Contract No. DC / 2008 / 03

Design, Build and Operate

Pillar Point Sewage Treatment Works:

Sixty-second Monthly EM&A Report

(For 1 to 31 December 2015)

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/oylw15092301 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 62nd EM&A Report for the period of December 2015 comprises two parts prepared by two separate ETs and verified by IEC:

Parts	**Environmental Team Leaders**	**Independent Environmental Checker**
Part 1 - Construction Phase EM&A Report for December 2015	Ms. Mandy To of ERM Hong Kong Limited	Mr. Tang Yu Tin of AECOM
Part 2 - Operation Phase EM&A Report for December 2015	Ms. Vivian Chan of SMEC Asia Limited	Mr. Tang Yu Tin of AECOM

AECOM
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, Hong Kong
香港新界沙田鄉事會路138號
新城市中央廣場第2座8樓
www.aecom.com

+852 3922 9000 tel
+852 3922 9797 fax

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.

AECOM
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, Hong Kong
香港新界沙田鄉事會路138號
新城市中央廣場第2座8樓
www.aecom.com

+852 3922 9000 tel
+852 3922 9797 fax

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)
SMEC - Ms. Vivian Chan (Fax No. 3995 8101)
ATAL–Degremont–China State JV – Mr. Barry Lee (Fax No. 2811 3321)

Part 1 – Construction Phase EM&A Report for December 2015

ATAL-Degrémont-China State Joint Venture

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

January 2016

Environmental Resources Management
16/F, Berkshire House,
25 Westlands Road,
Quarry Bay, Hong Kong
Telephone: (852) 2271 3000
Facsimile: (852) 2723 5660
E-mail: post.hk@erm.com
http://www.erm.com

ATAL-Degrémont-China State Joint Venture

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

January 2016

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: 8 January 2016

AECOM
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, Hong Kong
香港新界沙田鄉事會路138號
新城市中央廣場第2座8樓
www.aecom.com

+852 3922 9000 tel
+852 3922 9797 fax

Your Ref:
Our Ref: 60017423/C/oylw16011201

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)

12 January 2016

Dear Sir,

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

Monthly EM&A Report for December 2015 (Construction Phase)

Reference is made to Environmental Team (ET)'s draft of the Monthly EM&A Report for December 2015 provided by email dated 8, 11 and 12 January 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 (Fax No. 2404 2744)
ERM – Ms. Mandy To (Fax No. 2723 5660)
ATAL–Degremont–China State JV – Mr. Barry Lee (Fax No. 2811 3321)

CONTENTS

EXECUTIVE SUMMARY

LIST OF TABLES

LIST OF ANNEXES

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 62nd monthly Environmental Monitoring and Audit (EM&A) report presenting the EM&A works carried out during the period from 1 to 31 December 2015 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. Air quality monitoring, weekly environmental site audits and landscape and visual monitoring for construction phase were not conducted in December 2015.

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 as-built drawing on landscape and visual mitigation measures with explanatory statement was sent to DSD and will be submitted to EPD for deposit after DSD's approval.

A letter notifying the completion of construction works and proposing the termination of construction phase EM&A programme had been endorsed by IEC on 22 December 2015. The letter will be submitted to EPD after approval of SOR and DSD. The ET will prepare a Final EM&A report to summarise the findings of the construction EM&A programme for EPD's approval.

1 INRODUCTION

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 62nd EM&A report which summarises the monitoring results and audit findings for the EM&A programme during the reporting period from **1** to **31 December 2015**.

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 PROJECT INFORMATION

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. 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. Air quality monitoring and weekly environmental site audits for construction phase were not conducted in December 2015.

4 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 December 2015.

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 [a]	Non-inert C&D Materials [b]		
		C&D Materials Recycled [c]	C&D Waste Disposed of at Landfill [d]	Chemical Waste
December 2015	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 December 2015.

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 sent to DSD and will be 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 December 2015.

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 had been endorsed by IEC on 22 December 2015. The letter will be submitted to EPD after approval of SOR and DSD. 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 REVIEW OF THE EM&A DATA AND EIA PREDICTIONS

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 December 2015.

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^3	77,600.00 m^3	116,400.00 m^3	136,327.61 m^3
Amount of C&D Materials Reused on other site	-	-	-	3,163.89 m^3
Amount of C&D Materials Reused on site	14,926.00 m^3	18,000.00 m^3	20,150.00 m^3	24,358.89 m^3

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 Sent to Fill Banks	46,563.00 m^3	59,600.00 m^3	96,250 m^3	108,804.86 m^3
General Refuse	Small	-	-	2,308.21 tonnes
Chemical Waste	Small	-	-	810.00 L

Notes:

(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^3.

(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.

11 CONCLUSIONS

This EM&A Report presents the EM&A programme undertaken during the reporting period from 1 to 31 December 2015 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.

No air quality monitoring was carried out in December 2015. 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.

The as-built drawing on landscape and visual mitigation measures with explanatory statement was sent to DSD and will be submitted to EPD for deposit after DSD's approval.

A letter notifying the completion of construction works and proposing the termination of EM&A programme had been endorsed by IEC on 22 December 2015. The letter will be submitted to EPD after approval of SOR and DSD.

Annex A

Location of Project

PROPOSED FACILITIES AND BUILDINGS

SECTION 1 INLET PUMPING STATION AND PRELIMINARY TREATMENT WORKS

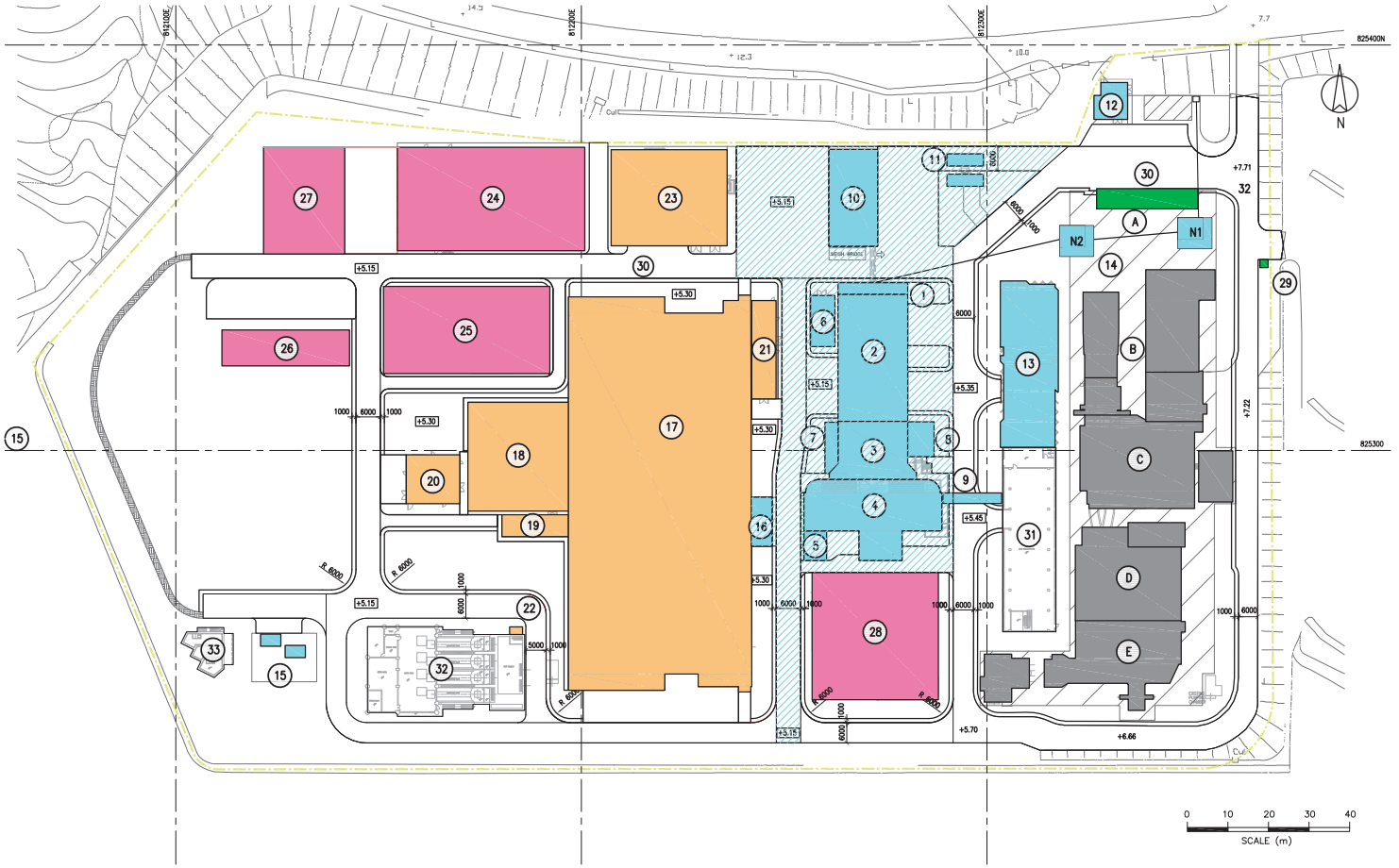
1. INLET CHAMBER
2. COARSE SCREENS AND INLET PUMPING STATION
3. FINE SCREEN CHANNELS
4. GRIT CHAMBERS
5. INLET FLOWMETER CHAMBER
6. PTW MCC ROOM
7. BLOWER ROOM
8. SCREENING SKIP HOUSE
9. ODOR DUCT SUPPORTING BRIDGE
10. SEPTIC WASTE RECEPTION STATION
11. WEIGHBRIDGE
12. ELECTRICAL BUILDING 1
13. ADMINISTRATION BUILDING
14. INLET CHAMBERS
15. PAYMENT FLOWMETER CHAMBER
16. CEPT INLET CHAMBER

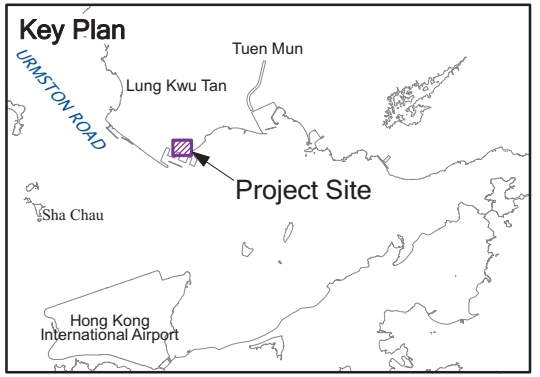
SECTION 2 CEPT TANKS UV DISINFECTION

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 DEWATERING 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 HANDING BUILDING
- 32 EXISTING OUTFALL PUMPING STATION
- 33 EXISTING TERMINAL MANHOLE

Annex A

Contract No. DC/2008/03 - Design, Build and Operate Pillar Point Sewage Treatment Works
Layout of Project

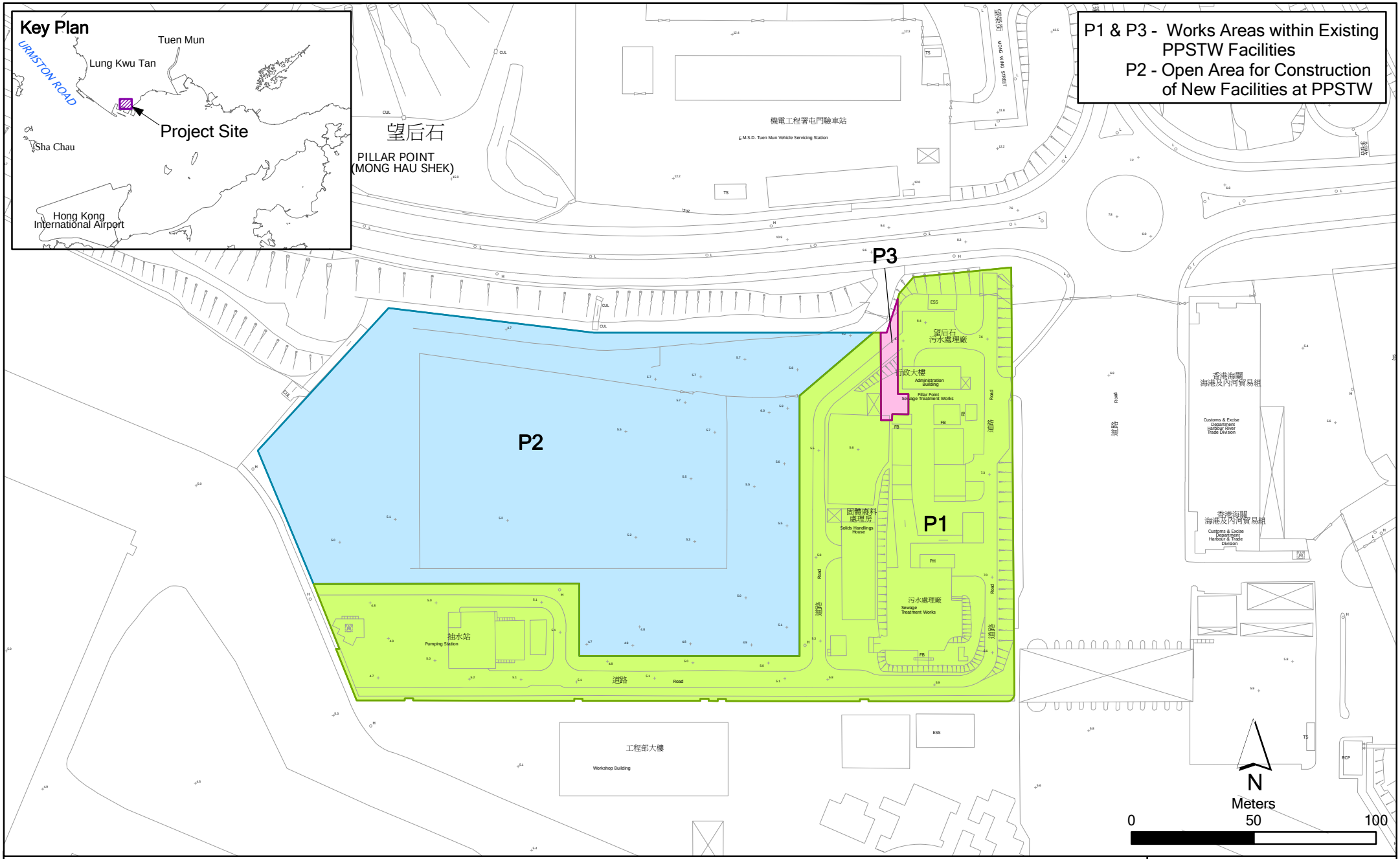
FILE: 0119806c
DATE: 20/12/2010

Environmental Resources Management

ERM

Annex B

Works Location



Annex B

Location of Works Areas

File: 0119806_location of works.mxd
Date: 15/12/2010

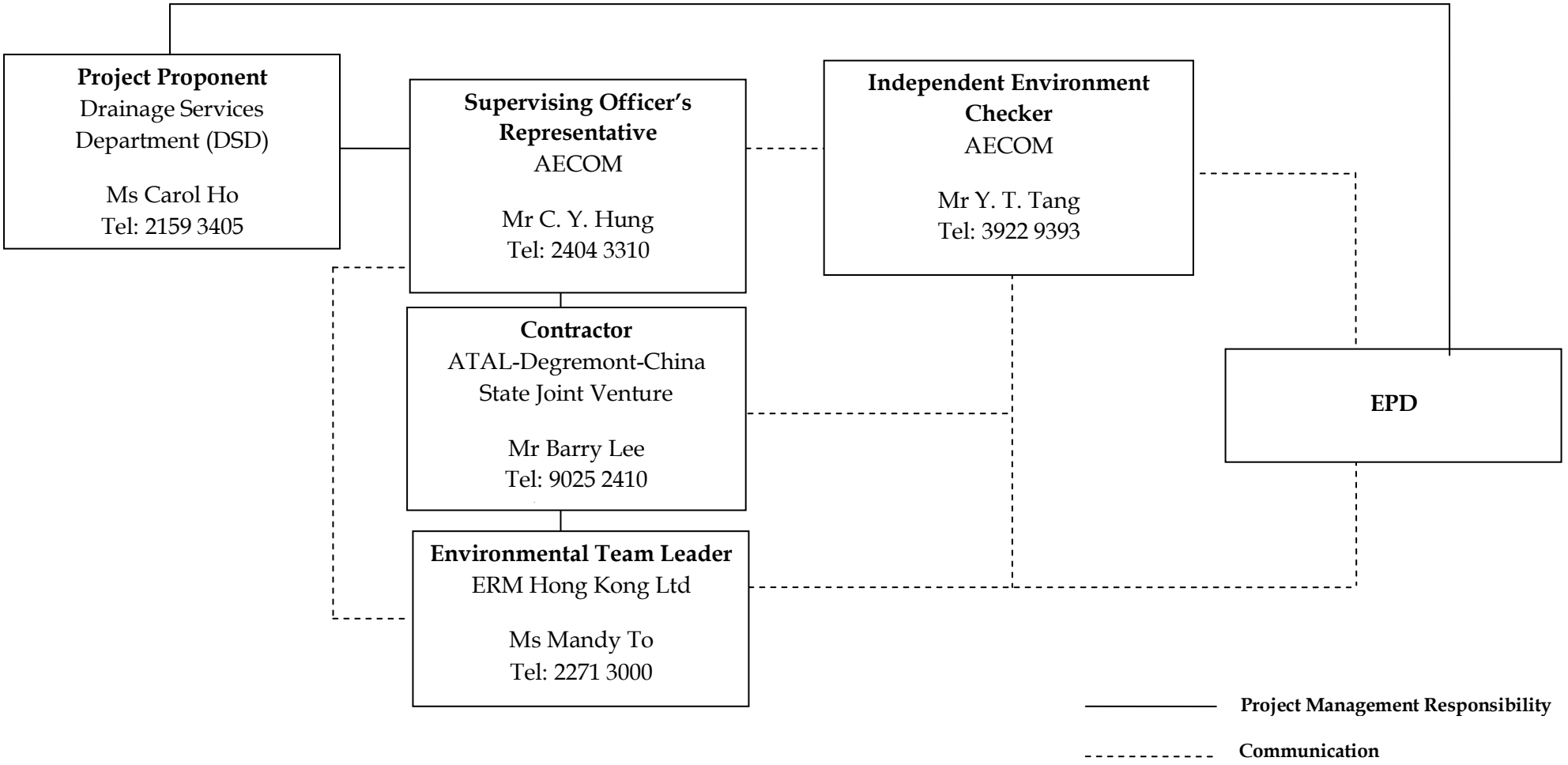
Environmental Resources Management

ERM

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
Summary of Environmental Mitigation Measures in the EIA and EM&A Manual			
Construction Phase			
Air Quality	Dust mitigation measures stipulated in *the Air Pollution Control (Construction Dust) Regulation* 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 crashed 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	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: • Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport. • Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents. • Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area.	Work site/During the construction period	√
Waste Management	*Good Site Practices* Recommendations for good site practices during the construction activities include: • 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 • Training of site personnel in proper waste management and chemical handling procedures • Provision of sufficient waste disposal points and regular collection of waste • Appropriate measures to minimise windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers • Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors.	Work site/During the construction period	√

