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Report No.: 0041/17/ED/0132C

Monthly EM&A Report August 2017

Client : Drainage Services Department

Project : Contract No. CM 14/2016
Environmental Team for Operational
Environmental Monitoring and Audit for Siu
Ho Wan Sewage Treatment Works

Report No.: : 0041/17/ED/0132C

Prepared by: Louis K. T. Chan

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A handwritten signature in black ink, appearing to be "Colin K. L. Yung", written over a horizontal line.

Colin K. L. Yung
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沛然環境評估
工程顧問有限公司

Our Ref: 1458/17-0032

19 September 2017

By Post and E-mail

Drainage Service Department
Projects and Development Branch
Consultants Management Division
42/F, Revenue Tower,
5 Gloucester Road
Wan Chai, Hong Kong

Attn: Mr. CHUNG Ching Hong, Romeo (E/CM9)

Dear Sir,

RE: CONTRACT NO. CM 13/2016
OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE
TREATMENT WORKS (SHWSTW)
MONTHLY ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REPORT (AUGUST 2017)

Reference is made to the submission of Monthly Environmental Monitoring and Audit (EM&A) Report for August 2017 (Report No.: 0041/17/ED/0132C) received from the Environmental Team (ET), Messrs. Fugro Technical Services Ltd., on 18 September 2017 via email.

We would like to inform you that we have no adverse comment on the captioned submission and hereby verify the same in accordance with Condition 4.3 of the Environmental Permit (EP) for the captioned Project (Permit No.: EP-076/2000).

Should you have any queries, please contact the undersigned, or our Mr. Rodney IP at 2815 7028.

Yours sincerely,

For and on behalf of
Allied Environmental Consultants Ltd.

Grace M. H. KWOK
Independent Environmental Checker

GK/ri/rc

c.c. Fugro Technical Service (ET Leader)
AECOM

Attn: Mr. Colin YUNG
Attn: Ms. Joanne TSOI

(By E-mail)
(By E-mail)



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EXECUTIVE SUMMARY

This Monthly Environmental Monitoring and Audit (EM&A) Report is prepared for Contract No. CM 14/2016 – “Environmental Monitoring and Audit for Operation of Siu Ho Wan Sewage Treatment Works” (hereafter referred to as “the Contract”) for the Drainage Services Department (DSD) of Hong Kong Special Administrative Region. Fugro Technical Services Limited (hereafter referred to as “FTS”) was appointed as the Environmental Team by DSD, to implement the Environmental Monitoring & Audit (EM&A) programme in accordance with the Operational EM&A Plan of the Contract.

The Contract is part of the “Upgrading of Siu Ho Wan Sewage Treatment Works” (hereinafter referred as “the Project”) which was classified as “Designated Project” under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap 499) and Environmental Impact Assessment (EIA) Report (Register No. EIAR-124BC) was completed in September 1997. The current Environmental Permit (EP) No. EP-076/2000 was issued in August 2000 to Drainage Services Department (DSD).

In accordance with the EP, an approved operational Environmental Monitoring and Audit Plan (EM&A Plan) was submitted. According to the approved EM&A plan, air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis of H₂S, in addition, water quality monitoring, sediment quality monitoring, benthic survey, Chinese White Dolphin monitoring and waste management are the key environmental concern of the Project.

This is the first Monthly EM&A Report for the Project which summarizes findings of the EM&A works during the reporting period from 1 August 2017 to 31 August 2017 (the “reporting period”).

Breaches of Action and Limit Levels

Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out on 8, 16, 21 and 30 August 2017. No exceedances of Action/Limit levels at ASR were recorded and No non-compliance of odour monitoring at ASR were recorded in the reporting period.

Compliant Log

There was no complaint received in relation to the environmental impact during the report period.

Notifications of Summons and Successful Prosecutions

There were no notifications of summons or prosecutions received during the reporting period.

Summary of the Environmental Mitigations Measures

Mitigation measures specified in the EP and EIA Report such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment unit prior to stack exhaust was implemented during the reporting period.

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Future Key Issues

The key issues to be considered in the coming reporting month include:

Potential environmental impacts arising from the operation of Siu Ho Wan Sewage Treatment Works (SHWSTW) are mainly associated with air quality, water quality, sediment quality, benthic ecology, waste management and distribution and abundance of Chinese White Dolphin.

During this reporting period, H₂S data collected (total 4 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW as the wind direction during the measurement was in a non-ideal direction e.g. SW, N, NW, as such wind direction was not from SHWSTW towards ASR. Therefore the measured H₂S data from the reporting period could not be representative to reflect the odour impact from SHWSTW during operational phase. Due to inadequacy of representative data, further H₂S measurement and olfactometry analysis are required to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³).



INTRODUCTION

1.1 Background

- 1.1.1 The Project "Upgrading of Siu Ho Wan Sewage Treatment Works" is to upgrade the Siu Ho Wan Sewage Treatment Works (SHWSTW) from the preliminary treatment level to chemically enhanced primary treatment (CEPT) level with UV disinfection facilities. The Project is required to comply with Environmental Permit in respect of the construction and operation phases of the Plant.
- 1.1.2 Under the Environmental Impact Assessment Ordinance, the Project was classified as "Designated Project". The Environmental Impact Assessment (EIA) study was completed in September 1997 with the EIA Report of Register No. EIAR-124BC and Environmental Monitoring and Audit (EM&A) Manual, and the Environmental Permit (EP) of No. EP-076/2000 was issued in August 2000 to Drainage Services Department (DSD).
- 1.1.3 The CEPT part has been completed and was put into operation in March 2005. The UV disinfection works were substantially completed in December 2006. It is considered that the operation of the Project shall be deemed to start when the UV disinfection facilities have been completely installed and tested.

1.2 Project Description

- 1.2.1 The project proponent was Drainage Services Department (DSD). AECOM was commissioned by DSD as the Engineer for the Project. Allied Environmental Consultants Limited (AEC) was commissioned by DSD as the Independent Environmental Checker (IEC) in the operation phase of the Project. Fugro Technical Services Limited (FTS) was appointed as the Environmental Team (ET) by DSD to implement the EM&A programme for the operation phase of the Project including air quality monitoring, water quality monitoring, sediment quality and benthic survey, and Chinese White Dolphin monitoring.

1.3 Project Organization

- 1.3.1 The project organization for environmental works is shown in **Appendix A**. The contact person and telephone numbers of key personnel for the captioned project are shown in **Table 1.1**.

Table 1.1 Contact Persons and Telephone Numbers of Key Personnel

Organization	Role	Contact Person	Telephone No.	Fax No.
DSD	Project Proponent Representative	Mr. Romeo Chung	2594 7266	2827 8526
AECOM	Engineer Representative (ER)	Ms. Joanne Tsoi	3922 9423	3922 9797
AEC	Independent Environmental Checker (IEC)	Ms. Grace Kwok	2815 7028	2815 5399
FTS	ET Leader (ETL)	Mr. Colin Yung	3565 4114	2450 8032

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1.4 Work Undertaken during the Report Period

1.4.1 During this reporting period, the principal work activities included:

- performed comprehensive operation and maintenance services for the electrical, mechanical and electronic systems / equipment at Siu So Wan Sewage Treatment Works (SHWSTW).
- alleviate as far as practicable the impact that the facilities and sewage systems imposed on the environment of Hong Kong.



2. AIR QUALITY MONITORING

2.1 Methodology of H₂S Concentration Monitoring

2.1.1 15-min H₂S concentration was measured using a Jerome 631-X analyzer. This analyzer is capable of measuring H₂S concentration in the range of 1 ppb to 50 ppm with a resolution of 1 ppb and operates within a temperature range of 0°C to 40°C at an air flow rate of 0.15 L/min. Odour gas samples were drawn by built-in a suction pump of the analyzer and passed through a gold film sensor. The trace level of H₂S of the samples were determined electrochemically on the gold film sensor. Meteorological conditions including temperature, wind speed, wind direction and relative humidity were also measured at the time of the monitoring. Table 2.1 summarizes the equipment used in H₂S monitoring.

Table 2.1 Equipment used for H₂S Concentration Monitoring

Equipment	Manufacturer / Model	Serial Number	Sensor Number	Calibration Date	Next Calibration Date
Gold Film Hydrogen Sulphide Analyzer	JEROME X631 0003	2966	14-11-23-R2D	2 June 2017	1 June 2018

2.2 Methodology of Odour Patrol Monitoring

2.2.1 Odour patrol monitoring was carried out in accordance with the European Standard method: BS EN13725, to ensure the odour sensitivities of all patrol members are within 20-80 ppb/V. Environmental conditions were record as follows:

- i. Prevailing Weather Condition;
- ii. Wind Direction;
- iii. Wind Speed;
- iv. Location where Odour is detected;
- v. Source of Odour detected;
- vi. Perceived intensity of Odour detected;
- viii. Duration of Odour detected; and
- ix. Characteristics of Odour detected

The perceived intensity is classified into 5 categories as shown in **Table 2.2** below.



Table 2.2 Categories of Odour Intensity

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

2.3 Methodology of Odour Sampling and Olfactometry Analysis

- 2.3.1 Odour gas samples were collected in a Nalophan sampling bag placed inside a vacuum air-tight sampler using passive sampling technique. Approximately 60 liter of gas sample was collected at each sampling. All samples collected on the sampling day were returned to laboratory for olfactometry analysis within 24 hours and analyzed within 2 hours upon receiving.
- 2.3.2 ALS Technichem (HK) Pty Ltd (HOKLAS Reg. No. 066), was appointed to be the laboratory for olfactometry analysis of the gas sample.
- 2.3.3 The odour concentration of the samples were determined by Forced-choice Dynamic Olfactometer in accordance with the European Standard Method: BS EN13725. Testing were also performed by a panel of six members who have been trained to comply with the requirement of European Standard Method: BS EN13725. All testing were completed within 24 hours upon sampling.

2.4 Monitoring Location

- 2.4.1 H₂S concentration monitoring, odour patrol monitoring and odour sampling were carried out at the Air Sensitive Receiver (ASR), Cheung Tung Road near the Bus Repot at the west of the Siu Ho Wan Treatment Plant. The location of ASR is shown in **Figure 1**.

2.5 Monitoring Frequency and Duration

The durations and frequencies of H₂S concentration measurement, odour patrolling and odour sampling are summarized in **Table 2.3** below.

Table 2.3 Durations and Frequencies of Air Quality Monitoring Programme

	Duration	Frequency
H ₂ S concentration monitoring	15 minutes	¹ Weekly basis for 6 months during the initial operation stage
Odour patrol		
Odour sampling for olfactometry analysis	³ 15 minutes	² First week of the odour patrol monitoring

Remark:

1) In case excessive odour nuisance was detected during the odour patrol monitoring or the standard of the 5 odour units cannot be complied with during the odour panel monitoring, the odour patrol monitoring and H₂S



concentration monitoring shall be extended for a period of three months to cater for the warm-up period of the functioning of the additional mitigation measures.

2) In case the relationship between H₂S concentration (ppb) with the odour unit (OU/m³) cannot conclude from the correlation study carried out at the first week of the odour patrol monitoring due to invalid data, additional odour sampling for olfactometry analysis shall be carried out for the correlation study.

3) Sufficient air samples (approximate 60L) may be collected in less than 15 minutes during odour sampling.

2.5.1 The monitoring schedule for the present and next reporting period is provided in **Appendix B**.

2.6 Event and Action Plan

2.6.1 Action and limit levels for air quality monitoring are presented in **Table 2.4**.

Table 2.4 Action and Limit Levels for Air Quality Monitoring

Parameter	Action	Limit
Odour	One complaint received for specific odour event	Two or more independent complaints receive for specific odour event

2.6.2 The event and action plan for air quality monitoring is provided in **Appendix C**.

2.7 Quality Assurance and Quality Control

2.7.1 A control sample was collected by purging odour-free nitrogen gas from a certified gas cylinder on site at each sampling.

2.7.2 Calibration of the analyzer is conducted every year at the laboratory of the manufacturer. The calibration certificates for the analyzers are shown in **Appendix D**.

2.7.3 In order to ensure the analyzer is functioning properly, manual sensor regeneration and zero adjustment were performed before each set of odour monitoring.

2.8 Monitoring Results and Observations

2.8.1 In accordance with the notification of commencement of Operational EM&A Programme submitted by ET (Ref.: MCL/ED/0449/2017/C) dated on 3 August 2017, the H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was commenced on 8 August 2017 which no objection was received by EPD.

2.8.2 Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out on 8, 16, 21 and 30 August 2017. No exceedances of Action/Limit levels at ASR were recorded and No non-compliance of odour monitoring at ASR were recorded in the reporting period.

2.8.3 The meteorological data including temperature, wind speed and direction of the reporting period at ASR is summarised in **Table 2.5**.



Table 2.5 Summary of Meteorological Data in Reporting Period

Date	Time	Temperature (° C)	Relative Humidity (%)	Wind Direction	Wind speed (km/h)
8 August 2017	14:37 – 14:52	34.6	62	SW	0.8
16 August 2017	10:30 – 10:45	30.0	72	N	0.7
21 August 2017	10:04 – 10:19	33.3	60	N	1.5
30 August 2017	09:40 – 09:55	28.5	81	NW	0.9

2.8.4 The monitoring results in the reporting period are summarised in **Table 2.6**. Graphical plots of results and details of monitoring data are shown in **Appendix E**.

Table 2.6 Summary of H₂S Concentration Monitoring Result in Reporting Period

Monitoring Location	Monitoring Parameter				
	H ₂ S concentration* (ppb)		Odour Patrol^ (Odour Level)	Olfactometry Analysis of H ₂ S (OU/m ³)	
	Range	Average	Range	Range	Average
ASR	0 - 4	1.3	0 - 0	13 - 26	18.5

Remark:

*The value of H₂S Concentration was taken in average of 15 min for each measurement.

