ATAL – Degrémont – China State Joint Venture

Contractor's Submission Form (CSF)

Contract No.	DC/2008/03		
Project Title:	Design, Build and Operate Pillar Point Sewage Treatment Works		
CSF No.:	DC200803/CSF/GD/800326	**Issue: B**	**Date: 18th May 2016**
To:	Drainage Services Department (ST1)	**Your Ref: Nil**	
Attention:	Supervising Officer's – Michael K.F. Yeung		
Cc:	dc200803.aecom@gmail.com ; ATAL-Mandy Tsoi ; ADJV – Norman Cheng		
From:	ATAL-Degremont-China State Joint Venture		
Title:	Monthly EM&A Report No.8 (March 2016)		
Specification:	-		
Purpose:	*Information / ~~Comments~~ / ~~Approval~~		

Description of Contents:

We submit herewith 8 copies of the Monthly EM&A Report for March 2016.

Attachment: *Yes / ~~No~~ **Number of Copies: 8**

Remarks:

Issued By: _____ **Printed Name:** Norman Cheng

Designation: Operation Manager **Date:** 18th May 2016

Received By: _____ **Date:** _____

(Signature & Received Chop)

*Delete if not applicable

(Rev.9)

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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)

17 May 2016

Dear Madam,

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

Monthly EM&A Report for March 2016 (8th Monthly Operation Phase Monitoring Report for March 2016)

Reference is made to Environmental Team (ET)'s draft of the Monthly EM&A Report for March 2016 provided by email dated 15 April 2016 and 17 May 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 1755)
SMEC – Ms. Vivian Chan (Fax No. 3995 8101)
ATAL–Degremont–China State JV – Mr. Raymond Chan (Fax No. 2811 3321)

ATAL – Degrémont – China State Joint Venture

SMEC ASIA

65th Monthly EM&A Report (8th Monthly Operation Phase Monitoring Report for March 2016)

Contract No. DC/2008/03

Design, Build and Operate
Pillar Point Sewage Treatment Works

May 2016

AUSTRALIA | ASIA | MIDDLE EAST | AFRICA | PACIFIC

ATAL – Degrémont – China State Joint Venture

SMEC ASIA

65th Monthly EM&A Report (8th Monthly Operation Phase Monitoring Report for March 2016)

Contract No. DC/2008/03

Design, Build and Operate
Pillar Point Sewage Treatment Works

May 2016

Certified By **Vivian CHAN**
ET Leader

Project/Deliverable No.	7076134 | D16/02
Project Name	Upgrading of Pillar Point Sewage Treatment Works – Design, Build and Operate
Report Name	65th Monthly EM&A Report (8th Monthly Operation Phase Monitoring Report for March 2016)
Report Date	May 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)	April 2016	Man CHEUNG	Vivian CHAN	Alexi BHANJA
2.0 (Final)	May 2016	Man CHEUNG	Vivian CHAN	Alexi BHANJA

ISSUE REGISTER

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EXECUTIVE SUMMARY

E.1. In accordance with the Environmental Monitoring and Audit Manual (EM&A Manual) and the Environmental Permit (EP-321/2008/B) for the Upgrading of Pillar Point Sewage Treatment Works (PPSTW) (the Project), odour and water quality monitoring is required during the first year after Project commissioning and Water Quality Monitoring is required for each emergency discharge event. The purpose of operation phase monitoring is to confirm the predictions of odour and water quality made in the EIA report.

E.2. As confirmed by the Contractor, all major construction activities of the upgraded PPSTW has been completed in August 2015. The Operation Phase of the Upgraded PPSTW commenced on 15 August 2015. This Monthly Operation Phase Monitoring Report (Post-commissioning) summarizes monitoring events carried out during post-commissioning period from 1 to 31 March 2016. There were a total of three monitoring events carried out during the reporting period. The exact dates of monitoring carried out in this month are tabulated below:

Table E-1 Dates of Monitoring Events

Monitoring Events	8th Reporting Month Monitoring Period: 1 – 31 March 2016
Odour Monitoring	15/3/2016
H_2S Monitoring	1/3/2016 - 31/3/2016 (continuous monitoring)
Landscape and Visual Monitoring	11/3/2016

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

Breach of Action and Limit Levels

E.4. No exceedance of Action and Limit Level of odour monitoring was recorded at the monitoring location in the reporting month.

E.5. No exceedance of Action and Limit Level of odour emission monitoring was recorded at the monitoring location in the reporting month.

E.6. No significant impact was detected between the pre-commission and post-commission periods of PPSTW from the benthic survey monitoring results.

E.7. The ecotoxicological assessment results for effluent sample collected during dry season indicated that the effluent from PPSTW is considered not inducing unacceptable toxicity to aquatic life.

E.8. No non-compliance of the landscape and visual mitigation measures has been recorded during the reporting month.

Environmental Complaint

E.9. In this reporting period, no environmental complaint in relation to the EM&A Programme was recorded.

Reporting Change

E.10. This is the 8th Monthly Operation Phase Monitoring report and no reporting changes were made in the Reporting Period.

Major Activities on Site

E.11. 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.12. 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.13. 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 eighth Monthly Operational Phase Monitoring Reports which summarizes the findings of EM&A works during the reporting period from 1 to 31 March 2016.

Figure 1-1 Site Location

2 ODOUR MONITORING

2.1 Monitoring Methodology and Parameters

2.1.1 In accordance with Section 2.7.1.1 to 2.7.1.9 of the final EM&A Manual, odour patrols are required to be conducted for a period of one year during the operation of the upgraded PPSTW, one patrol for daytime and one patrol for evening every month at the same locations as for the baseline monitoring.

2.1.2 The 1-year monthly odour patrol might be extended as stipulated in second and third bullet point in Table 2.4 of Final EM&A Manual.

2.1.3 The odour monitoring should not be undertaken on rainy days and hourly meteorological conditions (temperature, wind speed & direction, humidity) as shown in ***Appendix I*** 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 Pre-commissioning monitoring conducted in Year 2013.

Table 2-2 Action and Limit Levels for Odour Patrol

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

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

2.5 Event and Action Plan

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

2.6 Monitoring Results and Observations

2.6.1 The odour patrol was carried out on 15 March 2016 during daytime and evening by two "panellists" (Panellist A and Panellist B) at all monitoring stations, as required by the EM&A Manual.

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

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.

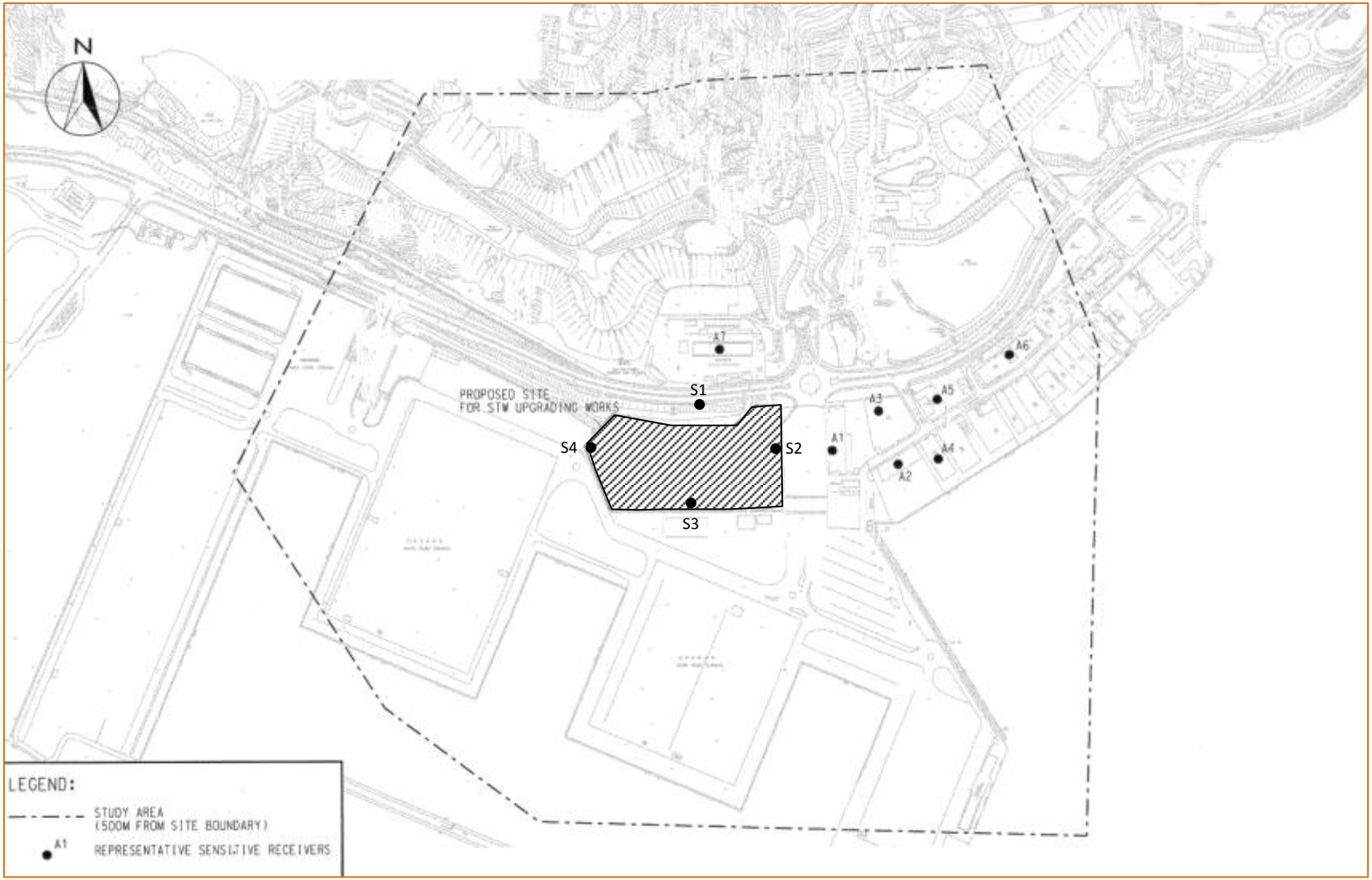
2.6.5 During the odour patrol, no noticeable odour due to operation of the PPSTW was observed at the sensitive receivers.

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 H***.

3.6 Monitoring Results

Air Samples and Olfactometric Analysis

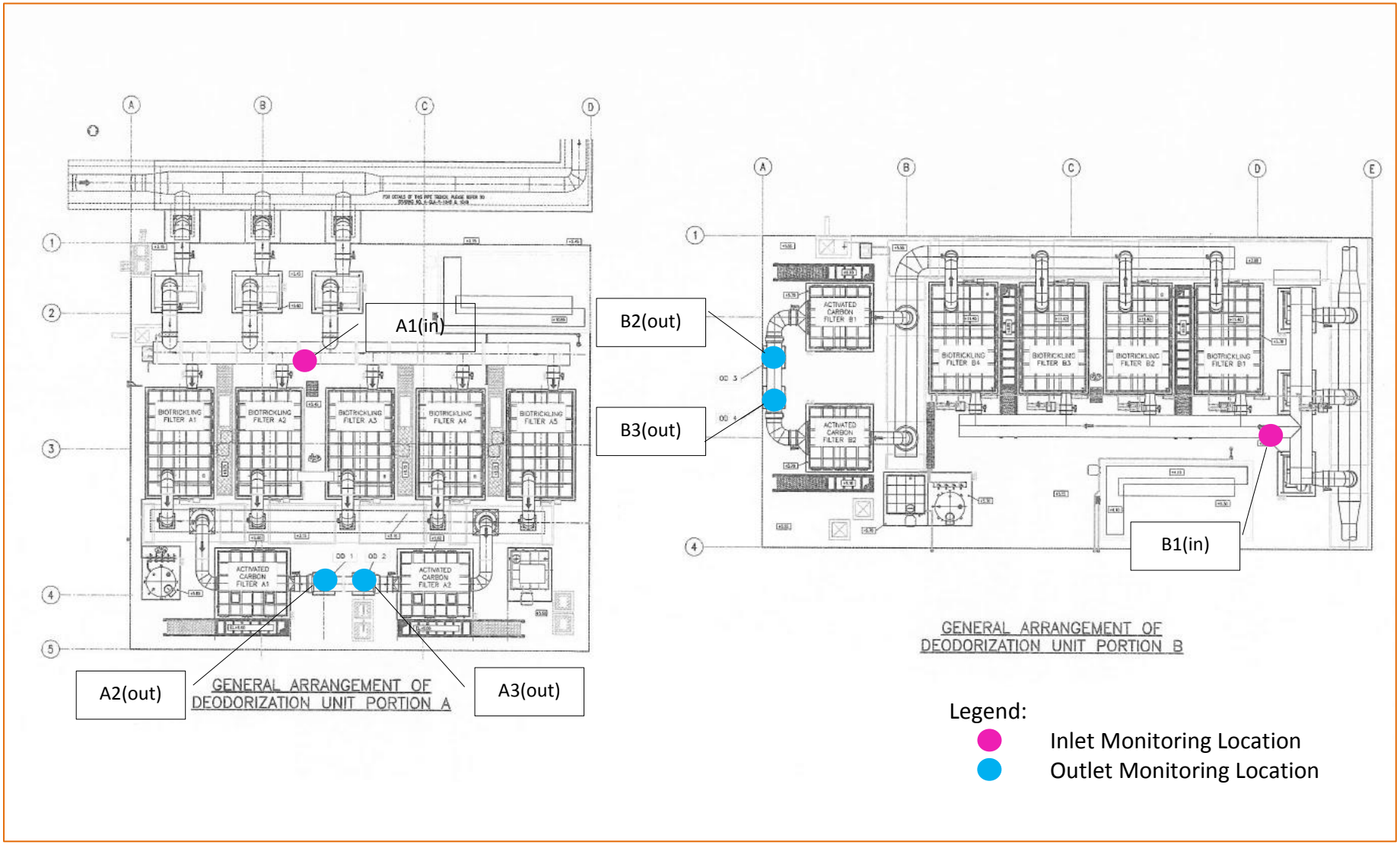
3.6.1 No air sampling for olfactometric analysis was carried out during the reporting month. The next monitoring is scheduled in August 2016, at 1 year after commissioning of the upgraded PPSTW, and the exact date of sampling will be agreed with the Independent Environmental Checker (IEC) in due course.

