

**Contract No. DC / 2008 / 03**

**Design, Build and Operate**

**Pillar Point Sewage Treatment Works:**

**Sixty-third Monthly EM&A Report**

**(For 1 to 31 January 2016)**

### **Preface**

Contract No. DC/2008/03 of Design, Build and Operate Pillar Point Sewage Treatment Works (the Project) comprises both construction and operation of the sewage treatment plant.

In accordance with EP-321/2008A Item 2.8 and 2.9 and EP-321/2008B Item 2.8 and 2.9, transplanted trees and compensatory trees shall be planted within the site before operation of the Project. Both compensatory trees and transplanted trees were planted onsite by August 2015. With the tree planting physically completed (though its as-built record was reviewed by the Environmental Team (ET) of Construction Phase), the Operation Phase EM&A should proceed without further waiting so that monitoring data for the operation phase could be obtained as soon as possible. Therefore, the Operation Phase EM&A was commenced on 15 August 2015. In consequence, there is an overlapping period for Construction Phase EM&A and Operation Phase EM&A before the formal termination of the Construction Phase EM&A. A self-explanatory letter ref. 60017423/C/o/ylw15092301 dated 23 September 2015 from Independent Environmental Checker (IEC) was submitted via DSD to EPD for perusal and record (a copy is included in the next page).

The 63<sup>rd</sup> EM&A Report for the period of January 2016 comprises two parts prepared by two separate ETs and verified by IEC:

<b>Parts</b>	<b>Environmental Team Leaders</b>	<b>Independent Environmental Checker</b>
Part 1 - Construction Phase EM&A Report for January 2016	Ms. Mandy To of ERM Hong Kong Limited	Mr. Tang Yu Tin of AECOM
Part 2 - Operation Phase EM&A Report for January 2016	Ms. Vivian Chan of SMEC Asia Limited	Mr. Tang Yu Tin of AECOM

The as-built drawing on landscape and visual mitigation measures with explanatory statement was submitted by DSD to EPD on 7 January 2016 for deposit. A letter notifying the completion of construction works and proposing the termination of Construction Phase EM&A programme was sent by DSD to EPD on 28 January 2016. EPD confirmed on 23 February 2016 no objection to the proposed termination of Construction Phase EM&A programme. The Construction Phase EM&A Report for January 2016 will be the last monthly report for Construction Phase EM&A programme.

Your Ref:  
Our Ref: 60017423/C/oylw15092301

**By Hand & By Fax (2833 9162)**

Drainage Services Department  
Sewage Services Branch  
Harbour Area Treatment Scheme Division  
5/F., Western Magistracy,  
2A Pok Fu Lam Road,  
Hong Kong.

Attn: Mr. Edwin Lau (T: 2159 3409)

23 September 2015

Dear Sir,

**Contract No. DC/2008/03**  
**Design, Build and Operate**  
**Pillar Point Sewage Treatment Works**

**Overlapping of Construction Phase EM&A and Operation Phase EM&A**

We elaborate below for your perusal and record the circumstance and reason leading to the overlapping of the construction phase EM&A and the operation phase EM&A, i.e. the latter commenced on 15 August 2015 before the formal termination of the former.

In accordance with Environmental Permit (EP) No. EP-321/2008A Items 2.8 and 2.9 and EP No. EP-321/2008B Items 2.8 & 2.9, transplanted trees and compensatory trees shall be planted within the site before the operation of the Project. Both compensatory trees and transplanted trees were planted onsite by August 2015. Those trees, which were considered dead or not suitable for transplantation as commented by the Contractor's tree arborist, have been replaced in accordance with EP-321/2008B Items 2.8 & 2.9. With the tree planting physically completed (though its as-built record was being reviewed by the Environmental Team), we concurred with the Contractor and his Environmental Team (ET) that the operation phase EM&A should proceed without waiting further so that monitoring data for the operation phase could be obtained as soon as possible. In consequence, the operation phase EM&A commenced on 15 August 2015, before the formal termination of the construction phase EM&A. We sum up the status of the construction phase, as follows:

1. As already reported in the EM&A report for the month of July 2015, all construction works (including those have the potential to result in a significant environmental impact) were practically completed on or before 17 May 2015 and only minor defects corrections works are being undertaken. On this basis, we concurred with the ET that the regular environmental site inspection, dust monitoring and on-site landscape audit could be suspended from July 2015.

2. With all tree planting physically completed in August 2015, the ET is currently reviewing various tree records and tree compensations. After the as-built tree drawings have been certified by the ET and verified by us, the ET will conduct a final landscape visual audit for the construction phase. If the results of the audit is acceptable to both the ET and us, a proposal to terminate the construction phase EM&A will be submitted via DSD to EPD for approval in accordance with Final EM&A Manual Clauses 7.3.1.7 and 7.1.3.8.

We trust that the above circumstance and reason justifies an overlap of the construction phase EM&A and operation phase EM&A. The overlap does not and will not have any adverse impact on either of the construction phase EM&A and operation phase EM&A. We will follow up with the Contractor and the ET to ensure that the overlap would come to an end soon. Further update will be given in upcoming EM&A reports.

Should you have any queries, please feel free to contact the undersigned at 3922 9393.

Yours faithfully,

For and on behalf of  
AECOM Asia Co. Ltd.



Y T Tang  
Independent Environmental Checker

c.c.	DSD/ST1 - Mr. Michael K. F. Yeung	(Fax No. 2827 8619)
	AECOM - Mr. Tim Lee	
	SOR (DC/2008/03) - Mr. C. Y. Hung	(Fax No. 2404 2744)
	ERM - Ms. Winnie Ko	(Fax No. 2723 5660)
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	ATAL-Degremont-China State JV - Mr. Barry Lee	(Fax No. 2811 3321)

Part 1 – Construction Phase EM&A Report for  
January 2016

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ATAL-Degrémont-China State Joint Venture

Contract No. DC/2008/03  
Design, Build and Operate Pillar  
Point Sewage Treatment Works:  
*Sixty-third Monthly EM&A Report*

February 2016

**Environmental Resources Management**

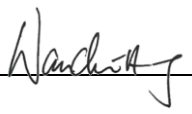

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ATAL-Degrémont-China State Joint Venture

Contract No. DC/2008/03  
Design, Build and Operate Pillar  
Point Sewage Treatment Works:  
*Sixty-third Monthly EM&A Report*

February 2015

Reference 0119806

For and on behalf of ERM-Hong Kong, Limited	
Approved by:	Frank Wan
Signed:	
Position:	Partner
Certified by:	
	(Environmental Team Leader - Mandy To)
Date:	3 February 2015



Your Ref:  
Our Ref: 60017423/C/oylw16021101

**By Hand & By Fax (2833 9162)**

Drainage Services Department  
Sewage Services Branch  
Harbour Area Treatment Scheme Division  
5/F., Western Magistracy,  
2A Pok Fu Lam Road,  
Hong Kong.

Attn: Mr. Edwin Lau (T: 2159 3409)

11 February 2016

Dear Sir,

**Contract No. DC/2008/03  
Design, Build and Operate  
Pillar Point Sewage Treatment Works**

**Monthly EM&A Report for January 2016 (Construction Phase)**

Reference is made to Environmental Team (ET)'s draft of the Monthly EM&A Report for January 2016 provided by email dated 3 and 11 February 2016. We have no further comment.

We hereby verify the said Monthly EM&A Report as having complied with the requirement as set out in the EM&A Manual in accordance with the condition 3.6 of Environmental Permit No. EP-321/2008/B.

Should you have any queries, please feel free to contact the undersigned at 3922 9393.

Yours faithfully,

For and on behalf of  
AECOM Asia Co. Ltd.



Y T Tang  
Independent Environmental Checker

c.c. AECOM – Mr. C Y Hung  
ERM – Ms. Mandy To  
ATAL–Degremont–China State JV – Mr. Barry Lee

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## EXECUTIVE SUMMARY

The construction works of *DC/2008/03 of Design, Build and Operate Pillar Point Sewage Treatment Works (the Project)* commenced on 13 November 2010. This is the 63<sup>rd</sup> monthly Environmental Monitoring and Audit (EM&A) report presenting the EM&A works carried out during the period from 1 to 31 January 2016 in accordance with the EM&A Manual. The operation of the Project commenced on 15 August 2015. In the meantime, the establishment period had started on 15 August 2015.

Major construction works and minor defects were completed in June 2015 and November 2015, respectively. A letter notifying the completion of main works and proposing the suspension of the environmental site inspection and dust monitoring was sent to IEC on 3 July 2015. A supplemental letter proposing the suspension of monthly onsite landscape audit was sent to IEC on 18 July 2015. A letter stating no objection on the proposed suspension from the IEC was sent to DSD on 31 July 2015. The as-built drawing on landscape and visual mitigation measures with explanatory statement was submitted to EPD on 7 January 2016 for deposit after DSD's approval. A letter notifying the completion of construction works and proposing the termination of construction phase EM&A programme was sent to EPD on 28 January 2016 and was pending for EPD's approval.

Air quality monitoring, weekly environmental site audits and landscape and visual monitoring for construction phase were not conducted in January 2016.

### Waste Management

Waste generated from this Project includes inert construction and demolition (C&D) materials (public fill) and non-inert C&D materials (construction wastes). No inert C&D material was generated from the Project. No metals, papers/ cardboard packing and plastics were sent to recyclers for recycling during the reporting period.

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

No exceedance was recorded during the reporting period.

No non-compliance event was recorded during the reporting period.

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

### Future Key Issues

The ET will prepare a Final EM&A report to summarise the findings of the construction EM&A programme for EPD's approval.

# 1 INTRODUCTION

ERM-Hong Kong, Limited (ERM) was appointed by ATAL - Degrémont - China State Joint Venture (ADC-JV) (the Contractor) as the Environmental Team (ET) to undertake the Environmental Monitoring and Audit (EM&A) programme for the *Contract No. DC/2008/03 of Design, Build and Operate Pillar Point Sewage Treatment Works (the Project)*.

## 1.1 PURPOSE OF THE REPORT

This is the 63rd EM&A report which summarises the monitoring results and audit findings for the EM&A programme during the reporting period from 1 to 31 January 2016.

## 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 organization, construction programme, construction works undertaken and status of the Environmental Permits (EP)/licences over the construction phase of the Project.

### Section 3: **Environmental Monitoring Requirements**

It summarises the environmental monitoring requirements including monitoring parameters, programmes, methodologies, frequency, locations, Action and Limit Levels, Event/ Action Plans, environmental mitigation measures as recommended in the approved EIA report, EP and relevant environmental requirements stated in the Contract Specification.

### Section 4: **Implementation Status on Environmental Mitigation Measures**

It summarises the implementation of environmental protection measures during the reporting period.

### Section 5: **Monitoring Results**

It summarises the monitoring results obtained in the reporting period.

### Section 6: **Waste Management**

It summarises the quantity of public fill and construction waste generated in the reporting period

Section 7: **Environmental Site Inspection**

It summarises the audit findings of the weekly site inspections undertaken within the reporting period.

Section 8: **Environmental Non-conformance**

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

Section 9: **Further Key Issues**

It summarises the impact forecast and monitoring schedule for the next reporting month.

Section 10: **Review of the EM&A Data and Predictions**

It compares the monitoring data and waste quantity against the predictions in the approved Project EIA report.

Section 11: **Conclusions**

## 2.1

## BACKGROUND

The existing Pillar Point Sewage Treatment Works (PPSTW) is located to the north of the Tuen Mun River Trade Terminal and is abutting the Lung Mun Road in the north. It is a preliminary treatment works with screening and grit removal processes and the treated effluent is discharged to the sea (North Western Water Control Zone) via a twin submarine outfall. The *Review of the Tuen Mun and Tsing Yi Sewerage Master Plan (RTMTYSMP)*, commissioned in February 1999, recommended that the sewage treatment capacity be expanded and the plant be upgraded to chemically enhanced primary treatment (CEPT) with disinfection. This is to cater for the projected ultimate population and planned developments in the Tuen Mun area, and to improve the effluent quality reducing pollution loadings to the receiving waters.

The upgrading of the PPSTW comprises the following works:

- expanding the treatment capacity of the existing PPSTW to cope with the increased peak wet-weather sewage flow in Tuen Mun area;
- upgrading the sewage treatment level of the existing PPSTW to incorporate chemical treatment with disinfection at minimum removal rates of 70%, 55% and 99.9% of suspended solids (SS), biochemical oxygen demand (BOD) and *E.coli*, respectively;
- upgrading the existing septic waste reception facilities at PPSTW; and
- providing and upgrading ancillary facilities including the administration building, workshop, laboratory, odour control facilities, sludge handling and dewatering facilities, access roads and minor landscaping works within the STW for the operation and maintenance of the upgraded STW.

The potential environmental impacts of the Project have been studied in the “*Upgrading of Pillar Point Sewage Treatment Works*” (EIAO Register No: AEIAR-145/2008). The EIA was approved on 10 June 2008 under the *Environmental Impact Assessment Ordinance* (EIAO) and an Environmental Permit (EP-321/2008) for the works was granted on 17 November 2008. A variation of an Environmental Permit was granted on 30 May 2014 (EP-321/2008/B). Under the requirements of Condition 3.1 of EP-321/2008/B, an EM&A programme as set out in the EM&A Manual is required to be implemented.

The construction works commenced on 13 November 2010. Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. The operation of the Project commenced on 15 August 2015.

## 2.2 GENERAL SITE DESCRIPTION

The open area adjacent to the existing PPSTW has been designated for the upgrading works. The layout of the upgrading works is illustrated in *Annex A*.

## 2.3 CONSTRUCTION ACTIVITIES

Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. A letter notifying the completion of main works and proposing the suspension of the environmental site inspection and dust monitoring was sent to IEC on 3 July 2015. A supplemental letter proposing the suspension of monthly onsite landscape audit was sent to IEC on 18 July 2015. A letter stating no objection on the proposed suspension from the IEC was sent to DSD on 31 July 2015. A letter notifying the completion of construction works and proposing the termination of construction phase EM&A programme was sent to EPD on 28 January 2016 and was pending for EPD's approval.

The locations of the construction activities are shown in *Annex B*. The construction programme of the Project is presented in *Annex L*.

## 2.4 PROJECT ORGANISATION AND MANAGEMENT STRUCTURE

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

## 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 2.1*.

**Table 2.1** *Summary of Environmental Licensing, Notification and Permit Status*

Permit/Licences/Notification	Reference	Validity Period	Remarks
Environmental Permit	EP-321/2008/B	Throughout the Contract	Permit granted on 30 May 2014
Notification of Construction Works under the Air Pollution Control (Construction Dust) Regulation	Ref No. 308136	Throughout the Contract	-
Water Discharge License	WT00019356-2014	10 July 2014 - 31 July 2016	Wastewater discharge licence was issued by EPD on 10 July 2014.
Chemical Waste Producer Registration	5213-421-A2620-01	Throughout the Contract	Licence approved on 28 October 2010



Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. A letter notifying the completion of main works and proposing the suspension of the environmental site inspection and dust monitoring was sent to IEC on 3 July 2015. A supplemental letter proposing the suspension of monthly onsite landscape audit was sent to IEC on 18 July 2015. A letter stating no objection on the proposed suspension from the IEC was sent to DSD on 31 July 2015. Final landscape and visual audit was carried out on 13 November 2015. A letter notifying the completion of construction works and proposing the termination of construction phase EM&A programme was sent to EPD on 28 January 2016 and was pending for EPD's approval.

Air quality monitoring and weekly environmental site audits for construction phase were not conducted in January 2016.

***IMPLEMENTATION STATUS ON ENVIRONMENTAL PROTECTION REQUIREMENTS***

The Contractor has implemented environmental mitigation measures and requirements as stated in the approved EIA Report, EM&A Manual and EP. The implementation status of the measures during the reporting period is summarised in *Annex I*.

Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. As mentioned in *Section 3*, no air quality monitoring was carried out in January 2016.

Wastes generated from this Project include inert construction and demolition (C&D) materials (public fill) and non-inert C&D materials (construction waste). Construction waste comprises general refuse, metals and paper/cardboard packaging materials. Metals generated from the Project are also grouped into construction waste as the materials were not disposed of with others at public fill. Reference has been made to the Monthly Summary Waste Flow Table prepared by the Contractor (see *Annex J*). With reference to the relevant handling records and trip tickets of this Project, the quantities of different types of waste generated in the reporting month are summarised in *Table 6.1*.

**Table 6.1** *Quantities of Waste Generated from the Project*

Month/Year	Quantity			
	Total Inert C&D Materials Generated <sup>(a)</sup>	Non-inert C&D Materials <sup>(b)</sup>		
		C&D Materials Recycled <sup>(c)</sup>	C&D Waste Disposed of at Landfill <sup>(d)</sup>	Chemical Waste
January 2016	0.00 tonnes	0.00 kg	0.00 tonnes	0 L

**Notes:**

- (a) Inert C&D materials (public fill) include bricks, concrete, building debris, rubble and excavated spoil. In total, 0.00 tonnes of inert C&D waste were generated from the Project, of which 0.00 tonnes were reused in this Contract and the remaining 0.00 tonnes were disposed as public fill. The detailed waste flow is presented in *Annex J*.
- (b) Non-inert C&D materials (construction wastes) include metals, paper / cardboard packaging waste, plastics and other wastes such as general refuse. Metals generated from the Project were grouped into construction wastes as the materials were not disposed of with others at the public fill.
- (c) 0.00 kg of metals, papers/ cardboard packing and plastics were sent to recyclers for recycling during the reporting period.
- (d) Construction wastes other than metals, paper/cardboard packaging, plastics and chemicals were disposed of at WENT Landfill by subcontractors.

## 7 ENVIRONMENTAL INSPECTIONS

### 7.1 WEEKLY SITE AUDITS

Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. As mentioned in *Section 3*, no weekly site audits were carried out in January 2016.

### 7.2 LANDSCAPE AND VISUAL MONITORING

Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. All transplanted and compensatory trees were planted onsite as per Condition 2.9 of the Environmental Permit (EP-321/2008/B). Final landscape and visual audit was carried out and the as-built drawing on landscape and visual mitigation measures with explanatory statement was submitted to EPD for deposit after DSD's approval.

## 8 ENVIRONMENTAL NON-CONFORMANCE

### 8.1.1 *Summary of Monitoring Exceedance*

As mentioned in Section 3, no air quality monitoring was carried out in January 2016.

### 8.1.2 *Summary of Environmental Non-Compliance*

No non-compliance event was recorded during the reporting period.

### 8.1.3 *Summary of Environmental Complaint*

No complaint was received during the reporting period. The cumulative environmental complaint log is shown in *Annex K*.

### 8.1.4 *Summary of Environmental Summon and Successful Prosecution*

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

## 9 *FUTURE KEY ISSUES*

### 9.1 *KEY ISSUES FOR THE COMING MONTH*

Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. A letter notifying the completion of main works and proposing the suspension of the environmental site inspection and dust monitoring was sent to IEC on 3 July 2015. A supplemental letter proposing the suspension of monthly onsite landscape audit was sent to IEC on 18 July 2015. A letter stating no objection on the proposed suspension from the IEC was sent to DSD on 31 July 2015.

A letter notifying the completion of construction works and proposing the termination of construction phase EM&A programme was sent to EPD on 28 January 2016 and was pending for EPD's approval. The ET will prepare a Final EM&A report to summarise the findings of the construction EM&A programme for EPD's approval.

### 9.2 *MONITORING SCHEDULE FOR THE NEXT REPORTING PERIOD*

No TSP monitoring was scheduled as the suspension of the environmental site inspection and dust monitoring has been proposed for IEC agreement following completion of main construction works for the Project on 3 July 2015.

### 10.1 AIR QUALITY

Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. As mentioned in *Section 3*, no air quality monitoring was carried out in January 2016.

### 10.2 WASTE MANAGEMENT

The estimated amount of waste generated from the Project and the cumulative quantities of waste generated up to this reporting month are presented in *Table 10.1*. The amount of inert C&D material sent to public fills is higher than the estimated amount in the EIA. With reference to the C&D Material Assessment (Contractor's General Submission (CSF) No.: DC200803/CSF/SAF/060026/A), the difference in quantities is mainly due to the differences in excavation depths and the excavation methods in the Contract Works and that assumed in the Reference Design. During the variation of an Environmental Permit (VEP-398/2013), the quantity of C&D Material was re-estimated and the estimate amount was revised. Recommended mitigation measures in *Sections 7.5.1.1 to 7.5.1.9* of the EIA will continue to be implemented during the construction stage.

**Table 10.1** *Amount of C&D Materials, General Wastes and Chemical Wastes Actually Generated and Estimated in the EIA and C&D Material Assessment*

Type of Material	Estimated Amount of Public Fill and Construction Waste in the EIA (inert & non-inert)	Estimated Amount of Public Fill and Construction Waste in C&D Material Assessment (CSF No.: DC200803/CSF/SAF/060026/A) (c)	Estimated Amount of Public Fill and Construction Waste in the C&D Material Assessment (VEP-398/2013)(d)	Accumulated Actual Amount of Public Fill and Construction Waste Recorded (a) (b) (inert & non-inert)
Amount of C&D Materials Arising	61,489.00 m <sup>3</sup>	77,600.00 m <sup>3</sup>	116,400.00 m <sup>3</sup>	136,327.61 m <sup>3</sup>
Amount of C&D Materials Reused on other site	-	-	-	3,163.89 m <sup>3</sup>
Amount of C&D Materials Reused on site	14,926.00 m <sup>3</sup>	18,000.00 m <sup>3</sup>	20,150.00 m <sup>3</sup>	24,358.89 m <sup>3</sup>



Type of Material	Estimated Amount of Public Fill and Construction Waste in the EIA (inert & non-inert)	Estimated Amount of Public Fill and Construction Waste in C&D Material Assessment (CSF No.: DC200803/CSF/SAF/060026/A) <sup>(c)</sup>	Estimated Amount of Public Fill and Construction Waste in the C&D Material Assessment (VEP-398/2013) <sup>(d)</sup>	Accumulated Actual Amount of Public Fill and Construction Waste Recorded <sup>(a) (b)</sup> (inert & non-inert)
Amount of C&D Materials Sent to Fill Banks	46,563.00 m <sup>3</sup>	59,600.00 m <sup>3</sup>	96,250 m <sup>3</sup>	108,804.86 m <sup>3</sup>
General Refuse	Small	-	-	2,308.21 tonnes
Chemical Waste	Small	-	-	810.00 L
<b>Notes:</b>				
(a) The actual amount of C&D Materials has been recorded since the commencement of construction works.				
(b) The density of soil and rock (bulked) is 1.8 tonnes/m <sup>3</sup> .				
(c) The estimated amount of C&D material generated from the Contract Works was revised in the C&D Material Assessment and submitted to the SO on 9 September 2010 (CSF No.: DC200803/CSF/SAF/060026/A) because of the new plant & facility layout.				
(d) The estimated amount of C&D material generated from the Contract Works was revised in the C&D Material Assessment (VEP-398/2013) on 22 March 2013.				

### 10.3

#### CONCLUSION OF THE REVIEW

The EIA predictions and monitoring results since the commencement of the construction works have been reviewed. The EIA concluded that the Project would not cause adverse impacts to the environment, and monitoring results have also confirmed that so far. Mitigation measures recommended in the EP, EIA and EM&A Manual will continue to be implemented throughout the construction phase of the Project.

This EM&A Report presents the EM&A programme undertaken during the reporting period from 1 to 31 January 2016 in accordance with EM&A Manual and requirements of EP (EP-321/2008/B).

Major construction works and minor defects had been completed in June 2015 and November 2015, respectively. A letter notifying the completion of main works and proposing the suspension of the environmental site inspection and dust monitoring was sent to IEC on 3 July 2015. A supplemental letter proposing the suspension of monthly onsite landscape audit was sent to IEC on 18 July 2015. A letter stating no objection on the proposed suspension from the IEC was sent to DSD on 31 July 2015. The as-built drawing on landscape and visual mitigation measures with explanatory statement was submitted to EPD on 7 January 2016 for deposit after DSD's approval.

No air quality monitoring was carried out in January 2016. As such, no monitoring exceedance was recorded.

No non-compliance event was recorded during the reporting period.

No complaint and summons/prosecution was received during the reporting period.

A letter notifying the completion of construction works and proposing the termination of EM&A programme was sent to EPD on 28 January 2016 and was pending for EPD's approval. The ET will prepare a Final EM&A report to summarise the findings of the construction EM&A programme for EPD's approval.