^Odour Level: 0 – Not detected, 1 – Slight, 2 – Moderate, 3 – Strong, 4 – Extreme

2.8.5 According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). However in the reporting period, H₂S data collected (total 4 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW as the wind direction during the measurement was in a non-ideal direction e.g. SW, N, NW, as such wind direction was not from SHWSTW towards ASR. Therefore the measured H₂S data from the reporting period could not be representative to reflect the odour impact from SHWSTW during operational phase. Due to inadequacy of representative data, further H₂S measurement and olfactometry analysis are required to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). The result of correlation study will be presented in the subsequent Monthly EM&A Report.

2.8.6 No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period. Although results of olfactometry analysis from the odour sampling during the reporting period exceeded the compliance of 5 odour units (based on averaging time of 5 seconds at the nearest ASR), however, no relationship can be drawn from the H₂S concentration and the exceeded results of the odour unit from the olfactometry analysis so far in the reporting period. Besides, based on the onsite odour patrol monitoring and the records of wind direction, the exceedances from the olfactometry analysis were not project-related. Therefore no non-compliance of odour monitoring at ASR were recorded in the reporting period.

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- 2.8.7 Even though specific sources of odour that would contribute to the odour nuisance at ASRs was not observed in this monitoring exercise, some other odour sources in neighboring environment such as nearby bus depot and Refuse Transfer Station might also affect the results of H₂S concentration monitoring and odour monitoring.
- 2.8.8 Odour mitigation measures such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment unit prior to stack exhaust were implemented during the reporting period.

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3. WATER QUALITY MONITORING

3.1 Status of EM&A Programme of Water Quality Monitoring

- 3.1.1 In accordance with Section 5.1 of the EM&A Plan, water quality monitoring should be carried out in the North Western Waters during the first five years of the operational phase of the Project on a bimonthly basis. No water quality monitoring work was conducted during the reporting period. The methodologies and the results of water quality monitoring will be reported in the subsequent Monthly EM&A report.

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4. SEDIMENT QUALITY MONITORING AND BENTHIC SURVEY

4.1 Status of EM&A Programme of Sediment Quality Monitoring and Benthic Survey

- 4.1.1 In accordance with Section 6.1 of the EM&A Plan, sediment quality monitoring and benthic survey should be carried out in the North Western Waters during the first five years of the operational phase of the Project on a bimonthly basis. No sediment quality monitoring work and benthic survey was conducted during the reporting period. The methodologies and the results of sediment quality monitoring and benthic survey will be reported in the subsequent Monthly EM&A report.



5. CHINESE WHITE DOLPHIN MONITORING

5.1 Data Interpretation

- 5.1.1 In accordance with Section 4.1 of the EM&A Plan, relevant information on the distribution and abundance of Chinese White Dolphins (CWDs) in Hong Kong should be obtained from the Agriculture, Fisheries and Conservation Department (AFCD), and be reviewed on a bimonthly basis during the operational phase of the Project for a period of 5 years.
- 5.1.2 The increased amount of sewage discharged from Siu Ho Wan Sewage Treatment Works was identified as a potential issue of concern for CWDs. Referring to the latest AFCD's report, "*Monitoring of Marine Mammals in Hong Kong Waters (2016-17)*", 178 line-transect vessel surveys were conducted among 10 survey areas in Hong Kong from April 2016 to March 2017; the areas included Northeast Lantau (NEL), Northwest Lantau (NWL), West Lantau (WL), Southwest Lantau (SWL), Southeast Lantau (SEL), Deep Bay (DB), Lamma (LM), Po Toi (PT), Ninepins (NP), and Sai Kung (SK). The locations of survey areas are presented in **Figure 3**. Under the Hong Kong-Zhuhai-Macao Bridge related EM&A, supplementary surveys were also conducted among NEL, NWL, WL and SWL, bringing the total survey effort to 8,143.0 km. The discharge point of Siu Ho Wan outfall is situated at a location about 1 km off NEL, as such our scope shall focus solely on CWDs findings within NEL.
- 5.1.3 During the 12-month monitoring period, 371 sightings of CWDs totalling 1,233 individuals were recorded. The highest number of sightings occurred in WL, with 220 groups of CWDs recorded. SWL and NWL also recorded 83 and 62 sightings, respectively.
- 5.1.4 In contrast to the numerous sightings in WL, only 1 lone dolphin was sighted in NEL despite the 1,850.3 km of survey effort in this area during the 12-month period. Dolphin occurrence in NEL has plummeted over the past decade, from 20 CWDs in 2001 to 1 CWD in 2014. Between 2015 and 2016, no sightings were recorded in NEL, and the abundance estimate in this area has reached its lowest point. The details of the CWDs abundances are presented in **Appendix F**.
- 5.1.5 The impact of increased effluent discharged from Siu Ho Wan outfall on CWDs remains unclear. However, anthropogenic disturbances such as increasing level of vessel traffic, construction of HZMB and expansion of Hong Kong International Airport are perceived as causes of decline in local abundance of CWDs. Continued systematic dolphin surveying in Lantau Island is necessary to further study this issue.

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6. ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

6.1 Implementation Status

- 6.1.1 Although no site inspection is prescribed during the operation of the Plant in accordance with the approved EM&A Plan, SHWSTW is reminded to fully and properly implement mitigation measures specified in the EP and EIA Report. Mitigation measures such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment prior to stack exhaust was implemented in the reporting period. A summary of mitigation measures implementation schedule is provided in **Appendix G**.



7. ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS

7.1.1 SHWSTW is reminded to fully comply with EP conditions. All measures and recommendations in the EP, EIA Report and approved waste management plan shall be fully and properly implemented. During the reporting period, following measures in related to solid and liquid waste management was implemented:

- The influent of waste water shall be treated by Chemically Enhanced Primary Treatment with UV disinfection;
- Trip-ticket system shall be implemented for Sludge and sediment;
- The acceptance criteria for Landfill disposal should be followed;
- Chemical waste should be properly handled and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.

7.1.2 A summary of mitigation measures implementation schedule is provided in **Appendix G**.



8. SUMMARY OF EXCEEDANCE OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMITS

8.1.1 Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out on 8, 16, 21 and 30 August 2017. No exceedances of Action/Limit levels at ASR were recorded.

8.1.2 Although results of olfactometry analysis from the odour sampling during the reporting period exceeded the compliance of 5 odour units (based on averaging time of 5 seconds at the nearest ASR), however, no relationship can be drawn from the H₂S concentration and the exceeded results of the odour unit from the olfactometry analysis so far in the reporting period. Besides, based on the onsite odour patrol monitoring and the records of wind direction, the exceedances from the olfactometry analysis were not project-related. Therefore no non-compliance of odour monitoring at ASR were recorded in the reporting period.



9. SUMMARY OF ENVIRONMENTAL COMPLAINTS

9.1.1 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to the environmental impact during the report period. Summaries of complaints, notification of summons and successful prosecutions are presented in **Table 9.1** and **Table 9.2**.

Table 9.1 Cumulative Statistics on Complaints

Environmental Parameters	Cumulative No. Brought Forward	No. of Complaints This Month	Cumulative Project-to-Date
Air	0	0	0
Noise	0	0	0
Water	0	0	0
Waste	0	0	0
Others	0	0	0
Total	0	0	0

Table 9.2 Cumulative Statistics on Notification of Summons and Successful Prosecutions

Environmental Parameters	Cumulative No. Brought Forward	No. of Notification of Summons and Prosecutions This Month	Cumulative Project-to-Date
Air	0	0	0
Noise	0	0	0
Water	0	0	0
Waste	0	0	0
Others	0	0	0
Total	0	0	0

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10. FUTURE KEY ISSUES

10.1.1 The key issues to be considered in the coming reporting month include:

Potential environmental impacts arising from the operation of SHWSTW are mainly associated with air quality, water quality, sediment quality, benthic ecology, waste management and distribution and abundance of CWD.

10.1.2 During this reporting period, H₂S data collected (total 4 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW as the wind direction during the measurement was in a non-ideal direction e.g. SW, N, NW, as such wind direction was not from SHWSTW towards ASR. Therefore the measured H₂S data from the reporting period could not be representative to reflect the odour impact from SHWSTW during operational phase. Due to inadequacy of representative data, further H₂S measurement and olfactometry analysis are required to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³).



11. CONCLUSION

- 11.1.1 Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out in the reporting month. No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period. Although results of olfactometry analysis from the odour sampling during the reporting period exceeded the compliance of 5 odour units (based on averaging time of 5 seconds at the nearest ASR), however, no relationship can be drawn from the H₂S concentration and the exceeded results of the odour unit from the olfactometry analysis so far in the reporting period. Besides, based on the onsite odour patrol monitoring and the records of wind direction, the exceedances from the olfactometry analysis were not project-related. Therefore no non-compliance of odour monitoring at ASR were recorded in the reporting period.
- 11.1.2 During this reporting period, H₂S data collected (total 4 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW as the wind direction during the measurement was in a non-ideal direction e.g. SW, N, NW, as such wind direction was not from SHWSTW towards ASR. Therefore the measured H₂S data from the reporting period could not be representative to reflect the odour impact from SHWSTW during operational phase. Due to inadequacy of representative data, further H₂S measurement and olfactometry analysis are required to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³).
- 11.1.3 No water quality monitoring, sediment quality monitoring and benthic survey work was conducted during the reporting period. Water quality monitoring, sediment quality monitoring and benthic survey will be conducted and reported in the next reporting period.
- 11.1.4 The latest AFCD's report, "*Monitoring of Marine Mammals in Hong Kong Waters (2016-17)*" in terms of the distribution and abundance of Chinese White Dolphins (CWDs) was reviewed. CWD occurrence in Northeast Lantau (NEL) has plummeted over the past decade, from 20 CWDs in 2001 to 1 CWD in 2014. Between 2015 and 2016, no sightings were recorded in NEL, and the abundance estimate in this area has reached its lowest point. The impact of increased effluent discharged from Siu Ho Wan outfall on CWDs remains unclear. However, anthropogenic disturbances such as increasing level of vessel traffic, construction of HZMB and expansion of Hong Kong International Airport are perceived as causes of decline in local abundance of CWDs. Continued systematic dolphin surveying in Lantau Island is necessary to further study this issue.
- 11.1.5 SHWSTW is reminded to fully comply with EP conditions. All environmental mitigation measures and recommendations in the EP, EIA Report and approved waste management plan shall be fully and properly implemented.
- 11.1.6 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to the environmental impact during the report period.

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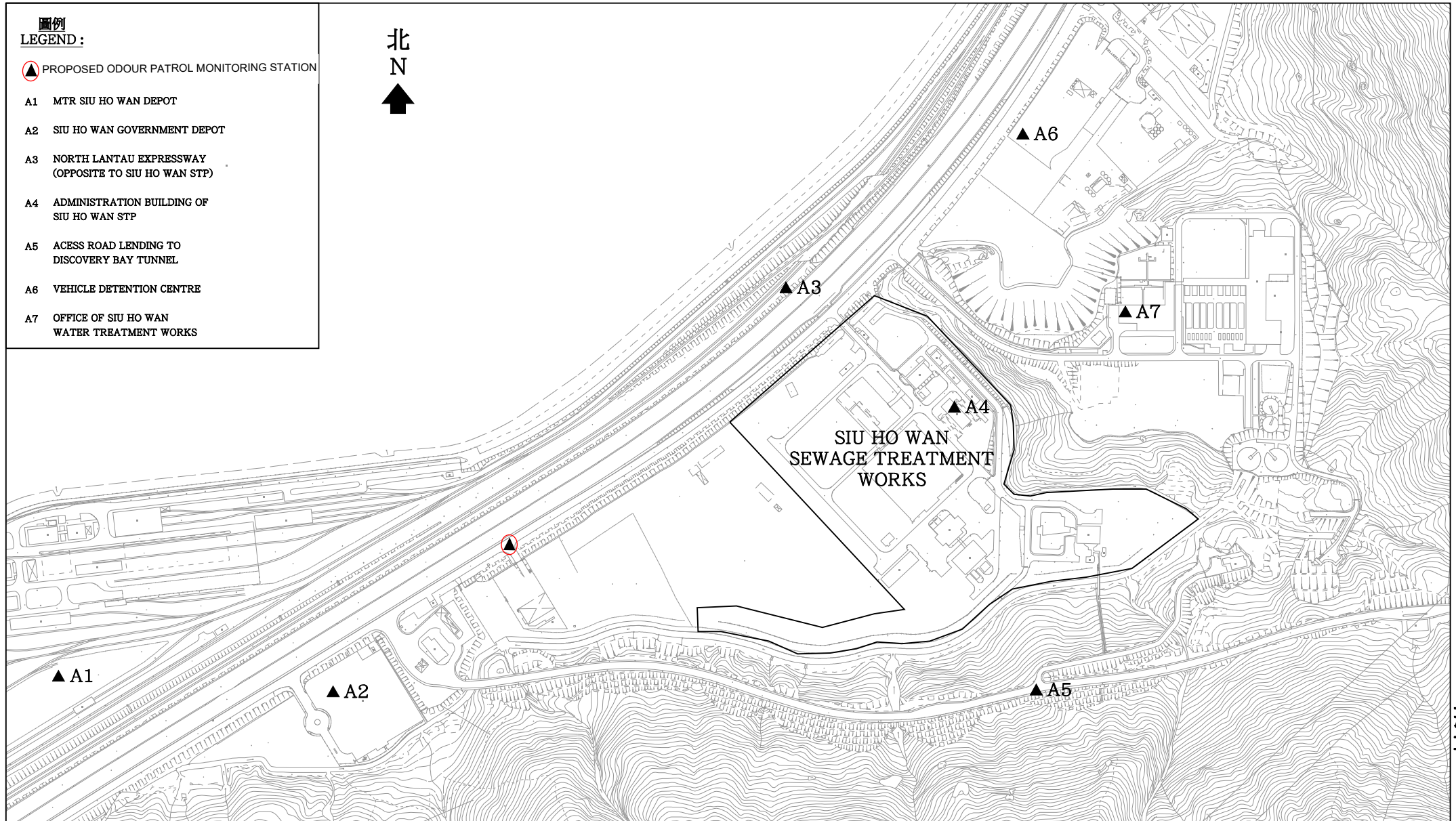
Report No.: 0041/17/ED/0132C

Figure 1

Monitoring Location of Air Sensitive Receiver

圖例
LEGEND:

- ▲ PROPOSED ODOUR PATROL MONITORING STATION
- A1 MTR SIU HO WAN DEPOT
- A2 SIU HO WAN GOVERNMENT DEPOT
- A3 NORTH LANTAU EXPRESSWAY
(OPPOSITE TO SIU HO WAN STP)
- A4 ADMINISTRATION BUILDING OF
SIU HO WAN STP
- A5 ACCESS ROAD LENDING TO
DISCOVERY BAY TUNNEL
- A6 VEHICLE DETENTION CENTRE
- A7 OFFICE OF SIU HO WAN
WATER TREATMENT WORKS



圖則名稱 drawing title

UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT
OPTIONAL ENVIRONMENTAL MONITORING AND AUDIT PLAN
ODOUR PATROL MONITORING STATIONS

繪畫 drawn

C.W. CHAN

日期 date

16-08-2006

核對 checked

C.K. LAM

日期 date

16-08-2006

批核 approved

S.K. WONG

日期 date

16-08-2006

部門 office

顧問工程管理部
CONSULTANTS MANAGEMENT DIVISION

圖則編號 drawing no.

