

OSCAR Bioenergy Joint Venture

Contract No. EP/SP/61/10
Organic Resources Recovery
Centre (Phase 1):
*Twenty-sixth Quarterly EM&A
Summary Report*

1 September 2021 - 30 November 2021

Environmental Resources Management

2509, 25/F, One Harbourfront,
18 Tak Fung Street,
Hung Hom, Kowloon, Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 3015 8052
E-mail: post.hk@erm.com
<http://www.erm.com>

Meinhardt Infrastructure and Environment Limited

**Organic Resources Recovery Centre,
Phase I**

Quarterly EM&A Report
(1 Sept 2021 – 30 Nov 2021)

(May 2022)

Verified by: W. K. Chiu



Position: Independent Environmental Checker

Date: 2 June 2022

OSCAR Bioenergy Joint Venture

Contract No. EP/SP/61/10
Organic Resources Recovery
Centre (Phase 1):
*Twenty-sixth Quarterly EM&A
Summary Report*

1 September 2021 – 30 November 2021

Reference 0279222

For and on behalf of ERM-Hong Kong, Limited	
Approved by:	Frank Wan
Signed:	
Position:	Partner
Certified by:	 (Environmental Team Leader – Mandy To)
Date:	16 May 2022

CONTENTS

EXECUTIVE SUMMARY

1	INTRODUCTION	1
1.1	PURPOSE OF THE REPORT	1
1.2	STRUCTURE OF THE REPORT	1
2	PROJECT INFORMATION	3
2.1	BACKGROUND	3
2.2	GENERAL SITE DESCRIPTION	4
2.3	MAJOR ACTIVITIES UNDERTAKEN	4
2.4	PROJECT ORGANISATION AND MANAGEMENT STRUCTURE	4
2.5	STATUS OF ENVIRONMENTAL APPROVAL DOCUMENTS	4
3	ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS	6
3.1	ENVIRONMENTAL MONITORING	6
3.1.1	<i>Air Quality</i>	6
3.1.2	<i>Odour</i>	8
3.2	SITE AUDIT	10
3.2.1	<i>Water Quality</i>	10
3.2.2	<i>Landscape and Visual</i>	11
4	MONITORING RESULTS	12
4.1	AIR QUALITY	12
4.1.1	<i>Commissioning Phase Monitoring</i>	12
4.1.2	<i>Operation Phase Monitoring</i>	12
4.2	ODOUR	15
4.2.1	<i>Operation Phase Monitoring</i>	15
4.3	WATER QUALITY	15
4.3.1	<i>Operation Phase Monitoring</i>	15
4.4	WASTE MANAGEMENT	18
4.4.1	<i>Operation Phase Monitoring</i>	18
5	SITE AUDIT	19
5.1	ENVIRONMENTAL SITE AUDIT	19
5.1.1	<i>Operation Phase</i>	19
5.2	LANDSCAPE AND VISUAL AUDIT	19
6	ENVIRONMENTAL NON-CONFORMANCE	21
6.1	SUMMARY OF ENVIRONMENTAL NON-COMPLIANCE	21
6.2	SUMMARY OF ENVIRONMENTAL COMPLAINT	21
6.3	SUMMARY OF ENVIRONMENTAL SUMMON AND SUCCESSFUL PROSECUTION	22
7	FUTURE KEY ISSUES	23

7.1	<i>KEY ISSUES FOR THE COMING REPORTING PERIOD</i>	23
8	<i>CONCLUSIONS</i>	24

LIST OF TABLES

<i>TABLE 2.1</i>	<i>SUMMARY OF ACTIVITIES UNDERTAKEN IN THE REPORTING PERIOD</i>
<i>TABLE 2.2</i>	<i>SUMMARY OF ENVIRONMENTAL LICENSING, NOTIFICATION AND PERMIT STATUS</i>
<i>TABLE 3.1</i>	<i>SAMPLING AND LABORATORY ANALYSIS METHODOLOGY</i>
<i>TABLE 3.2</i>	<i>EMISSION LIMIT FOR CAPCS STACK</i>
<i>TABLE 3.3</i>	<i>EMISSION LIMIT FOR CHP STACK</i>
<i>TABLE 3.4</i>	<i>EMISSION LIMIT FOR ASP STACK</i>
<i>TABLE 3.5</i>	<i>EMISSION LIMIT FOR STANDBY FLARING GAS UNIT ()</i>
<i>TABLE 3.6</i>	<i>ODOUR INTENSITY LEVEL</i>
<i>TABLE 3.7</i>	<i>ACTION AND LIMIT LEVELS FOR ODOUR NUISANCE</i>
<i>TABLE 3.8</i>	<i>EVENT AND ACTION PLAN FOR ODOUR MONITORING</i>
<i>TABLE 3.9</i>	<i>DISCHARGE LIMITS FOR EFFLUENT FROM THE EFFLUENT STORAGE TANK (AS STIPULATED IN WT00038391-2021)</i>
<i>TABLE 3.10</i>	<i>DISCHARGE LIMITS FOR EFFLUENT FROM THE PETROL INTERCEPTOR(S) (AS STIPULATED IN WT00038391-2021)</i>
<i>TABLE 4.1</i>	<i>HOURLY AVERAGE OF PARAMETERS RECORDED FOR CAPCS</i>
<i>TABLE 4.2</i>	<i>HOURLY AVERAGE OF PARAMETERS RECORDED FOR CHP 1</i>
<i>TABLE 4.3</i>	<i>HOURLY AVERAGE OF PARAMETERS RECORDED FOR CHP 2</i>
<i>TABLE 4.4</i>	<i>HOURLY AVERAGE OF PARAMETERS RECORDED FOR CHP 3</i>
<i>TABLE 4.5</i>	<i>HOURLY AVERAGE OF PARAMETERS RECORDED FOR ASP</i>
<i>TABLE 4.6</i>	<i>RESULTS OF THE DISCHARGE SAMPLE COLLECTED FROM THE EFFLUENT STORAGE TANK ON 28 SEPTEMBER 2021</i>
<i>TABLE 4.7</i>	<i>RESULTS OF THE DISCHARGE SAMPLE COLLECTED FROM THE EFFLUENT STORAGE TANK ON 15 OCTOBER 2021</i>
<i>TABLE 4.8</i>	<i>RESULTS OF THE DISCHARGE SAMPLE COLLECTED FROM THE EFFLUENT STORAGE TANK ON 9 NOVEMBER 2021</i>
<i>TABLE 4.9</i>	<i>RESULTS OF THE DISCHARGE SAMPLE FROM THE PETROL INTERCEPTOR 1 ON 15 OCTOBER 2021</i>
<i>TABLE 4.10</i>	<i>RESULTS OF THE DISCHARGE SAMPLE FROM THE PETROL INTERCEPTOR 2 ON 15 OCTOBER 2021</i>
<i>TABLE 4.11</i>	<i>QUANTITIES OF WASTE GENERATED FROM THE OPERATION OF THE PROJECT</i>

LIST OF ANNEXES

<i>ANNEX A</i>	<i>LOCATION OF PROJECT</i>
<i>ANNEX B</i>	<i>PROJECT ORGANISATION CHART AND CONTACT DETAIL</i>
<i>ANNEX C</i>	<i>IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES</i>
<i>ANNEX D</i>	<i>WASTE FLOW TABLE</i>
<i>ANNEX E</i>	<i>ENVIRONMENTAL COMPLAINT, ENVIRONMENTAL SUMMONS AND PROSECUTION LOG</i>
<i>ANNEX F</i>	<i>INVESTIGATION REPORT</i>
<i>ANNEX G</i>	<i>ODOUR PATROL RESULT</i>

EXECUTIVE SUMMARY

The construction works of *No. EP/SP/61/10 Organic Resources Recovery Centre Phase 1 (the Project)* commenced on 21 May 2015. This is the 26th quarterly Environmental Monitoring and Audit (EM&A) report presenting the EM&A works carried out during the period from 1 September to 30 November 2021 in accordance with the EM&A Manual. Substantial completion of the construction works was confirmed on 3 December 2018. In the meantime, the operation phase EM&A programme had commenced in March 2019. Substantial Completion in respect of substantial part of the Works was confirmed on 24 February 2020. The construction phase EM&A programme was completed in the end of February 2020.

Summary of Works undertaken during the Reporting Month

Works undertaken in the reporting month included:

- Operation of the Project, including organic waste reception, and operation of the pre-treatment facilities, anaerobic digesters, composting facilities, air pollution control systems, on-line emission monitoring system for the Centralised Air Pollution Control Unit (CAPCS), Co-generation Units (CHP)s and Ammonia Stripping Plant (ASP), and the wastewater treatment plant; and
- Process fine-tune, including adjustment of the ASP with new treatment media, modification of Continuous Environmental Monitoring System (CEMS) and Supervisory Control and Data Acquisition System (SCADA) rectification and improvement works following equipment failures and the alteration of different operation modes and measures to adapt to the high variation of SSOW nature and sources.

Environmental Monitoring and Audit Progress

Air Quality Monitoring

Exceedances on NO_x and SO₂ from CHP and NO_x, SO₂, VOCs and NH₃ from ASP were recorded on the on-line monitoring system from September to November 2021. It should be noted that measurements recorded under abnormal operating conditions, e.g. start up and stopping of stacks, unstable operation, test runs and interference of sensor, are disregarded.

In September, the exceedances in NO_x of CHP were found to be a result of the low biogas loading at the CHP. The exceedances of SO₂ of CHPs and ASP were found to be a result of the tripping of the desulphurisation system. In October, The exceedances of NO_x, VOCs and NH₃ in ASP were found to be a result of the unstable condition of the ASP system. In November, the exceedances of NO_x, VOCs and NH₃ in ASP were found to be a result of the unstable condition of the ASP system caused by unstable water flow resulted from the malfunctioning of various equipment (including the hot water circulation pump), leakage of piping and the blockage of the steam generator.

The Contractor has implemented mitigation measures to control the exceedance (including replacement of malfunctioned parts (desulphurisation system, columns of the ASP), cleaning for various parts (i.e. stripping column and packaging of the ASP), and carried out fine-tuning of equipment of the ASP).

The Contractor is recommended to closely monitor the processes of the modification of the ASP and the post-modification monitoring of emission level to avoid any exceedance.

As similar issues have been re-occurred for sometimes, the Contractor is advised to undertake a comprehensive review of the operation of the concerned systems and the effectiveness of the existing mitigation measures and proposed further measures to avoid the exceedance.

Odour

Odour patrol was conducted by the independent odour patrol team of ALS Technichem (HK) Pty Ltd on 3 September 2021. No Level 2 Odour Intensity was recorded during odour patrols.

Water Quality

No non-compliance to the effluent discharge limit stipulated in the discharge licence issued by the EPD under the *Water Pollution Control Ordinance* was recorded during this reporting period.

Waste Management

Waste generated from the operation of the Project includes chemical waste, waste generated from pre-treatment process and general refuse.

4,400 L of chemical waste was collected by licenced waste collector from the operation of the Project.

1,040.65 tonnes of waste generated from pre-treatment process from the operation of the Project was disposed of at landfill. Among the recyclable waste generated from pre-treatment process from the operation of the Project, 0.00 tonnes of metals, 0.00 tonnes of papers/ cardboard packing and 0.00 tonnes of plastics were sent to recyclers for recycling during the reporting period.

Around 8.53 tonnes of general refuse from the operation of the Project was disposed of at landfill. Among the recycled general refuse from the operation of the Project, 0.00 tonnes of metals, 0.00 tonnes of papers/ cardboard packing and 0.00 tonnes of plastics were sent to recyclers for recycling during the reporting period.

Findings of Environmental Site Audit

A summary of the monitoring activities undertaken in this reporting period is listed below:

- Joint Environmental Site Inspections 3 times
- Landscape & Visual Inspections 3 times

Monthly joint environmental site inspections were carried out. The environmental control/ mitigation measures (related to air quality, water quality, waste (including land contamination prevention), hazard-to-life and landscape and visual) recommended in the approved EIA Report and the EM&A Manual were properly implemented by the Contractor during the reporting month.

Environmental Exceedance/Non-conformance/Compliant/Summons and Prosecution

Exceedances for the air emission limits for the CHP and ASP stacks were recorded during the reporting period.

No complaint/ summon/prosecution was received in this reporting period.

Future Key Issues

Activities to be undertaken in the next reporting month include:

- Operation of the Project.
- Modification of the CHP and ASP to control the air emission.

ERM-Hong Kong, Limited (ERM) was appointed by OSCAR Bioenergy Joint Venture (the Contractor) as the Environmental Team (ET) to undertake the construction Environmental Monitoring and Audit (EM&A) programme for the *Contract No. EP/SP/61/10 of Organic Waste Treatment Facilities Phase I*, which the project name has been updated to *Organic Resources Recovery Centre (Phase I) (the Project)* since November 2017. ERM was also appointed by the Contractor to undertake the operation EM&A programme starting 1 March 2019.

1.1 PURPOSE OF THE REPORT

This is the 26th Quarterly EM&A report which summarises the monitoring results and audit findings for the EM&A programme during the reporting period from **1 September to 30 November 2021**.

1.2 STRUCTURE OF THE REPORT

The structure of the report is as follows:

Section 1: Introduction

It details the scope and structure of the report.

Section 2: Project Information

It summarises the background and scope of the Project, site description, project organisation and status of the Environmental Permits (EP)/licences.

Section 3: Environmental Monitoring and Audit Requirements

It summarises the environmental monitoring requirements including monitoring parameters, programmes, methodologies, frequency, locations, Action and Limit Levels, Event/ Action Plans, as well as environmental audit requirements as recommended in the EM&A Manual and approved EIA report.

