





**Odour Monitoring Report for Harbour Area  
Treatment Scheme Stage 2A  
(Operational Phase) (January 2022)**

Report No.: OT\_2022001

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## 1. Introduction

### 1.1. Background

1.1.1. Bestwise – Sun Fook Kong Joint Venture (the Contractors) appointed 3NV Technology Limited (3NV) to undertake the Odour Monitoring for the Operational Phase of the Harbour Area Treatment Scheme Stage 2A (hereafter referred to as “the Project”).

1.1.2. The Project is reference to Environmental Permit No. EP-322/2008/G issued on 9th May 2014 by the Environmental Protection Department (hereinafter called EPD) to the Drainage Services Department (hereinafter called the DSD) as the Permit Holder and the EM&A Manual for the HATS Stage 2A.

1.1.3. The odour measurement and odour patrol shall be conducted in the first five years upon commissioning of the expanded SCISTW. For the 1<sup>st</sup> year, odour monitoring shall be conducted every three months. For the 2<sup>nd</sup> to 5<sup>th</sup> year, if the monitoring results from the 1<sup>st</sup> year comply with the requirements stated in Section 2.38 and Section 2.41 of EM&A Manual, the frequency of the monitoring could be reduced to once every 6 months subject to EPD’s approval.

### 1.2. Objectives of the monitoring

1.2.1. The objective of odour patrol and odour measurement is to compare the result obtained from the operational phase with the baseline data at the designated points in order to determine the impact from the operation.

### 1.3. Objectives of the Report

1.3.1. The purpose of the odour monitoring report for the operational phase is to provide analysis and graphical presentation to determine if there are any changes of odour impacts with respect to the implementation of HATS Stage 2A.

## 2. Odour Patrol

### 2.1. Monitoring Requirement

2.1.1. An odour patrollist with at least 3 independent trained personnel / competent persons, will be provided to conduct the odour patrol work at 23 designated odour monitoring locations and at the site boundary of 8 PTW and the SCISTW. The patrollist will be “calibrated” with reference to European Standard Method: BS EN13725 to ensure the patrollist odour sensitivity within 20-80 ppb/V. The

Odour Certificates are shown in **Appendix B**.

- 2.1.2. The monitoring shall not be conducted on rainy days. Meteorological conditions including ambient temperature, relative humidity, wind speed and wind direction will be recorded with photo showing the sampling locations during each monitoring.
- 2.1.3. The independent trained personnel / competent persons shall:
- have their individual odour threshold of n-butanol in nitrogen gas in the range of 20 to 80 ppb/v required by the European Standard Method (EN 13725).
  - be at least 16 years of age and willing and able to follow instructions.
  - be free from any respiratory illnesses.
  - be engaged for a sufficient period to build up and monitor/detect at several monitoring location;
  - not be allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30 min before and during odour intensity analysis;
  - take great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics;
  - not communicate with each other about the results of their choices.

## **2.2. Monitoring Frequency**

- 2.2.1. Odour Patrol shall be conducted every three months for the first year of operation for 8 PTWs and expended SCISTW. The first odour monitoring shall be conducted within one month, after the operation of the upgraded PTWs and expended SCISTW. Subsequent odour monitoring shall be conducted at the 4th, 7th and 10th month.

## **2.3. Monitoring Location**

- 2.3.1. According to section 2.23 of the EM&A Manual, odour patrol monitoring will be conducted at the odour monitoring locations listed in **Table 2.1** and at the site boundary of 8 PTWs and SCISTW.
- 2.3.2. The layout of odour patrol monitoring locations is shown in **Appendix A**.

**Table 2.1 Odour Patrol Monitoring Locations**

ASR ID in EIA Report	Monitoring Station ID	Location
NP3	OM_NP1	King's Road Playground & Skating Area
NP4	OM_NP2	Customs HQ Tower (planned)
NP5	OM_NP3	K. Wah Centre
WC3	OM_WC1	Society for the Prevention of Cruelty to Animals
WC4	OM_WC2	Rest Garden near Wan Chai Interchange
C1	OM_C1	Sheung Wan Fire Station
C2	OM_C2	Water Front Divisional Police Station
C3	OM_C3	Sheung Wan Gala Point
FM2	OM_FM1	Western Wholesale Food Market
SB1	OM_SB1	University of Hong Kong Stanley Ho Sports Centre Pitch
SB2	OM_SB2	Home for the Elderly
SB3	OM_SB3	Maclehose Medical Rehabilitation Centre
SB4	OM_SB4	The Duchess of Kent Children's Hospital
CB1	OM_CB1	Cyber Centre
CB2	OM_CB2	Le Meridien Cyberport
WF2	OM_WF1	Wah Ming House, Wah Fu Estate
AB4	OM_AB1	Dairy Farm Ice and Cold Storage

ALC3	OM_ALC1	Shell Ap Lei Chau Depot
SCI1	OM_SCI1	Government Dockyard Offices
SCI3	OM_SCI2	COSCO Hit Terminal
SCI4	OM_SCI3	KMB Depot Office
SCI5	OM_SCI4	Planned FSD Diving Rescue and Diving Training Centre
SCI6	OM_SCI5	Club House

## 2.4. Monitoring Parameters

2.4.1. During the patrolling, the meteorological and surrounding information are recorded:

- the prevailing weather condition;
- the wind direction;
- the wind speed;
- location where odour is spotted;
- source of odour;
- perceived intensity of the odour;
- duration of odour; and
- characteristics of the odour detected
- some relevant meteorological data such as daily average temperature, and daily average humidity, on the day of odour patrol should be obtained from the nearest Hong Kong Observatory station for reference.

2.4.2. The perceived intensity is to be divided into 5 levels which are ranked in a descending order as shown in **Table 2.2**.

**Table 2.2 Description of Odour Intensity Levels**

Odour Level	Odour Intensity	Classification Criteria
0	Not detected	No odour perceives or an odour so weak that it cannot be easily characterised or described
1	Slight	Slight identifiable odour, and slight chance to have odour nuisance
2	Moderate	Moderate identifiable odour, and moderate chance to have odour nuisance
3	Strong	Strong identifiable, likely to have odour nuisance
4	Extreme	Extreme severe odour, and unacceptable odour level

### 3. Odour Patrol Monitoring Result

#### 3.1. Odour Intensity

3.1.1. The odour patrol monitoring result on 28<sup>th</sup> January 2022 is summarized in **Table 3.1**. The field record and photo record at the ASRs during the patrols are attached in **Appendix C**.

**Table 3.1 Summary of the Odour Patrol Results**

Monitoring Location	Odour Patrol Member		
	O-1	O-2	O-3
	Odour Intensity (0 to 4)		
OM_NP1	0	0	0
OM_NP2	0	0	0
OM_NP3	0	0	0
North Point PTW Boundary	1	1	1
OM_WC1	1	1	1
OM_WC2	0	0	0
Wan Chai East PTW Boundary	2	2	2



OM_C1	0	0	0
OM_C2	0	0	0
OM_C3	0	0	0
Central PTW Boundary	1	1	1
OM_FM1	0	0	0
OM_SB1	1	0	1
OM_SB2	0	0	0
OM_SB3	0	0	0
OM_SB4	0	0	0
Sandy Bay PTW Boundary	1	0	1
OM_CB1	1	1	1
OM_CB2	1	0	1
Cyberport PTW Boundary	0	0	0
OM_WF1	1	1	1
Wah Fu PTW Boundary	1	1	1
OM_AB1	0	0	0
Aberdeen PTW Boundary	1	1	1
OM_ALC1	0	0	0
Ap Lei Chau PTW Boundary	1	1	1
OM_SCI1	0	0	0
OM_SCI2	0	0	0
OM_SCI3	1	0	1
OM_SCI4	1	1	1
OM_SCI5	0	0	0
SCISTW Boundary Location A	0	0	0
SCISTW Boundary Location A1	1	1	1
SCISTW Boundary	2	2	1

Location B			
SCISTW Boundary Location C	2	2	1
SCISTW Boundary Location D	0	0	0

### 3.2. Meteorological Conditions

3.2.1. The meteorological conditions (including temperature, wind speed, wind direction, relative humidity) from the nearest Hong Kong Observatory's Weather Stations for each of the odour patrols were provided for reference in **Appendix D**.

### 3.3. Odour Patrol Result Discussion

3.3.1. Generally, the odour intensities detected around the SCISTW and PTWs were found to be ranging from level 0 up to level 2. Level 2 were recorded at three monitoring locations. With reference to Action / Limit Level as shown in **Table 3.2**, these three locations met the action level. However, at SCISTW Boundary Location B and SCISTW Boundary Location C, garbage odour was recorded and the nearby refuse transfer station was considered as the potential odour source. Hence, the exceedance at these two monitoring stations is concluded not-related to the project. For Wan Chai East PTW Boundary, odour was recorded occasionally with side wind and thus it is not a significant nuisance.

**Table 3.2 Action / Limit Levels of the Odour Patrol**

Parameter	Action	Limit
Odour Nuisance	Odour Intensity of 2 is measured from odour patrol	Odour Intensity of 3 or above is measured from odour patrol

3.3.2. By comparing our impact monitoring data with the baseline monitoring data, generally, there are no significant difference between two sets of data. A summary table are shown in **Table 3.3**.

**Table 3.3 Comparison between Baseline Data and Impact Data of Odour Patrol**

Monitoring Location	Operational Phase Baseline*	Operational Phase Impact#
	Odour Intensity (0 to 4)	
OM_NP1	0	0
OM_NP2	0	0
OM_NP3	0	0
North Point PTW Boundary	0	1
OM_WC1	0	1
OM_WC2	0	0
Wan Chai East PTW Boundary	0	2
OM_C1	0	0
OM_C2	0	0
OM_C3	0	0
Central PTW Boundary	0	1
OM_FM1	0	0
OM_SB1	0	1
OM_SB2	0	0
OM_SB3	0	0
OM_SB4	0	0
Sandy Bay PTW Boundary	0	1
OM_CB1	0	1
OM_CB2	0	1
Cyberport PTW Boundary	0	0
OM_WF1	0	1
Wah Fu PTW Boundary	0	1
OM_AB1	0	0
Aberdeen PTW Boundary	0	1
OM_ALC1	0	0
Ap Lei Chau PTW Boundary	0	1

OM_SCI1	0	0
OM_SCI2	0	0
OM_SCI3	1	1
OM_SCI4	0	1
OM_SCI5	0	0
SCISTW Boundary Location A	1	0
SCISTW Boundary Location A1	1	1
SCISTW Boundary Location B	2	2
SCISTW Boundary Location C	3	2
SCISTW Boundary Location D	1	0

Remark(s):

1. \* The Largest Data throughout the baseline period are extracted.
2. # The Largest Data among the three Odour Patrol Member are extracted.

#### 4. Summary of Odour Patrol Result

##### 4.1. Conclusion

- 4.1.1. In general, the odour patrol result is similar with the baseline data. There were three action level exceedances recorded but they are considered as not significant and non-project related.

##### 4.2. Recommendations

- 4.2.1. With the odour patrol result, it is recommended to take more attention on Wan Chai East PTW and implement more mitigation measures if necessary to better manage the odour from Wan Chai East PTW.

##### 4.3. Exceedance

- 4.3.1. There were three action level exceedances recorded at Wan Chai East PTW Boundary, SCISTW Boundary Location B and SCISTW Boundary Location C.
- 4.3.2. **Table 4.1** shown the Event/Action Plan for Operation Air Quality Monitoring.