Type of Impact	Environmental Protection Measures	Location/ Timing	Status
	• Separation of chemical wastes for special handling and appropriate treatment at the Chemical Waste Treatment Facility.		
Waste Management	*Waste Reduction Measures* 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: • Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal. • Encourage collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the work force • Proper storage and site practices to minimise the potential for damage or contamination of construction materials. • Plan and stock construction materials carefully to minimise amount of waste generated and avoid unnecessary generation of waste.	Work site/During planning & design stage, and construction stage	√
Waste Management	*General Refuse* General refuse should be stored in enclosed bins or compaction units separate from C&D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.	Work site / During the construction period	√
Waste Management	*Construction and Demolition Material* In order to minimise the impact resulting from collection and transportation of C&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	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	Mitigation measures and good site practices should be followed to control potential environmental impact from handling and transportation of C&D material. The mitigation measures include: • Where it is unavoidable to have transient stockpiles of C&D material pending collection for disposal, the transient stockpiles shall be located away from waterfront or storm drains as far as possible. • Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric. • Skip hoist for material transport should be totally enclosed by impervious sheeting. • Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving a construction site • 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. • 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. • All dusty materials should be sprayed with water prior to any loading, unloading or transfer operation so as to maintain the dusty materials wet. • The height from which excavated materials are dropped should be controlled to a minimum practical height to limit fugitive dust generation from unloading.	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	*Chemical Waste* 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.	Work site / During the construction period	√
Landscape & Visual	<u>Temporary Tree Nurseries</u> 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 & 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. Besides, these trees may also be positioned as visual mitigation during the construction period.	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	Hoarding 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	Dust and Erosion Control for Exposed Soil 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	Existing Tree Record Inventory 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	Construction Light	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	Tree Transplanting Apart from the 18 numbers of "*Leucaena leucocephala*", 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 **Figure 8.9.1**.	Work site / During design stage & construction period	√.
Landscape & Visual	Tree Compensation Ratio 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 "*Cassia surattensis*" 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 **Figure 8.9.1**.	Work site / During design stage & construction period	N/A
Landscape & Visual	Re-use of Existing Soil and Advance formation of Planting Area 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.	Work site / During design stage & construction period	√
Landscape & Visual	Establishment Period	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	Re-instatement of excavated Area All excavated area and disturbed area for utilities diversion, temporary road diversion, and pipeline woks 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	Appearance and Greening for the proposed structures 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.
Summary of Key Environmental Mitigation Measures in Contract Requirements			
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)
Sub-total	71,945.00	0.00	0.00	3280.00	71944.90	410.00	500.00	80.00	0.00	51.04
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
Sub-total	44,261.00	0.00	5684.00	3100.00	38576.70	300.00	360.00	120.00	0.00	17.23
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
Sub-total	11,403.00	0.00	11.00	763.00	11391.50	100.00	60.00	32.00	360.00	23.13
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
Sub-total	6,511.00	0.00	0.00	725.00	6511.00	120.00	0.00	15.00	450.00	21.25
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	**180.00**	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
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 2011based 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 though 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

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
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

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
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

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
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

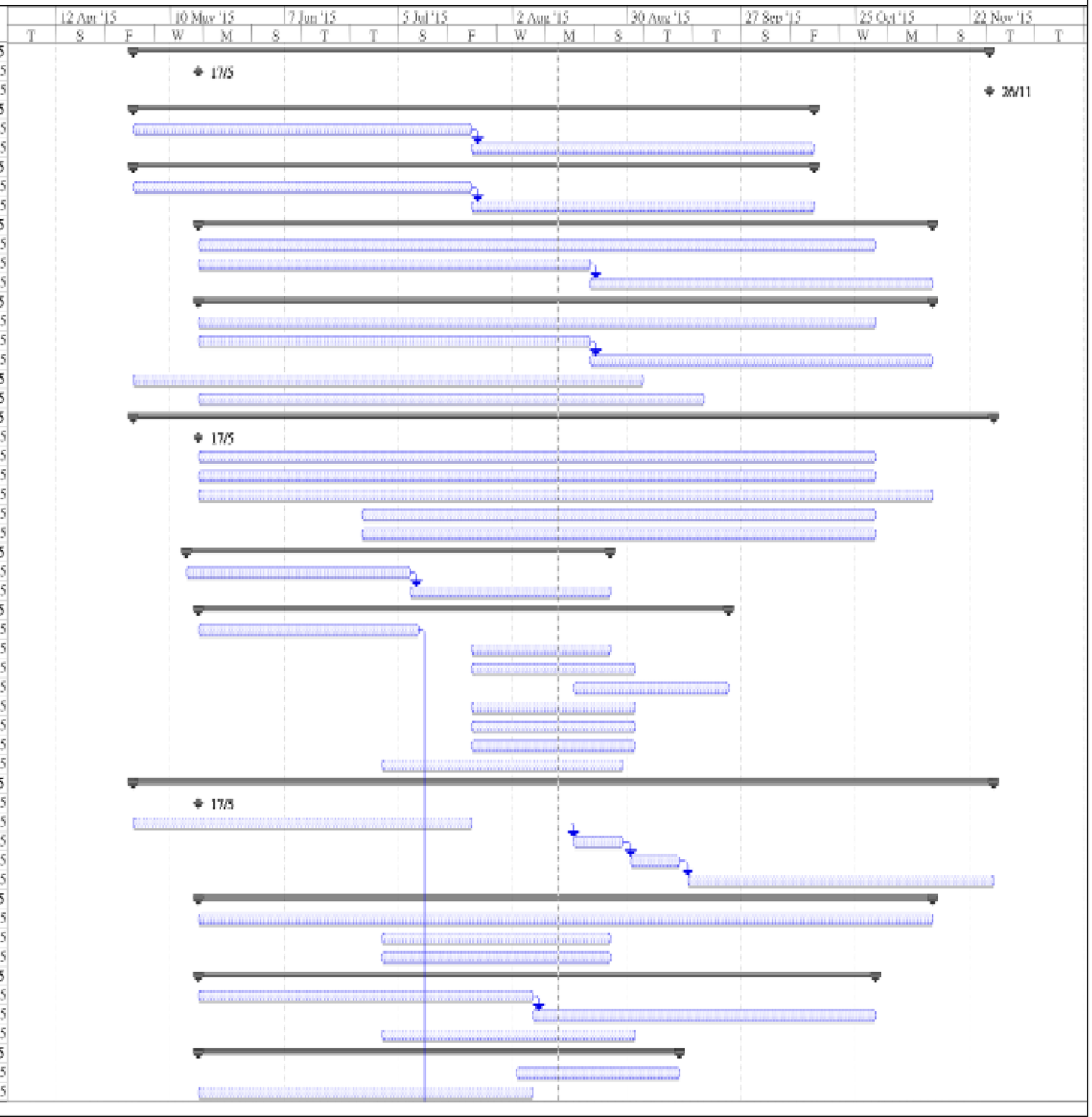
Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
August 2015	0	0
September 2015	0	0
October 2015	0	0
November 2015	0	0
December 2015	0	0
Overall Total	**0**	**0**

Annex L

Construction Programme of the Project

PPSTW Remianing Follow up Programme (after 17 May2015)

ID	Task Name	Duration	Start	Finish
1	**Design Submission**	**151 days?**	**Fri 1/5/15**	**Thu 26/11/15**
2	Design Submission	0 days?	Sun 17/5/15	Sun 17/5/15
3	Design Submission	0 days?	Thu 26/11/15	Thu 26/11/15
4	**DDA Final Package - Civil**	**120 days**	**Fri 1/5/15**	**Wed 14/10/15**
5	SO advance copy review	60 days	Fri 1/5/15	Wed 22/7/15
6	DC Sign final check cert	60 days	Thu 23/7/15	Wed 14/10/15
7	**DDA Final Package - E&M**	**120 days**	**Fri 1/5/15**	**Wed 14/10/15**
8	SO advance copy review	60 days	Fri 1/5/15	Wed 22/7/15
9	DC Sign final check cert	60 days	Thu 23/7/15	Wed 14/10/15
10	**CMS Submission**	**130 days**	**Sun 17/5/15**	**Thu 12/11/15**
11	CMS Compile package for Capproval	120 days	Sun 17/5/15	Thu 29/10/15
12	CMS resubmission	70 days	Sun 17/5/15	Thu 20/8/15
13	CMS resubmission - SO review and approval	60 days	Fri 21/8/15	Thu 12/11/15
14	**CSF Submission**	**130 days**	**Sun 17/5/15**	**Thu 12/11/15**
15	CSF Compile package for Cond.Approval	120 days	Sun 17/5/15	Thu 29/10/15
16	CSF resubmission	70 days	Sun 17/5/15	Thu 20/8/15
17	CSF resubmission - SO review and approval	60 days	Fri 21/8/15	Thu 12/11/15
18	**As built drawing - Civil**	**90 days**	**Fri 1/5/15**	**Wed 2/9/15**
19	**As built drawing - E&M**	**90 days**	**Sun 17/5/15**	**Thu 17/9/15**
20	**Civil Works**	**152 days?**	**Fri 1/5/15**	**Fri 27/11/15**
21	Civil Works	0 days?	Sun 17/5/15	Sun 17/5/15
22	List A - follow-up items	120 days	Sun 17/5/15	Thu 29/10/15
23	Defect List - Follow up items	120 days	Sun 17/5/15	Thu 29/10/15
24	New Defect List after Jan 2015	130 days	Sun 17/5/15	Thu 12/11/15
25	Improvement works	90 days	Fri 26/6/15	Thu 29/10/15
26	Remaining condition survey at some ext. bldg & sewer	90 days	Fri 26/6/15	Thu 29/10/15
27	**Landscaping works**	**75 days**	**Thu 14/5/15**	**Tue 25/8/15**
28	Remaining Lascaping works	40 days	Thu 14/5/15	Tue 7/7/15
29	Make good lanscaping area	35 days	Wed 8/7/15	Tue 25/8/15
30	**Remaining Road & Underground Works**	**94 days**	**Sun 17/5/15**	**Wed 23/9/15**
31	Plinth and Cable duct for lamp poles	40 days	Sun 17/5/15	Thu 9/7/15
32	Make good Pipe trench civer surface	24 days	Thu 23/7/15	Tue 25/8/15
33	Water ponding deck of PTW south	28 days	Thu 23/7/15	Mon 31/8/15
34	PTW screening skip house - bollards and ramp	28 days	Mon 17/8/15	Wed 23/9/15
35	Pretuded concrete cover at N1	28 days	Thu 23/7/15	Mon 31/8/15
36	Repair demaged concrete covers	28 days	Thu 23/7/15	Mon 31/8/15
37	O/S site wide storm & foul drain pipe test	28 days	Thu 23/7/15	Mon 31/8/15
38	CEPT water seepage & grating cover	43 days	Wed 1/7/15	Fri 28/8/15
39	**Polyshield issue**	**152 days?**	**Fri 1/5/15**	**Fri 27/11/15**
40	Polyshield issue	0 days?	Sun 17/5/15	Sun 17/5/15
41	Polyshield trail and study	60 days	Fri 1/5/15	Wed 22/7/15
42	Sludge removal for ret. Tk at SW	10 days	Mon 17/8/15	Fri 28/8/15
43	Re-coating by Sika Poxitar for ret. Tk at SW	10 days	Mon 31/8/15	Fri 11/9/15
44	Polyshield remedial at various other locations	55 days	Mon 14/9/15	Fri 27/11/15
45	**Fencing / Staircase / Handraining & other metal works**	**130 days**	**Sun 17/5/15**	**Thu 12/11/15**
46	SDB Roof staircase	130 days	Sun 17/5/15	Thu 12/11/15
47	Fecing at SHB top	40 days	Wed 1/7/15	Tue 25/8/15
48	Cat Ladder in SHB	40 days	Wed 1/7/15	Tue 25/8/15
49	**Terminal Manhole remaining works**	**120 days**	**Sun 17/5/15**	**Thu 29/10/15**
50	Cell B/C opening make good	60 days	Sun 17/5/15	Thu 6/8/15
51	Level sensor	60 days	Fri 7/8/15	Thu 29/10/15
52	Demolition of ADCJV Site office	44 days	Wed 1/7/15	Mon 31/8/15
53	**Remaining Door & Signage works**	**86 days**	**Sun 17/5/15**	**Fri 11/9/15**
54	SDB sliding door and FRP railing	30 days	Mon 3/8/15	Fri 11/9/15
55	Remianing Door Signage	60 days	Sun 17/5/15	Thu 6/8/15

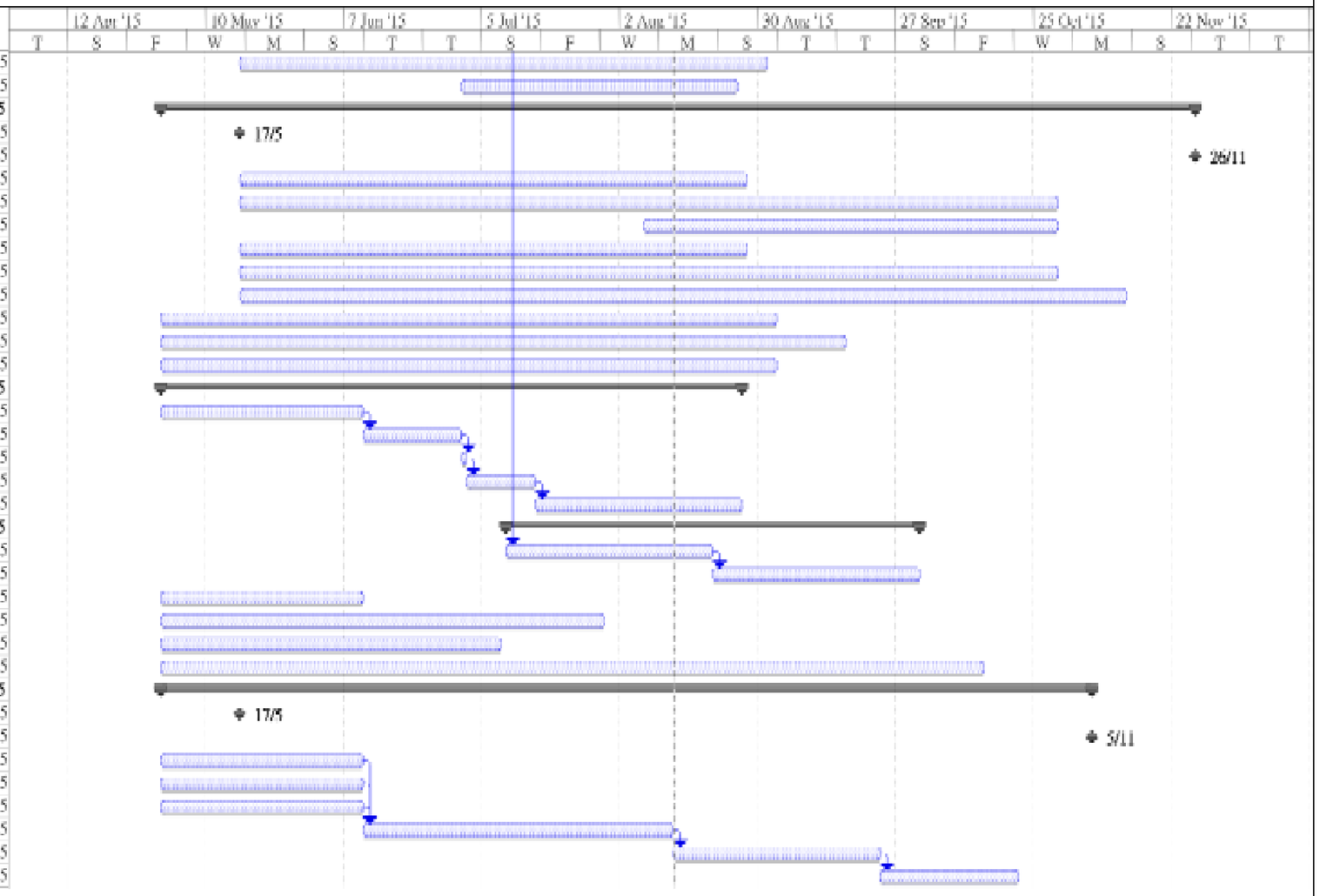


Project: PPSTW Remaining Follow-up
Date: Thu 13/8/15

Task | Milestone | Project Summary | External Milestone | Progress
Split | Summary | External Tasks | Inactive Task | Deadline