Section 4: Monitoring Results

It summarises monitoring results of the reporting period.

Section 5: Site Audit

It summarises the audit findings of the environmental as well as landscape and visual site audits undertaken within the reporting period.

Section 6: Environmental Non-conformance

It summarises any exceedance of environmental performance standard, environmental complaints and summons received within the reporting period.

Section 7: Further Key Issues

It summarises the impact forecast for the next reporting month.

Section 8: Conclusions

2.1

BACKGROUND

The Organic Resources Recovery Centre (ORRC) Phase I development (hereinafter referred to as “the Project”) is to design, construct and operate a biological treatment facility with a capacity of about 200 tonnes per day and convert source-separated organic waste from commercial and industrial sectors (mostly food waste) into compost and biogas through proven biological treatment technologies. The location of the Project site is shown in *Annex A*.

The environmental acceptability of the construction and operation of the Project had been confirmed by findings of the associated Environmental Impact Assessment (EIA) Study completed in 2009. The Director of Environmental Protection (DEP) approved this EIA Report under the *Environmental Impact Assessment Ordinance* (EIAO) (Cap. 499) in February 2010 (Register No.: AEIAR-149/2010) (hereafter referred to as the approved EIA Report). Subsequent Report on Re-assessment on Environmental Implications and Report on Re-assessment on Hazard to Life Implications were completed in 2013, respectively.

An Environmental Permit (EP) (No. EP-395/2010) was issued by the DEP to the EPD (Project Team), the Permit Holder, on 21 June 2010 and varied on 18 March 2013 (No. EP-395/2010/A) and 21 May 2013 (No. EP-395/2010/B), respectively. The Design Build and Operate Contract for the ORRC Phase 1 (Contract No. EP/SP/61/10 Organic Resources Recovery Centre (Phase 1) (the Contract)) was awarded to SITA Waste Services Limited, ATAL Engineering Limited and Ros-Roca, Sociedad Anonima jointly trading as the OSCAR Bioenergy Joint Venture (OSCAR or the Contractor). A Further EP (No. FEP-01/395/2010/B) was issued by the DEP to the OSCAR on 16 February 2015. Variation to both EPs (Nos. EP-395/2010/B and FEP-01/395/2010/B) were made in December 2015. The latest EPs, Nos. EP-395/2010/C and FEP-01/395/2010/C, were issued by the DEP on 21 December 2015.

Under the requirements of Condition 5 of the EP (No. FEP-01/395/2010/C), an Environmental Monitoring and Audit (EM&A) programme as set out in the approved EM&A Manual (hereinafter referred to as EM&A Manual) is required to be implemented during the construction and operation of the Project. ERM-Hong Kong, Ltd (ERM) has been appointed by OSCAR as the Environmental Team (ET) for the construction phase EM&A programme and the Monitoring Team (MT) for the operation phase EM&A programme for the implementation of the EM&A programme in accordance with the requirements of the EP and the approved EM&A Manual.

The construction works commenced on 21 May 2015. The operation phase of

the EM&A programme commenced on 1 March 2019 ⁽¹⁾. The construction phase EM&A programme was completed in the end of February 2020.

2.2 GENERAL SITE DESCRIPTION

The Project Site is located at Siu Ho Wan in North Lantau with an area of about 2 hectares. The layout of the Project Site is illustrated in *Annex A*. The facility received and treated an average of 116 to 136 tonnes of source separated organic waste per day during the reporting month.

2.3 MAJOR ACTIVITIES UNDERTAKEN

A summary of the major activities undertaken in the reporting period is shown in *Table 2.1*.

Table 2.1 Summary of Activities Undertaken in the Reporting Period

Activities Undertaken in the Reporting Period
<ul style="list-style-type: none"> Systems being operated – waste reception, pre-treatment, CAPCS extraction, the digesters, the centrifuge, the composting tunnels, the desulphurisation, the emergency flare, the CHPs, the ASP and the biological waste water treatment plant (about 116 - 136 t/d SSOW input); and Process fine-tune – adjustment of the ASP operational parameters with new treatment media, CEMS/SCADA modification and improvement work following equipment failures and the alteration of different operation modes and measures to adapt to the high variation of SSOW nature and sources.

2.4 PROJECT ORGANISATION AND MANAGEMENT STRUCTURE

The project organisation chart and contact details are shown in *Annex B*.

2.5 STATUS OF ENVIRONMENTAL APPROVAL DOCUMENTS

A summary of the valid permits, licences, and/or notifications on environmental protection for this Project is presented in *Table 2.2*.

Table 2.2 Summary of Environmental Licensing, Notification and Permit Status

Permit/ Licences/ Notification	Reference	Validity Period	Remarks
Environmental Permit	FEP-01/395/2010/C	Throughout the Contract	Permit granted on 21 December 2015
Notification of Construction Works under the Air Pollution Control	Ref No. 386715	Throughout the Contract	-

(1) As some of the minor items are yet to be closed out in March 2019, the construction phase EM&A programme and Operation Phase EM&A programme were undertaking in parallel in March 2019.

Permit/ Licences/ Notification	Reference	Validity Period	Remarks
(Construction Dust) Regulation			
Effluent Discharge License	WT00024352-2016	3 June 2016 – 30 June 2021	Approved on 3 June 2016
Effluent Discharge License	WT00038391-2021	7 July 2021 – 30 June 2026	Approved on 7 July 2021
Chemical Waste Producer Registration	WPN 5213-961- O2231-01	Throughout the Contract	Approved on 29 April 2015
Chemical Waste Producer Registration	WPN 5213-961- O2231-02	Throughout the implementation of the Project	Approved on 10 November 2017
Waste Disposal Billing Account	Account number: 702310	Throughout the Contract	-

3.1 ENVIRONMENTAL MONITORING

The air quality (including odour) monitoring to be carried out during the commissioning and operation phase of the Project are described below. Although water quality monitoring is not required for the operation phase under the EM&A programme, there are water quality monitoring requirement under the Water Discharge Licence of the plant under the *Water Pollution Control Ordinance* (WPCO). As part of this EM&A programme, the monitoring results will be reviewed to check the compliance with the WPCO requirements.

3.1.1 Air Quality

According to the EM&A Manual and EP requirements, stack monitoring are required during the commissioning and operation phase of the Project.

On-line monitoring (using continuous environmental monitoring system (CEMS)) shall be carried out for the centralised air pollution unit (CAPCS), cogeneration units (CHP) and the ammonia stripping plant (ASP) during the commissioning and operation phase. The last calibration was carried out on 15 June 2021.

The monitoring data is transmitted instantaneously to EPD (Regional Office) by telemetry system.

When the on-line monitoring for certain parameter cannot be undertaken, monitoring will be carried out using the following methodology approved by the EPD.

Table 3.1 Sampling and Laboratory Analysis Methodology

Parameters	Method	Stacks to be Monitored
Gaseous and vaporous organic substances (including methane)	USEPA Method 18	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Particulate	USEPA Method 5	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Carbon monoxide (CO)	USEPA Method 10	<ul style="list-style-type: none"> • CHP • ASP
Nitrogen oxides (NO _x)	USEPA Method 7E	<ul style="list-style-type: none"> • CHP • ASP
Sulphur dioxide (SO ₂);	USEPA Method 6	<ul style="list-style-type: none"> • CHP • ASP
Hydrogen chloride (HCl)	USEPA Method 26A	<ul style="list-style-type: none"> • CHP • ASP

Parameters	Method	Stacks to be Monitored
Hydrogen fluoride (HF)	USEPA Method 26A	<ul style="list-style-type: none"> • CHP • ASP
Oxygen (O ₂);	USEPA Method 3A	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Velocity and Volumetric Flow	USEPA Method 2	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Ammonia (NH ₃)	USEPA CTM 027	<ul style="list-style-type: none"> • ASP
Odour (including NH ₃ and H ₂ S)	EN 13725	<ul style="list-style-type: none"> • CAPCS
Water vapour content (continuous measurement of the water vapour content should not be required if the sample exhaust gas is dried before the emissions are analysed)	USEPA Method 4	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Temperature	USEPA Method 4	<ul style="list-style-type: none"> • CAPCS • CHP • ASP

With reference to the EM&A Manual, the air emission of the stacks shall meet the following emission limits as presented in *Tables 3.2 to 3.5*.

Table 3.2 *Emission Limit for CAPCS Stack*

Parameter	Emission Level (mg/Nm ³) ^(a)
VOCs (including methane)	680
Dust (or Total Suspended Particulates (TSP))	6
Odour (including NH ₃ & H ₂ S)	220 ^(b)
Notes:	
(a) Hourly average concentration	
(b) The odour unit is OU/Nm ³	

Table 3.3 *Emission Limit for CHP Stack*

Parameter	Maximum Emission Level (mg/Nm ³) ^{(a) (b)}
Dust (or Total Suspended Particulates)	15
Carbon Monoxide	650
NO _x	300
SO ₂	50
NMVOCs ^(c)	150
VOCs (including methane) ^(d)	1,500
HCl	10
HF	1
Notes:	
(a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.	
(b) Hourly average concentration	
(c) NMVOCs should be monitored by gas sampling and laboratory analysis at an agreed interval. For the first 12 months (starting from August 2019), monitoring should be carried out at quarterly intervals. The monitoring frequency should then be reduced to half-yearly for next 12 months (starting from August 2020).	

Parameter	Maximum Emission Level (mg/Nm ³) (a) (b)
(d) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.	

Table 3.4 *Emission Limit for ASP Stack*

Parameter	Maximum Emission Level (mg/Nm ³) (a) (b)
Dust (or Total Suspended Particulates)	5
Carbon Monoxide	100
NO _x	200
SO ₂	50
VOCs (including methane) (c)	20
NH ₃	35
HCl	10
HF	1

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 11% and dry basis.
- (b) Hourly average concentration
- (c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.

Table 3.5 *Emission Limit for Standby Flaring Gas Unit* ⁽¹⁾

Parameter	Maximum Emission level (mg/Nm ³) (a) (b)
Dust (or Total Suspended Particulates)	5
Carbon Monoxide	100
NO _x	200
SO ₂	50
VOCs (including methane) (c)	20
HCl	10
HF	1

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 11% and dry basis.
- (b) Hourly average concentration
- (c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.

3.1.2 Odour

To determine the effectiveness of the proposed odour mitigation measures and to ensure that the operation of the ORRC1 will not cause adverse odour impacts, odour monitoring of the CAPCS stack (see *Section 3.1.1*) and odour patrol will be carried out.

Odour patrol shall be conducted by independent trained personnel/ competent persons in summer months (i.e. from July to September) for the first two operational years of ORRC1 at monthly intervals along an odour patrol route at the Project Site boundary as shown in *Annex A*.

(1) A standby facility. Only operate when the CHPs are not in operation or when the biogas generated exceeded the utilisation rate of the CHPs.

The perceived odour intensity is divided into 5 levels. *Table 3.6* describes the odour intensity for different levels.

Table 3.6 *Odour Intensity Level*

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

Table 3.7 shows the action level and limit level to be used for odour patrol. Should any exceedance of the action and limit levels occurs, actions in accordance with the event and action plan in *Table 3.8* should be carried out.

Table 3.7 *Action and Limit Levels for Odour Nuisance*

Parameter	Action Level	Limit Level
Odour Nuisance (from odour patrol)	When one documented compliant is received ^(a) , or Odour Intensity of 2 is measured from odour patrol.	Two or more documented complaints are received ^(a) within a week; or Odour intensity of 3 or above is measured from odour patrol.
Note:		
(a) Once the complaint is received by the Project Proponent (EPD), the Project Proponent would investigate and verify the complaint whether it is related to the potential odour emission from the ORRC1 and its on-site wastewater treatment unit.		

Table 3.8 *Event and Action Plan for Odour Monitoring*

Event	Action	
	Person-in-charge of Odour Monitoring	Project Proponent ^(a)
Action Level		
Exceedance of action level (Odour Patrol)	<ol style="list-style-type: none"> 1. Identify source/ reason of exceedance; 2. Repeat odour patrol to confirm finding. 	<ol style="list-style-type: none"> 1. Carry out investigation to identify the source/ reason of exceedance. Investigation should be completed within 2 weeks; 2. Rectify any unacceptable practice; 3. Implement more mitigation measures if necessary; 4. Inform Drainage Services Department (DSD) or the operator of the Siu Ho Wan Sewage Treatment Works (SHWSTW) if exceedance is considered to be caused by the operation of the SHWSTW. 5. Inform North Lantau Refuse Transfer Station (NLTS) operator if exceedance is considered to be caused by the operation of NLTS.

Exceedance of action level (Odour Complaints)	<ol style="list-style-type: none"> 1. Identify source/reason of exceedance; 2. Carry out odour patrol to determinate odour intensity. 	<ol style="list-style-type: none"> 1. Carry out investigation and verify the complaint whether it is related to potential odour emission from the nearby SHWSTW; 2. Carry out investigation to identify the source/reason of exceedance. Investigation should be completed within 2 weeks; 3. Rectify any unacceptable practice; 4. Implement more mitigation measures if necessary; 5. Inform DSD or the operator of the SHWSTW if exceedance is considered to be caused by the operation of the SHWSTW. 6. Inform NLTS operator if exceedance is considered to be caused by the operation of NLTS.
<hr/>		
Limit Level		
Exceedance of limit level	<ol style="list-style-type: none"> 1. Identify source/reason of exceedance; 2. Inform EPD; 3. Repeat odour patrol to confirm findings; 4. Increase odour patrol frequency to bi-weekly; 5. Assess effectiveness of remedial action and keep EPD informed of the results; 6. If exceedance stops, cease additional odour patrol. 	<ol style="list-style-type: none"> 1. Carry out investigation to identify the source/reason of exceedance. Investigation should be completed within 2 week; 2. Rectify any unacceptable practice; 3. Formulate remedial actions; 4. Ensure remedial actions properly implemented; 5. If exceedance continues, consider what more/enhanced mitigation measures should be implemented; 6. Inform DSD or the operator of the SHWSTW if exceedance is considered to be caused by the operation of the SHWSTW.