Annex A

## Location of Project

**PROPOSED FACILITIES AND BUILDINGS**

**SECTION 1 INLET PUMPING STATION AND PRELIMINARY TREATMENT WORKS**

- 1 INLET CHAMBER
- 2 COARSE SCREENS AND INLET PUMPING STATION
- 3 FINE SCREEN CHANNELS
- 4 GRIT CHAMBERS
- 5 INLET FLOWMETER CHAMBER
- 6 PTW MCC ROOM

- 7 BLOWER ROOM
- 8 SCREENING SKIP HOUSE
- 9 ODOR DUCT SUPPORTING BRIDGE
- 10 SEPTIC WASTE RECEPTION STATION
- 11 WEIGHBRIDGE
- 12 ELECTRICAL BUILDING 1

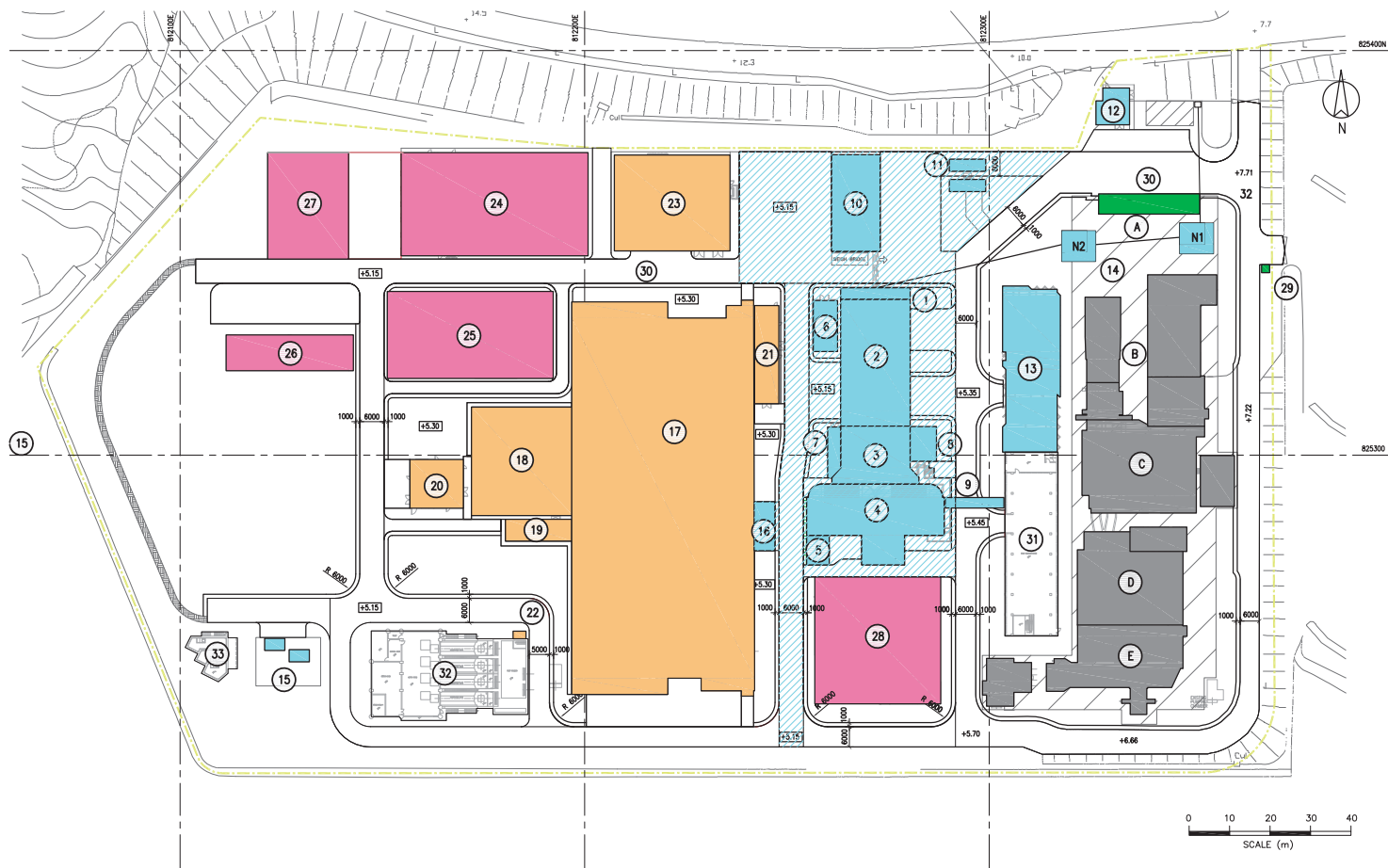
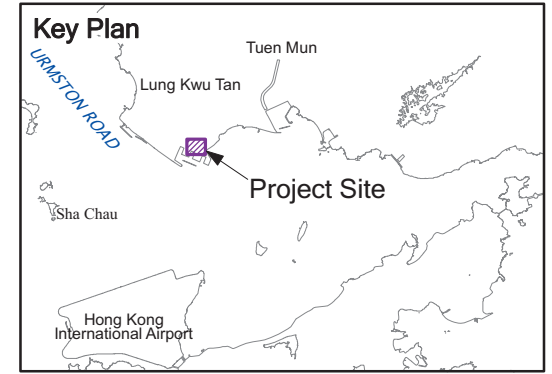
- 13 ADMINISTRATION BUILDING
- 14 INLET CHAMBERS
- 15 PAYMENT FLOWMETER CHAMBER
- 16 CEPT INLET CHAMBER

**SECTION 2 CEPT TANKS UV DISINFECTION**

- 17 CEPT TANKS
- 18 UV DISINFECTION CHANNELS
- 19 REUSE WATER PUMP ROOM
- 20 ELECTRICAL BUILDING 3
- 21 ELECTRICAL BUILDING 2
- 22 OUTFALL PUMPING STATION CONNECTION CHAMBER
- 23 CHEMICAL BUILDING

**SECTION 3 SLUDGE TREATMENT & HANDLING AND ODOUR CONTROL**

- 24 SLUDGE DEMATERING BUILDING
- 25 DEODORISATION UNITS (B)
- 26 SLUDGE SKIP STORAGE BUILDING
- 27 SLUDGE SKIP LOADING AREA
- 28 DEODORISATION UNITS (A)



**SECTION 4 EXISTING BUILDINGS TO BE DEMOLISHED**

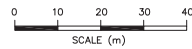
- A ADMINISTRATION BUILDING
- B INLET SCREW PUMPING STATION AND MOTOR HOUSE
- C COARSE SCREENS
- D BLOWER HOUSE AND GRIT CHANNELS
- E FINE SCREEN CHANNELS AND FLOWMETER CHAMBER

**SECTION 5 EXTERNAL WORKS**

- 29 GATE HOUSE
- 30 CAR PARK

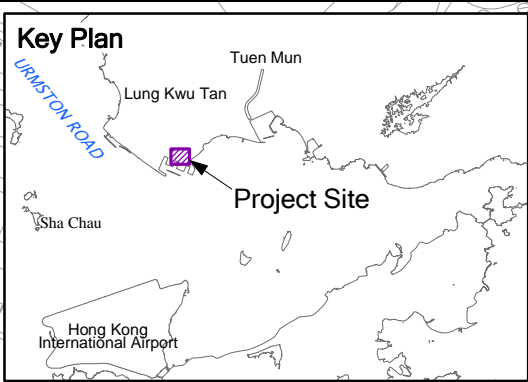
**EXISTING BUILDING TO BE RETAINED**

- 31 EXISTING SOLID HANDLING BUILDING
- 32 EXISTING OUTFALL PUMPING STATION
- 33 EXISTING TERMINAL MANHOLE

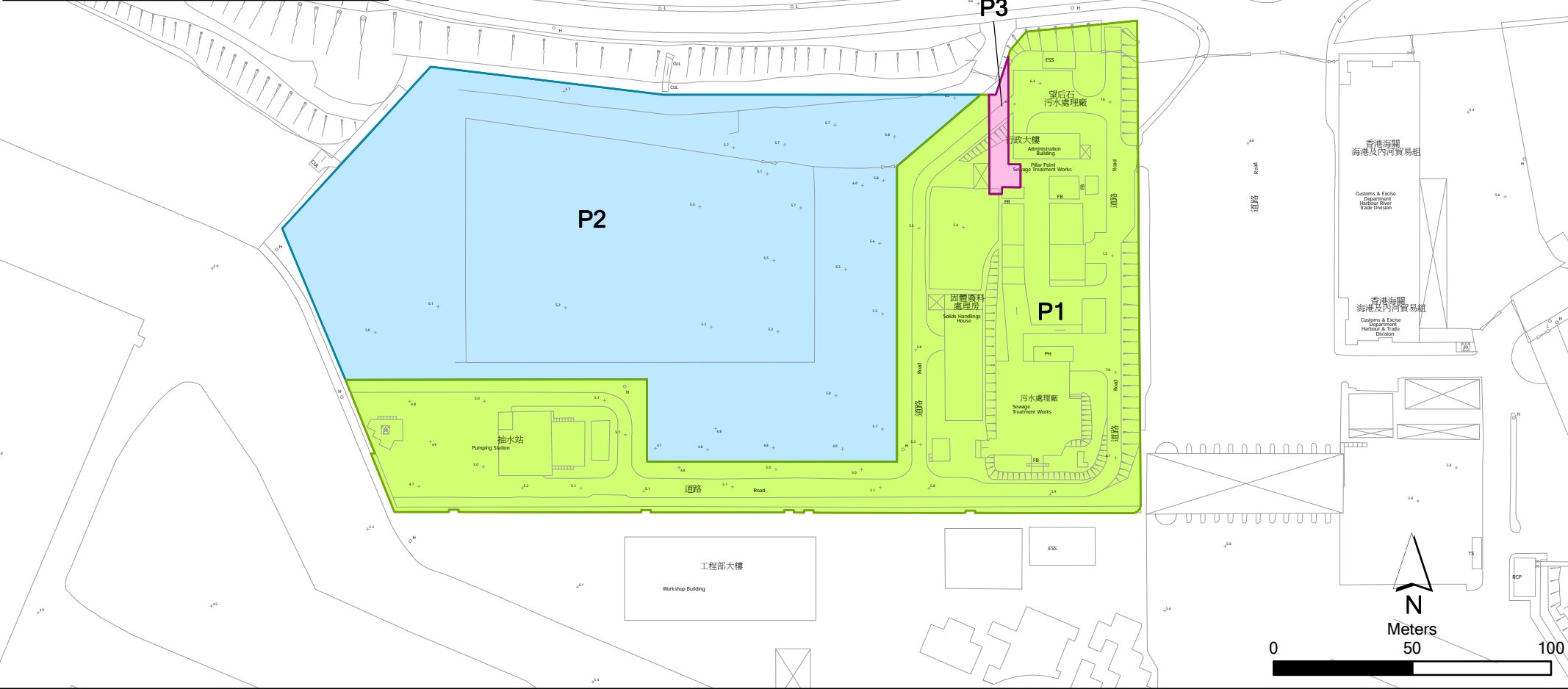


Annex B

## Works Location



**P1 & P3 - Works Areas within Existing PPSTW Facilities**  
**P2 - Open Area for Construction of New Facilities at PPSTW**



Annex B

Location of Works Areas

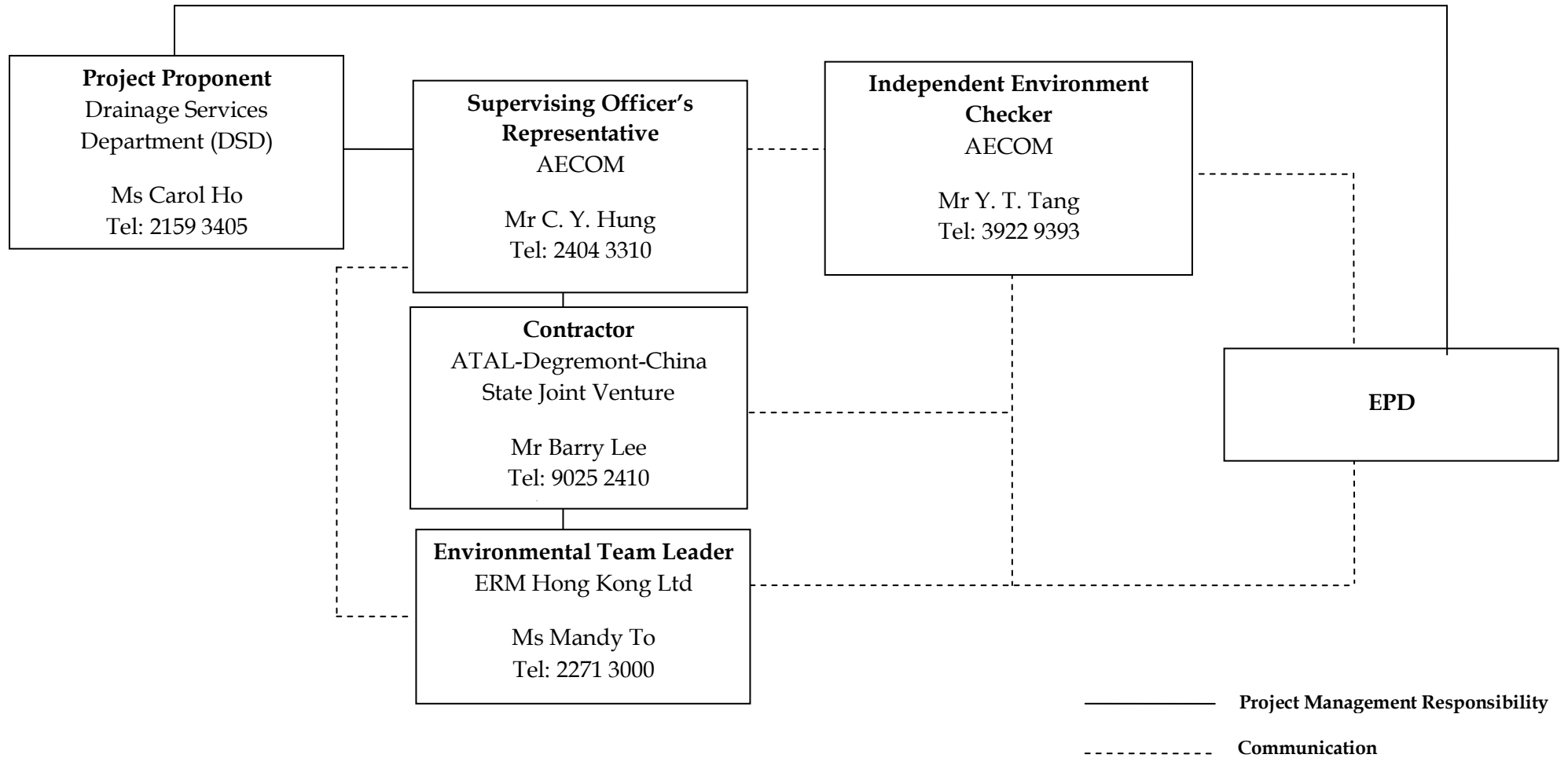
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Date: 15/12/2010



Annex C

## Project Organisation Chart with Contact Details

Project Organisation During Construction Phase (with contact details)





Annex D

(not used)

Annex E

(not used)

Annex F

(not used)

Annex G

(not used)

Annex H

(not used)

Annex I

## Implementation Schedule of Mitigation Measures

**Annex I**      **Summary of Mitigation Measures Implementation Schedule**

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
<i>Summary of Environmental Mitigation Measures in the EIA and EM&amp;A Manual</i>			
<i>Construction Phase</i>			
Air Quality	Dust mitigation measures stipulated in <i>the Air Pollution Control (Construction Dust) Regulation</i> shall be incorporated to control Post emission. Notice shall be given to authority prior to commencing of work.	Work sites / during construction period	√ Notice of works commencement was submitted to EPD on 3 August 2010.
Water Quality	The practices outlined in ProPECC PN 1/94 Construction Site Drainage should be adopted. It is recommended to install perimeter channels in the works areas to intercept runoff as site boundary prior to the commencement of any earthwork. To prevent storm runoff from washing across exposed soil surfaces, intercepting channels should be provided. Drainage channels are also required to convey site runoff to sand/silt traps and oil interceptors. Provision of regular cleaning and maintenance can ensure the normal operation of these facilities throughout the construction period. Any practical options for the diversion and re-alignment of drainage should comply with both engineering and environmental requirements in order to ensure adequate hydraulic capacity of all drains.	Work site/During the construction period	√
Water Quality	There is a need to apply to EPD for a discharge license under the WPCO for discharging effluent from the construction site. The discharge quality is required to meet the requirements specified in the discharge license. All the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. Reuse and recycling of the treated effluent can minimize water consumption and reduce the effluent discharge volume. The beneficial uses of the treated effluent may include dust suppression, wheel washing and general cleaning. If monitoring of the treated effluent quality from the works areas is required during the construction phase of the Project, the monitoring should be carried out in accordance with the WPCO license which is under the ambit of regional office (RO) of EPD.	Work site/During the construction period	√ Discharge licence was awarded by EPD on 7 December 2010.
Water Quality	The construction programme should be properly planned to minimise soil excavation, if any, in rainy seasons. This prevents soil erosion from exposed soil surfaces. Any exposed soil surfaces should also be properly	Work site/During the construction period	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	protected to minimize dust emission. In areas where a large amount of exposed soil exists, earth bunds or sand bags should be provided. Exposed stockpiles should be covered with tarpaulin or impervious sheets at all times. The stockpiles of materials should be placed at locations away from any stream course so as to avoid releasing materials into the water bodies. Final surfaces of earthworks should be compacted and protected by permanent work. It is suggested that haul roads should be paved with concrete and the temporary access roads protected using crushed stone or gravel, wherever practicable. Wheel washing facilities should be provided at all site exists to ensure that earth, mud and debris would not be carried out of the works areas by vehicles.		
Water Quality	Good sites practices should be adopted to clean the rubbish and litter on the construction sites so as to prevent the rubbish and litter from spreading from the site area. It is recommended to clean the construction sites on a regular basis.	Work site/During the construction period	√
Water Quality	The presence of construction workers generates sewage. It is recommended to provide sufficient chemical toilets in the works areas. The toilet facilities should be more than 30m from any watercourse. A licensed water collector should be deployed to clean the chemical toilets on a regular basis. The construction workers can also make use of the existing toilet facilities within the PPSTW as necessary.	Work site/During the construction period	√
Water Quality	Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the project. Regular environmental audit on the construction phase of the project. Regular environmental audit on the construction site can provide an effective control of any malpractices and can achieve continual improvement of environmental performance on site.	Work site/During the construction period	√
Waste Management	Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.	Work site/During the construction period	√



Type of Impact	Environmental Protection Measures	Location/ Timing	Status
Waste Management	Any service shop and maintenance facilities should be located on hard standings within a bunded area, and stumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.	Work site/During the construction period	√
Waste Management	<p>Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with the chemical wastes. General requirements are given as follows:</p> <ul style="list-style-type: none"> <li>• Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport.</li> <li>• Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents.</li> <li>• Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area.</li> </ul>	Work site/During the construction period	√
Waste Management	<p><i>Good Site Practices</i> Recommendations for good site practices during the construction activities include:</p> <ul style="list-style-type: none"> <li>• Nomination of an approved person, such as a site manager, to be responsible for good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site</li> <li>• Training of site personnel in proper waste management and chemical handling procedures</li> <li>• Provision of sufficient waste disposal points and regular collection of waste</li> <li>• Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers</li> <li>• Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.</li> </ul>	Work site/During the construction period	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	<ul style="list-style-type: none"> <li>Separation of chemical wastes for special handling and appropriate treatment at the Chemical Waste Treatment Facility.</li> </ul>		
Waste Management	<p><i>Waste Reduction Measures</i></p> <p>Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:</p> <ul style="list-style-type: none"> <li>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.</li> <li>Encourage collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force</li> <li>Proper storage and site practices to minimise the potential for damage or contamination of construction materials.</li> <li>Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.</li> </ul>	Work site/ During planning & design stage, and construction stage	√
Waste Management	<p><i>General Refuse</i></p> <p>General refuse should be stored in enclosed bins or compaction units separate from C&amp;D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&amp;D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.</p>	Work site / During the construction period	√
Waste Management	<p><i>Construction and Demolition Material</i></p> <p>In order to minimise the impact resulting from collection and transportation of C&amp;D material for off-site disposal, the excavated material generated from site formation works for the proposed new facilities and units at the STW should be reused on-site as far as practicable. The surplus excavated material should be disposed of at the</p>	Work site / During design stage & construction period	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	designated public fill reception facility, as agreed with the Secretary of the Public Fill Committee, for other beneficial uses.		
Waste Management	<p>Mitigation measures and good site practices should be followed to control potential environmental impact from handling and transportation of C&amp;D material. The mitigation measures include:</p> <ul style="list-style-type: none"> <li>• Where it is unavoidable to have transient stockpiles of C&amp;D material pending collection for disposal, the transient stockpiles shall be located away from waterfront or storm drains as far as possible.</li> <li>• Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric.</li> <li>• Skip hoist for material transport should be totally enclosed by impervious sheeting.</li> <li>• Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving a construction site</li> <li>• The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores.</li> <li>• The load of dusty materials carried by vehicle leaving a construction site should be covered entirely by clean impervious sheeting to ensure dust materials do not leak from the vehicle.</li> <li>• All dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet.</li> <li>• The height from which excavated materials are dropped should be controlled to a minimum practical height to limit fugitive dust generation from unloading.</li> </ul>	Work site / During design stage & construction period	√
Waste Management	When disposing C&D material at a public filling facility, it shall be noted that the material shall only consist of earth, building debris and broken rock and concrete. The material shall be free from marine mud, household refuse, plastic, metals, industrial and chemical waste, animal and vegetable matter, and other material considered to be unsuitable by the Filling Supervisor. In order to monitor the disposal of the surplus C&D material at the designed public fill reception facility and to control fly tipping, a trip-ticket system should be included as one of the	Work site/ During design stage & construction period	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	contractual requirements and implemented by an Environmental Team undertaking the Environmental Monitoring and Audit work with reference to the ETWB TCW No. 31/2004 "Trip Ticket System for Disposal of Construction and Demolition Materials" as attached in Appendix 7-1. An Independent Environmental Checker should be responsible for auditing the results of the system.		
Waste Management	<p><i>Chemical Waste</i></p> <p>If chemical wastes are produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosive, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes, to either the Chemical Waste Treatment Centre, or another licensed facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.</p>	Work site / During the construction period	√
Landscape & Visual	<p><u>Temporary Tree Nurseries</u></p> <p>Temporary tree nurseries may be set up for the transplanted tree and proposed trees at an early stage to allow small trees to grow during the construction periods. By the time when planting area becomes available, trees mature and increase in trunk &amp; spread size. They will require minimal pruning and suffer much less damage during transplanting when comparing the travel distance from an on-site nursery to an off-site nursery.</p> <p>Besides, these trees may also be positioned as visual mitigation during the construction period.</p>	Work site/ During design stage & construction period	√. A tree nursery has been set up off-site near the site office.
Landscape & Visual	<u>No-intrusion Zone</u>	Work site/ During design stage & construction	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	To maximise protection to existing trees and ground vegetation, construction contracts may designate “No-intrusion Zone” to various areas within the site boundary with rigid and durable fencing for each individual no-intrusion zone. The contractor should close monitor and restrict the site working staff not to enter the “no-intrusion zone”, even for non-direct construction activities and storage of equipment.	period	
Landscape & Visual	<u>Hoarding</u> Hoarding or boundary fencing for construction shall be considered. It should be sensitively designed, subtle, camouflaged and more ‘permeable’ so that they fit into the existing environment when looking from outside.	Work site/ During design stage & construction period	√
Landscape & Visual	<u>Dust and Erosion Control for Exposed Soil</u> Excavation works and demolition of existing building blocks and which will be highly visible form surrounding areas should be well planned and with precautions to suppress dust. Exposed soil shall be covered or ‘camouflaged’ and watered often. Areas that are expected to be left with bare soil for a long period of time after excavation shall be properly covered with suitable protective fabric. Silt and erosion shall be controlled by ground barriers around the slope cutting area..	Work site/ During design stage & construction period	√
Landscape & Visual	<u>Existing Tree Record Inventory</u> All retained trees should be record photographically at the commencement of the Contract, and carefully protected during the construction period. Detailed tree protection specification shall be allowed and included in the Contract Specification, which specifying the tree protection requirement, submission and approval system, and the tree monitoring system.	Work site/ During design stage & construction period	√
Landscape & Visual	<u>Construction Light</u>	Work site / During design stage & construction period	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	All security floodlights for construction sites shall be equipped with adjustable shield, frosted diffusers and reflective covers, and be carefully controlled to minimize light pollution and night-time glare to nearby residences and GIC users. The Contractor shall consider other security measures which shall minimize the visual impacts.		
Landscape & Visual	<p><u>Tree Transplanting</u></p> <p>Apart from the 18 numbers of "<i>Leucaena leucocephala</i>", which are proposed to be felled in accordance with ETWB TCW No. 3/2006, all the affected trees shall be transplanted. Where practicable, trees shall be directly transplanted to permanent on-site locations. The location of the transplanted tree is shown in <b>Figure 8.9.1</b>.</p>	Work site / During design stage & construction period	√.
Landscape & Visual	<p><u>Tree Compensation Ratio</u></p> <p>The total number of compensatory trees planted in the project area shall not be less than 1:1 ratios by new trees. Required numbers and locations of compensatory trees shall be determined and agreed with Government during the tree felling application process under ETWCTC 3/2006. Compensatory trees shall be at least heavy standard size to create "immediate" greening effect. 81 numbers of "<i>Cassia surattensis</i>" will be provided as the additional compensatory planting for loss of greenery in the area due to removal of the affected trees. The location of the additional compensatory planting is shown in <b>Figure 8.9.1</b>.</p>	Work site / During design stage & construction period	N/A
Landscape & Visual	<p><u>Re-use of Existing Soil and Advance formation of Planting Area</u></p> <p>Existing topsoil shall be re-used where possible for new planting areas within the project. Advance formation of planting area and early implementation of the plating works can minimize adverse impact on trees. The construction program shall consider using the soil removed from one phase for backfilling another. Suitable storage ground, gathering ground and mixing ground may be set up on-site as necessary.</p>	Work site / During design stage & construction period	√
Landscape & Visual	<p><u>Establishment Period</u></p>	Work site/ During operation period	N/A. To be implemented during operation phase of Project.