**Table 4.1 Event/Action Plan for Operation Air Quality Monitoring**

Event	Action	
	Person-in-charge of Odour Monitoring	DSD
<b>Action Level</b>		
Exceedance of action level	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance;</li> <li>2. Repeat odour patrol to confirm finding;</li> <li>3. Repeat odour measurement at exhaust stacks of deodorization system of SCISTW (if exceedance at SCISTW) to confirm finding</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance.</li> <li>2. Investigation shall be completed within 2 week;</li> <li>3. Implement more mitigation measures if necessary.</li> </ol>
<b>Limit Level</b>		
Exceedance of Limit level	<ol style="list-style-type: none"> <li>1. Identify source / reason of exceedance;</li> <li>2. Repeat odour patrol to confirm finding;</li> <li>3. Repeat odour measurement at exhaust stacks of deodorization system of SCISTW (if exceedance at SCISTW) to confirm finding</li> <li>4. Increase monitoring frequency to monthly;</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 week;</li> <li>2. Rectify any unacceptable practice;</li> <li>3. Formulate remedial actions;</li> <li>4. Ensure amended working methods and remedial actions properly implemented;</li> </ol>

	5. If exceedance stops, cease additional monitoring.	5. If exceedance continues, consider what mitigation measures shall be implemented.
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4.3.3. According to the event and action plan, the reason/ source should be first identified. With reference to on-site observation, the odour characteristics and potential odour source of Wan Chai East PTW Boundary, SCISTW Boundary Location B and SCISTW Boundary Location C are listed in **Table 4.2**.

**Table 4.2 On-site Observation**

Location ID	On-Site Observation	
	Odour Characteristics	Potential Odour Source
Wan Chai East PTW Boundary	Sewage	Wan Chai East PTW
SCISTW Boundary Location B	Garbage	Refuse Collection Vehicle/ Roadside
SCISTW Boundary Location C	Garbage	West Kowloon Refuse Transfer Station

4.3.4. SCISTW Boundary Location B and SCISTW Boundary Location C are located near the West Kowloon Refuse Transfer Station. The potential odour source is mainly related to the station and the refuse collection vehicles. The action level exceedance at SCISTW Boundary Location B and SCISTW Boundary Location C are non-project related. For Wan Chai East PTW Boundary, odour was recorded occasionally with side wind and thus it is not a significant nuisance.

4.3.5. To confirm the findings and conclusion, odour patrol at these three locations is proposed to be repeated in February 2022. However, with the outbreak of COVID-19 on late January, conducting odour patrol without wearing a mask in public areas is a risk of infection and thus it is proposed to be repeated the odour patrol until the pandemic becomes more stable. The fifth wave of epidemic was last for over two months from late January to late April. Therefore, the repeating of odour patrol for confirmation of exceedance findings is not willing to perform before the regular odour monitoring in April 2022.

## 5. Odour Measurement

### 5.1. Monitoring Requirement

5.1.1. Air samples will be collected by passive sampling technique at the odour monitoring station. A Nalophan™ sampling bag will be placed inside an air-tight sampler and then drawn to vacuum for sampling. Approximately 60 litres of the gas sample is collected into the sampling bag for testing. A diagram of the passive sampling equipment that will be used for the sampling is shown below:



Figure 1: Passive Sampler

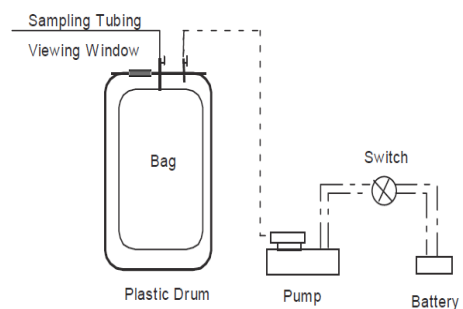


Figure 2: A Schematic Diagram of Sampling Device

- 5.1.2. Air samples in Nalophane bags shall be kept in cool condition not under direct sunlight exposure during the collection. If any condensate is observed on the inner surface of the sampled bag, the sample shall be discarded.
- 5.1.3. All samples collected during the sampling day shall be returned to laboratory at the same day. All olfactometry testing shall be conducted and finished within 24 hours after sampling.
- 5.1.4. The selected laboratory is the only local laboratory that is accredited by HOKLAS for the measurement of odour concentration following the European Standard Method BS EN13725:2003 (by dynamic olfactometry). The Reporting Limit for the Olfactometry Analysis is 11 OUE/m<sup>3</sup>.
- Odour concentration of the sample is determined by Forced-choice Dynamic Olfactometer in accordance to European Standard Method: BS EN13725:2003.
  - Testing should be performed by five qualified panellists who have been trained and complied with the requirement of the European Standard Method: BS EN13725:2003 in the range of 20 to 80 ppb/v and a standard deviation of  $R < 2.3$ .

- Testing shall be started immediately after sample receipt and all testing to be completed with 24 hours after sampling.
- 5.1.5. The odour concentration is measured by determining the dilution factor required to reach the detection threshold. The odour concentration at the detection threshold is by definition 1 OUE/m<sup>3</sup>. The odour concentration is then expressed in terms of multiples of the detection threshold



Figure 3: Olfactory Laboratory with Scentroid™ SS600 Olfactometer

- 5.1.6. During each odour sampling day, one blank sample should be collected for quality control. The sample will be taken by purging pure nitrogen gas into the odour bag directly on site as a blank sample.
- 5.1.7. All equipment for odour measurement and analysis are maintained and calibrated in according to the requirement of the European Standard Method EN13725.
- 5.2. Monitoring Frequency**
- 5.2.1. Odour measurement shall be conducted every three months for the first year of operation for the expanded SCISTW. The first odour measurement shall be conducted within one month after operation of the expanded SCISTW. Subsequent odour measurement shall be conducted at the 4th, 7th and 10th month.
- 5.3. Monitoring Location**
- 5.3.1. According to section 2.36 of the EM&A Manual, odour measurement will be conducted at 15 exhaust stacks of the deodorization system at SCISTW. The odour measurement locations are listed in **Table 5.1**. As suggested by the



contractor, the location ID is renamed to better identify the deodorization unit which is different from that on the detailed reporting requirement of odour monitoring report.

- 5.3.2. The layout of odour monitoring locations for odour measurement is shown in **Appendix E**.

**Table 5.1 Odour Monitoring Locations for Odour Measurement**

Location Point
DOU 1-R <sup>(1)</sup>
DOU 1-PS <sup>(2)</sup>
DOU 1B-1
DOU 1B-2
DOU 2-PS <sup>(3)</sup>
DOU 3
DOU 4-PS <sup>(4)</sup>
DOU 5-PS <sup>(5)</sup>
DOU 6
DOU 6A
DOU 6B
DOU 8-1
DOU 8-2
DOU 9-1
DOU 9-2

Notes:

- (1) Replace DOU 4-2 stated in Detailed Reporting Requirement of Odour Monitoring Report (Renaming to distinguish the source of odour is different from that of DOU4)
- (2) Replace DOU 1 stated in Detailed Reporting Requirement of Odour Monitoring Report (A polishing stage (PS) is added after the treatment of DOU 1 to enhance odour treatment performance)
- (3) Replace DOU 2 stated in Detailed Reporting Requirement of Odour Monitoring Report (A polishing stage (PS) is added after the treatment of DOU 2 to enhance odour treatment performance)
- (4) Replace DOU 4 stated in Detailed Reporting Requirement (A polishing stage (PS) is added after the treatment of DOU 4 to enhance odour treatment performance)
- (5) Replace DOU 5 stated in Detailed Reporting Requirement (A polishing stage (PS) is added after the treatment of DOU 5 to enhance odour treatment performance)

#### **5.4. Monitoring Parameter**

- 5.4.1. During sampling, following items will be recorded:

- ambient temperature;
- relative humidity;
- wind speed; and

- wind direction
- photo showing the sampling locations relative to existing land features

## 6. Odour Measurement Result

### 6.1. Odour Concentration and Odour Emission Rate

6.1.1. The odour measurement was conducted on 28<sup>th</sup> January 2022. The detail of location photo is shown in **Appendix E**.

6.1.2. The odour emission rate is listed in **Table 6.1**. The total odour emission rate is calculated to be 44,101 ou/s. **Appendix F** shown the detail monitoring results for each monitoring location.

**Table 6.1 Summary of Odour Emission Rate**

Location ID	Odour Emission Rate (ou/s)
DOU 1-R	201
DOU 1-PS	2,849
DOU 1B-1	42
DOU 1B-2*	N/A
DOU 2-PS	169
DOU 3	21,776
DOU 4-PS	496
DOU 5-PS	108
DOU 6	7,189
DOU 6A	4,396
DOU 6B	3,932
DOU 8-1	2,200
DOU 8-2*	N/A
DOU 9-1	97
DOU 9-2	646

Remark (s):

1. \* The exhaust stacks were in standby mode on the sampling day with information provided by DSD

### 6.2. Odour Measurement Result Discussion

6.2.1. The total odour emission rate presented in EIA Report Table 3.14 are given in **Appendix G**, the design total mitigated odour emission rate is 11,506.21 ou/s for Option 2 – Decentralized Design.

6.2.2. Comparison between impact monitoring data and data obtained from EIA is shown in **Table 6.2**.

**Table 6.2 Comparison between Impact Monitoring Data and Data Obtained from EIA**

Total Odour Emission Rate (ou/s)	
Operation Phase Impact	EIA
44,101	11,506.21

6.2.3. According to Table 2.3 of EM&A Manual, the Action / Limit Level is shown in **Table 6.3**.

**Table 6.3 Action / Limit Levels of the Odour Measurement**

Parameter	Action	Limit
Odour Nuisance	Measured total odour emission rate from exhaust stacks of deodorization system at SCSITW $\geq$ 0.9 x Total mitigated odour emission rate	Measured total odour emission rate from exhaust stacks of deodorization system at SCISTW $\geq$ Total mitigated odour emission rate

## 7. Summary of Odour Measurement

### 7.1. Conclusion

7.1.1. The impact total odour emission rate is still greater than the total mitigated odour emission rate presented in the EIA report. A limit level exceedance is recorded.

### 7.2. Recommendation

7.2.1. By consider the odour measurement result, it is recommended to investigate the root cause of the deviation between mitigated odour emission rate presented in EIA and the monitoring data.