Note:

(a) Project Proponent shall identify an implementation agent.

3.2

SITE AUDIT

Environmental mitigation measures (related to air quality, water quality, waste, land contamination, hazard-to-life, and landscape and visual) to be implemented during the operation phase of the Project are recommended in the approved EIA Report and EM&A Manual and are summarised in *Annex C*. Monthly site audits for operation phase will be carried out to check the implementation of these measures.

3.2.1

Water Quality

Compliance audits are to be undertaken to ensure that a valid discharge licence has been issued by EPD prior to the discharge of effluent from the operation of the Project site. Under Effluent Discharge Licence WT00038391-2021 (effective from July 2021), the effluent quality shall meet the discharge limits as described in *Table 3.9* and *Table 3.10*.

Table 3.9 *Discharge Limits for Effluent from the Effluent Storage Tank (as stipulated in WT00038391-2021)*

Parameters	Discharge Limit (mg/L)
Flow Rate (m ³ /day) ^(a)	645
pH (pH units) ^(b)	6-10 ^(c)
Suspended Solids ^(b)	800
Biochemical Oxygen Demand (5 days, 20°) ^(b)	800
Chemical Oxygen Demand ^(b)	2,000
Oil & Grease ^(b)	40
Total Nitrogen ^(b)	200
Total Phosphorus ^(b)	50
Surfactants (total) ^(b)	25

Notes:

- (a) Flow rate is not a parameter required to be monitored and reported by the Contractor in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.
- (b) Parameters required to be monitored and reported by the Contractor in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.
- (c) Range.

Table 3.10 *Discharge Limits for Effluent from the Petrol Interceptor(s) (as stipulated in WT00038391-2021)*

Parameters	Discharge Limit (mg/L)
Flow Rate (m ³ /day)	245 ^(a)
Suspended Solids ^(b)	30
Chemical Oxygen Demand ^(c)	80
Oil & Grease ^(c)	20
Surfactants (total) ^(b)	15

Notes:

- (a) The surface runoff flow rate limit was estimated by the overall yearly rainfall data. As the actual flowrate from the petrol interceptors depends on the weather condition instead of the performance of the petrol interceptor, monitoring and reporting of this parameter is not required. Hence this parameter is not reported in *Error! Reference source not found.* and *Table 4.10.*
- (b) Parameter not required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.
- (c) Parameters required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.

3.2.2 *Landscape and Visual*

In accordance with EM&A Manual, the landscape and visual mitigation measures shall be implemented.

For operation phase, site inspection shall be conducted once a month for the first year of operation of the Project. All measures as stated in the implementation schedule of the EM&A Manual (see *Annex C*), including compensatory planting, undertaken by both the Contractor and the specialist Landscape Sub-Contractor during the first year of the operation phase shall be audited by a Registered Landscape Architect (RLA) to ensure compliance with

the intended aims of the measures and the effectiveness of the mitigation measures.

4 MONITORING RESULTS

4.1 AIR QUALITY

4.1.1 Commissioning Phase Monitoring

Monitoring results of air quality parameters from stack emissions of the centralised air pollution control system, the ammonia stripping plant and the cogeneration units will be provided once available to show compliance with the monitoring requirements stated in the EM&A Manual (Rev. F) to support the termination of the construction phase EM&A programme.

4.1.2 Operation Phase Monitoring

The concentrations of concerned air pollutants emitted from the stacks of the CAPCS, CHP, and ASP during the reporting period are monitored on-line by the continuous environmental monitoring system (CEMS). During the reporting period, there is no need to operate the standby flare and therefore no monitoring of the flare stack was undertaken.

With reference to the emission limits shown in *Tables 3.2, 3.3 and 3.4*, the hourly average concentrations and the number of exceedances of the concerned air emissions monitored for the CAPCS, CHP and ASP during this reporting period are presented in *Tables 4.1 to 4.5*.

It should be noted that measurements recorded under abnormal operating conditions, e.g. start up and stopping of stacks, unstable operation, test runs and interference of sensor, are disregarded.

Table 4.1 *Hourly Average of Parameters Recorded for CAPCS*

Parameter	Range of Hourly Average Conc. (mg/Nm ³)	Emission Limit (mg/Nm ³)	Exceedance Identified	Remarks
VOCs (including methane)	0.00 – 131.03	680	Nil	Nil
Dust (or TSP)	0.00 – 0.00	6	Nil	Nil
Odour (including NH ₃ & H ₂ S) ^(b)	0.00 – 218.87	220	Nil	Nil

Note:
(a) The odour unit is OU/Nm³.

Table 4.2 *Hourly Average of Parameters Recorded for CHP 1*

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedance Identified	Remarks
Dust (or TSP)	NA ^(b)	15	Nil	Nil
Carbon Monoxide	NA ^(b)	650	Nil	Nil
NO _x	NA ^(b)	300	Nil	Nil
SO ₂	NA ^(b)	50	Nil	Nil
VOCs (including methane) ^(c)	NA ^(b)	1,500	Nil	Nil
HCl	NA ^(b)	10	Identified	Nil
HF	NA ^(b)	1	Nil	Nil

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.
- (b) CHP 1 was shut down in this reporting period for maintenance and preparation of overhaul.
- (c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.

Table 4.3 *Hourly Average of Parameters Recorded for CHP 2*

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedance Identified	Remarks
Dust (or TSP)	0 -	15	Nil	Nil
Carbon Monoxide	0 - 359	650	Nil	Nil
NO _x	0 - 308	300	Identified ^(c)	System unstable (e.g. low efficiency, unstable column temperature)
SO ₂	0 - 97	50	Identified ^(d)	Desulphurisation system tripped and resumed to normal after urgent maintenance.
VOCs (including methane) ^(b)	0 - 1,084	1,500	Nil	Nil
HCl	0 - 9	10	Nil	Nil
HF	0 - 1	1	Nil	Nil

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.
- (b) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.
- (c) Date with exceedances on NO_x (number of exceedances on the day) was identified on 1 (1), 2 (4) and 15 (1) September 2021.
- (d) Date with exceedances on SO₂ (number of exceedances on the day) was identified on 1 (8), 2 (1), 8 (1), 9 (2), 11 (5), 12 (7) and 13 (6) September 2021.

Table 4.4 Hourly Average of Parameters Recorded for CHP 3

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedances Identified	Remarks
Dust (or TSP)	0 – 11	15	Nil	Nil
Carbon Monoxide	0 – 578	650	Nil	Nil
NO _x	0 – 314	300	Identified ^(c)	System unstable (e.g. low efficiency, unstable column temperature)
SO ₂	0 – 93	50	Identified ^(d)	Desulphurisation system tripped and resumed to normal after urgent maintenance.
VOCs (including methane) ^(b)	0 – 1,363	1,500	Nil	Nil
HCl	0 – 3	10	Nil	Nil
HF	0 – 2	1	Nil	Nil

Notes:

(a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.

(b) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.

(c) Dates with exceedances on NO_x (number of exceedances on the day) were identified on 4 (1), 9 (2) and 10 (4) September 2021.

(d) Date with exceedances on SO₂ (number of exceedances on the day) were identified on 1 (8), 9 (8), 11 (7), 12 (7) and 13 (6) September 2021.

Table 4.5 Hourly Average of Parameters Recorded for ASP

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedances Identified	Remarks
Dust (or TSP)	0 – 4	5	Nil	Nil
Carbon Monoxide	0 – 95	100	Nil	Nil
NO _x	0 – 428	200	Identified ^(c)	System unstable (e.g. low efficiency, unstable column temperature)
SO ₂	0 – 58	50	Identified ^(d)	Desulphurisation system tripped and resumed to normal after urgent maintenance.
VOCs (including methane) ^(b)	0 – 166	20	Identified ^(e)	System unstable (e.g. low efficiency, unstable column temperature)
NH ₃	0 – 670	35	Identified ^(f)	System unstable (e.g. low efficiency, unstable column temperature)
HCl	0 – 0	10	Nil	Nil
HF	0 – 1	1	Nil	Nil

Notes:

(a) All values refer to an oxygen content in the exhaust gas of 11% and dry basis.

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedances Identified	Remarks
(b)				The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.
(c)				Dates with exceedances on NO _x (number of exceedances on the day) were identified on 4 (2), 9 (1), 10 (1), 13 (1), 15 (1), 16 (2), 22 (1), 24 (2) and 29 (2) September; 7 (1), 8 (10), 9 (17), 10 (3), 13 (3), 15 (3), 19 (2), 23 (1), 25 (2), 27 (2), 28 (2) and 29 (2) October; 3 (12), 4 (1), 5 (4), 9 (1), 10 (1), 13 (1), 15 (3), 17 (3), 18 (1), 26 (1), 27 (1), 29 (1) and 30 (5) November 2021.
(d)				Dates with exceedances on SO ₂ (number of exceedances on the day) were identified on 9 (3) and 11 (1) September 2021.
(e)				Dates with exceedances on VOCs (number of exceedances on the day) were identified on 13 (5) and 20 (1) October; 11 (1) and 16 (1) November 2021.
(f)				Dates with exceedances on NH ₃ (number of exceedances on the day) were identified on 4 (9), 18 (2), 20 (8), 21 (12), 22 (10), 24 (1), 25 (9), 26 (5) and 30 (1) September; 2 (6), 3 (2), 4 (8), 5 (3), 6 (7), 7 (2), 12 (2), 13 (15), 14 (6), 15 (5), 16 (7), 17 (8), 18 (2), 20 (2), 22 (5), 23 (9), 24 (3), 28 (2), 29 (4) and 31 (1) October; 1 (3), 6 (3), 7 (3), 8 (2), 9 (2), 10 (13), 11 (7), 12 (14), 13 (4), 15 (3), 16 (7), 17 (16), 18 (12), 20 (1), 21 (1), 22 (1), 27 (1) and 30 (1) November 2021.

4.2 ODOUR

4.2.1 Operation Phase Monitoring

Odour patrol was conducted by the independent odour patrol team of ALS Technichem (HK) Pty Ltd on 3 September 2021. According to the EM&A Manual and EP requirements, it is considered an exceedance if the odour intensity recorded by the panellists is Level 2 or above. During this reporting period, no Level 2 Odour Intensity was recorded. The odour patrol result is shown in *Annex G*.

4.3 WATER QUALITY

4.3.1 Operation Phase Monitoring

Effluent discharge was sampled monthly from the Effluent Storage Tank as stipulated in the operation phase discharge licence. Discharge from the Petrol Interceptors were sampled bi-monthly since July 2021 as stipulated in the operation phase discharge licence. The results of the discharge samples from the Effluent Storage Tank are recorded in *Table 4.6* to *4.8*. The results of the discharge samples from the Petrol Interceptors are recorded in *Table 4.9* and *4.10*.

Table 4.6 Results of the Discharge Sample Collected from the Effluent Storage Tank on 28 September 2021

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
Flow Rate (m ³ /day) ^(a)	0 - 266 ^(e)	645	Yes
pH (pH units) ^(b)	7.40 - 8.46 ^(e)	6-10 ^(c)	Yes
Suspended Solids ^{(b)(d)}	254 ^(d)	800	Yes

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
Biochemical Oxygen Demand (5 days, 20°) ^{(b) (d)}	50 ^(d)	800	Yes
Chemical Oxygen Demand ^{(b) (d)}	1,530 ^(d)	2,000	Yes
Oil & Grease ^{(b) (d)}	<5 ^(d)	40	Yes
Total Nitrogen ^{(b) (d)}	135 ^(d)	200	Yes
Total Phosphorus ^{(b) (d)}	26.8 ^(d)	50	Yes
Surfactants (total) ^{(b) (d)}	1.8 ^(d)	25	Yes

Notes:

- (a) Parameter not required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.
- (b) Parameters required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.
- (c) Daily Range.
- (d) Effluent sample collected on 28 September 2021.
- (e) Data collected daily.

Table 4.7 *Results of the Discharge Sample Collected from the Effluent Storage Tank on 15 October 2021*

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
Flow Rate (m ³ /day) ^(a)	39 - 460 ^(e)	645	Yes
pH (pH units) ^(b)	7.97 – 8.31 ^(e)	6-10 ^(c)	Yes
Suspended Solids ^{(b) (d)}	540 ^(d)	800	Yes
Biochemical Oxygen Demand (5 days, 20°) ^{(b) (d)}	68 ^(d)	800	Yes
Chemical Oxygen Demand ^{(b) (d)}	1,830 ^(d)	2,000	Yes
Oil & Grease ^{(b) (d)}	<5 ^(d)	40	Yes
Total Nitrogen ^{(b) (d)}	197 ^(d)	200	Yes
Total Phosphorus ^{(b) (d)}	29.7 ^(d)	50	Yes
Surfactants (total) ^{(b) (d)}	3.1 ^(d)	25	Yes

Notes:

- (f) Parameter not required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.
- (g) Parameters required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.
- (h) Daily Range.
- (i) Effluent sample collected on 15 October 2021.
- (j) Data collected daily.