H_2S Monitoring

3.6.2 Continuous H_2S monitoring was conducted from 1 to 31 March 2016 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. The second dry season operation phase effluent quality monitoring was completed on 3 February and 4 February 2016. Another 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 (mg/L)		
Total Nitrogen as N (mg/L)		
Total Nitrogen as N – Filtered (mg/L)		
Total Phosphorous as P (mg/L)		
Total Phosphorous as P – Filtered (mg/L)		
Total Organic Carbon (mg/L)		
Aluminum (Al) (µg/L)		
Boron (B) (µg/L)		
Iron (Fe) (µg/L)		

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

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

4.1.5 All laboratory analyses were carried out by ALS Technichem (HK) Pty Limited and Enviro Labs Limited. 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

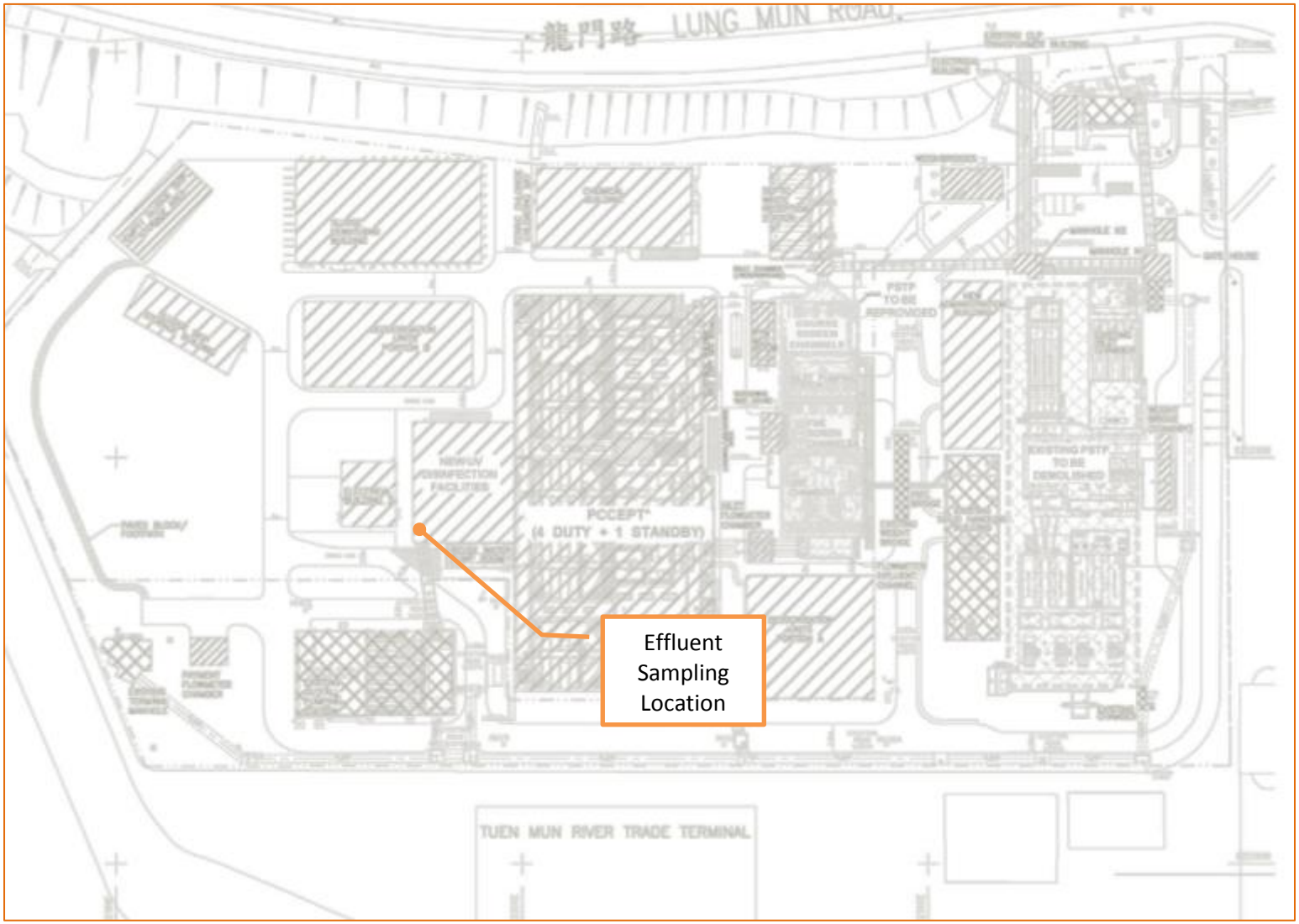
	TSS (mg/L)	BOD_5 (mg/L)	E. coli (counts/100mL)
Effluent Loadings at 95 Percentile	120	180	300,000
Upper Limit	240	360	#20,000

#: The upper limit is monthly geometric mean.

4.5 Monitoring Results

No effluent sampling was carried out during the reporting month. The next monitoring is scheduled in May 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 was completed on 18 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*** and calibration certificates for this equipment were provided in ***Appendix C***.

Table 5-3 Water Quality Monitoring Equipment

Equipment	Model	Serial Number
Multiparameter sonde	YSI Sonde 6920 v2	090019A8

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 May 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 dry season benthic survey was carried out on 21 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	~ 90% Soft mud + ~10% Coarse sand	Grey with brown surface	-	-
B2	Soft mud	Grey with brown surface	-	Rubbish inside sediments
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	-	Rubbish inside sediments
B6	Soft mud	Grey with brown surface	-	-
WSD1	~ 80% Soft mud + ~20% Coarse sand	Grey with brown surface	-	-
WSD2	~ 70% Soft mud + ~30% Coarse sand	Grey with brown surface	-	-
U2	~ 90% Soft mud + ~10% Coarse sand	Brown	-	-
NM1	~ 80% Soft mud + ~20% Coarse sand	Grey	Mild	-
NM6	~ 70% Soft mud + ~30% Coarse sand	Grey with brown surface	-	-

6.5.2 As revealed in ***Table 6-2*** , the sediments collected in B1 to B6 stations were mainly soft mud (90-100%). The sediment colour was grey with thin, brown surface. Rubbish was found in B2 to B5 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 (70-80%) and coarse sand (20-30%). The sediment colour was grey with thin, brown surface.

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

6.5.5 The sediments of station NM1 were soft mud (~80%). The sediment colour was grey while mild smell of hydrogen sulphite was detected. The sediments of station NM6 were mainly soft mud (~70%) with coarse sand as the remaining portion. The sediment colour was grey with thin, brown surface.

Benthic Baseline

6.5.6 The total abundance and total biomass of every phylum are summarized in ***Table 6-3***. A total of 2,566 specimens were collected. 143 out of the total 156 taxa were identified to genus or species levels. The most diverse phylum was Annelida (63 polychaete taxa),

followed by Mollusca (27 bivalve taxa + 17 gastropod taxa + 1 Scaphopod taxon), Arthropoda (10 crab taxa + 8 shrimp taxa + 4 amphipod taxa + 2 isopod taxa + 1 hermit crab taxon + 1 copepod taxon + 1 cumacean taxon) and Echinodermata (5 brittle star taxa + 1 sea urchin species + 1 sea cucumber taxon). Other less diverse phyla (1-3 taxa) were Cnidarin (sea pen and sea anemone), Hermichordata (acorn worm), Sipuncula, Echiura, Chordata (fishes), Nemertea and Phoronida.

6.5.7 In general, 47% of total abundance was Annelida (polychaetes, 1205 ind.). Other abundant phyla were Arthropoda (651 ind., 25%), Mollusca (491 ind., 19%) and Echinodermata (95 ind., 4%). Other phyla were relatively few in abundance while each contributed less than 2% of total abundance. The total biomass was 119.7913 g accounted mainly by Mollusca (83.4070 g, 70%). For the high biomass of Mollusca, it was mainly accounted one large prickly pen shell *Pinna muricata* (54.40 g) while other mollusks were usually small in size. Other biomass-contributing phyla were Echiura (10.3122 g, 9%), Echinodermata (8.6308 g, 7%) and Arthropoda (6.8904 g, 6%).

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	1205	47	1.1803	5
Arthropoda	651	25	6.8904	6
Mollusca	491	19	83.4070	70
Echinodermata	95	4	8.6308	7
Nemertea	41	2	0.2337	0
Sipuncula	36	1	0.0853	0
Cnidaria	20	1	2.3410	2
Echiura	14	1	10.3122	9
Chordata	6	0	5.1050	4
Hemichordata	6	0	0.0304	0
Phoronida	1	0	0.0002	0
Total	**2566**	**-**	**119.7913**	**-**

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 moderate in abundance (110-186 ind.) while the common phyla were Annelida (22-90 ind, relative abundance 20-61%), Arthropoda (11-105 ind., 10-57%) and Mollusca (10-44 ind., 6-37%).

6.5.11 Flushing water intake points: Stations WSD1 and WSD2 were moderate in abundance (109-117 ind.). The common phyla were Annelida (57-73 ind., 53-63%), Arthropoda (20-27 ind., 19-24%) and Mollusca (13-22 ind., 12-21%).

6.5.12 Secondary contact recreation subzone: Station U2 was very high in abundance (572 ind.). It was mainly accounted by Annelida (349 ind., 62%) followed by Arthropoda (105 ind., 19%) and Mollusca (95 ind., 17%).

6.5.13 Control stations: Station NM1 was high in abundance (338 ind.). The abundant phyla were Annelida (132 ind., 40%) and Arthropoda (127 ind., 38%) followed by Mollusca (54 ind., 16%). Station NM6 was very high in abundance (557 ind.). The abundant phyla were Annelida (212 ind., 39%), Mollusca (125 ind., 23%) and Arthropoda (110 ind., 20%). The less abundant phylum was Echinodermata (66 ind., 12%).