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	12 month establishment period for the soft landscape works will be allowed in the main contract. Most construction contracts in Hong Kong require the Contractor to carry out routine horticultural operations, including watering, pruning, weeding, pest control, replacement of dead plants etc. to ensure healthy establishment of new planting during a 12 month establishment period. This period also serves as a kind of warranty / guarantee on the quality of the plants supplied and installed by the Contractor. Monthly monitoring during the first year of establishment period is recommended.		
Landscape & Visual	<u>Re-instatement of excavated Area</u>  All excavated area and disturbed area for utilities diversion, temporary road diversion, and pipeline works will be reinstated to former conditions, subject to applicable Government Standards.	Work site / During design stage & operation period	N/A. To be implemented during operation phase of Project.
Landscape & Visual	<u>Appearance and Greening for the proposed structures</u> Compatible design, construction materials and surface finishes of the proposed structure should match with the nearby existing external appearance of PPSTW buildings for achieving visual uniformity. Finishing materials shall have due consideration to form, basic color, color/ tone variation, micro-and macro-texture, and reflectivity/light absorbance to avoid glare. Planting, such as turf, low groundcovers and climbers, may also be planted on top of these elements to provide greening and aesthetic effect.	Work site / During design stage & operation period	N/A. To be implemented during operation phase of Project.
<i>Summary of Key Environmental Mitigation Measures in Contract Requirements</i>			
Air Quality	Only Ultra-low-sulphur diesel (ULSD) should be used for all diesel-operated plants and equipments on site	Work sites / during construction period	√
Air Quality and Noise	Plants and equipments of good operation conditions should be used on site.	Work sites / during construction period	√
Noise	No diesel hammers should be used for piling works	Work sites / during construction period	√
Noise	Construction Noise Permits (CNP) should be applied for works conducted outside non-restricted hours.	Work sites / during construction period	√
Noise	Quiet construction equipments and the quietest practicable working methodologies should be adopted for works whenever feasible. Noise labels should be provided for air compressors. Hoods and cover panels	Work sites / during construction period	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	of generators and air compressors should be closed during operation. Noise labels should be provided for air compressors and hand-held percussive breakers.		
Waste Management	Temporary works construction on site should minimize the use of timber to reduce the quantity of C&D waste generated during works period.	Work sites / during construction period	√
Landscape and Visual	Retained or to-be-transplanted trees on site should be properly protected from physical damages and soil compacts with temporary fencing or hessian armouring whenever feasible.	Work sites / during construction period	√

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 ATAL-Degrémont-China State JV
- Δ Deficiency of Mitigation Measures but rectified by ATAL-Degrémont-China State JV
- N/A Not Applicable in Reporting Period



Annex J

## Waste Flow Table

**Contract No. : DC/2008/03 - Design, Build and Operate Pillar Point Sewage Treatment Works  
Monthly Summary Waste Flow Table**

Month	Actual Quantities of Inert C&D Materials Generated (see Note 13)					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated (see Note 13)				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
Nov 2010	2,248.00	0.00	0.00	55.00	2248.00	60.00	100.00	0.00	0.00	18.05 (see Note 4)
Dec 2010	11,314.00 (see Note 4)	0.00	0.00	225.00	11314.00	100.00	120.00	20.00	0.00	28.40 (see Note 4)
Jan 2011	58,383.00 (see Note 4)	0.00	0.00	3,000.00	58,382.90	250.00	280.00	60.00	0.00	4.59 (see Note 4)
<b>Sub-total</b>	<b>71,945.00</b>	<b>0.00</b>	<b>0.00</b>	<b>3280.00</b>	<b>71944.90</b>	<b>410.00</b>	<b>500.00</b>	<b>80.00</b>	<b>0.00</b>	<b>51.04</b>
Feb 2011	12,855.00	0.00	0.00	1,050.00	12,854.70	100.00	150.00	50.00	0.00	2.43 (see Note 4)
Mar 2011	22,859.00	0.00	0.00	1,500.00	22,858.70	150.00	180.00	55.00	0.00	9.02
Apr 2011	8,547.00 (see Note 7)	0.00	5,684.00(see Note 5, 7)	550.00	2,863.30	50.00	30.00	15.00	0.00	5.78
<b>Sub-total</b>	<b>44,261.00</b>	<b>0.00</b>	<b>5684.00</b>	<b>3100.00</b>	<b>38576.70</b>	<b>300.00</b>	<b>360.00</b>	<b>120.00</b>	<b>0.00</b>	<b>17.23</b>
May 2011	6,293.00 (see Note 7)	0.00	11.00 (see Note 5, 7)	425.00	6,282.00 (see Note 7)	45.00	25.00	10.00	360.00 (see Note 7)	8.83
Jun 2011	4,587.00 (see Note 7)	0.00	0.00 (see Note 7)	313.00	4,586.00 (see Note 7)	40.00	30.00	15.00	0.00	7.10
Jul 2011	523.00	0.00	0.00	25.00	522.90	15.00	5.00	10.00	0.00	7.20
<b>Sub-total</b>	<b>11,403.00</b>	<b>0.00</b>	<b>11.00</b>	<b>763.00</b>	<b>11391.50</b>	<b>100.00</b>	<b>60.00</b>	<b>32.00</b>	<b>360.00</b>	<b>23.13</b>
Aug 2011	571.00 (see Note 11)	0.00	0.00	50.00	571.00 (see Note 11)	0.00	0.00	15.00	450.00 (see Note 8)	6.12
Sept 2011	235.00	0.00	0.00	25.00	235	20.00	0.00	0.00	0.00	12.15 (see Note 9)
Oct 2011	5,705.00 (see Note 10)	0.00	0.00	650.00	5,705.00 (see Note 10)	100.00	0.00	0.00	0.00	2.98
<b>Sub-total</b>	<b>6,511.00</b>	<b>0.00</b>	<b>0.00</b>	<b>725.00</b>	<b>6511.00</b>	<b>120.00</b>	<b>0.00</b>	<b>15.00</b>	<b>450.00</b>	<b>21.25</b>
Nov 2011	6,294.00	0.00	0.00	775.00	6,294.00	50.00	0.00	0.00	0.00	44.84
Dec 2011	3,011.00	0.00	0.00	263.00	3,011.00	20.00	0.00	0.00	0.00	17.14
Jan 2012	349.00	64.00	0.00	25.00	284.60	20.00	150.00	0.00	0.00	49.01

Month	Actual Quantities of Inert C&D Materials Generated (see Note 13)					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated (see Note 13)				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
Sub-total	9,654.00	64.00	0.00	1063.00	9589.60	90.00	150.00	0.00	0.00	110.99
Feb 2012	3,371.00	30.00	0.00	2,810.00	3,341.00	150.00	0.00	0.00	0.00	48.72
Mar 2012	6,460.00	3,000.00	0.00	625.00	3,459.70	30.00	0.00	0.00	0.00	41.10
Apr 2012	3,774.00	3,000.00	0.00	250.00	774.40	40.00	0.00	0.00	0.00	40.01
Sub-total	13,605.00	6,030.00	0.00	3685.00	7575.10	220.00	0.00	0.00	0.00	129.83
May 2012	7,936.00	5,600.00	0.00	750.00	2,336.20	40.00	0.00	10.00	0.00	75.19
Jun 2012	13,091.00	7,500.00	0.00	875.00	5,590.80	40.00	35.50	8.00	0.00	66.74
Jul 2012	11,972.00	8,600.00	0.00	825.00	3,372.50	40.00	36.40	5.00	0.00	100.50
Sub-total	32,999.00	21,700.00	0.00	2450.00	11299.50	120.00	70.90	23.00	0.00	242.43
Aug 2012	11,660.00	11,000.00	0.00	950.00	659.80	30.00	10.00	6.00	0.00	78.77
Sept 2012	3,055.00	1,500.00	0.00	920.00	1,555.38	30.00	40.00	5.00	0.00	118.80
Oct 2012	2,657.00	200.00	0.00	500.00	2,457.01	30.00	59.40	8.00	0.00	124.04
Sub-total	17,372.00	12,700.00	0.00	2370.00	4672.19	90.00	109.40	19.00	0.00	321.61
Nov 2012	2,691.00	250.00	0.00	750.00	2,441.01	50.00	25.00	10.00	0.00	128.08
Dec 2012	4,319.00	400.00	0.00	200.00	3,919.13	60.00	20.00	15.00	0.00	165.28
Jan 2013	4,442.00	100.00	0.00	200.00	4,341.56	200.00	40.00	20.00	0.00	111.23
Sub-total	11,452.00	750.00	0.00	1150.00	10701.70	310.00	85.00	45.00	0.00	404.59
Feb 2013	1,286.00	85.00	0.00	50.00	1,201.23	<b>180.00</b>	35.00	16.00	0.00	99.44
Mar 2013	900.00	900.00	0.00	120.00	0.00	120.00	45.00	10.00	0.00	97.43
Apr 2013	680.00	680.00	0.00	300.00	0.00	22.00	50.00	15.00	0.00	80.21
Sub-total	2866.00	1665.00	0.00	470.00	1201.23	322.00	130.00	41.00	0.00	277.08
May 2013	1443.37	100.00	0.00	1020.00	1343.37	40.00	43.00	9.00	0.00	46.88 (see Note 16)

Month	Actual Quantities of Inert C&D Materials Generated (see Note 13)					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated (see Note 13)				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
June 2013	1993.06	50.00	0.00	850.00	1943.06	100.00	60.00	5.00	0.00	53.89
July 2013	1246.64	100.00	0.00	1100.00	1146.64	100.00	60.00	10.00	0.00	71.15
Sub-total	4683.07	250.00	0.00	2970.00	4433.07	240.00	163.00	24.00	0.00	171.92
August 2013	873.73	120.00	0.00	700.00	753.73	50.00	60.00	8.00	0.00	63.95
September 2013	748.43	50.00	0.00	650.00	698.43	40.00	60.00	5.00	0.00	41.28
October 2013	1701.99	45.00	0.00	1500.00	1656.99	20.00	60.00	5.00	0.00	34.79
Sub-total	3324.15	215.00	0.00	2850.00	3109.15	110.00	180.00	18.00	0.00	140.02
November 2013	1602.35	60.00	0.00	1490.00	1542.35	18.00	60.00	50.00	0.00	36.44
December 2013	1357.16	80.00	0.00	1100.00	1277.16	35.00	60.00	50.00	0.00	16.84
January 2014	714.34	20.00	0.00	690.00	694.34	16.00	60.00	97.00	0.00	27.82
Sub-total	3,673.85	160.00	0.00	3,280.00	3,513.85	69.00	180.00	197.00	0.00	81.10
February 2014	944.11	20.00	0.00	900.00	924.11	50.00	60.00	1120.00	0.00	7.66
March 2014	1200.95	50.00	0.00	1100.00	1150.95	40.00	50.00	5.00	0.00	19.78
April 2014	1803.58	50.00	0.00	1700.00	1753.58	40.00	30.00	5.00	0.00	12.13
Sub-total	3948.64	120.00	0.00	3700.00	3828.64	130.00	140.00	1130.00	0.00	39.57
May 2014	576.53	50.00	0.00	500.00	526.53	40.00	30.00	5.00	0.00	14.07
June 2014	707.48	30.00	0.00	640.00	677.48	30.00	20.00	0.00	0.00	11.65
July 2014	675.82	20.00	0.00	640.00	655.82	20.00	10.00	0.00	0.00	25.28
Sub-total	1959.83	100.00	0.00	1780.00	1859.83	90.00	60.00	5.00	0.00	51.00
August 2014	758.68	10.00	0.00	740.00	748.68	10.00	5.00	0.00	0.00	14.77

Month	Actual Quantities of Inert C&D Materials Generated (see Note 13)					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated (see Note 13)				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
September 2014	1171.44	20.00	0.00	1145.00	1151.44	20.00	10.00	0.00	0.00	15.71
October 2014	448.84	20.00	0.00	415.00	428.84	20.00	5.00	0.00	0.00	8.32
Sub-total	2378.96	50.00	0.00	2300.00	2328.96	50.00	20.00	0.00	0.00	38.8
November 2014	768.33	10.00	0.00	740.00	758.33	10.00	5.00	0.00	0.00	30.89
December 2014	766.77	10.00	0.00	740.00	756.77	5.00	3.00	0.00	0.00	17.94
January 2015	575.41	10.00	0.00	550.00	545.41	3.00	3.00	0.00	0.00	12.23
Sub-total	2110.51	30.00	0.00	2030.00	2060.51	18.00	11.00	0.00	0.00	61.06
February 2015	374.73	5.00	0.00	360.00	369.73	2.00	2.00	0.00	0.00	15.68
March 2015	678.52	5.00	0.00	665.00	673.52	1.00	2.00	0.00	0.00	40.00
April 2015	30.89	1.00	0.00	28.00	29.89	1.00	1.00	0.00	0.00	31.45
Sub-total	1084.14	11.00	0.00	1053.00	1073.14	4.00	5.00	0.00	0.00	87.13
May 2015	113.26	1.00	0.00	111.00	112.26	1.00	1.00	0.00	0.00	15.70
June 2015	17.01	0.00	0.00	15.00	17.01	0.00	0.00	0.00	0.00	11.32
July 2015	12.41 (see Note 17)	0.00	0.00	6.00	12.41	0.00	0.00	0.00	0.00	10.79
Sub-total	142.68	1.00	0.00	132.00	141.68	1.00	1.00	0.00	0.00	37.81
August 2015	16.69	0.00	0.00	16.00	16.69	0.00	0.00	0.00	0.00	0.62
September 2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October 2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total	16.69	0.00	0.00	16.00	16.69	0.00	0.00	0.00	0.00	0.62
November 2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Month	Actual Quantities of Inert C&D Materials Generated (see Note 13)					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated (see Note 13)				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
December 2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
January 2016	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	245,389.70	43,846.00	5,694.96	39,167.00	195,848.74	2,794.00	2,225.30	1,752.00	810.00	2,308.21

- Notes:
- (1) Metal and paper/cardboard packaging were collected by recycler for recycling.
  - (2) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material collected by recycler for recycling.
  - (3) General refuse was disposed of at WENT by subcontractors.
  - (4) The waste flow data for November and December 2010, January and February 2011 was updated in March 2011 based on SOR's comments and has been confirmed by the Contractor.
  - (5) The inert C&D materials were reused in the Contract No. EP/SP/58/08 at Tuen Mun Tsang Tsui.
  - (6) Chemical waste was collected through the licensed chemical waste collector, Dunwell Ind. (Holdings) Ltd, with the waste collection licence number 7111-757-W0015-WC.
  - (7) The waste flow data for April, May and June 2011 was updated in August 2011 based on SOR's comments and has been confirmed by the Contractor.
  - (8) The waste flow data of chemical waste for August 2011 was updated in October 2011 based on Contractor's revised waste flow summary.
  - (9) The waste flow data of general refuse for September 2011 was updated in November 2011 based on Contractor's revised waste flow summary.
  - (10) The waste flow data of C&D material for October 2011 was updated in December 2011 based on Contractor's revised waste flow summary.
  - (11) The waste flow data of C&D material for August 2011 was updated in January 2011 based on SOR's comments and has been confirmed by the Contractor.
  - (12) The waste flow data of metal and paper/cardboard packaging for June 2011 was revised in August 2012.
  - (13) The quantity of inert and non-inert C&D material generated from May 2012 to December and imported fill material was updated by the Contractor on 6 November 2012.
  - (14) The quantity of Rocks & Broken Concrete from November 2010 to November 2012 was updated by the Contractor on 12 December 2012.
  - (15) The quantity of C&D material reused in this Contract in Oct, Nov and Dec 2012 were updated by the Contractor on 5 January 2013.
  - (16) The quantity of general refuse in this Contract for May 2013 was updated by the Contractor in June 2013.
  - (17) The waste flow data for July 2015 was updated in August 2015 based on SOR's comments and has been confirmed by the Contractor.

Annex K

Environmental Complaint,  
Environmental Summons  
and Persecution Log

*Annex K Cumulative Complaint and Summons/Prosecutions Log*

<b>Reporting Month</b>	<b>Number of Complaints in Reporting Month</b>	<b>Number of Summons/Prosecutions in Reporting Month</b>
November 2010	0	0
December 2010	0	0
January 2011	0	0
February 2011	0	0
March 2011	0	0
April 2011	0	0
May 2011	0	0
June 2011	0	0
July 2011	0	0
August 2011	0	0
September 2011	0	0
October 2011	0	0
November 2011	0	0
December 2011	0	0
January 2012	0	0
February 2012	0	0
March 2012	0	0



<b>Reporting Month</b>	<b>Number of Complaints in Reporting Month</b>	<b>Number of Summons/Prosecutions in Reporting Month</b>
April 2012	0	0
May 2012	0	0
June 2012	0	0
July 2012	0	0
August 2012	0	0
September 2012	0	0
October 2012	0	0
November 2012	0	0
December 2012	0	0
January 2013	0	0
February 2013	0	0
March 2013	0	0
April 2013	0	0
May 2013	0	0
June 2013	0	0
July 2013	0	0
August 2013	0	0
September 2013	0	0
October 2013	0	0
November 2013	0	0

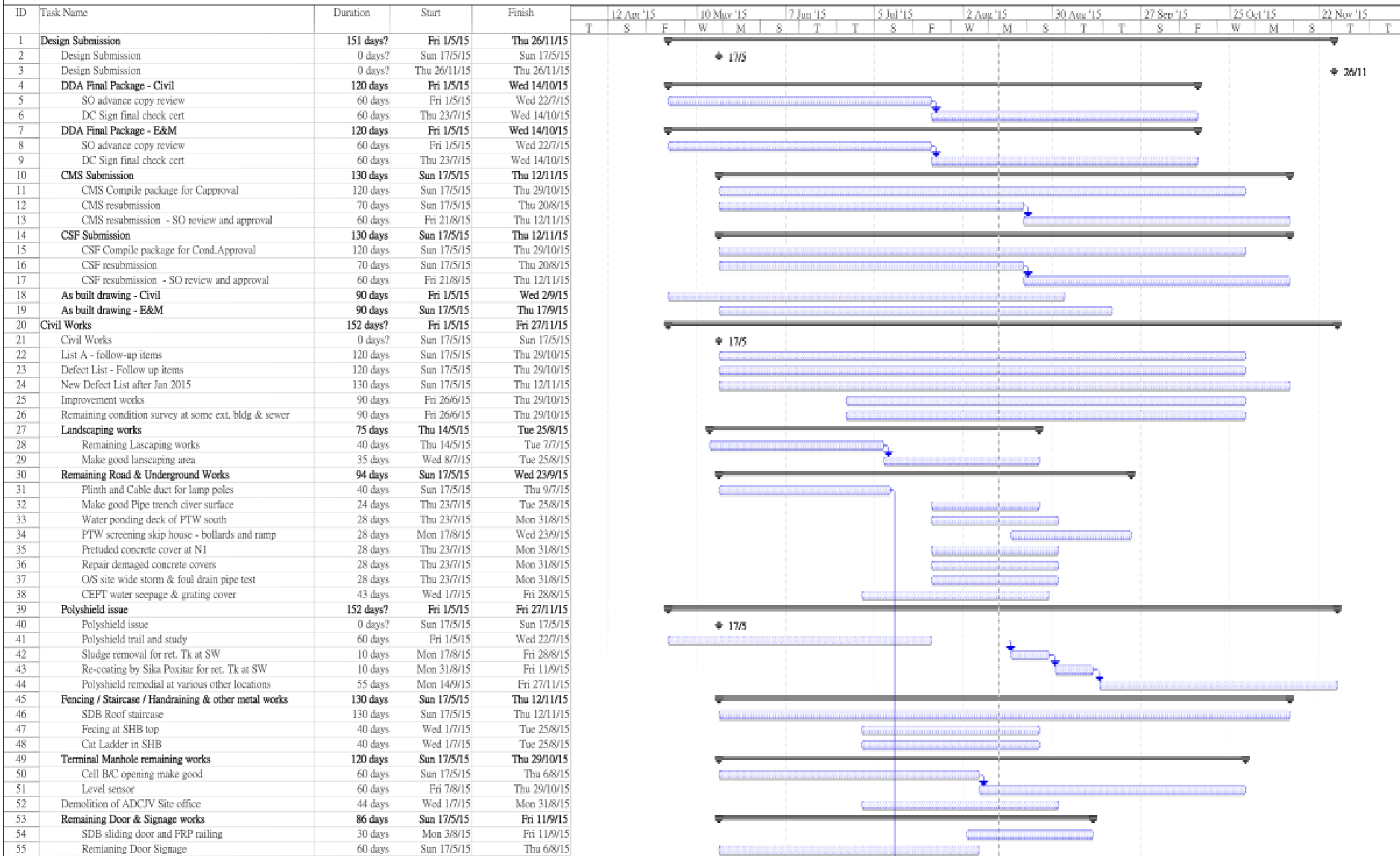
<b>Reporting Month</b>	<b>Number of Complaints in Reporting Month</b>	<b>Number of Summons/Prosecutions in Reporting Month</b>
December 2013	0	0
January 2014	0	0
February 2014	0	0
March 2014	0	0
April 2014	0	0
May 2014	0	0
June 2014	0	0
July 2014	0	0
August 2014	0	0
September 2014	0	0
October 2014	0	0
November 2014	0	0
December 2014	0	0
January 2015	0	0
February 2015	0	0
March 2015	0	0
April 2015	0	0
May 2015	0	0
June 2015	0	0
July 2015	0	0

<b>Reporting Month</b>	<b>Number of Complaints in Reporting Month</b>	<b>Number of Summons/Prosecutions in Reporting Month</b>
August 2015	0	0
September 2015	0	0
October 2015	0	0
November 2015	0	0
December 2015	0	0
January 2016	0	0
<b>Overall Total</b>	<b>0</b>	<b>0</b>

Annex L

## Construction Programme of the Project

PPSTW Remianing Follow up Programme (after 17 May2015)



Project: PPSTW Remaining Follow-up Date: Thu 13/8/15

Task Milestone Project Summary External Milestone Progress Deadline

Split Summary External Tasks Inactive Task



Part 2 – Operation Phase EM&A Report for  
January 2016

---





Your Ref:  
Our Ref: 60017423/C/oylw16030701

**By Hand & By Fax (2833 9162)**

Drainage Services Department  
Sewage Services Branch  
Harbour Area Treatment Scheme Division  
5/F., Western Magistracy,  
2A Pok Fu Lam Road,  
Hong Kong.