Table 4.8 *Results of the Discharge Sample Collected from the Effluent Storage Tank on 9 November 2021*

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
Flow Rate (m ³ /day) ^(a)	0 - 241 ^(e)	645	Yes
pH (pH units) ^(b)	7.97 – 8.13 ^(e)	6-10 ^(c)	Yes

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
Suspended Solids ^{(b) (d)}	158 ^(d)	800	Yes
Biochemical Oxygen Demand (5 days, 20°) ^{(b) (d)}	30 ^(d)	800	Yes
Chemical Oxygen Demand ^{(b) (d)}	934 ^(d)	2,000	Yes
Oil & Grease ^{(b) (d)}	<5 ^(d)	40	Yes
Total Nitrogen ^{(b) (d)}	49.9 ^(d)	200	Yes
Total Phosphorus ^{(b) (d)}	24.3 ^(d)	50	Yes
Surfactants (total) ^{(b) (d)}	<1.0 ^(d)	25	Yes

Notes:

(k) Parameter not required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.

(l) Parameters required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.

(m) Daily Range.

(n) Effluent sample collected on 9 November 2021.

(o) Data collected daily.

Table 4.9 *Results of the Discharge Sample from the Petrol Interceptor 1 on 15 October 2021*

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
Suspended Solids ^(b)	12 ^(a)	30	Yes
Chemical Oxygen Demand ^(c)	56 ^(a)	80	Yes
Oil & Grease ^(c)	<5 ^(a)	20	Yes
Surfactants (total) ^(b)	<1.0 ^(a)	15	Yes

Notes:

(a) Effluent sample collected on 15 October 2021.

(b) Parameter not required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.

(c) Parameters required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.

Table 4.10 *Results of the Discharge Sample from the Petrol Interceptor 2 on 15 October 2021*

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
Suspended Solids ^(b)	<2 ^(a)	30	Yes
Chemical Oxygen Demand ^(c)	15 ^(a)	80	Yes
Oil & Grease ^(c)	<5 ^(a)	20	Yes
Surfactants (total) ^(b)	<1.0 ^(a)	15	Yes

Notes:

(a) Effluent sample collected on 15 October 2021.

(b) Parameter not required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.

(c) Parameters required to be reported in accordance to Section B2 of the Effluent Discharge Licence under the WPCO.

No exceedance of discharge limit was recorded during the reporting period.

4.4 WASTE MANAGEMENT

4.4.1 Operation Phase Monitoring

Wastes generated from the operation of the Project include chemical waste, wastes generated from pre-treatment process and general refuse ⁽¹⁾. Reference has been made to the Monthly Summary Waste Flow Table prepared by the Contractor (see *Annex D*). With reference to the relevant handling records and trip tickets of this Project, the quantities of different types of waste generated from the operation of the Project in the reporting month are summarised in *Table 4.11*.

Table 4.11 Quantities of Waste Generated from the Operation of the Project

Month/Year	Chemical Waste	Waste Generated from Pre-treatment Process		General Refuse	
		Disposed of at CWTC	Disposed of at Landfill ^(a)	Recycled ^(b)	Disposed of at Landfill ^{(a) (c)}
September 2021	2,400 L ^(e)	304.01 tonnes	0.00 tonnes	2.88 tonnes	0.00 tonne
October 2021	0 L	342.38 tonnes	0.00 tonnes	2.65 tonnes	0.00 tonne
November 2021	2,000 L ^(f)	394.26 tonnes	0.00 tonnes	3.00 tonnes	0.00 tonne

Notes:

- (a) Waste generated from pre-treatment process and general refuse other than chemical waste and recyclables were disposed of at NENT landfill by sub-contractors.
- (b) Among waste generated from pre-treatment process, 0.00 tonne of metals, 0.00 tonne of papers/ cardboard packing and 0.00 tonne of plastics were sent to recyclers for recycling during the reporting period.
- (c) It was assumed that four 240-litre bins filled with 80% of general refuse were collected at each collection. The general refuse density was assumed to be around 0.15 kg/L.
- (d) Among general refuse, 0.00 tonnes of metals, 0.00 tonnes of papers/ cardboard packing and 0 tonnes of plastics were sent to recyclers for recycling during the reporting period.
- (e) It includes 1,000 L of spent ferric chloride solution and 1,400 L of spent lube oil.
- (f) 2,000 L of spent lube oil was disposed of at CWTC in November 2021.

(1) Public fill and construction waste may only be generated during maintenance works when there are civil or structural works.

5 *SITE AUDIT*

5.1 *ENVIRONMENTAL SITE AUDIT*

5.1.1 *Operation Phase*

The monthly inspections of the operation phase of the Project covered the operation phase environmental site inspections. The inspections checked the implementation of the recommended mitigation measures for air quality, landscape and visual, water quality, waste (land contamination) and hazard-to-life stated in the Implementation Schedule (see *Annex C*).

Follow-up actions resulting from the site inspections were generally taken as reported by the Contractor. The Contractor has implemented environmental mitigation measures recommended in the approved EIA Report and EM&A Manual.

September 2021

The monthly inspection of the operation phase of the Project on 17 September 2021 covered the operation phase environmental site audit. Joint site inspections was conducted by representatives of the Contractor, IEC and the MT on 17 September 2021 as required for the operation of the Project.

October 2021

The monthly inspection of the operation phase of the Project on 27 October 2021 covered the operation phase environmental site audit. Joint site inspections was conducted by representatives of the Contractor, IEC and the MT on 27 October 2021 as required for the operation of the Project.

November 2021

The monthly inspection of the operation phase of the Project on 26 November 2021 covered the operation phase environmental site audit. Joint site inspections was conducted by representatives of the Contractor, IEC and the MT on 26 November 2021 as required for the operation of the Project.

5.2 *LANDSCAPE AND VISUAL AUDIT*

It was confirmed that the necessary landscape and visual mitigation measures during the operation phase as summarised in *Annex C* were generally implemented by the Contractor. No non-compliance in relation to the landscape and visual mitigation measures was identified during the site audits in this reporting period and therefore no further actions are required. The ET/MT will keep track of the EM&A programme to check compliance with environmental requirements and the proper implementation of all necessary mitigation measures.

September 2021

Monthly inspection of the landscape and visual mitigation measures for the operation phase of the Project was performed on 17 September 2021.

October 2021

Monthly inspection of the landscape and visual mitigation measures for the operation phase of the Project was performed on 27 October 2021.

November 2021

Monthly inspection of the landscape and visual mitigation measures for the operation phase of the Project was performed on 26 November 2021.

6 ENVIRONMENTAL NON-CONFORMANCE

6.1 SUMMARY OF ENVIRONMENTAL NON-COMPLIANCE

September 2021

Non-compliance of emission limits for CHP and ASP were recorded during the reporting period.

The Contractor has reviewed the organic waste treatment processes (i.e. waste reception, waste pre-treatment, anaerobic digesters, and composting processes) and found that they were operated normally during the reporting period. The Contractor has investigated air pollution control systems for the CHP and ASP and identified several potential causes for the exceedance. Remedial and follow-up actions had been recommended to the Contractor to perform accordingly. The Investigation Report is shown in *Annex F*.

August 2021

Non-compliance of emission limits for CHP and ASP were recorded during the reporting period.

The Contractor has reviewed the organic waste treatment processes (i.e. waste reception, waste pre-treatment, anaerobic digesters, and composting processes) and found that they were operated normally during the reporting period. The Contractor has investigated air pollution control systems for the CHP and ASP and identified several potential causes for the exceedance. Remedial and follow-up actions had been recommended to the Contractor to perform accordingly. The Investigation Report is shown in *Annex F*.

October 2021

Non-compliance of emission limits for CHP and ASP were recorded during the reporting period.

The Contractor has reviewed the organic waste treatment processes (i.e. waste reception, waste pre-treatment, anaerobic digesters, and composting processes) and found that they were operated normally during the reporting period. The Contractor has investigated air pollution control systems for the CHP and the ASP and identified several potential causes for the exceedance. Remedial and follow-up actions had been recommended to the Contractor to perform accordingly. The Investigation Report is shown in *Annex F*.

6.2 SUMMARY OF ENVIRONMENTAL COMPLAINT

No complaint was received during the reporting period.

6.3

SUMMARY OF ENVIRONMENTAL SUMMON AND SUCCESSFUL PROSECUTION

No summon/prosecution was received during the reporting period. The cumulative summons/prosecution log is shown in *Annex E*.

7 *FUTURE KEY ISSUES*

7.1 *KEY ISSUES FOR THE COMING REPORTING PERIOD*

Activities to be undertaken for the coming reporting period are:

- Operation of the Project.
- Modification of the CHP and ASP to control the air emission.

This EM&A Report presents the EM&A programme undertaken during the reporting period from **1 September** to **30 November 2021** in accordance with EM&A Manual (Version F) and requirements of EP (FEP-01/395/2010/C).

For the operation phase, exceedances of the emission limits for stack monitoring (including CAPCS, CHP and ASP stacks) were recorded under normal operating conditions during the reporting period (see *Table 8.1*).

Table 8.1 *Exceedances for Stack Emissions*

Stack	Exceedances During the Reporting Period
Centralised Air Pollution Control Unit (CAPCS)	<ul style="list-style-type: none"> • Nil
Cogeneration Unit (CHP) 1	<ul style="list-style-type: none"> • Nil (CHP 1 was shut down in this reporting period for maintenance and preparation of overhaul)
Cogeneration Unit (CHP) 2	<ul style="list-style-type: none"> • Exceeded emission limit of NO_x on 1, 2, and 15 September • Exceeded emission limit of SO₂ on 1, 2, 8, 9, 11, 12 and 13 September 2021
Cogeneration Unit (CHP) 3	<ul style="list-style-type: none"> • Exceeded emission limit of NO_x on 4, 9 and 10 September. • Exceeded emission limit of SO₂ on 1, 9, 11, 12 and 13 September 2021
Ammonia Stripping Plant (ASP)	<ul style="list-style-type: none"> • Exceeded emission limit of NO_x on 4, 9, 10, 13, 15, 16, 22, 24 and 29 September; 7, 8, 9, 10, 13, 15, 19, 23, 25, 27, 28 and 29 October; 3, 4, 5, 9, 10, 13, 15, 17, 18, 26, 27, 29 and 30 November 2021. • Exceeded emission limit of SO₂ on 9 and 11 September; 2021 • Exceeded emission limit of VOCs on 13 and 20 October; 11 and 16 November 2021 • Exceeded emission limit of NH₃ on 4, 18, 20, 21, 22, 24, 25, 26 and 30 September; 2, 3, 4, 5, 6, 7, 12, 13, 14, 15, 16, 17, 18, 20, 22, 23, 24, 28, 29 and 31 October; 1, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 27 and 30 November 2021

In September, the exceedances in NO_x of CHP were found to be a result of the low biogas loading at the CHP. The exceedances of SO₂ of CHPs and ASP were found to be a result of the tripping of the desulphurisation system. In October, The exceedances of NO_x, VOCs and NH₃ in ASP were found to be a result of the unstable condition of the ASP system. In November, the exceedances of NO_x, VOCs and NH₃ in ASP were found to be a result of the unstable condition of the ASP system caused by unstable water flow resulted from the malfunctioning of various equipment (including the hot water circulation pump), leakage of piping and the blockage of the steam generator.

The Contractor has replaced malfunctioned parts (desulphurisation system, columns of the ASP), cleaning for various parts (i.e. stripping column and packaging of the ASP), and carried out fine-tuning of equipment of the ASP, the investigation on the underlying reasons of exceedances in CHP and ASP and the continuous seeking of better and more feedstock to increase biogas

loading and testing at ASP to optimise combustion efficiency and overall performance.

No non-compliance to the effluent discharge limit was recorded during this reporting period.