### 7.3. Exceedance

- 7.3.1. There was one limit level exceedance recorded during January 2022. With reference to **Table 4.1**, the reasons and sources are first investigated.
- 7.3.2. Investigation had been completed by DSD immediately to identify the source/reason of exceedance. The following summarized the justification:
- Based on the odour sampling results, the odour emissions were mainly come from deodorization units DOU 3, DOU 6, DOU 6A and DOU 6B with odour concentration 1291, 608, 470 and 387 OU/m<sup>3</sup> respectively. However, the measurements of H<sub>2</sub>S by the sensors at the emission stack of these deodorization units at the sampling time were 0.11ppm, 0.00ppm, 0.00ppm and 0.00ppm respectively.
  - According to Section 5.1 of the Environmental Guidance Note for Sewage Pumping Stations which is not a Designated Project issued by EPD, the equivalent detection threshold criterion (1 odour unit) of Hydrogen Sulphide (H<sub>2</sub>S) concentration is equivalent to 0.00047ppm by volume. Hence, the converted odour units for DOU 3, DOU 6, DOU 6A and DOU 6B based on the H<sub>2</sub>S measurement were calculated to be 234 OU/m<sup>3</sup>, <21 OU/m<sup>3</sup>, <21 OU/m<sup>3</sup> and <21 OU/m<sup>3</sup> respectively. Hence, from the H<sub>2</sub>S measurement data, the performance of deodorization units was in normal condition.
  - With limited information, it is difficult to make conclusion on the reason of odour measurement exceedance. It was suggested to carry out further monitoring to review the results and increase the monitoring frequency to monthly according to Table 2.5 of the EM&A Manual. However, the 5th wave of the COVID-19 pandemic in Hong Kong was very severe in February and March 2022. There were substantial risks of infection of COVID-19 during the odour patrol and odour measurement by smelling the gas from sewage treatment plant. Hence, the monthly odour monitoring in February and March 2022 was cancelled. The odour monitoring was resumed in April 2022 and the results will be further reviewed.
- 7.3.3. To further confirm the performance of deodorization device, it is recommended to counter check the H<sub>2</sub>S reading of the in-house sensors and portable equipment in order to provide more information on determination of odour exceedance reason in the next monitoring.

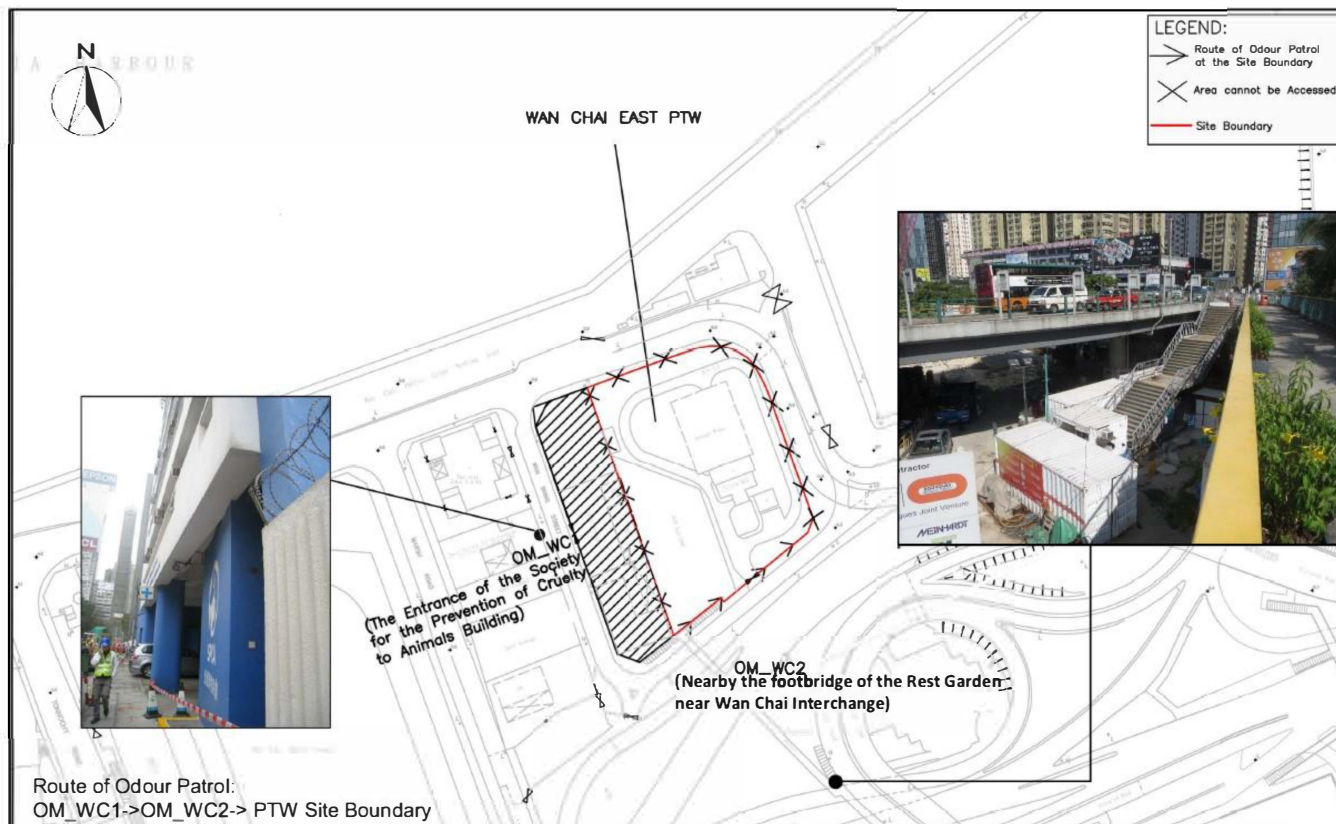
- End of Report -

## **Appendix A**

### **Odour Patrol Monitoring Locations**

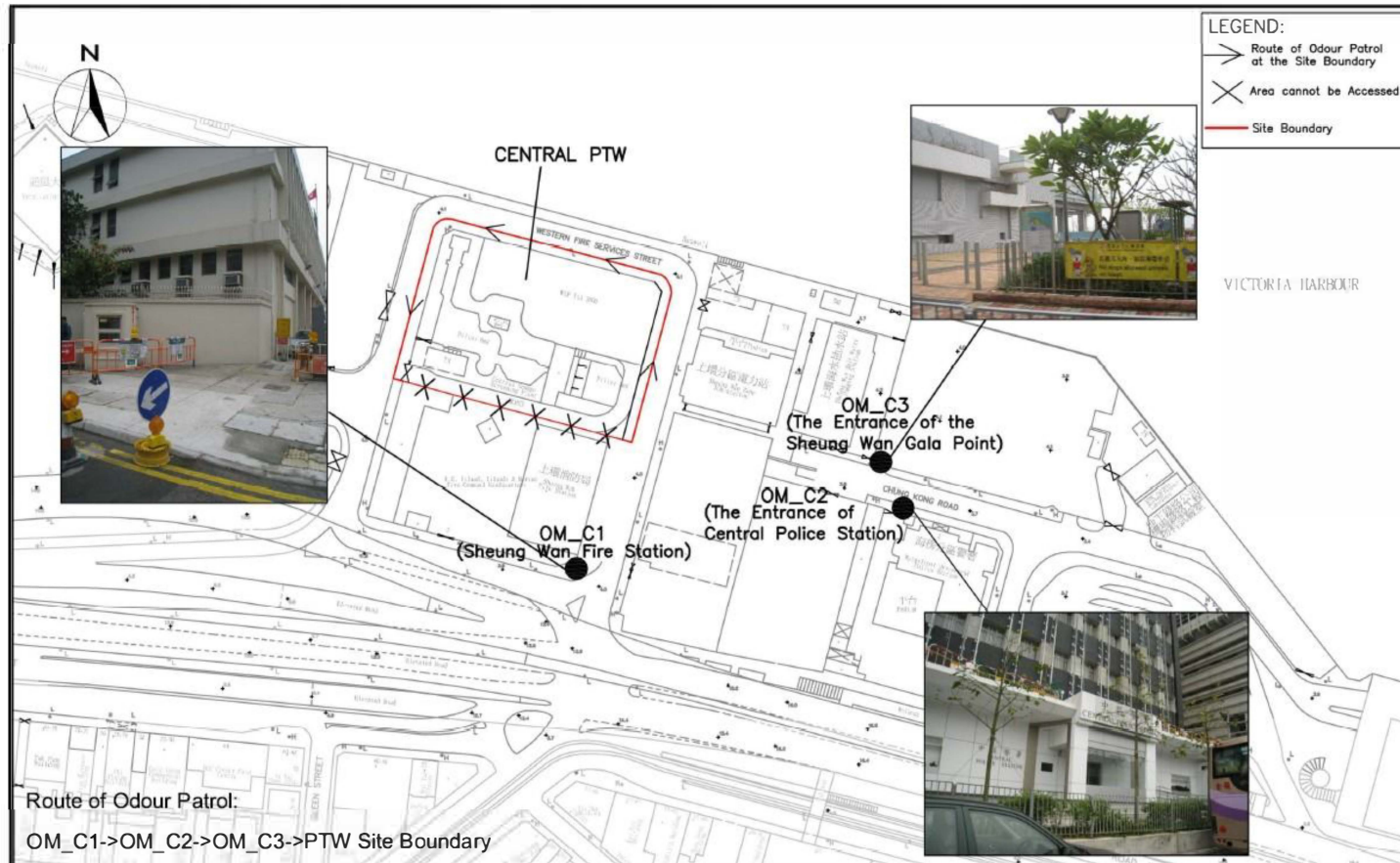


North Point PTW



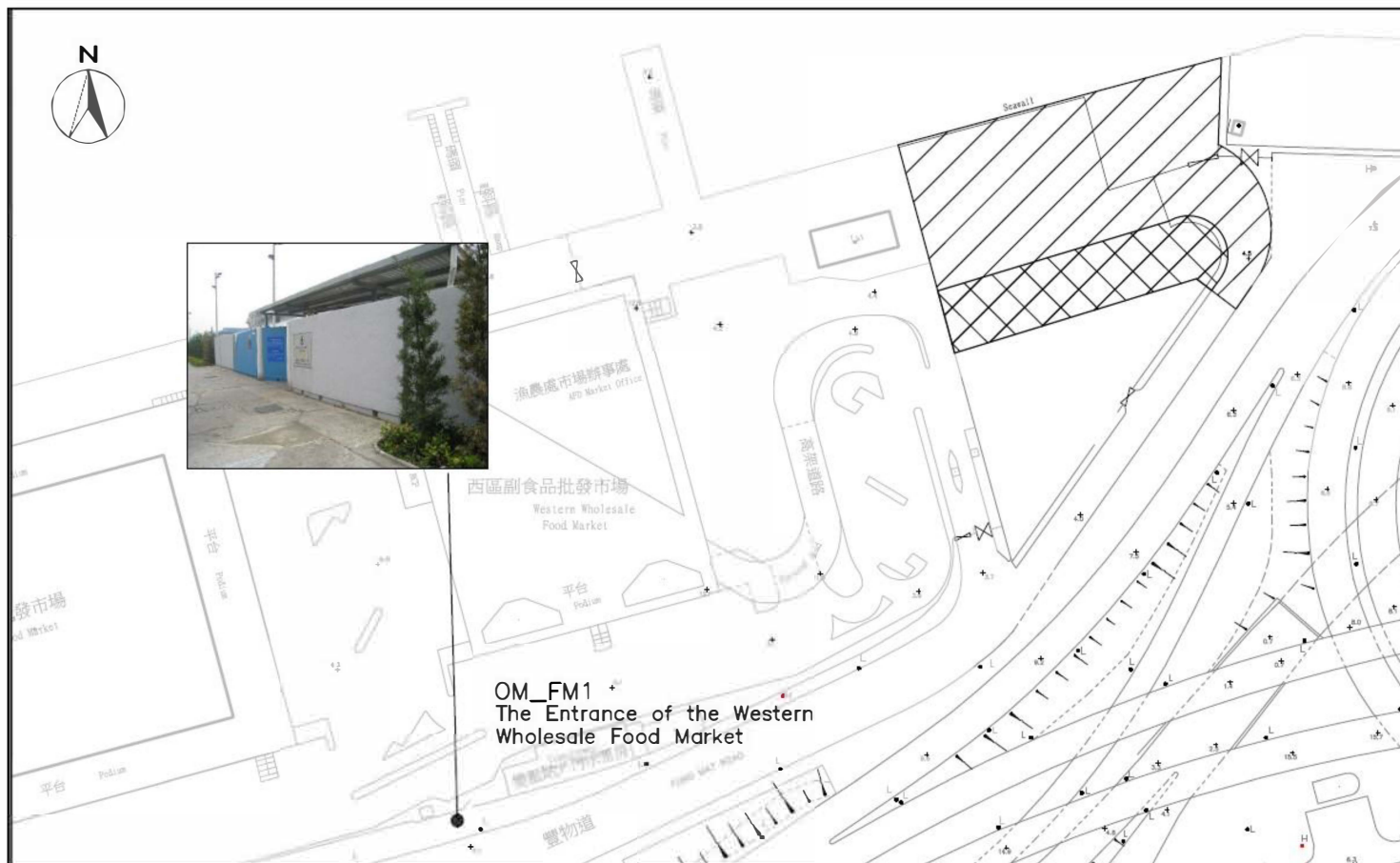
Wan Chai East PTW

# Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2022)