DCM/2006/063

比例 scale

N.T.S.

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Figure 2

Locations of Survey Areas of Chinese White Dolphins

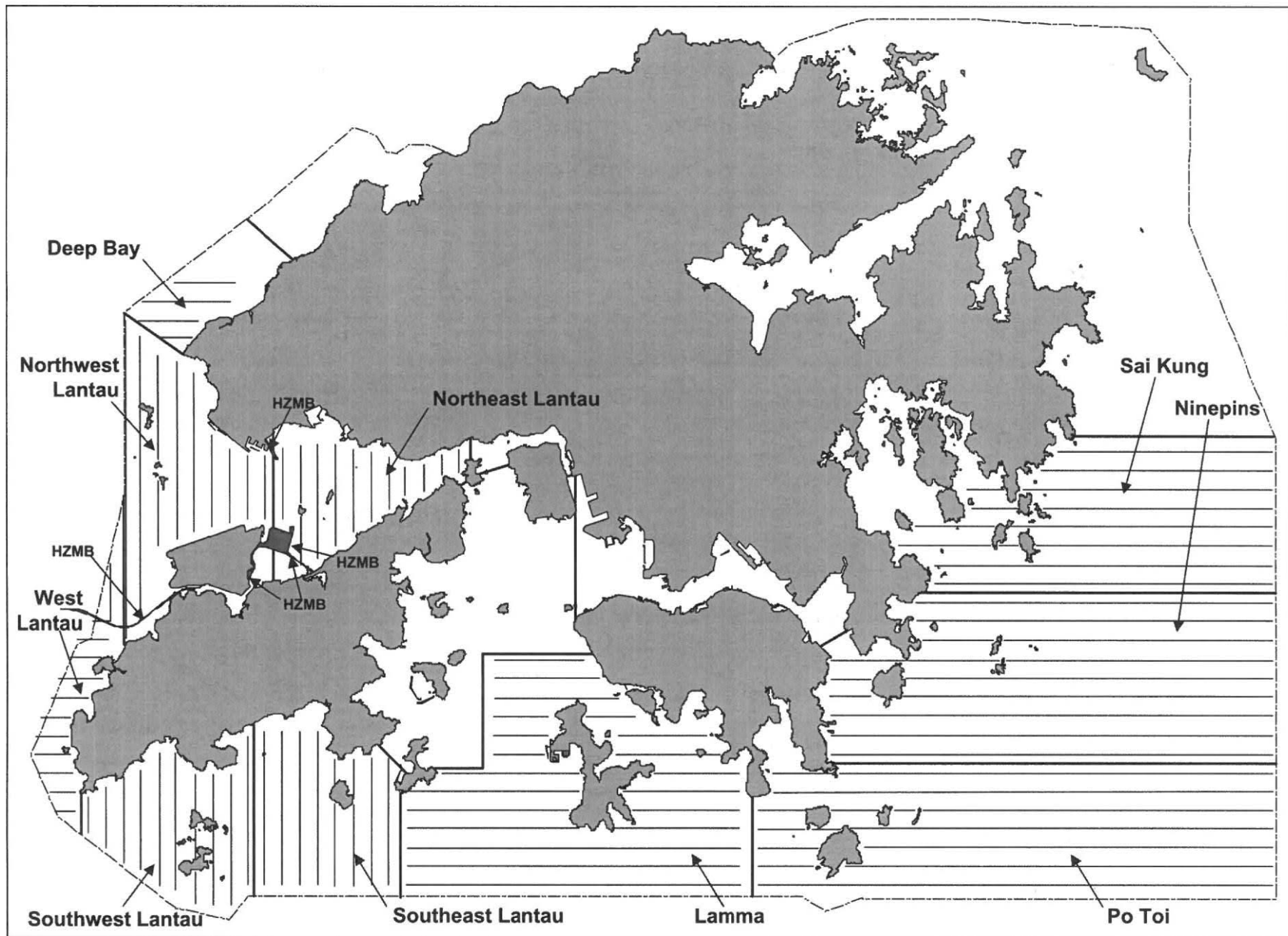


Figure 3 Ten Line-Transect Survey Areas within the Study Area chosen for the Present Monitoring Study (2016-17)

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Appendix A Project Organization Chart

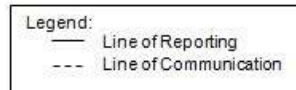
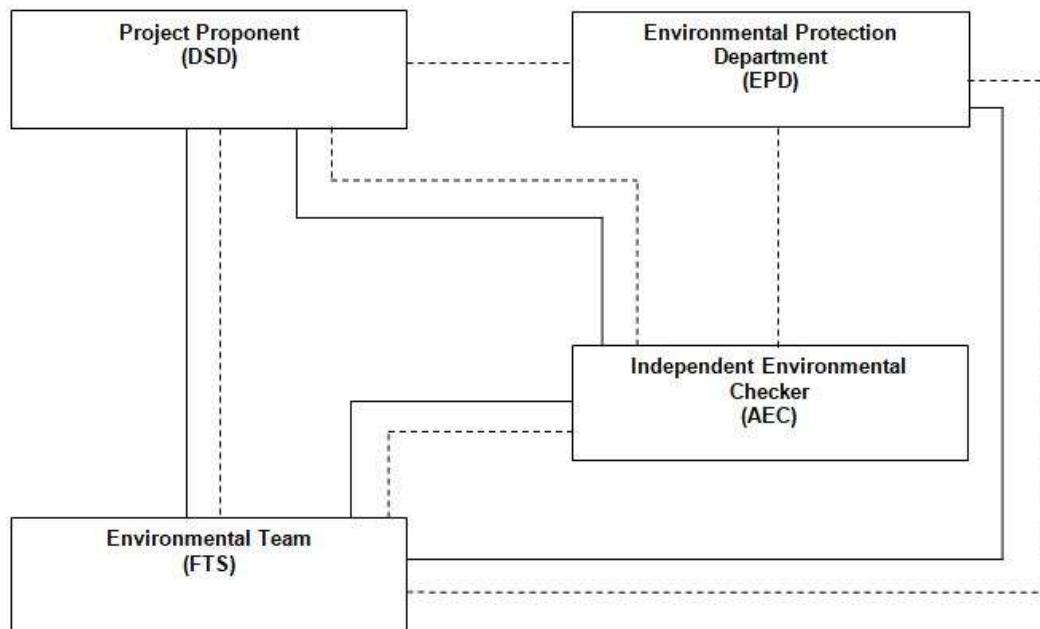
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Appendix B

Monitoring Schedule for Present and Next Reporting Period

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Monitoring Schedule for Present Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
		1 August 2017	2	3	4	5
6	7	8 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	9	10	11	12
13	14	15	16 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	17	18	19
20	21 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	22	23	24	25	26
27	28	29	30 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	31		

Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.
2. In accordance with the notification of commencement of Operational EM&A Programme (Ref.: MCL/ED/0449/2017/C) submitted by ET dated on 3 August 2017, the H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was commenced on 8 August 2017 which no objection was received by EPD.

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Report No.: 0041/17/ED/0132C

Monitoring Schedule for Next Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
					1 September 2017	2
3	4	5	6 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	7	8	9
10	11 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	12	13	14	15	16
17	18 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	19	20	21	22	23
24	25 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	26	27	28	29	30

Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.
2. The Commencement of Water Quality Monitoring, Sediment Quality Monitoring and Benthic Survey Works will be subjected to the approved from EPD in case there is any variation in the methodology between the EM&A Plan.

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Appendix C

Event and Action Plan for Air Quality Monitoring

FUGRO TECHNICAL SERVICES LIMITED

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Report No.: 0041/17/ED/0132C

EVENT	ACTION		
	ET	IEC	*Operator
Action Level			
One complaint received for specific odour event	<ol style="list-style-type: none"> 1. Check Operator's working methods; 2. Discuss with Operator on required remedial actions 	<ol style="list-style-type: none"> 1. Discuss with ET and Operator on the possible remedial actions; 2. Advise the Operator on the effectiveness of the proposed remedial measures; 3 Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Identify/ confirm source with ET; 2. Discuss with ET for remedial actions required; 3. Ensure remedial actions properly implemented 4. Rectify any unacceptable practice; 5. Amend operation methods if appropriate
Limit Level			
More than one complaint	<ol style="list-style-type: none"> 1. Investigated the causes of complaint; 2. Check Operator's working methods; 3. Carry out analysis of Operator's working procedures to determine possible mitigation to be implemented; 4. Arrange meeting with ET and EPD to discuss the remedial actions to be taken; 5. Discuss with EPD and the Operator on the required remedial actions; 6. Submit proposals for remedial actions within 3 working days of notification; 7. Assess effectiveness of Operator's remedial actions and keep EPD informed of the results; 8. Amend proposal if appropriate; 9. Resubmit proposal if problem still not under control 	<ol style="list-style-type: none"> 1. Discuss amongst ET and the Operator on the potential remedial actions; 2. Review the proposed remedial actions whenever necessary to assure their effectiveness and advise the Operator accordingly; 3. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Indentify/ confirm source with ET; 2. Confirm receipt of notification of failure in writing; 3. Inform ET, IEC and EPD; 4. Discuss with EPD and ET on the required remedial actions; 5. Ensure remedial actions properly implemented; 6. Take immediate action to avoid further exceedance; 7. Implement the agreed proposals

* The operator who is the constructor responsible for the operation during the maintenance period.

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Appendix D

Copy of Calibration Certificates of H₂S Analyzer



Certification of Instrument Calibration

Guyline (Asia) Ltd
Rm 1611, Eastern Harbour Centre
Quarry Bay,

RMA # 2459849

This is to certify that the Jerome **X631 0003** Gold Film Hydrogen Sulfide Analyzer, Serial Number **2966**, with Sensor Number **14-11-23-R2D**, was calibrated with standard units traceable to NIST.

Calibration Status as Received: **Out of Calibration**

		Actual		Calibration Gas		Allowable Range
Incoming:	Range 1	0.346	ppm H2S	0.500	ppm H2S	+/- 6%
	RSD %	10.17				<5%
Outgoing:	Range 1	0.476	ppm H2S	0.500	ppm H2S	+/- 6%
	RSD %	2.18				<5%

Calibration Status as Left: **In Calibration**

Estimated Uncertainty of Calibration System: 2.8%

Calibration Date: 02-Jun-2017 Recalibration Date: 01-Jun-2018

Temperature °F: % Relative Humidity:

Cheryl Hradek

Approved By: _____
Title: Cheryl Hradek - Quality Control

Date Approved: 05-Jun-2017

Equipment Used:

- H2S Calibration Standard:** CC-57152 NIST#: 1385481
Calibration Date: 17-Aug-2016 **Calibration Date Due:** 18-Aug-2019
- Mass Flow Controller B:** 124604 NIST#: 152971
Calibration Date: 28-Nov-2016 **Calibration Date Due:** 28-Nov-2017
- Mass Flow Controller D:** 124602 NIST#: 151792
Calibration Date: 08-Nov-2016 **Calibration Date Due:** 08-Nov-2017
- Digital Multimeter:** 66961028 NIST#: 7000660
Calibration Date: 28-Mar-2017 **Calibration Date Due:** 28-Mar-2018
- Flowmeter:** US10H44183 NIST#: 1813; 1817; 1796
Calibration Date: 08-Nov-2016 **Calibration Date Due:** 09-Nov-2017

Calibration Procedure Used: 730-0032

Arizona Instrument certifies that the above listed instrument meets or exceeds all published specifications and has been calibrated using standards whose accuracy are traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY within the limitations of the Institute's calibration services, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of self-calibration techniques.

Disclaimer: Any unauthorized adjustments, removal or breaking of QC seals, or other customer modifications on your Jerome Analyzer WILL VOID this factory calibration. Because any of the above acts could affect the calibration and readings of the instrument, their certification will no longer be valid and, further, Arizona Instrument LLC WILL NOT be responsible for any liabilities created as a result of using the instrument after such adjustments, seal removal, or modifications.

As long as a functional test is within range, according to the procedure outlined in the Operator's Manual, the instrument is performing correctly.