PPSTW Remianing Follow up Programme (after 17 May2015)

ID	Task Name	Duration	Start	Finish
56	Traffic sign and road marking	77 days	Sun 17/5/15	Mon 31/8/15
57	Door defects	40 days	Wed 1/7/15	Tue 25/8/15
58	**E&M Works**	**151 days?**	**Fri 1/5/15**	**Thu 26/11/15**
59	E&M Works	0 days?	Sun 17/5/15	Sun 17/5/15
60	E&M Works	0 days?	Thu 26/11/15	Thu 26/11/15
61	List B - follow-up items	75 days	Sun 17/5/15	Thu 27/8/15
62	Defect List - Follow up items	120 days	Sun 17/5/15	Thu 29/10/15
63	Defect Label - Follow up items	60 days	Fri 7/8/15	Thu 29/10/15
64	Improvement works	75 days	Sun 17/5/15	Thu 27/8/15
65	New Defect List after Jan 2015	120 days	Sun 17/5/15	Thu 29/10/15
66	DSD Defect List	130 days	Sun 17/5/15	Thu 12/11/15
67	Fine/Course Screen Improvement works	90 days	Fri 1/5/15	Wed 2/9/15
68	Foam control system	100 days	Fri 1/5/15	Wed 16/9/15
69	Enclosesure for Centrifuge	90 days	Fri 1/5/15	Wed 2/9/15
70	**FS Phase 2 Inspection**	**85 days**	**Fri 1/5/15**	**Wed 26/8/15**
71	Defect rectification at site	30 days	Fri 1/5/15	Wed 10/6/15
72	FS Inspection notification	14 days	Thu 11/6/15	Tue 30/6/15
73	FS Inspection	1 day	Wed 1/7/15	Wed 1/7/15
74	FS document	10 days	Thu 2/7/15	Wed 15/7/15
75	FSD approval	30 days	Thu 16/7/15	Wed 26/8/15
76	**Existing lamp pole replacement**	**60 days**	**Fri 10/7/15**	**Thu 1/10/15**
77	Lamp pole installation	30 days	Fri 10/7/15	Thu 20/8/15
78	Cabling	30 days	Fri 21/8/15	Thu 1/10/15
79	WBI system testing	30 days	Fri 1/5/15	Wed 10/6/15
80	Access Control system	65 days	Fri 1/5/15	Wed 29/7/15
81	CCTV	50 days	Fri 1/5/15	Wed 8/7/15
82	Other EC from SO	120 days	Fri 1/5/15	Wed 14/10/15
83	**SCADA Modification / Improvement**	**136 days?**	**Fri 1/5/15**	**Thu 5/11/15**
84	SCADA Modification / Improvement	0 days?	Sun 17/5/15	Sun 17/5/15
85	SCADA Modification / Improvement	0 days?	Thu 5/11/15	Thu 5/11/15
86	SO comments	30 days	Fri 1/5/15	Wed 10/6/15
87	OM comments	30 days	Fri 1/5/15	Wed 10/6/15
88	DSD Comments	30 days	Fri 1/5/15	Wed 10/6/15
89	JV Desicuss and Detail	45 days	Thu 11/6/15	Wed 12/8/15
90	Programming works	30 days	Thu 13/8/15	Wed 23/9/15
91	Testing	20 days	Thu 24/9/15	Wed 21/10/15



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

Task | Milestone | Project Summary | External Milestone | Progress
Split | Summary | External Tasks | Inactive Task | Deadline

Part 2 – Operation Phase EM&A Report for December 2015

AECOM
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, Hong Kong
香港新界沙田鄉事會路138號
新城市中央廣場第2座8樓
www.aecom.com
+852 3922 9000 tel
+852 3922 9797 fax

Your Ref:
Our Ref: 60017423/C/oylw16011501

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)

15 January 2016

Dear Sir,

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

Monthly EM&A Report for December 2015 (5th Monthly Operation Phase Monitoring Report for December 2015)

Reference is made to Environmental Team (ET)'s draft of the Monthly EM&A Report for December 2015 provided by email dated 11 and 15 January 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. 2441 2933)
SMEC – Ms. Vivian Chan (Fax No. 3995 8101)
ATAL–Degremont–China State JV – Mr. Barry Lee (Fax No. 2811 3321)

ATAL – Degrémont – China State Joint Venture

SMEC ASIA

62nd Monthly EM&A Report (5th Monthly Operation Phase Monitoring Report for December 2015)

Contract No. DC/2008/03

Design, Build and Operate
Pillar Point Sewage Treatment Works

January 2016

AUSTRALIA | ASIA | MIDDLE EAST | AFRICA | PACIFIC

ATAL – Degrémont – China State Joint Venture

SMEC ASIA

62nd Monthly EM&A Report (5th Monthly Operation Phase Monitoring Report for December 2015)

Contract No. DC/2008/03

Design, Build and Operate
Pillar Point Sewage Treatment Works

Janauary 2016

Certified By **Vivian CHAN**
ET Leader

Project/Deliverable No.	7076134 | D13/01
Project Name	Upgrading of Pillar Point Sewage Treatment Works – Design, Build and Operate
Report Name	62th Monthly EM&A Report (5th Monthly Operation Phase Monitoring Report for December 2015)
Report Date	January 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)	November 2015	Francis LEE	Vivian CHAN	Alexi BHANJA

ISSUE REGISTER

Distribution List	Date Issued	Number of Copies
ATAL Engineering - Degrémont SA - China State Construction Engineering Joint Venture	January 2016	1 soft copy
SMEC Project File:		1 electronic

SMEC COMPANY DETAILS

SMEC Asia Limited
27/F Ford Glory Plaza, 37-39Wing Hong Street, Cheung Sha Wan, Kowloon, Hong Kong
T +852 3995 8100|**F** +852 3995 8101
smecasia@smec.com |www.smec.com

CONTENTS

APPENDICES

TABLES

FIGURES

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 December 2015. 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	5rd Reporting Month Monitoring Period: 1 – 31 December 2015
Odour Monitoring	23/12/2015
H_2S Monitoring	1/12/2015 - 31/12/2015 (continuous monitoring)
Landscape and Visual Monitoring	11/12/2015

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.

E.7. No obvious change in biological parameters and species composition of benthic communities was observed at all stations between pre-commission and post-commission periods of PPSTW

Environmental Complaint

E.8. In this reporting period, no environmental complaint in relation to the EM&A Programme was recorded.

Reporting Change

E.9. This is the 5th Monthly Operation Phase Monitoring report and no reporting changes were made in the Reporting Period.

Major Activities on Site

E.10. 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.11. 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.12. 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^3/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^3/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 fifth Monthly Operational Phase Monitoring Reports which summarizes the findings of EM&A works during the reporting period from 1 to 31 December 2015.

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 H*** 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. [1]
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***.

[1] Wai Sang Sawmill Ltd. Had been demolished, the patrol and the monitoring location was kept as the same location as previous background monitoring 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 G***.

2.6 Monitoring Results and Observations

2.6.1 The odour patrol was carried out on 23 December 2015 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 fine and very hot. The weather condition during the period is provided in ***Appendix H***.

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.

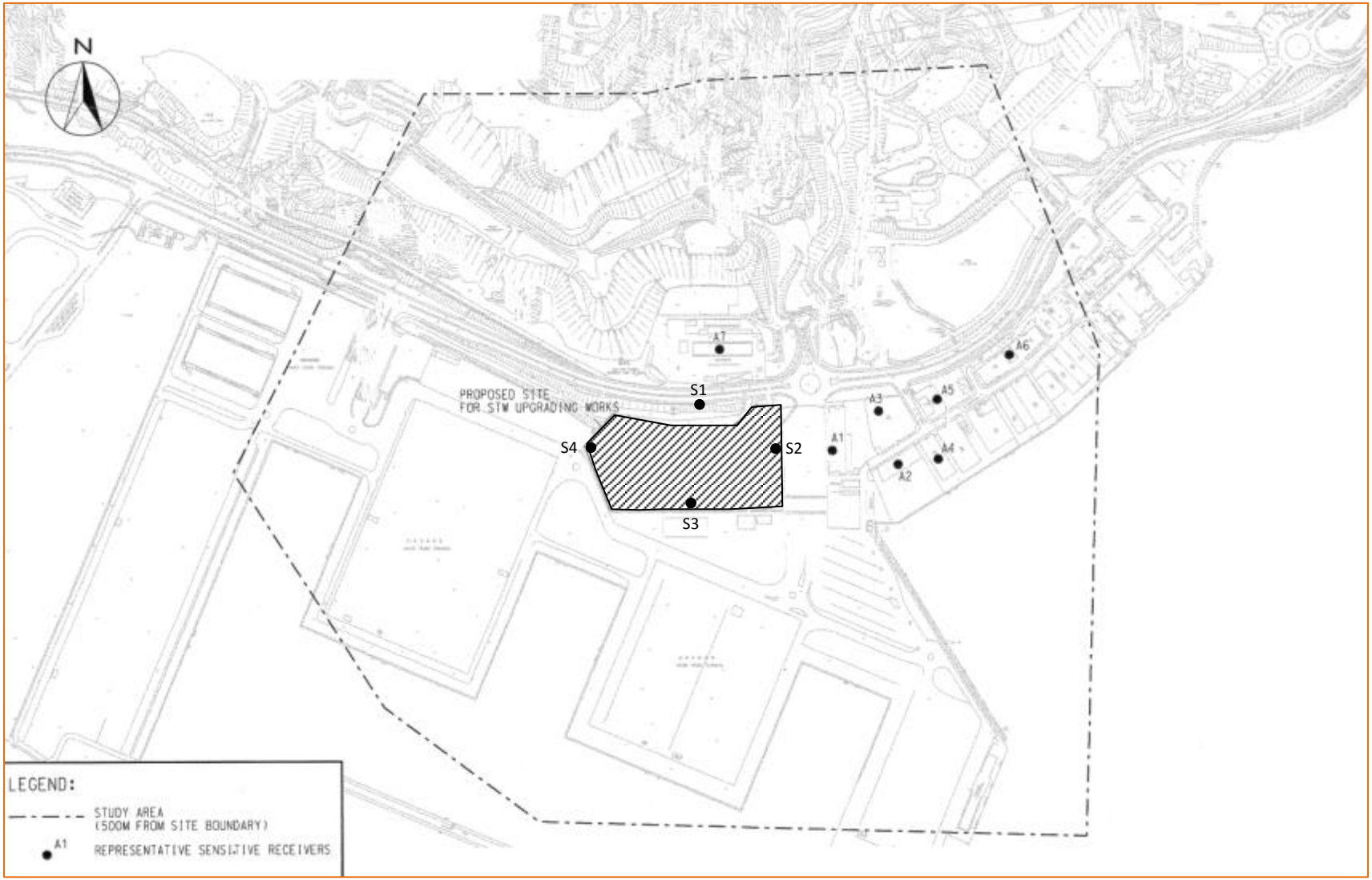
2.6.5 During the odour patrol, no noticeable odour due to operation of the PPSTW was observed at the sensitive receivers.

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 & Olfactomectric 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 1ou/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_2S Measurement

H_2S Measurement Methodology

i. H_2S level sensors were installed at the respective inlet and outlet of the deodorization units to continuously monitor the H_2S emission level at the stacks and H_2S 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

Deodourization 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_2S 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_2S Gas Detector	"Crowcon" Gasmonitor Plus Control Panel	"Crowcon" Xgard Type 1 H_2S 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 deodourizing 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 Deodourizing Units

Stack of Deodorizing unit	Design requirements of deodorizing unit	Odour emission rates
A2	• H=6.81m • V=19.58m/s • D=0.62m	1,786 ou/s (total emission from all vent pipes)
A3	• H=6.81m • V=19.58m/s • D=0.62m	

Stack of Deodorizing unit	Design requirements of deodorizing unit	Odour emission rates
B2	• H=6.81m • V=20.00m/s • D=0.62m	1,809 ou/s (total emission from all vent pipes)
B3	• H=6.81m • V=20.00m/s • D=0.62m	

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_2S measurement)	Odour emission rate from the outlet of the deodorizaiton unit exceeds 80% of the permitted value in ***Table 3-3***.	Odour emission rate from outlet of the deodorization unit exceeds the permitted value in ***Table 3-3***.

3.5 Event and Action Plan

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

3.6 Monitoring Results

Air Samples and Olfactometric Analysis

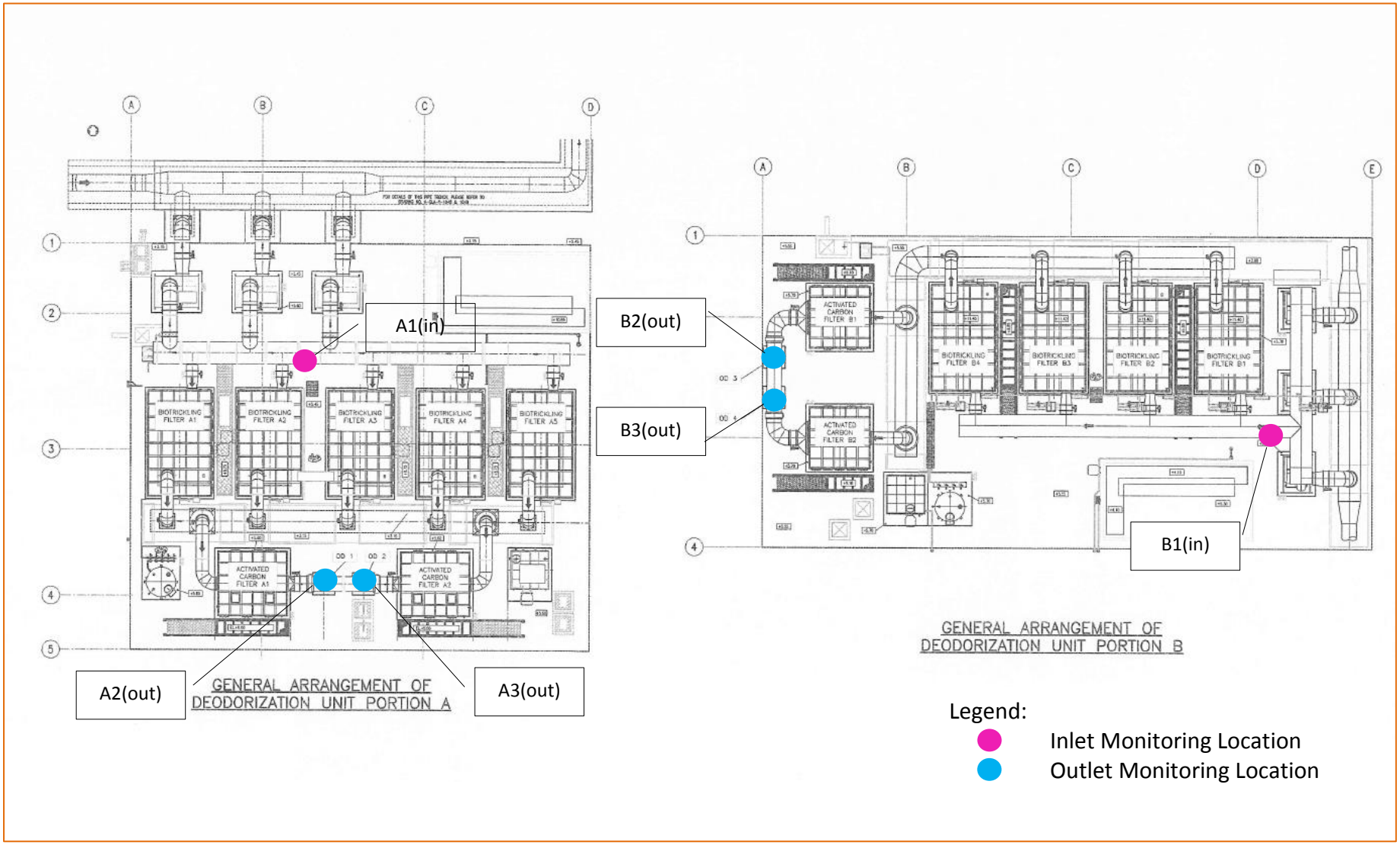
3.6.1 No air sampling for olfactometric analysis was carried out during the reporting month. The next monitoring is scheduled in August 2016, at 1 year after commissioning of the upgraded PPSTW, and the exact date of sampling will be agreed with the Independent Environmental Checker (IEC) in due course.

H_2S Monitoring

3.6.2 Continuous H_2S monitoring was conducted from 1 to 31 December 2015 and the results were provided in ***Appendix D***.