Attn: Ms. Carol Ho (T: 2159 3405)

7 March 2016

Dear Madam,

**Contract No. DC/2008/03  
Design, Build and Operate  
Pillar Point Sewage Treatment Works**

**Monthly EM&A Report for January 2016 (6<sup>th</sup> Monthly Operation Phase Monitoring Report for January 2016)**

Reference is made to Environmental Team (ET)'s draft of the Monthly EM&A Report for January 2016 provided by email dated 12 February, 3 and 4 March 2016. We have no further comment.

We hereby verify the said Monthly EM&A Report as having complied with the requirement as set out in the Final EM&A Manual.

Should you have any queries, please feel free to contact the undersigned at 3922 9393.

Yours faithfully,

For and on behalf of  
AECOM Asia Co. Ltd.



Y T Tang  
Independent Environmental Checker

c.c. AECOM – Mr. C Y Hung (Fax No. 2404 2744)  
SMEC – Ms. Vivian Chan (Fax No. 3995 8101)  
ATAL–Degremont–China State JV – Mr. Raymond Chan (Fax No. 2811 3321)

ATAL



ATAL – Degrémont – China State Joint Venture



## 63<sup>rd</sup> Monthly EM&A Report (6<sup>th</sup> Monthly Operation Phase Monitoring Report for January 2016)

Contract No. DC/2008/03

# Design, Build and Operate Pillar Point Sewage Treatment Works

March 2016





ATAL – Degrémont – China State Joint Venture



**63<sup>rd</sup> Monthly EM&A Report (6<sup>th</sup> Monthly Operation Phase Monitoring Report for January 2016)**

**Contract No. DC/2008/03**

# **Design, Build and Operate Pillar Point Sewage Treatment Works**

**March 2016**

**Certified By**

**Vivian CHAN**  
ET Leader

Project/Deliverable No.	7076134   D14/02
Project Name	Upgrading of Pillar Point Sewage Treatment Works – Design, Build and Operate
Report Name	63 <sup>rd</sup> Monthly EM&A Report (6 <sup>th</sup> Monthly Operation Phase Monitoring Report for January 2016)
Report Date	March 2016
Report for	ATAL Engineering - Degrémont SA - China State Construction Engineering Joint Venture

#### PREPARATION, REVIEW AND AUTHORISATION

Revision #	Date	Prepared by	Reviewed by	Approved by
1.0 (Draft)	February 2016	Man CHEUNG	Vivian CHAN	Alexi BHANJA
2.0 (Final)	March 2016	Man CHEUNG	Vivian CHAN	Alexi BHANJA

#### ISSUE REGISTER

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## EXECUTIVE SUMMARY

- E.1. In accordance with the Environmental Monitoring and Audit Manual (EM&A Manual) and the Environmental Permit (EP-321/2008/B) for the Upgrading of Pillar Point Sewage Treatment Works (PPSTW) (the Project), odour and water quality monitoring is required during the first year after Project commissioning and Water Quality Monitoring is required for each emergency discharge event. The purpose of operation phase monitoring is to confirm the predictions of odour and water quality made in the EIA report.
- E.2. As confirmed by the Contractor, all major construction activities of the upgraded PPSTW has been completed in August 2015. The Operation Phase of the Upgraded PPSTW commenced on 15 August 2015. This Monthly Operation Phase Monitoring Report (Post-commissioning) summarizes monitoring events carried out during post-commissioning period from 1 to 31 January 2016. There were a total of three monitoring events carried out during the reporting period. The exact dates of monitoring carried out in this month are tabulated below:

**Table E-1 Dates of Monitoring Events**

Monitoring Events	6 <sup>th</sup> Reporting Month Monitoring Period: 1 – 31 January 2016
Odour Monitoring	18/1/2016
H <sub>2</sub> S Monitoring	1/1/2016 - 31/1/2016 (continuous monitoring)
Landscape and Visual Monitoring	7/1/2016

- E.3. The monitoring results obtained were certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC) in accordance with the EM&A Manual.

### Breach of Action and Limit Levels

- E.4. No exceedance of Action and Limit Level of odour monitoring was recorded at the monitoring location in the reporting month.
- E.5. No exceedance of Action and Limit Level of odour emission monitoring was recorded at the monitoring location in the reporting month.
- E.6. No non-compliance of the landscape and visual monitoring has been recorded in the reporting month.

### Environmental Complaint

- E.7. In this reporting period, no environmental complaint in relation to the EM&A Programme was recorded.



## Reporting Change

- E.8. This is the 6<sup>th</sup> Monthly Operation Phase Monitoring report and no reporting changes were made in the Reporting Period.

## Major Activities on Site

- E.9. The major activities being carried out on site during the reporting period is list as follows:
- Normal operation of the upgraded PPSTW.

## Future Key Issues

- E.10. The Project has entered the Operation Phase since August 2015 and the upgraded PPSTW will continue its normal operation in the following monitoring period. Mitigation measures as proposed in the approved Environmental Impact Assessment report will be provided and maintained at the Project.
- E.11. Potential environmental impacts arising from the Project operation are mainly associated with odour and effluent discharging from the Project.

# 1 INTRODUCTION

## 1.1 Background

1.1.1 Before the upgrading, the Pillar Point Sewage Treatment Works (PPSTW) was a preliminary treatment works with 5.79m<sup>3</sup>/s capacity located at the north of Tuen Mun River Trade Terminal and bounded by Lung Mun Road to the north, as shown in **Figure 1-1**. The PPSTW used to provide only preliminary treatment – screening followed by grit removal – prior to effluent discharge into the sea (within the North Western Water Control Zone) via twin submarine outfalls.

1.1.2 The *Review of the Tuen Mun and Tsing Yi Sewerage Master Plan*, commissioned in February 1999, recommended upgrading the capacity of PPSTW to 6.08m<sup>3</sup>/s and upgrading the treatment level to incorporate Chemically Enhanced Primary Treatment (CEPT) with Ultraviolet (UV) disinfection. The aim of the upgrading works (the Project) is to provide sufficient capacity to meet future demand and pollutant loading for ultimate development scenario for Tuen Mun area, and to improve effluent quality.

1.1.3 An Environmental Impact Assessment (EIA) (EIA-145/2008) was carried out for the Project and was approved without conditions by the Environmental Protection Department (EPD) on 10 June 2008. An Environmental Permit (EP) (EP 321/2008) issued on 17 November 2008. Two Applications for variation of the EP was submitted and approved, and varied EPs, EP 321/2008/A and EP-321/2008/B were issued on 23 April 2013 and 30 May 2014 respectively. The Environmental Monitoring & Audit Manual (EM&A Manual) and EP provide guidelines for the Operational Phase Monitoring Reports and for preparation of the Operational Phase Monitoring Reports.

## 1.2 Major Activities on Site

1.2.1 The major activities being carried out on site during the reporting period is list as follows:

- Normal operation of the upgraded PPSTW.

## 1.3 Purpose of the Report

1.3.1 This is the sixth Monthly Operational Phase Monitoring Reports which summarizes the findings of EM&A works during the reporting period from 1 to 31 January 2016.

Figure 1-1 Site Location



## 2 ODOUR MONITORING

### 2.1 Monitoring Methodology and Parameters

- 2.1.1 In accordance with Section 2.7.1.1 to 2.7.1.9 of the final EM&A Manual, odour patrols are required to be conducted for a period of one year during the operation of the upgraded PPSTW, one patrol for daytime and one patrol for evening every month at the same locations as for the baseline monitoring.
- 2.1.2 The 1-year monthly odour patrol might be extended as stipulated in second and third bullet point in Table 2.4 of Final EM&A Manual.
- 2.1.3 The odour monitoring should not be undertaken on rainy days and hourly meteorological conditions (temperature, wind speed & direction, humidity) as shown in **Appendix G** were recorded in the monitoring period.
- 2.1.4 The odour patrol shall be conducted by two independent trained personnel/ competent persons patrolling and sniffing along the PPSTW boundary and the air sensitive receivers (ASRs) in the vicinity of the PPSTW as identified in Section 2.4.1.4 of the final EM&A Manual. The odour patrol shall be carried from less odorous locations to stronger odorous locations.
- 2.1.5 Subject to the prevailing weather forecast condition, odour patrol shall be conducted by independent trained personnel/competent persons at the downwind locations. During the patrol, the sequence should start from less odourous locations to stronger odourous locations.
- 2.1.6 The trained personnel/competent persons shall record the findings including odour intensity, odour nature and possible sources and local wind speed and direction at each monitoring location. The perceived odour intensity is divided into five levels (0 to 4):
- 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.

### 2.2 Monitoring Stations

- 2.2.1 The identified monitoring locations for odour patrol are tabulated in **Table 2-1** and illustrated in **Figure 2-1**.

**Table 2-1 Monitoring Locations for Odour Patrol**

Station ID	Description
A1	River Trade Terminal Office
A2	Chu Kong Warehouse 1

Station ID	Description
A3	Chu Kong Warehouse 2
A4	Wai Sang Sawmill Ltd. <sup>1</sup>
A5	Pillar Point Fire Station
A6	Sunhing Hung Kai Tuen Mun Godown
A7	EMSD Vehicle Servicing Station
S1	Northern Site Boundary
S2	Eastern Site Boundary
S3	Southern Site Boundary
S4	Western Site Boundary

## 2.3 Monitoring Personnel

2.3.1 The two independent trained personnel/competent persons (the “panellists”) have satisfied the requirements listed in Section 2.3.1.9 and 2.7.1.4 of the approved EM&A Manual during odour patrol, namely:

- Have their individual odour threshold of n-butanol in nitrogen gas in the range of 20 to 80ppb/v required by the European Standard Method (EN 13725).
- Be at least 16 years of age and willing and able to follow instructions.
- Be free from any respiratory illnesses.
- Be engaged for a sufficient period to build up and monitor/detect at several monitoring location.
- Not be allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30 min before and during odour intensity analysis.
- Take great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics.
- Not communicate with each other about the results of their choices.
- Do not normally work at or live in the area in the vicinity of PPSTW.

2.3.2 The two qualified panellists are Mr LEE Hok Yan Francis and Mr CHEUNG Man Kit. The Nose Sensory Test Reports of the two panellists are provided in **Appendix A**.

## 2.4 Action and Limit Levels

2.4.1 The Action and Limit Levels as proposed in Table 2.5 of the final EM&A Manual are summarized in **Table 2-2**.

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1. Wai Sang Sawmill Ltd. Had been demolished, the patrol and the monitoring location was kept as the same location as Pre-commissioning monitoring conducted in Year 2013.

**Table 2-2 Action and Limit Levels for Odour Patrol**

Parameter	Action Level	Limit Level
Odour Nuisance (from odour intensity analysis or odour patrol)	Odour intensity of higher than 1 is measured from odour intensity analysis	Odour intensity of 2 or above is measured from odour intensity analysis

**Note:** To avoid ambiguity, a more conservative approach will be adopted: Action Level will be trigger when odour intensity equals to 1 and Limit Level will be triggered when odour intensity is 2 or above due to the operation of the PPSTW.

## 2.5 Event and Action Plan

2.5.1 The Event and Action Plan for Odour Quality Monitoring is provided in *Appendix F*.

## 2.6 Monitoring Results and Observations

2.6.1 The odour patrol was carried out on 18 January 2016 during daytime and evening by two “panellists” (Panellist A and Panellist B) at all monitoring stations, as required by the EM&A Manual.

2.6.2 The Hong Kong Observatory’s Tuen Mun Weather Station reported that the weather on the day of the patrol was cloudy and cold. The weather condition during the period is provided in *Appendix G*.

2.6.3 The results for odour patrol at each monitoring location are provided in *Appendix B*.

2.6.4 No exceedance of the action or limit level was identified during the reporting period.

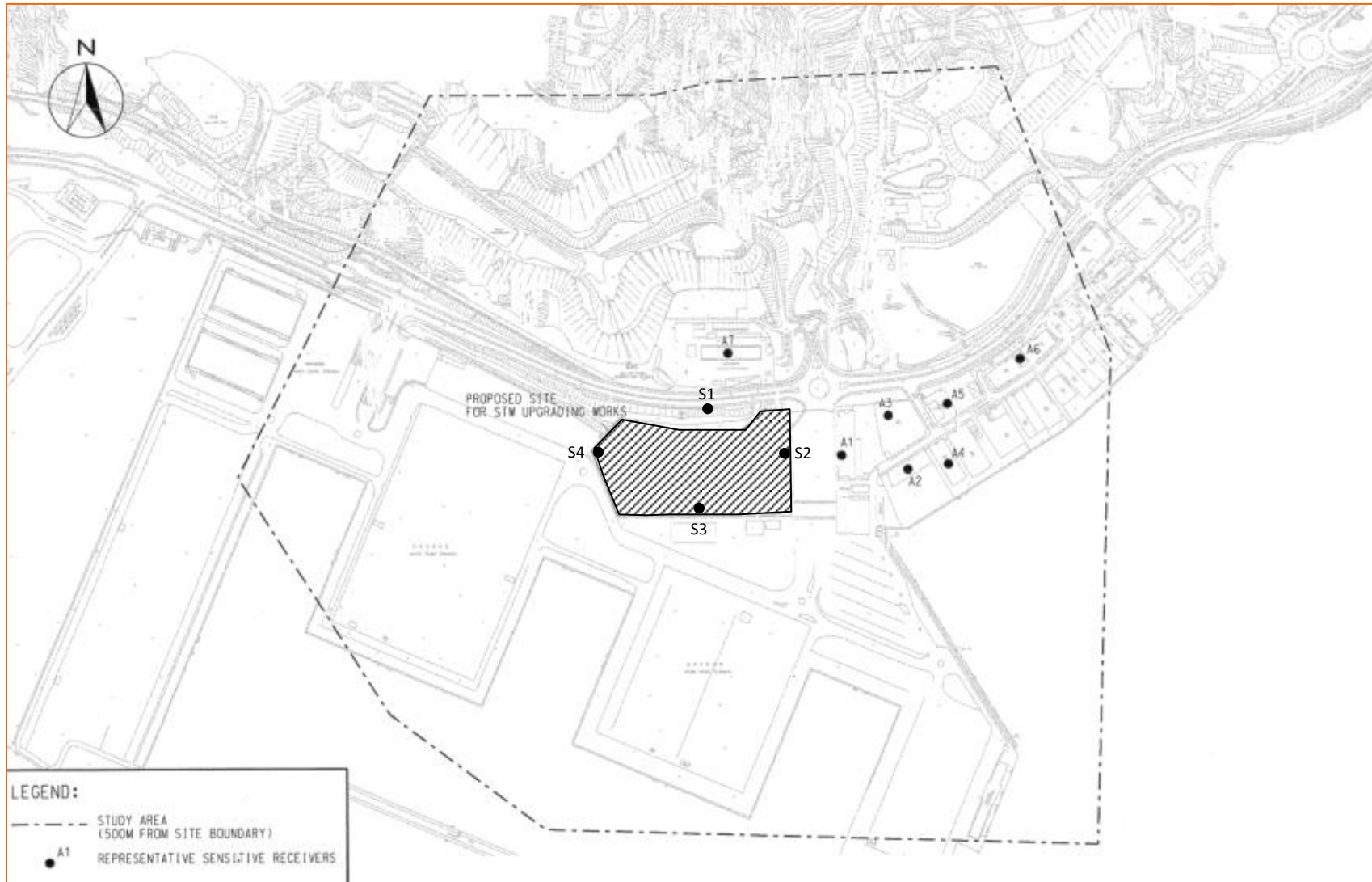
2.6.5 During the odour patrol, no noticeable odour due to operation of the PPSTW was observed at the sensitive receivers.

2.6.6 As predicted in Section 3.8.2.1 of the Final EIA report, there shall be no exceedances of the odour criteria at ASRs located outside of the project boundary. Since no odour monitoring results exceeded the odour criteria, the monitoring verified that the EIA predictions were correct.

## 2.7 Odour Complaint Registration System

2.7.1 An odour complaint registration system has been set up for the project. No odour complaint was received and registered in the odour complaint registration system in the reporting month.

**Figure 2-1 Monitoring Locations for Odour Patrol**



## 3 ODOUR EMISSION MONITORING

### 3.1 Monitoring Methodology and Parameters

3.1.1 In accordance with Section 3.8 of the Register of Change under Environmental Permit (EP) dated March 2013, two rounds of air sampling and olfactometric analysis are required to be conducted under full-load operation of the upgraded Pillar Point Sewage Treatment Works (PPSTW) to monitor the performance and effectiveness of the deodorization units. The first round of air sampling and olfactometric analysis will be conducted upon commissioning of the upgraded PPSTW and the second round will be carried out 1 year thereafter. The upgraded PPSTW commissioned on 15 August 2015 and the first round of air sampling and olfactometric analysis was carried out on 21 September 2015.

#### **Air Sampling & Olfactometric Analysis**

##### **Air Sampling Requirements and Methodology**

3.1.2 As stipulated in 1.3.2 of Annex 3F of the Final EM&A Manual, the source temperature shall be measured at the time of air sampling. Other meteorological conditions including wind speed, wind direction and relative humidity should also be measured at the time of the monitoring. Two samples at each inlet/ outlet should be collected. Air sampling shall not be conducted in rainy days as it would affect the odour strength of the sources.

3.1.3 The air sampling procedure followed the European Standard Method EN13725:2003 and the procedures are listed as follow:

- i. The sampling bags were prepared by filling the sampling bags with odour-free air at the odour laboratory to test any leaking problem.
- ii. Sampling bags were emptied before sampling.
- iii. For area sources, air samples were collected by hood sampling method. The odour sampling system includes a battery-operated air pump, a sampling vessel, and nalophane odour bags. Empty sample bag was placed in a rigid plastic container and the container was then evacuated at a controlled rate and the bag was filled. Sufficient volume of gas sample was collected at each sampling location and wind tunnel was employed during the sampling work.
- iv. For non-area sources or “hood” method cannot be applied due to site constraint, the air samples were collected using a positive displacement pump and nalophane odour bags. The Positive displacement pump would be connected to the odour source and the sample bag was filled at a fixed flowrate.
- v. The odour bags are Odour-free, which no odours added to the samples. The sampling bags were made of a material which does absorb or react with odorous samples. The odour bags were sufficiently impervious, reasonably robust, leak-free, equipped with leak-free fittings, compatible with olfactometer and other sampling equipment and the bags have sufficient capacity to complete a full test series.
- vi. The temperature of the sampling bags was kept above dew point and exposure of samples to sunlight was avoided. Exposure of samples to direct sunlight was avoided to minimise photochemical reactions.



- vii. The odour samples were delivered to a qualified laboratory for olfactometric analysis analysed within twenty-four hours.

#### **Olfactometric Analysis Requirements and Methodology**

- 3.1.4 The collected air samples were transported to Hong Kong Productivity Council (HKPC), which is a qualified laboratory for olfactometric analysis, within 24 hours.
- i. The odour concentrations of the samples were determined by a forced-choice dynamic olfactometer with a panel of human assessors.
  - ii. The odour concentration is measured by determining the dilution factor required to reach the detection threshold, which is  $1\text{ou}/\text{m}^3$ .
  - iii. The odour laboratory was ventilated to maintain an odour-free environment and to provide air to the panel members.
  - iv. The panellists were screened beforehand by using a 50-ppm solution/mixture of certified n-butanol standard gas in at least 3 sections on separated days with a pause of at least one day between sections, which the most sensitive and least sensitive individuals were eliminated and each odour testing session should comprise of 6 to 8 qualified panellists in 2 rounds of analysis.
  - v. The panel members were not allowed to eat or smoke one hour prior to the session, or use perfumes, after-shave lotions or any other fragrant essences before the session. They should be in the odour room 15 minutes before measurements. If they had health problems that affect their noses, they were not allowed to attend the testing session. No panel member were involved in the odour testing for more than 4 hours, within this period at least 2 ten minutes breaks for olfactory rest should be taken. The odour panel were housed in a room that constructs of odour-free materials and equipped with ventilation system.
  - vi. Regular calibration of the olfactometer was performed yearly to check the accuracy and repeatability of its dilution settings and to establish its calibration history. The olfactometer was calibrated regularly using propane as a tracer, which is an option recommended in BS 13725:2003 calibration method. The accuracy and repeatability of the olfactometer are calculated from two propane concentrations, one measured at the sniffing port of the olfactometer and once being the certified propane concentration.

### **H<sub>2</sub>S Measurement**

#### **H<sub>2</sub>S Measurement Methodology**

- i. H<sub>2</sub>S level sensors were installed at the respective inlet and outlet of the deodorization units to continuously monitor the H<sub>2</sub>S emission level at the stacks and H<sub>2</sub>S removal efficiency of the deodorization units.

## 3.2 Monitoring Stations

3.2.1 The air samples collection locations are tabulated in **Table 3-1** and illustrated in **Figure 3-1**.

**Table 3-1 Monitoring Locations for Air Sampling**

Deodorization Unit Portion	Station ID	Description
A	A1	Inlet for Portion A of the Deodorization Unit
	A2	Outlet from Activated Carbon Filter A1
	A3	Outlet from Activated Carbon Filter A2
B	B1	Inlet for Portion B of the Deodorization Unit
	B2	Outlet from Activated Carbon Filter B1
	B3	Outlet from Activated Carbon Filter B2

## 3.3 Monitoring Equipment

3.3.1 The equipment used for H<sub>2</sub>S Gas Detector was listed in **Table 3-2** and calibration certificates for this equipment were provided in **Appendix C**.

**Table 3-2 Odour Emission Monitoring Equipment**

Equipment	System Model	Detector Model	Unit	Channel Number	Serial Number
H <sub>2</sub> S Gas Detector	"Crowcon" Gasmonitor Plus Control Panel	"Crowcon" Xgard Type 1 H <sub>2</sub> S Gas Detector	A	1	410710/08-1
				4	410710/07-13
				5	410710/07-9
			B	1	410710/08-2
				4	410710/07-10
				5	410710/07-12

## 3.4 Action and Limit Levels

3.4.1 The design requirements for stacks (A2, A3 and B2, B3) of deodorizing units A and B stipulated in the Register of Change under Environmental Permit (EP) were summarized in **Table 3-3**.

**Table 3-3 Design Requirements for Outlet Stacks of Deodorizing Units**

Stack of Deodorizing unit	Design requirements of deodorizing unit	Odour emission rates
A2	<ul style="list-style-type: none"> <li>H=6.81m</li> <li>V=19.58m/s</li> <li>D=0.62m</li> </ul>	1,786 ou/s (total emission from all vent pipes)
A3	<ul style="list-style-type: none"> <li>H=6.81m</li> <li>V=19.58m/s</li> <li>D=0.62m</li> </ul>	

Stack of Deodorizing unit	Design requirements of deodorizing unit	Odour emission rates
B2	<ul style="list-style-type: none"> <li>H=6.81m</li> <li>V=20.00m/s</li> <li>D=0.62m</li> </ul>	1,809 ou/s (total emission from all vent pipes)
B3	<ul style="list-style-type: none"> <li>H=6.81m</li> <li>V=20.00m/s</li> <li>D=0.62m</li> </ul>	

3.4.2 The Action and Limit Levels as proposed in Table F.1 of Annex 3F of the Register of Change under Environmental Permit (EP) are summarized in **Table 3-4**.

**Table 3-4 Action and Limit Levels for Odour Emission Monitoring**

Parameter	Action Level	Limit Level
Odour Emission (from air sampling, olfactometric analysis and H <sub>2</sub> S measurement)	Odour emission rate from the outlet of the deodorization unit exceeds 80% of the permitted value in <b>Table 3-3</b> .	Odour emission rate from outlet of the deodorization unit exceeds the permitted value in <b>Table 3-3</b> .