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Report No.: 0041/17/ED/0132C

Appendix E

Results and Graphical Presentation of Air Quality Monitoring

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	08 August 2017
Monitoring Location:	ASR
Start Time:	14:37
End Time:	14:52
Temperature (°C)	34.6
Wind Speed (m/s)	0.8
Wind Direction	SW
Relative Humidity (%)	62

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2017-08-08	14:37:03	0.000
2017-08-08	14:38:03	0.000
2017-08-08	14:39:03	0.000
2017-08-08	14:40:03	0.001
2017-08-08	14:41:03	0.000
2017-08-08	14:42:03	0.000
2017-08-08	14:43:03	0.000
2017-08-08	14:44:03	0.000
2017-08-08	14:45:03	0.000
2017-08-08	14:46:03	0.000
2017-08-08	14:47:03	0.000
2017-08-08	14:48:03	0.000
2017-08-08	14:49:03	0.000
2017-08-08	14:50:03	0.000
2017-08-08	14:51:03	0.000
2017-08-08	14:52:03	0.000
Average H2S conc. (ppm)		0.000

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	16 August 2017
Monitoring Location:	ASR
Start Time:	10:30
End Time:	10:45
Temperature (°C)	30.0
Wind Speed (m/s)	0.7
Wind Direction	N
Relative Humidity (%)	72

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2017-08-16	10:30:31	0.000
2017-08-16	10:31:31	0.001
2017-08-16	10:32:31	0.001
2017-08-16	10:33:31	0.000
2017-08-16	10:34:31	0.000
2017-08-16	10:35:31	0.002
2017-08-16	10:36:31	0.000
2017-08-16	10:37:31	0.000
2017-08-16	10:38:31	0.000
2017-08-16	10:39:31	0.000
2017-08-16	10:40:31	0.000
2017-08-16	10:41:31	0.000
2017-08-16	10:42:31	0.000
2017-08-16	10:43:31	0.000
2017-08-16	10:44:31	0.000
2017-08-16	10:45:31	0.000
	Average H2S conc. (ppm)	0.000

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	21 August 2017
Monitoring Location:	ASR
Start Time:	10:04
End Time:	10:19
Temperature (°C)	33.3
Wind Speed (m/s)	1.5
Wind Direction	N
Relative Humidity (%)	60

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2017-08-21	10:04:18	0.006
2017-08-21	10:05:18	0.005
2017-08-21	10:06:18	0.004
2017-08-21	10:07:18	0.004
2017-08-21	10:08:18	0.003
2017-08-21	10:09:18	0.003
2017-08-21	10:10:18	0.005
2017-08-21	10:11:18	0.005
2017-08-21	10:12:18	0.004
2017-08-21	10:13:18	0.003
2017-08-21	10:14:18	0.006
2017-08-21	10:15:18	0.004
2017-08-21	10:16:18	0.004
2017-08-21	10:17:18	0.005
2017-08-21	10:18:18	0.004
2017-08-21	10:19:18	0.003
Average H2S conc. (ppm)		0.004

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	30 August 2017
Monitoring Location:	ASR
Start Time:	09:40
End Time:	09:55
Temperature (°C)	28.5
Wind Speed (m/s)	0.9
Wind Direction	NW
Relative Humidity (%)	81

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2017-08-30	09:40:06	0.000
2017-08-30	09:41:06	0.000
2017-08-30	09:42:06	0.000
2017-08-30	09:43:06	0.000
2017-08-30	09:44:06	0.001
2017-08-30	09:45:06	0.000
2017-08-30	09:46:06	0.000
2017-08-30	09:47:06	0.002
2017-08-30	09:48:06	0.000
2017-08-30	09:49:06	0.000
2017-08-30	09:50:06	0.000
2017-08-30	09:51:06	0.000
2017-08-30	09:52:06	0.000
2017-08-30	09:53:06	0.000
2017-08-30	09:54:06	0.001
2017-08-30	09:55:06	0.000
Average H2S conc. (ppm)		0.000

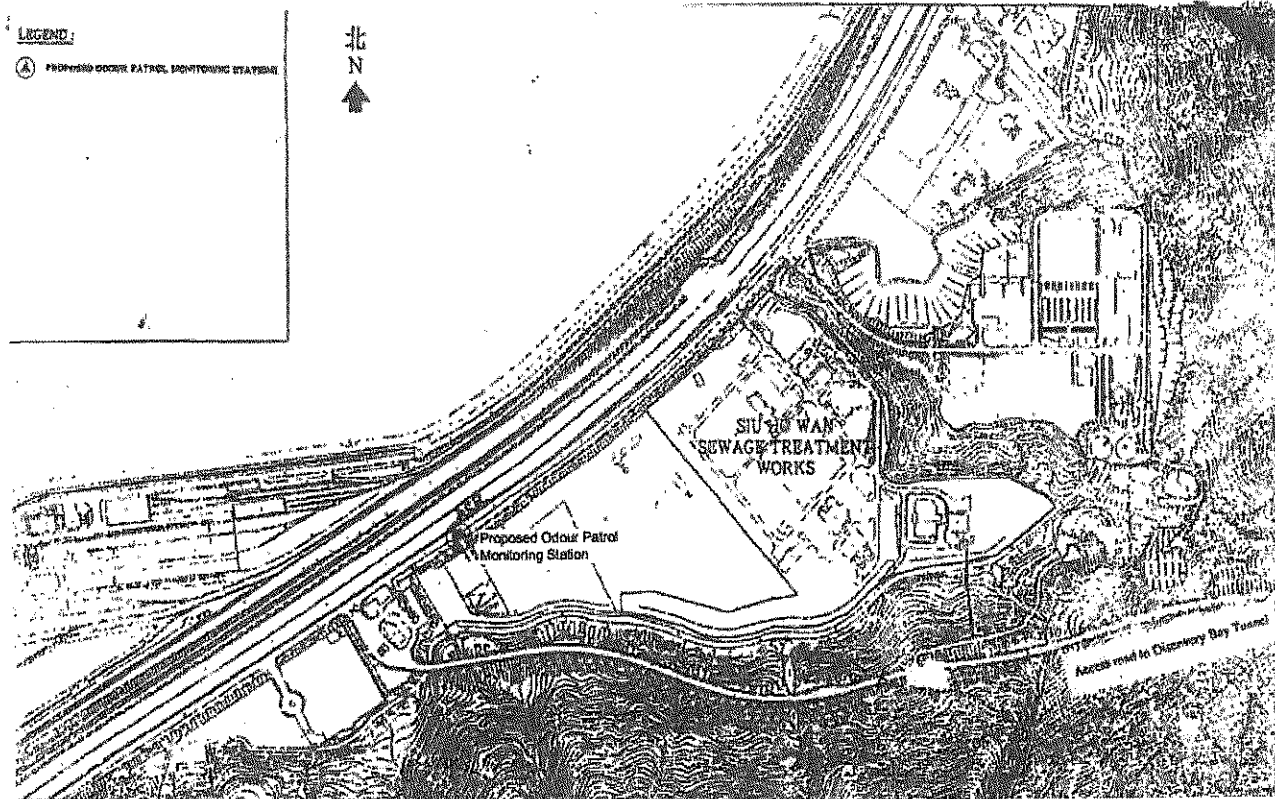
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Contract No. CM 14/2016
Environmental Team for Operational Environmental Monitoring and Audit for
Siu Ho Wan Sewage Treatment Works
Odour Patrol Monitoring Report



Odour Patrol Monitoring Date: 8/8/2017 Weather: fine

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	34.6 °C	Start Time:	14:37	End Time:	14:52
Wind Speed:	0.8 m/s	Wind Direction:	SW		
Nature of Odour:	N/A				
*Odour Intensity: (tick as appropriate)	<input checked="" type="checkbox"/> Not detected	<input type="checkbox"/> Slight	<input type="checkbox"/> Noticeable	<input type="checkbox"/> Strong	<input type="checkbox"/> Extreme

***Classification Criteria:**

- Not detected : No odour perceived or an odour so weak that it cannot be readily characterised or described.
- Slight : Identifiable odour, barely noticeable
- Noticeable : Identifiable odour, noticeable
- Strong : Identifiable odour, strong
- Extreme : Severe odour

Recorded by: [Signature]
Name: Kwok Hong Lai
Date: 8-8-2017

Checked by: [Signature]
Name: Cyrus Lo
Date: 8-8-2017

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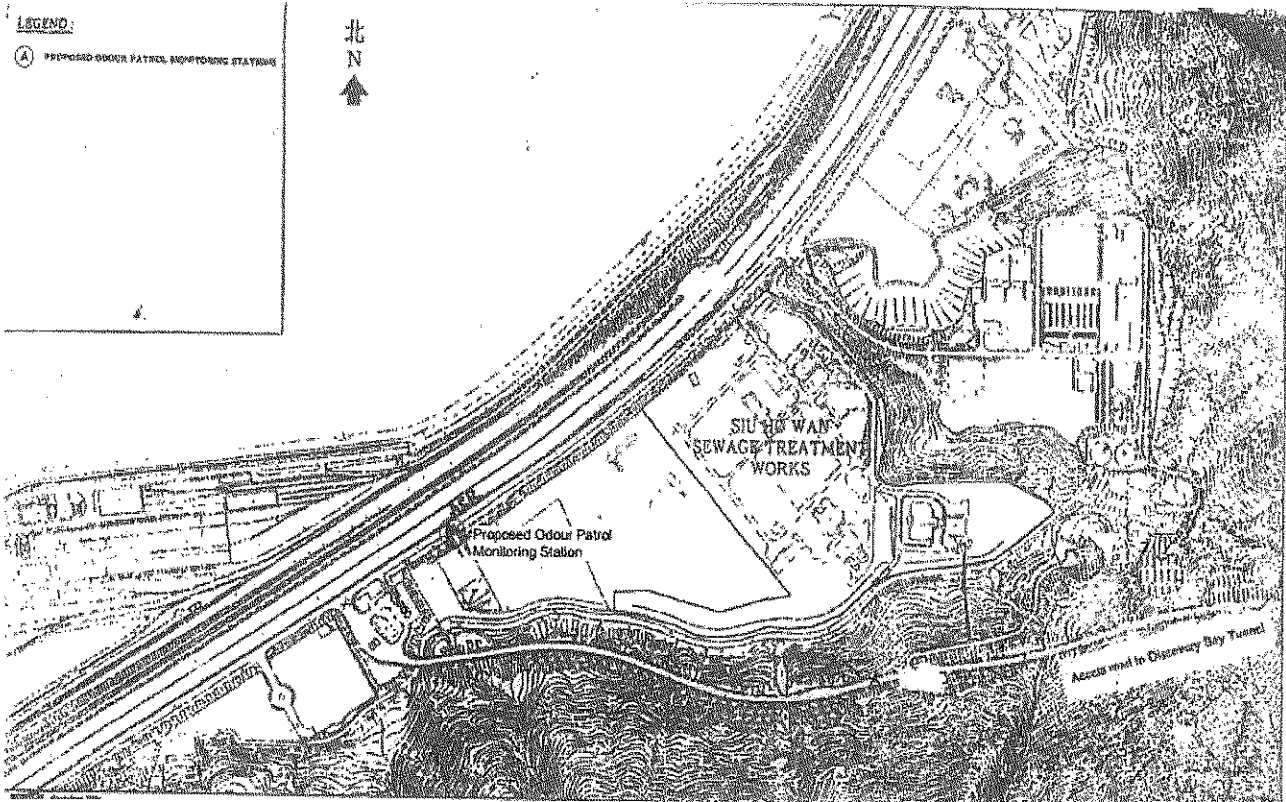
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**Contract No. CM 14/2016
Environmental Team for Operational Environmental Monitoring and Audit for
Siu Ho Wan Sewage Treatment Works
Odour Patrol Monitoring Report**



Odour Patrol Monitoring Date: 16 August 2017

Weather: Cloudy

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	30°C	Start Time:	10:30	End Time:	10:45
Wind Speed:	0.7 m/s	Wind Direction:	N		
Nature of Odour:	/				
*Odour Intensity: (tick as appropriate)	<input checked="" type="checkbox"/> Not detected	<input type="checkbox"/> Slight	<input type="checkbox"/> Noticeable	<input type="checkbox"/> Strong	<input type="checkbox"/> Extreme

***Classification Criteria:**

- Not detected : No odour perceived or an odour so weak that it cannot be readily characterised or described.
- Slight : Identifiable odour, barely noticeable
- Noticeable : Identifiable odour, noticeable
- Strong : Identifiable odour, strong
- Extreme : Severe odour