3.6.3 As shown in the continuous H_2S monitoring results, the average percentage of H_2S 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.[2]
Biochemical Oxygen Demand (mg/L)		
Suspended Solids (SS) (mg/L)		
Ammonia as N		
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 of Hong Kong (CMA). 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^{o}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_5 (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

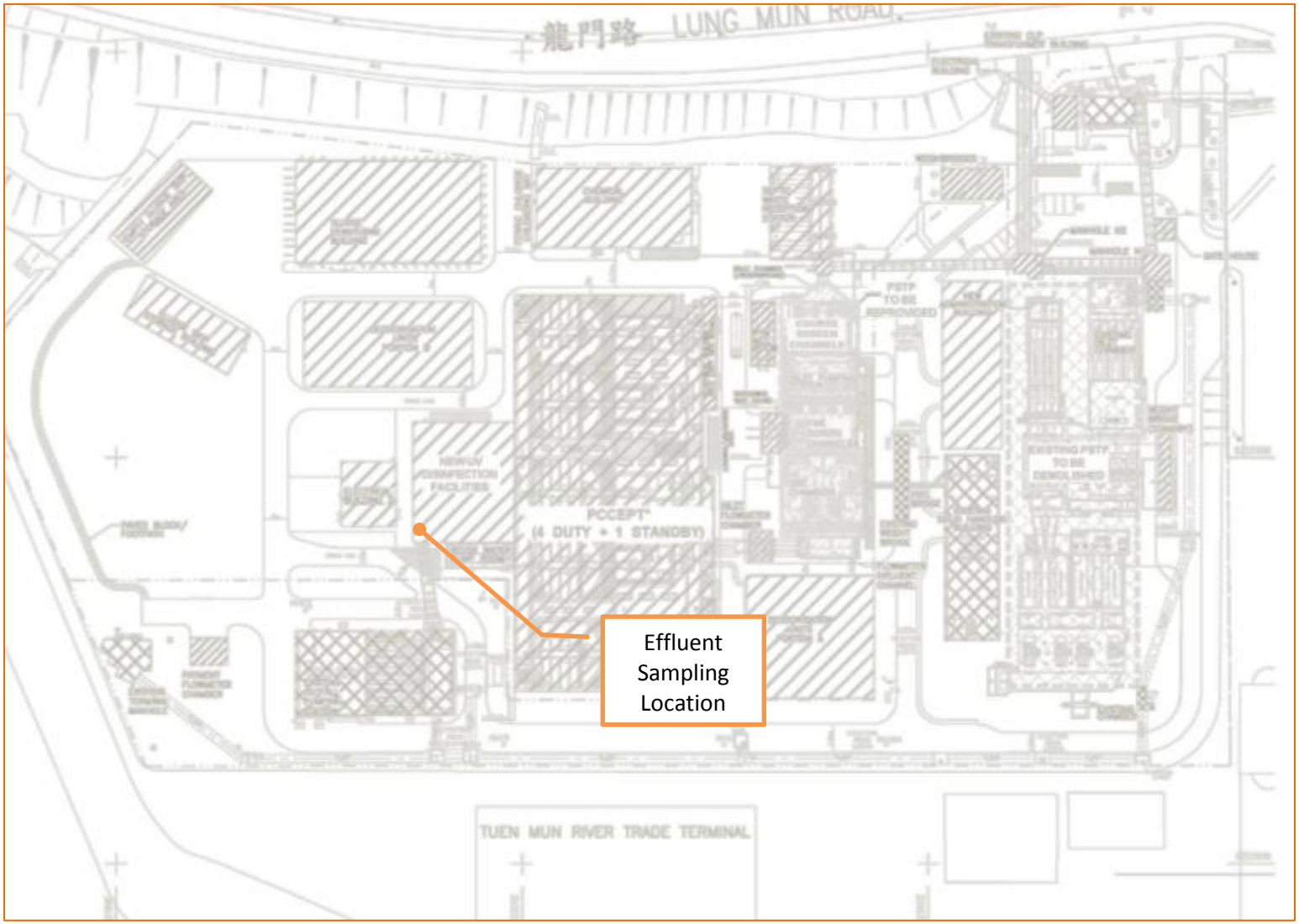
	TSS (mg/L)	BOD_5 (mg/L)	E. coli (counts/100mL)
Effluent Loadings at 95 Percentile	120	180	300,000
Upper Limit	240	360	#20,000

#: 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 in 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) [Ref. #3] 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	• If water depth >6m, 1m below water surface, mid-depth and 1m above seabed • If water depth <6m, and >3m, 1m below surface and 1m above seabed • If water depth <3m, mid-depth only
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^{o}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***.

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 in 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 $0.1m^2$ 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)[Ref.#4], Gallardo (1967)[Ref.#5], Fauchald (1977)[Ref.#6], Yang and Sun (1988)[Ref.#7], Wu et al. (1997)[Ref.#8], Sun and Yang (2004)[Ref.#9]; Arthropods: Dai and Yang (1991)[Ref.#10], Dong (1991)[Ref.#11]; and Molluscs: Qi (2004)[Ref.#12]. 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,

$$H' = -\Sigma (Ni / N) \ln (Ni / N) \quad \textit{(Shannon and Weaver, 1963)}$$

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

where S is the total number of species in the sample, N is the total number of individuals, and Ni is the number of individuals of the i^{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.

4. Day, J.H., 1967. A monograph on the polychaeta of South Africa. Trustees of the British Museum, London.
5. 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.
6. 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.
7. Yang, D.J, Sun, R.P., 1988. Polychaetous annelids commonly seen from the Chinese waters (Chinese version). China Agriculture Press, China.
8. Wu, B.L., Wu, Q.Q., Qiu, J.W., Lu, H., 1997. Fauna Sinica, Phylum Annelida, Class Polychaeta, Order Phyllodocimorpha. Science Press. Beijing.
9. Sun, R.P., Yang, D.J., 2004. Fauna Sinica. Phylum Annelida. Class Polychaeta II, Order Nereidida. Science Press. Beijing.
10. Dai, A.Y., Yang, S.L., 1991. Crabs of the China Seas. China Ocean Press. Beijing.
11. Dong, Y.M., 1991. Fauna of ZheJiang Crustacea. Zhejiang Science and Technology Publishing House. ZheJiang.
12. Qi, Z.Y., 2004. Seashells of China. China Ocean Press. Beijing, China.

6.3 Monitoring Equipment

6.3.1 A 0.1m^2 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^2)	Density (ind. m^{-2})	Biomass (g m^{-2})	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

Sediment Condition

6.5.1 The sediment texture and colour and hydrogen sulphite (H_2S) odour at the monitoring stations are shown in ***Table 6-2***.

Table 6-2 Sediment Texture and Colour at Monitoring Stations

Station ID	Sediment Texture	Sediment Colour	Level of H_2S Odour	Remarks
B1	Soft mud	Grey with brown surface	-	-
B2	Soft mud	Grey with brown surface	-	-
B3	Soft mud	Grey with brown surface	-	Rubbish inside sediments
B4	Soft mud	Grey with brown surface	-	Rubbish inside sediments
B5	Soft mud	Grey with brown surface	-	-
B6	Soft mud	Grey with brown surface	-	-
WSD1	~ 70% Soft mud + ~30% Coarse sand	Grey with brown surface	-	Lots of broken shells
WSD2	~ 60% Soft mud + ~40% Coarse sand	Grey with brown surface	-	Broken shells and rubbish inside sediments
U2	~ 90%% Fine sand + ~10% Soft mud	Grey	-	-
NM1	Soft mud	Grey with brown surface	Mild	-
NM6	~90% Soft mud + ~10% coarse sand	Grey	-	-

6.5.2 As revealed in ***Table 6-2*** , the sediments collected in B1 to B6 stations were soft mud. The sediment colour was grey with thin, brown surface. Rubbish was found in B3 and B4 sediments that reflected the dumping activities of vessel from nearby typhoon shelter.

6.5.3 The sediments of stations WSD1 and WSD2 were intermediate mixture of soft mud (60-70%) and coarse sand (30-40%). The sediment colour was grey with thin, brown surface.

Lots of broken shells were found inside the sediments. Rubbish was found in WSD2 sediments that reflected the dumping activities of vessel from nearby typhoon shelter.

6.5.4 The sediments of station U2 was mainly grey, soft mud (~90%) with coarse sand as the remaining portion.

6.5.5 The sediments of station NM1 were soft mud. The sediment colour was grey with thin, brown surface while mild smell of hydrogen sulphite was detected. The sediments of station NM6 were mainly soft mud (~90%) with coarse sand as the remaining portion. The sediment colour was grey.

Benthic Baseline

6.5.6 The total abundance and total biomass of every phylum are summarized in ***Table 6-3***. A total of 472 specimens were collected. 83 of 90 taxa were identified to genus or species levels. The most diverse phylum was Annelida (45 polychaete taxa), followed by Arthropoda (10 crab species + 6 shrimp taxa + 3 amphipod taxa + 1 hermit crab taxon + 1 isopod taxon), Mollusca (12 bivalve taxa + 1 gastropod species), Echinodermata (3 brittle star taxa + 2 sea cucumber taxa), Sipuncula (2 taxa), Echiura (2 taxa), Chordata (1 fish species) and Nemertea (1 taxon).

6.5.7 In general, 57% of total abundance was Annelida (polychaetes, 271 ind.). The second and third abundant phyla were Echinodermata (72 ind., 15%) and Arthropoda (60 ind., 13%) respectively. The less abundant phyla were Sipuncula (31 ind., 7%) and Mollusca (26 ind., 6%). Other phyla were relatively few in abundance while each contributed less than 2% of total abundance. The total biomass was 24.6330 g accounted mainly by Arthropoda (14.1614 g, 57%), Mollusca (5.2817 g, 21%) and Echinodermata (3.5717 g, 14%).

6.5.8 All recorded species were common with no conservation interest. The complete list of species identified in the collected specimens is provided in ***Appendix F***.

Table 6-3 Abundance and Biomass for Each Phylum

Phylum	Abundance (individuals)	%age of Abundance	Biomass (g)	%age of Biomass
Annelida	271	57	1.1803	5
Echinodermata	72	15	3.5717	14
Arthropoda	60	13	14.1614	57
Sipuncula	31	7	0.1063	0
Mollusca	26	6	5.2817	21
Nemertea	7	1	0.0533	0
Echiura	4	1	0.2456	1
Chordata	1	0	0.0327	0
Total	**472**	**-**	**24.6330**	**-**

Note: 0%: total individual / biomass of the phylum is <1% of that of all specimens

6.5.9 The relative abundance of each phylum for each sampling locations are shown in ***Table 6-4***.

6.5.10 Gazetted beaches: Stations B1-B6 were very low in abundance (3-19 ind.) while the common phyla were Annelida (2-15 ind, relative abundance 25-100%) and Arthropoda (1-5 ind., 8-63%). All phyla were very low in abundance at all beach stations.

6.5.11 Flushing water intake points: Station WSD1 was low in abundance (38 ind.) while Annelida was the common phylum (30 ind., 79%). Station WSD2 was moderate in abundance (115 ind.) while Annelida was the abundant phylum at low-moderate abundance (93 ind. 81%).

6.5.12 Secondary contact recreation subzone: Station U2 was low in abundance (43 ind.). Annelida (27 ind., 63%) and Mollusca (7 ind., 17%) were the common phyla at low abundances.

6.5.13 Control stations: Station NM1 was low in abundance (36 ind.) while the common phylum was Annelida (25 ind., 70%) at low abundance. Station NM6 was moderate in abundance (179 ind.). The common phyla were Echinodermata (69 ind., 39%), Annelida (51 ind., 29%) and Sipuncula (29 ind., 17%) at low abundances.

Table 6-4 Relative Abundance (Percentage) of Each Phylum at Monitoring Stations

	Station ID																					
	B1		B2		B3		B4		B5		B6		WSD1		WSD2		U2		NM1		NM6	
Phylum	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Annelida	2	25	15	79	3	100	5	63	8	80	12	93	30	79	93	81	27	63	25	70	51	29
Arthropoda	5	63	2	11			2	25	2	20	1	8	5	14	19	17	4	10	4	12	16	9
Chordata																	1	3				
Echinodermata													2	6					1	3	69	39
Echiura													1	3			2	5			1	1
Mollusca															1	1	7	17	5	14	13	8
Nemertea	1	13	2	11			1	13							1	1	1	3	1	3		
Sipuncula															1	1	1	3			29	17
Total	**8**		**28**		**26**		**19**		**16**		**27**		**11**		**7**		**27**		**78**		**140**	

6.6 Results

Ecological Status of the Benthic Communities

6.6.1 The number of species, density, biomass, Shannon-weaver Diversity Index (H') and Pielou's Species Evenness (J) values for each sample are provided in ***Table 6-5***, ***Figure 6-1*** and ***Figure 6-2***.

6.6.2 The condition and responses (if any) of macrobenthic communities of all stations were evaluated below.

6.6.3 The complete list of species identified in the collected specimens is provided in ***Appendix F***.

Table 6-5 Number of Species, Abundance, Biomass, Shannon-Weaver Diversity Index (H') and Pielou's Species Evenness (J) at Every Monitoring Station

Station ID	Mean				
	Number of Species (spp. 0.5m^2)	Density (ind.m^{-2})	Biomass (gm^{-2})	Shannon-weaver Diversity index H'	Pielou's Species Evenness J
B1	6	16	5.34	1.67	0.93
B2	9	38	14.58	1.82	0.83
B3	3	6	0.01	1.10	1.00
B4	6	16	0.4	1.67	0.93
B5	7	20	0.93	1.89	0.97
B6	8	26	0.06	1.95	0.94
WSD1	16	76	1.62	2.39	0.86
WSD 2	29	230	5.12	2.02	0.60
U2	23	86	1.58	2.80	0.89
NM1	20	72	4.47	2.71	0.90
NM6	38	358	15.17	2.45	0.67

Figure 6-1 Graphical Plots of Comparison of Species Number at Each Monitoring Station