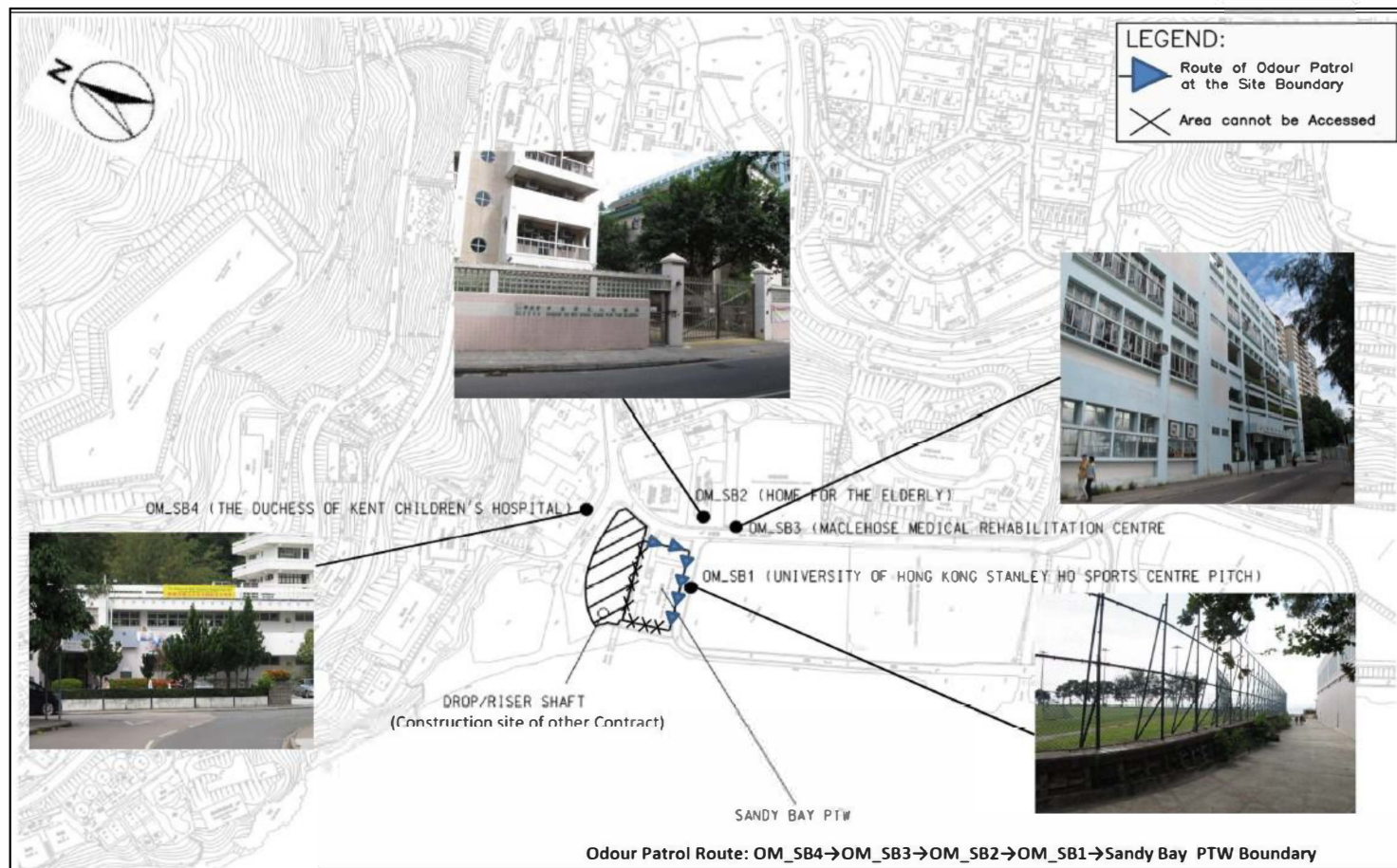


Central PTW

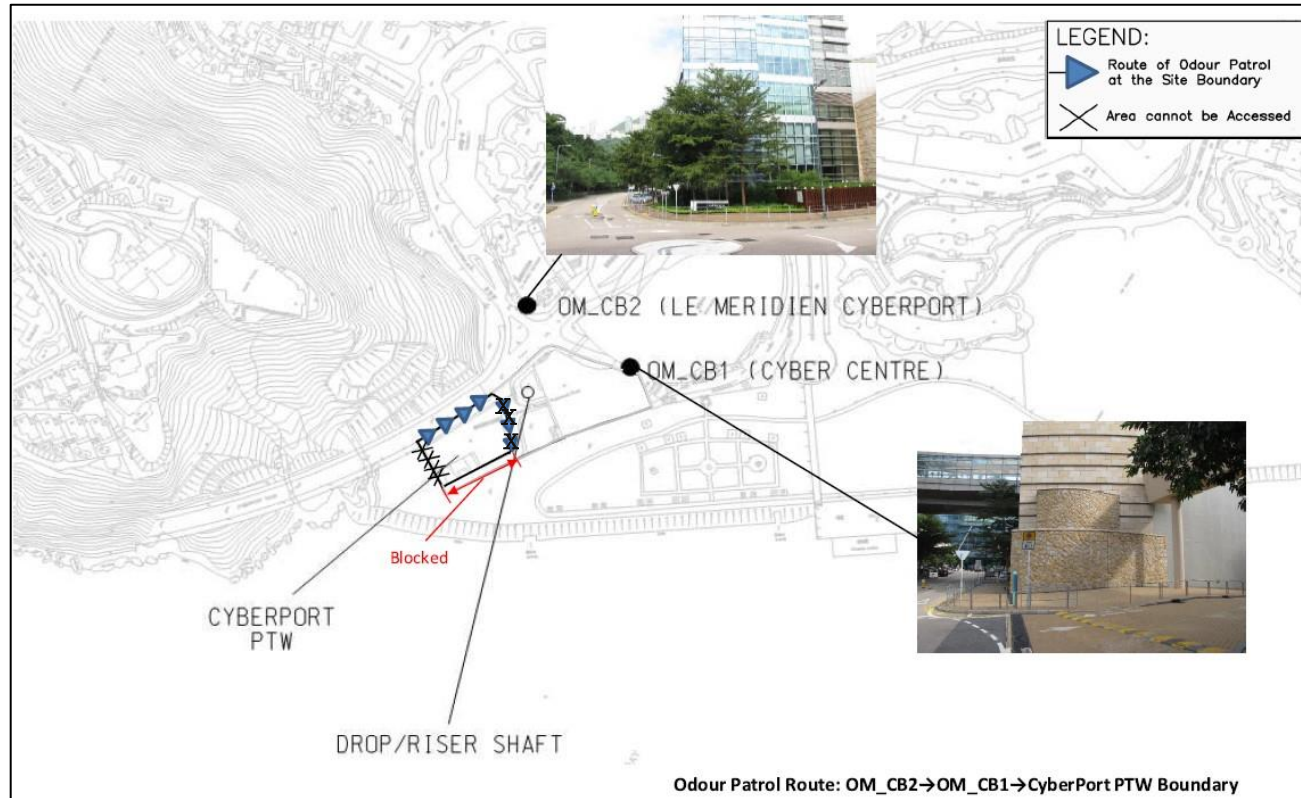




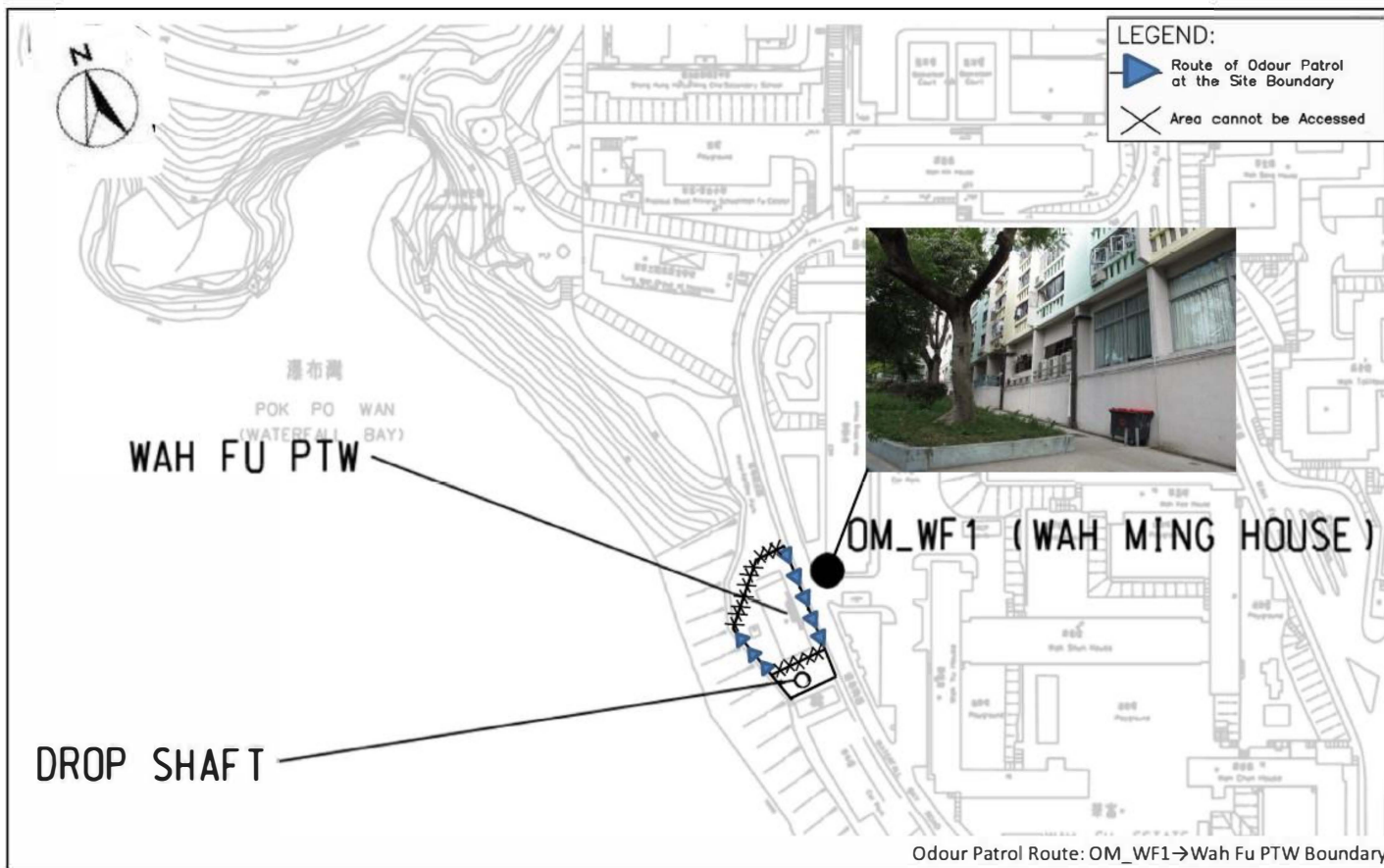
Western Wholesale Food Market



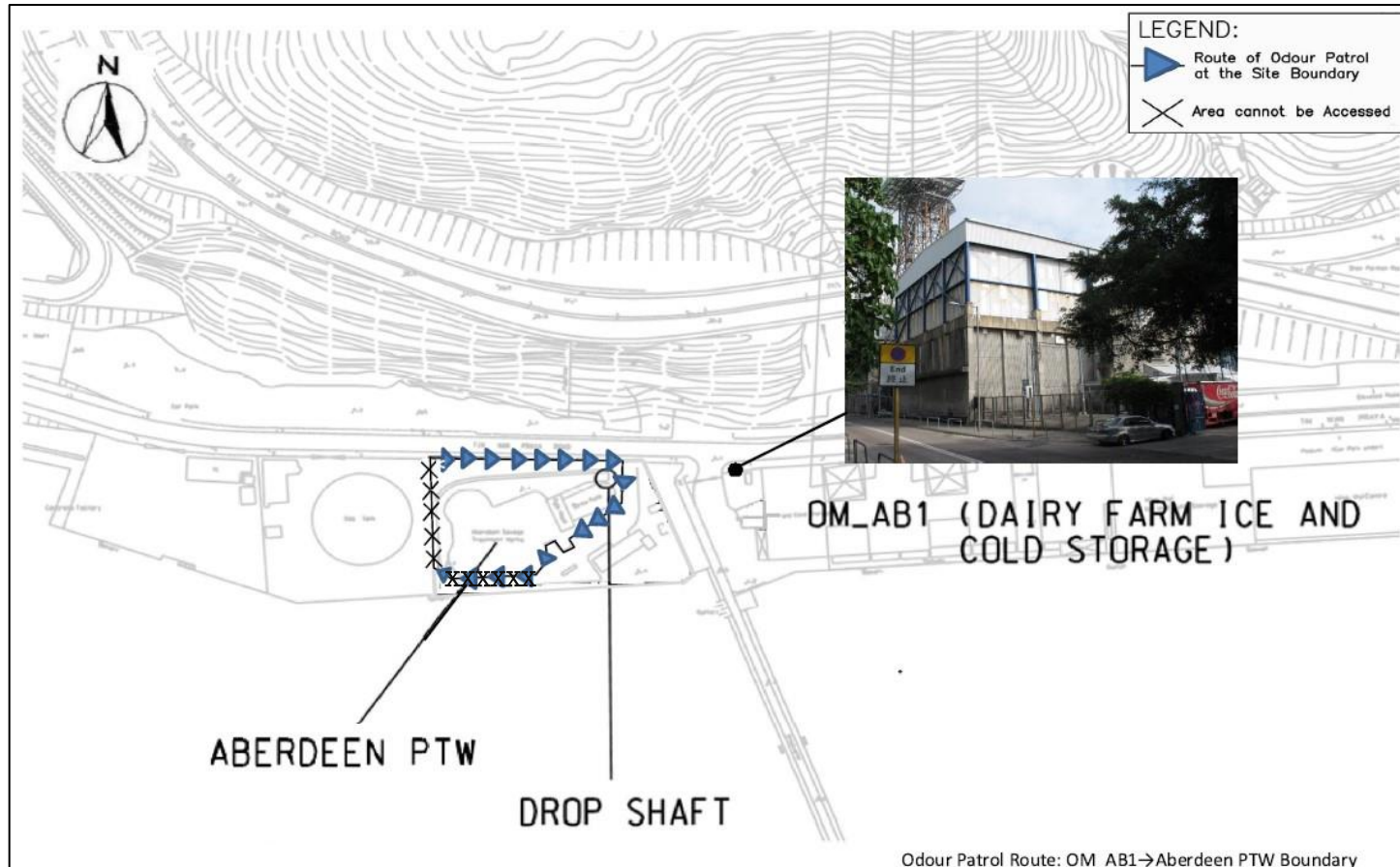
### Sandy Bay PTW



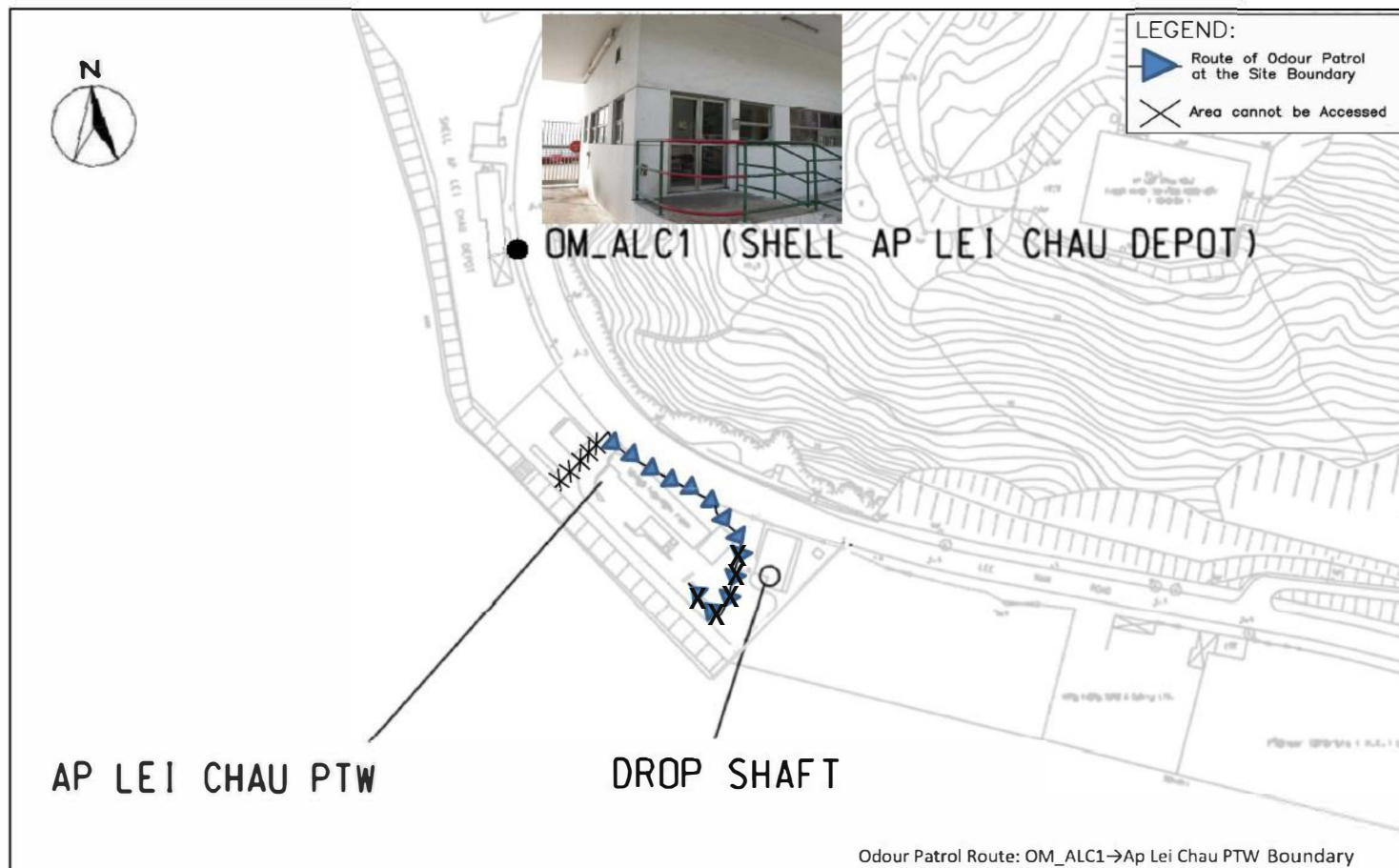
### Cyberport PTW



Wah Fu PTW

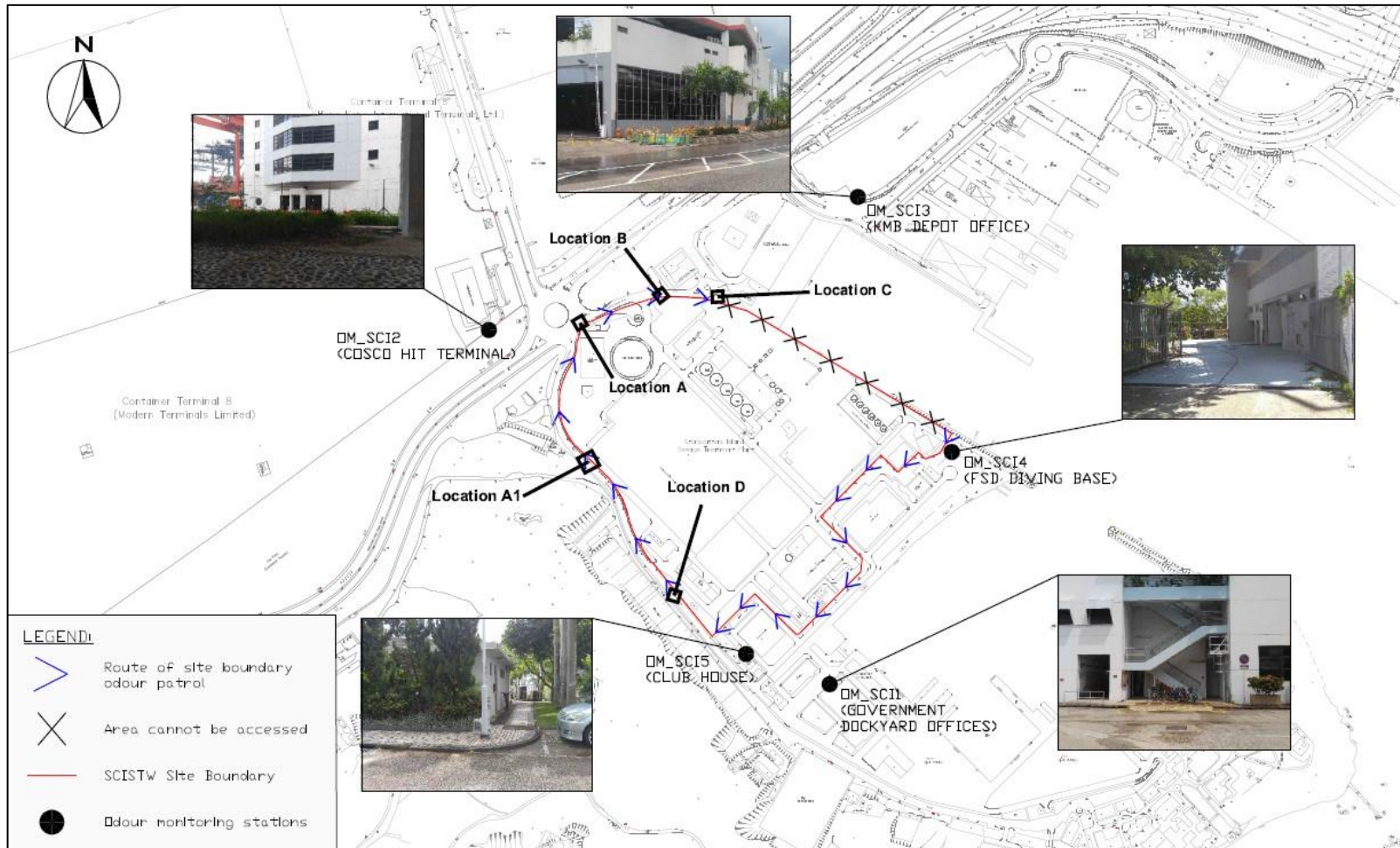


Aberdeen PTW



Ap Lei Chau PTW

**Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2022)**



**SCISTW**

## **Appendix B**

### **Odour Certificates**





## Certificate for a Qualified Odour Panellist

This is to certify that

Choi Wai Yiu

has participated in Ten (10) sets of individual n-Butanol Screening Tests

during 08 April 2021 to 14 April 2021

**with Individual Threshold: 46 ppb/v; Standard Deviation: 1.36**

and

fulfil the Requirement of the European Standard Method of Air Quality –  
Determination of Odour Concentration by Dynamic Olfactometry (EN13725)

