discharged Into Drainage And Sewerage Systems, Inland And Coastal Waters (TM-DSS) to WPCO License, and make sure it will not cause adverse impact to the public sewerage system and SHWSTW.

6.3.2.5 To minimise the possibility of system failure of the new WWTP, regular inspection of the equipment and systems in the WWTP will be performed to ensure the facility is in good condition. Upkeep of facilities will be performed to maintain the WWTP in an adequate state. Regular calibration and adjustments to continuous measurement equipment and facilities' instrumentation will also be undertaken to ensure the functionality of the WWTP.

6.3.2.6 Chemicals will be stored within project boundary at a bunded area, and a separate drainage system will be provided as appropriate to avoid any spilled chemicals from entering the storm drain in case of accidental spillage. Contingency plans will be developed by the Contractor prior to the commencement of the operation of the Project such that in case of any accidental spillage, measures such as how to confine the affected area and clean up procedure would be implemented immediately so as to minimize the potential water impacts on the environment. Also, adequate tools for cleaning up spilled chemicals will be stored on site and appropriate training shall be provided to staff to further prevent potential adverse water quality impacts from happening.

6.3.2.7 The minor modifications and enhancement works at NLTS will not increase the amount of wastewater generated from the waste transfer building. With the implementation of the proposed mitigation measures and maintain good site practice, adverse water quality impact is not anticipated during the operational phase.

6.3.2.8 As there is no direct discharge to the water body, cumulative water quality impact from concurrent projects is therefore not anticipated.

7 Landscape and Visual Impact

7.1.1.1 As discussed in **Section 2.1**, the Project includes the development of a new GTWTF and the minor modification and enhancement works at NLTS. Most of the plant and equipment of the Project will be accommodated within a new GTWTF building, the existing waste transfer building and the DG store will not be visible from the visual sensitive receivers (VSRs). The height of new GTWTF building would be similar to existing waste transfer building (about 19m), the flare stack would need a maximum height of 19 m.

7.1.1.2 There will be a columbarium next to the Project, also a residential cluster would be developed atop MTRCL Siu Ho Wan Depot around 1.2km away. Since these developments will have a view of the Project, there is a need to make the Project visually appealing.

7.1.1.3 With the minor modification works and enhancement works at the existing waste transfer building and the development of the new GTWTF, the visual impact of the Project site will be considered holistically to minimise visual impact, and the aesthetic appearance design principles will be in line with other refuse transfer stations in Hong Kong.

7.1.1.4 The representative VSRs, their respective visual sensitivity, and their potential visual impacts from the development of the new GTWTF and the modifications/ enhancement works at Project, are provided in **Table 7.1**.

Table 7.1 - Identified Representative VSRs and their Visual Sensitivity

Visual Sensitive Receivers (VSR)	**Distance from the Project**	**Visual Sensitivity**	**Potential Visual Impact**
Proposed Columbarium	Immediately adjacent	Medium (Other specified uses)	Low (Top part of the buildings and stack in the Project would be visible from upper floors of the proposed columbarium. Nevertheless, with appropriate architectural design in place, the visual impact is anticipated to be low)
Mobile receivers on the North Lantau Transport Corridor	120m	High (transient)	Low (The Project will be screened by vegetation / proposed columbarium at the site boundary)
Siu Ho Wan Depot Topside Development	1,200m	High (residential)	Low (Although located afar, the Project will be visible from the eastern end of the development. Nevertheless, with appropriate architectural design in place, the visual impact is anticipated to be low)
Intermediate elevated views from the Lantau Country Park	1,500m	High (Country Park)	Low (The elevation, distance and industrial character of the surrounding area will result in minimal impact)

Construction Phase

7.1.1.5 The construction area and contractors' temporary works areas will be minimised to reduce construction phase impacts to practical minimum.

7.1.1.6 As demonstrated in **Figure 7.1**, the new GTWTF will be located on an existing area reserved for future on-site development and currently landscaped with shrubs and trees. Tens of existing trees on the existing landscaping area will be affected, however, these trees are not registered as Old and Valuable Trees (OVT) and/or Tree of Particular Interest (TPI). The affected trees will be transplanted or fell and compensatory tree planting will be provided in accordance with the statutory requirements as stipulated in "DEVB TC No.4/2020 Tree Preservation". The construction works will be screened by hoardings for safety reasons and to avoid visual impact.

7.1.1.7 It is therefore considered that the landscape and visual impact during the construction phase will be insignificant.

Operational Phase

7.1.1.8 The principle of providing maximum greening will be implemented to compensate for the loss of the landscaped area within the Project site. Landscape areas within the Project site will be maintained regularly to retain the quality of greening.

7.1.1.9 Architectural design theme with respect the overall image / development to achieve visual conformity will be developed by the Contractor. The facade colour theme, pattern, texture, materials, finishing, greening features and building mass will be sensitively designed in form, base colour / tone variation, micro and macro texture, and reflectivity / light absorbance to avoid glare and to be compatible with the existing NLTS buildings and with the surrounding environment.

7.1.1.10 **Figure 7.2** shows an initial massing image of the waste transfer building and GTWTF. The design is subject to further development regarding colours and materials in conjunction with the adjacent columbarium.

7.1.1.11 With appropriate architectural design in place, the visual impact in the operational phase is anticipated to be low.

8 Waste Management

8.1 Current Situation

8.1.1.1 The existing operation at NLTS will generate general waste, dewatered sludge and chemical waste as discussed below.

General Waste

8.1.1.2 General refuse generated from site operations and personnel are disposed of at WENT landfill regularly.

Dewatered Sludge

8.1.1.3 The generation rate of dewatered sludge from the existing WWTP which treats leachate at NLTS is approximately 6,360kg per month, which is disposed of at WENT Landfill regularly. The feasibility to dispose of the dewatered sludge at T·PARK instead of WENT landfill shall be further explored by the Contractor, subject to further analysis of the sludge characteristics, logistics and operation requirement on site.

Chemical Waste

8.1.1.4 A few hundred litres of chemical waste per year, mainly spent lube oil from maintenance workshop at the existing NLTS, are generated from the maintenance activities, and is collected and transported to the Chemical Waste Treatment Centre by licenced collectors.

8.1.1.5 The handling and storage of chemicals and chemical waste should be in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

8.2 Potential Impacts Caused By The Project

Construction Phase

8.2.1.1 As discussed in **Section 2.6**, substantial site formation work is not required. The main activities which would potentially result in the generation of different type of waste including site clearance, excavation and construction of the substructure such as foundation and underground trenches and superstructure.

8.2.1.2 For construction and demolition (C&D) material, non-inert material such as top-soil and vegetation will be generated from site clearance and excavation of the Project as described in **Section 2**. Inert C&D material mainly consists of artificial hard material from the removal of the concrete slab at the existing dangerous goods (DG) storage area, removal of the existing DG building, and concrete residue from construction works. With respect to the small scale of the construction works, it is anticipated that

only around 4,100m^3 of C&D material (including both inert[2] and non-inert C&D material[3]) will be generated.

8.2.1.3 Measures have been introduced by the Contractor under Environment, Transport and Works Bureau (ETWB) TCW No. 33/2002, "Management of Construction and Demolition Material Including Rock" to enhance the management of construction and demolition material, and to minimize its generation at source. In addition, a Construction and Demolition Material Management Plan should be prepared to minimize C&D material generation and encourage proper management of such material.

8.2.1.4 The export of the surplus C&D material, including but not limited to artificial hard material (e.g. broken concrete) and inert soft material, to other concurrent projects (e.g. site formation and roadworks) for their beneficial reuse shall be explored. The Project Proponent will continue to liaise with other concurrent projects to explore the possibility to deliver the surplus fill material to nearby concurrent projects for beneficial reuse. Inert materials can be delivered to public fill reception facility for further sorting and reuse.

8.2.1.5 Non-inert C&D materials will mainly be generated from the demolition of existing structures and tree felling. Felled trees, twigs and branches would be reused as much on-site as far as possible. The remainder will be sent to Y·PARK in Tuen Mun for recycling and beneficial use.

8.2.1.6 Waste reduction measures on reducing the volume of non-inert C&D waste include but not limited to the following:

- Use of topsoil as backfilling material;
- On-site or off-site composting;
- Reuse of materials such as formwork where possible;
- Recycling of materials that can no longer by re-used, such as metals and packaging;
- Recycling of wood waste to wood chip for landscape works or energy production; and
- Recycling of wood waste in Y·PARK.

8.2.1.7 Disposal of surplus non-inert materials (e.g. timber, steel, sheeting, vegetation) to landfill sites will only be considered as the last resort. The other waste types arising from construction activities include chemical waste and general waste.

8.2.1.8 For chemical waste arising from the modification and enhancement works of the existing NLTS and from the construction of the Project, if not properly stored and disposed of, may pose environmental, health and safety hazards, which include toxic

[2] Inert C&D material including around 500m^3 of artificial hard material from the removal of concrete slab at the existing DG storage area, and 1,900m^3 from soil from excavation works.
[3] Non-inert C&D material including 420 m^3 of topsoil from the landscaping area, roughly 300 m^3 of vegetation and 980 m^3 of Packaging Waste, Metal, Glass, Timber, Bamboo and other organic material.

effect to the workforce, adverse effect on air, water and land from chemical spills, and fire hazards. The chemical wastes that are likely to be generated from the development include scrap batteries, used paint, engine oils, lubricants, hydraulic fluids, mineral oils / cleaning fluids, halogenated solvents and solutions. These chemical wastes should be collected at designated location within the site and transferred to Chemical Waste Treatment Centre (CWTC) at Tsing Yi for further treatment. The quantity of chemical wastes is anticipated to be small, roughly a few to few ten litres per month during construction.

8.2.1.9 For general waste, it will be generated from site operations and personnel on site. It is anticipated that there will be less than 100 members of the workforce in the construction site, thus the quantity of general waste generated at site is anticipated to be small, less than 3 tonne per month. The general waste will be transferred to landfill.

8.2.1.10 The proposed export outlets and transportation routing for different type of C&D materials generated during the construction phase are given in the table below.

Table 8.1 - Quantity and Transportation Route of C&D Material and Waste Generated by the Project During Construction

Item	Quantity (approx.)	Disposal Outlets	Tentative Transportation Route
Inert C&D Material (e.g. Surplus Soft Inert C&D material, AHM*, Hard inert C&D material (grade III granite)	2,400 m^3	Concurrent Projects or TM38 Temporary Construction Waste Sorting Facility or TM Area 38 Fill Bank	Via Cheung Tung Road, North Lantau Highway, TM-CLKL, Lung Mun Road to TM Area 38 Fill Bank (alternative route may apply if there are other projects to accept the C&D materials)
Non-inert C&D Material (e.g. topsoil and vegetation from the landscaping area)	1,700 m^3	WENT Landfill and Y·PARK for woody material	Via Marine Vessel to WENT Landfill and subsequent transport to Y·PARK via Nim Wan Road for woody material
Chemical waste (e.g. lubricant oil, solvents)	Few to a few tens of litres per month	CWTC	Via Truck – Sham Shui Kok Road, Sunny Bay Road, North Lantau Highway, Tsing Sha Highway, Tsing Yi Road
General Waste (from Contractor)	< 3 ton per month	WENT Landfill	Via Marine Vessel to WENT Landfill

Note:

* Artificial Hard Materials (AHM) includes, but not limited to broken concrete, asphalt, bitumen and granular materials, etc.

8.2.1.11 Careful design, planning and good site management should be adopted to handle the waste issues arising from the Project. The Contractor should prepare a waste management plan in accordance with ETWB TCW No. 19/2005 "Environmental Management on Construction Sites" and submitted to the *Service Manager* for approval. Public fill, general refuse and chemical waste should be segregated and stored separately for disposal or transfer for further treatment. Waste should be properly stored at site and windblown litter and dust should be minimised during

transportation. Waste should be disposed of at licensed sites and a disposal permit should be obtained as appropriate.