### 3.5 Event and Action Plan

3.5.1 The Event and Action Plan for Air Quality Monitoring (Operation Phase) is provided on **Appendix F**.

### 3.6 Monitoring Results

#### Air Samples and Olfactometric Analysis

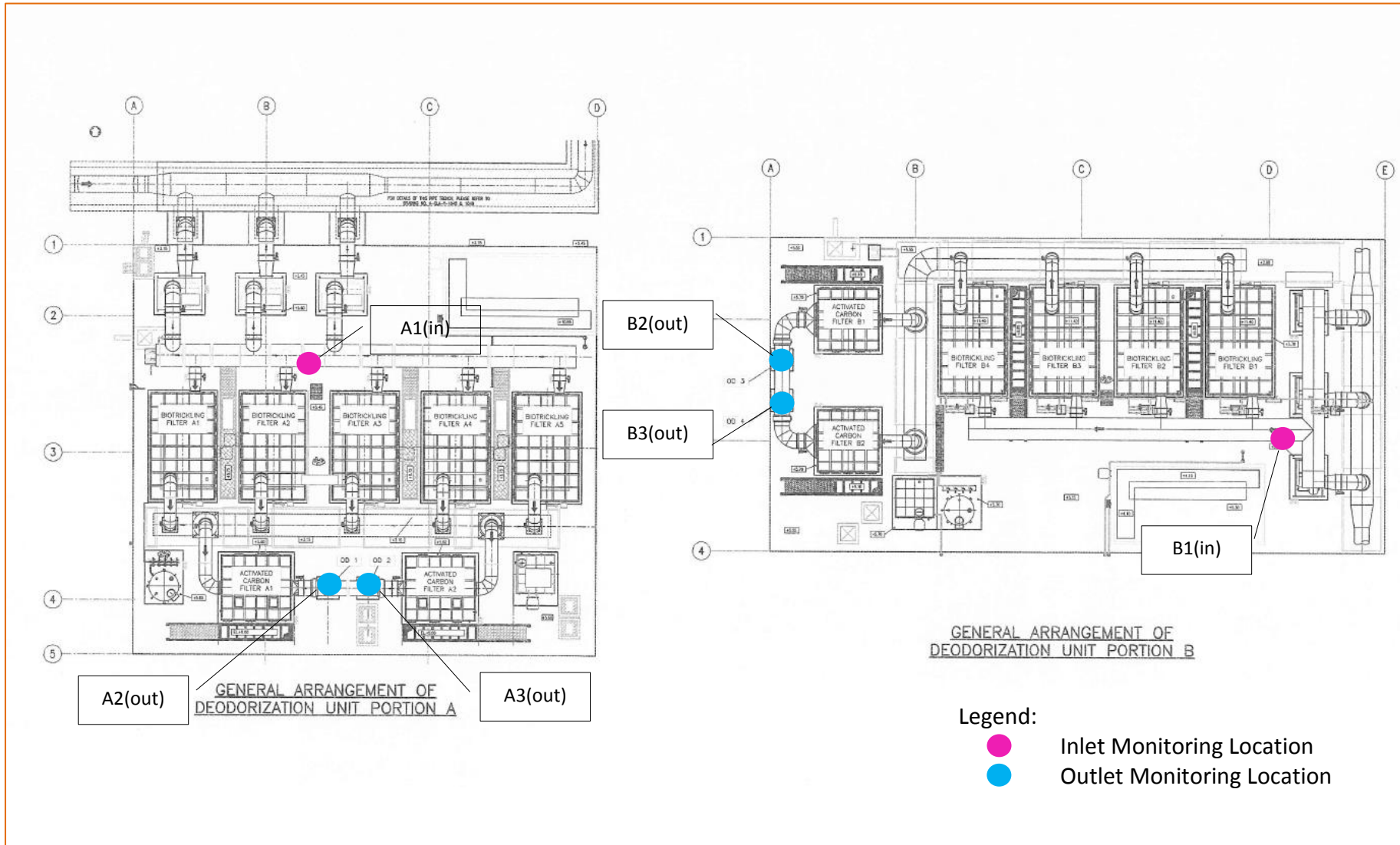
3.6.1 No air sampling for olfactometric analysis was carried out during the reporting month. The next monitoring is scheduled in August 2016, at 1 year after commissioning of the upgraded PPSTW, and the exact date of sampling will be agreed with the Independent Environmental Checker (IEC) in due course.

#### H<sub>2</sub>S Monitoring

3.6.2 Continuous H<sub>2</sub>S monitoring was conducted from 1 to 31 January 2016 and the results were provided in **Appendix D**.

3.6.3 As shown in the continuous H<sub>2</sub>S monitoring results, the average percentage of H<sub>2</sub>S removal efficiency of the deodorization units were 100%, which is well above the designed control efficiency of at least 90% of the deodorizing units as stipulated in Condition 2.6 of the Environmental Permit No.EP-321/2008/B (EP). To conclude, the effectiveness of the odour control system complied with the design criteria and satisfies the EP requirements.

**Figure 3-1 Air sampling locations**



## 4 PPWQM Effluent quality Monitoring

### 4.1 Monitoring Methodology and Parameters

- 4.1.1 In accordance with Para 3.4.1.1 of the approved EM&A Manual, a one year impact monitoring of Post Project Water Quality Monitoring (PPWQM) programme shall be implemented after Project commissioning. Effluent quality monitoring is required as part of the PPWQM programme and shall be carried out during the operation phase of the upgraded PPSTW.
- 4.1.2 Para 1.2.1 of Appendix E of the approved EM&A Manual stated that two cycles of effluent sampling each of a full 24-hour period during both wet and dry seasons over the field work period of one year shall be carried out to characterize the quality of the treated effluent.
- 4.1.3 Operation Phase of the upgraded PPSTW was scheduled to commence on 15 August 2015, hence the one year operation phase monitoring period shall run from 15 August 2015 to 14 August 2016. The first wet season operation phase effluent quality monitoring was completed on 23 August 2015 and 24 August 2015. The first dry season operation phase effluent quality monitoring was completed on 9 November 2015 and 10 November 2015. Another dry season monitoring are scheduled in February 2016 and the second wet season effluent quality monitoring is scheduled in May 2016. The exact date of monitoring will be agreed with the Independent Environmental Checker (IEC) in due course.
- 4.1.4 Effluent monitoring parameters and frequency for effluent quality monitoring as agreed by the Director of Environmental Protection (DEP) are summarised in **Table 4-1**.

**Table 4-1 Effluent Quality Monitoring Parameters and Frequency**

Parameter (unit)	Type	Frequency
E.coli (CFU/1000mL)	Laboratory Analysis	Two cycles of a full 24-hour period during both wet and dry seasons. <sup>2</sup>
Biochemical Oxygen Demand (mg/L)		
Suspended Solids (SS) (mg/L)		
Ammonia as N (mg/L)		
Total Nitrogen as N (mg/L)		
Total Nitrogen as N – Filtered (mg/L)		
Total Phosphorous as P (mg/L)		
Total Phosphorous as P – Filtered (mg/L)		
Total Organic Carbon (mg/L)		
Aluminum (Al) (µg/L)		
Boron (B) (µg/L)		
Iron (Fe) (µg/L)		

2. The proposal included the appropriate time intervals over the 24 hour period and analysed for a range of variables were endorsed by IEC on 16 November 2012 and approved by EPD on 5 March 2013.

Parameter (unit)	Type	Frequency
Mercury (Hg) (µg/L)		
Arsenic (As) (µg/L)		
Barium (Ba) (µg/L)		
Cadmium (Cd) (µg/L)		
Chromium (Cr) (µg/L)		
Copper (Cu) (µg/L)		
Lead (Pb) (µg/L)		
Manganese (Mn) (µg/L)		
Nickel (Ni) (µg/L)		
Silver (Ag) (µg/L)		
Vanadium (V) (µg/L)		
Zinc (Zn) (µg/L)		

4.1.5 All laboratory analyses were carried out by ALS Technichem (HK) Pty Limited and The Chinese Manufacturers Association (CMA) of Hong Kong. Both two laboratories are HOKLAS accredited laboratory.

4.1.6 A composite sample of treated effluent was collected by an auto sampler (Hach Sigma AWRS Sampler) on a half-hourly basis over a 24-hour period. The sample was then stored in insulated containers with ice packs to maintain a dark and below 4°C condition without freezing. All collected samples were delivered to the testing laboratory within 24 hours of sampling.

## 4.2 Monitoring Stations

4.2.1 Effluent quality monitoring was carried out at the effluent outlet of the PPSTW as shown in **Figure 4-1**.

## 4.3 Sampling Equipment

4.3.1 An auto effluent sampler, Hach Sigma AWRS Sampler, as shown in **Photo 4-1** was installed at the site for collection of effluent sample for laboratory analysis. Details of the sampler are provided in **Table 4-2**.

**Photo 4-1 Hach Sigma AWRS Sampler**



**Table 4-2 Effluent Quality Monitoring Equipment**

Equipment	Brand and Model	Serial Number
Hach Sigma AWRS Sampler	Hach Sigma AWRS Sampler Model 3542SDRH	131000484113

**Effluent Sampling Procedures**

- i. The power supply was checked to ensure the sampler works properly.
- ii. The polyethylene sampling bottles were installed properly in the sampler and were cleaned for up to 3 times with source liquid prior to sample collection.
- iii. The auto sampler automatically collected treated effluent in sampling bottle from the discharge outlet of the PPSTW on an half-hourly basis over 24-hours period.
- iv. Technician gathered 24 hourly treated effluent samples and mixed all samples up in a bucket.
- v. A composite effluent sample was collected from the bucket and stored in appropriate containers with suitable preservative as provided by the laboratory.
- vi. The samples were sent to HOKLAS accredited laboratory immediately for analysis.

**4.4 Effluent Discharge Assumptions and Limit**

4.4.1 As presented in Table 4.13 of the approved EIA report and repeated in **Table 4-3** below, effluent loadings from the upgraded PPSTW were assumed and used to assess the potential impact to the receiving marine water.

**Table 4-3 Assumed Effluent Loadings from the Upgraded PPSTW in the EIA Report**

	TSS (mg/L)	BOD <sub>5</sub> (mg/L)	E. coli (counts/100mL)
Effluent Loadings at 95 Percentile	120	180	300,000

4.4.2 As presented in **Table 4-4** below, effluent loadings from the upgraded PPSTW were assumed and used to assess the potential impact to the receiving marine water.

**Table 4-4 Effluent Loadings from the Upgraded PPSTW in Water Discharge license**

	TSS (mg/L)	BOD <sub>5</sub> (mg/L)	E. coli (counts/100mL)
Effluent Loadings at 95 Percentile	120	180	300,000
Upper Limit	240	360	#20,000

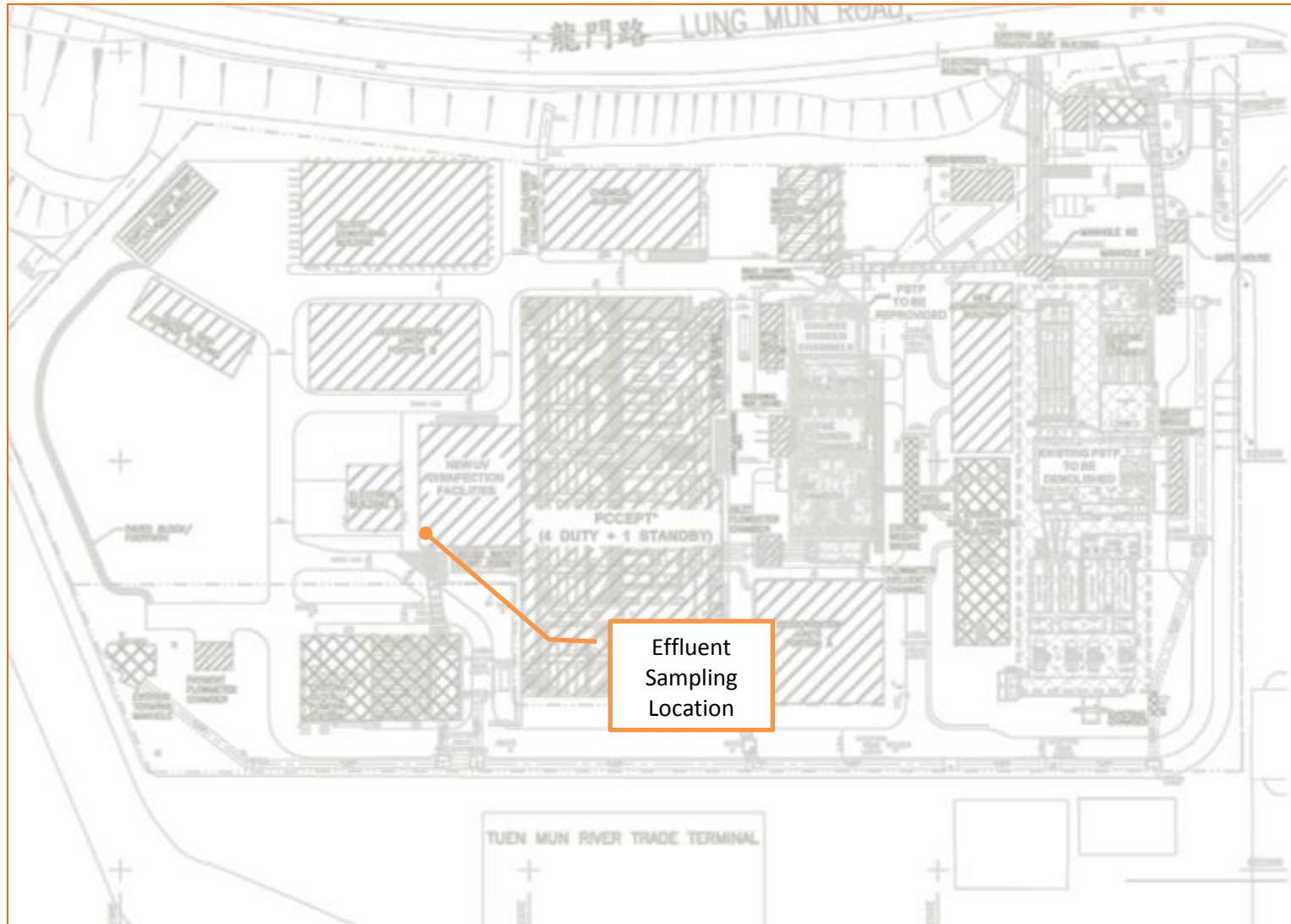
#: The upper limit is monthly geometric mean.

## 4.5 Monitoring Results

- 4.5.1 No effluent sampling was carried out during the reporting month. The next monitoring is scheduled from 3 February 2016 to 4 February 2016.



**Figure 4-1** Monitoring Locations for Effluent Quality Monitoring



## 5 PPWQM WATER QUALITY MONITORING

### 5.1 Monitoring Methodology and Parameters

- 5.1.1 In accordance with Section 3.4.1.1 of the final EM&A Manual, PPWQM programme shall be implemented during first year of the Operation Phase of the upgraded PPSTW.
- 5.1.2 Section 1.3.1 of Appendix E of the final EM&A Manual stated that water quality monitoring should be performed four times over the field work period of one year to give adequate coverage of different tidal states during both wet and dry seasons. The operation phase of Upgraded PPSTW commenced on 15 August 2015, hence the one year field work shall run from 15 August 2015 to 14 August 2016. The first wet season and dry season operation phase water quality monitoring were completed on 26 August 2015 and on 5 November 2015 respectively. The second dry season water quality monitoring is scheduled in February 2016, and the second wet season operation phase water monitoring works is scheduled in May 2016. Exact dates of monitoring will be agreed with the IEC in due course.
- 5.1.3 Water monitoring parameters, frequency and water depths for water quality monitoring as agreed with the Director of Environmental Protection (DEP) <sup>[Ref. #3]</sup> are summarised in **Table 5-1**.

**Table 5-1 Water Quality Monitoring Parameters, Frequency and Water Depth**

Parameter (unit)	Type	Frequency	Water Depth
Temperature (°C)	In situ Measurement	Mid-flood tide and Mid-ebb tide	<ul style="list-style-type: none"> <li>• If water depth &gt;6m, 1m below water surface, mid-depth and 1m above seabed</li> <li>• If water depth &lt;6m, and &gt;3m, 1m below surface and 1m above seabed</li> <li>• If water depth &lt;3m, mid-depth only</li> </ul>
Turbidity (NTU)			
pH			
DO (mg/L and %)			
Salinity (ppt)			
E.coli (CFU/100mL)	Laboratory Analysis		
BOD (mg/L)			
SS (mg/L)			
Nitrate (mg/L)			
Nitrite (mg/L)			
Total Nitrogen as N (mg/L)			
Total Nitrogen as N – Filtered (mg/L)			
Total Phosphorous as P (mg/L)			
Total Phosphorous as P – Filtered (mg/L)			
Ammonia (mg/L)			

- 5.1.4 All laboratory analyses were carried out by ALS Technichem (HK) Pty Limited, which is a HOKLAS accredited laboratory.

3. Via Drainage Services Department's letter memo dated 7 Dec 2012 (ref.: DSD SS 8/4329DS/CE200251/17) and Environmental Department's letter dated 5 March 2013 (ref.: (9) in Ax (11) to EP2/N4/F/34 Pt. 9)

5.1.5 Samples were stored in appropriate containers provided in advance by the testing laboratory. The containers were immediately sealed and labelled. Sample ID and sampling date were marked on each sample. The samples were then stored in insulated containers with ice packs to maintain a dark and below 4°C condition without freezing. All collected samples were delivered to the testing laboratory within 24 hours of sampling.

## 5.2 Monitoring Stations

5.2.1 As agreed with DEP, water quality monitoring was carried out at 11 monitoring stations as shown in **Table 5-2**. Locations are shown in **Figure 5-1**.

**Table 5-2 Monitoring Locations for Water Quality Monitoring**

Station ID	Description of Location	Co-ordinates	
		Easting	Northing
B1	Butterfly Beach	813517.1	825825.6
B2	Castle Peak Beach	815779.2	826530.7
B3	Kadoorie Beach	816098.4	826328.0
B4	Cafeteria Old Beach	816310.1	826240.2
B5	Cafeteria New Beach	816751.8	825888.4
B6	Golden Beach	816813.5	825493.2
WSD1	Flushing Water Intake near Butterfly Beach	813103.0	825511.1
WSD2	Flushing Water Intake near LRT Terminus	815241.3	825860.0
U2	Secondary Contact Recreation Subzone at Lung Kwu Tan	809704.9	827855.5
NM6	Control Station	820121.5	807822.1
NM1	Control Station	823025.4	820503.9

## 5.3 Monitoring Equipment

5.3.1 The equipment used for water quality monitoring was listed in **Table 5-3**.

**Table 5-3 Water Quality Monitoring Equipment**

Equipment	Model	Serial Number
Multiparameter sonde	YSI Sonde 6920 v2	11F100014

## 5.4 Action and Limit Levels

5.4.1 The Action and Limit Levels for the water quality monitoring was established by using the baseline water monitoring data which carried out before commissioning of the upgraded PPSTW for each monitoring locations. The Action and Limit Levels are showed in **Table 5-4**.

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## 5.5 Monitoring Results and Observations

- 5.5.1 No water quality monitoring was carried out during the reporting month. The next water quality monitoring is scheduled on 18 February 2016.

**Table 5-4 Action and Limit Levels for Water Quality**

Parameters	Detection Limit	Dry Season (October to March)		Wet Season (April to September)	
		Action Level *	Limit Level **	Action Level *	Limit Level **
DO in mg/L	0.01	6.39 (Surface & Middle) 6.25 (Bottom)	6.22 (Surface & Middle) 6.15 (Bottom)	5.14 (Surface & Middle) 4.51 (Bottom)	4.84 (Surface & Middle) 4.49 (Bottom)
DO in %age	0.1	90.0 (Surface & Middle) 88.6 (Bottom)	87.7 (Surface & Middle) 87.2 (Bottom)	74.7 (Surface & Middle) 65.9 (Bottom)	70.6 (Surface & Middle) 65.6 (Bottom)
Turbidity in NTU	0.1	6.8	9.4	6.8	8.4
Salinity in ppt	0.01	31.98	32.15	29.66	30.06
E.coli count	1	90	102	333	1002
BOD in mg/L	2	2	3	2	>2
SS in mg/L	2	11	14	9	13
Nitrate in mg/L	0.01	0.52	0.85	0.7	0.72
Nitrite in mg/L	0.01	0.18	0.29	0.11	0.14
Total Nitrogen in mg/L	0.1	1.2	1.6	1.3	1.4
Total Phosphorous in mg/L	0.1	0.1	>0.1	0.1	>0.1
Ammonia in mg/L	0.01	0.18	0.21	0.21	0.24

**Note:**

\* Action Levels were derived based on 95 percentile of baseline data. If baseline monitoring results were found to be below the detection limit, the detection was used as the Action Level or for calculation of the 95th percentile. During impact monitoring, 120% of upstream control station value at the same tide on the same day shall also be used as the Action Level for assessment of the monitoring results.

\*\* Limit Levels were derived based on 99 percentile of baseline data. If baseline monitoring results were found to be below the detection limit, the detection was used as the Limit level or for calculation of the 99th percentile. During impact monitoring, 130% of upstream control station value at the same tide on the same day shall also be used as the Limit Level for assessment of the monitoring results.

**Figure 5-1** Monitoring Locations for Water Quality Monitoring



## 6 PPWQM BENTHIC SURVEY

### 6.1 Monitoring Methodology and Parameters

- 6.1.1 In accordance with Para 3.4.1.1 of the approved EM&A Manual, Post Project Water Quality Monitoring programme was implemented during the first year of Operation Phase. Benthic Survey shall be carried out as part of PPWQM programme during the first year of operation phase of the upgraded PPSTW.
- 6.1.2 Para 1.5.1 of Appendix E of the approved EM&A Manual stated that benthic survey should be performed four times over the field work period of one year, in parallel with the sediment sampling, covering both wet and dry season.
- 6.1.3 The operation of Upgraded PPSTW is scheduled to commence on 15 August 2015, hence the one year operation phase monitoring period shall run from 15 August 2015 to 14 August 2016. The first wet season operation phase benthic survey was carried out on 15 August 2015 and the first dry season operation phase benthic survey was carried out on 14 November 2015 together with sediment quality sampling. The second season benthic surveys are scheduled in February 2016, and the second wet season operation phase benthic survey is scheduled in May 2016. The exact day of monitoring will be agreed with the IEC in due course.
- 6.1.4 The collected benthos samples were analysed for the below parameters through Field Sampling and Laboratory Work:
- Species composition to the lowest taxonomic level.
  - Benthic community structure.

#### Field Sampling

- 6.1.5 At each monitoring station, five replicates of sediment samples were collected using a 0.1m<sup>2</sup> van Veen grab. Collected samples were accepted when at least two-third of grab volume was filled. A photographic record of the sediment texture and colour was taken. The samples were washed with gentle seawater through a plastic box with sieve of 0.5mm mesh size. Large animals that were visible from the residues were hand-picked into a small plastic vial. All remains were transferred into a plastic container for temporary storage.

#### Laboratory Work

- 6.1.6 The samples were delivered to laboratory within two hours of completion of field works. The samples were preserved with 70% ethanol solution followed by staining with 1% Rose Bengal solution. The samples were stored for one day to ensure sufficient preservation and staining. The fauna collected were sorted out from the sediment residues. For quality assurance, the sediment residues of one-third sorted samples were randomly rechecked. No missed fauna was found in the recheck.
- 6.1.7 The collected specimens were identified to the lowest taxonomic resolution. Examination of the morphological features of the specimens was undertaken with the aid of both stereoscopic and compound microscopes.

- 6.1.8 The taxonomic classification was conducted according with the following references: Polychaetes: Day (1967)<sup>[Ref.#4]</sup>, Gallardo (1967)<sup>[Ref.#5]</sup>, Fauchald (1977)<sup>[Ref.#6]</sup>, Yang and Sun (1988)<sup>[Ref.#7]</sup>, Wu et al. (1997)<sup>[Ref.#8]</sup>, Sun and Yang (2004)<sup>[Ref.#9]</sup>; Arthropods: Dai and Yang (1991)<sup>[Ref.#10]</sup>, Dong (1991)<sup>[Ref.#11]</sup>; and Molluscs: Qi (2004)<sup>[Ref.#12]</sup>. The number of individuals of each species was recorded by counting the anterior portions of the fauna only. Total biomass of each species was determined as preserved wet weight, after blotting the animals on filter paper for 3 minutes before weighing to the nearest 0.0001g.