The Requirement of the Odour Threshold of n-Butanol in Nitrogen Gas in the Range of 20 – 80 ppb/v  
with at least 10 sets of Individual threshold estimates and standard deviation less than 2.3

14 April 2021

Issue Date

14 April 2022

Valid Until

Fung Lim Chee, Richard



## Certificate for a Qualified Odour Panellist

This is to certify that

Chan Wai Hung

has participated in Ten (10) sets of individual n-Butanol Screening Tests

during 19 June 2020 to 17 July 2021

**with Individual Threshold: 47 ppb/v; Standard Deviation: 1.22**

and

fulfil the Requirement of the European Standard Method of Air Quality –  
Determination of Odour Concentration by Dynamic Olfactometry (EN13725)

The Requirement of the Odour Threshold of n-Butanol in Nitrogen Gas in the Range of 20 – 80 ppb/v  
with at least 10 sets of Individual threshold estimates and standard deviation less than 2.3

17 July 2021

Issue Date

17 July 2022

Valid Until

Fung Lim Chee, Richard



## Certificate for a Qualified Odour Panellist

This is to certify that

Poon Kwong Lun

has participated in Ten (10) sets of individual n-Butanol Screening Tests

during 12 June 2020 to 26 July 2021

**with Individual Threshold: 36 ppb/v; Standard Deviation: 1.14**

and

fulfil the Requirement of the European Standard Method of Air Quality –  
Determination of Odour Concentration by Dynamic Olfactometry (EN13725)

The Requirement of the Odour Threshold of n-Butanol in Nitrogen Gas in the Range of 20 – 80 ppb/v  
with at least 10 sets of Individual threshold estimates and standard deviation less than 2.3

26 July 2021

Issue Date

26 July 2022

Valid Until

Fung Lim Chee, Richard

## **Appendix C**

### **Field Record and Photo Record**

Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2022)



Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation		
											Odour Characteristics	Potential Odour Source	
OM_NP1	1	Cloudy	11:49	21.3	81.4	0.5	328	0	NA	NA	NA	NA	
	2							0					
	3							0					
OM_NP2	1		11:47	23.8	67.8	0.0	---	---	0	NA	NA	NA	NA
	2								0				
	3								0				
OM_NP3	1		11:40	21.0	85.0	1.4	256	256	0	NA	NA	NA	NA
	2								0				
	3								0				
North Point PTW Boundary	1		11:36	22.2	81.3	1.7	090	090	1	Continuous	Side wind	Vehicle Exhaust	From the road
	2								1				
	3								1				
OM_WC1	1	Cloudy	13:00	21.2	78.5	1.9	324	1	Intermittent	Side wind	Sewage	WC PTW	
	2							1					
	3							1					

Odour Monitoring Report for Harbour Area Treatment  
Scheme Stage 2A (Operational Phase) (January 2022)



Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
OM_WC2	1	Cloudy	12:56	23.1	74.0	0.5	110	0	NA	NA	NA	NA
	2							0				
	3							0				
Wan Chai East PTW Boundary	1	Cloudy	12:50	25.6	66.9	0.6	306	2	Intermittent	Side wind	Sewage	WC PTW
	2							2				
	3							2				
OM_C1	1	Cloudy	13:32	20.6	80.0	3.0	032	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_C2	1	Cloudy	13:36	20.2	80.9	1.9	081	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_C3	1	Cloudy	13:37	20.4	81.1	1.8	108	0	NA	NA	NA	NA
	2							0				
	3							0				

**Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2022)**



Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
Central PTW Boundary	1	Cloudy	13:27	21.5	82.3	0.0	--	1	Continuous	NA	Sewer	Central PTW
	2							1				
	3							1				
OM_FM1	1	Cloudy	13:50	21.7	70.9	1.9	079	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SB1	1	Cloudy	14:22	22.2	68.8	1.6	239	1	Intermittent	Downwind	Sewage	SB PTW
	2							0	NA	NA	NA	NA
	3							1	Intermittent	Downwind	Sewage	SB PTW
OM_SB2	1	Cloudy	14:14	23.1	74.7	0.0	--	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SB3	1	Cloudy	14:18	22.8	73.9	0.7	250	0	NA	NA	NA	NA
	2							0				
	3							0				

Odour Monitoring Report for Harbour Area Treatment  
Scheme Stage 2A (Operational Phase) (January 2022)



Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
OM_SB4	1	Cloudy	14:11	23.4	67.3	1.4	066	0	NA	NA	NA	NA
	2							0				
	3							0				
Sandy Bay PTW Boundary	1	Cloudy	14:16	21.8	69.4	2.1	025	1	Intermittent	Downwind	Sewage	SB PTW (Near SB1)
	2							0	NA	NA	NA	NA
	3							1	Intermittent	Downwind	Sewage	SB PTW (Near SB1)
OM_CB1	1	Cloudy	14:39	22.3	74.2	0.6	013	1	Intermittent	Side wind	Cooking	Le Meridien Hotel
	2							1				
	3							1				
OM_CB2	1	Cloudy	14:41	21.6	75.3	1.1	175	1	Intermittent	Upwind	Cooking	Le Meridien Hotel
	2							0	NA	NA	NA	NA
	3							1	Intermittent	Upwind	Cooking	Le Meridien Hotel
Cyberport PTW Boundary	1	Cloudy	14:33	22.1	75.2	1.2	081	0	NA	NA	NA	NA
	2							0				
	3							0				



**Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2022)**



Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
OM_WF1	1	Cloudy	15:01	21.1	79.0	0.4	215	1	Intermittent	Side wind	Cooking	Wah Ming House
	2							1				
	3							1				
Wah Fu PTW Boundary	1	Cloudy	15:06	22.2	76.1	0.7	191	1	Intermittent	Downwind	Sewage	WF PTW
	2							1				
	3							1				
OM_AB1	1	Cloudy	15:25	21.3	68.8	1.8	097	0	NA	NA	NA	NA
	2							0				
	3							0				
Aberdeen PTW Boundary	1	Cloudy	15:23	23.9	70.0	0.3	356	1	Intermittent	Side wind	Grassy & Sea water	Nearby vegetation and the seashore
	2							1				
	3							1				
OM_ALC1	1	Cloudy	15:43	24.6	61.9	0.8	172	0	NA	NA	NA	NA
	2							0				
	3							0				

Odour Monitoring Report for Harbour Area Treatment  
Scheme Stage 2A (Operational Phase) (January 2022)



Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
Ap Lei Chau PTW Boundary	1	Cloudy	15:48	22.5	78.1	0.0	--	1	Intermittent	Side wind	Sewage	ALC PTW
	2							1				
	3							1				
OM_SCI1	1	Cloudy	10:17	20.8	92.2	0.4	237	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SCI2	1	Cloudy	10:40	19.7	86.6	2.7	344	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SCI3	1	Cloudy	10:50	20.5	84.7	1.9	159	1	Intermittent	Downwind	Sea water	From the seashore
	2							0	NA	NA	NA	NA
	3							1	Intermittent	Downwind	Sea water	From the seashore
OM_SCI4	1	Cloudy	9:34	20.1	87.7	1.0	002	1	Continuous	Downwind	Sea water	From the seashore
	2							1				
	3							1				

Odour Monitoring Report for Harbour Area Treatment  
Scheme Stage 2A (Operational Phase) (January 2022)



Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
OM_SCI5	1	Cloudy	10:26	20.4	93.3	0.0	--	0	NA	NA	NA	NA
	2							0				
	3							0				
SCISTW Boundary Location A	1	Cloudy	10:01	19.8	96.7	0.7	051	0	NA	NA	NA	NA
	2							0				
	3							0				
SCISTW Boundary Location A1	1	Cloudy	10:33	21.1	92.3	0.3	290	1	Continuous	Upwind	Sewage	SCISTW
	2							1				
	3							1				
SCISTW Boundary Location B	1	Cloudy	9:57	20.7	94.9	0.0	--	2	Continuous	NA	Garbage	Refuse Collection Vehicle/ Roadside
	2							2				
	3							1				
SCISTW Boundary Location C	1	Cloudy	9:55	20.7	87.4	0.6	311	2	Continuous	Side wind	Garbage	Refuse Transfer Station
	2							2				
	3							1				







**Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2022)**

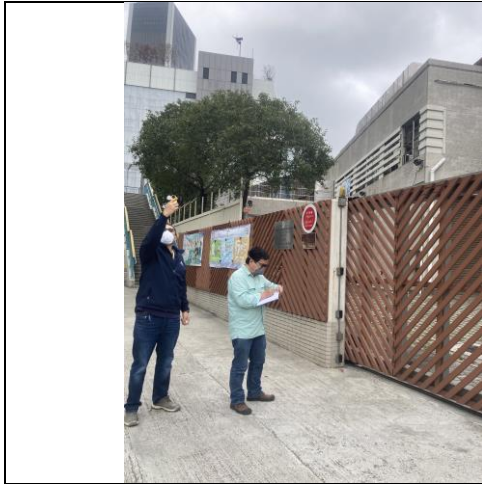


Location ID	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
SCISTW Boundary Location D	1	Cloudy	10:30	20.6	91.0	0.0	--	0	NA	NA	NA	NA
	2							0				
	3							0				

Remark:

- T: Air Temperature;
- RH: Relative Humidity;
- WS: Wind Speed;
- WD: Wind Direction.