8.2.1.12 A trip-ticket system will also be implemented to ensure that the disposal of C&D materials is properly documented and verified.

8.2.1.13 In summary, the handling and disposal of these materials and wastes during the construction phase will require proper management in order not to cause environmental impacts and nuisance. It is anticipated that there would not be any insurmountable impacts during construction phase, provided that good site practices and other appropriate mitigation measures are implemented.

Operational Phase

8.2.1.14 The waste generated during the operational phase of the Project would mainly consist of treatment by-products such as grits and dewatered sludge, etc. The by-products, which are minimal in terms of quantity, will be disposed of at WENT Landfill. The waste / by-products that will be generated from the operation of the proposed GTWTF are tallied in the table below.

Table 8.2 - Quantity and Transportation Route of Waste / By-product Generated During Operation Phase

Waste Type	Quantity (approx.)	Disposal Outlets	Tentative Transportation Route
By-products from GTWTF	30tpd of sludge and solids	WENT Landfill or T·PARK (subject to confirmation during the operation phase of GTWTF)	Via Marine Vessel to WENT Landfill, along with the MSW.
Chemical waste (e.g. lubricant oil, solvents)	Few to a few tens of litres per month	CWTC	Via Truck – Sham Shui Kok Road, Sunny Bay Road, North Lantau Highway, Tsing Sha Highway, Tsing Yi Road
General Waste (from Contractor)	< 1 tonne per month	WENT Landfill	Via Marine Vessel to WENT Landfill

8.2.1.15 The GTW Treatment by-products will be loaded onto marine vessel onsite directly and transported to WENT landfill for disposal.

8.2.1.16 A variety of chemicals will be used during the operation of NLTS. Handling of chemicals and chemical waste should stipulate to the Waste Disposal (Chemical Waste) (General) Regulation. Fuel oil tanks and pipelines should be properly designed. Chemicals and chemical waste should be so handled and stored to avoid any spillage and land contamination. Existing practices are in place to handle the small quantities of chemical waste from the operation of NLTS and will be expanded to encompass chemical waste generated by the Project.

8.2.1.17 By implementing maintaining good site practices and follow relevant statutory guidelines (such as "Site Practice for Waste Reduction in Construction Industry" and "Know your environmental responsibilities: Managing construction and demolition materials properly - A Guide for Developers, Contractors and Property Managers" issued by EPD, segregation and storage of different types of waste in different containers, and the collection of recyclables by providing separate labelled bins), waste impact from the Project is not anticipated.

8.2.1.18 In summary, by the implementation of mitigation and management measures, only limited amount of waste would be generated during the construction and operation stages. Insurmountable waste impact from the Project is not anticipated.

9 Land Contamination Impacts

9.1 Current Situation

9.1.1.1 The land of NLTS was reclaimed over 20 years ago and has only been used as a refuse transfer station. Therefore, it is unlikely there will be other potential contamination sources.

9.1.1.2 Site walkovers have been conducted in 2020 and 2021 to review potential sources of land contamination, which include the DG store, fire services tank room, pump room, diesel tank, tipping hall, compaction hall, waste containers storage / berthing area and WWTP. The structure of these facilities has been assessed and generally to be in good condition and no sign of leakage or spillage has been observed during the site walks. The existing DG store for the diesel, storage of sodium hypochlorite and sodium hydroxide is located above ground and is well contained within a building. Thus, land contamination associated with the demolition and relocation of the fire services tank room, pump room and DG store is not expected. Other facilities will be retained without relocation.

9.1.1.3 As shown in **Figure 2.1b**, the Project is located within the existing NLTS site.

9.2 Potential Impacts Caused by the Project

Construction Phase

9.2.1.1 After reviewing the aerial photos (**Appendix B**) and relevant documents, there has not been any record of land contamination within NLTS since its commissioning on reclaimed land in 1998. The construction of the Project is not anticipated to have any land contamination issues.

Operational Phase

9.2.1.2 During the operational phase, potential land contamination may arise if there is any spillage of chemicals on un-paved areas. The chemicals to be stored on site include diesel, mineral oil and chemical reagents (sodium hydroxide, phosphoric acid, polymer, ferric chloride, lime). The floor of the NLTS is either paved with concrete in the outdoor areas used for vehicle and pedestrian movements or covered by vegetation at the landscaped areas which are not used for transportation of materials. Thus, with the implementation of the Spill Handling Plan, potential land contamination is not anticipated. The design of the reprovisioned DG store will comply with the DG Ordinance and include design features to avoid leakage or spillage such as containment bunds, alarm for leakage, automatic pumping control and proper storage containers.

9.2.1.3 Land contamination from the Project during the operational phase is therefore not anticipated.

10 Hazard to Life

10.1 Current Situation

10.1.1.1 Potential hazardous facilities in the vicinity of the Project include the Siu Ho Wan Water Treatment Works (SHWWTW) and Sham Shui Kok Chlorine Transshipment Dock (SSK Dock).

10.1.1.2 SHWWTW is classified as a Potentially Hazardous Installation (PHI) due to the storage of liquid chlorine on site. NLTS is located within the 1km Consultation Zone (CZ) of SHWWTW, which is approximately 480m away. According to WSD, the on-site chlorine generation facilities at SHWWTW will be commissioned by the end of 2022 and aiming to replace the use of liquid chlorine. Once the on-site chlorine generation facilities are completed, the storage of liquid chlorine would be reduced.

10.1.1.3 The SSK Dock is located immediately adjacent to the NLTS and is currently used to transfer chlorine drums from marine vessels to road tankers for transshipment to the WTWs around the territory. This SSK Dock would no longer be used as a chlorine transshipment facility upon completion of all on-site chlorine generation facilities at WTWs in Hong Kong. However, this dock may be utilised for the transshipment of explosives in the future. Although the transshipment dock for explosives is still yet to be confirmed, it is recommended to consider its potential cumulative effects in order to cater for a more conservative assessment.

10.1.1.4 The location of the SHWWTW, the potential transshipment dock for explosives and the Project are shown in **Figure 10.1**.

Dangerous Goods Store

10.1.1.5 As discussed in **Section 2**, a new DG store will be provided by the Contractor as part of the Project to replace the existing DG store. The new DG store will comply with all relevant ordinances and requirements.

10.2 Potential Impacts Caused by the Project

Construction Phase

10.2.1.1 The total number of construction workforce on site for the Project, is anticipated to be less than 100. As a result, even prior to switching to on-site chlorine generation, it would not induce significant risk within the CZ of SHWWTW during the construction phase, wherein the potential impact of societal risk is only temporary and confined during the construction period.

10.2.1.2 The construction of the Project would not involve the use of explosives. Hence, no additional risk would be imposed to both the SHWWTW and SSK Dock, and the

prevailing individual risk level will be maintained. Besides, the 1×10^{-5} / year individual risk contour is very unlikely to encroach on the Project Site due to substantial separation distance. Thus, it is anticipated the overall risks during construction phase will comply with the standards.

Operational Phase

10.2.1.3 There would be no significant increase in the extent of the workforce at the waste transfer building of the existing NLTS after the completion of the proposed works. No installation with hazard-to-life potential is proposed as part of the minor modifications and enhancements of the waste transfer building. Thus, societal and individual risks would remain compliant with the respective criteria.

10.2.1.4 As for the operation of the new GTWTF, since GTW is not a chemical/hazardous waste, spillage of GTW within the site will not cause hazard-to-life impacts to the staff or the general public.

10.2.1.5 The biogas generated from the new WWTP for the GTWTF will be directly flared by the flaring system to avoid storage of biogas on-site as much as practicable and minimize the associated explosion risk. The location of the flaring system will be within the Project as indicated in **Figure 10.1** which is away from the SSK Dock and from the future columbarium. A biogas buffer tank, however, is still necessary to hold the minimal biogas temporarily for start-up of the flaring system or other combustion system for heat recovery. The biogas buffer tank will be in order of size of $5m^3$ to $10m^3$ and be operated under low pressure (i.e. 0.3 bar) to lower the risk of biogas explosion, and be properly managed through regular checking and maintenance to minimise the likelihood of causing hazard-to-life of the on-site personnel and general public. Since the buffer tank will only store a minimal volume of biogas temporarily for start-up system only, even in the unlikely case of an explosion the scale and impact would be small. The combination of low pressure and proper management to reduce the probability of an explosion, combined with the small scale of the storage tank to reduce impact, mean that the hazard-to-life impact of the biogas buffer tank would not pose unacceptable impact to overall individual and societal risks.

10.2.1.6 The current layout plan shows that the waste transfer building of NLTS lies between the GTWTF and the SSK dock. Therefore, any blast wave or flying fragments associated with potential hazardous events from the explosives transshipment activities would not cause knock-on impact to the biogas tank due to the shielding effects of the waste transfer building.

10.2.1.7 On the other hand, with reference to the EIA report for "Development of Organic Waste Treatment Facilities, Phase 2", the consequence distance from the Sulphur Absorption Vessel (with a capacity of 7kg methane at 0.4 barg) is 20m (flash fire from the rupture). The maximum capacity of the biogas tank of this Project is only 11.3kg (with less than 6kg methane at 0.3 barg). Given the sufficient buffer distance of the

biogas tank and the site boundary (around 45m) and the shielding effects offered by the waste transfer building, it is anticipated that the biogas tank of this Project will not cause off-site impact or knock-on impact to the SSK Dock.

10.2.1.8 Also, as the additional population associated with the Project is small (less than 5 personnel in operation stage), the additional society risks arising from the Project would be insignificant.

10.2.1.9 The tentative commissioning year of the Project is 2027. With reference to information from Water Supplies Department[4], upgrading works is currently being undertaken at SHWWTW to provide on-site chlorine generation plants. The works is expected to be completed by 2022. Thus, it is anticipated that the risk associated with the chlorine storage at SHWWTW and chlorine unloading activities at SSK Dock would be eliminated.

10.2.1.10 The existing DG store accommodates sodium hypochlorite and sodium hydroxide will be relocated to facilitate the construction of proposed GTWTF. The existing DG store will be decommissioned and demolished after the commissioning of new DG store. The new DG store will be a reprovision of the existing DG store and the types and volume of chemicals stored at the new DG store will be similar to the current volume which is lower than the exempted quantity stated in the Dangerous Goods (Application and Exemption) Regulations, Cap 295E. Thus, hazard-to-life impact posed by the DG store is not anticipated.

10.2.1.11 Thus, it is anticipated that the Project will not cause unacceptable risk to the site personnel and general public.

[4] https://www.wsd.gov.hk/en/core-businesses/major-infrastructure-projects/major-projects-under-construction/9363wf/index.html

11 Other Aspects

11.1 Noise Impact

11.1.1.1 The nearest planned Noise Sensitive Receiver (NSR) is the proposed comprehensive residential and commercial development atop Siu Ho Wan Depot, which is located at more than 500m from NLTS. The nearest existing NSR is located at Tai Ho which is more than 2km from NLTS. There are no NSRs within 300m of the NLTS.

11.1.1.2 As there are neither existing nor planned NSRs within 300m from the Project, there would not be any significant impacts caused by the construction and operation of the Project.

11.1.1.3 While mitigation measures are not required for both the construction and operation of the Project, the Contractor are encouraged to implement the best practices to minimise the noise generated as much as practicable.

11.2 Ecology

11.2.1.1 The Project will be constructed within the site boundary of the NLTS which has no ecological sensitive habitat. Besides, no marine works will be required for the construction and operation of the project. No ecological impacts, either terrestrial or marine, are anticipated. Mitigation measures are not required.

11.3 Cultural Heritage

11.3.1.1 No cultural heritage impacts are expected, as the Project will be constructed within the site boundary of the NLTS. Mitigation measures are not required.