Recorded by: [Signature]
Name: Man Cheuk Yin
Date: 16 August 2017

Checked by: [Signature]
Name: Cyrus Lai
Date: 16 August 2017

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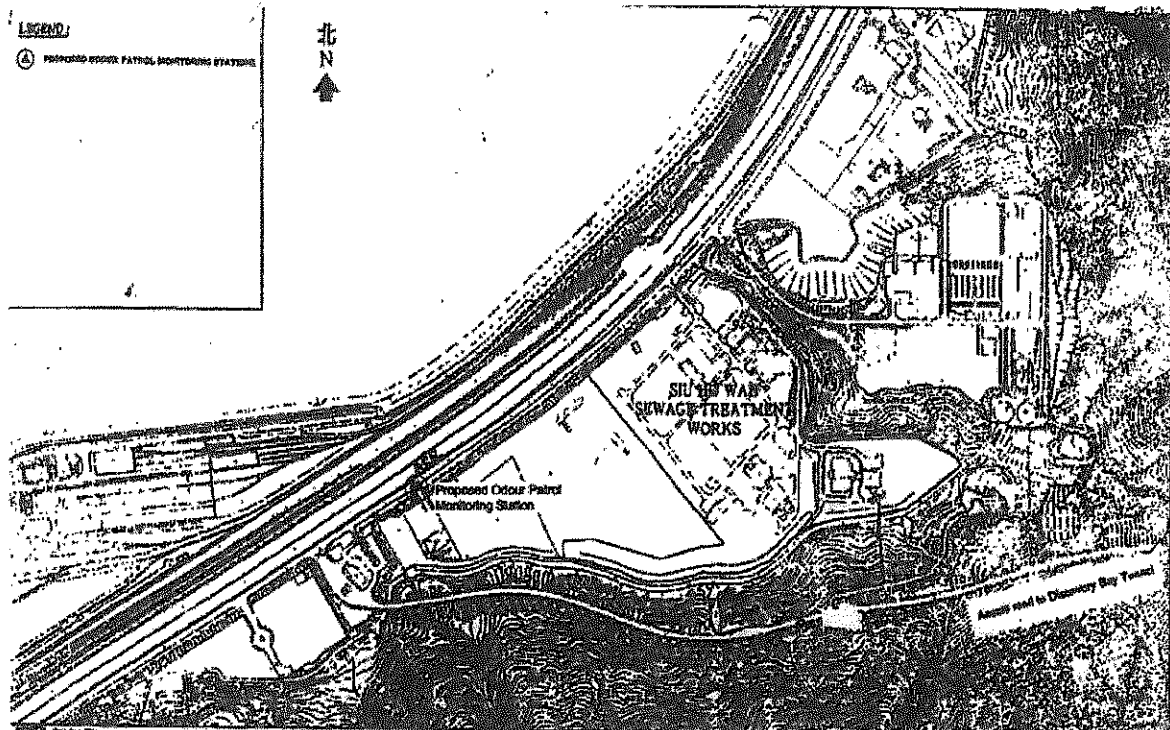
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Contract No. CM 14/2016
Environmental Team for Operational Environmental Monitoring and Audit for
Siu Ho Wan Sewage Treatment Works
Odour Patrol Monitoring Report



Odour Patrol Monitoring Date: 21/8/2017 Weather: Fine

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	<u>33.3 °C</u>	Start Time:	<u>10:04</u>	End Time:	<u>10:19</u>
Wind Speed:	<u>1.5 m/s</u>	Wind Direction:	<u>N</u>		
Nature of Odour:	/				
*Odour Intensity: (tick as appropriate)	<input checked="" type="checkbox"/> Not detected	<input type="checkbox"/> Slight	<input type="checkbox"/> Noticeable	<input type="checkbox"/> Strong	<input type="checkbox"/> Extreme

***Classification Criteria:**

- Not detected : No odour perceived or an odour so weak that it cannot be readily characterised or described.
- Slight : Identifiable odour, barely noticeable
- Noticeable : Identifiable odour, noticeable
- Strong : Identifiable odour, strong
- Extreme : Severe odour

Recorded by: Jimmy L
Name: Kwok Weng Lai
Date: 21-08-2017

Checked by: Gym Lee
Name: Gym Lee
Date: 21-08-2017

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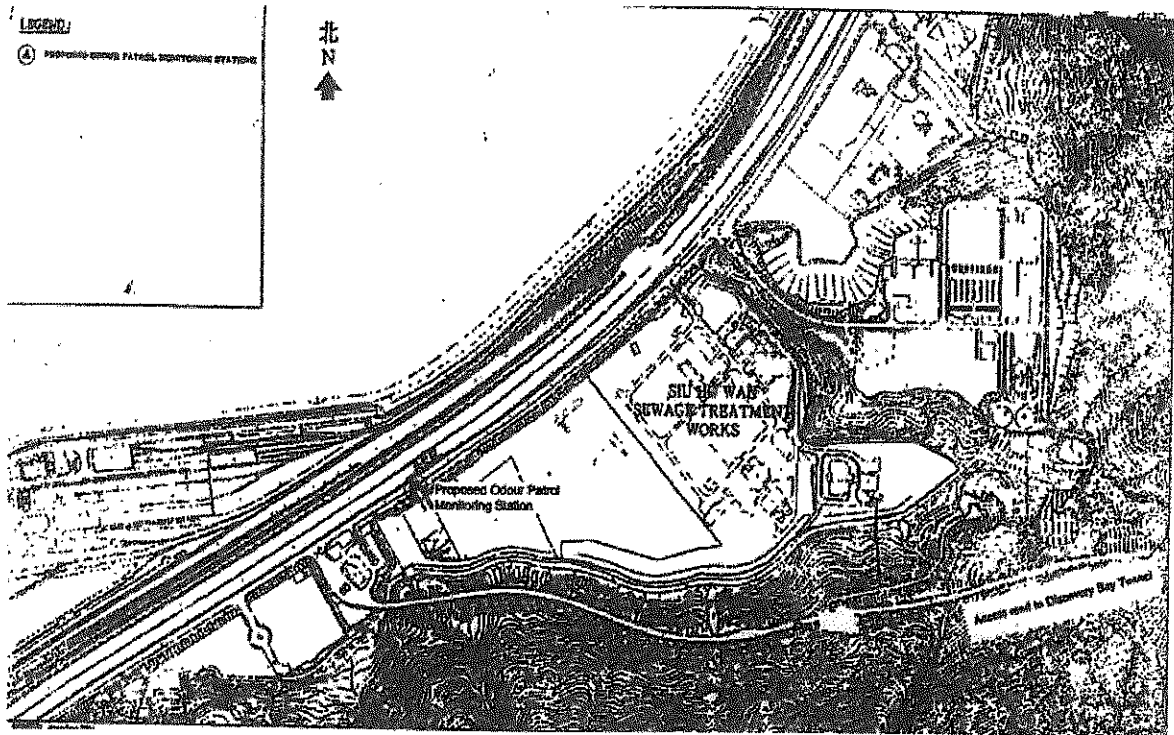
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Contract No. CM 14/2016
Environmental Team for Operational Environmental Monitoring and Audit for
Siu Ho Wan Sewage Treatment Works
Odour Patrol Monitoring Report



Odour Patrol Monitoring Date: 30/8

Weather: Fine

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	<u>28.9</u>	Start Time:	<u>09:40</u>	End Time:	<u>09:55</u>
Wind Speed:	<u>0.9 m/s</u>		Wind Direction:	<u>NW</u>	
Nature of Odour:					
*Odour Intensity: (tick as appropriate)	<input checked="" type="checkbox"/> Not detected	<input type="checkbox"/> Slight	<input type="checkbox"/> Noticeable	<input type="checkbox"/> Strong	<input type="checkbox"/> Extreme

***Classification Criteria:**

- Not detected : No odour perceived or an odour so weak that it cannot be readily characterised or described.
- Slight : Identifiable odour, barely noticeable
- Noticeable : Identifiable odour, noticeable
- Strong : Identifiable odour, strong
- Extreme : Severe odour

Recorded by: Jimmy L
Name: Kwok Leung Lam
Date: 30/8/2017

Checked by: Cyus Lo
Name: Cyus Lo
Date: 30/8/2017

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CERTIFICATE OF ANALYSIS

CLIENT:	MaterialLab Consultants Limited	WORK ORDER:	HK1762374
CONTACT:	Cyrus Lai	LABORATORY:	Hong Kong
ADDRESS:	Room 723 & 725, 7/F, Block B, Profit Industrial Building 1-15 Kwai Fung Crescent, Kwai Chung Hong Kong	SUB-BATCH:	0
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	DATE RECEIVED:	08 August 2017
SITE:	Siu Ho Wan	DATE OF ISSUE:	19 August 2017
PO:	---	SAMPLE TYPE:	Air
		No. of SAMPLES:	1

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 08th August, 2017 at Siu Ho Wan.

The sample(s) were analysed and reported on an as received basis.

NOTES

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

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.


Richard Fung
General Manager - Hong Kong

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METHOD STATEMENT

A. Odour Concentration

1. Odour Sampling

Odour gas sample was collected by passive sampling technique. A Nalophan™ sampling bag was placed inside an air-tight sampler and then drawn to vacuum. Approximately 60 litre of gas sample was collected into the sampling bag for testing.

The sample was collected at the ASR of the Siu Ho Wan and shown in Appendix 1.

2. Olfactometry Testing

Odour concentration was determined by a Forced-choice Dynamic Olfactometer in accordance with the European Standard Method (EN13725).

This European Standard specifies a method for the objective determination of the odour concentration of a gaseous sample using dynamic olfactometry with human assessors and the emission rate of odours emanating from point sources, area sources with outward flow and area sources without outward flow.

This European Standard is applicable to the measurement of odour concentration of pure substances, defined mixtures and undefined mixtures of gaseous odorants in air or nitrogen, using dynamic olfactometry with a panel of human assessors being the sensor.

The unit of measurement is the odour unit per cubic metre: OU_e/m^3 . The odour concentration is measured by determining the dilution factor required to reach the detection threshold. The odour concentration at the detection threshold is by definition 1 OU_e/m^3 . The odour concentration is then expressed in terms of multiples of the detection threshold. The range of measurement including pre-dilution prior to the olfactometry analysis is typically from 10^1 OU_e/m^3 to 10^7 OU_e/m^3 .

Olfactometry Testing was performed by using the Scentroid™ SS6000 Olfactometer. The testing was performed by at least five qualified panellists who have been selected through an n-butanol screening test.

All testing finished within 24 hours after sample receipt.

**RESULT****1. Odour Concentration**

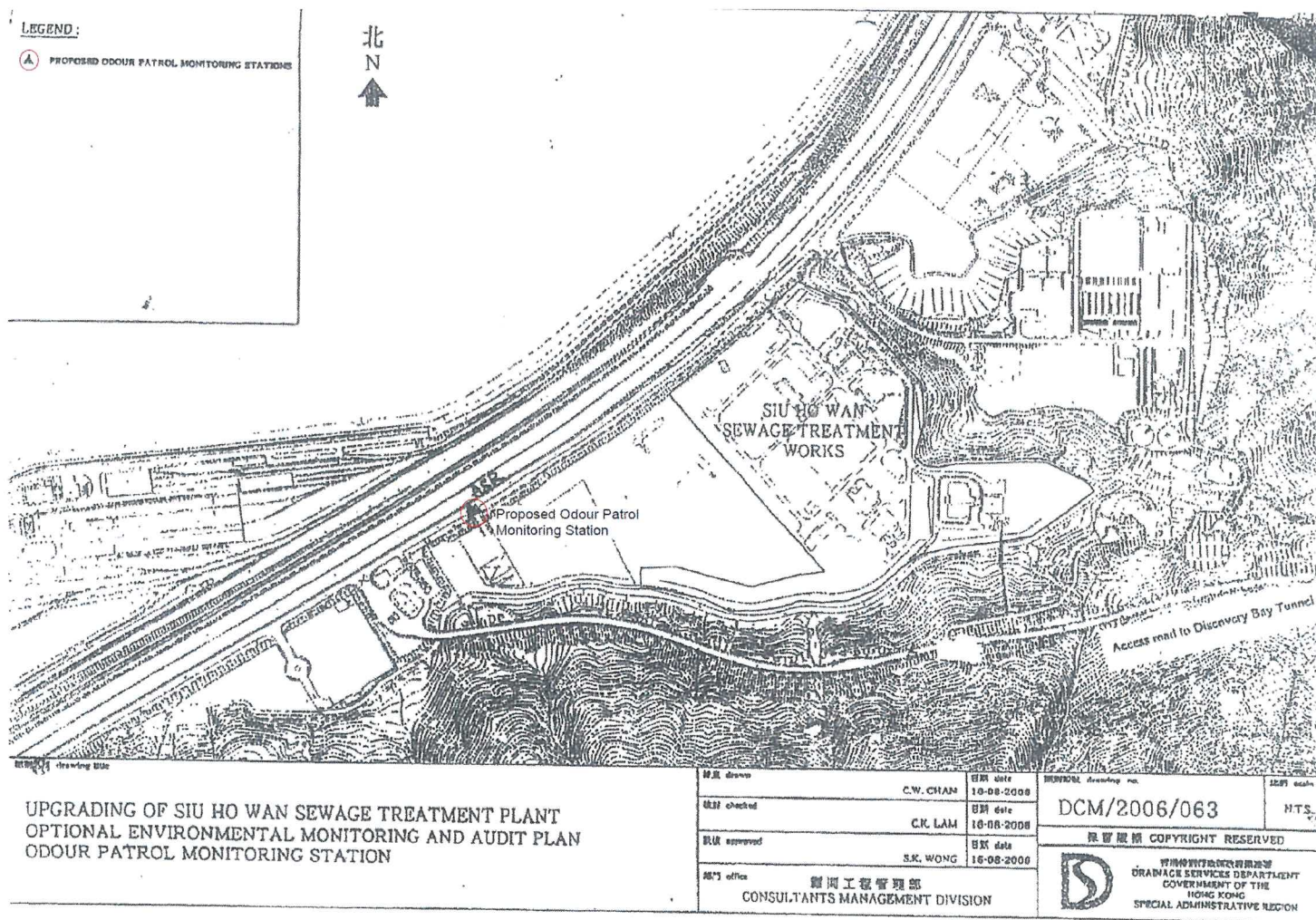
Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _e /m ³)	Odour Concentration (OU _e /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1762374001	Siu Ho Wan - ASR	Air	8 August 2017	14:37 - 14:41	5	18	34.6	62	0.8	SW

Remark:

1. LOR denotes limit of reporting.
2. The Ambient temperature, relative humidity, wind speed and wind direction were measured and provided by the client.

APPENDIX 1

A1.1. Layout of the Sampling Location





CERTIFICATE OF ANALYSIS

CLIENT:	Materialab Consultants Limited	WORK ORDER:	HK1762378
CONTACT:	Cyrus Lai	LABORATORY:	Hong Kong
ADDRESS:	Room 723 & 725, 7/F, Block B, Profit Industrial Building 1-15 Kwai Fung Crescent, Kwai Chung Hong Kong	SUB-BATCH:	0
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	DATE RECEIVED:	16 August 2017
SITE:	Siu Ho Wan	DATE OF ISSUE:	19 August 2017
PO:	---	SAMPLE TYPE:	Air
		No. of SAMPLES:	1

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 16th August, 2017 at Siu Ho Wan.