	
<p>OM_NP1</p>	<p>OM_NP2</p>
	
<p>OM_NP3</p>	<p>North Point PTW Boundary</p>
	
<p>OM_WC1</p>	<p>OM_WC2</p>



Wan Chai East PTW Boundary



OM\_C1



OM\_C2



OM\_C3



Central PTW Boundary



OM\_FM1



OM\_SB1



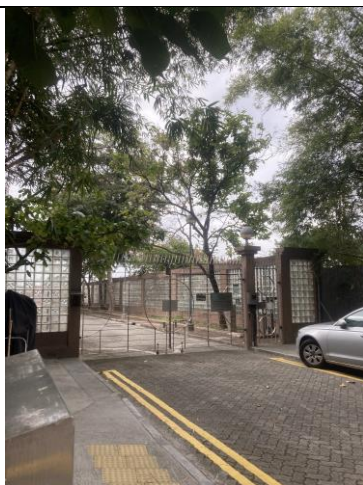
OM\_SB2



OM\_SB3



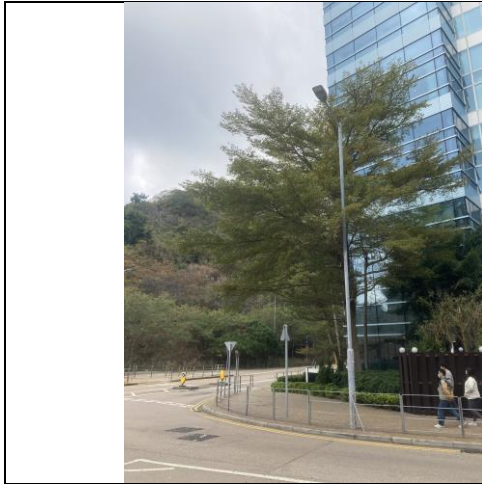
OM\_SB4



Sandy Bay PTW Boundary



OM\_CB1



OM\_CB2



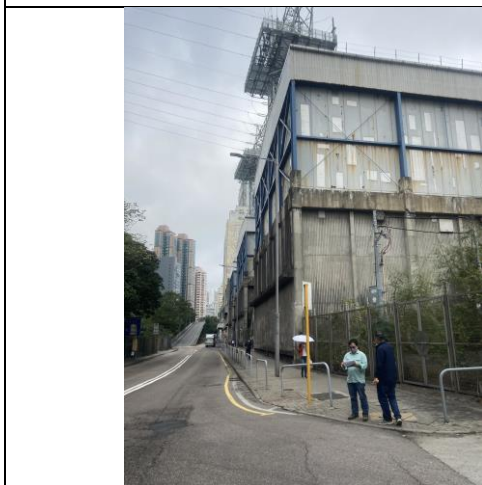
Cyberport PTW Boundary



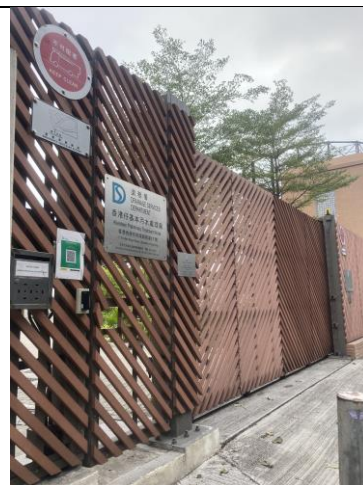
OM\_WF1



Wah Fu PTW Boundary



OM\_AB1



Aberdeen PTW Boundary





OM\_ALC1



Ap Lei Chau PTW Boundary



OM\_SCI1



OM\_SCI2



OM\_SCI3



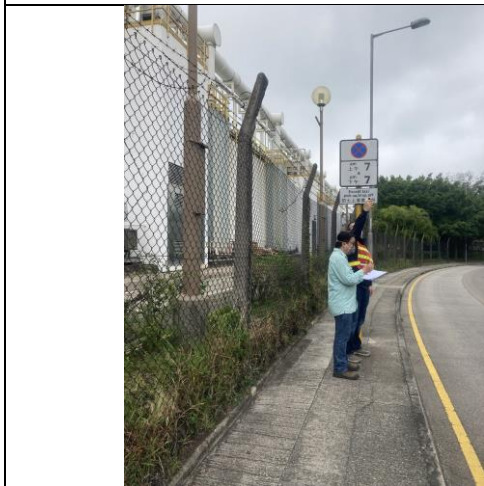
OM\_SCI4



OM\_SC15



SCISTW Boundary Location A



SCISTW Boundary Location A1



SCISTW Boundary Location B



SCISTW Boundary Location C



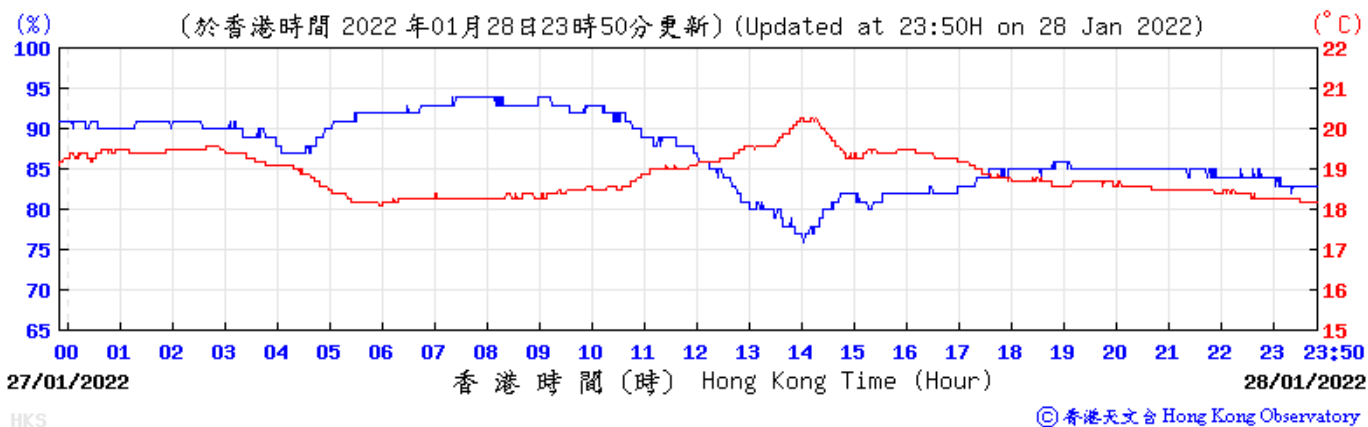
SCISTW Boundary Location D

## **Appendix D**

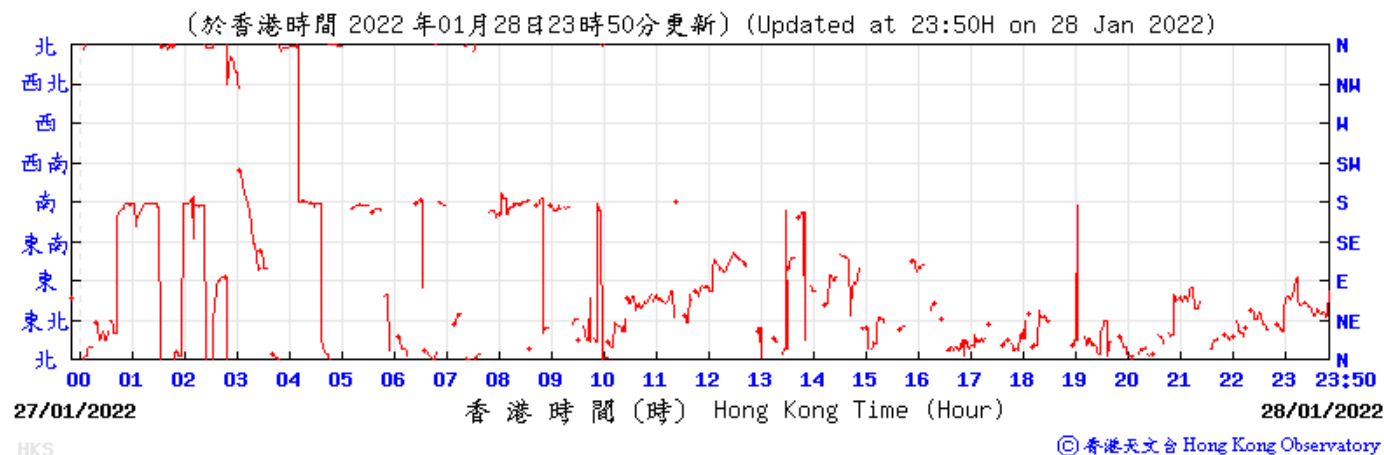
### **Meteorological Information from the Hong Kong Observatory Station**

### Meteorological Information from the Hong Kong Observatory Station

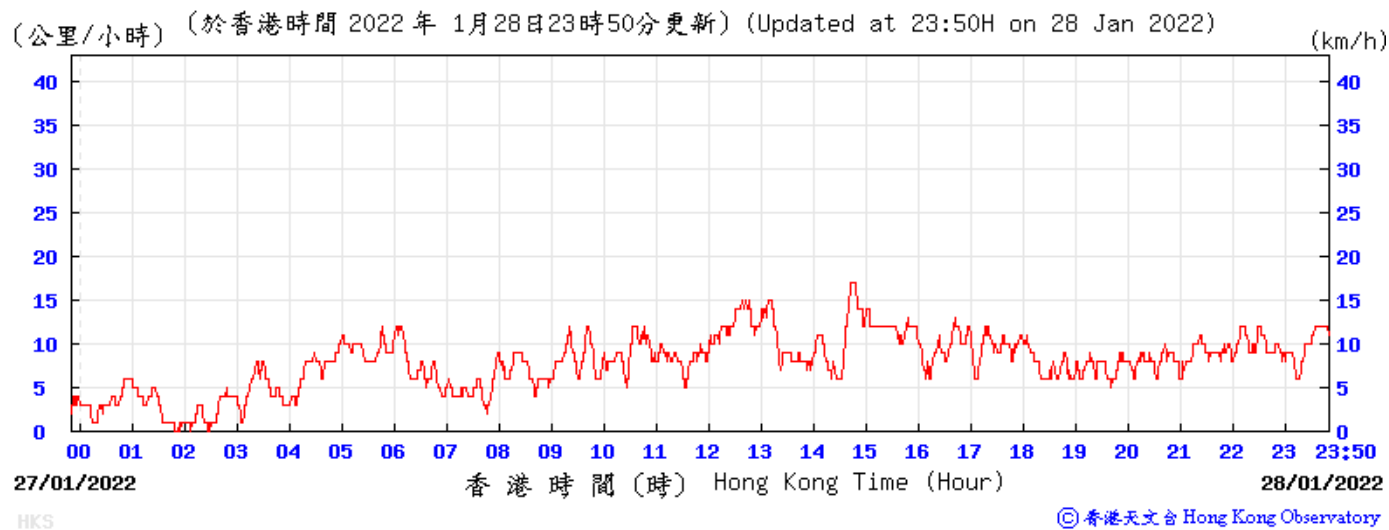
Temperature/Humidity:



Wind Direction:

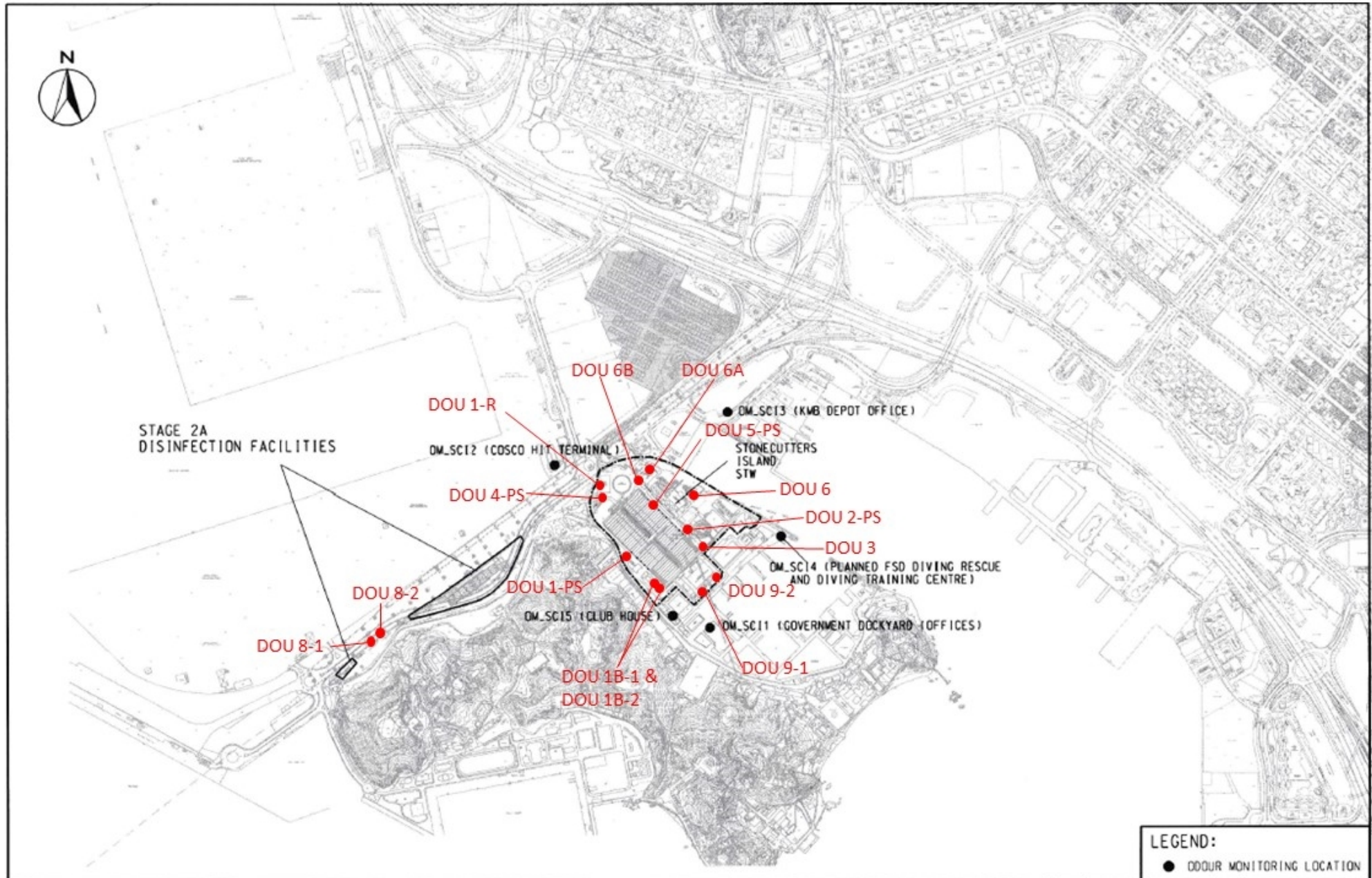


Wind Speed:



## **Appendix E**

### **Layout of Odour Monitoring Locations for Odour Measurement**



Sampling Locations Photos



DOU 1B-1



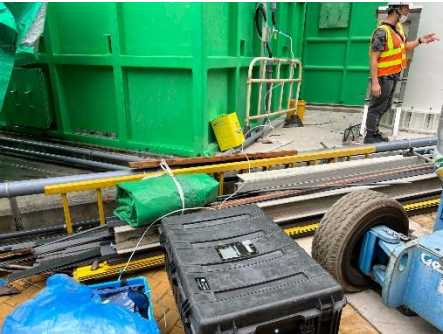
DOU 1B-2



DOU 1-PS



DOU 1-R



DOU 2-PS



DOU 3



DOU 4-PS



DOU 5-PS



Sampling Location Photos



DOU 6



DOU 6A



DOU 6B



DOU 8-1



DOU 8-2



DOU 9-1



DOU 9-2

## **Appendix F**

### **Odour Measurement Result**

## RESULT

### 1. Odour Concentration

ALS Sample ID	Location ID	Sampling Date	Sampling Time	Analysis Date	Analysis Time	LOR <sup>[Note 1]</sup> (ou <sub>E</sub> /m <sup>3</sup> )	Odour Concentration (ou <sub>E</sub> /m <sup>3</sup> )	Duct Volumetric Flow Rate <sup>[Note 2]</sup> (m <sup>3</sup> /hr)	Odour Emission Rate (ou <sub>E</sub> /s)
HK2204329-001	DOU 1B-1	28-Jan-22	12:00 - 12:15	28-Jan-22	18:35 - 18:41	11	19	8148	42
HK2204329-002	DOU 1B-2	28-Jan-22	11:55 - 12:10	28-Jan-22	18:45 - 18:51	11	14	NA	NA
HK2204329-003	DOU 1-PS	28-Jan-22	10:30 - 10:35	28-Jan-22	17:20 - 17:26	11	695	14762	2849
HK2204329-004	DOU 1-R	28-Jan-22	10:09 - 10:14	28-Jan-22	16:44 - 16:51	11	289	2500	201
HK2204329-005	DOU 2-PS	28-Jan-22	10:42 - 10:47	28-Jan-22	17:30 - 17:36	11	53	11493	169
HK2204329-006	DOU-3	28-Jan-22	11:43 - 11:48	28-Jan-22	18:25 - 18:31	11	1291	60707	21776
HK2204329-007	DOU 4-PS	28-Jan-22	10:19 - 10:23	28-Jan-22	16:55 - 16:59	11	73	24409	496
HK2204329-008	DOU 5-PS	28-Jan-22	11:23 - 11:28	28-Jan-22	18:00 - 18:06	11	12	31292	108
HK2204329-009	DOU 6	28-Jan-22	09:36 - 11:33	28-Jan-22	16:12 - 16:18	11	608	42566	7189
HK2204329-010	DOU 6A	28-Jan-22	09:47 - 10:00	28-Jan-22	16:21 - 16:27	11	470	33693	4396
HK2204329-011	DOU 6B	28-Jan-22	09:53 - 11:33	28-Jan-22	16:33 - 16:40	11	387	36573	3932
HK2204329-012	DOU 8-1	28-Jan-22	12:35 - 13:00	28-Jan-22	19:05 - 19:11	11	1291	6132	2200
HK2204329-013	DOU 8-2	28-Jan-22	12:33 - 12:53	28-Jan-22	18:55 - 19:01	11	1205	NA	NA
HK2204329-014	DOU 9-1	28-Jan-22	11:00 - 11:05	28-Jan-22	17:40 - 17:46	11	73	4782	97
HK2204329-015	DOU 9-2	28-Jan-22	11:07 - 11:12	28-Jan-22	17:50 - 17:56	11	470	4953	646
HK2204329-016	Field Blank	28-Jan-22	-	28-Jan-22	19:15 - 19:20	11	<11	-	-
Total Emissions									44099

Note:

1. LOR denotes limit of reporting.
2. The volumetric flow rate data were provided by the client.
3. All the collected sample volume of the gas bags was sufficient for olfactometry analysis.
4. Field Blank containing pure and odorous nitrogen gas was filled by ALS staff.

### On Site Meteorological Data during the Sampling Period

ALS Sample ID	Location ID	Sampling Date	Measured Time	Weather Condition	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)	Barometric Pressure (hPa)
HK2204329-001	DOU 1B-1	28-Jan-22	12:15	Cloudy	23.3	91.3	0.0	--	1015
HK2204329-002	DOU 1B-2	28-Jan-22	12:15	Cloudy	23.3	91.3	0.0	--	1016
HK2204329-003	DOU 1-PS	28-Jan-22	10:30	Cloudy	21.6	83.5	1.2	119	1016
HK2204329-004	DOU 1-R	28-Jan-22	10:09	Cloudy	22.8	89.3	0.3	072	1016
HK2204329-005	DOU 2-PS	28-Jan-22	10:42	Cloudy	22.6	90.5	1.2	068	1016
HK2204329-006	DOU 3	28-Jan-22	11:45	Cloudy	21.4	93.4	0.5	127	1015
HK2204329-007	DOU 4-PS	28-Jan-22	10:19	Cloudy	23.0	75.8	0.0	--	1016
HK2204329-008	DOU 5-PS	28-Jan-22	11:22	Cloudy	21.7	93.4	0.0	--	1016
HK2204329-009	DOU 6	28-Jan-22	9:34	Cloudy	20.0	86.0	1.6	160	1014
HK2204329-010	DOU 6A	28-Jan-22	9:47	Cloudy	21.8	85.0	0.5	191	1014
HK2204329-011	DOU 6B	28-Jan-22	9:53	Cloudy	22.4	89.5	0.5	179	1014
HK2204329-012	DOU 8-1	28-Jan-22	12:53	Cloudy	22.2	72.3	1.0	089	1015
HK2204329-013	DOU 8-2	28-Jan-22	12:53	Cloudy	22.2	72.3	1.0	089	1015
HK2204329-014	DOU 9-1	28-Jan-22	10:59	Cloudy	21.1	84.2	1.0	090	1014
HK2204329-015	DOU 9-2	28-Jan-22	11:06	Cloudy	23.4	92.5	0.6	093	1014

## **Appendix G**

### **Total Odour Emission Rate Extracted from EIA report**

Odour Monitoring Report for Harbour Area Treatment  
Scheme Stage 2A (Operational Phase) (January 2022)



Option 2 - Decentralized Design							
CEPT Facilities (Odd No. Units) & Flow Distribution Channel)	146162.21	S-O2-DO1	12	1.86	20	1	4384.87
CEPT Facilities (Even No. Units) & NWKPS + NWKPS O/F chamber	136086.21	S-O2-DO2	12	1.86	20	1	4082.59
Sludge Treatment Facilities (include Sludge Storage Tanks, Sludge Dewatering Building 1 & 2, Existing and New Sludge Cake Silos)	19057.82	S-O2-DO3	6	2.40	12.58	3	571.73
Stage 1 MPS & Riser Shaft	6518.89	S-O2-DO4	18	1.13	12.28	4	195.57
Stage 2A MPS & Riser Shaft	6518.89	S-O2-DO5	18	1.13	12.28	4	195.57
NWKPTW	19963.88	S-O2-DO6	13	2.26	12.28	8	598.92
Flow Distribution Chambers	2688.01	S-O2-DO7	4.5	0.32	10.48	2	80.64
New Flow Distribution Chamber							
Chlorination Contact Tank	37776.64	S-C-DO1	11	1.13	7.2	4	1133.30
Drop Shaft and Chamber 15A	2630.22	S-C-DO2	4	0.57	8.84	2	263.02

**Total: 11,506.21**

Note: (1) CEPT facilities include Influent upflow structure, distribution channel, flocculation tanks, sedimentation tanks & effluent weirs, drop shafts, scum pit and rapid mixing tank of sedimentation tanks  
(2) MPS is Main Pumping Station  
(3) NWKPTW, NWKPS & NWKOF chambers are North West Kowloon PTW, NWKPTW Pumping Station & NWKPTW Overflow Chamber, respectively  
(4) The emission rate included a 1.31 ambient temperature correction factor.