12 Mitigation Measures

12.1.1.1 **Sections 5 to 11** have concluded that the Project, after the implementation of the following good site management practices and typical environmental mitigation measures, will not result in any insurmountable cumulative impacts. The mitigation measures proposed are summarised below.

Construction Phase

12.1.1.2 Implementation of good site practices and mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulation as well as the Recommended Pollution Control Clauses for Construction Contracts to mitigate dust emissions.

12.1.1.3 Follow the requirements stipulated in the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation and Air Pollution Control (Fuel Restriction) Regulations (i.e. use of ultra-low sulphur diesel) to minimise exhaust from constructional plants and equipment.

12.1.1.4 The use of exempted non-road mobile machinery in the construction site should be avoided as far as possible, whereby electrified non-road mobile machinery should be deployed as far as practical. On-site electricity should also be provided in order to minimize air emissions or avoid the use of diesel generators / equipment, thereby mitigating air emissions from diesel usage.

12.1.1.5 Follow the good practices in accordance with ProPECC PN 2/93 “Noise from Construction Activities – Non-statutory Controls” to minimise noise impacts.

12.1.1.6 Best management practices in the Practice Note for Professional Persons on Construction Site Drainage (ProPECC PN 1/94) shall be implemented to mitigate water impacts from run-off during the construction stage.

12.1.1.7 The construction area and contractors’ temporary works areas shall be optimised as far as practical to reduce footprint and to reduce visual impact.

12.1.1.8 The construction period shall be reduced as far as practicable, and the construction works shall be screened by hoardings to avoid impacts on the adjacent landscapes and VSRs.

12.1.1.9 Careful design, planning and good site management should be adopted to handle the waste. The Contractor should prepare a waste management plan to keep record of the waste quantity. Public fill, general refuse and chemical waste should be segregated and stored separately for disposal or transfer for further treatment. Waste should be properly stored at site and windblown litter and dust should be minimised during transportation. Waste should be disposed of at licensed sites and a disposal permit should be obtained as appropriate.

Operational Phase

12.1.1.10 Key proven technologies and practices listed below will be adopted.

- The GTWTF will be enclosed in a building with roller doors closed by default and opened only to allow vehicles to enter and exist, and close again afterwards. Odourous gas will be pumped to a 2-stage wet chemical scrubber and activated carbon filter for odour treatment prior to discharge to minimise odour.

- Continuous monitoring of air flow, H_2S and NH_3 concentrations at the exhaust outlet of the deodourisation systems and rigorous control measures to ensure the emission rate (emission rate = emission concentration x flow rate) would not exceed the emission rate limit as shown in the **Table 5.5** above. This will be coupled with requirements for regular maintenance of the air scrubbing system to maintain good ventilation and air quality;

- The Project will construct a GTWTF building which will house a new WWTP to treat the wastewater generated from the GTWTF to comply with the discharge requirements as specified in the license under WPCO before discharge to the public sewerage system, which prevents water impacts. No wastewater will be discharged directly to water bodies.

- Biogas generated from the new WWTP for GTWTF will be flared to avoid the emissions of biogas to atmosphere as much as practicable. A small biogas buffer tank will be required, and the combination of (1) low pressure and good management to reduce probability of explosion, and (2-) small size and location as far as possible from sensitive receivers to minimise impact, combine to result in a low hazard-to-life risk.

- The minor modifications and enhancement works to the existing NLTS are all being undertaken with the goal of enhancing environmental performance and system resilience. The upgrade to the deodourisation system to a two-stage system (in which Stage 1 has a H_2S and NH_3 removal efficiencies of at least 98% and at least 90% respectively and Stage 2 has a H_2S and NH_3 removal efficiencies of at least 90% and at least 80% respectively) will further enhance the performance.

- The existing conventional diesel marine vessel will be replaced with low-emission vessels (such as diesel-electric vessels) to reduce emissions, and on-shore power supply will be enhanced by installation of new charging station to provide on-shore power for the vessels without necessitating the use of on-board diesel power when berthing;

- The architectural design theme for the Project will respect the overall image of the existing NLTS, the surrounding land, and the adjacent new columbarium to mitigate visual impact.

- Waste generated by the Project will include by-products from the new GTWTF, small quantities of chemical wastes and general waste from the Contractor. The existing practices for the operating NLTS will be expanded to encompass the operation of the GTWTF, including use of licenced collectors for chemical waste, and disposing of general waste at WENT landfill.

- Future land contamination risks will be mitigated by the proper storage in bunded areas for the DG (chemicals) required for the process with mitigation measures and management plan in place. The design of DG store will be in compliance with all statutory requirements.

13 Conclusions

13.1.1.1 This Project Profile has assessed the potential impacts of the proposed new GTWTF and the minor modifications and enhancement works at NLTS. The assessment has found that and that with good site and operational management practices, appropriate design, and the mitigation measures proposed that there are no insurmountable environmental impacts.

13.1.1.2 Given that the effectiveness of the required mitigation measures has been demonstrated in many real examples, it would be beyond doubt that the environmental impact of the Project falls well within the guidelines and criteria laid down in the EIAO-TM.

Figures

EXISTING SHAM SHUI KOK
CHLORINE TRANSSHIPMENT DOCK

EXISTING DIESEL STORAGE TANK

EXISTING WASTE TRANSFER BUILDING

EXISTING NLTS BOUNDARY

EXISTING DANGEROUS GOODS STORE,
FIRE SERVICES WATER TANK ROOM
AND PUMP ROOM

SHAM SHUI KOK

NORTH LANTAU HIGHWAY

SHAM SHUI KOK DRIVE

CHEUNG TUNG ROAD

LEGEND

EXISTING NLTS BOUNDARY

EXISTING WASTE TRANSFER BUILDING

EXISTING SHAM SHUI KOK
CHLORINE TRANSSHIPMENT DOCK

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B	FINAL ISSUE	GL	05/22
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Contract No. and Title

DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

LAYOUT VIEWPLAN OF EXISTING NLTS

Drawing no.			Rev.
FIGURE 2.1a			B
Drawn	Date	Checked	Approved
GL	05/22	JS	FC
Scale		Status	
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EXISTING SHAM SHUI KOK CHLORINE TRANSSHIPMENT DOCK

EXISTING WASTE TRANSFER BUILDING

EXISTING NLTS BOUNDARY

EXTENSION OF WASTE TRANSFER BUILDING INCLUDING PROPOSED DANGEROUS GOODS STORE, FIRE SERVICES WATER TANK ROOM AND PUMP ROOM

PROPOSED GREASE TRAP WASTE TREATMENT FACILITY

PROPOSED COLUMBARIUM AT SIU HO WAN (EXTENT TENTATIVE ONLY)

SHAM SHUI KOK

NORTH LANTAU HIGHWAY

SHAM SHUI KOK DRIVE

CHEUNG TUNG ROAD

LEGEND

- EXISTING NLTS BOUNDARY
- PROPOSED GREASE TRAP WASTE TREATMENT FACILITY
- EXISTING WASTE TRANSFER BUILDING
- PROPOSED COLUMBARIUM AT SIU HO WAN (EXTENT TENTATIVE ONLY)
- EXISTING SHAM SHUI KOK CHLORINE TRANSSHIPMENT DOCK

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

PROPOSED LAYOUT VIEWPLAN OF FUTURE NLTS

Drawing no.			Rev.
FIGURE 2.1b			B
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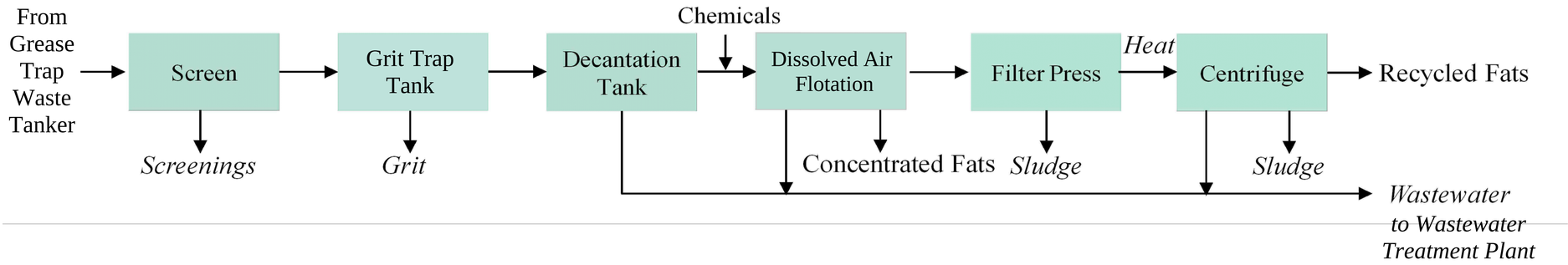

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

SIMPLE PROCESS FLOW DIAGRAM OF GREASE TRAP WASTE TREATMENT FACILITY

Drawing no.	Rev.
FIGURE 2.2	B

Drawn	Date	Checked	Approved
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N.T.S.	PRELIMINARY

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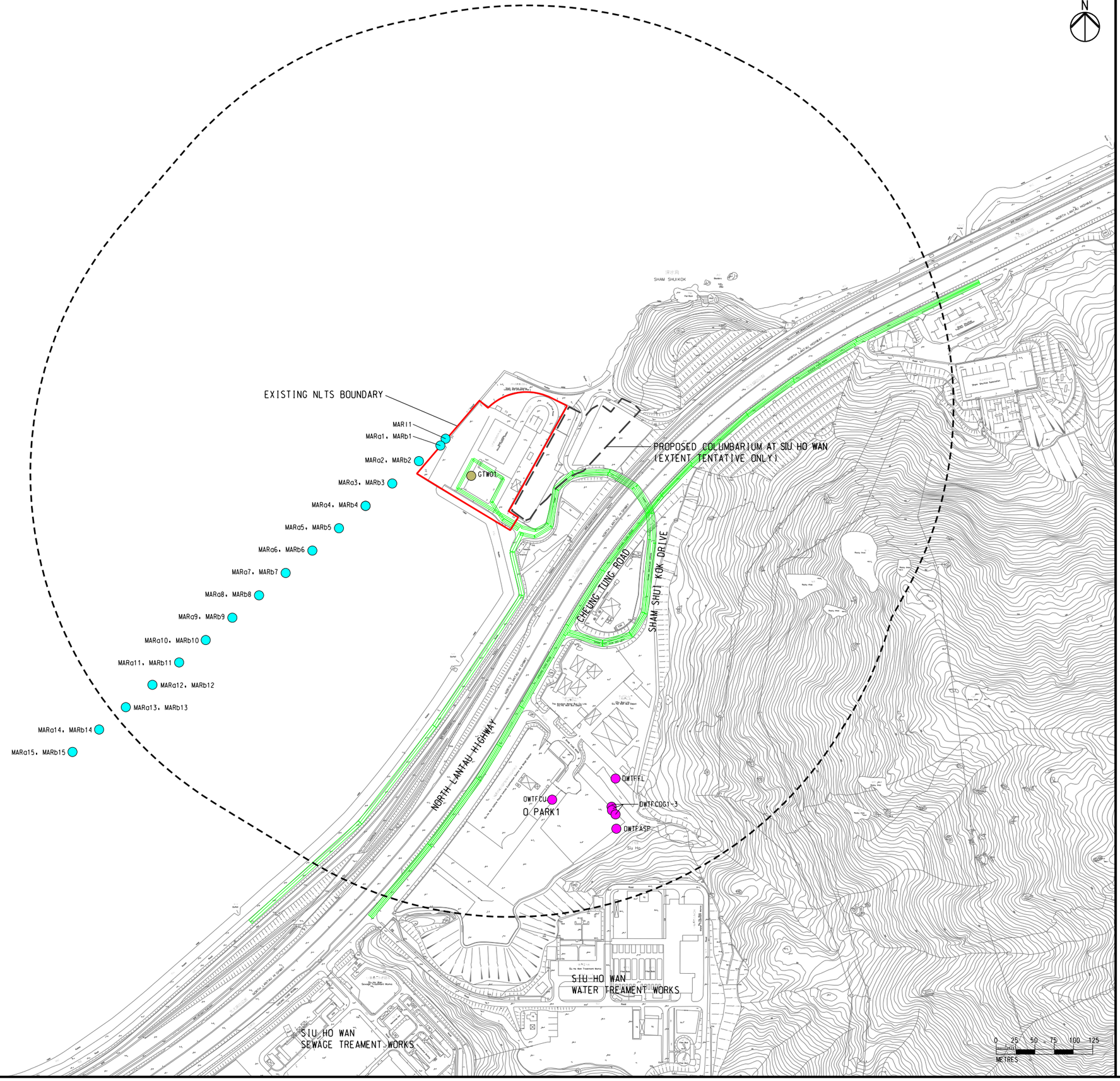