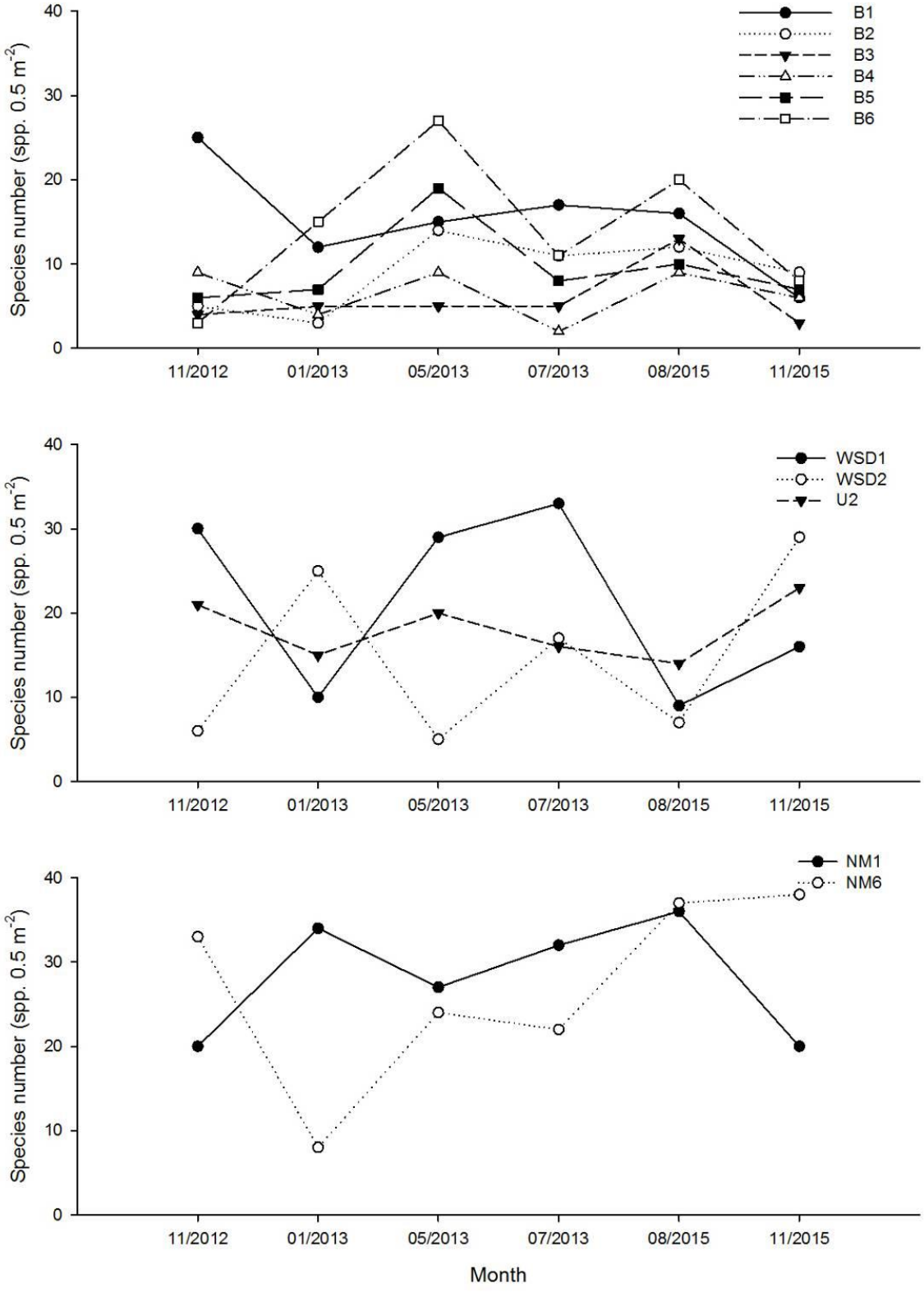


Figure 6-2 Graphical Plots of Comparison of Density at Each Monitoring Station

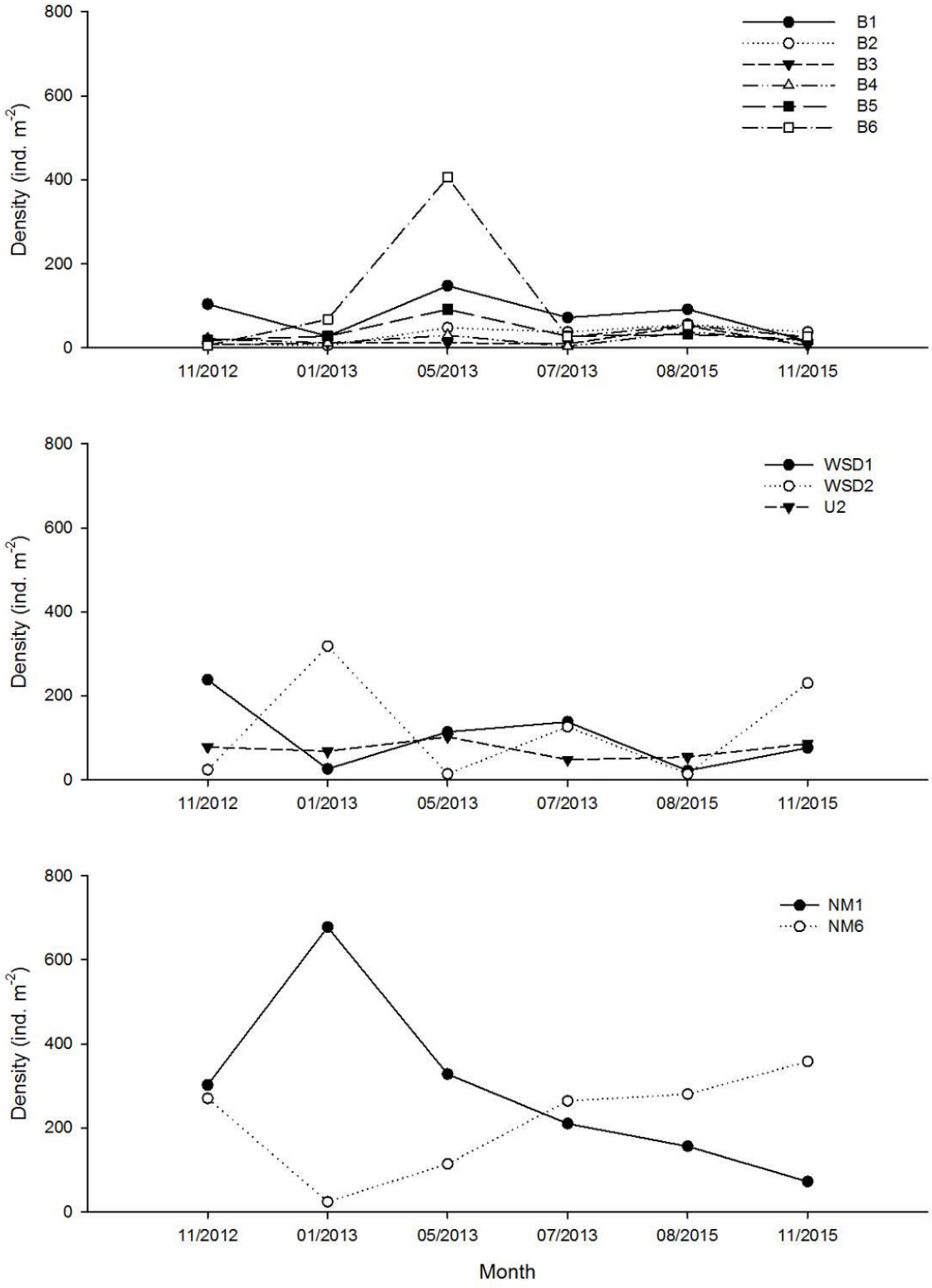


Figure 6-3 Graphical Plots of Comparison of Biomass at Each Monitoring Station

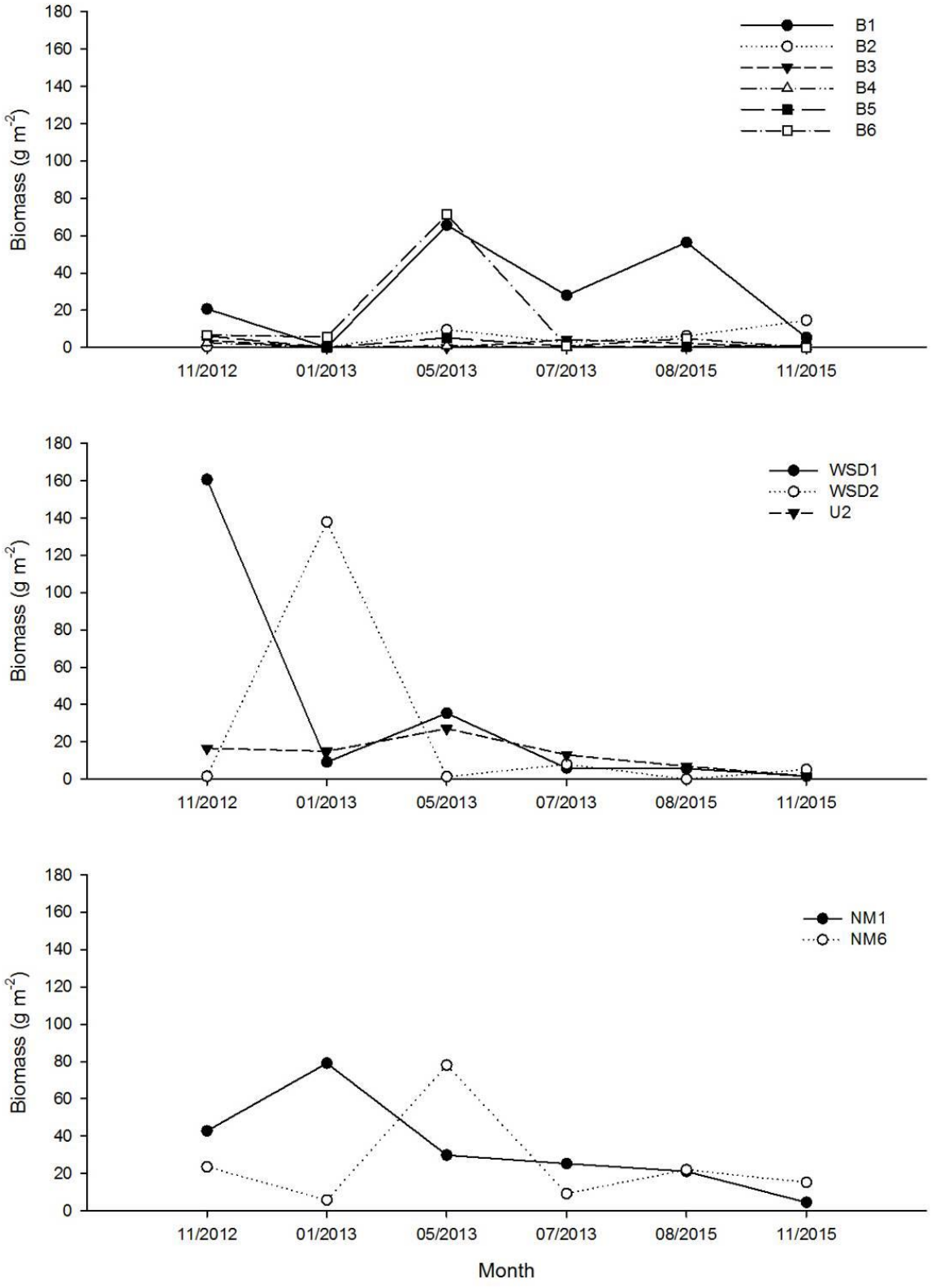


Figure 6-4 Graphical Plots of Comparison of Shannon-Weaver Diversity Index (H') at Each Monitoring Station

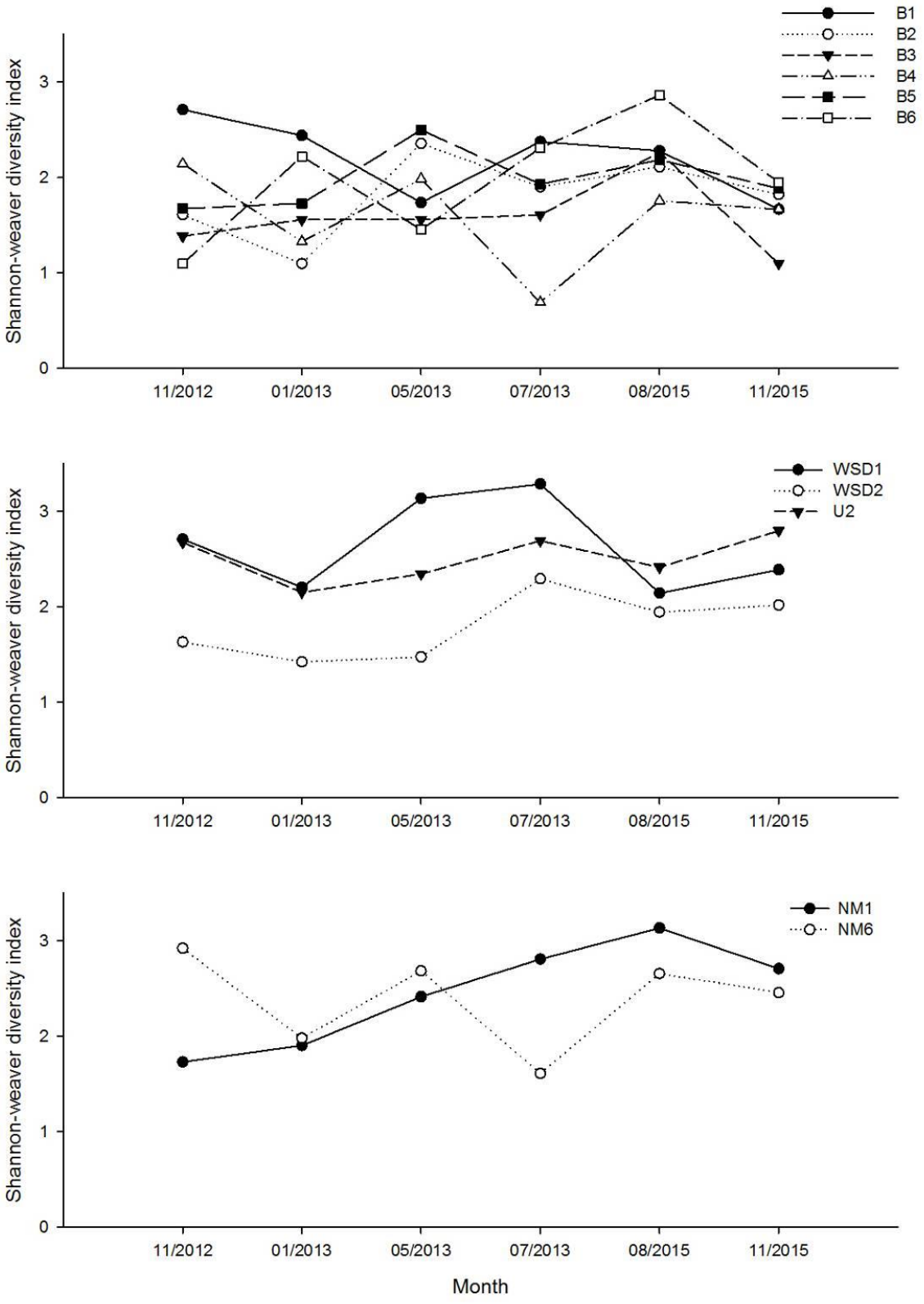
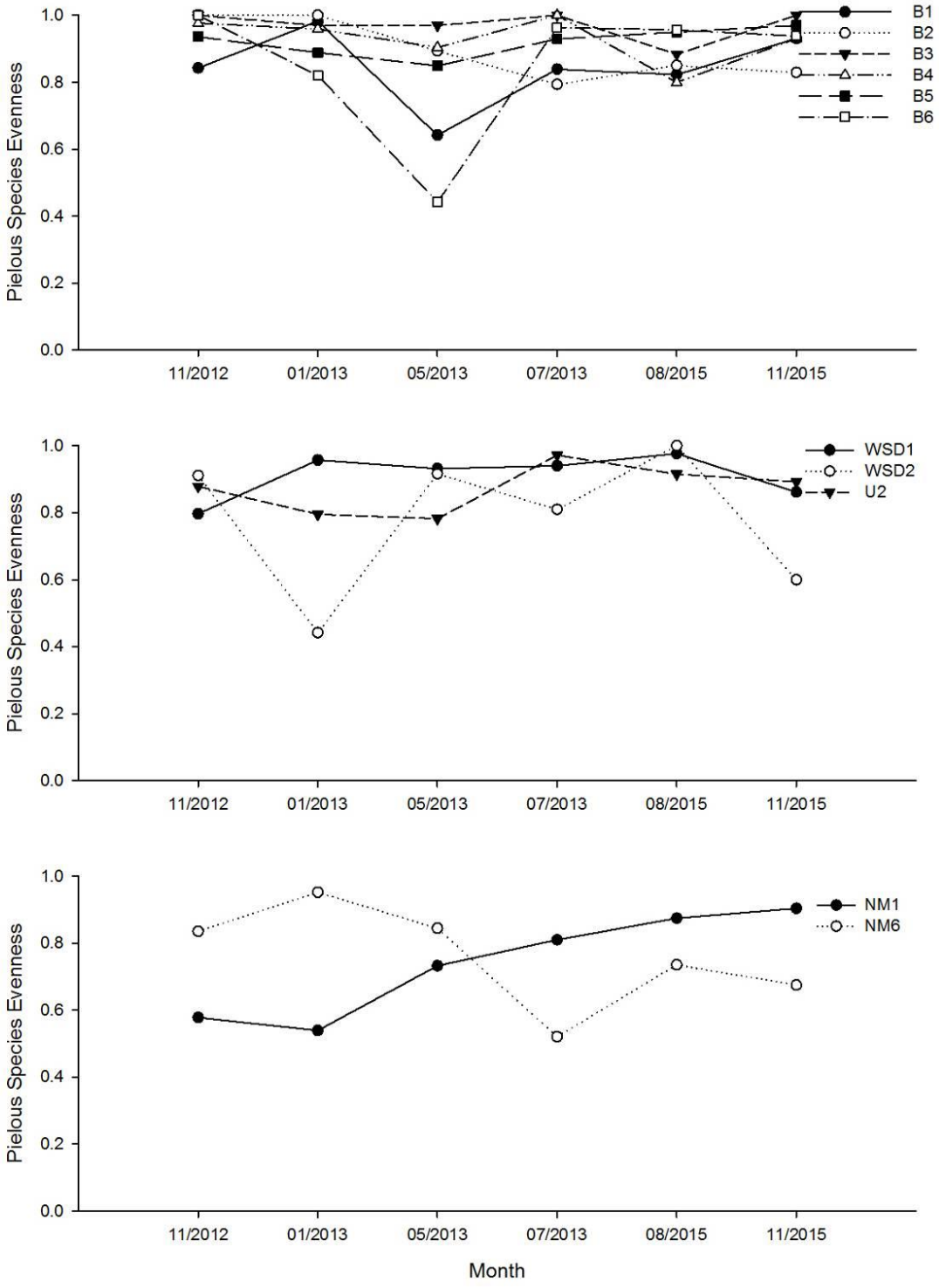


Figure 6-5 Graphical Plots of Comparison of Pielou's Species Evenness (J) at Each Monitoring Station



6.7 Results Analysis

6.7.1 In order to investigate any responses of benthic communities after the upgrading works of PPSTW, samplings were conducted during an one year pre-commission period and an one year post-commission period. . For pre-commission period, two samplings were conducted in dry season (Nov. 2012 & Jan. 2013) and wet season (May. & Jul. 2013) respectively. For the post-commission period, the first samplings of wet season and dry season were conducted in August 2015 and November 2015 respectively.

6.7.2 Post-commission benthic survey monitoring results for November 2015 were compared to the pre-commission benthic survey baseline monitoring results in ***Table 6-1*** and ***Table 6-5***; and ***Figure 6-1*** to ***Figure 6-5.***

Gazetted beaches

6.7.3 For station B1, the mean species number and density ranged 16-19 spp. 0.5 m^{-2} and 66-110 ind. m^{-2} between dry and wet seasons of the pre-commission period. Slight declines of mean H' (from 2.58 to 2.06) and J (from 0.91-0.74) were observed in the wet season. It was due to the increased dominance of bivalve species Paphia undulata and sea cucumber Protankyra bidentata. Moreover it accounted for the increased mean biomass in wet season (from 10.46 to 46.80 g m^{-2}).

6.7.4 In the post-commission period, the species number (16 spp. 0.5 m^{-2}), density (92 ind. m^{-2}), H' (2.28) and J (0.82) of wet season (results of Aug. 2015 only) were similar to that of pre-commission period. The biomass (56.41 g m^{-2}) was generally higher than that of pre-commission period. Because the abundant sea cucumber Protankyra bidentate (total 4.22 g) and bivalve Paphia undulata (total 22.25 g) were bigger. The species number (6 spp. 0.5m^{-2}), density (16 ind. m^{-2}) and H' (1.67) of dry season (results of Nov. 2015 only) were lower than that of pre-commission period. The biomass (5.34 g m^{-2}) and J (0.93) of dry season were similar to that of pre-commission period.

6.7.5 For stations B2 to B5, all were low in mean species number (4-14 spp. 0.5 m^{-2}), density (8-60 ind. m^{-2}) and H' (1.34-2.22) in the pre-commission period while no obvious change was observed between dry and wet seasons. The commonly occurring polychaete Mediomastus sp. was an opportunistic species feeding on organic matters in sediments (Cheung et al., 2008). It indicated a mild but long term condition of organic enrichment. As mentioned above, all taxa were very even relatively while high J was resulted.

6.7.6 In the post-commission period, no obvious change of benthic community was noticed at B2-B5. The species number (3-13 spp. 0.5 m^{-2}), density (6-56 ind. m^{-2}), biomass (0.01-14.58 g m^{-2}) and H' (1.10-2.27) maintained at low value in wet and dry seasons (results of Aug. and Nov. 2015 only).

6.7.7 For station B6, there were increases of mean species number (from 9 to 19 spp. 0.5 m^{-2}), density (from 37 to 216 ind. m^{-2}) and biomass (from 6.22 to 36.14 g m^{-2}) from dry to wet season in the pre-commission period. The increased density and biomass were due to high dominance of pea crab Xenophthalmus pinnotheroides (290 ind. m^{-2}) in May 2013. Moreover high dominance of this pea crab species resulted in increased mean H' slightly (from 1.66 to 1.88) but decreased mean J (from 0.91 to 0.70) in wet season.