### Data Analysis

- 6.1.9 Data collected from five replicate samples at every monitoring station were pooled together for data analysis. Shannon-Weaver Diversity Index ( $H'$ ) and Pielou's Species Evenness ( $J$ ) were calculated using the formulae below,

$$H' = -\sum (N_i / N) \ln (N_i / N) \quad (\text{Shannon and Weaver, 1963})$$

$$J = H' / \ln S \quad (\text{Pielou, 1966})$$

where  $S$  is the total number of species in the sample,  $N$  is the total number of individuals, and  $N_i$  is the number of individuals of the  $i^{\text{th}}$  species

## 6.2 Monitoring Stations

- 6.2.1 In accordance with Para 1.5.1 of Appendix E of the approved EM&A Manual, benthic survey was undertaken in parallel with sediment sampling using the same monitoring stations. Nine of the stations represented the sensitive receivers which could potentially be affected by the untreated or partially treated effluent from the PPSTW (B1 to B6: gazetted beaches; WSD1 to WSD2: flushing water intake points and U2: secondary contact recreation subzone).
- 6.2.2 Stations NM1 and NM6 were control stations locating outside the influence zone of the emergency discharge as predicted by the water quality modelling and would unlikely be affected by the PPSTW.
- 6.2.3 During the benthic survey, slight adjustments to the location of seven of the monitoring stations were necessary due to shallow water near the shore that made the original locations inaccessible by the sampling vessel. The revised co-ordinates are provided in **Appendix E** for reference.

- 
- Day, J.H., 1967. A monograph on the polychaeta of South Africa. Trustees of the British Museum, London.
  - Gallardo, V., 1967. Polychaeta from the Bay of Nha Trang, South Viet Nam. In: Scientific Results of Marine Investigations of the South China Sea and the Gulf of Thailand 1959-1961, Naga Report 4(3). Scripps Institution of Oceanography, University of California Press. La Jolla, California, 35-279.
  - Fauchald, K., 1977. The polychaete worms. Definitions and keys to the orders, families and genera. Natural History Museum of Los Angeles County, Science Series 28. Los Angeles, U.S.A.
  - Yang, D.J., Sun, R.P., 1988. Polychaetous annelids commonly seen from the Chinese waters (Chinese version). China Agriculture Press, China.
  - Wu, B.L., Wu, Q.Q., Qiu, J.W., Lu, H., 1997. Fauna Sinica, Phylum Annelida, Class Polychaeta, Order Phyllodocimorpha. Science Press. Beijing.
  - Sun, R.P., Yang, D.J., 2004. Fauna Sinica. Phylum Annelida. Class Polychaeta II, Order Nereidida. Science Press. Beijing.
  - Dai, A.Y., Yang, S.L., 1991. Crabs of the China Seas. China Ocean Press. Beijing.
  - Dong, Y.M., 1991. Fauna of ZheJiang Crustacea. Zhejiang Science and Technology Publishing House. Zhejiang.
  - Qi, Z.Y., 2004. Seashells of China. China Ocean Press. Beijing, China.



### 6.3 Monitoring Equipment

6.3.1 A 0.1m<sup>2</sup> van Veen grab, as shown in *Photo 6-1*, was used to collect sediment samples for laboratory analysis.

**Photo 6-1 Van Veen Grab Sampler**



### 6.4 Dry Season Baseline Ecological Status of the Benthic Communities

6.4.1 The results will be comparing to the dry season mean benthic baseline survey results which were conducted in dry season before commissioning of the upgraded PPSTW at each monitoring locations. The mean of the benthic survey conduct during baseline were showed in *Table 6-1*.

**Table 6-1 Benthic Survey Dry Season Baseline Results Summary**

Station ID	Mean				
	Number of Species (spp. 0.5m <sup>2</sup> )	Density (ind. m <sup>-2</sup> )	Biomass (g m <sup>-2</sup> )	Shannon weaver Diversity index H'	Pielou's Species Evenness J
B1	19	66	10.46	2.58	0.91
B2	4	8	0.37	1.35	1.00
B3	5	10	2.01	1.47	0.98
B4	7	17	1.40	1.74	0.97
B5	7	23	3.21	1.70	0.91
B6	9	37	6.22	1.66	0.91
WSD1	20	132	84.89	2.46	0.88
WSD2	16	171	69.70	1.53	0.68
U2	18	73	15.65	2.42	0.84
NM1	27	490	60.92	1.82	0.56
NM6	21	147	14.62	2.45	0.89

---

## 6.5 Monitoring Results

- 6.5.1 No benthic survey was carried out during the reporting month. The next benthic survey is scheduled on 21 February 2016.

## 7 PPWQM SEDIMENT QUALITY MONITORING

### 7.1 Monitoring Methodology and Parameters

- 7.1.1 In accordance with Section 3.4.1.1 of the final EM&A Manual, PPWQM programme shall be implemented during first year of the Operation Phase of the upgraded PPSTW.
- 7.1.2 Para 1.4.1 of Appendix E of the approved EM&A Manual stated that sediment quality monitoring should be performed four times over the field work period of one year to give adequate coverage of different tidal states during both wet and dry seasons.
- 7.1.3 The operation of Upgraded PPSTW is scheduled to commence in 15 August 2015, hence the one year operation phase monitoring period shall run from 15 August 2015 to 14 August 2016. The first wet season and dry season operation phase sediment quality monitoring were completed on 15 August 2015 and 15 November 2015 respectively. The second dry season sediment quality monitoring is scheduled in February 2016, and the second wet season operation phase sediment quality monitoring is scheduled in May 2016. The exact day of monitoring will be agreed with the IEC in due course.
- 7.1.4 **Table 7-1** summarizes the monitoring parameters agreed with the DEP and reference measurement methods.

**Table 7-1 Sediment Quality Monitoring Parameters and Measurement Methods**

Parameter	Method Reference / Technique <sup>13</sup>
Percentage of Silt/ Clay	BS 1377
pH Value	APHA 4500H: B
Acid Volatile Sulphide (AVS)	Allen H.E. et al , 1991
Total Volatile Solids (TVS)	APHA 2540 G
Total Organic Carbon (TOC)	APHA 5310 B
Ammonia (NH <sub>4</sub> -N)	APHA 4500NH3: B&C
Total Nitrogen	APHA 4500Norg: D APHA 4500NO3: I
Total Phosphorus	APHA 4500P: B&H
Aluminium, Arsenic, Barium, Boron, Cadmium, Copper, Chromium, Lead, Manganese, Nickel, Silver, Vanadium, Zinc	USEPA 6020A
Iron	USEPA 6010A
Mercury	APHA 3112B

- 7.1.5 All laboratory analysis was carried out by ALS Technichem (HK) Pty Limited, which is a HOKLAS accredited laboratory.

<sup>13</sup> The proposal included the sampling locations and analysis of sediment samples to be conducted were endorsed by IEC on 16 November 2012 and approved by EPD on 5 March 2013.

- 7.1.6 Samples were stored in appropriate containers provided in advance by the testing laboratory. The containers were immediately sealed and labelled. Sample ID and sampling date were marked on each sample. The samples were then stored in insulated containers with ice packs to maintain a dark and below 4°C condition without freezing. All collected samples were collected by the testing laboratory within 24 hours of sampling.

## 7.2 Monitoring Stations

- 7.2.1 As agreed with the DEP, the sediment quality monitoring were carried out at the same 11 monitoring stations as for water quality monitoring, as shown in [Table 5-2](#) and in [Figure 5-1](#).
- 7.2.2 During the sediment sampling, slight adjustments to the location of seven of the monitoring stations were necessary due to shallow water near the shore that made the original locations inaccessible by the sampling vessel. The revised co-ordinates of the seven monitoring stations (B1, B3 to B6, WSD1 and U2) are provided in [Appendix E](#) for reference. As far as reasonably practicable, the relocated sampling points were chosen at the closest possible locations from the original locations. The relocated stations were 73 to 341m from the original co-ordinates with similar water depth (difference <1.0m). Hence the sediment quality monitoring data can be aligned with the water quality data.

## 7.3 Monitoring Equipment

- 7.3.1 A 0.1m<sup>2</sup> van Veen grab, same as the equipment used for benthic survey in [Section 6.3](#) used for sample collection.

## 7.4 Action and Limit Levels

- 7.4.1 The Action and Limit Levels for the sediment quality monitoring was established by using the baseline sediment monitoring data which carried out before commissioning of the upgraded PPSTW for each monitoring locations. The Action and Limit Levels were shown in [Table 7-2](#).

## 7.5 Monitoring Results and Observations

- 7.5.1 No sediment sampling was carried out during the reporting month. The next Sediment sampling is scheduled on 21 February 2016.

**Table 7-2 Action and Limit Levels for Sediment Quality**

Station ID	B1		B2		B3		B4		B5		B6		WSD1		WSD2		U2		NM1		NM6	
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
pH	7.8	7.8	7.8	7.8	7.8	7.8	8.0	8.0	7.9	7.9	8.1	8.1	8.1	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.1	8.1
Volatile Solids (%)	6.5	6.7	7.4	7.6	35.3	36.7	5.2	5.2	6.0	6.2	4.3	4.4	4.1	4.2	5.3	5.5	3.6	3.6	2.4	2.4	1.5	1.5
Acid Volatile Sulphides (mg/kg)	46	47	227	233	94	95	40	41	38	39	36	37	37	10	10	23	23	10	10	14	14	10
Ammonia (mg/kg)	10	10	20	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Nitrite + Nitrate (mg/kg)	0.5	0.5	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.2	0.2	0.2	0.2	0.4	0.4	1.0	1.0	0.2	0.2
Total Nitrogen (mg/kg)	1,090	1,098	1,237	1,239	1,236	1,239	999	1,000	968	970	843	849	590	590	680	688	657	667	631	638	435	439
Total Phosphorus (mg/kg)	551	554	603	605	631	633	526	528	533	537	439	442	324	324	373	374	459	459	362	364	448	458
Aluminium(mg/kg)	39,800	40,280	45,175	45,595	47,140	47,588	39,655	40,011	38,985	39,317	30,135	30,347	24,135	24,667	32,945	33,789	23,355	23,391	19,582	19,996	17,750	17,950
Boron(mg/kg)	31	31	35	35	33	33	26	26	26	26	21	21	20	20	25	26	23	23	24	24	13	13
Iron(mg/kg)	34,005	34,241	39,295	39,619	38,395	38,639	35,655	35,851	34,280	34,456	26,610	26,762	21,530	21,906	30,385	31,037	52,980	53,796	19,200	19,520	22,220	22,364
Mercury(mg/kg)	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Arsenic(mg/kg)	12	12	13	13	14	14	13	13	13	13	10	10	7	7	10	10	13	13	8	8	10	10
Barium(mg/kg)	49	49	56	57	56	56	46	46	45	45	36	36	30	30	65	66	30	31	35	36	23	24
Cadmium(mg/kg)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Chromium(mg/kg)	42	42	52	52	52	52	44	44	42	42	31	31	26	27	32	33	31	31	25	26	22	22
Copper(mg/kg)	40	40	81	81	65	65	49	49	45	45	32	32	25	26	54	56	26	26	24	25	13	13
Lead(mg/kg)	40	40	54	54	51	51	42	42	41	41	33	33	26	26	29	30	41	41	63	65	22	22
Manganese(mg/kg)	664	672	543	546	580	583	531	533	537	539	529	535	385	386	480	481	695	701	562	565	356	362
Nickel(mg/kg)	25	25	30	30	30	30	25	25	25	25	18	18	15	15	18	19	19	19	14	14	13	13
Silver(mg/kg)	0.5	0.5	0.7	0.7	0.7	0.7	0.5	0.5	0.6	0.6	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.1	0.1
Vanadium(mg/kg)	49	49	60	60	58	58	51	52	50	51	40	40	28	28	31	31	38	39	33	34	33	34
Zinc(mg/kg)	133	134	187	188	172	173	140	141	139	140	105	105	87	89	99	101	111	112	105	108	51	52
Total Organic Carbon(%)	1.08	1.09	1.44	1.44	1.26	1.27	0.97	0.97	1.09	1.10	0.82	0.83	0.81	0.83	1.19	1.22	0.94	0.96	1.01	1.02	0.44	0.45
Gravel (%)	10	10	0	0	0	0	1	1	1	1	9	9	22	22	16	17	3	3	33	34	10	10
Sand (%)	31	31	2	2	4	4	18	18	15	15	33	33	48	49	39	40	69	70	51	51	65	66
Silt (%)	37	37	63	63	61	61	57	58	57	57	39	39	24	24	43	44	34	35	18	19	26	27
Clay (%)	33	33	44	44	44	44	36	36	37	38	26	26	29	30	34	35	19	20	18	18	19	19

**Note:**  
 \* Action Levels were derived based on 95 percentile of baseline data and 120% of upstream control station value on the same day shall also be used as the Action Level for assessment of the monitoring results.  
 \*\* Limit Levels were derived based on 99 percentile of baseline data and 130% of upstream control station value on the same day shall also be used as the Limit Level for assessment of the monitoring results.

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## 8 LANDSCAPE AND VISUAL MONITORING

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- 8.1.1 In accordance with Section 5.4 of the final EM&A Manual, landscape and visual mitigation measures shall be monitored monthly during the first year of the Operational Phase to ensure the effectiveness of the mitigation measures. All measures undertaken by both the Contractor and their Landscape Contractor during the first year of the operational phase shall be audited by the registered landscape architect (RLA).
- 8.1.2 ERM Hong Kong Limited (ERM) has been commissioned to carry out the landscape and visual mitigation measures monitoring including the 12 months establishment period in the Operation Phase.

### 8.2 Monitoring Results and Recommendations

- 8.2.1 The landscape and visual monitoring was carried out on 7 January 2016. The Hong Kong Observatory's Tuen Mun Weather Station reported that the weather on the day of the monitoring was fine and cold. The weather condition during the period is provided in **Appendix G**.
- 8.2.2 The site inspection findings and recommendations made by the RLA are contained in the monthly Operational Phase Landscape & Visual Monitoring Report prepared by ERM is provided in **Appendix H**. The findings and recommendations also summarised in **Table 8-1**.
- 8.2.3 No non-compliance of the landscape and visual mitigation measures has been recorded in ERM's landscape and visual mitigation measures monitoring report.

**Table 8-1 Summary of Site Audit findings and recommendations**

Area of Works	Establishment Works Stage	
	Observation	Recommendation/Action
<i>Outstanding issues</i>		
<i>Issues Observed in this Audit</i>		
Within Pillar Point Sewage Treatment Works	Trees nos. 131, 133, 134 and 129 in ground floor garden were observed in poor condition during this site inspection.	<p>It is strongly recommended to provide sufficient watering and carry out necessary maintenance works for the Trees, Groundcover &amp; Lawn. (i.e.: Watering shall be carried out daily during the dry season, generally September to April.)</p> <p>Weeds should be removed by approved mechanical or manual means so as not to cause any damage.</p> <p>It is recommended to replace those groundcover/ Lawn in poor condition if no further improvement is observed for its health condition.</p>
Within Pillar Point Sewage Treatment Works	Compensatory trees were replaced during this site inspection.	-
Within Pillar Point Sewage Treatment Works	The non-abrasive nylon rope for securing the trees was observed to be too tight.	It is recommended to release or replace that non-abrasive nylon rope in tight or poor condition for its health condition.

## 9 CONCLUSION

9.1.1 In accordance with the EM&A Manual for the Upgrading of PPSTW, operation phase monitoring report is required on a monthly basis after the Project commissioning. The purpose of the operation phase monitoring report is to confirm the predictions of odour and water quality made in the EIA report and also ensure the effectiveness of the landscape and visual mitigation measure.

9.1.2 This is the 6<sup>th</sup> Monthly Operation Phase Monitoring Report which summarizes all environmental monitoring events carried out during post-commissioning period from 1 to 31 January 2016. A total of three monitoring events were carried out during the reporting period.

9.1.3 The exact dates of monitoring carried out are shown in **Table 9-1**, below:

**Table 9-1 Monitoring Dates During Reporting Month**

Monitoring Events	6 <sup>th</sup> Reporting Month Monitoring Period: 1 – 31 January 2016
Odour Monitoring	18/1/2016
H <sub>2</sub> S Monitoring	1/1/2016 - 31/1/2016 (continuous monitoring)
Landscape and Visual Monitoring	7/1/2016

9.1.4 The monitoring results carried out in reporting period were certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC) in accordance with the EM&A Manual.

9.1.5 All laboratory results satisfied the QA/QC requirements and all monitoring equipment was properly calibrated and has valid calibration certificates.

9.1.6 No exceedance of Action and Limit Level of odour monitoring was recorded at the monitoring location in the reporting month.

9.1.7 No exceedance of Action and Limit Level of odour emission monitoring was recorded at the monitoring location in the reporting month.

9.1.8 No non-compliance of the landscape and visual mitigation measures has been recorded.

9.1.9 No environmental complaint was reported during the reporting month.

9.1.10 The ET will keep track on the EM&A programme to ensure the compliance of environmental requirements and the proper implementation of all necessary mitigation measures.



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## APPENDIX A

### Nose Sensory Test Report

**SMEC ASIA LIMITED**



**REPORT ON  
NOSE SENSORY TEST**

(Project No. : 4101-10000535 #004)



Environmental Management Division  
Hong Kong Productivity Council

**Quality Index**

Date	Reference No.	Prepared by	Endorsed by
4 Sep 2014	10000535#004	KW Poon 	CHAU Kam Man, Grant 

*Nose Sensory Test*

*SMEC Asia Limited.*

## 1. COMPANY NAME AND NAME OF PANELISTS

Company name : SMEC Asia Limited  
Name of panelists : (1) Lee Hok Yan, Francis  
(2) Ma Man Wah, Winnie


## 2. OBJECTIVE

The objective of this study was to have a nose sensory test for SMEC Asia limited staff, Lee Hok Yan (Francis) and Ma Man Wah (Winnie), and report them if they are to be “certified panelists” according to the British Standard Method BS EN13725:2003.

## 3. TESTING DATES AND LOCATION

The dates of testing and testing location are summarized in Table 1:


**Table 1: Name of panelist, testing dates and testing location**

Name of panelist	Testing Dates	Testing location
Lee Hok Yan, Francis	(1) 21 May 2014 (2) 23 May 2014 (3) 01 September 2014	 4/F, Odour research laboratory , HKPC Building, 78 Tat Chee Avenue, Kowloon
Ma Man Wah, Winnie	(1) 21 May 2014 (2) 23 May 2014 (3) 01 September 2014	

## 4. METHODOLOGY OF MEASUREMENT

The methodology of the nose sensory test was listed in Table 2:

**Table 2: Methodology of the nose sensory test**

Description	Methodology	Photo
Nose sensory test	BS EN13725:2003:- (1) Odour concentration measurement (60 ppm n-butanol): Dynamic olfactometer (Model TO9, Ecoma) (2) Force choice method	 Olfactometer (Model TO9, Ecoma)

## 5. RESULTS OF THE TEST

The individual test results are summarized in Table 3 and Table 4.

**Table 3: Nose sensory test results for Lee Hok Yan, Francis**

<b>Name of panelist:</b>	Francis Lee			
<b>Company:</b>	SMEC			
<b>Reference material:</b>	60.00 ppm n-Butanol in nitrogen			
Date	Odour concentration OU <sub>E</sub> / m <sup>3</sup> (A)	ppb V/V (B) = (D)/(A)*1000	log ppb V/V (ITE) (C) = log(B)	n-Butanol μmol/mol (ppm) (D)
21/5/2014	724	82.9	1.9184	60.00
21/5/2014	724	82.9	1.9184	60.00
21/5/2014	362	165.7	2.2194	60.00
23/5/2014	724	82.9	1.9184	60.00
23/5/2014	724	82.9	1.9184	60.00
23/5/2014	724	82.9	1.9184	60.00
23/5/2014	1448	41.4	1.6174	60.00
1/9/2014	1448	41.4	1.6174	60.00
1/9/2014	724	82.9	1.9184	60.00
1/9/2014	724	82.9	1.9184	60.00
standard dev. (C)		s <sub>ITE</sub>		0.1709
mean value (C)		Y <sub>ITE</sub>		1.8883

Nose Sensory Test

SMEC Asia Limited.

repeatability requirement	$10^{s_{ITE}} \leq 2.3$		
accuracy requirement	$20 \leq$	$10^{y_{ITE}} \leq$	80
repeatability	1.482	$10^{s_{ITE}}$	Pass
accuracy	77.32	$10^{y_{ITE}}$	Pass

Where ITE is individual threshold estimates  
 S ITE is Standard deviation of individual threshold estimates  
 y ITE is Average of individual threshold estimates

Table 4: Nose sensory test results for Ma Man Wah, Winnie

Name of panelist: **Winnie Ma**  
 Company: **SMEC**  
 Reference material: **60.00** ppm n-Butanol in nitrogen

Date	Odour concentration OU <sub>E</sub> / m <sup>3</sup> (A)	ppb V/V (B) = (D)/(A)*1000	log ppb V/V (ITE) (C) = log(B)	n-Butanol μmol/mol (ppm) (D)
21/5/2014	724	82.9	1.9184	60.00
21/5/2014	724	82.9	1.9184	60.00
21/5/2014	1448	41.4	1.6174	60.00
23/5/2014	1448	41.4	1.6174	60.00
23/5/2014	1448	41.4	1.6174	60.00
23/5/2014	1448	41.4	1.6174	60.00
23/5/2014	1448	41.4	1.6174	60.00
23/5/2014	1448	41.4	1.6174	60.00
1/9/2014	1448	41.4	1.6174	60.00
1/9/2014	1448	41.4	1.6174	60.00
1/9/2014	1448	41.4	1.6174	60.00

standard dev. (C)       $s_{ITE}$       0.1269  
 mean value (C)       $y_{ITE}$       1.6776

repeatability requirement	$10^{s_{ITE}} \leq 2.3$		
accuracy requirement	$20 \leq$	$10^{y_{ITE}} \leq$	80

*Nose Sensory Test*

*SMEC Asia Limited.*

<b>repeatability</b>	<b>1.339</b>	<b><math>10^{s \text{ ITE}}</math></b>	<b>Pass</b>
<b>accuracy</b>	<b>47.60</b>	<b><math>10^{y \text{ ITE}}</math></b>	<b>Pass</b>

Where ITE is individual threshold estimates  
 S ITE is Standard deviation of individual threshold estimates  
 y ITE is Average of individual threshold estimates

\*All the results were calculated according to BS EN13725:2003.

## 6. DISCUSSION

Referring to the nose sensory test results, the following findings could be summarized:

- a. Both Lee Hok Yan, Francis and Ma Man Wah, Winnie of SMEC Asia Limited passed the repeatability and accuracy requirement of nose sensory test according to British standard method BS EN13725:2003.
- b. Both Lee Hok Yan, Francis and Ma Man Wah, Winnie of SMEC Asia Limited are certified panelists with effective from 01 September 2014 to 31 August 2015.

## 7. LIMITATION OF MEASUREMENT

The results obtained in this test are only representative of the nose sensory system at the specific time. The result should not be extrapolated to other conditions without caution. Please refer to code of behavior of BS EN13725:2003 for the details.

Environmental Management Division  
 Hong Kong Productivity Council

04 September 2014

**SMEC ASIA LIMITED**



**REPORT ON  
NOSE SENSORY TEST**

(Project No. : 4101-10000535 #047)



Environmental Management Division  
Hong Kong Productivity Council

**Quality Index**

Date	Reference No.	Prepared by	Endorsed by
03 July 2015	10000535#047v2	KW Poon 	CHAU Kam Man, Grant 

*Nose Sensory Test*

*SMEC Asia Limited.*

## 1. COMPANY NAME AND NAME OF PANELISTS

Company name : SMEC Asia Limited  
Name of panelists : (1) Cheung Man Kit  
(2) Lee Hok Yan, Francis

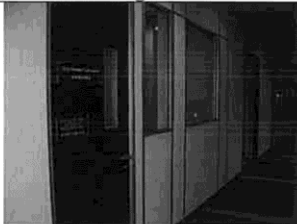
## 2. OBJECTIVE

The objective of this study was to have a nose sensory test for SMEC Asia limited staff, Cheung Man Kit and Lee Hok Yan (Francis), and report them if they are to be “certified panelists” according to the British Standard Method BS EN13725:2003.

## 3. TESTING DATES AND LOCATION

The dates of testing and testing location are summarized in Table 1:

**Table 1: Name of panelist, testing dates and testing location**

Name of panelist	Testing Dates	Testing location
Cheung Man Kit	(1) 29 April 2015 (2) 05 May 2015 (3) 10 May 2015	 4/F, Odour research laboratory , HKPC Building, 78 Tat Chee Avenue, Kowloon
Lee Hok Yan, Francis (Re-certified)	(1) 10 May 2015	

## 4. METHODOLOGY OF MEASUREMENT


The methodology of the nose sensory test was listed in Table 2:



Nose Sensory Test

SMEC Asia Limited.