LEGEND

- EXISTING NLTS BOUNDARY
- 500m ASSESSMENT AREA
- PROPOSED COLUMBARIUM AT SIU HO WAN (EXTENT TENTATIVE ONLY)
- MARINE EMISSION SOURCES
- INDUSTRIAL EMISSION SOURCES
- VEHICLE EMISSION SOURCES
- GTWTF FLARE STACK

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

LOCATIONS OF EMISSION SOURCES

Drawing no.	Rev.
FIGURE 2.3a	B

Drawn	Date	Checked	Approved
GL	05/22	JS	FC

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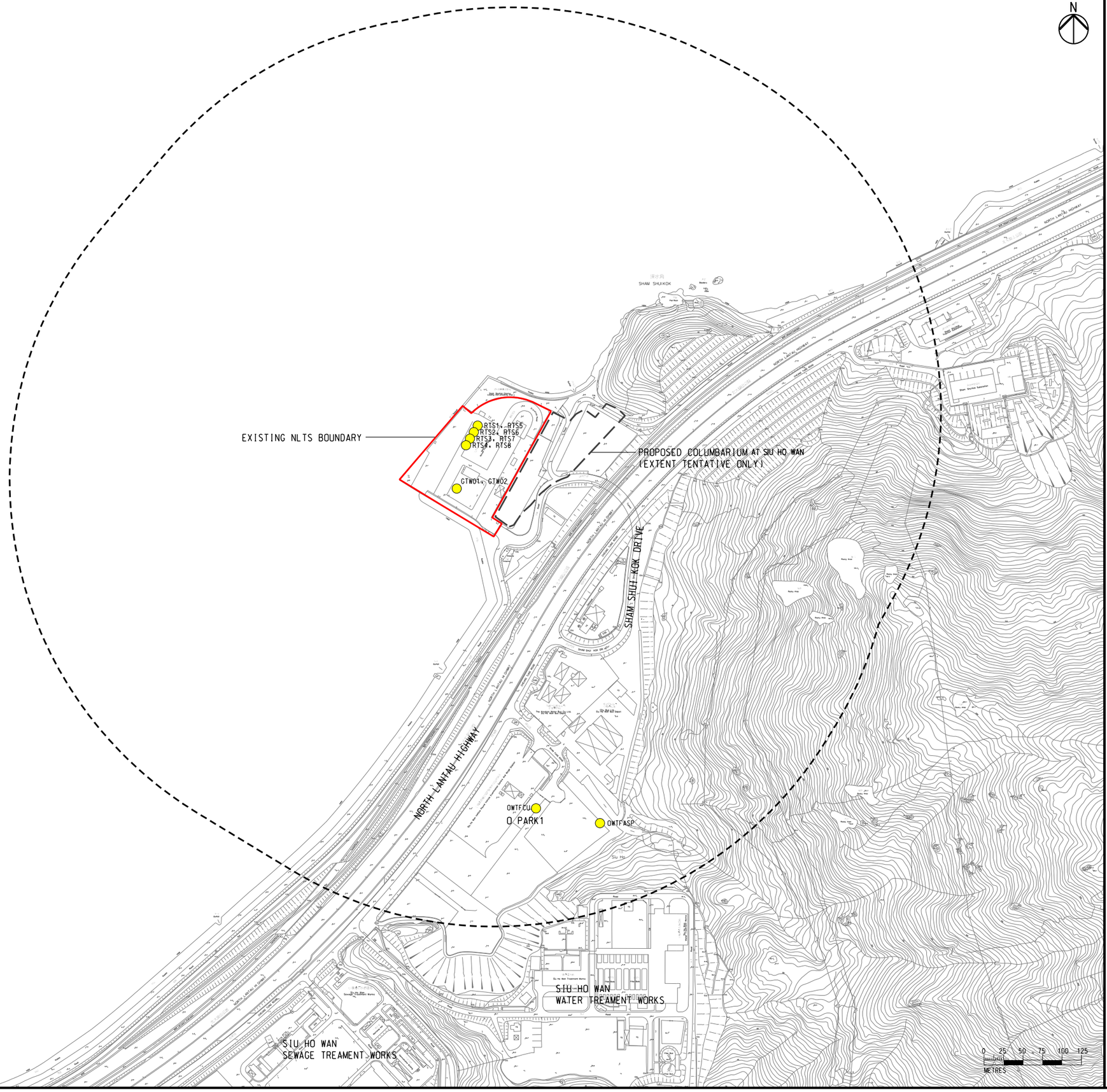
Printed by : 5/17/2022
Filename : \\hkgnts27\C1ENV\env\temp\Jason (Don't Delete)\NLTS_To Gary\Figure 2.2a - Locations of Emission Sources.dgn



LEGEND

- EXISTING NLTS BOUNDARY
- 500m ASSESSMENT AREA
- PROPOSED COLUMBARIUM AT SIU HO WAN (EXTENT TENTATIVE ONLY)
- ODOUR EMISSION SOURCES

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

LOCATIONS OF ODOUR SOURCES

Drawing no.	Rev.
FIGURE 2.3b	B

Drawn	Date	Checked	Approved
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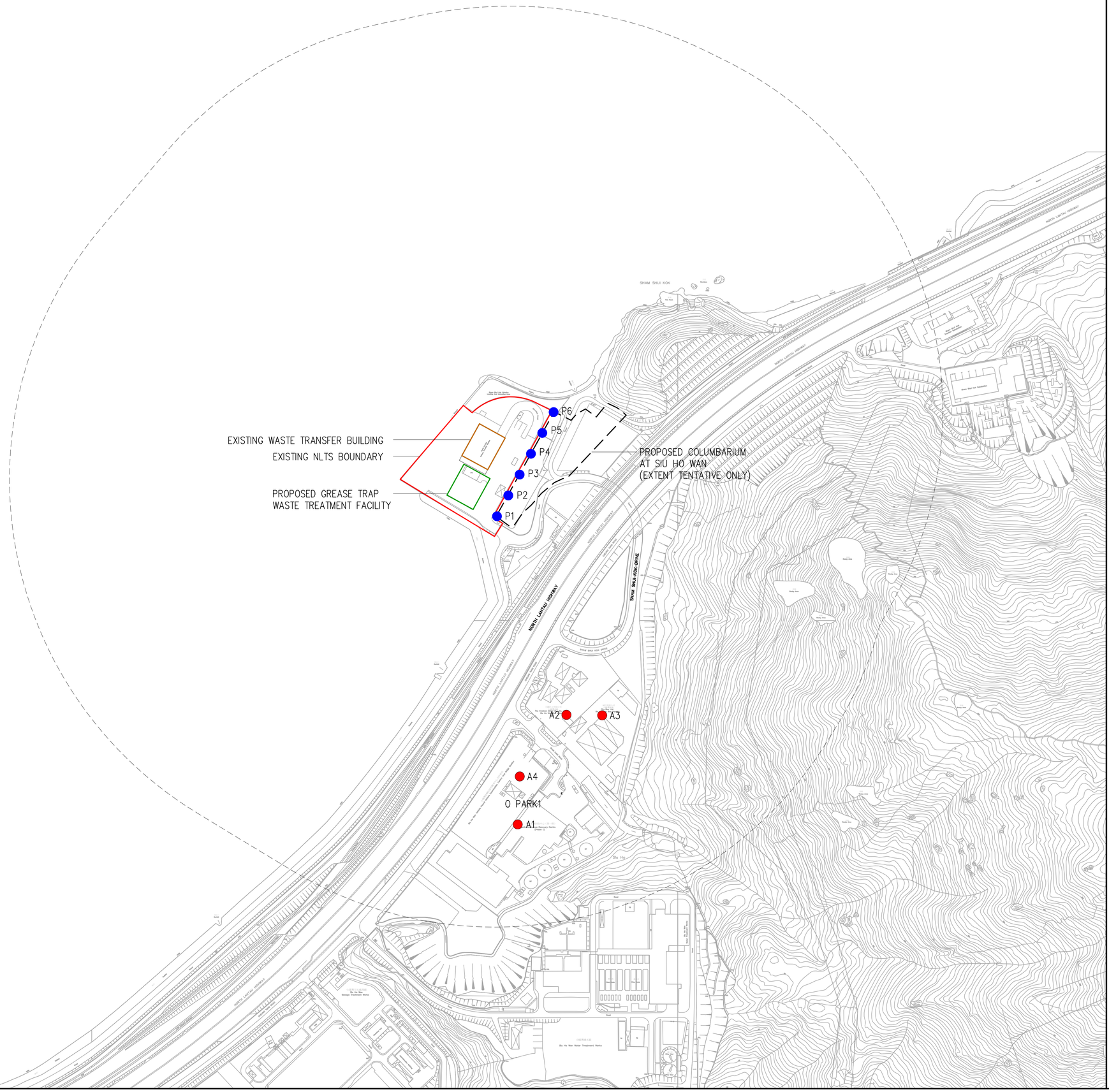
Printed by : 5/17/2022
Filename : \\hkgnts27\CIENV\env\temp\Jason (Don't Delete)\NLTS_To Gary\Figure 2.2b - Locations of Odour Sources.dgn



LEGEND

- EXISTING NLTS BOUNDARY
- 500m ASSESSMENT AREA
- PROPOSED GREASE TRAP WASTE TREATMENT FACILITY
- EXISTING WASTE TRANSFER BUILDING
- PROPOSED COLUMBARIUM AT SIU HO WAN (EXTENT TENTATIVE ONLY)
- REPRESENTATIVE EXISTING AIR SENSITIVE RECEIVERS
- REPRESENTATIVE PLANNED AIR SENSITIVE RECEIVERS (FOR PROPOSED COLUMBARIUM)