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

Phylum	Station ID																					
	B1		B2		B3		B4		B5		B6		WSD1		WSD2		U2		NM1		NM6	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Annelida	63	33.9	22	20.0	54	47.0	66	42.3	90	60.8	87	55.1	57	52.3	73	62.4	349	61.0	132	39.1	212	38.1
Arthropoda	105	56.5	47	42.7	11	9.6	46	29.5	32	21.6	21	13.3	20	18.3	27	23.1	105	18.4	127	37.6	110	19.7
Chordata	1	0.5	-	-	2	1.7	-	-	2	1.4	-	-	-	-	-	-	1	0.2	-	-	-	-
Cnidaria	-	-	-	-	-	-	1	0.6	1	0.7	1	0.6	-	-	-	-	1	0.2	3	0.9	13	2.3
Echinodermata	3	1.6	-	-	-	-	2	1.3	3	2.0	2	1.3	2	1.8	1	0.9	4	0.7	12	3.6	66	11.8
Echiura	1	0.5	-	-	1	0.9	1	0.6	-	-	-	-	-	-	-	-	7	1.2	-	-	4	0.7
Hemichordata	-	-	1	0.9	3	2.6	2	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mollusca	10	5.4	40	36.4	39	33.9	32	20.5	17	11.5	44	27.8	22	20.2	13	11.1	95	16.6	54	16.0	125	22.4
Nemertea	2	1.1	-	-	4	3.5	6	3.8	3	2.0	3	1.9	7	6.4	3	2.6	10	1.7	2	0.6	1	0.2
Phoronida	-	-	-	-	-	-	-	-	-	-	-	-	1	0.9	-	-	-	-	-	-	-	-
Sipuncula	1	0.5	-	-	1	0.9	-	-	-	-	-	-	-	-	-	-	-	-	8	2.4	26	4.7
Total	**186**	**100**	**110**	**100**	**115**	**100**	**156**	**100**	**148**	**100**	**158**	**100**	**109**	**100**	**117**	**100**	**572**	**100**	**338**	**100**	**557**	**100**

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	44	372	26.75	2.89	0.76
B2	27	220	6.85	2.38	0.72
B3	36	230	9.59	3.15	0.88
B4	43	312	0.42	3.36	0.89
B5	41	296	0.67	3.33	0.90
B6	41	316	1.44	3.15	0.85
WSD1	35	218	1.66	3.20	0.90
WSD 2	38	234	4.17	3.32	0.91
U2	63	1144	43.43	3.44	0.83
NM1	67	676	132.59	3.41	0.81
NM6	67	1114	12.00	3.04	0.75

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

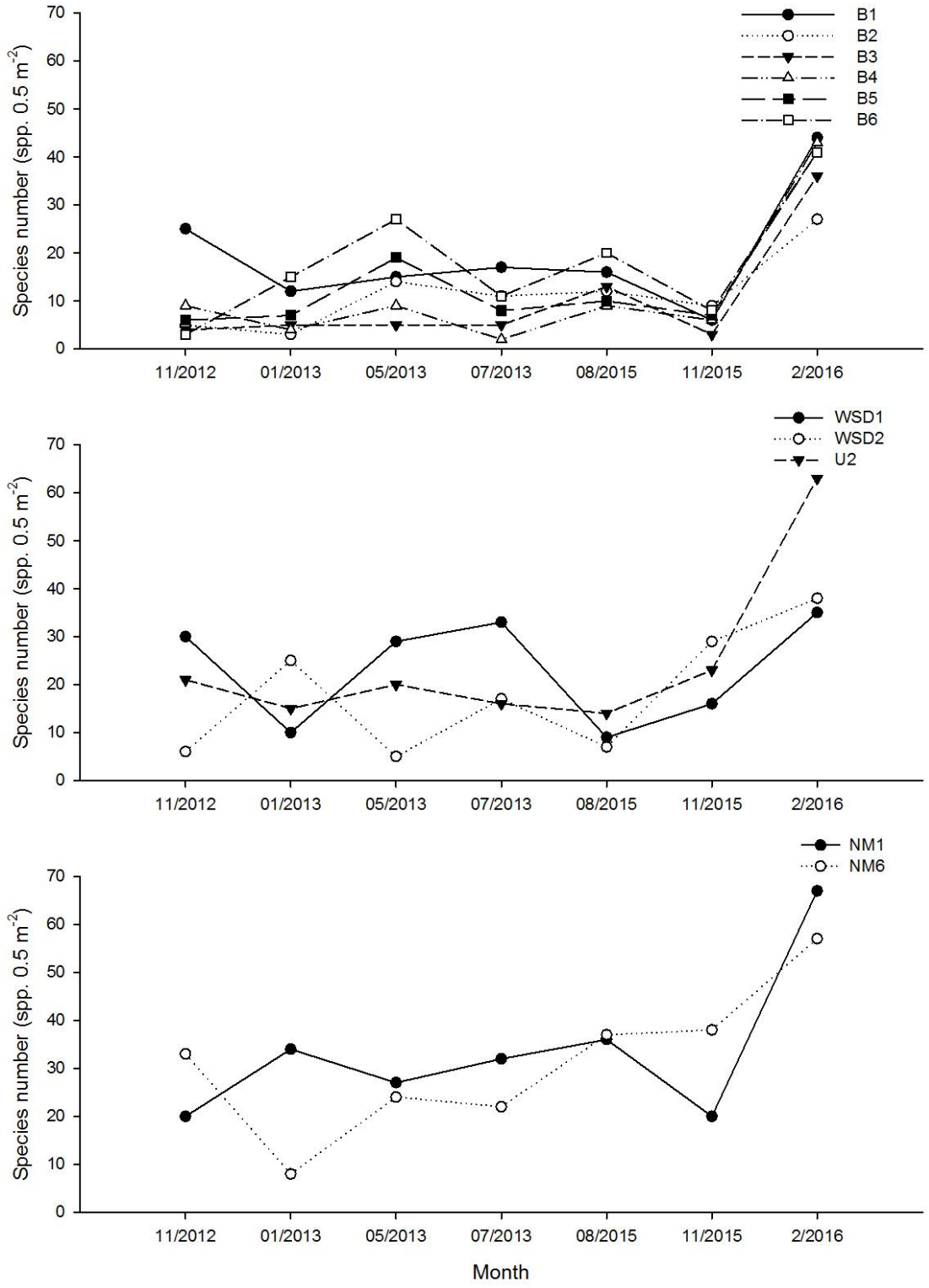


Figure 6-2 Graphical Plots of Comparison of Density at Each Monitoring Station

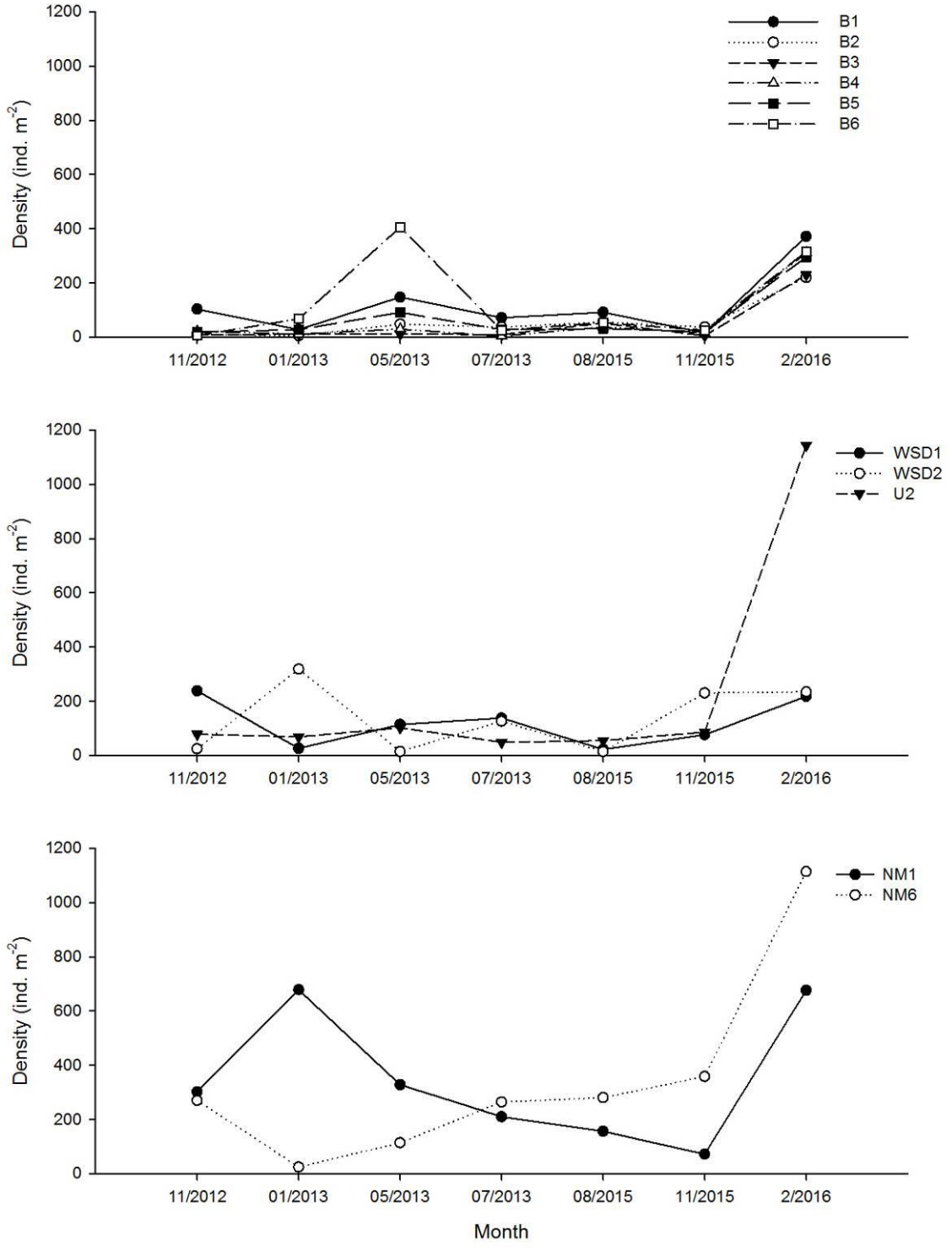


Figure 6-3 Graphical Plots of Comparison of Biomass at Each Monitoring Station

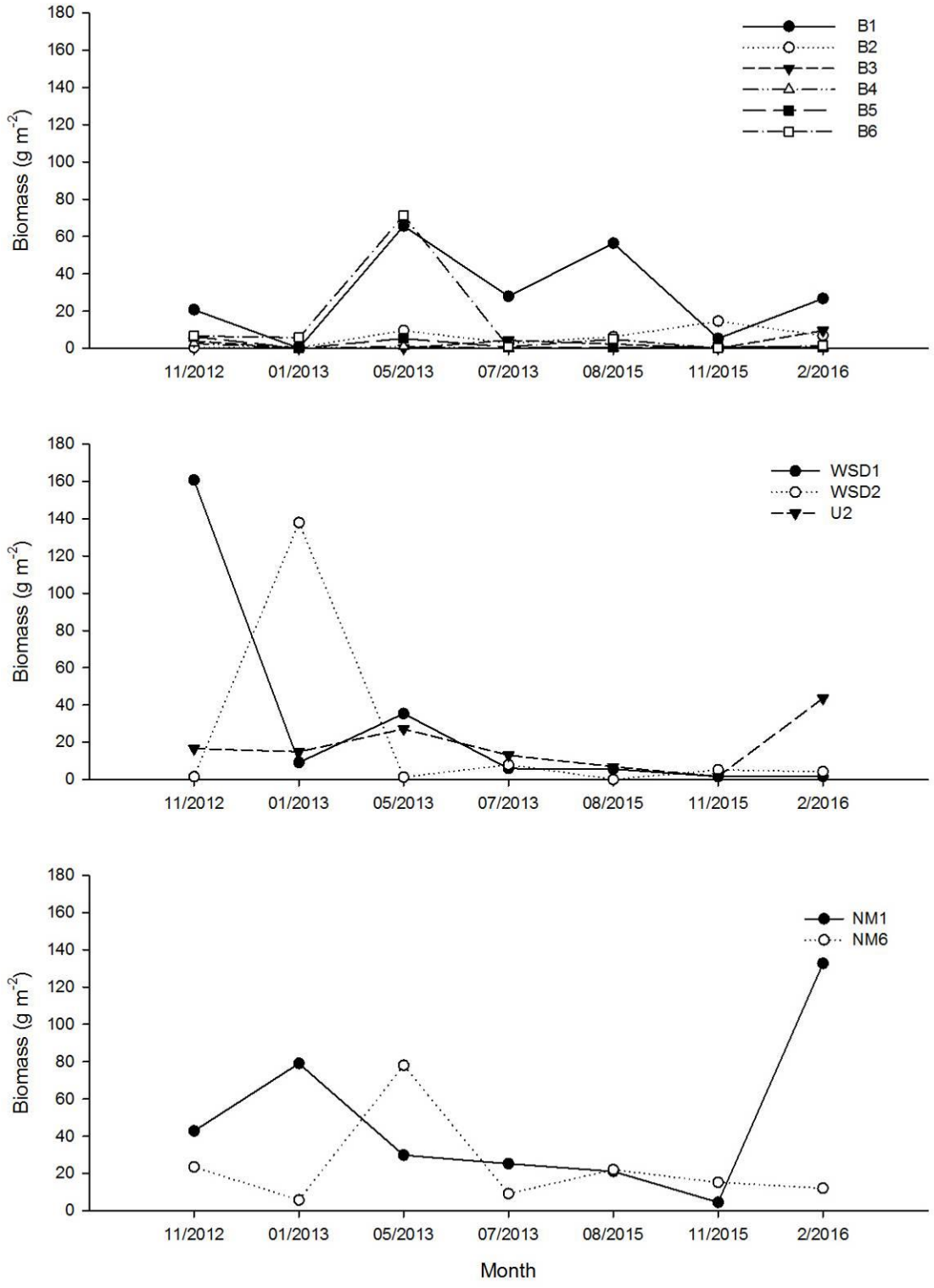


Figure 6-4 Graphical Plots of Comparison of Shannon-Weaver Diversity Index (H') at Each Monitoring Station