**Table 2: Methodology of the nose sensory test**

Description	Methodology	Photo
Nose sensory test	BS EN13725:2003:- (1) Odour concentration measurement (60 ppm n-butanol): Dynamic olfactometer (Model TO9, Ecoma) (2) Force choice method	 Olfactometer (Model TO9, Ecoma)

## 5. RESULTS OF THE TEST

Certified 60ppm/v standard n-butanol gas was applied as reference material and the n-butanol thresholds in the range of 20 to 80 ppb/v (accordance with BS EN13725:2003) was determined as follows (Table 3):-

**Table 3: Nose sensory test results**

Odour panelist	Repeatability	Accuracy	Pass/ Fail
	(Requirement: Repeatability $\leq 2.3$ )	(Requirement: $20 \leq \text{Accuracy} \leq 80$ )	
Cheung Man Kit	2.28	79.25	Pass
Lee Hok Yan, Francis	1.45	77.81	Pass

\*The requirements followed BS EN13725:2003.

## 6. DISCUSSION

Referring to the nose sensory test results, the following findings could be summarized:

- a. Both Cheung Man Kit and Lee Hok Yan, Francis of SMEC Asia Limited passed the repeatability and accuracy requirement of nose sensory test according to British standard method BS EN13725:2003.
- b. Both Cheung Man Kit and Lee Hok Yan, Francis of SMEC Asia Limited are certified panelists with effective from 10 May 2015 to 09 May 2016.

*Nose Sensory Test*

*SMEC Asia Limited.*

## **7. LIMITATION OF MEASUREMENT**

The results obtained in this test are only representative of the nose sensory system at the specific time. The result should not be extrapolated to other conditions without caution. Please refer to code of behavior of BS EN13725:2003 for the details.

Environmental Management Division  
Hong Kong Productivity Council

03 July 2015

*Environmental Management Division  
Hong Kong Productivity Council*

*HKPC/4101/10000535/047/150604kw  
Page 3*

## APPENDIX B

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### Odour Monitoring Results and Field Record Sheet

### Summary of Odour Intensity (OI) at Each Monitoring Location

Date	Period	ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour Intensity		Odour Characteristics
							Panellist 1	Panellist 2	
18-January-16	Daytime (14:57-15:25)	A1	River Trade Terminal Office	15:07	S	1.7	0	0	-
		A2	Chu Kong Warehouse 1	15:03	SW	1.0	0	0	-
		A3	Chu Kong Warehouse 2	15:04	SW	0.1	0	0	-
		A4	Wai Sang Sawmill Ltd.	15:02	SW	0.1	0	0	-
		A5	Pillar Point Fire Station	15:01	SW	0.1	0	0	-
		A6	Sunhing Hung Kai Tuen Mun Godown	14:57	W	1.1	0	0	-
		A7	EMSD Servicing Vehicle Station	15:11	N	0.3	0	0	-
		S1	Northern Site Boundary	15:15	W	1.9	0	0	-
		S2	Eastern Site Boundary	15:25	NW	0.1	0	0	-
		S3	Southern Site Boundary	15:23	SW	0.4	0	0	-
		S4	Western Site Boundary	15:20	NW	0.1	0	0	-
		18-January-16	Evening (17:00-17:28)	A1	River Trade Terminal Office	17:16	N	0.1	0
A2	Chu Kong Warehouse 1			17:07	SW	0.2	0	0	-
A3	Chu Kong Warehouse 2			17:06	SW	2.4	0	0	-
A4	Wai Sang Sawmill Ltd.			17:03	SW	0.1	0	0	-
A5	Pillar Point Fire Station			17:04	S	0.1	0	0	-
A6	Sunhing Hung Kai Tuen Mun Godown			17:00	W	0.1	0	0	-
A7	EMSD Servicing Vehicle Station			17:13	N	0.1	0	0	-
S1	Northern Site Boundary			17:19	W	0.7	0	0	-
S2	Eastern Site Boundary			17:28	N	0.1	0	0	-
S3	Southern Site Boundary			17:25	E	0.1	0	0	-
S4	Western Site Boundary			17:23	N	0.1	0	0	-

Upgrading of Pillar Point STW - Investigation, Design and Construction  
 Operation Period EM&A - Odour Patrol Record Sheet



Date	18/01/2016
HKO Monitoring Location	Tuen Mun
Weather	Sunny
Temperature	18°C
Humidity	low

- Odour Intensity (OI)
- 0- Not detected and an odour so weak that it cannot be easily characterized and described.
  - 1- Slight identifiable odour and slight chance to have odour nuisance.
  - 2- Moderate identifiable and moderate chance to have odour nuisance.
  - 3- Strong identifiable, likely to have odour nuisance.
  - 4- Extreme severe odour and unacceptable odour level.

ID	Location	Daytime Period: 14:57 - 15:25					Evening Period: 17:00 - 17:28				
		Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics	Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics
A1	River Trade Terminal Office	15:07	S	1.7	0	—	<del>17:16</del>	N	0.1	0	—
A2	Chu Kong Warehouse 1	15:03	SW	1.0	0	—	17:07	SW	0.2	0	—
A3	Chu Kong Warehouse 2	15:04	SW	0.1	0	—	17:06	SW	2.4	0	—
A4	Wai Sang Sawmill Ltd.	15:02	SW	0.1	0	—	17:03	SW	0.1	0	—
A5	Pillar Point Fire Station	15:01	SW	0.1	0	—	17:04	S	0.1	0	—
A6	Sunhing Hung Kai Tuen Mun Godown	14:57	SW	1.1	0	—	17:00	W	0.1	0	—
A7	EMSD Servicing Vehicle Station	15:11	N	0.3	0	—	17:13	N	0.1	0	—
S1	Northern Site Boundary	15:15	W	1.9	0	—	17:19	W	0.7	0	—
S2	Eastern Site Boundary	15:25	NW	0.1	0	—	17:28	N	0.1	0	—
S3	Southern Site Boundary	15:23	SW	0.4	0	—	17:25	E	0.1	0	—
S4	Western Site Boundary	15:20	NW	0.1	0	—	17:23	N	0.1	0	—

I declare that the below requirements as listed in Clauses 2.3.1.9 and 2.7 of the final EM&A Manual are complied with:

- passing the nose sensory test;
- being free from any respiratory illnesses;
- no smoking, eating, drinking (except water) or using chewing gum or sweets 30 min before and during odour intensity analysis;
- taking great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics;
- no communication with each other about the results of our choices; and
- not normally working at or live in the areas in the vicinity of PPSTW.

	<u>Name</u>	<u>Signature</u>	<u>Date</u>
Recorded By:	Man Cheung	<i>Man Cheung</i>	18-1-2016
Checked By:	Vivian Chan	<i>Vivian Chan</i>	19-1-16

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Upgrading of Pillar Point STW - Investigation, Design and Construction  
 Operation Period EM&A - Odour Patrol Record Sheet



Date	18 January 2016
HKO Monitoring Location	Tuen Mun
Weather	Sunny
Temperature	18°C
Humidity	low

Odour Intensity (OI)

- 0- Not detected and an odour so weak that it cannot be easily characterized and described.
- 1- Slight identifiable odour and slight chance to have odour nuisance.
- 2- Moderate identifiable and moderate chance to have odour nuisance.
- 3- Strong identifiable, likely to have odour nuisance.
- 4- Extreme severe odour and unacceptable odour level.

ID	Location	Daytime Period: 14:57 - 15:25				Evening Period: 17:00 - 17:28					
		Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics	Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics
A1	River Trade Terminal Office	15:07	S	1.7	0	/	17:16	N	0.1	0	/
A2	Chu Kong Warehouse 1	15:03	SW	1	0	/	17:07	SW	0.2	0	/
A3	Chu Kong Warehouse 2	15:04	SW	0.1	0	/	17:05	SW	2.4	0	/
A4	Wai Sang Sawmill Ltd.	15:02	SW	0.1	0	/	17:03	SW	0.1	0	/
A5	Pillar Point Fire Station	15:01	SW	0.1	0	/	17:04	S	0.1	0	/
A6	Sunhing Hung Kai Tuen Mun Godown	14:57	W	1.1	0	/	17:00	W	0.1	0	/
A7	EMSD Servicing Vehicle Station	15:11	N	0.3	0	/	17:13	N	0.1	0	/
S1	Northern Site Boundary	15:15	W	1.9	0	/	17:19	W	0.7	0	/
S2	Eastern Site Boundary	15:23	NW	0.1	0	/	17:28	N	0.1	0	/
S3	Southern Site Boundary	15:23	SW	0.4	0	/	17:25	NW	0.1	0	/
S4	Western Site Boundary	15:20	NW	0.1	0	/	17:23	N	0.1	0	/

I declare that the below requirements as listed in Clauses 2.3.1.9 and 2.7 of the final EM&A Manual are complied with:

- passing the nose sensory test;
- being free from any respiratory illnesses;
- no smoking, eating, drinking (except water) or using chewing gum or sweets 30 min before and during odour intensity analysis;
- taking great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics;
- no communication with each other about the results of our choices; and
- not normally working at or live in the areas in the vicinity of PPSTW.

	Name	Signature	Date
Recorded By:	Francis Lea		18-1-2016
Checked By:	Virgia Chan		17-1-16

707134 | Odour Patrol Record Sheet | Revision No. 1

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## APPENDIX C

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### Monitoring Equipment Calibration Certificates



**FireMark Hong Kong Limited.**  
瑞志香港有限公司

## Calibration Certificate

Number: CCS/64926A

Customer: ATAL-Degremont Joint Venture  
Contact Person: Mr. Gary Chan  
System Model: "Crowcon" Gasmonitor Plus Control Panel  
Detector Model: "Crowcon" Xgard Type 1 H2S Gas Detector  
Plant Address: DOUA at DSD Pillar Point Sewage Treatment Works

Channel Number	Sensor Type	Measuring Range	Serial Number	Alarm 1	Alarm 2	Calibration Gas	Result
1	H2S	0 to 100ppm	AE8124	100	100	100ppm	Passed
2	H2S	0 to 50ppm	AE8134A	50	50	50ppm	Passed
3	H2S	0 to 50ppm	AE8134B	50	50	50ppm	Passed
4	H2S	0 to 10ppm	AE8141A	10	10	10ppm	Passed
5	H2S	0 to 10ppm	AE8141B	10	10	10ppm	Passed
6	H2S	0 to 10ppm	AE8107A	10	10	10ppm	Passed
7	H2S	0 to 10ppm	AE8107B	10	10	10ppm	Passed
8	H2S	0 to 10ppm	AE8107C	10	10	10ppm	Passed
9	H2S	0 to 10ppm	AE8107D	10	10	10ppm	Passed
10	H2S	0 to 10ppm	AE8107D	10	10	10ppm	Passed

**Remarks:** Instrument PASSED – fit for service.

**Next calibration:** 25<sup>th</sup> Jan 2016

Authorized Signature



Technical Department

26<sup>th</sup> Jan 2015

Unit 901, 9/F., Lai Sun Commercial Centre, 680 Cheung Sha Wan Road, Kowloon, Hong Kong  
Tel: (852) 2751 8875 Fax : (852) 2751 8806





**FireMark Hong Kong Limited.**  
瑞志香港有限公司

## Calibration Certificate

Number: CCS/64925A

Customer: ATAL-Degremont Joint Venture  
Contact Person: Mr. Gary Chan  
System Model: "Crowcon" Gasmonitor Plus Control Panel  
Detector Model: "Crowcon" Xgard Type 1 H2S Gas Detector  
Plant Address: DOB at DSD Pillar Point Sewage Treatment Works

Channel Number	Sensor Type	Measuring Range	Serial Number	Alarm 1	Alarm 2	Calibration Gas	Result
1	H2S	0 to 100ppm	AE8224	100	100	100ppm	Passed
2	H2S	0 to 50ppm	AE8234A	50	50	50ppm	Passed
3	H2S	0 to 50ppm	AE8234B	50	50	50ppm	Passed
4	H2S	0 to 10ppm	AE8241A	10	10	10ppm	Passed
5	H2S	0 to 10ppm	AE8241B	10	10	10ppm	Passed
6	H2S	0 to 10ppm	AE8207A	10	10	10ppm	Passed
7	H2S	0 to 10ppm	AE8207B	10	10	10ppm	Passed
8	H2S	0 to 10ppm	AE8207C	10	10	10ppm	Passed
9	H2S	0 to 10ppm	AE8207D	10	10	10ppm	Passed

**Remarks:** Instrument PASSED – fit for service.

**Next calibration:** 25<sup>th</sup> Jan 2016

Authorized Signature



Technical Department

26<sup>th</sup> Jan 2015

Unit 901, 9/F., Lai Sun Commercial Centre, 680 Cheung Sha Wan Road, Kowloon, Hong Kong  
Tel: (852) 2751 8875 Fax : (852) 2751 8806



## Calibration Certificate

Number: CCS/65694

Customer: ATAL-Degremont Joint Venture  
Contact Person: Mr. Gary Chan  
System Model: "Crowcon" Gasmonitor Plus Control Panel  
Detector Model: "Crowcon" Xgard Type 1 H2S Gas Detector  
Plant Address: DOUA at DSD Pillar Point Sewage Treatment Works

Channel Number	Sensor Type	Measuring Range	Serial Number	Alarm 1	Alarm 2	Calibration Gas	Result
1	H2S	0 to 100ppm	AE8124	100	100	100ppm	Passed
2	H2S	0 to 50ppm	AE8134A	50	50	50ppm	Passed
4	H2S	0 to 10ppm	AE8141A	10	10	10ppm	Passed
5	H2S	0 to 10ppm	AE8141B	10	10	10ppm	Passed
7	H2S	0 to 10ppm	AE8107B	10	10	10ppm	Passed
9	H2S	0 to 10ppm	AE8107D	10	10	10ppm	Passed
10	H2S	0 to 10ppm	AE8107E	10	10	10ppm	Passed

Remarks: Instrument PASSED – fit for service.

Next calibration: 12<sup>th</sup> Jan 2017

Authorized Signature



Technical Department

13<sup>th</sup> Jan 2016

FireMark Hong Kong Limited  
Flat A, 11/F., Hop Hing Industrial Building, 704 Castle Peak Road, Lai Chi Kok,  
Kowloon, Hong Kong.  
Tel : (852) 2751 8871 Fax : (852) 2751 880



## Calibration Certificate

Number: CCS/65695

Customer: ATAL-Degremont Joint Venture  
Contact Person: Mr. Gary Chan  
System Model: "Crowcon" Gasmonitor Plus Control Panel  
Detector Model: "Crowcon" Xgard Type 1 H2S Gas Detector  
Plant Address: DOB at DSD Pillar Point Sewage Treatment Works

Channel Number	Sensor Type	Measuring Range	Serial Number	Alarm 1	Alarm 2	Calibration Gas	Result
1	H2S	0 to 100ppm	AE8224	100	100	100ppm	Passed
2	H2S	0 to 50ppm	AE8234A	50	50	50ppm	Passed
3	H2S	0 to 50ppm	AE8234B	50	50	50ppm	Passed
4	H2S	0 to 10ppm	AE8241A	10	10	10ppm	Passed
5	H2S	0 to 10ppm	AE8241B	10	10	10ppm	Passed
6	H2S	0 to 10ppm	AE8207A	10	10	10ppm	Passed

Remarks: Instrument PASSED – fit for service.

Next calibration: 12<sup>th</sup> Jan 2017

Authorized Signature



Technical Department

13<sup>th</sup> Jan 2016

FireMark Hong Kong Limited  
Flat A, 11/F., Hop Hing Industrial Building, 704 Castle Peak Road, Lai Chi Kok,  
Kowloon, Hong Kong.  
Tel : (852) 2751 8871 Fax : (852) 2751 880

Remarks:

1. The sensor of channel number 1 is used for monitoring the H<sub>2</sub>S emission level at inlet.
2. The sensor of channel number 4 and 5 are used for monitoring the H<sub>2</sub>S emission level at outlet.

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## Appendix D

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### Odour Emission Monitoring Result

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S														
		HST8124_H <sub>2</sub> S			HST8141A_H <sub>2</sub> S			HST8224_H <sub>2</sub> S			HST8241A_H <sub>2</sub> S														
		INLET DOUA			OUTLET1 DOUA			OUTLET2 DOUA			INLET DOUB			OUTLET1 DOUB			OUTLET2 DOUB								
		ppm			ppm			ppm			ppm			ppm			% removal efficiency			% removal efficiency					
1/1/2016	00:00:00-00:59:59	16.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
	01:00:00-01:59:59	9.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
	02:00:00-02:59:59	8.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	03:00:00-03:59:59	7.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	04:00:00-04:59:59	6.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	05:00:00-05:59:59	7.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	06:00:00-06:59:59	11.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	07:00:00-07:59:59	12.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	08:00:00-08:59:59	8.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	09:00:00-09:59:59	10.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	10:00:00-10:59:59	10.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	11:00:00-11:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	12:00:00-12:59:59	6.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	13:00:00-13:59:59	5.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	14:00:00-14:59:59	6.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	15:00:00-15:59:59	6.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	16:00:00-16:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	17:00:00-17:59:59	5.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	18:00:00-18:59:59	8.5	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	19:00:00-19:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	20:00:00-20:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	21:00:00-21:59:59	9.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	22:00:00-22:59:59	7.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
23:00:00-23:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
1/2/2016	00:00:00-00:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	01:00:00-01:59:59	6.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	02:00:00-02:59:59	5.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	03:00:00-03:59:59	4.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	04:00:00-04:59:59	98.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	05:00:00-05:59:59	10.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	06:00:00-06:59:59	6.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	07:00:00-07:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	08:00:00-08:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	09:00:00-09:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	10:00:00-10:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	11:00:00-11:59:59	7.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	12:00:00-12:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	13:00:00-13:59:59	5.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	14:00:00-14:59:59	6.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
15:00:00-15:59:59	5.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S		
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	16:00:00-16:59:59	6.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	5.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	7.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	6.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	5.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	6.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	6.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
1/3/2016	00:00:00-00:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	6.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	4.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	3.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	3.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	6.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	5.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	5.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	5.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	17.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	9.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	8.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	9.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%			
1/4/2016	00:00:00-00:59:59	11.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	4.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	5.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S		
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	08:00:00-08:59:59	5.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	8.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	8.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	8.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	6.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	9.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	8.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	8.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	9.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	11.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	11.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	10.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
1/5/2016	00:00:00-00:59:59	8.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	100.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	10.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	7.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	6.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	7.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	6.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	8.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	21.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	16.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	11.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	13.5	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	11.6	0.0	0.0	7.0	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	9.4	0.0	0.0	8.4	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	9.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	10.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	11.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	12.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	12.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	12.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8224_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S		
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
1/6/2016	00:00:00-00:59:59	11.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	10.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	11.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	9.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	16.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	16.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	14.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	14.1	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	11.9	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	11.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	10.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	12.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	14.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	36.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	14.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	18.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	13.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	12.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	11.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	14.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	13.5	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	10.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	8.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	6.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%			
1/7/2016	00:00:00-00:59:59	7.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	7.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	7.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	7.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	8.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	9.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	12.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	11.2	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	9.4	0.0	0.0	8.4	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	10.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	16.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	13.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	10.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	11.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
15:00:00-15:59:59	19.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%			



Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S	HST8241B_H2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	16:00:00-16:59:59	14.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	10.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	12.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	100.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	24.9	0.0	0.0	8.4	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	12.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	10.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	10.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
1/8/2016	00:00:00-00:59:59	9.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	9.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	7.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	6.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	6.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	11.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	21.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	7.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	7.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	8.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	10.7	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	10.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	11.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	11.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	10.7	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	10.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	9.6	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	9.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	16.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	14.7	0.0	0.0	8.4	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	14.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	12.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	11.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	10.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%			
1/9/2016	00:00:00-00:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	10.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	8.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	12.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	11.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	8.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	100.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S		DOUB OUTLET H <sub>2</sub> S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB				
		ppm	ppm	ppm	ppm	ppm	ppm	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency
	08:00:00-08:59:59	14.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	16.0	0.0	0.0	8.4	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	19.0	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	17.2	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	10.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	9.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	10.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	7.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	11.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	11.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	11.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	9.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	9.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
1/10/2016	00:00:00-00:59:59	7.9	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	5.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	10.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	13.5	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	10.7	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.8	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	9.1	0.0	0.0	8.4	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.2	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.5	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.3	0.0	0.0	11.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.3	0.0	0.0	11.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.5	0.0	0.0	11.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.6	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	14.1	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	10.7	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	9.1	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	7.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	59.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	14.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	9.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8224_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S		
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
1/11/2016	00:00:00-00:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	9.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	6.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	4.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	5.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	6.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	11.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	8.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	6.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	6.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	5.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	6.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	7.1	0.0	0.0	7.0	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	6.3	0.0	0.0	7.0	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	6.5	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	6.3	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	5.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%			
1/12/2016	00:00:00-00:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	16.6	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	4.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	5.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	7.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	6.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	16.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	21.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
15:00:00-15:59:59	22.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%			

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S		DOUB OUTLET H <sub>2</sub> S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB				
		ppm	ppm	ppm	ppm	ppm	ppm	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency
	16:00:00-16:59:59	30.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	32.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	15.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	11.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	10.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	9.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	7.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
1/13/2016	00:00:00-00:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	7.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	5.3	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	5.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	5.3	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	21.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	15.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	9.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	11.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	10.6	0.0	0.0	0.0	0.0	0.0	100%	100%	N/A <sup>[Note1]</sup>	N/A <sup>[Note1]</sup>
	15:00:00-15:59:59	8.7	0.0	0.0	0.0	0.0	0.0	100%	100%	N/A <sup>[Note1]</sup>	N/A <sup>[Note1]</sup>
	16:00:00-16:59:59	6.8	0.0	0.0	0.0	0.0	0.0	100%	100%	N/A <sup>[Note1]</sup>	N/A <sup>[Note1]</sup>
	17:00:00-17:59:59	5.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
23:00:00-23:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	
1/14/2016	00:00:00-00:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency
		ppm	ppm	ppm	ppm	ppm	ppm						
	08:00:00-08:59:59	5.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%	100%	100%
	09:00:00-09:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	10:00:00-10:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	11:00:00-11:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	12:00:00-12:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	100%	100%
	13:00:00-13:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	14:00:00-14:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	15:00:00-15:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	16:00:00-16:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	17:00:00-17:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	18:00:00-18:59:59	20.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	19:00:00-19:59:59	11.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	20:00:00-20:59:59	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%	100%	100%
	21:00:00-21:59:59	9.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%	100%	100%
	22:00:00-22:59:59	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%	100%	100%
	23:00:00-23:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
1/15/2016	00:00:00-00:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	01:00:00-01:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	02:00:00-02:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	03:00:00-03:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	04:00:00-04:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	05:00:00-05:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	06:00:00-06:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	07:00:00-07:59:59	7.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%	100%	100%
	08:00:00-08:59:59	7.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	09:00:00-09:59:59	6.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	10:00:00-10:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	11:00:00-11:59:59	9.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	12:00:00-12:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	13:00:00-13:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	14:00:00-14:59:59	14.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	15:00:00-15:59:59	11.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	16:00:00-16:59:59	9.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	17:00:00-17:59:59	7.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	18:00:00-18:59:59	7.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	19:00:00-19:59:59	8.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%	100%	100%
	20:00:00-20:59:59	31.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%	100%	100%
	21:00:00-21:59:59	10.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	22:00:00-22:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%
	23:00:00-23:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	100%	100%

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S	HST8241A_H2S	HST8241B_H2S
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency
		ppm	ppm	ppm	ppm	ppm	ppm						
1/16/2016	00:00:00-00:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	6.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	6.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	5.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	6.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	6.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	6.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	7.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%			
1/17/2016	00:00:00-00:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	5.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	5.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	100.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	11.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	6.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	7.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	6.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	6.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
15:00:00-15:59:59	6.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%			