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

LOCATIONS OF REPERESNTATIVE AIR SENSITIVE RECEIVERS

Drawing no.			Rev.
FIGURE 5.1			B
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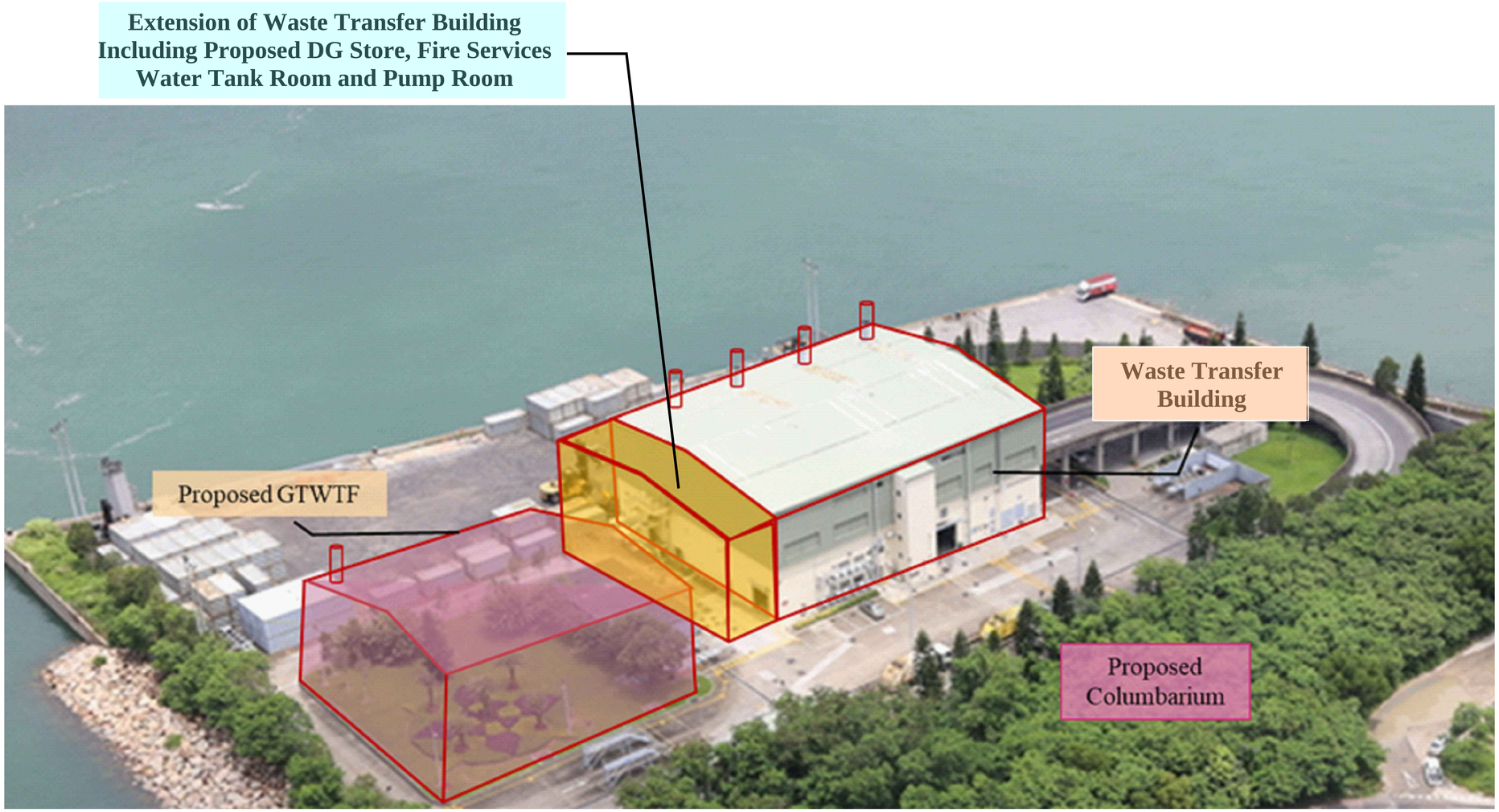

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

PROPOSED DESIGN SKETCH OF PROJECT

Drawing no.	Rev.
FIGURE 7.1	B

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

INITAL MASS OF THE PROJECT

Drawing no.	Rev.
FIGURE 7.2	A

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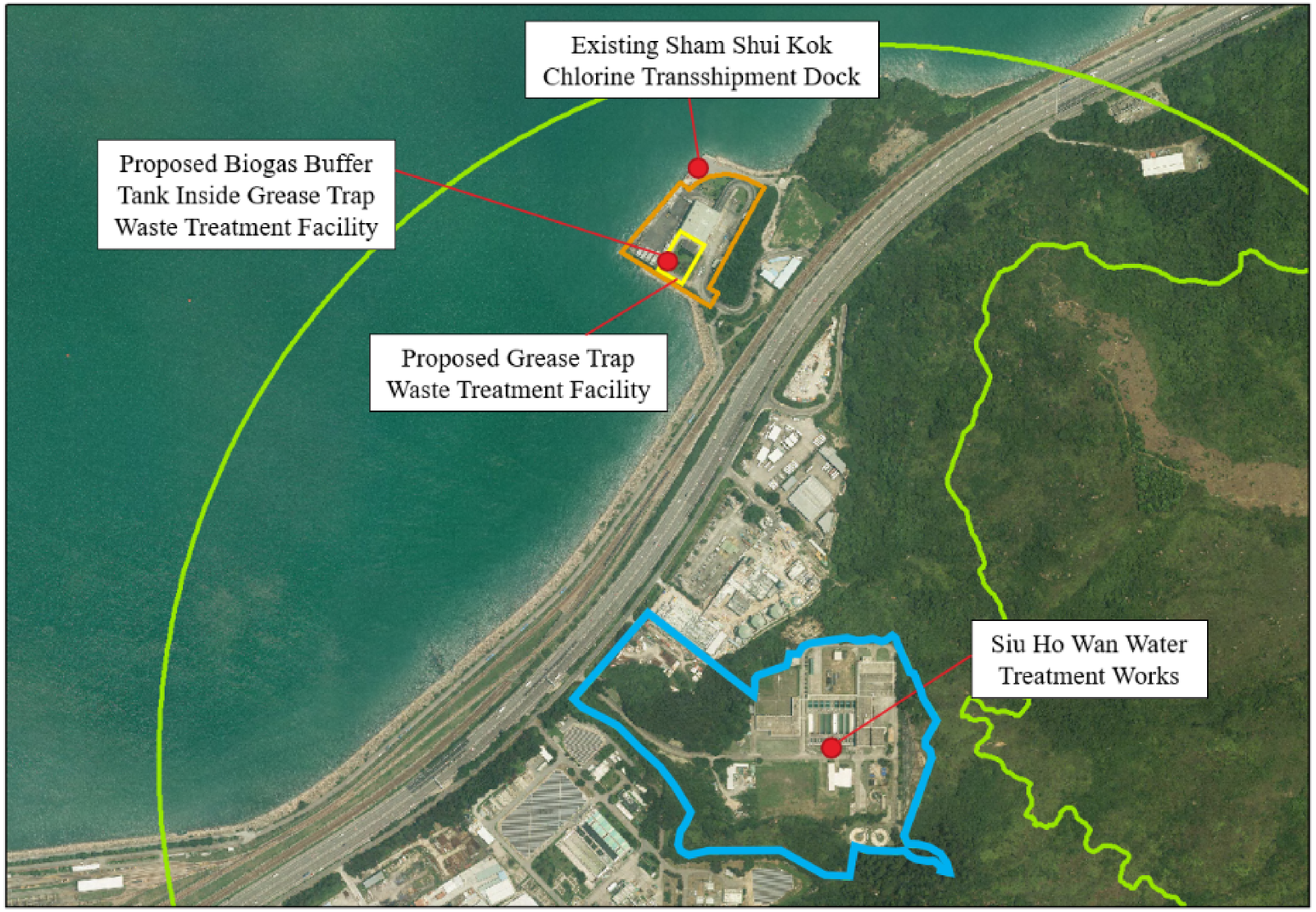

LEGEND

- Site Boundary
- PHI Consultation Zone
- Siu Ho Wan Water Treatment Works

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DEVELOPMENT OF A GREASE TRAP WASTE TREATMENT FACILITY AND MINOR MODIFICATIONS AND AND ENHANCEMENT WORKS AT NORTH LANTAU TRANSFER STATION – PROJECT PROFILE

Drawing title

LOCATION OF NEARBY POTENTIAL HAZARDOUS FACILITIES

Drawing no.			Rev.
FIGURE 10.1			B
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Appendix A

Air Emissions Inventory and Results Summary

Table A1 Summary of Emission Parameters (Chimneys)

Source	Source ID	Type	X	Y	Release Height	Exit Temperature	Exit velocity	Internal diameter	Emission Rate								Remarks
									NO_x	RSP	FSP	SO_2	HCl	HF	Formaldehyde	Odour	
			(m)	(m)	(mAG)	(K)	(m/s)	(m)	g/s	g/s	g/s	g/s	g/s	g/s	g/s	OU/s	
GTWTF Flare	GTW01	POINT	817715	819978	19	1073	0.636	0.29	2.19E-03	5.48E-05	5.48E-05	5.48E-04	1.10E-04	1.10E-05	2.19E-04	0.00E+00	[1] [2] [10]
GTWTF DOU	GTW01	POINT	817718	819969	19	Ambient	20.2	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.97E+02	[3] [4] [10]
	GTW02	POINT	817718	819969	19	Ambient	20.2	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E+01	
NLTS Tipping Hall	RTS1	POINT	817745	820050	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E+02	[4] [10]
	RTS2	POINT	817740	820042	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E+02	
	RTS3	POINT	817735	820033	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E+02	
	RTS4	POINT	817730	820025	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E+02	
	RTS5	POINT	817745	820050	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+01	
	RTS6	POINT	817740	820042	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+01	
	RTS7	POINT	817735	820033	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+01	
	RTS8	POINT	817730	820025	19	Ambient	9.8	1.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E+01	
ORRC1 (O-Park1)	OWTFCU	POINT	817820	819559	25	308	15	1.80	-	-	-	-	0.00E+00	0.00E+00	4.74E-01	7.44E+03	[5] [6] [7] [8] [9] [10]
	OWTFCOG1	POINT	817897	819550	12	453	16.5	0.50	-	-	-	-	1.95E-02	1.95E-03	2.73E-02	0.00E+00	
	OWTFCOG2	POINT	817897	819546	12	453	16.5	0.50	-	-	-	-	1.95E-02	1.95E-03	2.73E-02	0.00E+00	
	OWTFCOG3	POINT	817902	819545	12	453	16.5	0.50	-	-	-	-	1.95E-02	1.95E-03	2.73E-02	0.00E+00	
	OWTFFL	POINT	817903	819522	18	1173	13.3	2.20	-	-	-	-	1.17E-01	1.17E-02	1.10E-01	0.00E+00	
	OWTFASP	POINT	817902	819540	12	413	9.2	0.50	-	-	-	-	1.19E-02	1.19E-03	1.11E-02	1.49E+03	

Note:

[1] Biogas generation rate (19.7Nm^3/hr) pro rata from WKTS based on capacity. Exhaust flue gas flow rate (39.45Nm^3/hr) adopted as advised and confirmed achievable by design engineer.

[2] Temperature and exit velocity referenced from Project profile for Direct EP application for WKTS GTWTF (DIR-133/2005). Stack diameter calculated from flue gas flow rate and exit velocity.

[3] Flow rate and temperature provided by design engineer

[4] Stack diameter and release height referenced from as-built drawing of NLTS

[5] Stack parameters (location, release height, exit temperature, exit velocity and internal diameter) referenced from Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015).

[6] Emission rate of criteria air pollutants (NO_x, RSP, FSP, SO_2) for ORRC1 are not shown as comparative assessment (Base Case and With Project Scenarios) was carried out for criteria air pollutants;
while cumulative assessment was carried out for non-criteria air pollutants (HCl, HF, Formaldehyde).

[7] HCl/HF emission rate referenced from Appendix 3.1 of Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015).

[8] Formaldehyde emission limit of CHP (14 mg/m^3 at 273K, dry basis, 6% oxygen content) at Yuen Long South Effluent Polishing Plant (YLSEPP), referenced from YLSEPP EIA (EIA-278/2022), is adopted.