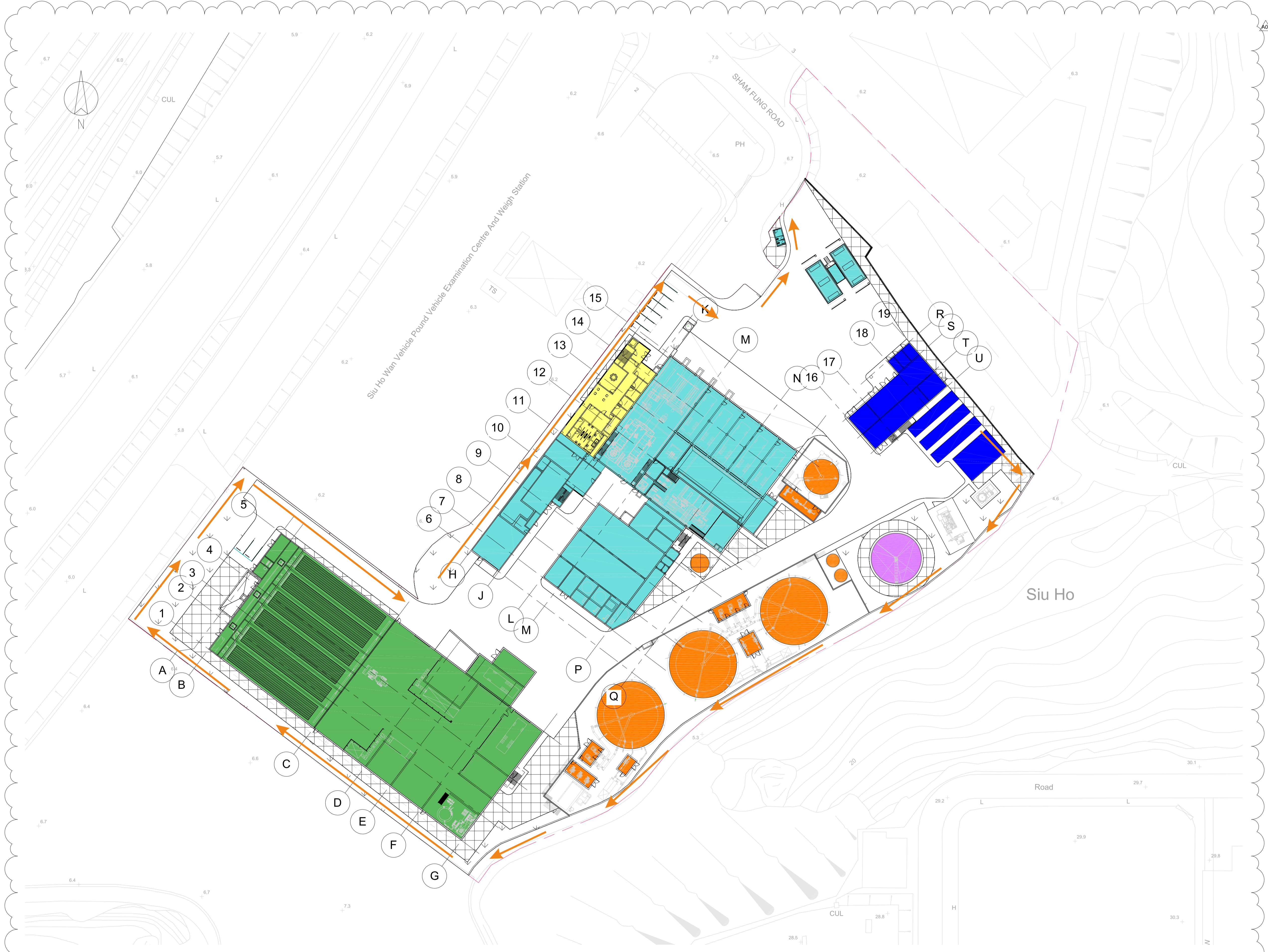
The environmental control /mitigation measures related to air quality, water quality, waste (including land contamination prevention), hazard-to-life and landscape and visual recommended in the approved EIA Report and the EM&A Manual were properly implemented by the Contractor during the reporting period.

Monthly landscape and visual monitoring were conducted in the reporting period. The necessary landscape and visual mitigation measures recommended in the approved EIA Report were generally implemented by the Contractor.

No complaint/summon/prosecution was received.

Annex A

Project Layout



Key
 Patrol Route

A01	05/03/15	CW	MB	IMTECH BACKGROUNDS UPDATED
A00	18/02/15	CW	MB	DRAFT ISSUE
REV	DATE	BY	APP	DESCRIPTION

CLIENT
 ENVIRONMENTAL PROTECTION DEPARTMENT
 GOVERNMENT OF THE HKSAR

CLIENT'S CONSULTANT
 **AECOM**
 AECOM ASIA CO. LTD.

CONTRACTOR

 OSCAR BIOENERGY JV

LEAD DESIGNER
 **ARUP**
 Ove Arup & Partners Hong Kong Limited

ENVIRONMENTAL TEAM
 **ERM**
 ERM HONG KONG LIMITED

INDEPENDENT CONSULTANTS
 **MEINHARDT**
 Meinhardt Infrastructure and Environment Limited
 邁達基建築環保工程顧問有限公司

PROJECT
 ORGANIC WASTE TREATMENT FACILITIES
 PHASE 1
 EP/SP/61/10

STATUS
 DRAFT ISSUE

DRAWING TITLE
 SITE LAYOUT

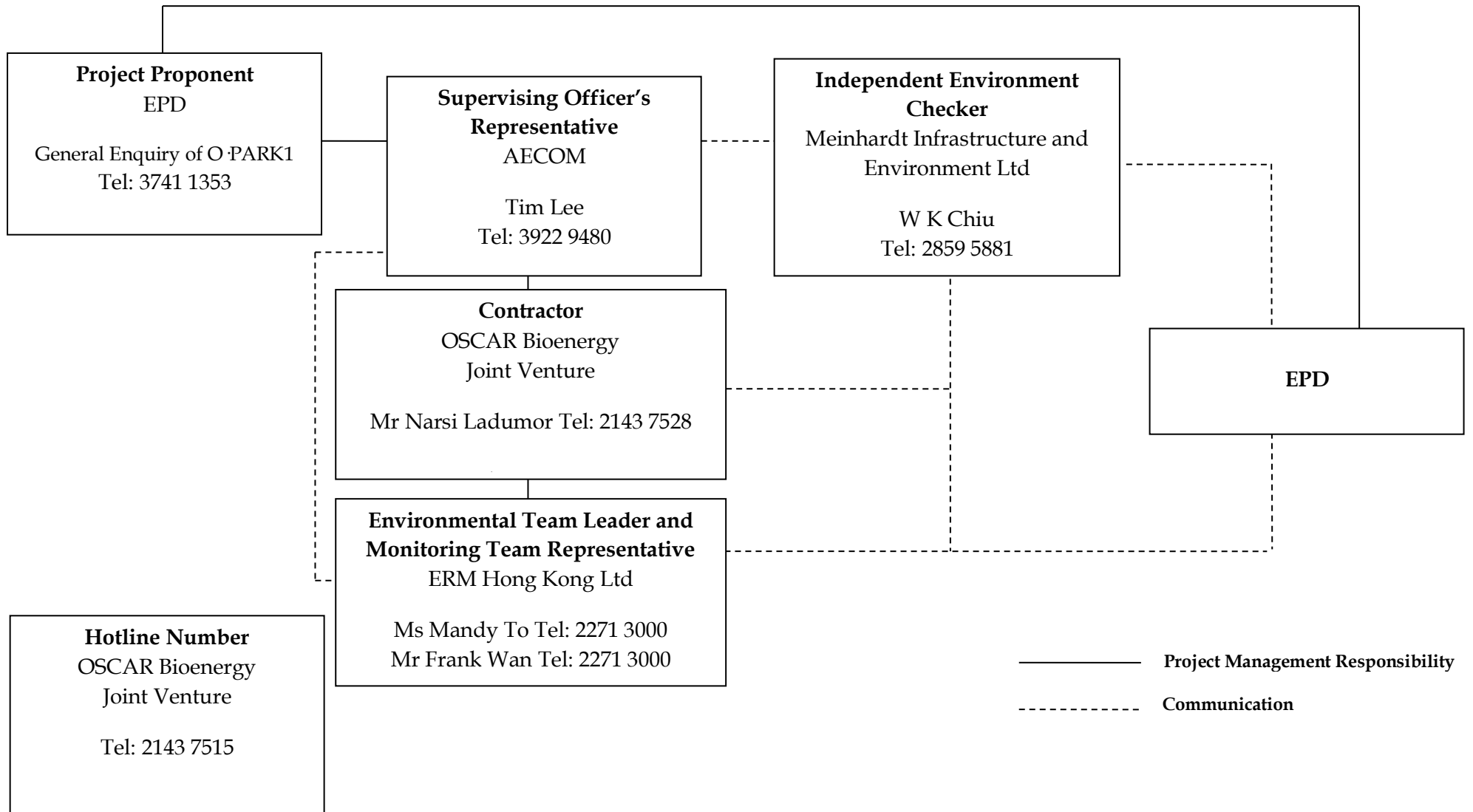
DRAWN CW	CHECKED RS	APPROVED DP
SCALE 1:500@A1 / 1:1000@A3	DATE 12/02/15	
JOB NO. 239956	DRAWING NO. DR-OAP-20-0-CA-1001	REV. A01

Plot Time: 05/03/15 21:20:07
 Plot Location: C:\Users\mathew.brown\Documents\QWTF_Architectural_Working_Models (Combined) CEH_mathew.brown.rvt

Annex B

Project Organisation Chart with Contact Details

Project Organization (with contact details)



Annex C

Implementation Schedule of Mitigation Measures

Annex C Summary of Mitigation Measures Implementation Schedule for Operation Phase