The sample(s) were analysed and reported on an as received basis.

NOTES

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

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.


Richard Fung
General Manager Hong Kong

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METHOD STATEMENT



A. Odour Concentration

1. Odour Sampling

Odour gas sample was collected by passive sampling technique. A Nalophan™ sampling bag was placed inside an air-tight sampler and then drawn to vacuum. Approximately 60 litre of gas sample was collected into the sampling bag for testing.

The sample was collected at the ASR of the Siu Ho Wan and shown in Appendix 1.

2. Olfactometry Testing

Odour concentration was determined by a Forced-choice Dynamic Olfactometer in accordance with the European Standard Method (EN13725).

This European Standard specifies a method for the objective determination of the odour concentration of a gaseous sample using dynamic olfactometry with human assessors and the emission rate of odours emanating from point sources, area sources with outward flow and area sources without outward flow.

This European Standard is applicable to the measurement of odour concentration of pure substances, defined mixtures and undefined mixtures of gaseous odorants in air or nitrogen, using dynamic olfactometry with a panel of human assessors being the sensor.

The unit of measurement is the odour unit per cubic metre: OU_e/m^3 . The odour concentration is measured by determining the dilution factor required to reach the detection threshold. The odour concentration at the detection threshold is by definition 1 OU_e/m^3 . The odour concentration is then expressed in terms of multiples of the detection threshold. The range of measurement including pre-dilution prior to the olfactometry analysis is typically from 10^1 OU_e/m^3 to 10^7 OU_e/m^3 .

Olfactometry Testing was performed by using the Scentroid™ SS6000 Olfactometer. The testing was performed by at least five qualified panellists who have been selected through an n-butanol screening test.

All testing finished within 24 hours after sample receipt.

**RESULT****1. Odour Concentration**

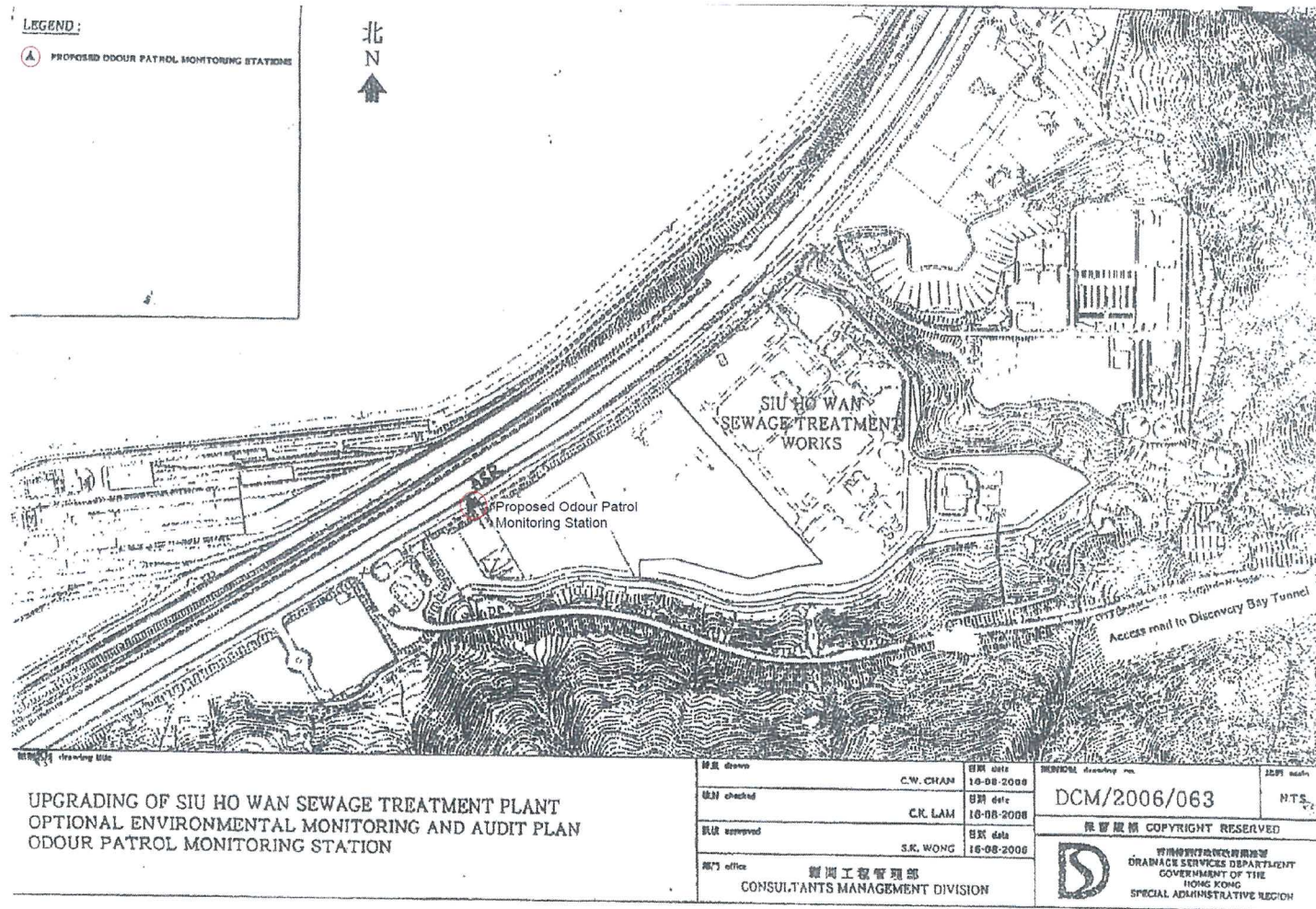
Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _e /m ³)	Odour Concentration (OU _e /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1762378001	Siu Ho Wan - ASR	Air	16 August 2017	10:30 - 10:35	5	17	30	72	0.7	N

Remark:

1. *LOR denotes limit of reporting.*
2. The Ambient temperature, relative humidity, wind speed and wind direction were measured and provided by the client.

APPENDIX 1

A1.1. Layout of the Sampling Location





CERTIFICATE OF ANALYSIS

CLIENT:	Materialab Consultants Limited	WORK ORDER:	HK1763829
CONTACT:	Cyrus Lai	LABORATORY:	Hong Kong
ADDRESS:	Room 723 & 725, 7/F, Block B, Profit Industrial Building 1-15 Kwai Fung Crescent, Kwai Chung Hong Kong	SUB-BATCH:	0
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	DATE RECEIVED:	21 August 2017
SITE:	Siu Ho Wan	DATE OF ISSUE:	30 August 2017
PO:	---	SAMPLE TYPE:	Air
		No. of SAMPLES:	1

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 21st August, 2017 at Siu Ho Wan.

The sample(s) were analysed and reported on an as received basis.

NOTES

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

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.


Richard Fung
General Manager - Hong Kong

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METHOD STATEMENT

A. Odour Concentration

1. Odour Sampling

Odour gas sample was collected by passive sampling technique. A Nalophan™ sampling bag was placed inside an air-tight sampler and then drawn to vacuum. Approximately 60 litre of gas sample was collected into the sampling bag for testing.

The sample was collected at the ASR of the Siu Ho Wan and shown in Appendix 1.

2. Olfactometry Testing

Odour concentration was determined by a Forced-choice Dynamic Olfactometer in accordance with the European Standard Method (EN13725).

This European Standard specifies a method for the objective determination of the odour concentration of a gaseous sample using dynamic olfactometry with human assessors and the emission rate of odours emanating from point sources, area sources with outward flow and area sources without outward flow.

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Olfactometry Testing was performed by using the Scentroid™ SS6000 Olfactometer. The testing was performed by at least five qualified panellists who have been selected through an n-butanol screening test.

All testing finished within 24 hours after sample receipt.

**RESULT****1. Odour Concentration**

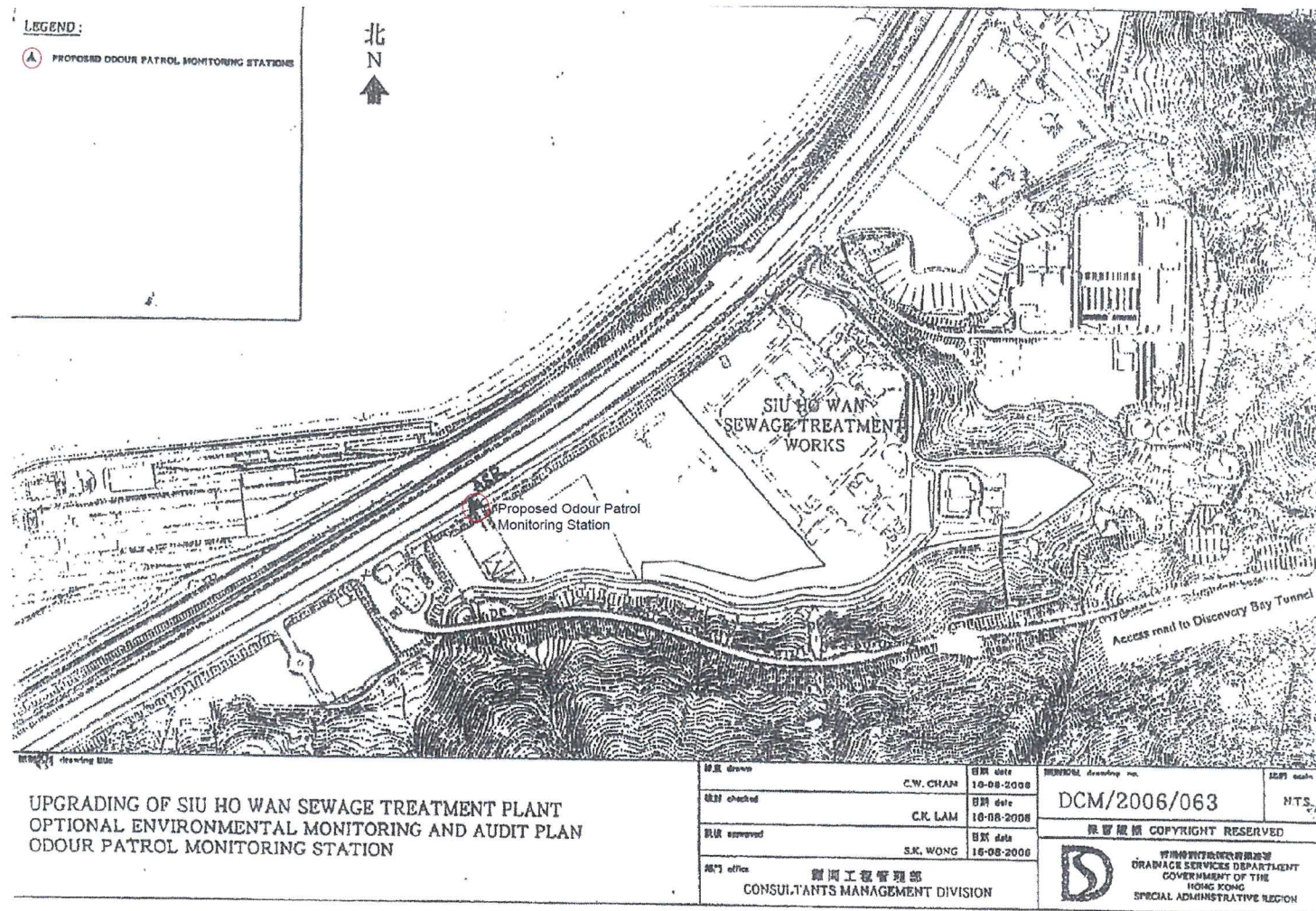
Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _E /m ³)	Odour Concentration (OU _E /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1763829001	Siu Ho Wan - ASR	Air	21 August 2017	10:04 - 10:08	5	13	33.3	60	1.5	N

Remark:

1. *LOR denotes limit of reporting.*
2. The Ambient temperature, relative humidity, wind speed and wind direction were measured and provided by the client.

APPENDIX 1

A1.1. Layout of the Sampling Location





CERTIFICATE OF ANALYSIS

CLIENT:	Materialab Consultants Limited	WORK ORDER:	HK1763834
CONTACT:	Cyrus Lai	LABORATORY:	Hong Kong
ADDRESS:	Room 723 & 725, 7/F, Block B, Profit Industrial Building 1-15 Kwai Fung Crescent, Kwai Chung Hong Kong	SUB-BATCH:	0
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	DATE RECEIVED:	30 August 2017
SITE:	Siu Ho Wan	DATE OF ISSUE:	04 September 2017
PO:	---	SAMPLE TYPE:	Air
		No. of SAMPLES:	1

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 30th August, 2017 at Siu Ho Wan.

The sample(s) were analysed and reported on an as received basis.

NOTES

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Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.


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General Manager - Hong Kong

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METHOD STATEMENT

A. Odour Concentration

1. Odour Sampling

Odour gas sample was collected by passive sampling technique. A Nalophan™ sampling bag was placed inside an air-tight sampler and then drawn to vacuum. Approximately 60 litre of gas sample was collected into the sampling bag for testing.

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Olfactometry Testing was performed by using the Scentroid™ SS6000 Olfactometer. The testing was performed by at least five qualified panellists who have been selected through an n-butanol screening test.

All testing finished within 24 hours after sample receipt.