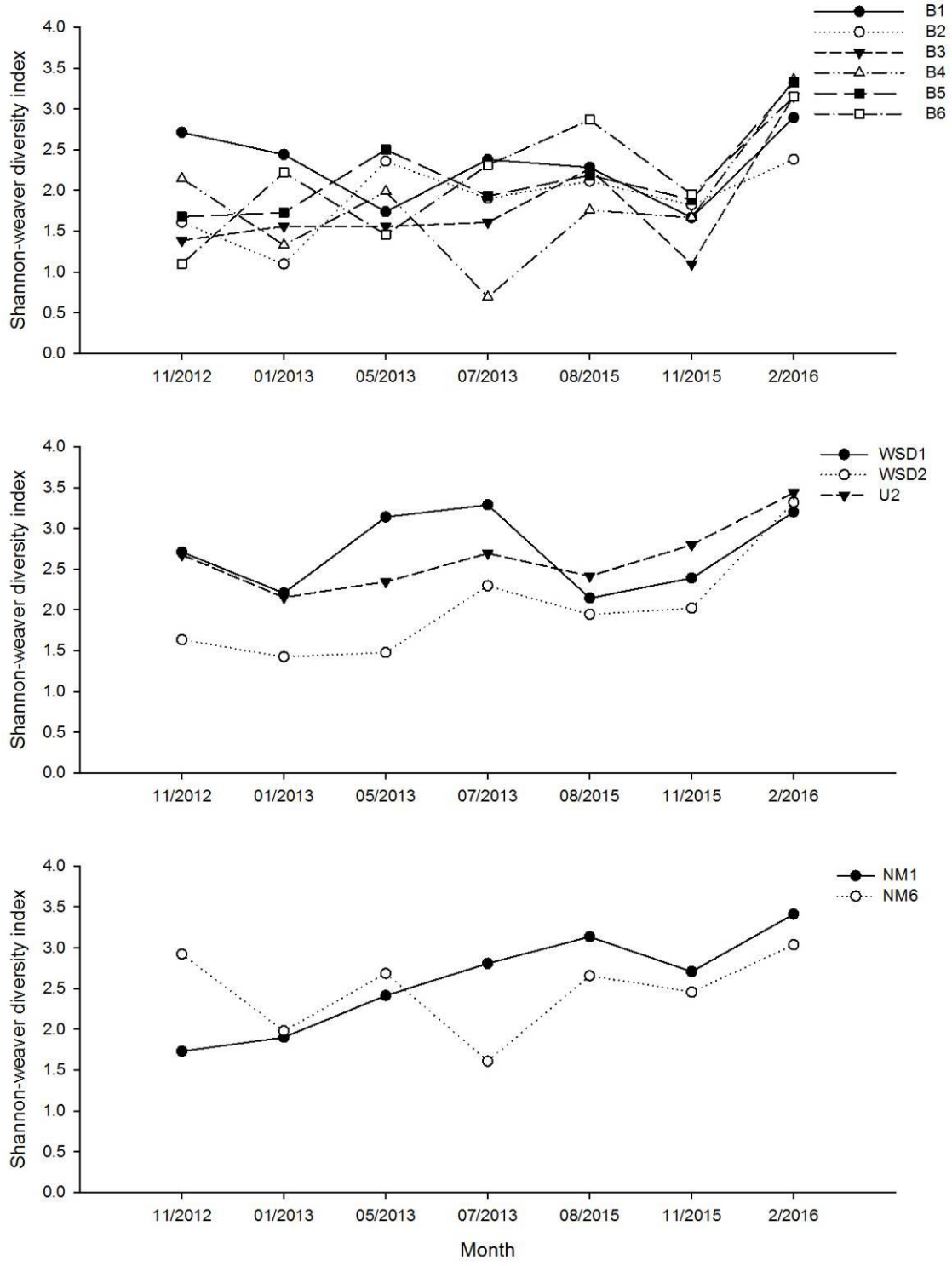
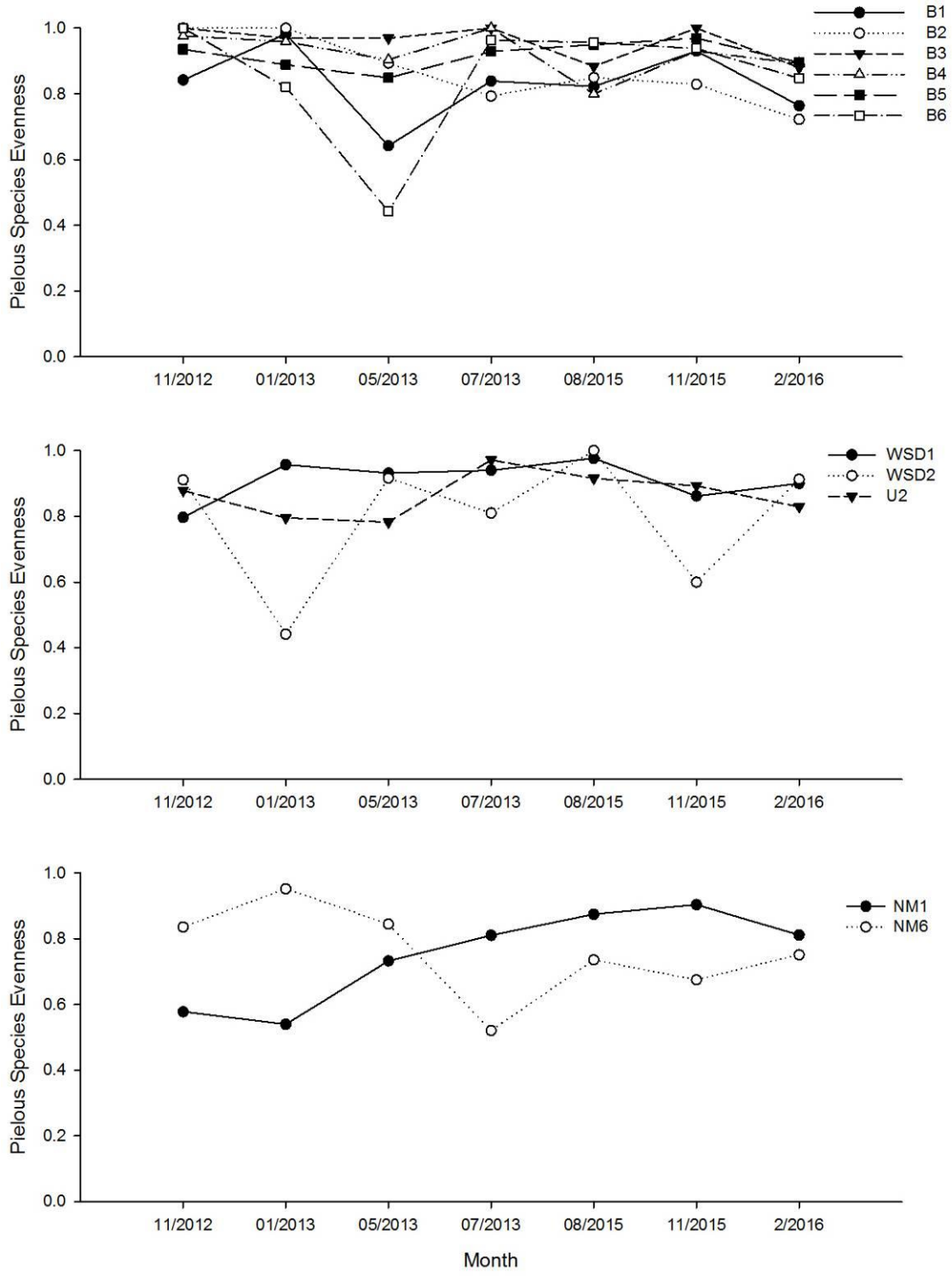


Figure 6-5 Graphical Plots of Comparison of Pielou's Species Evenness (J) at Each Monitoring Station



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 between pre-commission period and post-commission period. For pre-commission period, two samplings were conducted in dry season (Nov 2012 & Jan 2013) and wet season (May & Jul 2013) within a one year period. For the post-commission period, one sampling of wet season (Aug 2015) and two samplings of dry season (Nov 2015 & Feb 2016) were conducted. The next sampling for wet season would be scheduled in May 2016.

6.7.2 Post-commission benthic survey monitoring results for February 2016 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 2.6 to 2.1) and *J* (from 0.9-0.7) 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 10.5 to 46.8 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'* (2.3) and *J* (0.8) 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. For the dry season, the mean species number (25 spp. 0.5m^{-2}) and density (194 ind. m^{-2}) of dry season were clearly higher than that of pre-commission period. Due to dominace of copepods in Feb. 2016, the mean *H'* (2.3) and *J* (0.8) remained similar as that of pre-commission period. It was due to increased species number and abundance recorded in Feb. 2016. The mean biomass (16.0 g m^{-2}) was also 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, the species number (9-13 spp. 0.5 m^{-2}), density (32-56 ind. m^{-2}), biomass (0.2-6.2 g m^{-2}), *H'* (1.8-2.3) and *J* (0.8-0.9) of wet season remained similar (results of Aug. 2015 only). For the dry season, there were clear increases of species number (18-25 spp. 0.5 m^{-2}), density (118-164 ind. m^{-2}) and *H'* (2.1-2.6) relative to that of pre-commission period. It was due to increased species number and abundance recorded in Feb. 2016. The taxa distribution was even while the mean *J* (0.8-0.9) remained high. The mean biomass ranged 0.4-10.7 g m^{-2} and remained similar. Besides, amphipod *Ampelisca* sp. and bivalve *Ruditapes philippinarum* were dominant at B2 in Feb. 2016.

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 6.2 to 36.1 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 1.7 to 1.9) but decreased mean *J* (from 0.9 to 0.7) 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 (4.9 g m^{-2}) returned to low value. There was no abundant species while all taxa were even in distribution. Higher *H'* (2.9) and *J* (1.0) were resulted relative to wet season of pre-commission period. For the dry season, there were clear increases of mean species number (25 spp. 0.5 m^{-2}), density (171 ind. m^{-2}) and *H'* (2.6) relative to that of pre-commission period. It was due to increased species number and abundance recorded in Feb. 2016. And polychaete *Sternaspis scutata* became dominant in Feb. 2016. The mean *J* (0.9) remained similar. Although the mean abundance was higher, all collected fauna were small in size. The mean biomass (0.8 g m^{-2}) was lower than that of pre-commission period.

Flushing water intake points

6.7.9 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 (126-132 ind. m^{-2}) and *J* (0.9) remained similar in the pre-commission period. Increased mean species number leaded to higher mean *H'* (from 2.5 to 3.2) 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 84.9 to 20.6 g m^{-2}) in the following sampling months (Jan., May & Jul. 2013).

6.7.10 In the post-commission period, the species number (9 spp. 0.5 m^{-2}), density (22 ind. m^{-2}), biomass (5.6 g m^{-2}) and *H'* (2.1) 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* (1.0). For dry season, the mean species number (26 spp. 0.5 m^{-2}), density (147 ind. m^{-2}), *H'* (2.8) and *J* (0.9) were similar to that of pre-commission period. There was decrease of mean biomass (1.6 g m^{-2}) 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 Nov. 2012 survey of pre-commission period. But it was no longer dominant in the next sampling month (Feb. 2016)

6.7.11 For station WSD2, the mean species number was similar between two seasons (11-16 spp. 0.5 m^{-2}) in the pre-commission period. But there were clear decreases of mean density (171-70 ind. m^{-2}) and biomass (69.7-4.6 g m^{-2}) from dry to wet season. It 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'* (1.5-1.9) and *J* (0.7-0.9) were similar and remained at low-moderate level between two seasons.

6.7.12 In the post-commission period, the species number (7 spp. 0.5 m^{-2}), density (14 ind. m^{-2}), biomass (<0.1 g m^{-2}) and *H'* (1.9) of wet season (results of Aug. 2015 only) were at low value. Every taxon was low and similar in density resulting in high *J* (1.0). For the dry season, the mean species number (34 spp. 0.5 m^{-2}), density (232 ind. m^{-2}), *H'* (2.7) and *J* (0.8) were higher than 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 (4.6 g m^{-2}). But it was no longer dominant in the next sampling month (Feb. 2016).