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
<i>Summary of Environmental Mitigation Measures in the EIA and EM&A Manual</i>				
<i>A. Air Quality</i>				
3.78	2.7 & 2.13 – 2.19	<p><u>Air Pollution Control (Construction Dust) Regulation & Good Site Practices</u></p> <ul style="list-style-type: none"> •Commissioning tests shall be conducted to confirm the centralized air pollution control unit, the cogen units, the standby flaring unit and ASP against the design emission levels as stated in Tables 2.2 - 2.5. •Odour monitoring shall be conducted at the stack exhaust of the centralized air pollution control unit weekly in the first month of the commissioning stage. 	OWTF Stacks/ During Commissioning Stage	√
3.78	2.7-2.12	<p><u>Air Pollution Control and Stack Monitoring</u></p> <ul style="list-style-type: none"> •Stack monitoring shall be installed for the centralized air pollution control unit, cogen units and ASP of OWTF to ensure that the air emissions from OWTF would meet the design emission limits as well as EPD criteria. 	During Operation	√
3.78	2.20- 2.28	<ul style="list-style-type: none"> •Odour Patrol at site boundary of OWTF 	OWTF Site Boundary/ During Operation (The need to continue the odour patrol after the end of the 2-year monitoring period would depend on the monitoring results and should be agreed with EPD)	N/A
<i>B. Hazard to Life</i>				
4.103	3.4	<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> •3m high fence should be constructed along the boundary facing the SHWWTW •Emergency evacuation procedures should be formulated and the Contractor should ensure on site staff should be familiar with these procedures. Diagram showing the escape routes to a safe place should be posted in the site notice boards and at the entrance/exit of site. A copy of the latest version emergency procedures should be dispatched to Tung Chung Fire Station for reference once available. •The emergency procedures should specify means of providing a rapid and direct warning (e.g. Siren and Flashing Light) to personnel on site in the event of chlorine gas release in the SHWWTW. 	Work Site / During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<ul style="list-style-type: none"> •The Contractor should establish a communication channel with the SHWWTW operation personnel and FSD. In case of any hazardous incidents in the treatment works, operation personnel of SHWWTW should advise the Contractor to inform personnel on site to proceed with emergency procedure. The Contractor should appoint a Liaison Officer to communicate with FSD Incident Commander on site in case of emergency. •Periodic drills should be coordinated and conducted to ensure all on site personnel are familiar with the emergency procedures. Upon completion of the drills, a review on every step taken should be conducted to identify area of improvement. Prior notice of periodic drills should be given to Station Commander of Tung Chung Fire Station. Joint operational exercise with FSD and SHWWTW is recommended. 		
<i>C. Water Quality</i>				
5.44	4.5	<p><u>Wastewater from Organic Waste Treatment Process</u></p> <p>The Project site will be equipped with an adequately sized wastewater treatment plant. A high rate type of active sludge system specifically designed for the removal of nitrogen components from the wastewater in combination with conversion of residual BOD and COD would be deployed. The wastewater treatment plant would also be incorporated with SHARON or annamox technology or equivalent to achieve high total overall nitrogen removal. Wastewater generated from the OWTF (including wastewater from dewatering process, leachate from waste reception area, condensate from biogas handling, wastewater from scrubber of air treatment system and any surplus water from truck washing facility) will be diverted to the wastewater treatment plant. Treated effluent will then be stored temporarily in order to be used as process water within the plants. The storage volume would be around 20 m³. Overflow from the tank will be discharged to foul sewers. The polluting parameters in effluent shall be in compliance with the requirements specified in the TM- DSS. The design, installation and operation of the wastewater treatment plant shall be licensed under the Waste Disposal Ordinance and subject to the effluent monitoring as required under the WPCO which is under the ambit of regional office (RO) of EPD. To ensure that wastewater can be adequately treated and effluent from treatment plant can meet the standards listed in TM- DSS, the following mitigation measure should be conducted.</p> <ul style="list-style-type: none"> • Cleaning and maintenance of treatment facilities should be conducted on a regular basis to ensure that removal rate of each treatment facility would not be reduced. • Cleaning and maintenance of pipelines should be carried out on a regular basis to prevent block of pipeline and leaching of wastewater, and therefore prevent overflowed or leached wastewater discharging into nearby drainages and water streams. • Regular site inspection should be conducted to ensure that no wastewater can be directly discharged into nearby water streams. 	Work Site / During Design & Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
5.55	4.5	In the scrubber, spraying water should be re-circulated to minimize the need for external water. The spraying water would be collected at the bottom of the scrubber. Excess water would be discharged to the wastewater treatment plant as described in Section 5.54.	Work Site / During Design & Operation Period	√
5.56	4.5	The waste reception, treatment facilities and compost storages of OWTF should be located in enclosed buildings to prevent generation of contaminated rain runoff. All surface runoff such as washed water generated in the treatment processes areas should be properly collected and diverted to the on-site wastewater treatment plant as described in Section 5.54.	Work Site / During Design & Operation Period	√
5.57	4.5	All drainage system for collection and transferring wastewater generated in the OWTF to the on-site wastewater treatment plant as described in Section 5.54 should be capable of preventing clogging and easy maintenance and cleaning.	Work Site / During Design & Operation Period	√
<i>D. Waste Management</i>				
6.50	5.12	<p><u>Good Site Practices</u></p> <p>Good operational practices should be adopted to Minimize waste management impacts:</p> <ul style="list-style-type: none"> •Obtain the necessary waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Chemical Waste) (General) Regulation and the Land (Miscellaneous Provision) Ordinance (Cap. 28); •Nomination of an approved person to be responsible for good site practice, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site; •Use of a waste haulier licensed to collect specific category of waste; •A trip-ticket system should be included as one of the contractual requirements and implemented by the Environmental Team to monitor the disposal of solid wastes at public filling facilities and landfills, and to control fly tipping. Reference should be made to ETWB TCW No. 31/2004. •Training of site personnel in proper waste management and chemical waste handling procedures; •Separation of chemical wastes for special handling and appropriate treatment at a licensed facility; •Routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors; •Provision of sufficient waste disposal points and regular collection for disposal; •Adoption of appropriate measures to minimize windblown litter and dust during transportation of waste, such as covering trucks or transporting wastes in enclosed containers; and •Implementation of a recording system for the amount of wastes generated, recycled and 	During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		disposed of (including the disposal sites).		
6.51	5.13	<p><u>Waste Reduction Measures</u></p> <p>Good management and control can prevent the generation of significant amounts of waste. It is recommended that the following good operational practices should be adopted to ensure waste reduction:</p> <ul style="list-style-type: none"> •Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal; •Encourage collection of aluminum cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors. Separate labelled bins should be provided to help segregate this waste from other general refuse generated by the work force; and •Any unused chemicals or those with remaining functional capacity should be reused as far as practicable. 	During Operation Period	√
6.52	5.14	<p><u>Wastes Generated from Pre-Treatment Process</u></p> <p>Wastes generated from pre-treatment process should be recycled as far as possible. Wastes generated from pre-treatment process should also be separated from any chemical waste and stored in covered skips. The recyclables should be collected by licensed collectors, while the rest of the waste should be removed from the site on a daily basis to minimize odour, pest and litter impacts. Open burning must be strictly prohibited.</p>	Pre-Treatment Process/ During Operation Period	√
6.53-6.56	5.15-5.18	<p><u>Chemical Wastes</u></p> <ul style="list-style-type: none"> •Chemical waste generated from machinery maintenance and servicing should be managed in accordance with Code of Practice on the Packaging, Labelling and storage of Chemical Wastes under the provisions of Waste Disposal (Chemical Waste) (General) Regulation. The chemical waste should be collected by drum-type containers and removed by licensed chemical waste contractors. •Plant / equipment maintenance schedules should be planned in order to minimize the generation of chemical waste. •Non-recyclable chemical wastes and lubricants should be disposed of at appropriate facilities, such as CWTC. Copies or counterfoils from collection receipts issued by the licensed waste collector should be kept for recording purpose. •Recyclable chemical waste will be transported off-site for treatment by a licensed collector. The Contractor will need to register with EPD as a chemical waste producer. Where possible, chemical wastes (e.g. waste lubricants) would be recycled at appropriate facilities, such as Dunwell's oil re-refinery. 	Whole Site / During Operation Period	√
6.57-6.58	5.19-5.20	<u>General Refuse</u>	Whole Site / During Operation	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<ul style="list-style-type: none"> •Waste generated in offices should be reduced through segregation and collection of recyclables. To promote the recycling of wastes such as used paper, aluminum cans and plastic bottles, it is recommended that recycling bins should be clearly labelled and placed at locations with easy access. For the collection of recyclable materials, they should be collected by licensed collectors. •General refuse, other than segregated recyclable wastes, should be separated from any chemical waste and stored in covered skips. The general refuse should be removed from the site on a daily basis to minimize odour, pest and litter impacts. Also, open burning of refuse must be strictly prohibited. 	Period	
<i>E. Proposed Land Contamination Preventive Measures</i>				
6.65	5.21 (i)	<u>Fuel Oil Containers</u> <ul style="list-style-type: none"> •Fuel oil should be stored in suitable containers. •All fuel oil containers should be securely closed. •Appropriate labels showing the name of fuel oil should be posted on the containers. •Drip trays should be provided for all containers. 	Fuel Oil Storage Containers /During Operation Period	√
6.65	5.21 (ii)	<u>Storage Area</u> <ul style="list-style-type: none"> •Distance between the fuel oil refuelling points and the fuel oil containers should be minimized. •The storage area should be used for fuel oil storage only. •No surface water drains or foul sewers should be connected to the storage area. •The storage area should be enclosed by three sides by a wall and have an impermeable floor or surface. 	Fuel Oil Storage Area /During Operation Period	√
6.65	5.21 (iii)	<u>Fuel Oil Spillage Response</u> An Oil Spill Response Plan should be prepared by the operator to document the appropriate response procedures for oil spillage incident in detail. General procedures to be taken in case of fuel oil spillage are presented below. <ul style="list-style-type: none"> • <u>Training</u> Training on oil spill response actions should be given to relevant staff. The training should cover the followings: <ul style="list-style-type: none"> - Tools & resources to combat oil spillage and fire, e.g. locations of oil spill handling equipment and firefighting equipment; - General methods to deal with oil spillage and fire incidents; - Procedures for emergency drills in the event of oil spills and fire; and - Regular drills should be carried out. • <u>Communication</u> Establish communication channel with the Fire Services Department (FSD) and EPD to 	Whole Site / During Operation Phase	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<p>report any oil spillage incident so that necessary assistance from relevant department could be quickly sought.</p> <ul style="list-style-type: none"> • <u>Response Procedure</u> Any fuel oil spillage within the Project Site should be immediately reported to the Site Manager with necessary details including location, source, possible cause and extent of the spillage Site Manager should immediately attend to the spillage and initiate any appropriate action to confine and clean up the spillage. The response procedures should include the following: <ul style="list-style-type: none"> - Identify and isolate the source of spillage as soon as possible. - Contain the oil spillage and avoid infiltration into soil / groundwater and discharge to storm water channels. - Remove the oil spillage. - Clean up the contaminated area. - If the oil spillage occurs during refuelling, the refuelling operation should immediately be stopped. - Recovered contaminated fuel oil and the associated material to remove the spilled oil should be considered as chemical waste. The handling and disposal procedures for chemical wastes are discussed in the following paragraphs. 		
6.66	5.22 (i)	<p><u>Chemicals and Chemical Wastes Handling & Storage</u></p> <ul style="list-style-type: none"> • Chemicals and chemical wastes should only be stored in suitable containers in purpose-built areas. • The storage of chemical wastes should comply with the requirements of the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. • The storage areas for chemicals and chemical wastes should have an impermeable floor or surface. The impermeable floor I surface should possess the following properties: <ul style="list-style-type: none"> - Not liable to chemically react with the materials and their containers to be stored. - Able to withstand normal loading and physical damage caused by container handling - The integrity and condition of the impermeable floor or surface should be inspected at regular intervals to ensure that it is satisfactorily maintained • For liquid chemicals and chemical wastes storage, the storage area should be bonded to contain at least 110% of the storage capacity of the largest containers or 20% of the total quantity of the chemicals/chemical wastes stored, whichever is the greater. 	Whole Site / During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<ul style="list-style-type: none"> Storage container should be checked at regular intervals for their structural integrity and to ensure that the caps or fill points are tightly closed. Chemical handling should be conducted by trained workers under supervision. 		
6.66	5.22 (ii)	<p><u>Chemicals and Chemical Wastes Spillage Response</u> A Chemicals and / or Chemical Wastes Spillage Response Plan should be prepared by the operator to document in detail the appropriate response procedures for chemicals or chemical wastes spillage incidents. General procedures to be undertaken in case of chemicals I chemical waste spillages are presented below</p> <ul style="list-style-type: none"> Training Training on spill response actions should be given to relevant staff. The training should cover the followings: <ul style="list-style-type: none"> Tools & resources to handle spillage, e.g. locations of spill handling equipment; General methods to deal with spillage; and Procedures for emergency drills in the event of spills. Communication Establish communication channel with Fire Services Department (FSD) and EPD to report the spillage incident so that necessary assistance from relevant department could be quickly sought. Response Procedures Any spillage within OWTF site should be reported to the Site Manager. Site Manager shall attend to the spillage and initiate any appropriate actions needed to confine and clean up the spillage. The response procedures should include the followings: <ul style="list-style-type: none"> Identify and isolate the source of spillage as soon as possible; Contain the spillage and avoid infiltration into soil / groundwater and discharge to storm water channels (in case the spillage occurs at locations out of the designated storage areas); Remove the spillage; the removal method / procedures documented in the Material Safety Data Sheet (MSDS) of the chemicals spilled should be observed; Clean up the contaminated area (in case the spillage occurs at locations out of the designated storage areas); and The waste arising from the cleanup operation should be considered as chemical wastes. 	Whole Site / During Operation Period	√
6.67 - 6.69	5.23- 5.25	<p><u>Incident Record</u></p> <ul style="list-style-type: none"> After any spillage, an incident report should be prepared by the Site Manager. The incident report should contain details of the incident including the cause of the 	Whole Site / During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<p>incident, the material spilled and estimated spillage amount, and also the response actions undertaken. The incident record should be kept carefully and able to be retrieved when necessary.</p> <ul style="list-style-type: none"> • The incident report should provide sufficient details for the evaluation of any environmental impacts due to the spillage and assessment of the effectiveness of measures taken. • In case any spillage or accidents results in significant land contamination, EPD should be informed immediately and the Project operator should be responsible for the cleanup of the affected area. The responses procedures described in Sections 6.65 - 6.66 of the EIA Report should be followed accordingly together with the land contamination assessment and remediation guidelines stipulated in the <i>Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management</i> and the <i>Guidance Note for Contaminated Land Assessment and Remediation</i>. 		
<i>F. Landscape and Visual</i>				
7.98 & Table 7.8	Table 6.2	<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> • Aesthetic design of the facade, including its colour theme, pattern, texture, materials, finishing and associated structures to harmonize with the surrounding settings • Grass / groundcover planting to soften the roof • Heavy standard tree planting to screen proposed associated structures • Grasscrete paving to soften the harshness of large paved surface areas wherever possible 	Within Project Area / During Design & Operation Stages	√

Remark:

- √ Compliance of Mitigation Measures
- <> Compliance of Mitigation but need improvement
- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by OSCAR Bioenergy JV
- Δ Deficiency of Mitigation Measures but rectified by OSCAR Bioenergy JV
- N/A Not Applicable in Reporting Period

Annex D

Waste Flow Table

No. EP/SP/61/10 of Organic Resources Recovery Centre (Phase 1)
Monthly Summary Waste Flow Table

Month	Chemical Waste	Waste Generated from Pretreatment Process				General Refuse							
		Disposed of at Landfill (see Note 1)	Metals (see Note 2)	Paper/ cardboard packaging (see Note 2)	Plastics (see Note 3)	Disposed of at Landfill (see Note 1 & 4)		Metals (see Note 2)		Paper/ cardboard packaging (see Note 2)		Plastics (see Note 3)	
	Litre	tonne	tonne	tonne	tonne	No. of collection	tonne	No. of collection	tonne	No. of collection	tonne	No. of collection	tonne
March 2019	1,200	477.08	0	0	0	26	1.50	0	0	0	0	0	0
April 2019	0	455.60	0	0	0	22	1.27	0	0	0	0	0	0
May 2019	1,000	528.22	0	0	0	25	2.88	0	0	0	0	1	0.39
June 2019	0	459.23	0	0	0	24	2.76	0	0	0	0	0	0
July 2019	0	521.79	0	0	0	26	3.00	0	0	0	0	0	0
August 2019	40	441.05	0	0	0	27	3.11	0	0	0	0	0	0
September 2019	1,800	576.28	0	0	0	24	2.76	0	0	0	0	0	0
October 2019	0	441.22	0	0	0	25	2.88	0	0	0	0	0	0
November 2019	1,600	451.57	0	0	0	26	3.00	0	0	0	0	0	0
December 2019	1,009	488.13	0	0	0	24	2.76	0	0	0	0	0	0
January 2020	0	388.20	0	0	0	23	2.65	0	0	0	0	0	0
February 2020	4,525	372.97	0	0	0	24	2.76	0	0	0	0	0	0
March 2020	1,200	351.71	0	0	0	27	3.11	0	0	0	0	0	0
April 2020	0	363.92	0	0	0	21	2.42	0	0	0	0	0	0
May 2020	800	294.36	0	0	0	25	2.88	0	0	0	0	0	0
June 2020	0	347.23	0	0	0	25	2.88	0	0	0	0	0	0
July 2020	200	852.07	0	0	0	26	3.00	0	0	0	0	0	0
August 2020	0	700.25	0	1.20	0	25	2.88	0	0	0	0	0	0
September 2020	400	579.64	0	5.31	0	26	3.00	0	0	0	0	0	0
October 2020	0	840.75	0	5.83	0	24	2.76	0	0	0	0	0	0
November 2020	0	688.20	0	0.80	0	25	2.88	0	0	0	0	0	0
December 2020	766	685.47	0	0	0	25	2.88	0	0	0	0	0	0
January 2021	1,800	634.00	0	0	0	25	2.88	0	0	0	0	0	0
February 2021	6,120	377.72	0	0	0	21	2.42	0	0	0	0	0	0
March 2021	6,000	325.21	0	0	0	27	3.11	0	0	0	0	0	0

Month	Chemical Waste	Waste Generated from Pretreatment Process				General Refuse							
		Disposed of at Landfill (see Note 1)	Metals (see Note 2)	Paper/ cardboard packaging (see Note 2)	Plastics (see Note 3)	Disposed of at Landfill (see Note 1 & 4)		Metals (see Note 2)		Paper/ cardboard packaging (see Note 2)		Plastics (see Note 3)	
		Litre	tonne	tonne	tonne	tonne	No. of collection	tonne	No. of collection	tonne	No. of collection	tonne	No. of collection
April 2021	9,700	651.29	0	0	0	22	2.53	0	0	0	0	0	0
May 2021	4,000	671.03	0	0	0	24	2.76	0	0	0	0	0	0
June 2021	0	558.72	0	0	0	25	2.88	0	0	0	0	0	0
July 2021	0	382.74	0	0	0	26	3.00	0	0	0	0	0	0
August 2021	3,420	687.05	0	0	0	26	3.00	0	0	0	0	0	0
September 2021	2,400	304.01	0	0	0	25	2.88	0	0	0	0	0	0
October 2021	0	342.38	0	0	0	23	2.65	0	0	0	0	0	0
November 2021	2,000	394.26	0	0	0	26	3.00	0	0	0	0	0	0
Total	49,980	16,633.36	0	13.14	0	815	91.12	0	0	0	0	1	0.39

Notes:

1. General refuse was disposed of at NENT by subcontractors.
2. Metal and paper/cardboard packaging were collected by recycler for recycling.
3. Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material collected by recycler for recycling.
4. It was assumed that four 240-litre bins filled with 80% of general refuse were collected at each collection. The general refuse density was assumed to be around 0.15 kg/L.