6.7.8 In the post-commission period, the species number (20 spp. 0.5 m^{-2}) of wet season (results of Aug. 2015 only) was similar to that of pre-commission period. Due to the sharp decline of previously dominant pea crab Xenophthalmus pinnotheroides, the density (54 ind. m^{-2}) and

biomass (4.91 g m^{-2}) returned to low value. There was no abundant species while all taxa were even in distribution. Higher H' (2.87) and J (0.96) were resulted. The species number (8 spp. 0.5 m^{-2}), density (26 ind. m^{-2}), H' (1.95) and J (0.94) of dry season (results of Nov. 2015 only) were similar to that of pre-commission period. (4.91 g m^{-2}). The biomass declined to 0.06 g m^{-2} due to lack of large-sized fanua. Overall the benthic community of B6 became similar to that of stations B2-B5.

6.7.9 In general, there was no obvious change of benthic communities at all beach stations between pre-commission and post-commission periods.

Flushing water intake points

6.7.10 For station WSD1, the mean species number increased from dry to wet season (from 20 to 31 spp. 0.5 m^{-2}) while the mean density remained similar (126-132 ind. m^{-2}) in the pre-commission period. Increased mean species number leaded to higher mean H' (from 2.46 to 3.21) and J (from 0.88 to 0.94) in wet season. Since every taxon was quite even in abundance, no abundant species could be determined except November 2012 (pea crab Xenophthalmus pinnotheroides: 56 ind. m^{-2}; polychaete Eunice indica: 44 ind. m^{-2}). It accounted for the decreased mean biomass (from 84.89 to 20.61 g m^{-2}) in the following sampling months (Jan., May & Jul. 2013).

6.7.11 In the post-commission period, the species number (9 spp. 0.5 m^{-2}), density (22 ind. m^{-2}), biomass (5.55 g m^{-2}) and H' (2.15) of wet season (results of Aug. 2015 only) decreased clearly relative to that of pre-commission period. Every taxon was low and similar in density, resulting in high J (0.98). The species number (16 spp. 0.5 m^{-2}), density (76 ind. m^{-2}), H' (2.39) and J (0.86) of dry season (results of Nov. 2015 only) were similar to that of pre-commission period. There was decrease of biomass (1.62 g m^{-2}) relatively due to cease of previously dominant pea crab Xenophthalmus pinnotheroides as mentioned. The polychaete Eunice indica was abundant species with density (44 ind. m^{-2}) similar to the November 2012 survey of pre-commission period.

6.7.12 For station WSD2, the species number (5-25 spp. 0.5 m^{-2}), density (14-318 ind. m^{-2}) and biomass (1.30-137.93 g m^{-2}) varied much among the sampling months in the pre-commission period. No seasonal pattern was observed. Such variation was mainly due to the variable abundance of pea crab Xenophthalmus pinnotheroides (228 ind. m^{-2} in dry season; 28 ind. m^{-2} in wet season). In general, the mean H' (1.53-1.89) and J (0.68-0.86) were similar and remained at low-moderate level between the dry and wet seasons.

6.7.13 In the post-commission period, the species number (7 spp. 0.5 m^{-2}), density (14 ind. m^{-2}), biomass (0.04 g m^{-2}) and H' (1.95) of wet season (results of Aug. 2015 only) were at low value. Every taxon was low and similar in density resulting in high J (1.00). The species number (29 spp. 0.5 m^{-2}), density (230 ind. m^{-2}), H' (2.02) and J (0.60) of dry season (results of Nov. 2015 only) were similar to that of pre-commission period. Polychaete Eunice indica (132 ind. m^{-2}) was the dominant species. Its size was much lower than the previously dominant pea crab Xenophthalmus pinnotheroides accounting for the decreased biomass (5.12 g m^{-2}).

6.7.14 In general, the species number and density were quite variable while the biomass decreased clearly at both stations. Relatively the H' and J were stable. It was yet to determine any significant change of benthic community between pre-commission and post-commission periods.

Secondary contact recreation subzone

6.7.15 In the pre-commission period, there was no significant change of the biological parameters at station U2. The mean species number (18 spp. 0.5 m^{-2}), density (73-75 ind. m^{-2}) and biomass (15.65-20.01 g m^{-2}) remained at low to moderate level. And the H' (2.42-2.52) and J (0.84-0.88) remained at moderate level. The overall commonly occuring species was pea crab Xenophthalmus pinnotheroides at low densities (22-40 ind. m^{-2}).

6.7.16 In the post-commission period (results of Aug. and Nov. 2015 only), the species number (14-23 spp. 0.5 m^{-2}), density (54-86 ind. m^{-2}) and H' (2.42-2.80) remained similar. No abundant species was determined while every taxon was even in distribution resulting increased J (0.89-0.92). The cease of previously common pea crab Xenophthalmus pinnotheroides accounted for decreased biomass (1.58-6.85 g m^{-2}).

Control stations

6.7.17 For station NM1, the mean species number was similar (27-30 spp. 0.5 m^{-2}) between the dry and wet seasons in the pre-commission period. But the mean density (from 490 to 269 ind. m^{-2}) and biomass (from 60.92 to 27.52 g m^{-2}) decreased from dry to wet season. Since the taxa were more even in abundances relatively, the mean H' (from 1.82 to 2.61) and J (from 0.56 to 0.77) increased in the wet season. The declined density was mainly accounted by variable abundance of dominant pea crab Xenophthalmus pinnotheroides.

6.7.18 In the post-commission period, the species number (36 spp. 0.5m^{-2}) increased but the density decreased (156 ind. m^{-2}) in the wet season relative to that of pre-commission period. And biomass (21.03 g m^{-2}) remained similar to the that of pre-commission period. In addition, the species number (20 spp. 0.5m^{-2}), density (72 ind. m^{-2}) and biomass (4.47 g m^{-2}) of dry season decreased relative to that of pre-commission period. The previously abundant pea crab Xenophthalmus pinnotheroides decreased in abundance and even ceased. The taxa distribution was more even resulting higher H' (2.71-3.13) and J (0.87-0.90).

6.7.19 For station NM6, the species number (8-33 spp. 0.5m^{-2}), density (24-270 ind. m^{-2}) and biomass (5.74-78.07 g m^{-2}) varied much among the sampling months in the pre-commission period. It leaded to variable H' (1.61-2.92) and J (0.52-0.95). Such a variation was mainly due to the variable abundance of pea crab Xenophthalmus pinnotheroides. In general the species compositions varied that no consistent abundant species was determined.

6.7.20 In the post-commission period (results of Aug. and Nov. 2015 only), the species number (37-38 spp. 0.5 m^{-2}), density (280-358 ind. m^{-2}) and H' (2.45-2.66) were higher than that of pre-commission period. The benthic community was dominated by brittle star Amphioplus depressus (88-134 ind. m^{-2}) that resulted in similar J (0.67-0.74). The biomass (15.17-21.97 g m^{-2}) was relatively lower than that of pre-commission period because this brittle star species was much smaller than previously abundant pea crab Xenophthalmus pinnotheroides.

6.7.21 Since the benthic communities at NM1 and NM6 were quite variable during the pre-commission period, it was yet to determine any significant change of benthic community between pre-commission and post-commission periods.

6.8 Impact Evaluation of the Upgraded Pillar Point Sewage Treatment Works

6.8.1 During the pre-commission period, there were higher variations of species number, total abundance and species composition at stations B1, B6, WSD1, WSD2, NM1 and NM6. Based on similar sediment condition and relatively stable H' and J, the variations would not be caused by the changes of environmental condition. It was believed that the distribution of benthic communities were in strong patchy pattern at small spatial scale at these stations. The result differences were due to variation of grab sampling location.

6.8.2 Based on the present available results, there is neither obvious nor consistent change on biological parameters and species composition of benthic communities at all stations between the pre-commission and post-commission periods of PPSTW. The biological parameters showed natural, seasonal fluctuations. Although there were changes of dominant species at few stations, it did not reflect any changes of environmental condition. Since the originally dominating species were opportunistic, short-lived or motile, replacement of dominant species was a natural process. More consolidated discussion would be given after completion of post-commission monitoring.

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 [13]
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_4-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.

[13] 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^{o}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^2 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 in 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	
Monitoring Parameters	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.

8 LANDSCAPE AND VISUAL MONITORING

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 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 I***. The findings and recommendations also summarised in ***Table 8-1***.

8.2.2 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
Outstanding issues		
Issues Observed in this Audit		
Within Pillar Point Sewage Treatment Works	Tree, Groundcover & Lawn in ground floor garden were observed in poor condition during this site inspection.	It is 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	7 nos. of compensatory trees were observed in the progress of removal and would be replaced when new trees were arrived.	-
Within Pillar Point Sewage Treatment Works	Ground & Lawn in roof garden were observed improved during this site inspection.	-

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 5th Monthly Operation Phase Monitoring Report which summarizes all environmental monitoring events carried out during post-commissioning period from 1 to 31 December 2015. 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	5rd Reporting Month Monitoring Period: 1 – 31 December 2015
Odour Monitoring	23/12/2015
H_2S Monitoring	1/12/2015 - 31/12/2015 (continuous monitoring)
Landscape and Visual Monitoring	11/12/2015

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 obvious change in biological parameters and species composition of benthic communities was observed at all stations between pre-commission and post-commission periods of PPSTW.

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

9.1.10 No environmental complaint was reported during the reporting month.

9.1.11 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.

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

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

Name of panelist: **Francis Lee**

Company: SMEC

Reference material: 60.00 ppm n-Butanol in nitrogen

Date	Odour concentration OU_E / m^3 (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_{ITE}	0.1709
mean value (C)	y_{ITE}	1.8883

repeatability requirement		$10^{s\,ITE}$ <=	2.3
accuracy requirement	20 <=	$10^{y\,ITE}$ <=	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_E / m^3 (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
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		$10^{s\,ITE}$ <=	2.3
accuracy requirement	20 <=	$10^{y\,ITE}$ <=	80

repeatability	1.339	$10^{s\,ITE}$	Pass
accuracy	47.60	$10^{y\,ITE}$	Pass

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

*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

1. COMPANY NAME AND NAME OF PANELISTS

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

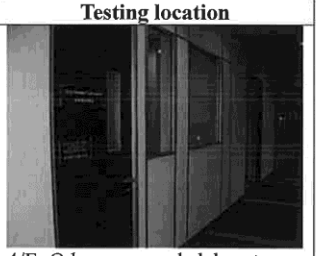
2. OBJECTIVE

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:

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 (Requirement: Repeatability ≤ 2.3)	Accuracy (Requirement: 20 ≤ Accuracy ≤ 80)	Pass/ Fail
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.

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

APPENDIX B

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	
23-December-15	Daytime (14:16-14:42)	A1	River Trade Terminal Office	14:29	N	1.2	0	0	-
		A2	Chu Kong Warehouse 1	14:22	N	0.1	0	0	-
		A3	Chu Kong Warehouse 2	14:21	N	3.0	0	0	-
		A4	Wai Sang Sawmill Ltd.	14:19	E	0.1	0	0	-
		A5	Pillar Point Fire Station	14:20	S	1.1	0	0	-
		A6	Sunhing Hung Kai Tuen Mun Godown	14:16	N	0.3	0	0	-
		A7	EMSD Servicing Vehicle Station	14:26	SW	0.1	0	0	-
		S1	Northern Site Boundary	14:32	N	0.7	0	0	-
		S2	Eastern Site Boundary	14:42	E	0.4	0	0	-
		S3	Southern Site Boundary	14:40	NW	0.1	0	0	-
		S4	Western Site Boundary	14:38	S	0.1	0	0	-
23-December 15	Evening (17:01-17:31)	A1	River Trade Terminal Office	17:15	N	0.5	0	0	-
		A2	Chu Kong Warehouse 1	17:08	E	1.1	0	0	-
		A3	Chu Kong Warehouse 2	17:07	E	2.6	0	0	-
		A4	Wai Sang Sawmill Ltd.	17:04	S	0.1	0	0	-
		A5	Pillar Point Fire Station	17:05	S	0.3	0	0	-
		A6	Sunhing Hung Kai Tuen Mun Godown	17:01	NE	0.1	0	0	-
		A7	EMSD Servicing Vehicle Station	17:11	E	0.1	0	0	-
		S1	Northern Site Boundary	17:19	SW	3.0	0	0	-
		S2	Eastern Site Boundary	17:31	E	0.1	0	0	-
		S3	Southern Site Boundary	17:28	NW	0.1	0	0	-
		S4	Western Site Boundary	17:25	S	0.9	0	0	-

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

Date	23 - 12 - 2015
HKO Monitoring Location	Tuen Mun
Weather	Fine, Hazy
Temperature	22°C
Humidity	42%

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 odur level.

ID	Location	Daytime Period: 14:16 - 14:42					Evening Period: 17:01 - 17:31				
		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	14:29	N	1.2	0	/	17:15	N	0.5	0	/
A2	Chu Kong Warehouse 1	14:22	N	0.1	0	/	17:08	E	1.1	0	/
A3	Chu Kong Warehouse 2	14:21	N	3.0	0	/	17:07	E	2.6	0	/
A4	Wai Sang Sawmill Ltd.	14:19	NE	0.1	0	/	17:04	S	0.1	0	/
A5	Pillar Point Fire Station	14:20	S	1.1	0	/	17:05	S	0.3	0	/
A6	Sunhing Hung Kai Tuen Mun Godown	14:16	N	0.3	0	/	17:01	NE	0.1	0	/
A7	EMSD Servicing Vehicle Station	14:26	SW	0.1	0	/	17:11	E	0.1	0	/
S1	Northern Site Boundary	14:32	N	0.7	0	/	17:19	SW	3	0	/
S2	Eastern Site Boundary	14:42	E	0.4	0	/	17:31	E	0.1	0	/
S3	Southern Site Boundary	14:40	NW	0.1	0	/	17:28	NW	0.1	0	/
S4	Western Site Boundary	14:38	S	0.1	0	/	17:25	S	0.9	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:	Franc Shee		23/12/2015
Checked By:	Vivian Chan		24/12/15

707134 | Odour Patrol Record Sheet | Revision No. 1
z:\jobs\7076134 - atal - et for ppstw operation period\06 engineering\odour patrol record sheet r2.docx

Page 1 of 1

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

Date	23/12/2015
HKO Monitoring Location	Tuen Mun
Weather	Fine, Flog
Temperature	22°C
Humidity	92%

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 odur level.

ID	Location	Daytime Period: 14:16 - 14:42					Evening Period: 17:01 - 17:31				
		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	14:29	N	1.2	0	—	17:15	N	0.5	0	—
A2	Chu Kong Warehouse 1	14:22	N	0.1	0	—	17:08	E	1.1	0	—
A3	Chu Kong Warehouse 2	14:21	N	3.0	0	—	17:07	E	2.6	0	—
A4	Wai Sang Sawmill Ltd.	14:19	NE	0.1	0	—	17:04	S	0.1	0	—
A5	Pillar Point Fire Station	14:20	S	1.1	0	—	17:05	S	0.3	0	—
A6	Sunhing Hung Kai Tuen Mun Godown	14:16	N	0.3	0	—	17:01	NE	0.1	0	—
A7	EMSD Servicing Vehicle Station	14:26	SW	0.1	0	—	17:11	E	0.1	0	—
S1	Northern Site Boundary	14:32	N	0.7	0	—	17:19	SW	3.0	0	—
S2	Eastern Site Boundary	14:42	E	0.4	0	—	17:31	E	0.1	0	—
S3	Southern Site Boundary	14:40	NW	0.1	0	—	17:28	NW	0.1	0	—
S4	Western Site Boundary	14:38	S	0.1	0	—	17:25	S	0.9	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:	Man Cheung	Man	23/12/2015
Checked By:	Vivian Chan	VC	24/12/15

707134 | Odour Patrol Record Sheet | Revision No. 1
z:\jobs\7076134 - atal - et for ppstw operation period\06 engineering\odour patrol record sheet r2.docx

Page 1 of 1

APPENDIX C

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: 25th Jan 2016

Authorized Signature

Technical Department
26th 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

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: 25th Jan 2016

Authorized Signature

Technical Department
26th 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

Remarks:

1. The sensor of channel number 1 is used for monitoring the H_2S emission level at inlet.
2. The sensor of channel number 4 and 5 are used for monitoring the H_2S emission level at outlet.

3. As advised by the Contractor's H_2S Sensor supplier, the validation period of the certification is 1 year. Therefore the expiry date of the H_2S Sensor calibration certificate is 25 January 2016.