[9] Odour emission of OWTFCU & OWTFASP referenced from latest ORRC1 Seventy-Sixth Monthly EM&A Report. Odour emission of OWTFASP was expressed in NH3 (mg/Nm3) in ORRC1 EM&A report and converted to OU/s as follows:

1 OU = 0.037 ppm (Reference: Ammonia Fact Sheet, AERISA)

0.037 ppm x 17.031 g/mol / (24.45 m^3/mol at 298K x 273 K / 298 K) = 0.02813 mg/Nm^3

35 mg/Nm^3 = 1244.2 OU/Nm^3

Flow Rate = 9.2m/s x (0.25m)^2 x π = 1.806 m^3/s x (273 K/413 K) = 1.194 Nm^3/s

1244.2 OU/Nm^3 * 1.194 Nm^3/s = 1485.7 OU/s

[10] Detailed calculation of emission rates and modelling assumptions are given in the calculation spreadsheet submitted separately

Table A2 Summary of Emission Parameters (Vessels at NLTS)

Source	Source Description	Source ID	Type	X	Y	Release Height	Exit Temperature	Exit velocity	Internal diameter	NO_x Emission Rate		RSP/FSP Emission Rate [3]		SO_2 Emission Rate	
										Base Case	With Project	Base Case	With Project	Base Case	With Project
				(m)	(m)	(m)	(K)	(m/s)	(m)	(g/s)	(g/s) [2]	(g/s)	(g/s) [2]	(g/s)	(g/s) [2]
NLTS-Main Engine [1] [4]	Maneuvering	MARa1	POINT	817684	820027	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa2	POINT	817650	819997	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa3	POINT	817615	819969	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa4	POINT	817581	819940	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa5	POINT	817545	819911	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa6	POINT	817510	819881	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa7	POINT	817476	819853	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa8	POINT	817440	819824	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa9	POINT	817407	819794	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa10	POINT	817373	819767	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa11	POINT	817338	819737	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa12	POINT	817303	819709	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa13	POINT	817269	819680	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa14	POINT	817234	819651	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
		MARa15	POINT	817199	819622	11	426	8	0.2	6.65E-03	5.32E-03	3.63E-04	2.90E-04	1.05E-03	8.40E-04
NLTS-Auxiliary Engine [1] [4]	Berthing	MARI1	POINT	817675	820017	11	315	8	0.2	9.50E-01	3.04E-01	3.80E-02	1.22E-02	1.98E-01	6.34E-02
	Maneuvering	MARb1	POINT	817684	820027	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb2	POINT	817650	819997	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb3	POINT	817615	819969	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb4	POINT	817581	819940	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb5	POINT	817545	819911	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb6	POINT	817510	819881	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb7	POINT	817476	819853	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb8	POINT	817440	819824	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb9	POINT	817407	819794	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb10	POINT	817373	819767	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb11	POINT	817338	819737	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb12	POINT	817303	819709	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb13	POINT	817269	819680	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb14	POINT	817234	819651	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04
		MARb15	POINT	817199	819622	11	315	8	0.2	2.12E-03	1.70E-03	8.49E-05	6.79E-05	4.41E-04	3.53E-04

Note:

[1] Stack parameters (location, release height, exit temperature, exit velocity and internal diameter) referenced from Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015).

[2] Diesel electric vessel is adopted, whereby, when comparing with the conventional diesel vessel, via a conservative approach, it is assumed to have:

- 20% reduction in emission from berthing and maneuvering (Reference: https://www.ihi.co.jp/var/ezwebin_site/storage/original/application/c5cadc33f2440631f665e12c75409e14.pdf); and
- 60% reduction in engine load during berthing – as electricity is partially supplied onshore, which can reduce air emission
  (References: https://link.springer.com/article/10.1007/s00550-020-00497-y, https://www.britishports.org.uk/system/files/documents/shore_power_tyndall.pdf)
- Total emission reduction during berthing = 1 - (1 - 0.2)(1 - 0.6) = 0.68 = 68%

[3] FSP emission rate is not given in Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015)
As a conservative assumption, FSP emission rates are assumed to be equal to RSP emission rates.

[4] With reference to Environmental Review Report for "Organic Waste Treatment Facilities Phase 1: Proposed Design Change" (VEP488/2015), marine vessels operate during the following periods:

- Berthing: 06:00-07:00, 13:00-14:00
- Maneuvering: 07:00-08:00, 11:00-12:00, 14:00-15:00, 18:00-19:00

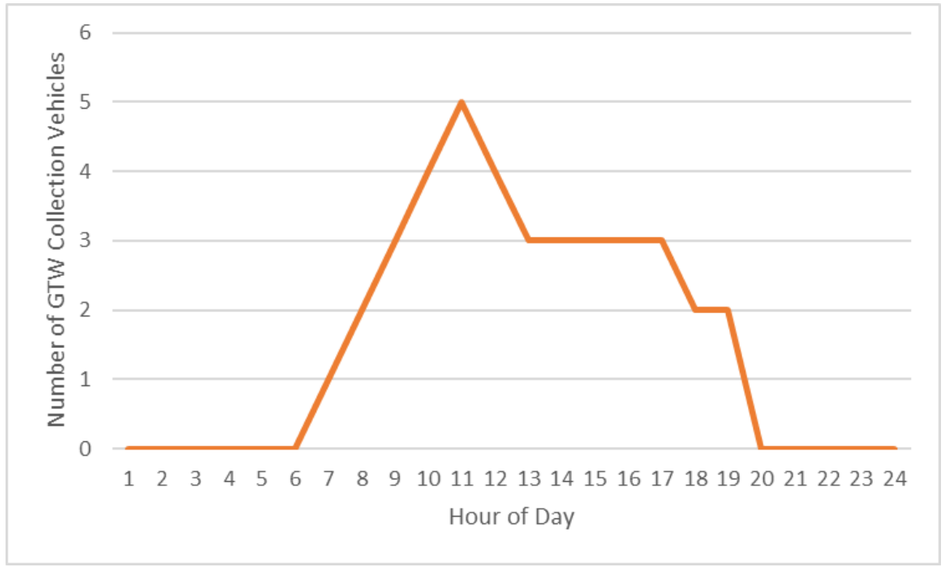
Modelling Emissions from GTW Collection Vehicles

Tailpipe emissions from GTW collection vehicles on the open road network have been considered for air quality assessment. The hourly profile of GTW collection vehicles provided by the Traffic Engineer are given in **Figure A1**.

The latest EmFAC-HK v4.3 model has been adopted. The running emission factors at different speeds (1kph increment) are derived by "Emfac" mode. General road speed of 50kph is assumed on public roads while road speed for internal access at NLTS is set to 10kph based on speed limit within NLTS. As the Project will commence operation in Year 2027, emission factors for Year 2027 will be adopted. All GTW collection vehicles are assumed to be of type HGV9 as emission factors for HGV9 are higher than those for other HGV types (i.e. HGV7 and HGV8) in EmFAC.

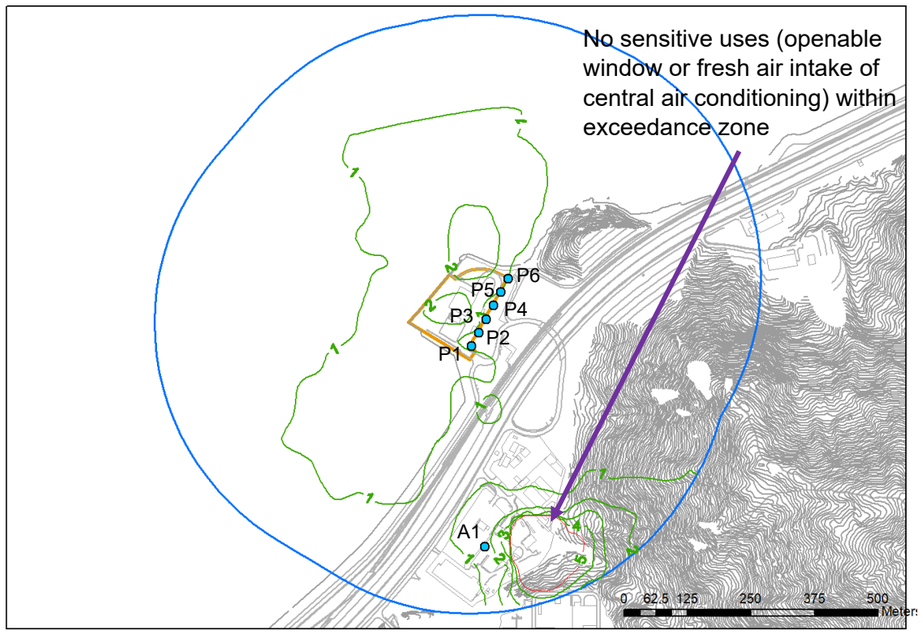
For conservative assessment, the daily profile of lowest temperature and relative humidity data in each hour for each month (i.e. 24 hours data in each month and for 12 months) based on Year 2020 data from Chek Lap Kok Weather Station has been derived to calculate the vehicular emission factors in the corresponding period on hourly basis and then simulate the short term and long-term air quality impact.

Figure A1 Hourly profile of GTW collection vehicles in NLTS

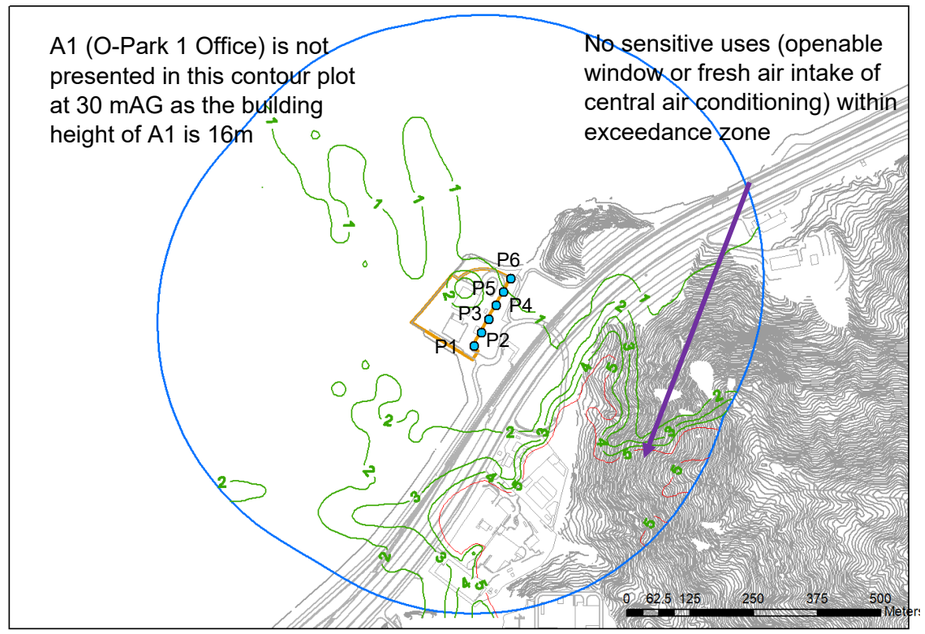


Contour of Cumulative Maximum 5-second Average Odour Concentration (in OU)