**RESULT****1. Odour Concentration**

Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _E /m ³)	Odour Concentration (OU _E /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1763834001	Siu Ho Wan - ASR	Air	30 August 2017	09:40-09:48	5	26	28.5	81	0.9	NW

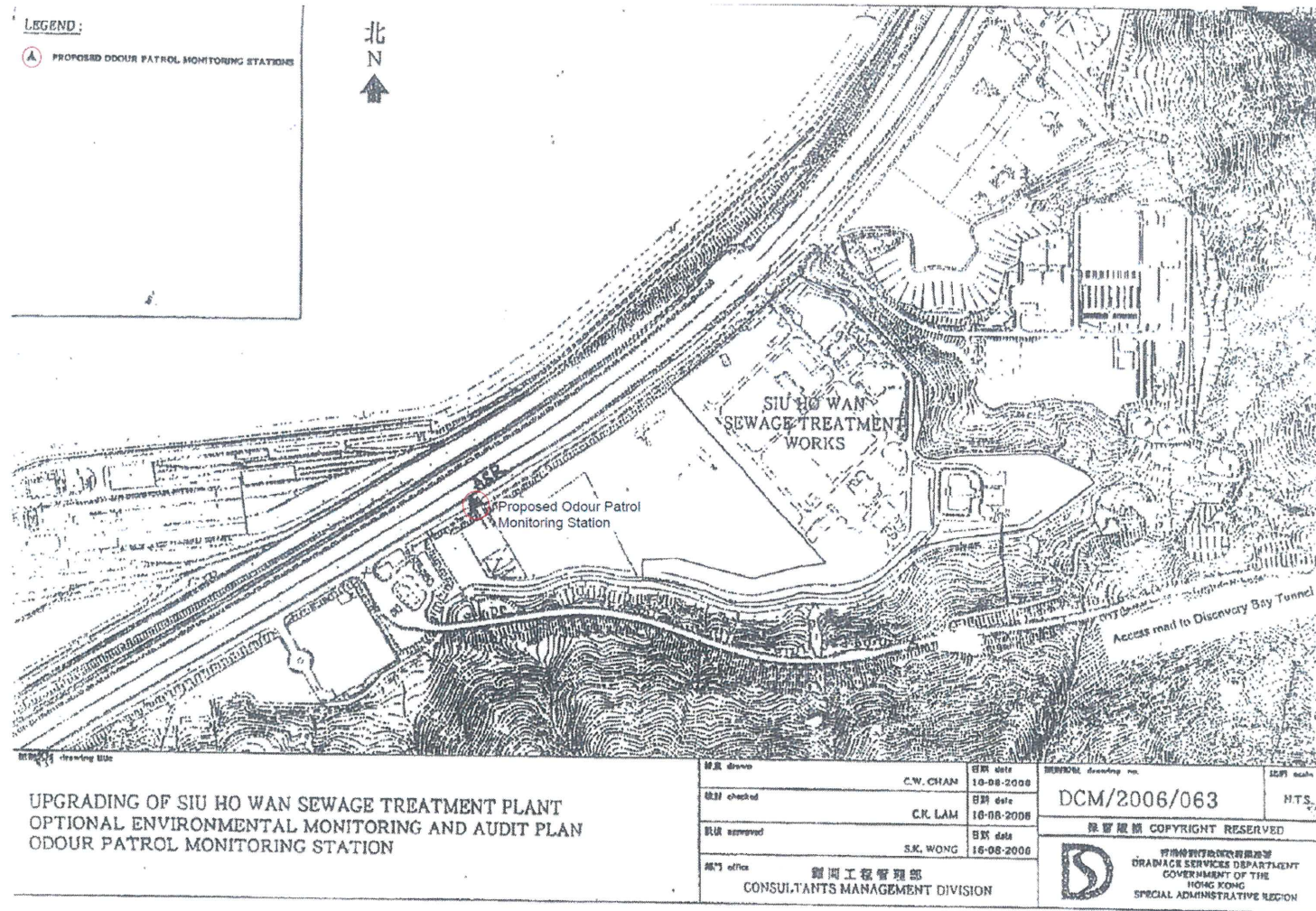
Remark:

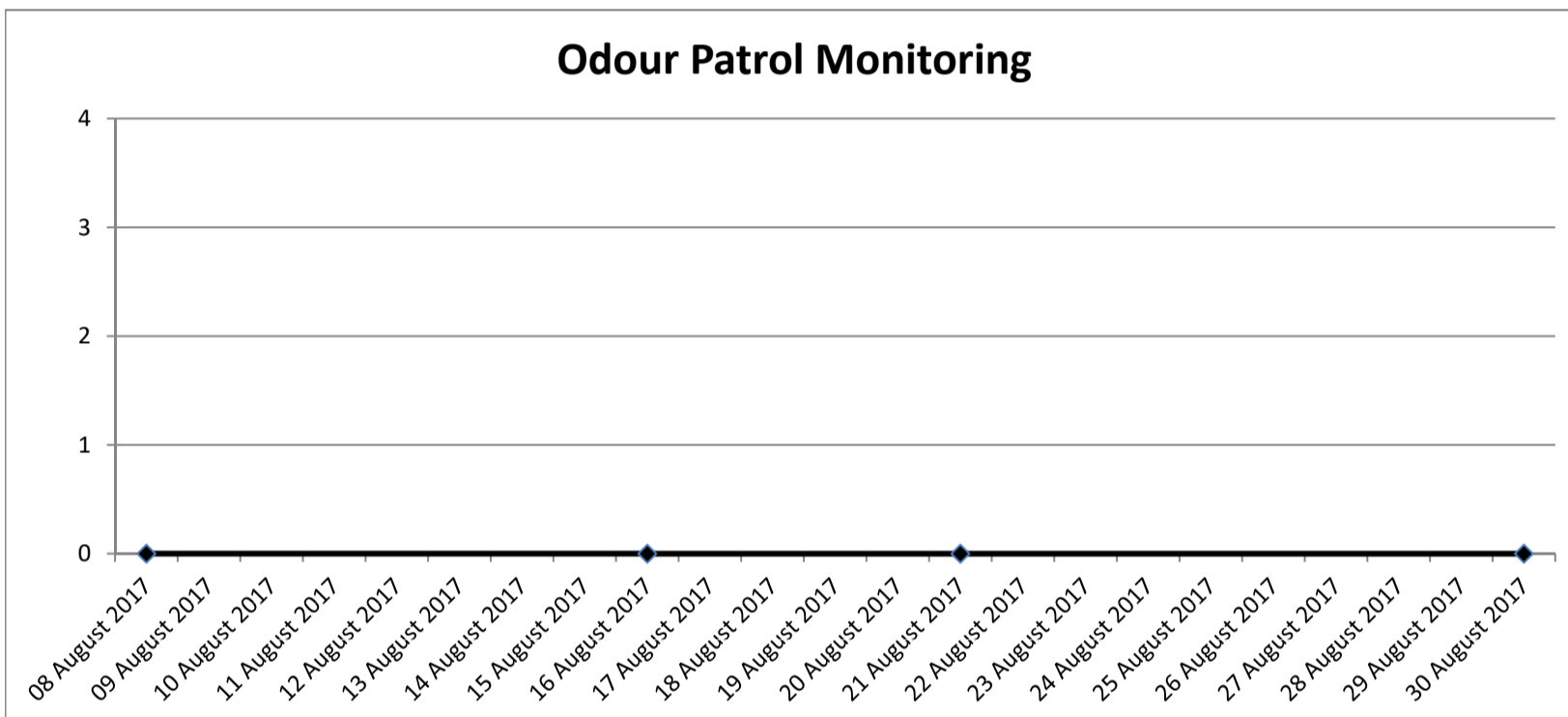
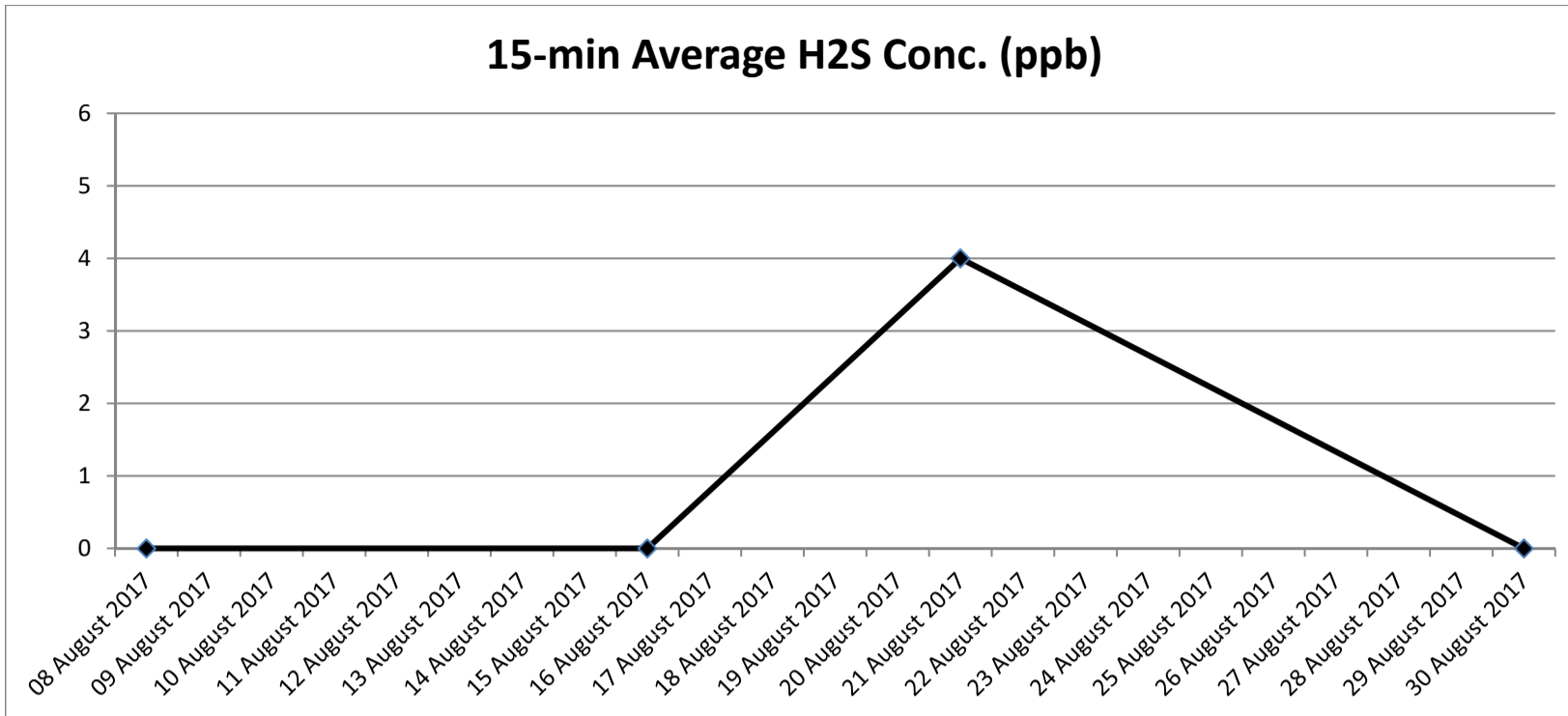
1. *LOR denotes limit of reporting.*
2. The Ambient temperature, relative humidity, wind speed and wind direction were measured and provided by the client.



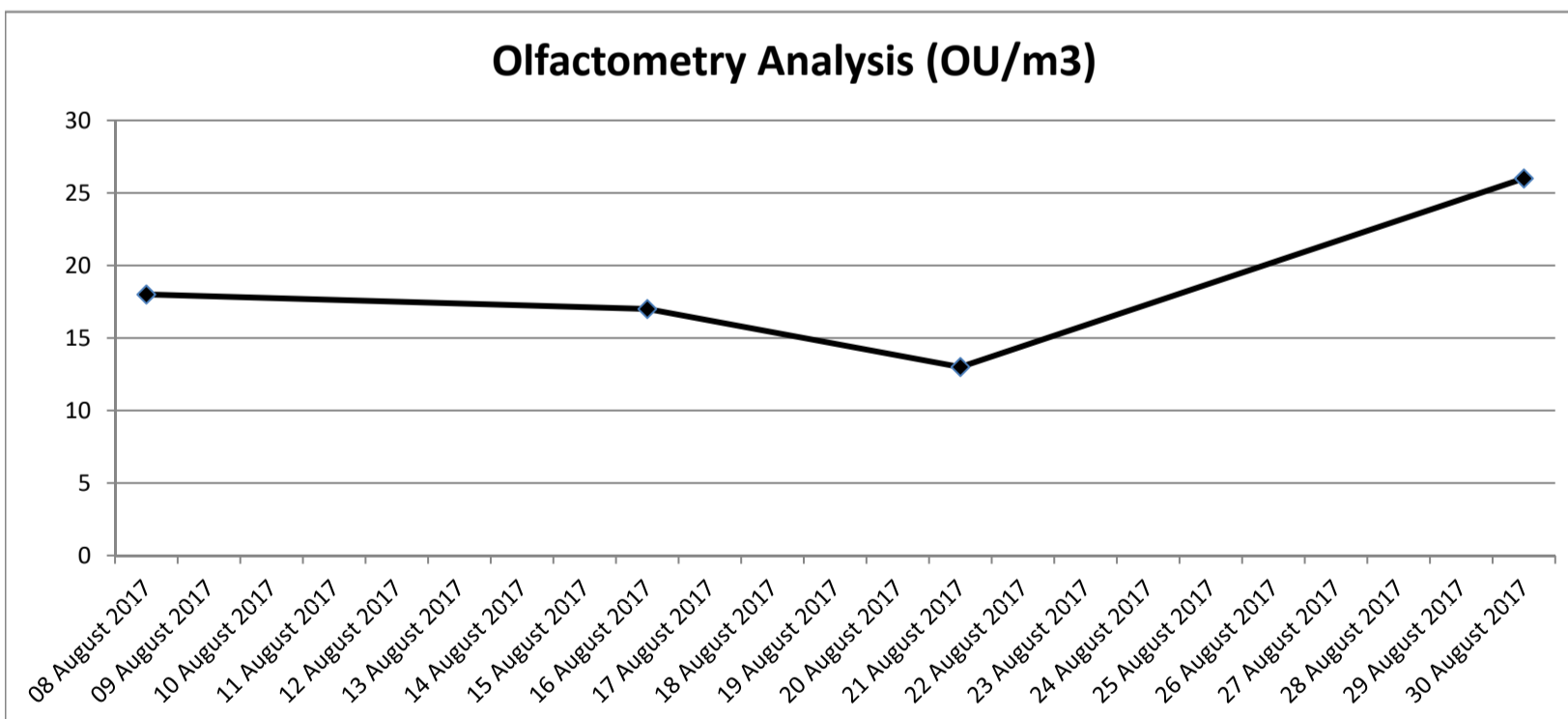
APPENDIX 1

A1.1. Layout of the Sampling Location





Note:
Y-axis refers to the Odour Level: 0 - Not Detected; 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme



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Tuen Mun, N.T.,
Hong Kong.