Appendix D

Odour Emission Monitoring Result

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/1/2015	00:00:00-00:59:59	19.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	14.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	15.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	24.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	33.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	35.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	24.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	24.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	21.6	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	8.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	13.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	17.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	25.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	34.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	34.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	23.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	25.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	31.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	33.7	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	26.8	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	24.7	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	31.3	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	25.1	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	36.8	0.0	0.0	13.0	0.0	0.0	100%	100%	100%	100%
12/2/2015	00:00:00-00:59:59	20.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	15.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	13.5	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	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	8.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	9.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	11.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	13.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	16.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	16.0	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	10.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	11.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	12.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	16.0	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	13.8	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	36.0	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	38.5	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	31.9	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	37.9	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	46.2	0.0	0.0	12.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	35.4	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	26.3	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	26.3	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
12/3/2015	00:00:00-00:59:59	17.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	22.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	15.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	22.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	20.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	28.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	32.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	25.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	15.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	10.7	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.1	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	28.3	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	21.7	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	15.6	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	24.7	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	19.8	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	13.2	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	14.1	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	14.1	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	23.1	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	25.1	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	28.2	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	23.5	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	19.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
12/4/2015	00:00:00-00:59:59	13.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	13.3	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	8.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	9.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	9.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	10.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	13.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	18.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	12.9	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	16.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	15.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	16.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	13.4	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	21.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	28.2	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	33.9	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	22.4	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	32.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	34.4	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	28.9	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	19.8	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	16.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	16.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
12/5/2015	00:00:00-00:59:59	19.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	26.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	17.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	24.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	19.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	16.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	30.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	16.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	13.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	12.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	9.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	9.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	13.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	16.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	16.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	17.3	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	15.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	16.6	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	17.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	19.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	16.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	13.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	16.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	13.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/6/2015	00:00:00-00:59:59	9.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.9	0.0	0.0	3.3	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	6.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	9.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	71.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.8	0.0	0.0	3.3	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	5.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	7.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.3	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	4.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	9.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	17.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	13.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	16.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	15.4	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	17.9	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	18.0	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	13.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	12.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	11.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	13.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
12/7/2015	00:00:00-00:59:59	10.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	11.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	7.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	7.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	7.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	9.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.5	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	7.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.5	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	9.6	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	11.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	10.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	13.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	12.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	100.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	15.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	10.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
12/8/2015	00:00:00-00:59:59	9.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.8	0.0	0.0	4.5	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	9.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	11.3	0.0	0.0	3.3	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	13.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	18.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	10.8	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	11.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	10.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	17.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	9.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	9.3	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	7.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	13.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	29.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	10.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	7.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
12/9/2015	00:00:00-00:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	9.3	0.0	0.0	2.9	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	13.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	13.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	11.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	12.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	16.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	23.5	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	12.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	11.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	10.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	10.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	16.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	11.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	5.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	5.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
12/10/2015	00:00:00-00:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.7	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	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	5.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	5.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	5.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	21.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	14.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	12.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	11.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	9.1	0.0	0.0	3.9	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	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/11/2015	00:00:00-00:59:59	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	6.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	6.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	7.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	7.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	71.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	52.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	39.8	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	43.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	43.7	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	39.2	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	33.2	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	31.3	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	30.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
12/12/2015	00:00:00-00:59:59	29.3	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	14.4	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	13.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	9.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	8.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	8.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	8.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	7.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	6.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	14.7	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	9.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	9.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	8.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	12.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	12.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	10.4	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	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	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	7.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	8.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	5.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	7.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	9.1	0.0	0.0	2.3	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	6.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	6.3	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
12/13/2015	11:00:00-11:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	7.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	11.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	12.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	12.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	10.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	10.0	0.0	0.0	3.9	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%
	00:00:00-00:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	84.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
12/14/2015	04:00:00-04:59:59	6.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	6.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/15/2015	08:00:00-08:59:59	6.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	6.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	9.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.8	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	13.2	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	13.2	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	10.0	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	13.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	9.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	10.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.7	0.0	0.0	3.9	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%
	00:00:00-00:59:59	7.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.7	0.0	0.0	1.0	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	5.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	4.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	5.0	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	2.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	20.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	9.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	9.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.2	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	2.2	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	10.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	10.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	9.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/16/2015	00:00:00-00:59:59	5.7	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	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.2	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	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	8.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	15.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	6.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.8	0.0	0.0	3.3	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	6.2	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	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	4.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	4.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	4.7	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	2.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	6.2	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	3.3	0.0	0.0	100%	100%	100%	100%
12/17/2015	00:00:00-00:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	4.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	2.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	4.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	4.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	7.5	0.0	0.0	2.2	0.0	0.0	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%
	14:00:00-14:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	4.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	4.7	0.0	0.0	2.9	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	7.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	34.4	0.0	0.0	15.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	11.0	0.0	0.0	5.1	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%
12/18/2015	00:00:00-00:59:59	6.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	4.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	5.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	5.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	10.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	4.7	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	5.7	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	6.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
12/19/2015	00:00:00-00:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	7.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.0	0.0	0.0	2.3	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	3.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/20/2015	08:00:00-08:59:59	5.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	5.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	5.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	16.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	12.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.8	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	2.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.3	0.0	0.0	2.3	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	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	9.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	00:00:00-00:59:59	11.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.9	0.0	0.0	3.9	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	5.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	12.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	12.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	9.1	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.8	0.0	0.0	7.7	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	5.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	5.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	5.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	11.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	10.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	11.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	13.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	13.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	7.6	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%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/21/2015	00:00:00-00:59:59	26.4	0.0	0.0	6.5	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	6.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	5.7	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	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	5.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	16.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	7.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	7.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	7.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	7.6	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.3	0.0	0.0	9.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.3	0.0	0.0	3.3	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	8.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	6.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
12/22/2015	00:00:00-00:59:59	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	5.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.4	0.0	0.0	2.2	0.0	0.0	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%
	06:00:00-06:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	6.3	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	9.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	37.4	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	15.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	9.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	9.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	15.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	8.8	0.0	0.0	2.9	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	9.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	9.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	11.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	10.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	10.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	10.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
12/23/2015	00:00:00-00:59:59	10.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	10.7	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	3.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	7.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	9.1	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	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	7.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	9.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	7.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	9.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	19.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	10.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	13.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	15.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	16.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	11.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	9.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
12/24/2015	00:00:00-00:59:59	8.1	0.0	0.0	2.9	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	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	10.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	10.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	11.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/25/2015	08:00:00-08:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	12.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.8	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	2.9	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	12.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	10.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	13.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	13.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	14.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	13.7	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	16.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	13.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	11.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	28.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	00:00:00-00:59:59	15.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	10.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	9.1	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	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	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	2.2	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	8.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	9.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	9.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	9.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.5	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	7.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	9.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/26/2015	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	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.7	0.0	0.0	2.9	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	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	6.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	5.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	6.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.2	0.0	0.0	3.3	0.0	0.0	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%
	12:00:00-12:59:59	6.2	0.0	0.0	2.9	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	16.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	7.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	5.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	7.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	6.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	6.0	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	6.6	0.0	0.0	2.9	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%
12/27/2015	00:00:00-00:59:59	53.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	7.9	0.0	0.0	2.9	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	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	4.1	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	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	5.0	0.0	0.0	2.9	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	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	4.9	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	5.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.6	0.0	0.0	2.2	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%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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	7.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	7.6	0.0	0.0	2.9	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	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	11.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.8	0.0	0.0	3.9	0.0	0.0	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%
	23:00:00-23:59:59	8.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
12/28/2015	00:00:00-00:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	5.0	0.0	0.0	2.2	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	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	5.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	5.0	0.0	0.0	2.2	0.0	0.0	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%
	12:00:00-12:59:59	5.7	0.0	0.0	2.2	0.0	0.0	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%
	14:00:00-14:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	24.9	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	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	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	6.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	7.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
12/29/2015	00:00:00-00:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.7	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	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	7.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	8.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/30/2015	08:00:00-08:59:59	8.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	9.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	9.1	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	2.2	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	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.5	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	2.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	6.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	6.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	13.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	11.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	11.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
12/30/2015	00:00:00-00:59:59	8.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.2	0.0	0.0	3.3	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	5.0	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	5.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.6	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	5.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	91.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	11.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	9.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.2	0.0	0.0	1.6	0.0	0.0	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%
	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	8.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	9.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	10.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	10.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	10.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	9.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	9.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	9.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	10.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H2S		DOUB INTLET H2S	DOUB OUTLET H2S		DOUA OUTLET H2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H2S	HST8141B_H2S	HST8241A_H_2S	HST8241B_H_2S
		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
12/31/2015	00:00:00-00:59:59	7.9	0.0	0.0	1.6	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	6.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.5	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	12.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	9.4	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	7.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.3	0.0	0.0	0.3	0.0	0.0	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%
	16:00:00-16:59:59	6.3	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	9.1	0.0	0.0	0.3	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	6.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	11.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	30.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	17.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%

APPENDIX E

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.

APPENDIX F

PPWQM Benthic Survey Monitoring Results

List of collected specimens at every monitoring station (November 2015)

Monitoring station: B1 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	C	*Neoxenophthalmus obscurus*	1	0.03							2	0.06	3	0.09
2	C	*Typhlocarcinus villosus*	1	2.39									1	2.39
3	N	Nemertea spp.	1	0.01									1	0.01
4	P	*Aglaophamus dibranchis*									1	0.00	1	0.00
5	P	Maldanidae spp.					1	0.01					1	0.01
6	S	Penaeidae spp.							1	0.17			1	0.17
		column sum	**3**	**2.43**	**0**	**0.00**	**1**	**0.01**	**1**	**0.17**	**3**	**0.06**	**8**	**2.67**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B2 Sampling date: 14/11/2015														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	C	*Macrophthalmus latreillei*							1	6.47			1	6.47
2	C	*Typhlocarcinops denticarpus*			1	0.72							1	0.72
3	N	Nemertea spp.					1	0.01	1	0.01			2	0.01
4	P	*Bhawania brevis*							1	0.00			1	0.00
5	P	*Capitella* sp.	1	0.00									1	0.00
6	S	*Harmothoe* sp.			1	0.00							1	0.00
7	P	*Linopherus paucibranchiata*					2	0.01	6	0.03			8	0.04
8	P	*Micronephtys sphaerocirrata*	1	0.01	1	0.01	1	0.00					3	0.02
9	P	*Poecilochaetus* sp.			1	0.02							1	0.02
		column sum	**2**	**0.01**	**4**	**0.75**	**4**	**0.01**	**9**	**6.51**	**0**	**0.00**	**19**	**7.29**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B3 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	P	*Aricidea* sp.							1	0.00			1	0.00
2	P	*Ophiodromus angustifrons*			1	0.00							1	0.00
3	P	*Otopsis* sp.							1	0.00			1	0.00
		column sum	0	0.00	1	0.00	0	0.00	2	0.00	0	0.00	3	0.00

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B4 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	C	*Typhlocarcinops denticarpus*			1	0.15							1	0.15
2	N	Nemertea spp.	1	0.00									1	0.00
3	P	*Aglaophamus dibranchis*									1	0.01	1	0.01
4	P	*Leocrates chinensis*			1	0.01							1	0.01
5	P	*Linopherus paucibranchiata*	1	0.00	2	0.01							3	0.01
6	S	Unidentified juvenile shrimp					1	0.03					1	0.03
		column sum	**2**	**0.00**	**4**	**0.16**	**1**	**0.03**	**0**	**0.00**	**1**	**0.01**	**8**	**0.20**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B5 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	C	*Typhlocarcinops denticarpus*	1	0.45									1	0.45
2	P	*Aglaophamus dibranchis*	1	0.00	1	0.01							2	0.01
3	P	*Linopherus paucibranchiata*									1	0.00	1	0.00
4	P	*Micronephtys sphaerocirrata*			1	0.00							1	0.00
5	P	*Nephtys* sp.									2	0.00	2	0.00
6	P	*Prionospio* sp.					1	0.00	1	0.00			2	0.00
7	S	*Atypopenaeus* sp.					1	0.00					1	0.00
		column sum	**2**	**0.45**	**2**	**0.01**	**2**	**0.00**	**1**	**0.00**	**3**	**0.00**	**10**	**0.46**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B6 Sampling date: 14/11/2015														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Corophium* sp.			1	0.00							1	0.00
2	P	*Aglaophamus dibranchis*	1	0.00			1	0.00	1	0.00			3	0.01
3	P	*Bhawania brevis*	1	0.00									1	0.00
4	P	*Capitella* sp.							1	0.00			1	0.00
5	P	*Cirriformia* sp.	1	0.00									1	0.00
6	P	*Linopherus paucibranchiata*							3	0.01			3	0.01
7	P	*Lumbrineris* sp.							1	0.01	1	0.00	2	0.01
8	P	Maldanidae spp.	1	0.00									1	0.00
		column sum	**4**	**0.00**	**1**	**0.00**	**1**	**0.00**	**6**	**0.02**	**1**	**0.00**	**13**	**0.03**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: WSD1 Sampling date: 14/11/2015														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	C	*Hexapinus granuliferus*			1	0.06					1	0.13	2	0.19
2	Ec	*Protankyra bidentata*			1	0.11					1	0.20	2	0.31
3	Eh	*Paraarhynchite* sp.			1	0.22							1	0.22
4	Hc	*Diogenes* sp.									1	0.04	1	0.04
5	P	*Capitella* sp.	1	0.00					1	0.00	1	0.00	3	0.00
6	P	*Eunice indica*	3	0.00			1	0.00	7	0.03			11	0.03
7	P	*Glycera alba*			1	0.00	1	0.00	1	0.00	1	0.00	4	0.00
8	P	*Laonice cirrata*									1	0.00	1	0.00
9	P	*Linopherus paucibranchiata*	1	0.00									1	0.00
10	P	*Marphysa stragulum*					1	0.00					1	0.00
11	P	*Poecilochaetus* sp.									1	0.00	1	0.00
12	P	*Prionospio malmgreni*							3	0.00	2	0.00	5	0.00
13	P	*Syllis* sp.					1	0.00	1	0.00			2	0.00
14	P	*Tharyx* sp.							1	0.00			1	0.00
15	S	*Alpheus brevicristatus*	1	0.00									1	0.00

Monitoring station: WSD1 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
16	S	Unidentified juvenile shrimp					1	0.00					1	0.00
		column sum	**6**	**0.01**	**4**	**0.39**	**5**	**0.01**	**14**	**0.03**	**9**	**0.38**	**38**	**0.81**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: WSD2 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	Amphipoda spp.			1	0.00							1	0.00
2	B	*Ruditapes philippinarum*							1	0.15			1	0.15
3	C	*Charybdis affinis*			1	0.39							1	0.39
4	C	*Portunus pulchricristatus*					1	0.56					1	0.56
5	C	*Thalamita sima*							1	0.04			1	0.04
6	C	*Typhlocarcinus villosus*	1	0.06									1	0.06
7	C	*Xenophthalmus pinnotheroides*	1	0.02	2	0.26			1	0.09	1	0.06	5	0.46
8	Hc	*Diogenes* sp.							2	0.03	2	0.20	4	0.23

Monitoring station: WSD2 Sampling date: 14/11/2015														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
9	N	Nemertea spp.			1	0.01							1	0.01
10	P	*Bhawania brevis*	1	0.00									1	0.00
11	P	*Capitella* sp.			3	0.01			1	0.00			4	0.01
12	P	*Cirratulus* sp.			2	0.00							2	0.00
13	P	*Cirriformia* sp.							1	0.00			1	0.00
14	P	*Eteone* sp.	1	0.00									1	0.00
15	P	*Eunice indica*	27	0.17	19	0.12	1	0.00	3	0.01	16	0.21	66	0.51
16	P	*Glycera alba*	1	0.00					1	0.00			2	0.00
17	P	*Glycera chirori*							3	0.03	1	0.02	4	0.05
18	P	*Glycinde gurjanovae*							1	0.01			1	0.01
19	P	*Harmothoe* sp.									1	0.01	1	0.01
20	P	Nereididae spp.							1	0.01			1	0.00
21	P	Phyllodocidae spp.	1	0.00									1	0.00
22	P	*Poecilochaetus* sp.							2	0.00			2	0.00
23	P	*Prionospio ehlersi*							1	0.00			1	0.00

Monitoring station: WSD2 Sampling date: 14/11/2015														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
24	P	*Samytha* sp.			1	0.00							1	0.00
25	P	*Tharyx* sp.			1	0.00					2	0.00	3	0.00
26	P	*Thelepus* sp.			1	0.01							1	0.01
27	S	*Alpheus brevicristatus*			1	0.05			1	0.00			2	0.05
28	S	Unidentified juvenile shrimp	1	0.00	1	0.01					1	0.01	3	0.03
29	Sp	*Phascolosoma esculenta*			1	0.01							1	0.01
		column sum	**34**	**0.26**	**35**	**0.85**	**2**	**0.57**	**20**	**0.37**	**24**	**0.51**	**115**	**2.56**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

List of collected specimens at every monitoring station (November 2015)

Monitoring station: U2 Sampling date: 14/11/2015														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	Amphipoda spp.			3	0.09	1	0.05	2	0.08	1	0.04	7	0.26
2	B	*Ruditapes philippinarum*									1	0.29	1	0.29
3	C	*Charybdis affinis*					1	0.01	1	0.01			2	0.02
4	C	*Portunus pulchricristatus*	1	0.03									1	0.03
5	C	*Thalamita sima*	1	0.02									1	0.02
6	C	*Typhlocarcinus villosus*	1	0.01									1	0.01
7	C	*Xenophthalmus pinnotheroides*									1	0.00	1	0.00
8	Hc	*Diogenes* sp.							1	0.00			1	0.00
9	N	Nemertea spp.	1	0.00			2	0.02					3	0.02
10	P	*Bhawania brevis*							1	0.00			1	0.00
11	P	*Capitella* sp.							1	0.01			1	0.01
12	P	*Cirratulus* sp.	1	0.00	1	0.01	1	0.00	2	0.00			5	0.01
13	P	*Cirriformia* sp.	1	0.00									1	0.00
14	P	*Eteone* sp.					1	0.00					1	0.00

Monitoring station: U2 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
15	P	*Eunice indica*	1	0.01									1	0.01
16	P	*Glycera alba*	1	0.00									1	0.00
17	P	*Glycera chirori*	1	0.00									1	0.00
18	P	*Glycinde gurjanovae*	1	0.00					1	0.00			2	0.00
19	P	*Harmothoe* sp.	1	0.00			1	0.00	4	0.01	1	0.00	7	0.01
20	P	Nereididae spp.	1	0.06									1	0.06
21	P	Phyllodocidae spp.							1	0.01			1	0.00
22	P	*Poecilochaetus* sp.					1	0.00					1	0.00
23	P	*Prionospio ehlersi*	1	0.00									1	0.00
		column sum	**13**	**0.15**	**4**	**0.09**	**8**	**0.09**	**14**	**0.11**	**4**	**0.34**	**43**	**0.79**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