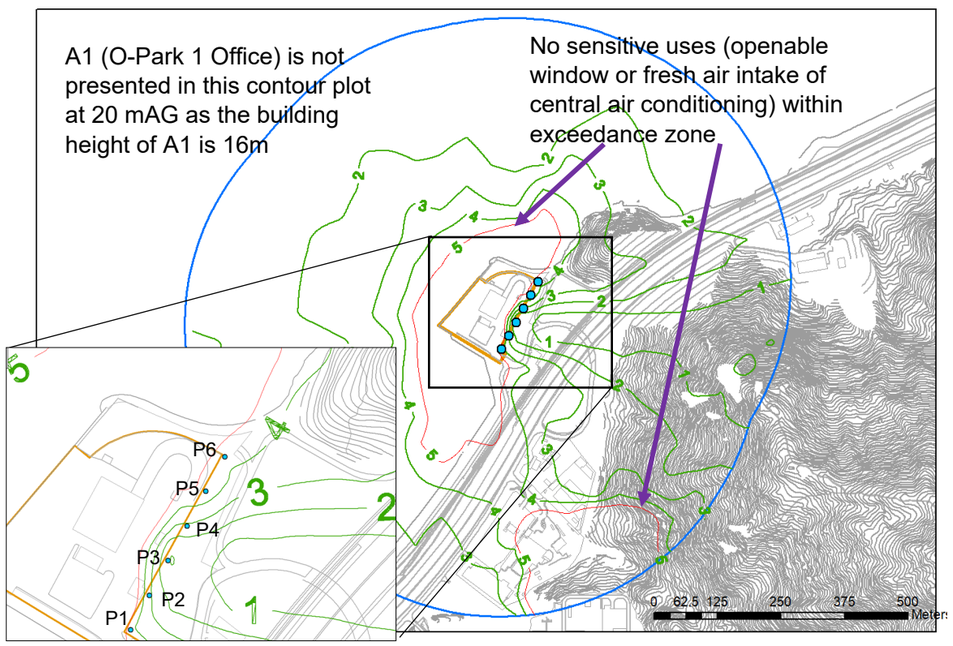
16mAG

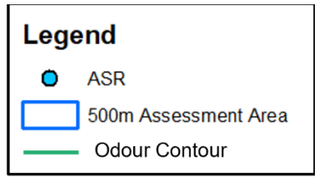


30mAG



20mAG





Air Quality Impact Assessment Results

Maximum Hourly NO_2 Concentration (Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level	Building Height (mAG)	Maximum 1-hour NO_2 Concentration at different elevation of ASR in metre, $\mu g/m^3$ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	57	56	100	148	45		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	54	52					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	30	42					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	77	75					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	119	118	184	374	115	72	66
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	104	110	130	121	94	75	60
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	99	111	163	479	99	76	55
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	112	122	139	412	116	113	110
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	120	130	171	410	145	134	124
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	99	106	173	366	103	90	77

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Annual Averaged NO_2 Concentration (Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged NO_2 Concentration at different elevation of ASR in metre, $\mu g/m^3$ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.07	0.07	0.09	0.16	0.06		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.09	0.09					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.08	0.08					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.08	0.08					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.54	0.55	0.59	0.79	0.40	0.32	0.25
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.65	0.70	0.77	0.82	0.52	0.40	0.32
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.77	0.84	0.90	0.96	0.62	0.48	0.37
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.74	0.79	0.82	0.88	0.59	0.46	0.37
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.63	0.66	0.71	0.78	0.51	0.41	0.34
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.48	0.49	0.54	0.64	0.40	0.32	0.28

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Maximum Hourly NO_2 Concentration (With Project Scenario)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level	Building Height (mAG)	Maximum 1-hour NO_2 Concentration at different elevation of ASR in metre, $\mu g/m^3$ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	19	18	54	103	15		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	18	17					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	10	14					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	25	24					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	39	41	110	166	74	41	21
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	41	44	63	69	65	58	31
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	40	41	52	181	34	24	18
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	41	54	71	159	74	58	48
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	57	69	116	147	119	87	54
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	50	52	111	132	63	53	40

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Annual Averaged NO_2 Concentration (With Project Scenario)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged NO_2 Concentration at different elevation of ASR in metre, $\mu g/m^3$ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.06	0.06	0.07	0.12	0.06		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.09	0.08					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.07	0.07					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.08	0.08					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.48	0.39	0.33	0.42	0.30	0.16	0.12
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.39	0.39	0.39	0.43	0.28	0.20	0.15
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.38	0.40	0.41	0.46	0.30	0.21	0.16
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.35	0.37	0.39	0.41	0.28	0.21	0.16
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.30	0.32	0.37	0.41	0.28	0.20	0.15
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.24	0.25	0.29	0.35	0.24	0.16	0.13

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Change in Maximum Hourly Averaged NO_2 Concentration (With Project Scenario against Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level	Building Height (mAG)	Maximum 1-hour NO_2 Concentration at different elevation of ASR in metre, $\mu g/m^3$ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	-39	-38	-46	-45	-30		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	-36	-35					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	-20	-29					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	-52	-51					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-80	-77	-73	-208	-41	-31	-44
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-63	-66	-67	-53	-30	-16	-29
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-60	-70	-111	-298	-65	-51	-37
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-71	-68	-68	-253	-42	-55	-62
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-63	-61	-54	-263	-26	-47	-70
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-49	-54	-62	-234	-40	-37	-37

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Change in Annual Averaged NO_2 Concentration (With Project Scenario against Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged NO_2 Concentration at different elevation of ASR in metre, $\mu g/m^3$ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	-0.01	-0.01	-0.02	-0.04	0.00		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	-0.01	-0.01					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	-0.01	-0.01					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.00	0.00					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-0.06	-0.16	-0.26	-0.37	-0.10	-0.15	-0.13
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-0.27	-0.31	-0.37	-0.38	-0.24	-0.20	-0.17
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-0.39	-0.44	-0.49	-0.51	-0.32	-0.26	-0.21
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-0.40	-0.43	-0.44	-0.47	-0.31	-0.26	-0.21
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-0.33	-0.34	-0.34	-0.37	-0.24	-0.21	-0.18
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-0.24	-0.24	-0.25	-0.30	-0.17	-0.16	-0.15

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Air Quality Impact Assessment Results

Maximim 24-hour RSP Concentration (Base Case)

ASR ID	Description	Location		Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour RSP Concentration at different elevation of ASR in metre, μg/m³ [1]						
		X	Y			1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.10	0.10	0.28	1.55	0.08		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.09	0.09					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.05	0.09					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.13	0.13					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.21	0.21	1.81	5.10	1.06	0.22	0.11
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.22	0.28	1.37	1.70	0.83	0.45	0.17
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.21	0.22	0.28	7.47	0.18	0.13	0.10
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.25	0.29	0.41	6.22	0.42	0.31	0.25
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.33	0.37	1.41	6.53	0.66	0.48	0.29
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.31	0.35	1.54	5.79	0.45	0.31	0.25

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Annual Averaged RSP Concentration (Base Case)

ASR ID	Description	Location		Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged RSP Concentration at different elevation of ASR in metre, μg/m³ [1]						
		X	Y			1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.003	0.003	0.004	0.015	0.002		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.004	0.004					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.003	0.003					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.004	0.004					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.023	0.023	0.032	0.083	0.020	0.014	0.011
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.028	0.030	0.037	0.049	0.024	0.018	0.013
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.032	0.035	0.038	0.060	0.026	0.020	0.015
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.031	0.034	0.038	0.062	0.027	0.020	0.016
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.028	0.032	0.046	0.070	0.030	0.022	0.017
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.023	0.025	0.039	0.064	0.023	0.017	0.013

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Maximum 24-hour RSP Concentration (With Project Scenario)

ASR ID	Description	Location		Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour RSP Concentration at different elevation of ASR in metre, μg/m³ [1]						
		X	Y			1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.04	0.03	0.10	0.50	0.03		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.04	0.04					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.02	0.03					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.05	0.05					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.09	0.08	0.59	1.64	0.35	0.07	0.04
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.08	0.10	0.46	0.57	0.28	0.15	0.06
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.08	0.08	0.10	2.40	0.08	0.05	0.03
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.09	0.10	0.16	2.01	0.15	0.10	0.08
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.11	0.13	0.46	2.10	0.23	0.17	0.11
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.10	0.12	0.50	1.86	0.15	0.11	0.08

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Annual Averaged RSP Concentration (With Project Scenario)

ASR ID	Description	Location		Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged RSP Concentration at different elevation of ASR in metre, μg/m³ [1]						
		X	Y			1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.003	0.003	0.003	0.007	0.002		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.004	0.004					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.003	0.003					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.004	0.004					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.021	0.017	0.016	0.031	0.012	0.007	0.005
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.017	0.017	0.018	0.021	0.012	0.008	0.006
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.017	0.017	0.017	0.025	0.012	0.009	0.007
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.015	0.016	0.016	0.024	0.012	0.009	0.007
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.013	0.014	0.018	0.026	0.012	0.009	0.007
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.010	0.011	0.015	0.024	0.010	0.007	0.005

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Change in Maximum 24-hour RSP Concentration (With Project Scenario against Base Case)

ASR ID	Description	Location		Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour RSP Concentration at different elevation of ASR in metre, μg/m³ [1]						
		X	Y			1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	-0.06	-0.06	-0.19	-1.05	-0.04		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	-0.06	-0.06					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	-0.03	-0.05					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	-0.08	-0.08					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-0.12	-0.13	-1.22	-3.46	-0.71	-0.14	-0.07
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-0.14	-0.18	-0.91	-1.13	-0.55	-0.30	-0.11
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-0.13	-0.13	-0.18	-5.06	-0.11	-0.09	-0.06
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-0.16	-0.19	-0.26	-4.22	-0.27	-0.20	-0.17
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-0.22	-0.24	-0.95	-4.43	-0.43	-0.31	-0.19
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-0.21	-0.23	-1.04	-3.93	-0.30	-0.20	-0.17

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Change in Annual Averaged RSP Concentration (With Project Scenario against Base Case)

ASR ID	Description	Location		Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged RSP Concentration at different elevation of ASR in metre, μg/m³ [1]						
		X	Y			1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.000	0.000	-0.001	-0.008	0.000		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.000	0.000					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.000	0.000					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.000	0.000					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-0.001	-0.006	-0.016	-0.051	-0.008	-0.007	-0.005
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-0.011	-0.013	-0.019	-0.027	-0.012	-0.009	-0.007
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-0.015	-0.018	-0.021	-0.035	-0.014	-0.011	-0.009
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-0.016	-0.019	-0.021	-0.037	-0.015	-0.012	-0.009
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-0.015	-0.018	-0.028	-0.044	-0.017	-0.013	-0.010
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-0.013	-0.014	-0.023	-0.040	-0.013	-0.010	-0.008

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Air Quality Impact Assessment Results

Maximum 24-hour FSP Concentration (Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour FSP Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.10	0.10	0.28	1.55	0.08		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.09	0.09					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.05	0.09					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.13	0.13					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.21	0.21	1.81	5.10	1.06	0.22	0.11
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.22	0.28	1.37	1.70	0.83	0.45	0.17
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.21	0.22	0.28	7.47	0.18	0.13	0.10
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.25	0.29	0.41	6.22	0.42	0.31	0.25
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.33	0.37	1.41	6.53	0.66	0.48	0.29
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.31	0.35	1.54	5.79	0.45	0.31	0.25

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Annual Averaged FSP Concentration (Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged FSP Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.003	0.003	0.004	0.015	0.002		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.004	0.004					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.003	0.003					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.004	0.004					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.023	0.023	0.032	0.083	0.020	0.014	0.011
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.028	0.030	0.037	0.049	0.024	0.018	0.013
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.032	0.035	0.038	0.060	0.026	0.020	0.015
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.031	0.034	0.038	0.062	0.027	0.020	0.016
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.028	0.032	0.046	0.070	0.030	0.022	0.017
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.023	0.025	0.039	0.064	0.023	0.017	0.013

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Maximum 24-hour FSP Concentration (With Project Scenario)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour FSP Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.04	0.03	0.10	0.50	0.03		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.04	0.04					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.02	0.03					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.05	0.05					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.09	0.08	0.59	1.64	0.35	0.07	0.04
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.08	0.10	0.46	0.57	0.28	0.15	0.06
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.08	0.08	0.10	2.40	0.08	0.05	0.03
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.09	0.10	0.16	2.00	0.15	0.10	0.08
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.11	0.13	0.46	2.10	0.23	0.17	0.11
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.10	0.12	0.50	1.86	0.15	0.11	0.08

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Annual Averaged FSP Concentration (With Project Scenario)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged FSP Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.003	0.003	0.003	0.007	0.002		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.004	0.004					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.003	0.003					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.004	0.004					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.020	0.016	0.016	0.031	0.012	0.007	0.005
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.016	0.016	0.017	0.021	0.012	0.008	0.006
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.016	0.017	0.017	0.024	0.012	0.009	0.007
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.015	0.016	0.016	0.024	0.012	0.009	0.007
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.013	0.014	0.018	0.026	0.012	0.009	0.007
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.010	0.011	0.015	0.024	0.010	0.007	0.005