Annex E

Environmental Complaint,
Environmental Summons
and Persecution Log

Annex E Cumulative Complaint and Summons/Prosecutions Log

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
May 2015	0	0
June 2015	0	0
July 2015	0	0
August 2015	0	0
September 2015	0	0
October 2015	0	0
November 2015	0	0
December 2015	0	0
January 2016	0	0
February 2016	0	0
March 2016	0	0
April 2016	0	0
May 2016	0	0
June 2016	0	0
July 2016	0	0
August 2016	0	0
September 2016	0	0
October 2016	0	0

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
November 2016	0	0
December 2016	0	0
January 2017	0	0
February 2017	0	0
March 2017	0	0
April 2017	0	0
May 2017	0	0
June 2017	0	0
July 2017	0	0
August 2017	0	0
September 2017	0	0
October 2017	0	0
November 2017	0	0
December 2017	0	0
January 2018	0	0
February 2018	0	0
March 2018	0	0
April 2018	0	0
May 2018	0	0
June 2018	0	0

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
July 2018	0	0
August 2018	0	0
September 2018	1	0
October 2018	0	0
November 2018	0	0
December 2018	0	0
January 2019	0	0
February 2019	0	0
March 2019	0	0
April 2019	0	0
May 2019	0	0
June 2019	0	0
July 2019	0	0
August 2019	0	0
September 2019	0	0
October 2019	0	0
November 2019	0	0
December 2019	0	0
January 2020	0	0
February 2020	0	0

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
March 2020	0	0
April 2020	0	0
May 2020	0	0
June 2020	0	0
July 2020	0	0
August 2020	0	0
September 2020	0	0
October 2020	0	0
November 2020	0	0
December 2020	0	0
January 2021	0	0
February 2021	0	0
March 2021	0	0
April 2021	0	0
May 2021	0	0
June 2021	0	0
July 2021	0	0
August 2021	0	0
September 2021	0	0
October 2021	0	0

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
November 2021	0	0
Overall Total	1	0

Annex F

Investigation Reports

Annex F1

Investigation Report for September 2021

Investigation Report of CEMS Exceedances

Date	1 – 30 September 2021
Time	Continuous monitoring throughout September 2021
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Cogeneration Unit (CHP) and Ammonia Stripping Plan (ASP)
Exceedance Description	<ol style="list-style-type: none"> 1. Continuous monitoring was carried out at the CAPCS, CHP and ASP throughout the reporting period using the CEMS. According to the EM&A Manual, exceedance is considered if the emission concentration of the concerned pollutants is higher than the emission limits stated in Tables 2.2, 2.3 and 2.5 of the EM&A Manual (Version F) for CAPCS, CHP and ASP respectively. The concentration of the concerned air pollutants were monitored on-line by the CEMS. Exceedances of various emission parameters were recorded on the CEMS including: <ul style="list-style-type: none"> • NO_x and SO₂ in CHP 2 and CHP 3 • NO_x, SO₂ and NH₃ in the ASP 2. According to the Contractor, exceedance of NO_x occurred mainly at CHPs operated at loading with less than 150 tonnes of SSOW. 3. The Contractor explained that the exceedances recorded in the CHPs were due to the low biogas loading which resulted in the poor performance efficiency in CHP. 4. The Contractor explained that the exceedances in ASP were caused by unstable temperature and blockage of the column and temperature instability in the thermal oxidiser, which have led to incomplete combustion of biogas and NH₃ in ASP. 5. The Contractor explained that the SO₂ exceedances in the CHPs and the ASP occurred due to equipment tripping of the air blower of the desulphurisation system.
Action Taken / Action to be Taken	<ul style="list-style-type: none"> • The quantity of SSOW was around 120 tonnes per day in this reporting month, which was lower than the desirable quantity. The Contractor will continue to actively liaise with EPD in their monthly meeting with an aim to increase the quantity of SSOW that can be treated daily, such that sufficient biogas can be generated for the CHP to be able to operate at optimal efficiency. • The Contractor has been fine-tuning and upgrading the ASP and its parts for better control. The Contractor has also replaced the blocked column in October 2021. • The malfunctioned parts in the de-sulphurisation system was replaced.

	<ul style="list-style-type: none">• CHP 1 was shut down for maintenance in this reporting period and for the preparation of overhaul in the coming months.
Remedial Works and Follow-up Actions	<p>The Contractor is recommended to closely monitor the processes, including the modification works and follow-up emission monitoring of the CHP and ASP to avoid exceedance.</p> <p>As similar issues have been re-occurred for sometimes, the Contractor is advised to undertake a comprehensive review of the operation of the concerned systems and the effectiveness of the existing mitigation measures and proposed further measures to avoid the exceedance.</p>

Prepared by: Angela Yung, MT Representative

Date 15 October 2021

Annex F2

Investigation Report for October 2021

Investigation Report of CEMS Exceedances

Date	1 - 31 October 2021
Time	Continuous monitoring throughout October 2021
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Ammonia Stripping Plant (ASP)
Exceedance Description	<ol style="list-style-type: none"> Continuous monitoring was carried out at the CAPCS, CHP and ASP throughout the reporting period using the CEMS. According to the EM&A Manual, exceedance is considered if the emission concentration of the concerned pollutants is higher than the emission limits stated in Tables 2.2, 2.3 and 2.5 of the EM&A Manual (Version F) for CAPCS, CHP and ASP respectively. The concentration of the concerned air pollutants were monitored on-line by the CEMS. Exceedances of various emission parameters were recorded on the CEMS including: <ul style="list-style-type: none"> • NO_x, VOCs and NH₃ in the ASP The Contractor explained the exceedances occurred due to system instability caused by unstable stripping column temperature, blockage of stripping column and high ammonia content in the ASP inlet.
Action Taken / Action to be Taken	<ul style="list-style-type: none"> • To ensure stripping efficiency and stable operation of the ASP, the Contractor has arranged acid cleaning for the stripping column in this reporting month and packing cleaning in the next reporting month.
Remedial Works and Follow-up Actions	<p>The Contractor is recommended to closely monitor the processes, including the modification works and follow-up emission monitoring of the ASP to avoid exceedance.</p> <p>As similar issues have re-occurred in the ASP for sometimes, the Contractor is advised to undertake a comprehensive review of the operation of the concerned systems and the effectiveness of the existing mitigation measures and proposed further measures to avoid the exceedance.</p>

Prepared by: Angela Yung, MT Representative

Date: 11 November 2021

Annex F3

Investigation Report for November 2021

Investigation Report of CEMS Exceedances

Date	1 – 30 November 2021
Time	Continuous monitoring throughout November 2021
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Ammonia Stripping Plant (ASP)
Exceedance Description	<p>1. Continuous monitoring was carried out at the CAPCS, CHP and ASP throughout the reporting period using the CEMS. According to the EM&A Manual, exceedance is considered if the emission concentration of the concerned pollutants is higher than the emission limits stated in Tables 2.2, 2.3 and 2.5 of the EM&A Manual (Version F) for CAPCS, CHP and ASP respectively. The concentration of the concerned air pollutants were monitored on-line by the CEMS. Exceedances of various emission parameters were recorded on the CEMS including:</p> <ul style="list-style-type: none"> • NO_x, VOCs and NH₃ in the ASP <p>2. The Contractor has investigated the cause of the exceedance and identified that the exceedances was due to system instability caused by unstable water flow resulted from the malfunctioning of a few equipment (including the hot water circulation pump), leakage of piping and the blockage of the steam generator.</p>
Action Taken / Action to be Taken	To ensure stripping efficiency and stable operation of the ASP, the Contractor has arranged clearing of the blockage, cleaning of the column and adjustment of the operation parameter since mid-November. The Contractor has also arranged packaging cleaning in the next reporting month.
Remedial Works and Follow-up Actions	<p>The Contractor is recommended to closely monitor the processes, including the modification works and follow-up emission monitoring of the ASP to avoid exceedance.</p> <p>The Contractor should review the routine inspection and maintenance schedule of the ASP and conduct preventative maintenance to avoid similar re-occurrence of the equipment failure.</p>

Prepared by: Angela Yung, MT Representative

Date: 13 December 2021

Annex G

Odour Patrol Result



CERTIFICATE OF ANALYSIS

CLIENT:	OSCAR BIOENERGY JOINT VENTURE	WORK ORDER:	HK2135920
CONTACT:	MR TERENCE CHAN	LABORATORY:	HONG KONG
ADDRESS:	NO. 5, SHAM FUNG ROAD, SIU HO WAN, NORTH LANTAU ISLAND, NT, HONG KONG	SUB-BATCH:	0
		DATE OF PATROL:	3 rd SEPTEMBER, 2021
		DATE OF ISSUE:	9 th SEPTEMBER, 2021
PROJECT:	ODOUR PATROL FOR THE ORGANIC RESOURCES RECOVERY CENTRE PHASE 1 IN SIU HO WAN	SAMPLE TYPE:	ODOUR PATROL
SITE:	ORGANIC RESOURCES RECOVERY CENTRE PHASE 1 (O-PARK 1)	NO. OF LOCATIONS:	8

COMMENTS

Odour Patrol was conducted by ALS Technichem (HK) Pty Ltd staff during 10:28 - 10:44 and 16:01 - 16:17.

Sampling information (Project name, Sample ID) is provided by client.

NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

The results related only to the items tested. All pages of this report have been checked and approved for release.

Richard Fung
Managing Director - Hong Kong

This report may not be reproduced except with prior written approval from ALS Technichem (HK) Pty Ltd.



1. Summary of Work

The odour patrol was conducted during daytime and evening time.

2. Odour Patrol

Odour patrolling is a process to make use of the calibrated olfactory senses (i.e. the nasal sense) of the patrol members to evaluate the odour and its intensity during a patrol exercise at the site.

The patrol work was conducted by two odour patrol team members from ALS Technichem (HK) Pty Ltd during each time session. All members are free from any respiratory diseases during patrol day. None of the members has been working or living in the area of the vicinity of the inspection zone.

The patrol team was required to move slowly from one to the other monitoring locations and use their olfactory senses to detect odour at each location.

The location of odour sources and the areas to be affected by the odour nuisance were identified as much as possible.

During the patrolling, the meteorological and surrounding information were recorded:

- the prevailing weather condition;
- the wind direction;
- the wind speed;
- location where odour is spotted;
- possible source of odour;
- perceived intensity of the odour;
- duration of odour; and
- characteristics of the odour detected.

The perceived intensity is to be divided into 5 levels which are ranked in an ascending order as follows:

0	Not detected	No odour perceives or an odour so weak that it cannot be easily characterised or described
1	Slight	Identifiable odour, slight
2	Moderate	Identifiable odour, moderate
3	Strong	Identifiable odour, strong
4	Extreme	Severe odour

The odour patrol location was shown in Appendix 1.