Secondary contact recreation subzone

6.7.13 For station U2, there was no significant change of the biological parameters in the pre-commission period, the mean species number (18 spp. 0.5 m^{-2}), density (73-75 ind. m^{-2}) and biomass (15.7-20.0 g m^{-2}) remained at low to moderate value. And the *H'* (2.4-2.5) and *J* (0.8-0.9) remained at moderate level. The overall commonly occuring species was pea crab *Xenophthalmus pinnotheroides* at low densities (22-40 ind. m^{-2}).

6.7.14 In the post-commission period, the species number (14 spp. 0.5 m^{-2}), density (54 ind. m^{-2}), *H'* (2.4) and *J* (0.9) of wet season (results of Aug. 2015 only) remained similar to that of pre-commission period. The cease of previously common pea crab *Xenophthalmus pinnotheroides* accounted for decreased biomass (6.8 g m^{-2}). For the dry season, there were clear increases of mean species number (43 spp. 0.5 m^{-2}), density (615 ind. m^{-2}), biomass (22.5 g m^{-2}) and *H'* (3.1) relative to that of pre-commission period. It was due to increased species number and abundance recorded in Feb. 2016. No abundant species was determined while every taxon was even in distribution resulting high *J* (0.9).

Control stations

6.7.15 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 60.9 to 27.5 g m^{-2}) decreased from dry to wet season. Since the taxa were more even in abundances relatively, the mean *H'* (from 1.8 to 2.6) and *J* (from 0.6 to 0.8) increased in the wet season. The declined density was mainly accounted by variable abundance of dominant pea crab *Xenophthalmus pinnotheroides*.

6.7.16 In the post-commission period, the species number (36 spp. 0.5m^{-2}), *H'* (3.1), *J* (0.9) increased but the density decreased (156 ind. m^{-2}) in the wet season (results of Aug. 2015 only) relative to that of pre-commission period. The biomass (21.0 g m^{-2}) remained similar. For the dry season, the mean species number (44 spp. 0.5m^{-2}), *H'* (3.1), *J* (0.9) increased but the mean density (374 ind. m^{-2}) decreased relative to that of pre-commission period. The mean biomass (68.5 g m^{-2}) remained similar. The previously abundant pea crab *Xenophthalmus pinnotheroides* decreased in abundance and even ceased in following sampling months (Nov. 2015 & Feb. 2016)

6.7.17 For station NM6, the species number, density and biomass varied much among the sampling months in the pre-commission period. Overall the mean species number (21-23 spp. 0.5m^{-2}), density (147-189 ind. m^{-2}) and *H'* (2.1-2.4) were similar between two seasons. The mean biomass increased (from 14.6 to 43.6 g m^{-2}) but the *J* decreased (from 0.9 to 0.7) from dry to wet season. The changes were mainly due to the variable abundance of pea crab *Xenophthalmus pinnotheroides*. In general the species compositions varied that no consistent abundant species was determined.

6.7.18 In the post-commission period, the species number (37 spp. 0.5 m^{-2}), density (280 ind. m^{-2}) and *H'* (2.7) of wet season (results of Aug. 2015 only) were higher than that of pre-commission period. For the dry season, there were clear increases of mean species number (48 spp. 0.5 m^{-2}) and density (736 ind. m^{-2}) relative to that of pre-commission period. And increased species number resulted in higher mean *H'* (2.7). Brittle star *Amphioplus depressus* (88-134 ind. m^{-2}) became dominant in Aug. and Nov. 2015 resulting in lower *J* (0.7) relative to that of pre-commission period. The biomass (13.6-22.0 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*.

6.8 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 Pea crab *Xenophthalmus pinnotheroides* was the dominant species in the survey area during pre-commission period. According to other previous benthic surveys (Table 5.3), this crab species was reported commonly occurring in Hong Kong waters in variable densities (2-310 ind. / m^2). No correlation could be observed between its abundance and pollution. Since low densities (<10 ind / m^2) of this species were reported in both polluted waters (e.g. Causeway Bay and Yau Tong Bay) and unpolluted waters (e.g. Tung Lung Chau and Shek O Quarry). In general, it was found more abundant in North Western WCZ (e.g. Lung Kwu Sheung Tan, Tai Lam Kok and Tsing Chau Wan). It might indicate this species preferred waters of higher organic detritus but lower salinity due to influx of Pearl River. Relatively pea crab *Xenophthalmus pinnotheroides* was also reported a common species in the estuarial region of Changjiang River (Yangtze River) (Li *et al*., 2007). In the post-commission period (results of Aug. and Nov. 2015 only), this pea crab species decreased much in abundance and even ceased at few stations. It reflected that it was an opportunistic, short-lived and motile animal.

6.8.3 During the post-commisssion period, there were clear increases of species number and density at all monitoring stations. It reflected seasonal recruitment in the survey area. Some abundant taxa were commonly found at most stations such as Copepoda spp., amphipod *Ampelisca* sp. and polychaete *Sternaspis scutata*. These abundant taxa were generally motile and short in life cycle that their dominance might not persist in the next sampling month. Or its dominance would be replaced by other species through natural succession.

6.8.4 Based on the present findings, the biological parameters and species composition showed natural, seasonal fluctuations during the whole survey period. No significant impact was detected between the pre-commission and post-commission periods of PPSTW. 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 was completed on 21 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

[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.

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

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*** was 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 were gathered before commissioning of the upgraded PPSTW for each monitoring locations. The Action and Limit Levels are 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 May 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 landscape and visual monitoring was carried out on 11 March 2016. The Hong Kong Observatory's Tuen Mun Weather Station reported that the weather on the day of the patrol was fine and cold. The weather condition during the period is provided in ***Appendix I***.

8.2.2 The site inspection findings and recommendations made by the RLA are contained in the monthly Operational Phase Landscape & Visual Monitoring Report prepared by ERM is provided in ***Appendix J***. The findings and recommendations also summarised in ***Table 8-1***.

8.2.3 No non-compliance of the landscape and visual mitigation measures has been recorded in ERM's landscape and visual mitigation measures monitoring report.

Table 8-1 Summary of Site Audit findings and recommendations

Area of Works	Establishment Works Stage	
	Observation	**Recommendation/Action**
Outstanding issues		
Issues Observed in this Audit		
Within Pillar Point Sewage Treatment Works	Trees nos. 131, 133, 134 and 129 in ground floor garden were observed in poor condition during this site inspection.	It is strongly recommended to carry out additional maintenance works for the trees. The Contractor would duly investigate the health conditions of the trees and replace those trees if necessary.
Within Pillar Point Sewage Treatment Works	The non-abrasive nylon rope for securing the trees was observed to be too tight.	It is strongly recommended to release or replace that non-abrasive nylon rope in tight or poor condition for its health condition.
Within Pillar Point Sewage Treatment Works	Shrubs & Groundcover were observed in poor condition during this site inspection	It is recommended to provide sufficient watering and carry out necessary maintenance works for the Shrubs & Groundcover. It is also recommended that the approved maintenance programme for monitoring of health condition of the tree is required for the upcoming month. It is recommended to replace those trees in poor condition if no further improvement is observed for its health condition.

9 ECOTOXICOLOGICAL ASSESSMENT

9.1 Assessment Methodology

9.1.1 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. Ecotoxicological Assessment shall be carried out as part of PPWQM programme during the first year of operation phase of the upgraded PPSTW.

9.1.2 Para 1.6.1 of Appendix E of the approved EM&A Manual stated that Ecotoxicological Assessment shall be carried out to determine the toxicity of the treated effluent and the toxicity of the receiving marine water.

9.1.3 An Ecotoxicological Assessment Programme with detailed requirements for conducting Whole Effluent Toxicity Test (WETT) was submitted and approved by the Director of Environmental Protection.

9.1.4 As the hydrodynamic conditions change between wet and dry seasons, each WETT is proposed to be conducted once during wet season and once during dry season in the first year after project commencement. Furthermore, the three (3) WETTs may be conducted separately as test species may not be available at the same time. Effluent sample collection for the first wet season WETT was carried out on 3 to 4 February 2016.

9.2 Whole Effluent Toxicity Test (WETT)

9.2.1 WETT was conducted to determine the whole effluent toxicity of UV disinfected CEPT effluent from Pillar Point Sewage Treatment Works for the following three (3) species:

- Dinoflagellate (*Prorocentrum dentatum*), with 7-days growth inhibition test
- Barnacle Larvae (*Balanus amphitrite*), with 4-days settlement test
- Fish (*Oryzias melastigma*), with 14-days survival and growth test

9.2.2 The toxicity tests for barnacle larvae, fish and algae are to determine the chronic toxicity of the effluents to the species via percentage of successful metamorphosis, growth measurements and cell density measurements respectively.

9.2.3 The WETT followed the protocol agreed and adopted in previous study that aimed to establish fisheries and marine ecological criteria appropriate to local marine biota and fisheries resources (Centre for Coastal Pollution and Conservation (CCP&C), 2001). The species proposed in this WETT are based on their availability according to the PPWQM timeline, of which are considered as the “representative local species” of great ecological and fisheries significance.

Effluent Sample Collection

9.2.4 Effluent sample collection for WETT was conducted on 3 February 2016 to 4 February 2016, in conjunction with the effluent sampling. Sampling location and procedures shall

follow the effluent monitoring programme as specified in the PPWQM Programme. The effluent sampling was planned to ensure adequate volume was collected in order to prepare sufficient amount of flow-weighted composite sample for WETT. The effluent samples was kept in sterilized containers and transported to the laboratory using a chilled vehicle. WETT commenced within 36 hours from sample collection.

Dilution Seawater Collection

9.2.5 Dilution seawater used for WETT was collected from Clear Water Bay, Sai Kung. The site is away from any effluent discharge and is free from toxicity and other contamination. It is also far from areas of agricultural runoff, storm sewers or other potential point source contaminations.

9.2.6 The collected seawater was filtered and stored in a fibre tank and circulated through a UV sterilization system for more than 24 hours. Autoclave sterilization was completed at 120°C at least fifteen (15) minutes before use.

9.2.7 The salinity was adjusted to 30% with artificial sea salt or distilled water if necessary.

Test Methodology and Procedures

9.2.8 The WETT methodology and procedures followed the *Standard Operating Procedures for Whole Effluent Toxicity Test (SOP for WETT)* developed by the Environmental Protection Department (EPD) for the proposed species issued in February 2009. The test consisted of five effluent concentrations and the WETT results will be used to derive the inhibition concentration (IC), No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) to determine whether toxicity of the effluent has exceeded the target toxicity level.

9.2.9 At least three (3) replicates of each control and effluent concentration were tested such that parametric and non-parametric statistical tests can be performed for each set of data.

Reference Toxicant Testing

9.2.10 Cadmium (Cd^{2+}) was used as the reference toxicant. Five (5) concentrations spanning over the effective concentration range were selected for testing. The concentration range covered at least one IC below and one IC above the intended IC. In addition, to facilitate regression analysis, at least two levels of inhibition between 10% and 90% were included.

9.2.11 Five (5) replicates for each reference toxicant concentration was made and dose-response curves will be constructed based on the findings to calculate LOEC, NOEC and IC.

9.2.12 An additional effluent sample was retained. Should the effluent toxicity level exceed the target, the sample will be further analyzed for contaminants as listed in ***Table 9.1***.

Table 9-1 List of Contaminants and Analytical Methods to be Applied

Determinant	Suggested Method	Suggested Detection Limit (ug/L)
Aluminium	USEPA 200.7	1
Antimony		1
Arsenic		1
Barium		1
Chromium III		1
Copper		1
Lead		1
Mercury		0.1
Nickel		1
Selenium		1
Silver		1
Tin		1
Vanadium		1
Zinc		1
Ammonia	APHA 4500NH: G	10
Sulphide	APHA 20e 4500-S^{2-}	10
TCDD	USEPA 1613	1 TEQ pg/L
Toluene	USEPA 1624	10
Diazinon	USEPA 1657	0.01
Malathion	USEPA 1657	0.01
Sulphide	APHA 17ed 4500-S^{2-}	0.01
Suspended Solids	APHA 17ed 2540D	2

9.2.13 The suggested detection limit is based on local/international authority approved standard.

Data Collection and Analysis

9.2.14 All raw data including water quality measurements, cell counts, fish sizes and mortality was recorded on data sheets. Formal statistical analysis of raw data will be performed in accordance with the flowchart in Figure 5.1 in the SOP for each respective species.