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Change in Maximum 24-hour FSP Concentration (With Project Scenario against Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour FSP Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	-0.06	-0.06	-0.19	-1.05	-0.04		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	-0.06	-0.06					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	-0.03	-0.05					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	-0.08	-0.08					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-0.12	-0.13	-1.22	-3.46	-0.71	-0.14	-0.07
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-0.14	-0.18	-0.91	-1.13	-0.55	-0.30	-0.11
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-0.13	-0.14	-0.18	-5.06	-0.11	-0.09	-0.06
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-0.16	-0.19	-0.26	-4.22	-0.27	-0.20	-0.17
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-0.22	-0.24	-0.95	-4.43	-0.43	-0.31	-0.19
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-0.21	-0.23	-1.04	-3.93	-0.30	-0.20	-0.17

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Change in Annual Averaged FSP Concentration (With Project Scenario against Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Averaged FSP Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.000	0.000	-0.001	-0.008	0.000		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.000	0.000					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.000	0.000					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.000	0.000					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-0.002	-0.007	-0.017	-0.051	-0.008	-0.007	-0.005
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-0.011	-0.014	-0.020	-0.027	-0.012	-0.009	-0.007
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-0.016	-0.018	-0.021	-0.036	-0.014	-0.011	-0.009
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-0.017	-0.019	-0.021	-0.038	-0.015	-0.012	-0.009
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-0.016	-0.018	-0.028	-0.044	-0.017	-0.013	-0.010
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-0.013	-0.014	-0.024	-0.040	-0.013	-0.010	-0.008

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Air Quality Impact Assessment Results

Maximum 10-Minute SO_2 Concentration (Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 10-minute SO_2 Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	17	17	47	277	13		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	15	15					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	9	13					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	23	22					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	61	64	321	861	178	39	29
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	56	63	208	274	132	74	29
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	52	61	80	1236	54	39	28
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	60	63	66	1047	69	54	44
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	57	64	250	1092	114	81	50
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	63	63	255	968	79	51	45

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Maximum 24-hour SO_2 Concentration (Base Case)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour SO2 Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.5	0.5	1.5	8.1	0.4		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.5	0.5					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.3	0.5					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.7	0.7					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	1.1	1.1	9.4	26.6	5.5	1.1	0.6
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	1.1	1.4	7.1	8.8	4.3	2.3	0.9
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	1.1	1.1	1.4	38.9	0.9	0.7	0.5
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	1.3	1.5	2.1	32.4	2.1	1.6	1.3
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	1.7	1.9	7.3	34.0	3.4	2.5	1.5
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	1.6	1.8	8.0	30.2	2.3	1.6	1.3

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Maximum 10-Minute SO_2 Concentration (With Project Scenario)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 10-minute SO_2 Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	6	5	15	89	4		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	5	5					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	3	4					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	7	7					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	19	21	103	276	58	13	10
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	18	20	67	88	42	24	9
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	17	20	26	396	17	13	9
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	19	20	21	335	22	17	14
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	18	20	80	350	36	26	16
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	20	20	81	310	25	16	14

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Maximum 24-hour SO_2 Concentration (With Project Scenario)

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour SO2 Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.2	0.2	0.5	2.6	0.1		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.2	0.2					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.1	0.1					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.2	0.2					
P1	Proposed Columbarium at Siu Ho Wan	817902	819678	1.5	27	0.4	0.4	3.0	8.5	1.8	0.4	0.2
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.4	0.5	2.4	3.0	1.5	0.8	0.3
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.4	0.4	0.5	12.5	0.4	0.2	0.2
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.4	0.5	0.8	10.4	0.8	0.5	0.4
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.6	0.6	2.4	10.9	1.1	0.8	0.5
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.5	0.6	2.6	9.7	0.8	0.6	0.4

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.

Change in Maximum 10-Minute SO_2 Concentration (With Project Scenario against Base Case)

ASR ID	Background concentrations of HF are not available. Values presented refer to the	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 10-minute SO_2 Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	-12	-11	-32	-188	-9		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	-10	-10					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	-6	-9					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	-15	-15					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-41	-44	-219	-585	-120	-26	-20
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-38	-43	-141	-186	-89	-50	-19
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-35	-42	-54	-840	-37	-26	-19
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-41	-43	-45	-712	-47	-37	-30
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-39	-43	-170	-742	-77	-55	-34
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-43	-43	-173	-658	-54	-34	-30

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Change in Maximum 24-Hour SO_2 Concentration (With Project Scenario against Base Case)

ASR ID	Background concentrations of HF are not available. Values presented refer to the	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum 24-hour SO_2 Concentration at different elevation of ASR in metre, μg/m³ [1] 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	-0.3	-0.3	-1.0	-5.5	-0.3		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	-0.3	-0.3					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	-0.2	-0.3					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	-0.5	-0.4					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	-0.7	-0.7	-6.4	-18.1	-3.7	-0.7	-0.4
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	-0.7	-1.0	-4.7	-5.8	-2.9	-1.6	-0.6
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	-0.7	-0.7	-0.9	-26.4	-0.6	-0.4	-0.3
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	-0.9	-1.0	-1.3	-22.0	-1.3	-1.1	-0.9
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	-1.2	-1.3	-4.9	-23.1	-2.3	-1.6	-1.0
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	-1.1	-1.2	-5.4	-20.5	-1.5	-1.1	-0.9

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Values indicate contribution from project (NLTS and GTWTF) only.
[4] Negative value indicates contribution from NLTS/GTWTF under With Project Scenario is lower than Base Case

Air Quality Impact Assessment Results

Maximum 1-hour HCl Concentration

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum HCl Concentration at different elevation of ASR in metre (ug/m^3) 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	4.1	4.7	8.8	15.6	22.1		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	4.9	5.0					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	5.2	5.2					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	3.6	4.6					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	2.4	2.4	2.5	2.8	6.5	13.4	18.6
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	2.3	2.3	2.4	2.8	6.4	14.1	18.5
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	2.1	2.1	2.2	2.6	5.8	12.4	17.4
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	2.1	2.1	2.1	2.7	5.8	11.8	15.2
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	2.0	2.0	2.0	2.5	5.9	12.0	16.3
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	1.8	1.9	1.9	2.4	5.4	11.5	15.5
Air Quality Standard						2100						

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Background concentrations of HCl are not available. Values presented refer to the contribution from ORRC1 and GTWTF.

Annual HCl Concentration

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual HCl Concentration at different elevation of ASR in metre (ug/m^3) 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.10	0.14	0.28	0.55	0.95		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.35	0.36					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.29	0.30					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.22	0.30					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.17	0.17	0.17	0.18	0.22	0.26	0.29
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.16	0.16	0.16	0.18	0.20	0.24	0.27
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.16	0.15	0.16	0.17	0.19	0.23	0.25
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.15	0.14	0.15	0.15	0.18	0.22	0.25
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.13	0.13	0.13	0.14	0.17	0.20	0.24
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.12	0.12	0.12	0.13	0.15	0.19	0.22
Air Quality Standard						20						

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Background concentrations of HCl are not available. Values presented refer to the contribution from ORRC1 and GTWTF.

Maximum 1-hour HF Concentration

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum HF Concentration at different elevation of ASR in metre (ug/m^3) 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.4	0.5	0.9	1.6	2.2		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.5	0.5					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.5	0.5					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.4	0.5					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.2	0.2	0.2	0.3	0.7	1.3	1.9
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.2	0.2	0.2	0.3	0.6	1.4	1.9
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.2	0.2	0.2	0.3	0.6	1.2	1.7
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.2	0.2	0.2	0.3	0.6	1.2	1.5
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.2	0.2	0.2	0.3	0.6	1.2	1.6
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.2	0.2	0.2	0.2	0.5	1.2	1.5
Air Quality Standard						240						

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Background concentrations of HF are not available. Values presented refer to the contribution from ORRC1 and GTWTF.

Annual HF Concentration

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual HF Concentration at different elevation of ASR in metre (ug/m^3) 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.01	0.01	0.03	0.05	0.09		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.04	0.04					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.03	0.03					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.02	0.03					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.02	0.02	0.02	0.02	0.02	0.03	0.03
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.02	0.02	0.02	0.02	0.02	0.02	0.03
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.02	0.02	0.02	0.02	0.02	0.02	0.03
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.01	0.01	0.01	0.02	0.02	0.02	0.02
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.01	0.01	0.01	0.01	0.02	0.02	0.02
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Air Quality Standard						14						

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Background concentrations of HF are not available. Values presented refer to the contribution from ORRC1 and GTWTF.

Maximum 30-minute Formaldehyde Concentration

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum Formaldehyde Concentration at different elevation of ASR in metre (ug/m^3) 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	18	19	25	33	41		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	19	20					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	20	20					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	18	19					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	24	23	24	24	28	33	41
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	24	23	23	24	26	31	39
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	23	23	23	24	26	29	38
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	23	23	23	24	25	28	36
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	23	22	23	23	24	28	35
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	22	22	22	22	23	27	35
Air Quality Standard						100						

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Maximum short-term formaldehyde concentration recorded at EPD's Air Quality Monitoring Stations (13ug/m3) in 2016-2020 included as background in the cumulative concentrations

Annual Formaldehyde Concentration

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Annual Formaldehyde Concentration at different elevation of ASR in metre (ug/m^3) 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	4.6	4.6	4.9	5.3	6.0		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	5.1	5.2					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	5.0	5.0					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	4.8	4.9					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	5.5	5.4	5.5	5.6	5.7	6.0	6.3
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	5.4	5.4	5.4	5.5	5.6	5.8	6.1
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	5.3	5.3	5.3	5.4	5.5	5.6	5.9
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	5.2	5.2	5.2	5.3	5.4	5.5	5.7
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	5.2	5.1	5.1	5.2	5.2	5.4	5.6
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	5.1	5.1	5.1	5.1	5.1	5.3	5.4
Air Quality Standard						9						

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.
[3] Maximum annual formaldehyde concentration recorded at EPD's Air Quality Monitoring Stations (4.39ug/m3) in 2016-2020 included as background in the cumulative concentrations

Maximum 5-second Odour Concentration

ASR ID	Description	Location X	Location Y	Lowest Assessment Level (mAG)	Building Height (mAG)	Maximum Odour Concentration at different elevation of ASR in metre (OU) 1.5	5	10	15	20	25	30
A1	O-Park 1 Office	817795	819539	1.5	16	0.3	0.3	0.6	1.2	3.9		
A2	KMB Siu Ho Wan Depot	817858	819680	1.5	5	0.3	0.3					
A3	Citybus Siu Ho Wan Depot	817904	819678	1.5	5	0.3	0.3					
A4	Siu Ho Wan Vehicle Pound	817798	819601	1.5	5	0.2	0.3					
P1	Proposed Columbarium at Siu Ho Wan	817769	819934	1.5	27	0.4	0.4	0.4	0.4	4.2	1.2	1.2
P2	Proposed Columbarium at Siu Ho Wan	817783	819960	1.5	27	0.4	0.4	0.4	0.4	3.1	1.2	1.1
P3	Proposed Columbarium at Siu Ho Wan	817798	819987	1.5	27	0.4	0.4	0.4	0.4	0.9	1.2	1.3
P4	Proposed Columbarium at Siu Ho Wan	817812	820014	1.5	27	0.4	0.4	0.4	0.4	2.9	1.1	1.4
P5	Proposed Columbarium at Siu Ho Wan	817827	820040	1.5	27	0.3	0.3	0.3	0.9	4.8	1.0	1.1
P6	Proposed Columbarium at Siu Ho Wan	817841	820067	1.5	27	0.3	0.3	0.3	0.7	4.3	1.0	0.9

Note:
[1] Cells in grey colour mean that there is no ASR beyond that elevation.
[2] Roof level of proposed columbarium at Siu Ho Wan is 27m.

Appendix B

Aerial Photos for Land Contamination Assessment

1993

2000

2006

2012

2018