List of collected specimens at every monitoring station (November 2015)

Monitoring station: NM1 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Corophium* sp.									1	0.00	1	0.00
2	B	*Saccella cuspidata*							1	0.07			1	0.07
3	B	*Tellina minuta*					1	0.02	1	0.27			2	0.29
4	B	*Theora lata*					1	0.09					1	0.09
5	C	*Neoxenophthalmus obscurus*					1	0.01	1	0.06	1	0.00	3	0.07
6	Ec	*Amphioplus lucidus*							1	0.02			1	0.02
7	G	*Sinum incisum*	1	1.51									1	1.51
8	N	Nemertea spp.							1	0.00			1	0.00
9	P	*Aglaophamus dibranchis*			1	0.03	1	0.00	1	0.01			3	0.03
10	P	*Aglaophamus sinensis*	1	0.02	1	0.01	2	0.02	2	0.04	2	0.02	8	0.11
11	P	*Anobothrus* sp.									1	0.00	1	0.00
12	P	*Ehlersileanira incisa hwanghaiensis*					1	0.00					1	0.00
13	P	*Glycinde gurjanovae*									1	0.00	1	0.00
14	P	*Harmothoe* sp.			1	0.00							1	0.00

Monitoring station: NM1 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
15	P	*Heteromastus* sp.					1	0.01	2	0.01	1	0.01	4	0.03
16	P	*Laonice cirrata*									1	0.00	1	0.01
17	P	*Lumbrineris shiinoi*											1	0.00
18	P	Nereididae spp.							1	0.00			1	0.00
19	P	*Poecilochaetus* sp.									1	0.00	1	0.00
20	P	*Prionospio ehlersi*											2	0.00
		column sum	**2**	**1.53**	**3**	**0.04**	**10**	**0.16**	**11**	**0.47**	**10**	**0.04**	**36**	**2.23**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

List of collected specimens at every monitoring station (November 2015)

Monitoring station: NM6 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	Ampelisca sp.			1	0.00							1	0.00
2	B	Clausinella calophylla					1	0.33					1	0.33
3	B	Paphia gallus									1	0.76	1	0.76
4	B	Paphia undulata					1	0.87					1	0.87
5	B	Siliqua minima					1	0.03					1	0.03
6	B	Tellina iridella							1	0.19			1	0.19
7	B	Tellina minuta					1	0.11					1	0.11
8	B	Tellina sp.			1	0.02	1	0.02					2	0.04
9	B	Timoclea lionota			1	0.14	1	0.16			3	0.28	5	0.58
10	C	Raphidopus ciliatus							1	0.06			1	0.06
11	C	Typhlocarcinops denticarpus									1	0.11	1	0.11
12	C	Xenophthalmus pinnotheroides	3	0.17	2	0.25	1	0.03	1	0.16	2	0.39	9	1.01
13	Ec	Amphioplus depressus	7	0.19	9	0.41	22	1.22	16	0.52	13	0.53	67	2.88
14	Ec	Amphioplus sp.			1	0.04							1	0.04

Monitoring station: NM6 Sampling date: 14/11/2015														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
15	Ec	Ekmanothyone sp.			1	0.33							1	0.33
16	Eh	Arhynchite sp.											1	0.00
17	Is	Cyathura sp.			1	0.00							1	0.00
18	P	Cirriformia sp.			1	0.00							1	0.00
19	P	Eunice indica					1	0.00					1	0.00
20	P	Glycera alba					3	0.00	1	0.00	1	0.00	5	0.01
21	P	Glycera chirori	1	0.00	1	0.02	1	0.01			1	0.00	4	0.03
22	P	Glycinde gurjanovae	2	0.00									2	0.00
23	P	Linopherus paucibranchiata			1	0.00							1	0.00
24	P	Lumbrineris shiinoi					2	0.00					2	0.00
25	P	Lygdamis sp.									1	0.00	1	0.00
26	P	Lysidice ninetta					1	0.00					1	0.00
27	P	Magelona sp.	1	0.00					2	0.00			3	0.00
28	P	Maldanidae spp.					1	0.00					1	0.00
29	P	Mediomastus sp.					2	0.00					2	0.00

Monitoring station: NM6 Sampling date: 14/11/2015													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
30	P	Micronephtys sphaerocirrata	1	0.00									1	0.00
31	P	Pectinaria conchilega									1	0.01	1	0.00
32	P	Poecilochaetus sp.			1	0.00	1	0.00			1	0.00	3	0.02
33	P	Prionospio malmgreni	5	0.00	4	0.00	6	0.01	2	0.00	1	0.00	18	0.00
34	P	Samytha sp.	1	0.00					1	0.00			2	0.00
35	P	Tharyx sp.					2	0.00					2	0.00
36	S	Unidentified juvenile shrimp							1	0.00				
37	S	Upogebia wushienweni			2	0.06							2	0.06
38	Sp	Apionsoma trichocephalus	9	0.03	6	0.02	5	0.01	4	0.01	5	0.02	29	0.09
		column sum	**30**	**0.40**	**33**	**1.31**	**54**	**2.80**	**30**	**0.95**	**32**	**2.12**	**179**	**7.58**

B = Bivalve, C = Crab, Cn = Cnidarin, Ec = Echinoderm, P = Polychaete
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2
wt = 0.00 / 0.1 m^2 : The specimen with total biomass less than 0.01 / 0.1 m^2

APPENDIX G

Event and Action Plan

Event and Action Plan for Odour Monitoring

EVENT	ACTION			
	ET	IEC	SOR	CONTRACTOR
ACTION LEVEL				
Exceedance of action level or receipt of any odour complaint	1. Identify source/reason of exceedance or odour complaints; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance or complaints. Investigation shall be completed within 1 week; 4. Repeat odour patrol to confirm finding; and 5. If exceedance continues, notify the Contractor, IEC and SOR.	1. Check odour patrol results submitted by ET; 2. Check Contractor's mitigation measures. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing. 2. Notify DSD; and 3. Ensure remedial measures properly implemented.	1. Notify the SOR, ET, IEC and DSD when receipt of odour complaint; 2. Rectify any unacceptable practice; and formulate remedial actions; and 3. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.
LIMIT LEVEL				
Exceedance of Limit level or receipt of two or more complaints in 3 months	1. Identify source / reason of exceedance or odour complaints; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance or complaints. Investigation shall be completed within 1 week; 4. Repeat odour patrols to confirm findings; 5. Increase odour patrol frequency to bi-weekly until no exceedance is detected at the ASR in the conservative 2 months and 6. If exceedance continues, notify the Contractor, IEC and SOR.	1. Check patrol results submitted by ET; 2. Discuss amongst SOR and Contractor on the potential remedial actions; 3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly; 4. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify DSD; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; and 4. Ensure remedial measures properly implemented.	1. Notify the SOR, ET, IEC and DSD when receipt of odour complaints; 2. Modify or improve design as appropriate; 3. Submit proposals for remedial actions to IEC within three working days of notification of odour exceedance / complaint; 4. Implement the agreed proposals 5. Resubmit proposals if problem still not under control; and 6. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.

Event and Action Plan for Odour Emission Monitoring

EVENT	ACTION			
	ET	IEC	SOR	CONTRACTOR
ACTION LEVEL				
Exceedance of action level	1. Identify source/reason of exceedance; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 1 week; 4. Monitor H_2S level sensors readings to confirm finding; and 5. If exceedance continues, notify the Contractor, IEC and SOR	1. Check H_2S level sensors readings submitted by ET; 2. Discuss with ET and Contractor on the possible remedial actions as appropriate 3. Advise SOR on the effectiveness of the proposed remedial measures if any 4. Supervise implementation of remedial measures if any	1. Confirm receipt of notification of exceedance in writing; and 2. Notify DSD. 3. Ensure remedial actions (if any) properly implemented.	1. Rectify any unacceptable practice if any.
LIMIT LEVEL				
Exceedance of Limit level	1. Identify source / reason of exceedance or odour complaints; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 1 week; 4. Monitor H_2S level sensors readings to confirm findings; 5. If exceedance continues, notify the Contractor, IEC and SOR; and 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	1. Check H_2S level sensors readings and/or olfactometry analysis results submitted by ET; 2. Discuss amongst SOR and Contractor on the potential remedial actions; 3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly; 4. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify DSD; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; and 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.	1. Modify or improve system setting as appropriate; 2. Submit proposals for remedial actions to IEC within three working days of notification of odour exceedance; 3. Implement the agreed proposals; 4. Amend proposals if appropriate; and 5. If exceedance continues, consider what portion of the work is responsible and stop that portion of work until the exceedance is abated.

APPENDIX H

Weather Conditions

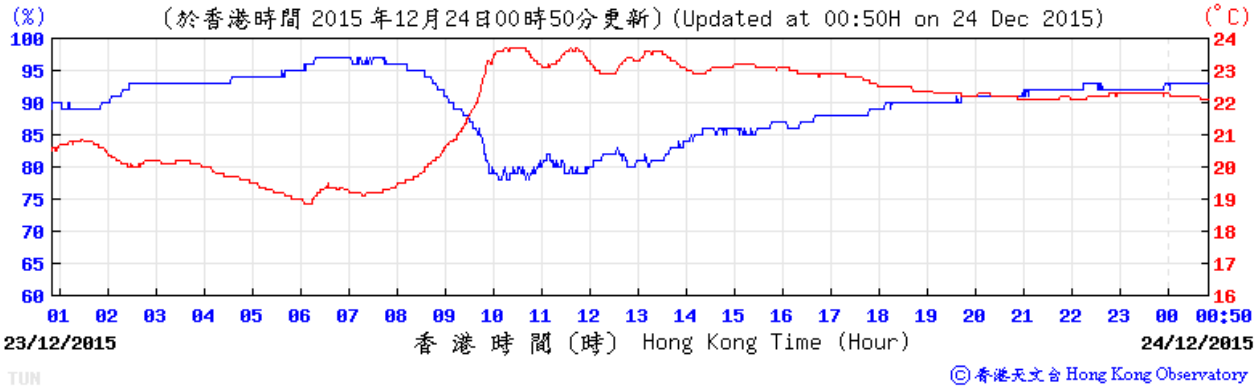
Daily Extract of Meteorological Observations, December 2015 – Tuen Mun Children and Juvenile Home

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	***	25.5	22.6	20.9	18.5	78.0	0.0	***	***
2	***	27.9	23.6	20.9	19.3	77.0	0.0	***	***
3	***	21.1	18.7	16.6	14.4	77.0	0.5	***	***
4	***	20.6	18.2	16.6	14.0	77.0	0.0	***	***
5	***	21.8	17.5	14.2	14.8	85.0	5.5	***	***
6	***	17.1	15.2	13.9	11.0	77.0	0.5	***	***
7	***	19.9	16.0	13.5	10.7	71.0	0.0	***	***
8	***	17.7	16.3	15.3	12.1	76.0	0.5	***	***
9	***	16.9	16.3	15.6	15.7	96.0	48.5	***	***
10	***	20.6	18.4	16.4	16.4	88.0	0.0	***	***
11	***	23.7	19.4	16.4	14.5	74.0	0.0	***	***
12	***	23.0	20.3	18.1	16.7	80.0	0.0	***	***
13	***	23.1	20.9	19.7	17.7	82.0	0.0	***	***
14	***	21.4	19.5	18.0	16.7	84.0	0.5	***	***
15	***	18.7	17.0	15.2	11.6	71.0	0.0	***	***
16	***	18.0	14.8	12.6	3.9	49.0	0.0	***	***
17	***	15.8	12.7	11.1	-2.8	34.0	0.0	***	***
18	***	18.3	13.1	9.3	0.1	41.0	0.0	***	***
19	***	21.5	15.7	11.9	5.3	50.0	0.0	***	***
20	***	17.3	15.9	14.5	11.6	78.0	2.5	***	***
21	***	22.9	18.8	15.4	15.3	81.0	0.0	***	***
22	***	22.0	20.4	18.8	17.8	85.0	0.0	***	***
23	***	23.7	21.7	18.9	19.8	89.0	0.0	***	***
24	***	26.7	22.9	18.8	20.8	89.0	0.5	***	***
25	***	19.1	17.3	14.2	12.8	76.0	2.5	***	***
26	***	19.7	16.5	15.0	10.9	69.0	0.0	***	***
27	***	17.4	16.2	14.6	13.7	85.0	2.0	***	***
28	***	19.4	16.7	15.0	11.2	70.0	0.0	***	***
29	***	21.1	17.8	15.0	12.6	72.0	0.0	***	***
30	***	19.5	16.8	14.3	12.4	76.0	0.5	***	***
31	***	21.0	17.1	14.4	11.8	71.0	0.0	***	***

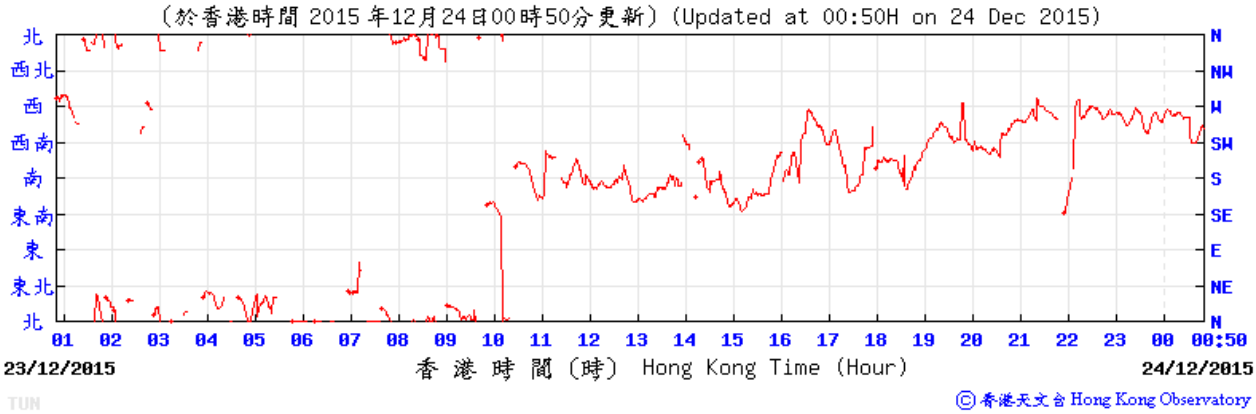
*** refers to unavailable
Rainfall measured in increment of 0.5 mm. Amount of < 0.5 mm cannot be detected

Hourly Meteorological Conditions on 23 December 2015 at Tuen Mun Station

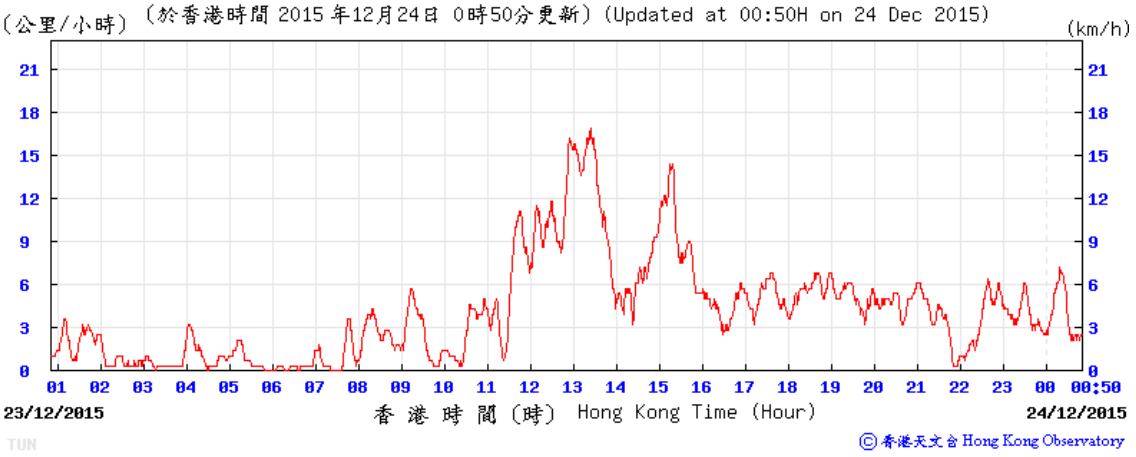
Temperature/ Humidity:



Wind Direction:



Wind Speed:



APPENDIX I

Landscape & Visual Impact Monitoring

Contract No. DC/2008/03
Design, Build and Operate Pillar Point Sewage Treatment Works
Establishment Period – 4th monthly L&V site audit

Site Inspection Date : 11 December 2015

Audited and Certified by:

Kenneth Ng (RLA No. 034 (99))

Area of Works	Items to be Monitored	Establishment Works Stage	
		Observation	Recommendation/Action
Issues Observed in this Audit			
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Area (Trees, Shrubs & Groundcover) Photo no. G-01 to G-05	Trees, Groundcover & Lawn in ground floor garden were observed in poor condition during this site inspection (Please see photo reference below)	It is 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	7 nos. of compensatory trees were observed in the progress of removal and would be replaced when new trees were arrived. (Please see photo reference below)	-

Area of Works	Items to be Monitored	Establishment Works Stage	
		Observation	Recommendation/Action
Within Pillar Point Sewage Treatment Works	Location at Roof Floor Planting Area (Roof Garden) in Photo no. F-01	Groundcover & Lawn in roof garden were observed improved during this site inspection (Please see photo reference below)	-

Tree was observed leaning and in unbalanced tree form

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

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 were observed in poor condition.

Photo no. **G-06**: Compensatory trees were observed in the progress of removal and would be replaced when new trees were arrived.

Photo no. **F-01**: Lawn and groundcover at roof floor were observed improved.