Target Toxicity Level

9.2.15 The target toxicity level is derived from the dilution potential of the receiving water body. The effluent from PPSTW is considered not inducing unacceptable toxicity to aquatic life if chronic toxicity at edge of mixing zone (EMZ) is < 1.0 chronic toxicity unit (TU_c). Based on these two conditions, the target chronic toxicity level shall be determined in a supplemental far-field modeling study to derive the average dilution factor (DF) at the edge of the mixing zone. The target chronic toxicity level can be determined as follows:

$$NOEC_{TARGET} = \frac{100}{DF_{EMZ} \times TU_c}$$

9.2.16 A water quality and plume dispersion modelling study is being carried out as part of the Post-Project Water Quality Monitoring Programme and chronic toxicity levels will be established based on the far-field dilution factor to be established by the model prior to the WETT. The target toxicity levels are summarized in ***Table 9.2***.

Table 9-2 Target Toxicity Levels of PPSTW Effluent

Effluent Characteristics	Dilution Factor		Target Level	
Chronic Toxicity	Wet Season	Dry Season	Wet Season	Dry Season
NOEC in 7-day algae growth inhibition test	451[Note 1]	504[Note 1]	≥22.2%	≥19.8%
NOEC in 4-day barnacle larvae settlement test				
NOEC in 14-day fish survival and growth test				

Note:
1. Dilution factor was generated from the plume dispersion modelling.

9.2.17 In the event that the results exceed the target toxicity levels, further investigation shall be carried out to identify specific pollutants that contributed to the toxicity, including:

- Sample analysis collected from testing chambers at the beginning and the end of WETT for contaminants as shown in Table 1.1;
- Review the data collected in the effluent quality testing and identify the pollutants that may contribute to the observed toxicity;
- Re-test the species that exceeded the target level toxicity; and
- Should the re-test results indicate persistent pollution, advise operators to implement measures to reduce contaminant concentrations in the effluent

Quality Assurance / Quality Control (QA/QC)

9.2.18 The QA/QC measures shall refer to the QA/QC section from the SOP for each respective species such that the acceptability criteria is met, as shown in ***Table 1.3***:

Table 9-3 Test Acceptability Criteria

Fish	Barnacle Larvae	Algae
• The average survival of fish in the control > 85%, AND • Significant change in body weight and/or body length is observable.	• Mean % settlement in the seawater control is greater than 50%	• The control cell density shall have increased by a factor >16 in 7 days, AND • The level of variability between control replicates (i.e. coefficient of variation) is <20%

9.2.19 Should the test results in the controls do not meet the acceptability criteria, the validity of WETT data should be evaluated and test to be re-performed if required.

9.3 Monitoring Results

7-Day Algae Growth Inhibition Test

9.3.1 Toxicity of the effluent sample was determined based on a 7 days algae growth inhibition test using *Prorocentrum dentatum* as the testing specie. The test was carried out in accordance with WETT Standard Operation Procedure (2009) published by the EPD. *Prorocentrum dentatum* was exposed to effluent test samples of five different concentrations for a 7 days test period. The toxicity of the sample was determined based on cell density and specific growth rate.

9.3.2 A summary of test result for the 7-Day Algae Growth Inhibition Test is provided in ***Table 9-4***.

Table 9-4 Summary of 7-Days Algae Growth Inhibition Test Results

Test Concentration (%)	Day 7 Percentage Inhibition of Growth Rate (%)		
	Replicate Results	Mean	Significant Different (p<0.05) from Negative Control
0 (Negative Control)	1.5	0.00	No
	-2.8		
	1.3		
6.25	0.1	0.51	No
	1.2		
	0.2		
12.5	-2.9	-0.41	No
	-1.3		
	3		
25	-3.5	-1.69	No
	-1.1		
	-0.5		
50	47.5	44.74	Yes
	47.6		
	39.2		
100	79.2	75.54	Yes
	73.4		
	74		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration(LOEC)	50%		
EC50 (Upper, Lower Confidence Level)	56.00% (48.2%, 66.7%)		

9.3.3 The NOEC for the dry season effluent sample was found to be 25% based on a 7-days algae growth inhibition test, which is higher than the targeted dry season NOEC of 22.2%. This implies that the chronic toxicity unit of effluent from PPSTW is less than one and it is considered not inducing unacceptable toxicity to aquatic life.

9.3.4 The growth curve of *Prorocentrum dentatum* in various concentrations of effluent samples and growth rate curve against various concentrations of control are provided in ***Appendix F***.

4-Day Barnacle Larvae Settlement Test

9.3.5 Toxicity of the effluent sample was determined based on a 4-day barnacle larvae settlement test using *Balanus Amphitrite* cypris Larvae as the testing specie. The test was carried out in accordance with WETT Standard Operation Procedure (2009) published by the EPD. *Balanus Amphitrite* cypris Larvae was exposed to effluent test samples of five different concentrations for a 4 days test period. The toxicity of the sample was determined based on the settlement ability of the barnacle larvae.

9.3.6 A summary of test result for the 4-Days Barnacle Larvae Settlement Test is provided in ***Table 9-5***.

Table 9-5 Summary of 4-Days Barnacle Larvae Settlement Test Results

Test Concentration (%)	Day 4 Percentage Settlement (%)		
	Replicate	Mean	Significant Different (p<0.05) from Negative Control
0 (Negative Control)	65	61.7	No
	60		
	60		
6.25	60	60.0	No
	65		
	55		
12.5	65	61.7	No
	60		
	60		
25	65	61.7	No
	65		
	55		
50	25	21.7	Yes
	20		
	20		
100	5	1.7	Yes
	0		
	0		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration(LOEC)	50%		

Test Concentration (%)	Day 4 Percentage Settlement (%)		
	Replicate	Mean	Significant Different (p<0.05) from Negative Control
EC50 (Upper, Lower Confidence Level)	42.6% (38.4%, 47.1%)		

9.3.7 The NOEC for the dry season effluent sample was found to be 25% based a 4-day barnacle larvae settlement test, which is higher than the targeted dry season NOEC of 22.2%. This implies that the chronic toxicity unit of effluent from PPSTW is less than one and it is considered not inducing unacceptable toxicity to aquatic life.

9.3.8 The growth curve of *Barnacle (Balanus Amphitrite)* Cypris Larvae in various concentrations of effluent samples and growth rate curve against various concentrations of control are provided in ***Appendix F***.

14-Day Fish Survival and Growth Test

9.3.9 Toxicity of the effluent sample was determined based on a 14 days fish survival and growth test using Marine Medaka *(Oryzias melastigma)* as the testing specie. The test was carried out in accordance with WETT Standard Operation Procedure (2009) published by the EPD. Marine Medaka *(Oryzias melastigma)* was exposed to effluent test samples of five different concentrations for a 14 days test period. The toxicity of the sample was determined based on fish survival and growth rate.

9.3.10 A summary of test result for the 14-Day Fish Survival and Growth Test is provided in ***Table 9-6*** and ***Table 9-7***.

Table 9-6 Summary of 14-Day Fish Survival Test Results

Test Concentration (%)	Average Growth Rate (mg/day)		
	Replicate Results	Mean	Significant Different (p<0.05) from Negative Control
0 (Negative Control)	65	61.7	No
	60		
	60		
6.25	60	60.0	No
	65		
	55		
12.5	65	61.7	No
	60		
	60		
25	65	61.7	No
	65		
	55		
50	25	21.7	Yes
	20		
	20		

Test Concentration (%)	Average Growth Rate (mg/day)		
	Replicate Results	Mean	Significant Different (p<0.05) from Negative Control
100	5	1.7	Yes
	0		
	0		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration(LOEC)	50%		
EC50 (Upper, Lower Confidence Level)	80.81% (68.8%, 94.9%)		

Table 9-7 Summary of 14-Day Fish Growth Test Results

Test Concentration (%)	Average Growth Rate (mg/day)		
	Replicate Results	Mean	Significant Different (p<0.05) from Negative Control
0 (Negative Control)	215.3	215.5	No
	211.6		
	219.7		
6.25	209.6	224.1	No
	220.8		
	241.8		
12.5	210.3	218.1	No
	220.0		
	224.1		
25	197.2	206.0	No
	198.4		
	222.4		
50	197.2	221.4	Yes
	198.4		
	222.4		
100	165.5	177.7	Yes
	189.3		
	178.2		
No Observable Effect Concentration (NOEC)	50%		
Lowest Observed Effect Concentration(LOEC)	100%		
EC50	>100%		
EC50 (Upper, Lower Confidence Level)	83.5% (54.5%, N/A)		

9.3.11 The NOEC for the dry season effluent sample was found to be 25% and 50% respectively based on a 14 days fish survival and growth test, which is higher than the targeted dry season NOEC of 22.2%. This implies that the chronic toxicity unit of effluent from PPSTW is less than one and it is considered not inducing unacceptable toxicity to aquatic life.

9.3.12 The growth curve of Marine Medaka *(Oryzias melastigma)*in various concentrations of effluent samples and growth rate curve against various concentrations of control are provided in ***Appendix .***

10 CONCLUSION

10.1.1 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.

10.1.2 This is the 8th Monthly Operation Phase Monitoring Report which summarizes all environmental monitoring events carried out during post-commissioning period from 1 to 31 March 2016. A total of three monitoring events were carried out during the reporting period.

10.1.3 The exact dates of monitoring carried out are shown in ***Table 10-1***, below:

Table 10-1 Monitoring Dates During Reporting Month

Monitoring Events	8th Reporting Month Monitoring Period: 1 – 31 March 2016
Odour Monitoring	15/3/2016
H_2S Monitoring	1/3/2016 - 31/2/2016 (continuous monitoring)
Landscape and Visual Monitoring	11/3/2016

10.1.4 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.

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

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

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

10.1.8 No significant impact was detected between the pre-commission and post-commission periods of PPSTW from the benthic survey monitoring results.

10.1.9 The ecotoxicological assessment results for effluent sample collected during dry season indicated that the effluent from PPSTW is considered not inducing unacceptable toxicity to aquatic life.

10.1.10 No non-compliance of the landscape and visual mitigation measures has been recorded during the reporting month.

10.1.11 No environmental complaint was reported during the reporting month.

10.1.12 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)

HKPC Hong Kong Productivity Council 香港生產力促進局

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

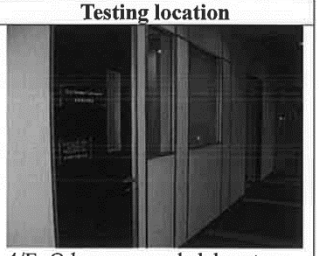
2. OBJECTIVE

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	
15-March-16	Daytime (14:40-15:10)	A1	River Trade Terminal Office	14:55	NW	0.1	0	0	-
		A2	Chu Kong Warehouse 1	14:45	S	0.6	0	0	-
		A3	Chu Kong Warehouse 2	14:44	S	1.3	0	0	-
		A4	Wai Sang Sawmill Ltd.	14:46	SW	0.1	0	0	-
		A5	Pillar Point Fire Station	14:43	S	3.1	0	0	-
		A6	Sunhing Hung Kai Tuen Mun Godown	14:40	SW	0.1	0	0	-
		A7	EMSD Servicing Vehicle Station	14:51	E	0.1	0	0	-
		S1	Northern Site Boundary	15:00	W	0.1	0	0	-
		S2	Eastern Site Boundary	15:11	S	0.1	0	0	-
		S3	Southern Site Boundary	15:10	W	0.1	0	0	-
		S4	Western Site Boundary	15:07	NW	0.1	0	0	-
15-March 16	Evening (17:00-17:30)	A1	River Trade Terminal Office	17:15	N	0.1	0	0	-
		A2	Chu Kong Warehouse 1	17:05	E	0.1	0	0	-
		A3	Chu Kong Warehouse 2	17:04	E	1.6	0	0	-
		A4	Wai Sang Sawmill Ltd.	17:06	E	0.1	0	0	-
		A5	Pillar Point Fire Station	17:03	SE	0.1	0	0	-
		A6	Sunhing Hung Kai Tuen Mun Godown	17:00	SE	0.5	0	0	-
		A7	EMSD Servicing Vehicle Station	17:10	S	0.1	0	0	-
		S1	Northern Site Boundary	17:20	W	0.6	0	0	-
		S2	Eastern Site Boundary	17:30	S	0.1	0	0	-
		S3	Southern Site Boundary	17:29	W	0.1	0	0	-
		S4	Western Site Boundary	17:26	N	0.2	0	0	-

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

Date	15/03/2016
HKO Monitoring Location	Tuen Mun
Weather	Cloudy
Temperature	14.1°C
Humidity	[redacted] Low