3. Odour Patrol Result:

3.1 Daytime:

Location	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
8	1	Sunny	10:28	30.0	76.3	0.9	298	0	NA	NA	NA	NA
	2							0				
7	1	Sunny	10:29	30.4	74.1	0.8	016	0	NA	NA	NA	NA
	2							0				
2	1	Sunny	10:32	31.0	74.0	0.5	348	1	Intermittent	Downwind	Biogas	Biogas Tank Valve Holder
	2							1				
3	1	Sunny	10:34	30.6	75.2	0.0	--	0	NA	NA	NA	NA
	2							0				
5	1	Sunny	10:37	30.8	80.8	0.0	--	1	Continuous	NA	Grassy smell	Nearby Vegetation
	2							1				



Location	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
6	1	Sunny	10:39	30.8	74.0	0.5	303	0	NA	NA	NA	NA
	2							0				
9	1	Sunny	10:41	31.0	74.6	0.8	082	0	NA	NA	NA	NA
	2							0				
10	1	Sunny	10:44	26.0	74.0	-	-	0	NA	NA	NA	NA
	2							0				

Remark:

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



3.2 Evening time:

Location	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
8	1	Sunny	16:01	32.3	70.2	0.9	298	0	NA	NA	NA	NA
	2							0				
7	1	Sunny	16:02	31.8	66.8	1.6	235	1	Continuous	Downwind	Refuse smell	Pre-treatment Hall
	2							1				
2	1	Sunny	16:05	31.8	70.5	0.5	090	1	Intermittent	Side wind	Biogas	Biogas Tank Valve Holder
	2							1				
3	1	Sunny	16:06	31.6	69.8	0.4	170	1	Intermittent	Side wind	Biogas	Biogas Tank Valve Holder
	2							1				
5	1	Sunny	16:10	32.3	70.4	0.6	132	0	NA	NA	NA	NA
	2							0				



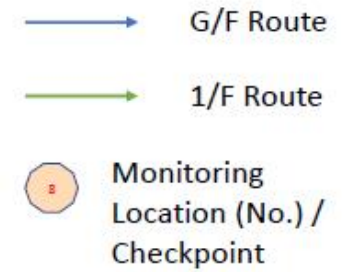
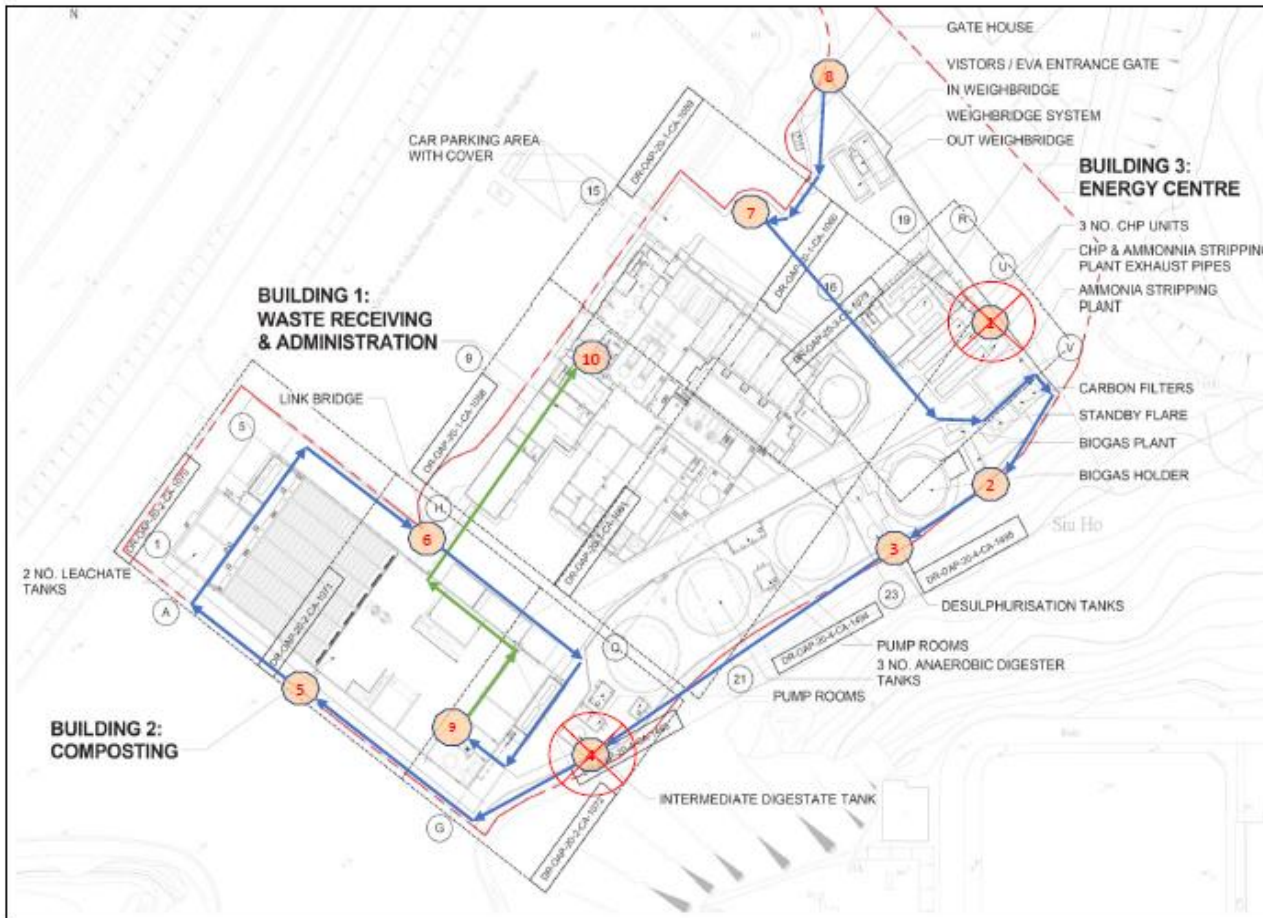
Location	Panellist	Weather	Time	T (°C)	RH (%)	WS (m/s)	WD (Degree)	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
6	1	Sunny	16:12	31.9	68.0	1.4	132	0	NA	NA	NA	NA
	2							0				
9	1	Sunny	16:14	32.5	71.4	0.4	051	0	NA	NA	NA	NA
	2							0				
10	1	Sunny	16:17	25.3	61.9	-	-	0	NA	NA	NA	NA
	2							0				

Remark:

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



APPENDIX 1 Odour Patrol Route

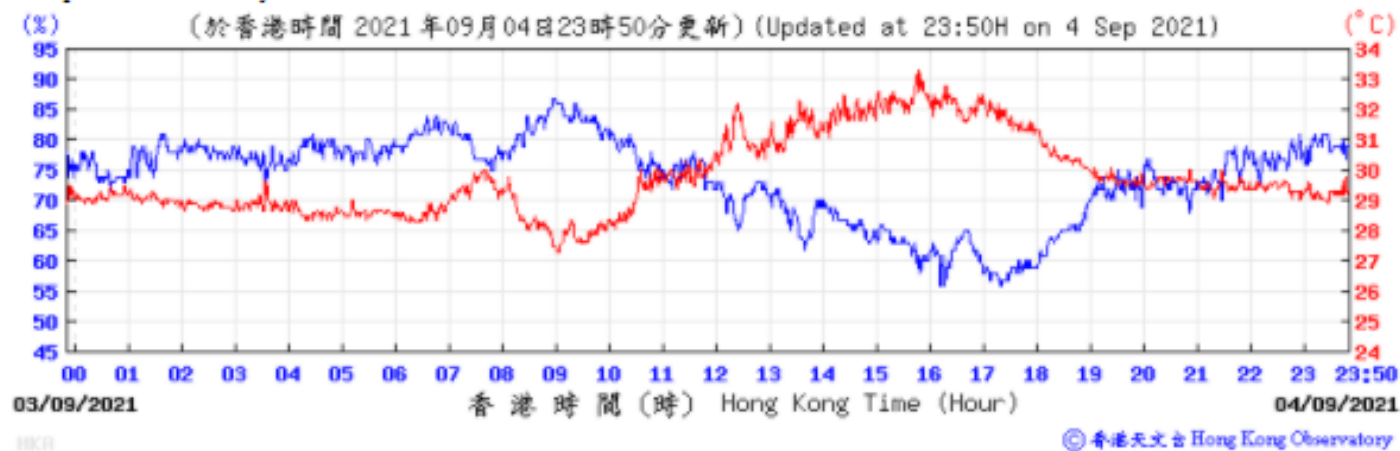




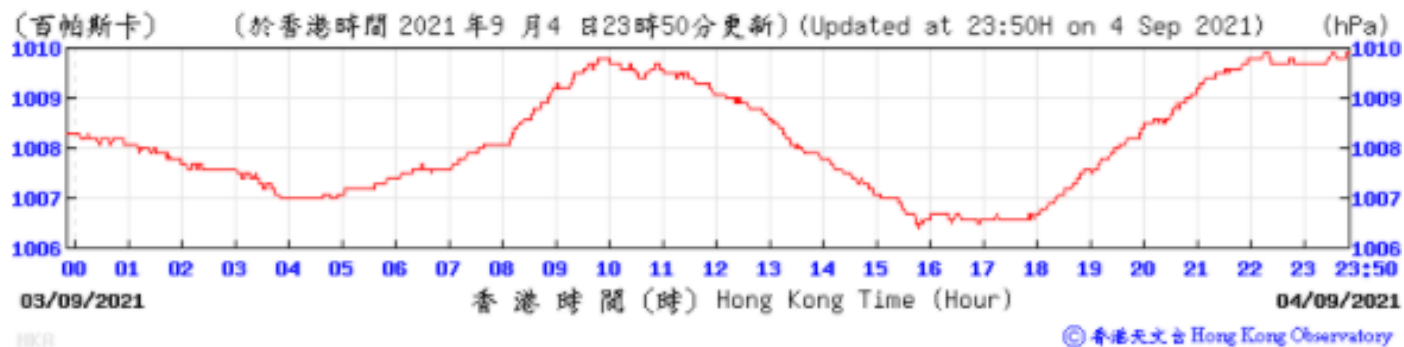
APPENDIX 2

Extract of Meteorological Observations from Hong Kong Airport Observatory Station

Temperature/Humidity:

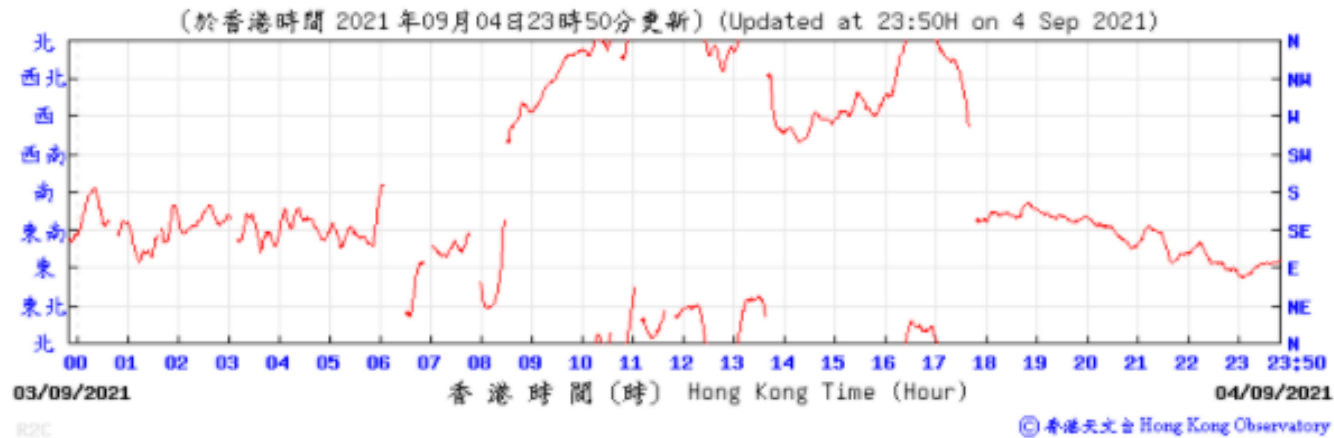


Pressure:

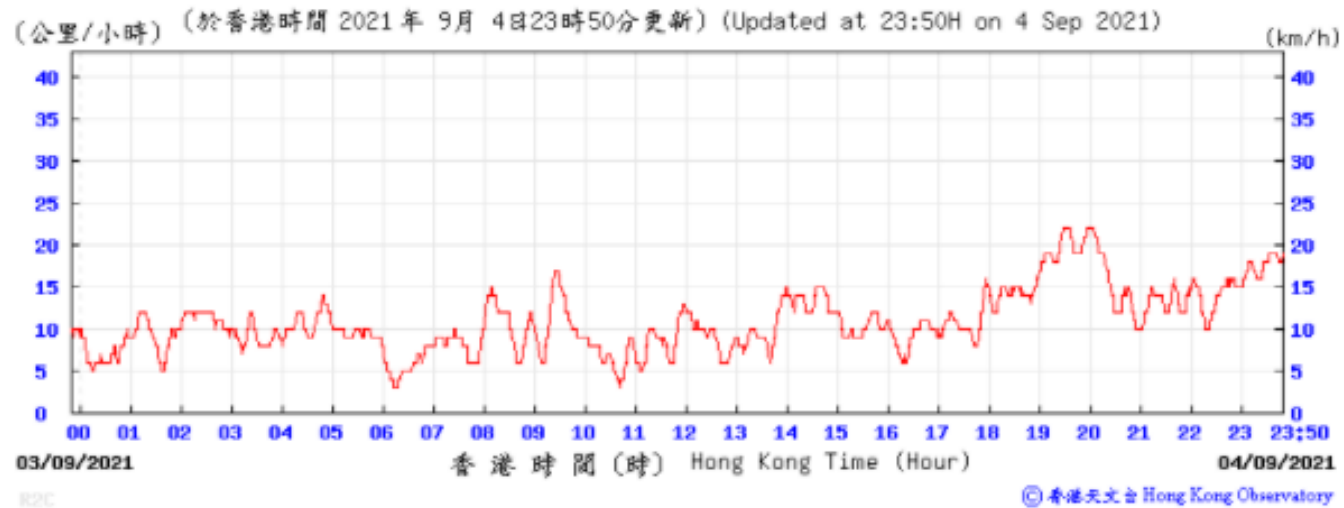




Wind Direction:



Wind Speed:





APPENDIX 3

A3.1 Odour Patrol at Different Locations – Daytime



Location: 2



Location: 3



Location: 5



Location: 6



Location: 7



Location: 8



Location: 9



Location: 10

A3.2 Odour Patrol at Different Locations - Evening time



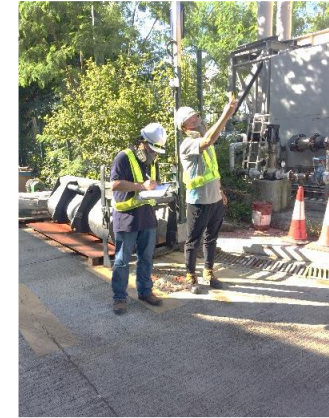
Location: 2



Location: 3



Location: 5



Location: 6



Location: 7



Location: 8



Location: 9



Location: 10