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S	HST8241B_H2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	16:00:00-16:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	7.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	6.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	6.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
1/18/2016	00:00:00-00:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	5.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	5.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	4.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	4.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	4.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	4.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	4.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	7.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	7.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	9.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	12.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%			
1/19/2016	00:00:00-00:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	4.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	4.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	4.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	4.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S		
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	08:00:00-08:59:59	3.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	4.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	52.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	22.1	0.0	0.0	34.7	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	8.8	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	6.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	5.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	5.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	4.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	4.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
1/20/2016	00:00:00-00:59:59	4.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	100.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	4.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	5.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	5.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	9.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	8.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	9.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	5.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	5.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	6.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	5.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	5.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	8.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	8.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		



Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S	HST8241B_H2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
1/21/2016	00:00:00-00:59:59	8.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	5.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	5.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	4.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	4.7	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	5.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	15.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	7.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	6.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	7.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	14.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	5.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	4.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%			
1/22/2016	00:00:00-00:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	4.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	4.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	3.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	3.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	3.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	4.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	5.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	5.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	6.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	6.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	4.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	5.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
15:00:00-15:59:59	75.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%			

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8224_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S		
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	16:00:00-16:59:59	10.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	8.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
1/23/2016	00:00:00-00:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	5.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	6.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	7.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	8.1	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	7.5	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	4.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	4.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	3.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	3.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	3.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	3.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	3.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	3.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	100.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%			
1/24/2016	00:00:00-00:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	5.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	4.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	2.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	8.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	3.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	3.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S	HST8241B_H2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	08:00:00-08:59:59	2.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	3.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	2.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	2.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	3.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	3.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	2.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	2.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	3.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	2.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	4.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	4.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
1/25/2016	00:00:00-00:59:59	4.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	2.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	2.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	4.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	6.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	7.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	8.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	7.8	0.0	0.0	2.8	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	7.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	41.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	6.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	6.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	3.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S		
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
1/26/2016	00:00:00-00:59:59	8.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	6.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	3.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	3.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	2.9	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	2.9	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	3.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	4.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	4.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	4.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	5.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	2.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	100.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	4.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	4.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	4.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	4.1	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	5.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%			
1/27/2016	00:00:00-00:59:59	4.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	4.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	5.3	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	3.5	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	3.5	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	3.5	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	4.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	4.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	5.0	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	5.1	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	5.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	5.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	4.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
15:00:00-15:59:59	4.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%			

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUB OUTLET H <sub>2</sub> S		
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H2S	HST8241B_H2S	HST8241B_H2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency		
		ppm	ppm	ppm	ppm	ppm	ppm						
	16:00:00-16:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	5.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	6.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	15.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	9.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	23:00:00-23:59:59	13.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
1/28/2016	00:00:00-00:59:59	13.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	12.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	10.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	6.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	7.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	10.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%		
	08:00:00-08:59:59	10.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%		
	09:00:00-09:59:59	10.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	10:00:00-10:59:59	11.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	11:00:00-11:59:59	10.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	12:00:00-12:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	13:00:00-13:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	14:00:00-14:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	15:00:00-15:59:59	6.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	16:00:00-16:59:59	4.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%		
	17:00:00-17:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	18:00:00-18:59:59	4.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		
	19:00:00-19:59:59	3.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	20:00:00-20:59:59	3.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	21:00:00-21:59:59	18.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
	22:00:00-22:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%		
23:00:00-23:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%			
1/29/2016	00:00:00-00:59:59	6.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%		
	01:00:00-01:59:59	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	02:00:00-02:59:59	6.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%		
	03:00:00-03:59:59	5.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	04:00:00-04:59:59	4.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	05:00:00-05:59:59	3.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	06:00:00-06:59:59	3.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%		
	07:00:00-07:59:59	2.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%		

Date	Time	DOUA INTLET H <sub>2</sub> S			DOUB INTLET H <sub>2</sub> S			DOUA OUTLET H <sub>2</sub> S		DOUB OUTLET H <sub>2</sub> S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB				
		ppm	ppm	ppm	ppm	ppm	ppm	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency
	08:00:00-08:59:59	3.5	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	3.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	4.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	19.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	5.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	11.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	15.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	13.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	12.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	7.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
1/30/2016	00:00:00-00:59:59	6.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	5.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	9.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	9.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	10.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	11.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	9.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	12.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	9.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.3	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	16.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	11.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	11.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	13.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H <sub>2</sub> S	DOUA OUTLET H <sub>2</sub> S		DOUB INTLET H <sub>2</sub> S	DOUB OUTLET H <sub>2</sub> S		DOUA OUTLET H <sub>2</sub> S		DOUB OUTLET H <sub>2</sub> S	
		HST8124_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8224_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S	HST8141A_H <sub>2</sub> S	HST8141B_H <sub>2</sub> S	HST8241A_H <sub>2</sub> S	HST8241B_H <sub>2</sub> S
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB				
		ppm	ppm	ppm	ppm	ppm	ppm	% removal efficiency	% removal efficiency	% removal efficiency	% removal efficiency
1/31/2016	00:00:00-00:59:59	13.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	13.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	11.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	7.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	4.4	0.0	0.0	3.8	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	4.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	4.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	4.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	3.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	3.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	4.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	3.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	3.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	3.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	3.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
20:00:00-20:59:59	3.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%	
21:00:00-21:59:59	3.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	
22:00:00-22:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	
23:00:00-23:59:59	4.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%	

Note

1. N/A refers to not applicable.

## APPENDIX E

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### Locations for Sediment Sampling and Benthic Survey



**The GPS Co-ordinates (in WGS84 Datum (ITRF96 Reference Frame)), Collection Time, Measured Water Depth and Tidal State of Monitoring Station**

Station ID	Description	Original Location		Revised Location		Remarks	
		Northing	Easting	Northing	Easting	Reason for Location Change	Distance from Original Location (m)
B1	Butterfly Beach	825825.6	813517.1	825702	813719	Inaccessible*	237
B2	Castle Peak Beach	826530.7	815779.2	-	-	-	-
B3	Kadoorie Beach	826328.0	816098.4	826188	815954	Inaccessible*	201
B4	Cafeteria Old Beach	826240.2	816310.1	826031	816143	Inaccessible*	268
B5	Cafeteria New Beach	825888.4	816751.8	825697	816470	Inaccessible*	341
B6	Golden Beach	825493.2	816813.5	825431	816748	Inaccessible*	90
WSD1	Flushing Water Intake near Butterfly Beach	825511.1	813103.0	825447	813138	Inaccessible*	73
WSD2	Flushing Water Intake near LRT Terminus	825860.0	815241.3	-	-	-	-
U2	Secondary Contact RecreationSubzone at Lung Kwu Tan	827855.5	809704.9	827761	809488	Inaccessible*	237
NM6	Control Station	820121.5	807822.1	-	-	-	-
NM1	Control Station	823025.4	820503.9	-	-	-	-

**Note:** \* Proposed location inaccessible by sampling vessel due to shallow water.

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## APPENDIX F

### Event and Action Plan

## Event and Action Plan for Odour Monitoring

EVENT	ACTION			
	ET	IEC	SOR	CONTRACTOR
<b>ACTION LEVEL</b>				
Exceedance of action level or receipt of any odour complaint	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance or odour complaints;</li> <li>2. Notify the Contractor, IEC and SOR of exceedance</li> <li>3. Carry out investigation to identify the source/reason of exceedance or complaints. Investigation shall be completed within 1 week;</li> <li>4. Repeat odour patrol to confirm finding; and</li> <li>5. If exceedance continues, notify the Contractor, IEC and SOR.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check odour patrol results submitted by ET;</li> <li>2. Check Contractor's mitigation measures.</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing.</li> <li>2. Notify DSD; and</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the SOR, ET, IEC and DSD when receipt of odour complaint;</li> <li>2. Rectify any unacceptable practice; and formulate remedial actions; and</li> <li>3. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.</li> </ol>
<b>LIMIT LEVEL</b>				
Exceedance of Limit level or receipt of two or more complaints in 3 months	<ol style="list-style-type: none"> <li>1. Identify source / reason of exceedance or odour complaints;</li> <li>2. Notify the Contractor, IEC and SOR of exceedance</li> <li>3. Carry out investigation to identify the source/reason of exceedance or complaints. Investigation shall be completed within 1 week;</li> <li>4. Repeat odour patrols to confirm findings;</li> <li>5. Increase odour patrol frequency to bi-weekly until no exceedance is detected at the ASR in the conservative 2 months and</li> <li>6. If exceedance continues, notify the Contractor, IEC and SOR.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check patrol results submitted by ET;</li> <li>2. Discuss amongst SOR and Contractor on the potential remedial actions;</li> <li>3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly;</li> <li>4. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Notify DSD;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; and</li> <li>4. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the SOR, ET, IEC and DSD when receipt of odour complaints;</li> <li>2. Modify or improve design as appropriate;</li> <li>3. Submit proposals for remedial actions to IEC within three working days of notification of odour exceedance / complaint;</li> <li>4. Implement the agreed proposals</li> <li>5. Resubmit proposals if problem still not under control; and</li> <li>6. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.</li> </ol>

Event and Action Plan for Odour Emission Monitoring

EVENT	ACTION			
	ET	IEC	SOR	CONTRACTOR
<b>ACTION LEVEL</b>				
Exceedance of action level	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance;</li> <li>2. Notify the Contractor, IEC and SOR of exceedance</li> <li>3. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 1 week;</li> <li>4. Monitor H<sub>2</sub>S level sensors readings to confirm finding; and</li> <li>5. If exceedance continues, notify the Contractor, IEC and SOR</li> </ol>	<ol style="list-style-type: none"> <li>1. Check H<sub>2</sub>S level sensors readings submitted by ET;</li> <li>2. Discuss with ET and Contractor on the possible remedial actions as appropriate</li> <li>3. Advise SOR on the effectiveness of the proposed remedial measures if any</li> <li>4. Supervise implementation of remedial measures if any</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing; and</li> <li>2. Notify DSD.</li> <li>3. Ensure remedial actions (if any) properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Rectify any unacceptable practice if any.</li> </ol>
<b>LIMIT LEVEL</b>				
Exceedance of Limit level	<ol style="list-style-type: none"> <li>1. Identify source / reason of exceedance or odour complaints;</li> <li>2. Notify the Contractor, IEC and SOR of exceedance</li> <li>3. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 1 week;</li> <li>4. Monitor H<sub>2</sub>S level sensors readings to confirm findings;</li> <li>5. If exceedance continues, notify the Contractor, IEC and SOR; and</li> <li>6. If the exceedance is identified by olfactometric analysis, carry out further air sampling and olfactometry analysis to demonstrate the effectiveness of the remedial measures taken</li> </ol>	<ol style="list-style-type: none"> <li>1. Check H<sub>2</sub>S level sensors readings and/or olfactometry analysis results submitted by ET;</li> <li>2. Discuss amongst SOR and Contractor on the potential remedial actions;</li> <li>3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly;</li> <li>4. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of exceedance in writing;</li> <li>2. Notify DSD;</li> <li>3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Ensure remedial measures properly implemented; and</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Modify or improve system setting as appropriate;</li> <li>2. Submit proposals for remedial actions to IEC within three working days of notification of odour exceedance;</li> <li>3. Implement the agreed proposals;</li> <li>4. Amend proposals if appropriate; and</li> <li>5. If exceedance continues, consider what portion of the work is responsible and stop that portion of work until the exceedance is abated.</li> </ol>

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## APPENDIX G

### Weather Conditions

Daily Extract of Meteorological Observations, January 2016 – Tuen Mun Children and Juvenile Home

Day	Mean Pressure (hPa)	Air Temperature			Mean Dew Point (deg. C)	Mean Relative Humidity (%)	Total Rainfall (mm)	Prevailing Wind Direction (degrees)	Mean Wind Speed (km/h)
		Absolute Daily Max (deg. C)	Mean (deg.C)	Absolute Daily Min (deg. C)					
1	***	22.0	18.4	16.0	13.1	72.0	0.0	***	***
2	***	22.3	18.8	15.4	14.8	79.0	0.0	***	***
3	***	20.1	19.2	18.0	18.4	96.0	4.5	***	***
4	***	23.9	21.1	19.1	19.2	89.0	0.0	***	***
5	***	22.0	21.0	19.4	20.0	94.0	3.0	***	***
6	***	25.9	21.3	18.4	17.3	79.0	0.5	***	***
7	***	23.3	18.6	16.2	13.5	73.0	0.0	***	***
8	***	22.5	18.1	15.3	13.5	75.0	0.0	***	***
9	***	21.9	18.2	14.8	13.4	74.0	0.0	***	***
10	***	19.8	18.4	17.1	15.5	84.0	8.0	***	***
11	***	21.6	17.9	16.0	15.7	87.0	29.5	***	***
12	***	18.4	16.5	15.4	11.7	73.0	0.0	***	***
13	***	21.3	15.7	12.5	10.7	73.0	0.0	***	***
14	***	19.7	15.7	13.8	12.2	80.0	2.0	***	***
15	***	15.0	14.3	13.7	13.8	97.0	39.5	***	***
16	***	18.6	16.9	14.5	15.9	94.0	12.0	***	***
17	***	19.6	17.5	14.5	15.8	90.0	18.5	***	***
18	***	18.2	14.8	11.0	9.1	69.0	0.0	***	***
19	***	17.8	16.0	14.5	10.9	72.0	0.0	***	***
20	***	17.0	15.8	15.0	13.9	89.0	4.5	***	***
21	***	16.4	15.5	13.8	14.6	94.0	0.5	***	***
22	***	13.8	11.8	9.0	11.1	95.0	27.0	***	***
23	***	9.1	7.5	6.6	2.7	72.0	0.0	***	***
24	***	6.8	4.1	2.3	-2.7	63.0	5.5	***	***
25	***	12.2	7.0	3.6	-6.9	37.0	0.0	***	***
26	***	11.5	8.3	6.5	-0.2	58.0	0.0	***	***
27	***	16.0	11.5	7.3	10.2	92.0	9.5	***	***
28	***	17.6	15.9	13.0	15.6	98.0	71.0	***	***
29	***	18.3	16.7	16.0	16.1	96.0	37.5	***	***
30	***	19.7	17.5	16.1	15.1	86.0	0.0	***	***
31	***	17.9	16.4	15.5	13.5	83.0	1.0	***	***

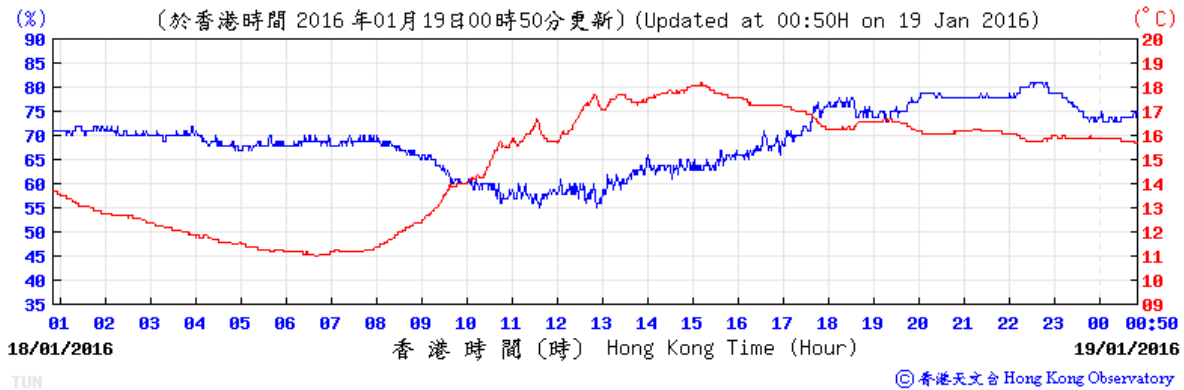
Note:

\*\*\* - information unavailable

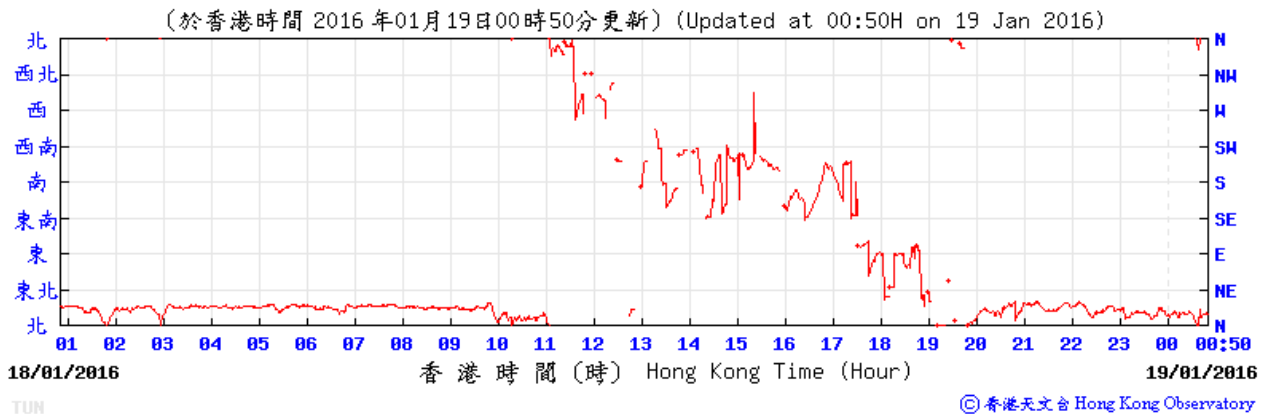
Rainfall measured in increment of 0.5 mm. Amount of < 0.5 mm cannot be detected.

### Hourly Meteorological Conditions on 18 January 2016 at Tuen Mun Station

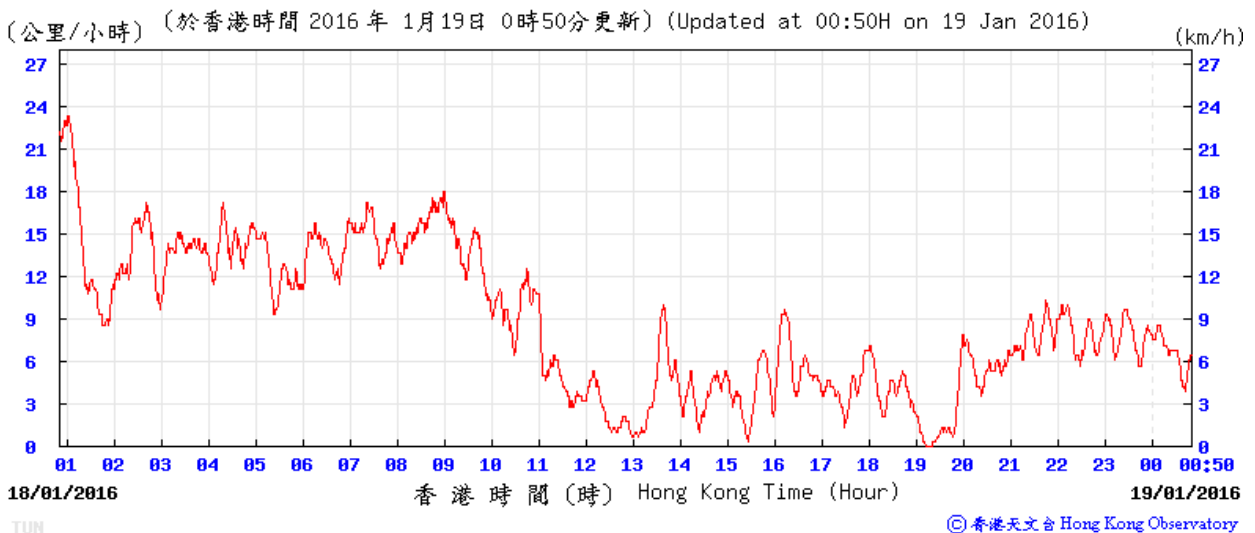
Temperature/ Humidity:



Wind Direction:



Wind Speed:



## APPENDIX H

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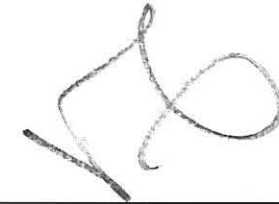
### Landscape & Visual Impact Monitoring



Contract No. DC/2008/03  
 Design, Build and Operate Pillar Point Sewage Treatment Works  
 Establishment Period – 5<sup>th</sup> monthly L&V site audit

Site Inspection Date : 7 January 2016

Audited and Certified by:



Kenneth Ng (RLA No. 034 (99))

Area of Works	Items to be Monitored	Previous Observation	Establishment Works Stage	
			Observation	Recommendation/Action
<i>Issues Observed in this Audit</i>				
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Area (Trees, Shrubs & Groundcover) Photo no. G-01 to G-05	Item #1	Tree nos. 131, 133, 134 and 129 in ground floor garden were observed in poor condition during this site inspection (Please see photo reference below)	It is strongly recommended to provide sufficient watering and carry out necessary maintenance works for the Trees, Groundcover & Lawn. (i.e. : Watering shall be carried out daily during the dry season, generally September to April. ) Weeds should be removed by approved mechanical or manual means so as not to cause any damage. It is recommended to replace those groundcover / lawn in poor condition if no further improvement is observed for its health condition.
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Area (Trees, Shrubs & Groundcover) Photo no. G-06	Item #2	Compensatory trees were replaced during this site inspection (Please see photo reference below)	-

Area of Works	Items to be Monitored	Previous Observation	Establishment Works Stage	
			Observation	Recommendation/Action
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Trees Area Photo no. G-07	-	The non-abrasive nylon rope for securing the trees were observed to be too tight.	It is recommended to release or replace that non-abrasive nylon rope in tight or poor condition for its health condition.

Tree was observed leaning and in unbalanced tree form



Photo no. G-01: Tree no. 131 were observed in poor condition.

Dieback and dead branch were observed



Existing wound was observed on the trunk



Photo no. G-02: Tree no. 133 were observed in poor condition.

Dieback and dead branch were observed

Wounds were observed on the trunk



Photo no. G-03: Tree no. 134 were observed in poor condition.

Dieback and dead branch were observed



Existing wound was observed on the trunk

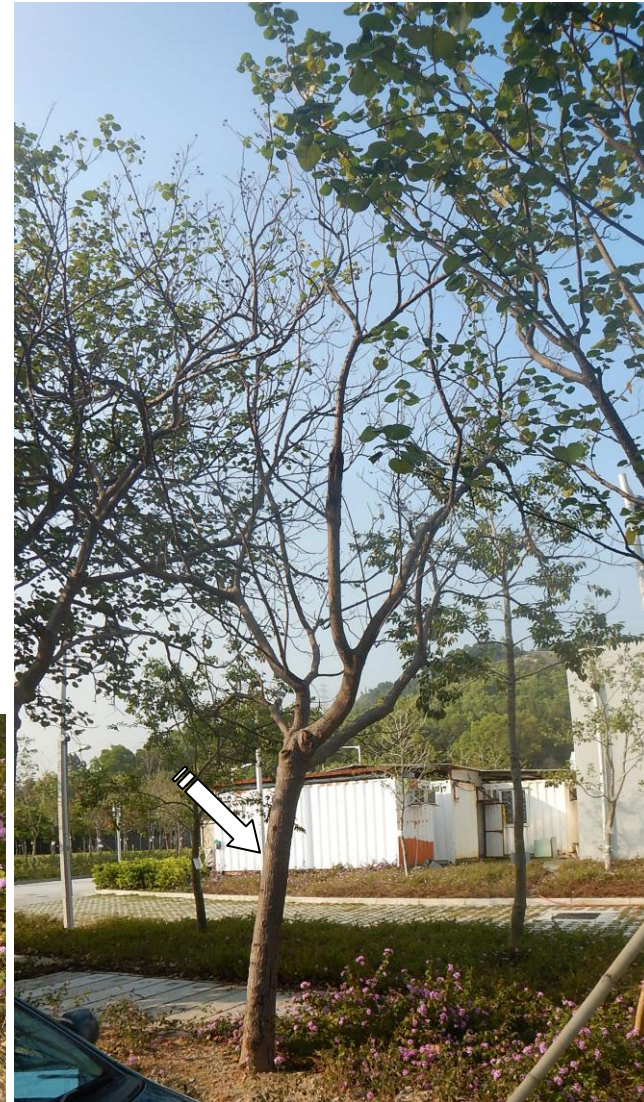


Photo no. **G-04**: Tree no. 129 were observed in poor condition.



Photo no. G-05: Lawn and groundcover had been improved.



Photo no. G-06: Compensatory trees had been replaced.





Photo no. G-07: The non-abrasive nylon rope for securing the trees were observed to be too tight.