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

ID	Location	Daytime Period: 14:40 - 15:10					Evening Period: 17:00 - 17:30				
		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	14:55	NW	0.1	0	/	17:15	N	0.1	0	/
A2	Chu Kong Warehouse 1	14:45	S	0.6	0	/	17:05	E	0.1	0	/
A3	Chu Kong Warehouse 2	14:44	S [redacted]	1.3	0	/	17:04	E	1.6	0	/
A4	Wai Sang Sawmill Ltd.	14:46	SW	0.1	0	/	17:06	E	0.1	0	/
A5	Pillar Point Fire Station	14:43	S	3.1	0	/	17:03	SE	0.1	0	/
A6	Sunhing Hung Kai Tuen Mun Godown	14:40	SW	0.1	0	/	17:00	SE	0.5	0	/
A7	EMSD Servicing Vehicle Station	14:51	E	0.1	0	/	17:10	S	0.1	0	/
S1	Northern Site Boundary	15:00	W	0.1	0	/	17:20	W	0.6	0	/
S2	Eastern Site Boundary	15:11	S	0.1	0	/	17:30	S	[redacted] 0.1	0	/
S3	Southern Site Boundary	[redacted] 15:10	W	0.1	0	/	17:21	W	0.1	0	/
S4	Western Site Boundary	15:07	NW	0.1	0	/	17:26	N	0.2	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:	Han Cheung	[signature]	15/03/2016
Checked By:	Vivian Chan	[signature]	16/03/16

707134 | Odour Patrol Record Sheet | Revision No. 1
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Upgrading of Pillar Point STW - Investigation, Design and Construction
Operation Period EM&A - Odour Patrol Record Sheet

Date	15 - 3 - 2016
HKO Monitoring Location	Tuen Mun
Weather	Cloudy
Temperature	14°C
Humidity	Low

Odour Intensity (OI)

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

ID	Location	Daytime Period:					Evening Period:				
		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	14:55	NW	0.1	0	/	17:15	N	0.1	0	/
A2	Chu Kong Warehouse 1	14:45	S	0.6	0	/	17:05	E	0.1	0	/
A3	Chu Kong Warehouse 2	14:44	0.75	1.3	0	/	17:04	E	01.6	0	/
A4	Wai Sang Sawmill Ltd.	14:46	SW	0.1	0	/	17:06	E	0.1	0	/
A5	Pillar Point Fire Station	14:43	S	3.1	0	/	17:03	SE	0.1	0	/
A6	Sunhing Hung Kai Tuen Mun Godown	14:40	SW	0.1	0	/	17:00	SE	0.5	0	/
A7	EMSD Servicing Vehicle Station	14:51	E	0.1	0	/	17:10	S	0.1	0	/
S1	Northern Site Boundary	15:00	W	0.1	0	/	17:20	W	0.6	0	/
S2	Eastern Site Boundary	15:11	S	0.1	0	/	17:30	S	0.1	0	/
S3	Southern Site Boundary	15:10	W	0.1	0	/	17:29	W	0.1	0	/
S4	Western Site Boundary	15:07	NW	0.1	0	/	17:26	N	0.2	0	/

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

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

	Name	Signature	Date
Recorded By:	Francis Lee		15/3/2016
Checked By:	Vivian Chan		16/3/16

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APPENDIX C

Monitoring Equipment Calibration Certificates

FIREMARK

Calibration Certificate

Number: CCS/65694

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

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

Remarks: Instrument PASSED – fit for service.

Next calibration: 12th Jan 2017

Authorized Signature

Technical Department
13th Jan 2016

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

FIREMARK

Calibration Certificate

Number: CCS/65695

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

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

Remarks: Instrument PASSED – fit for service.

Next calibration: 12th Jan 2017

Authorized Signature

Technical Department
13th Jan 2016

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

Remarks:

1. The sensor of channel number 1 is used for monitoring the H_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.

ALS Technichem (HK) Pty Ltd
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www.alsglobal.com

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

CONTACT:	MR IVAN LEUNG	**WORK ORDER:**	HK1600627
CLIENT:	ALS TECHNICHEM (HK) PTY LTD	**SUB-BATCH:**	0
ADDRESS:	11/F., CHUNG SHUN KNITTING CENTRE, 1-3 WING YIP STREET, KWAI CHUNG, N.T., HONG KONG	**LABORATORY:**	HONG KONG
		DATE RECEIVED:	05/01/2016
		DATE OF ISSUE:	08/01/2016

COMMENTS

The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.
The "Tolerance Limit" quoted is the acceptance criteria applicable for similar equipment used by the ALS Hong Kong laboratory or quoted from relevant international standards.
The "Next Calibration Date" is recommended according to best practice principals as practised by the ALS Hong Kong laboratory or quoted from relevant international standards.

Scope of Test:	Conductivity, Dissolved Oxygen, pH, Salinity, Turbidity and Temperature
Equipment Type:	Multifunctional Meter
Brand Name:	YSI
Model No.:	6920 V2
Serial No.:	090019A8
Equipment No.:	--
Date of Calibration:	05 January, 2016

NOTES

This is the Final Report and supersedes any preliminary report with this batch number.
Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Mr. Fung Lim Chee, Richard
General Manager -
Greater China & Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1600627
Sub-Batch: 0
Date of Issue: 08/01/2016
Client: ALS TECHNICHEM (HK) PTY LTD

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920 V2
Serial No.: 090019A8
Equipment No.: --
Date of Calibration: 05 January, 2016 Date of next Calibration: 05 April, 2016

Parameters:

Conductivity **Method Ref: APHA (21st edition), 2510B**

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	142.5	-3.0
6667	6692	+0.4
12890	12813	-0.6
58670	57932	-1.3
	Tolerance Limit (%)	±10

Dissolved Oxygen **Method Ref: APHA (21st edition), 4500-O: G**

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
1.56	1.63	+0.07
4.68	4.73	+0.05
8.16	8.09	-0.07
	Tolerance Limit (mg/L)	±0.20

pH Value **Method Ref: APHA 21st Ed. 4500H:B**

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.04	+0.04
7.0	6.95	-0.05
10.0	9.93	-0.07
	Tolerance Limit (pH unit)	±0.20

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Mr. Fung Lim Chee, Richard
General Manager
Greater China & Hong Kong

ALS Technichem (HK) Pty Ltd
ALS Environmental

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REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1600627
Sub-Batch: 0
Date of Issue: 08/01/2016
Client: ALS TECHNICHEM (HK) PTY LTD

Equipment Type: Multifunctional Meter
Brand Name: YSI
Model No.: 6920 V2
Serial No.: 090019A8
Equipment No.: --
Date of Calibration: 05 January, 2016 Date of next Calibration: 05 April, 2016

Parameters:

Turbidity

Method Ref: APHA 21st Ed. 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
4	3.9	-2.5
40	39.1	-2.3
80	78.9	-1.4
400	394.5	-1.4
800	793.1	-0.9
	Tolerance Limit (%)	±10.0

Salinity

Method Ref: APHA (21st edition), 2520B

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
10	9.97	-0.3
20	19.88	-0.6
30	29.85	-0.5
	Tolerance Limit (%)	±10

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
16	16.1	+0.1
23	23.1	+0.1
39	38.8	-0.2
	Tolerance Limit (°C)	±2.0

Remark: "Displayed Reading" presents the figures shown on item under calibration / checking regardless of equipment precision or significant figures.

Mr. Fung Lim Chee, Richard
General Manager -
Greater China & Hong Kong

ALS Technichem (HK) Pty Ltd
ALS Environmental

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Appendix D

Odour Emission Monitoring Result

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
3/1/2016	00:00:00-00:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	3.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	38.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	6.3	0.0	0.0	1.6	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	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	5.3	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	29.3	0.0	0.0	42.4	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	11.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.2	0.0	0.0	1.6	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	9.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	9.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	9.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	11.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	4.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	4.4	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	4.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	4.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	5.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
3/2/2016	00:00:00-00:59:59	5.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	3.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	3.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.1	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	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	20.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	28.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	16.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	11.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	9.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	7.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	15:00:00-15:59:59	24.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	11.4	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	2.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	4.4	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	5.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	5.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/3/2016	00:00:00-00:59:59	5.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	5.2	0.0	0.0	0.3	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	3.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	3.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.7	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	6.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	30.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	38.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	12.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	21.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	32.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	11.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	9.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	8.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	5.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	16.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
3/4/2016	00:00:00-00:59:59	5.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	5.4	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.3	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	11.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	15.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	07:00:00-07:59:59	9.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	9.3	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	00:00:00-00:59:59	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	15.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	20.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	28.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	10.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	39.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
3/5/2016	11:00:00-11:59:59	13.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	9.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	7.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	17.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	10.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	15.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	14.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	10.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	23:00:00-23:59:59	11.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
3/6/2016	00:00:00-00:59:59	13.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	11.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	11.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	13.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	14.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	16.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	15.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	15.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	11.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	11.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	9.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.4	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.3	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	5.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.5	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	9.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	11.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	10.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	41.6	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	18.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
3/7/2016	00:00:00-00:59:59	13.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	11.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	15.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	19.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	9.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	12.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	9.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	10.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	9.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	9.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	15:00:00-15:59:59	6.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.5	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	7.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	12.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	18.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	9.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	12.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	10.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/8/2016	00:00:00-00:59:59	8.8	0.0	0.0	2.2	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	5.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	13.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	30.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	11.4	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	24.2	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	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	20.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	55.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	45.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	22.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	25.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	12.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	11.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	12.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	14.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	9.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	13.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	14.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	14.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	10.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	9.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
3/9/2016	00:00:00-00:59:59	26.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	9.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	7.9	0.0	0.0	2.2	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	8.8	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	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	9.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	07:00:00-07:59:59	10.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	7.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	12.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	33.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	28.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	28.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	28.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	26.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	25.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	24.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	19.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	17.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	16.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	15.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	30.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	17.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	12.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	00:00:00-00:59:59	12.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	10.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	11.2	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	3.9	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	6.2	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	2.9	0.0	0.0	100%	100%	100%	100%
3/10/2016	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	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.7	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	2.2	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	23:00:00-23:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
3/11/2016	00:00:00-00:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	4.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.2	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	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	4.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	4.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	5.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	4.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	5.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	5.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	4.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	4.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	6.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/12/2016	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	7.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.2	0.0	0.0	2.2	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	8.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	5.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	15:00:00-15:59:59	4.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	4.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	4.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	3.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
3/13/2016	00:00:00-00:59:59	4.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	7.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	7.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.8	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	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	7.5	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	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	7.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	11.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	10.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
3/14/2016	00:00:00-00:59:59	10.6	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	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.2	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	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	07:00:00-07:59:59	4.0	0.0	0.0	2.2	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	4.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	100.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	12.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	4.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	4.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	5.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	5.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	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	6.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.2	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	1.6	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	6.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	6.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	6.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	5.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
3/15/2016	11:00:00-11:59:59	4.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	4.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	5.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	23:00:00-23:59:59	9.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
3/16/2016	00:00:00-00:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	4.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	4.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	4.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	7.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	13.2	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	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	5.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	9.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	5.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	4.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
3/17/2016	00:00:00-00:59:59	6.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	4.7	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	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.2	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	3.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	5.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	5.0	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	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	4.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	4.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	4.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	15:00:00-15:59:59	5.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	5.0	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
3/18/2016	00:00:00-00:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	5.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	4.7	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	1.6	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	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	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	46.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	53.9	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	17.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	15.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	14.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	14.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	12.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
3/19/2016	00:00:00-00:59:59	10.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	9.4	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	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	7.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	5.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	07:00:00-07:59:59	9.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	9.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	10.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	9.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.5	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	25.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	16.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	9.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	9.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	10.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	13.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	10.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	00:00:00-00:59:59	11.9	0.0	0.0	2.9	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	8.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	8.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	9.3	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	10.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	10.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	12.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/20/2016	11:00:00-11:59:59	10.1	0.0	0.0	2.3	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	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.8	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	2.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	9.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	11.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	10.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	23:00:00-23:59:59	10.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/21/2016	00:00:00-00:59:59	9.3	0.0	0.0	3.3	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	5.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	8.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	6.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	13.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	5.0	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	1.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	55.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	16.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	10.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	10.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	7.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	6.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
3/22/2016	00:00:00-00:59:59	5.3	0.0	0.0	1.6	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	5.0	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	1.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	5.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	4.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	4.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	4.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	4.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	6.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	100.0	0.0	0.0	100.0	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	100.0	0.0	0.0	40.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	20.6	0.0	0.0	3.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	13.5	0.0	0.0	2.5	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	15:00:00-15:59:59	11.0	0.0	0.0	1.7	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	10.7	0.0	0.0	1.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	10.1	0.0	0.0	1.4	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	1.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	10.1	0.0	0.0	1.4	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	10.1	0.0	0.0	1.4	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	10.1	0.0	0.0	1.2	0.0	0.0	100%	100%	100%	100%
3/23/2016	00:00:00-00:59:59	10.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	11.0	0.0	0.0	1.4	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	7.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	17.9	0.0	0.0	4.8	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	12.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	10.7	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	10.1	0.0	0.0	1.7	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	11.2	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	13.2	0.0	0.0	3.2	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	13.5	0.0	0.0	2.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.3	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	7.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	7.6	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	7.8	0.0	0.0	2.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.8	0.0	0.0	1.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	10.1	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	7.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	9.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	14.7	0.0	0.0	3.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	9.1	0.0	0.0	1.4	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
3/24/2016	00:00:00-00:59:59	8.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.8	0.0	0.0	0.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.2	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	8.5	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	7.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	07:00:00-07:59:59	7.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.8	0.0	0.0	1.4	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	9.4	0.0	0.0	1.8	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.5	0.0	0.0	1.7	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.3	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.6	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	7.8	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.6	0.0	0.0	0.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.7	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	4.7	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	5.0	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	7.1	0.0	0.0	1.4	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	7.9	0.0	0.0	1.7	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.5	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	9.1	0.0	0.0	1.8	0.0	0.0	100%	100%	100%	100%
	00:00:00-00:59:59	6.3	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	17.3	0.0	0.0	1.7	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	10.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	6.5	0.0	0.0	1.8	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.5	0.0	0.0	1.7	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.5	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	6.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	7.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	8.5	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	5.3	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
3/25/2016	11:00:00-11:59:59	4.4	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	4.8	0.0	0.0	0.4	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	5.1	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.9	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.3	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	5.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	5.3	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	5.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	6.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	7.1	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	23:00:00-23:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/26/2016	00:00:00-00:59:59	6.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	6.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	5.7	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	9.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	11.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	11.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	12.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	12.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.5	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	6.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/27/2016	00:00:00-00:59:59	8.8	0.0	0.0	2.2	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	6.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	8.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	8.8	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	2.2	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	10.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	8.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	6.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	6.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	15:00:00-15:59:59	6.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	6.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	8.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	7.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.8	0.0	0.0	2.3	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%
3/28/2016	00:00:00-00:59:59	10.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	8.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	6.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	6.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	7.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	6.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	34.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	10.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	10.1	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	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	10.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	8.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	7.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	7.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
3/29/2016	00:00:00-00:59:59	8.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	6.8	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	10.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	9.3	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	1.6	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	07:00:00-07:59:59	10.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	11.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	14.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	11.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	10.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	7.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	8.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	8.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	8.1	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.7	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	6.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	6.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	30.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	9.1	0.0	0.0	3.3	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	15.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	9.4	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	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	8.8	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	8.5	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	6.5	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	7.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	18.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	41.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	96.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
3/30/2016	11:00:00-11:59:59	100.0	0.0	0.0	99.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	27.6	0.0	0.0	5.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	20.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	14.4	0.0	0.0	2.4	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	14.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	12.9	0.0	0.0	0.6	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	19.6	0.0	0.0	3.2	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	19.3	0.0	0.0	2.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	17.9	0.0	0.0	2.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	16.2	0.0	0.0	2.6	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	16.0	0.0	0.0	3.2	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	14.4	0.0	0.0	2.6	0.0	0.0	100%	100%	100%	100%