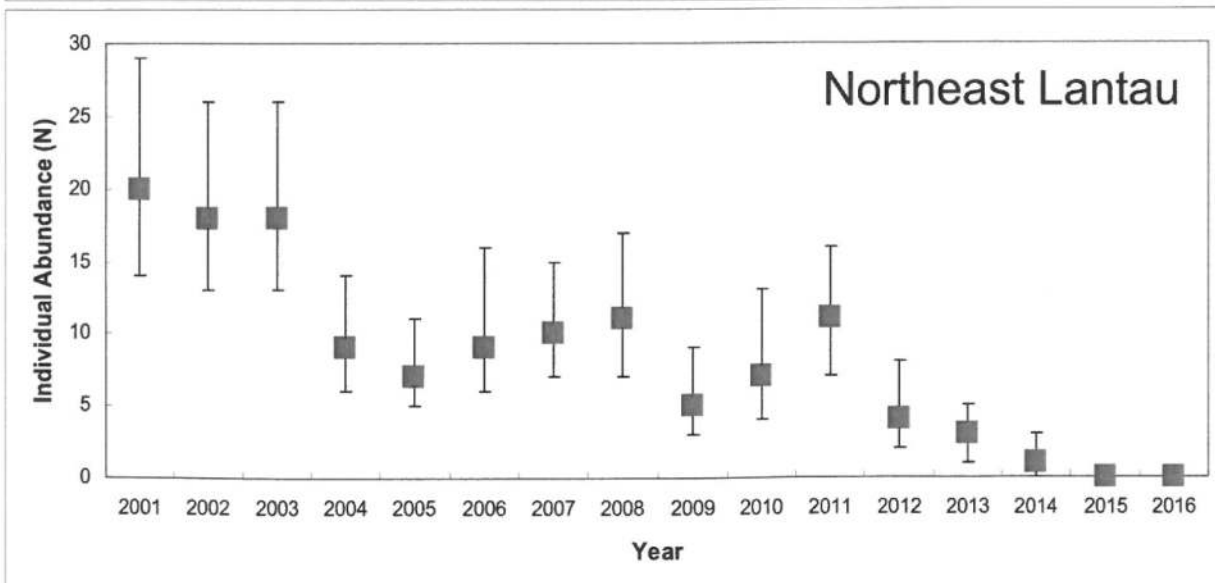
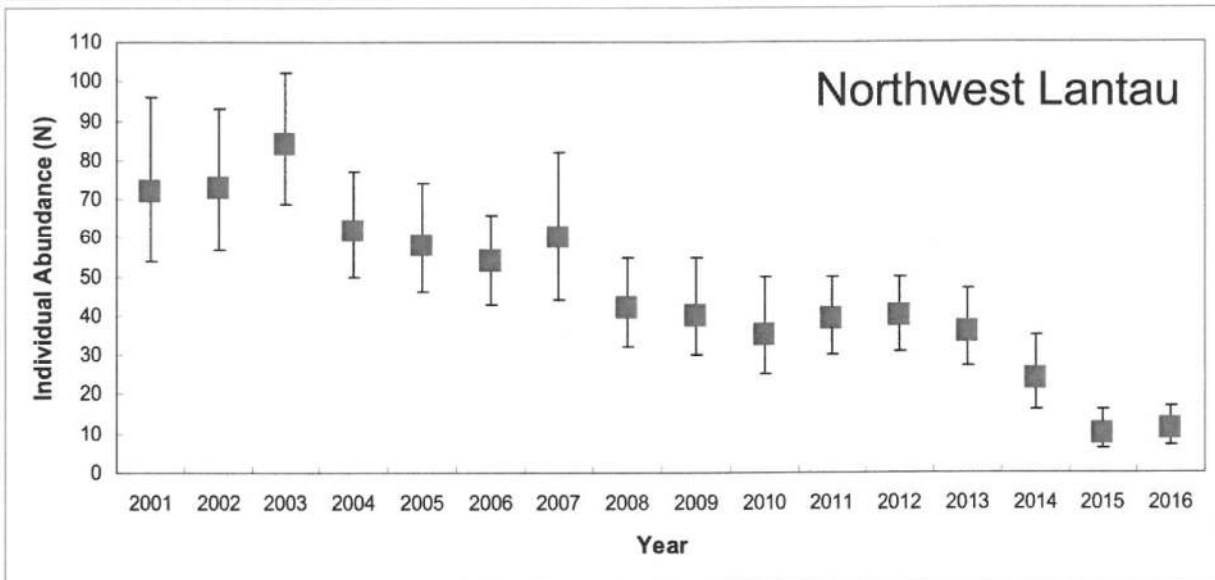
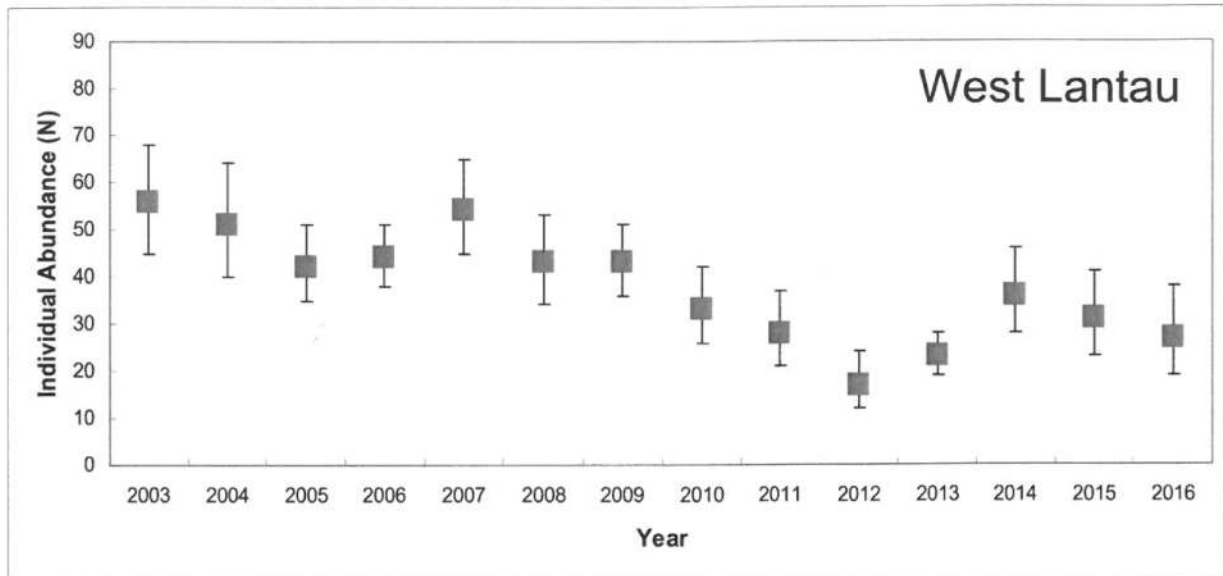
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Website : www.fugro.com



Report No.: 0041/17/ED/0132C

Appendix F

Annual Abundance of Chinese White Dolphins from 2001-2016



Temporal trends in annual abundance estimates of Chinese white dolphins in WL, NWL & NEL from 2001-16 (error bars: 95% confidence interval of abundance estimates)

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Report No.: 0041/17/ED/0132C

Appendix G

Environmental Mitigation Implementation Schedule (EMIS)

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Website : www.fugro.com



Report No.: 0041/17/ED/0132C

EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
Air Quality					
NA	4.5	NA	Odour reduction measures like aeration, chemical dosing system shall be implemented to reduce any odour impacts to an acceptable level.	SHWSTW	Implemented
3.4	4.5	NA	Sewage treatment works including sludge thickening tanks, the sludge pump house and sludge press house shall be completely enclosed.	SHWSTW	Implemented
3.4	4.5	NA	Exhaust air shall be ventilated to an odour scrubber prior to discharge. Ventilating air to a biological treatment unit with 95% odour removal efficiency prior to stack exhaust shall be implemented	SHWSTW	Implemented
Water Quality					
3.3	NA	4.01	To avoid impacts on the marine ecology due to effluent discharge, the disinfection facility as in Part B of the EP shall be equipped with an UV disinfection system capable of removing at least 99.9% of E.coli from the sewage	SHWSTW	Implemented
Waste Management					
3.6	NA	NA	Transportation of sludge shall be carried out in fully enclosed containers, or be placed in sludge skips with tarpaulin covers	SHWSTW	Implemented
NA	NA	5.02	Trip-ticket system mentioned shall be implemented. Trip-ticket is required for each truckload delivered to the landfills facilities according to WBTC No. 31/2004.	SHWSTW	Implemented
NA	NA	5.02	The acceptance criteria for Landfill disposal should be followed, i.e. solid content of sludge waste should be more than 30%.	SHWSTW	Implemented
NA	NA	5.02	The disposal of grit & debris (if any) generated during primary screening works should follow the requirement set in the WMP Section 4.05.	SHWSTW	Implemented
NA	NA	5.03	The wet sludge should be temporarily stored at the sludge buffer tank. It should then be transported to the centrifuge building for dewatering and discharged to the container for disposal. The whole process should be managed by the automatic electronic electronic system and monitored by the operators during operation.	SHWSTW	Implemented
NA	NA	5.04	The other solid waste material such as sediment and grit, refuse containers or collection bags should be temporarily stored in slips at designated area. Operators should ensure sufficient space is identified and provided for temporary storage of waste materials to facilitate collection. Storage of waste material on site will be kept to a minimum to avoid nuisance to local residents.	SHWSTW	Implemented
NA	NA	5.05	Chemical wastes which likely to be generated by activities arise from the maintenance, shall followed the Waste Disposal (Chemical Waste) (General) Regulation, includes Schedule 1 of the Regulation.	SHWSTW	Implemented
NA	NA	5.06	In case of unlikely occurred chemical spillage, procedures should be followed as according to the WMP Section 5.06.	SHWSTW	Implemented
NA	NA	5.07	Temporary storage areas should be identify and provided for the temporary storage of general	SHWSTW	Implemented

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Website : www.fugro.com



Report No.: 0041/17/ED/0132C

EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
			refuse to facilitate collection		
NA	NA	5.07	Domestics wastes refuse generated on-site will be stored in enclosed bins or compaction units separately	SHWSTW	Implemented
NA	NA	5.07	Sufficient dustbins should be provided for domestic waste if required.	SHWSTW	Implemented
NA	NA	5.07	Domestics wastes should be cleared daily and will be disposed off to the nearest licensed landfill or refuse transfer station.	SHWSTW	Implemented
NA	NA	5.07	Spearate labeled bins should be provided to segregate the waste generated by workforce. Waste recycle collector should be employed to collect the segregated waste	SHWSTW	Implemented
NA	NA	5.07	Cardboard and paper packaging (for plant, equipment and materials) should be recovered on site, properly stockpiled in dry condition and covered to prevent cross contamination by other materials.	SHWSTW	Implemented
NA	NA	5.07	Office waste should be minimized through using papers on both sides. Communication by electronic means should be used as far as possible.	SHWSTW	Implemented
NA	NA	5.07	The burning of refuse on-site is prohibited by law and shall not be undertaken	SHWSTW	Implemented
NA	NA	5.07	Toilet wastewater shall be transported to the STW for treatment	SHWSTW	Implemented
NA	NA	5.07	Arrangement for collection of recyclable materials by recycling contractors should be followed as according to the WMP Section 5.07.	SHWSTW	Implemented
NA	NA	5.08	All recycling materials removed by the recycling contractors should be properly recorded before the removal. The natures and quantities of the recycling materials, the date of removal and the name of the recycling contractor should be recorded.	SHWSTW	Implemented
NA	NA	5.09	To maintain the site in a clean and tidy condition during the operation, general measures specified in the WMP should be implemented on site at all times. Regular site inspections shall be undertaken by the management team to ensure the measures are implemented.	SHWSTW	Implemented
NA	NA	5.10	Daily cleaning should be performed daily after work within the plant and the public areas immediately next to the site.	SHWSTW	Implemented
NA	NA	5.11	The work officer in charge of the corresponding area should perform daily inspection on the items mentioned in the WMP Section 5.10. If observations were discovered, the work officer should record the result of the inspection on an inspection checklist with photos taken and submitted to the inspectors or Chief Technical Officer for review on the following day. Any deficiency should be rectified promptly.	SHWSTW	Implemented
NA	NA	5.12	Weekly tidying should be performed weekly within the site.	SHWSTW	Implemented
NA	NA	5.13	The inspector should perform Weekly Inspection on the items mentioned in the WMP Section 5.12. If observations were discovered, the work officer should record the result on an inspection checklist and submitted to the Chief Technical Officer for review on the following day. Any deficiency should be rectified promptly.	SHWSTW	Implemented

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Website : www.fugro.com



Report No.: 0041/17/ED/0132C

EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
NA	NA	5.14	All wastes generated through the operational phase will be managed in accordance with the protocols set out in the WMP Section 5.14.	SHWSTW	Implemented

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