Date	Time	DOUA INTLET H2S	DOUA OUTLET H_2S		DOUB INTLET H2S	DOUB OUTLET H_2S		DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	HST8141A_H_2S	HST8141B_H_2S	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
	23:00:00-23:59:59	15.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
3/31/2016	00:00:00-00:59:59	19.3	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	22.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	31.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	30.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	23.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	19.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	14.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	15.6	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	13.2	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	12.9	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	21.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	14.7	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	10.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	10.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	11.0	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	8.8	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	8.9	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	8.8	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	10.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	13.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	15.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	17.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	13.2	0.0	0.0	1.6	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 (February 2016)

Monitoring station: B1 Sampling date: 21/2/2016													
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.	7	0.00	5	0.00			3	0.00	1	0.00	16	0.00
2	A	Corophium sp.	6	0.00			7	0.00	2	0.00	4	0.00	19	0.01
3	B	Ruditapes philippinarum					1	0.00					1	0.00
4	B	Tellina minuta			1	0.00			2	0.00			3	0.01
5	B	Theora lata					1	0.00					1	0.00
6	B	Timoclea lionota			2	0.02							2	0.02
7	C	Eucrate sp.									1	0.02	1	0.02
8	C	Neoxenophthalmus obscurus	1	0.01	2	0.01	1	0.00					4	0.02
9	C	Typhlocarcinus villosus					2	0.44					2	0.44
10	Co	Copepoda spp.	6	0.00	8	0.00			28	0.01	15	0.00	57	0.02
11	Cu	Eocuma sp.	2	0.00					1	0.00			3	0.00
12	Ec	Ophiura pteracantha					1	0.00					1	0.00
13	Ec	Protankyra bidentata									2	1.92	2	1.92
14	Eh	Paraarhynchite sp.			1	10.21							1	10.21
15	F	Paratrypauchen microcephalus							1	0.53			1	0.53
16	G	Philine sp.	1	0.00					1	0.01			2	0.01
17	G	Volvulella ovulina									1	0.00	1	0.00
18	N	Nemertea spp.	1	0.00			1	0.04					2	0.05
19	P	Aglaophamus dibranchis					1	0.00	1	0.00			2	0.00
20	P	Aglaophamus sinensis									1	0.02	1	0.02
21	P	Chaetozone sp.					2	0.00					2	0.00
22	P	Ehlersileanira incisa hwanghaiensis	3	0.00									3	0.00
23	P	Glycera alba					4	0.00					4	0.00
24	P	Harmothoe sp.					1	0.00			1	0.01	2	0.01
25	P	Isolda sp.					3	0.00					3	0.00
26	P	Leocrates chinensis					1	0.01					1	0.01
27	P	Linopherus paucibranchiata	3	0.00									3	0.00
28	P	Lumbrineris shiinoi					1	0.00					1	0.00

Monitoring station: B1 Sampling date: 21/2/2016													
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.
29	P	Malacoceros sp.							1	0.00			1	0.00
30	P	Mediomastus sp.	1	0.00	1	0.00	4	0.00					6	0.01
31	P	Micronephtys sphaerocirrata	1	0.00					1	0.00			2	0.00
32	P	Neanthes sp.	2	0.00			1	0.00	1	0.00			4	0.01
33	P	Onuphis eremita					1	0.00					1	0.00
34	P	Ophiodromus angustifrons	1	0.00			1	0.00					2	0.00
35	P	Paraprionospio pinnata					1	0.00					1	0.00
36	P	Phylo ornatus					1	0.00					1	0.00
37	P	Poecilochaetus sp.							1	0.01			1	0.01
38	P	Polydora sp.	1	0.00									1	0.00
39	P	Prionospio ehlersi					4	0.00					4	0.00
40	P	Prionospio malmgreni					1	0.00					1	0.00
41	P	Syllis sp.					1	0.00			2	0.00	3	0.00
42	P	Tharyx sp.	3	0.00	2	0.00	7	0.00			1	0.00	13	0.01
43	S	Solenocera sp.					3	0.03					3	0.03
44	Sp	Apionsoma trichocephalus					1	0.00					1	0.00
		column sum	**39**	**0.03**	**22**	**10.25**	**53**	**0.55**	**43**	**0.57**	**29**	**1.98**	**186**	**13.38**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete
S = Shrimp, Sp = Sipunculan
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: 21/2/2016													
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.			27	0.01			4	0.00			31	0.01
2	A	Amphipoda spp.	1	0.00									1	0.00
3	A	Corophium sp.			2	0.00			1	0.00	9	0.01	12	0.01
4	Ac	Balanoglossus sp.			1	0.01							1	0.01
5	B	Paratapes undulatus							1	2.30			1	2.30
6	B	Ruditapes philippinarum			6	0.00					21	0.03	27	0.03
7	B	Theora lata			2	0.03			3	0.05	1	0.00	6	0.08
8	B	Timoclea lionota			1	0.00	1	0.00					2	0.00
9	C	Typhlocarcinops denticarpus			1	0.55							1	0.55
10	Cu	Eocuma sp.			1	0.00					1	0.00	2	0.00
11	G	Acteocina sp.					1	0.00					1	0.00
12	G	Mitrella bella	1	0.07									1	0.07
13	G	Monotygma sp.	1	0.00									1	0.00
14	G	Nassarius siquijorensis							1	0.16			1	0.16
15	P	Bhawania brevis			1	0.00							1	0.00
16	P	Chaetozone sp.									1	0.00	1	0.00
17	P	Decamastus sp.			4	0.01							4	0.01
18	P	Ehlersileanira incisa hwanghaiensis					1	0.17					1	0.17
19	P	Glycera alba			1	0.00							1	0.00
20	P	Glycinde gurjanovae	1	0.00	1	0.00							2	0.00
21	P	Harmothoe sp.									1	0.00	1	0.00
22	P	Mediomastus sp.					1	0.00	1	0.00			2	0.00
23	P	Phylo ornatus	1	0.00									1	0.00
24	P	Poecilochaetus sp.									1	0.01	1	0.01
25	P	Sigambra hanaokai			3	0.00	2	0.00					5	0.00
26	P	Sternaspis scutata	1	0.00									1	0.00
27	P	Tharyx sp.					1	0.00					1	0.00
		column sum	**6**	**0.07**	**51**	**0.62**	**7**	**0.18**	**11**	**2.50**	**35**	**0.05**	**110**	**3.42**

A = Amphipod, Ac = Acorn worm, B = Bivalve, C = Crab, Cu = Cumacean, G = Gastropod, 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: 21/2/2016													
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	1	0.00			4	0.00	7	0.00
2	A	Corophium sp.			2	0.00							2	0.00
3	Ac	Balanoglossus sp.					1	0.00			2	0.00	3	0.00
4	B	Barbatia amygdalumtostum			1	0.04	1	0.03					2	0.07
5	B	Gari sp.							2	0.00			2	0.00
6	B	Mactra cuneata			3	0.00			2	0.00	2	0.00	7	0.00
7	B	Paphia undulata	1	0.01									1	0.01
8	B	Raeta sp.									1	0.01	1	0.01
9	B	Tellina minuta					1	0.00					1	0.00
10	B	Theora lata	2	0.02	1	0.02	3	0.04			4	0.05	10	0.13
11	B	Timoclea lionota			2	0.01			1	0.00	2	0.00	5	0.01
12	Co	Copepoda spp.							1	0.00			1	0.00
13	Cu	Eocuma sp.					1	0.00					1	0.00
14	Eh	Arhynchite sp.							1	0.04			1	0.04
15	F	Cryptocentrus filifer	1	2.65			1	1.76					2	4.41
16	G	Babylonia sp.							1	0.01			1	0.01
17	G	Dentaliidae spp.			1	0.01							1	0.01
18	G	Haminoea sp.					2	0.00					2	0.00
19	G	Monotygma sp.							1	0.00			1	0.00
20	G	Natica sp.			3	0.01					2	0.00	5	0.01
21	N	Nemertea spp.	1	0.02			1	0.00	1	0.01	1	0.02	4	0.04
22	P	Aglaophamus dibranchis							1	0.00	1	0.00	2	0.00
23	P	Capitella sp.			2	0.00	1	0.00			1	0.00	4	0.00
24	P	Diopatra chiliensis	1	0.00	1	0.00							2	0.00
25	P	Ehlersileanira incisa hwanghaiensis					1	0.00			1	0.00	2	0.00
26	P	Glycera alba									1	0.00	1	0.00
27	P	Linopherus paucibranchiata					1	0.00					1	0.00
28	P	Mediomastus sp.	2	0.00	2	0.00							4	0.00
29	P	Micronephtys sphaerocirrata	1	0.00	2	0.00	3	0.01			1	0.00	7	0.01
30	P	Neanthes sp.	1	0.00	1	0.00	1	0.00					3	0.00
31	P	Otopsis sp.					1	0.00					1	0.00

Monitoring station: B3 Sampling date: 21/2/2016													
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.
32	P	Paraprionospio pinnata	2	0.00									2	0.00
33	P	Sigambra hanaokai	1	0.00									1	0.00
34	P	Sternaspis scutata	2	0.00			5	0.00	8	0.00	6	0.00	21	0.00
35	P	Tharyx sp.	1	0.00			1	0.00	1	0.00			3	0.00
36	Sp	Apionsoma trichocephalus							1	0.00			1	0.00
		column sum	17	2.69	22	0.10	26	1.85	21	0.06	29	0.09	115	4.79

A = Amphipod, Ac = Acorn worm, B = Bivalve, Co = Copepod, Cu = Cumacean, Eh = Echiuran, F = Fish, G = Gastropod, N = Nemertean, P = Polychaete, Sp = Sipunculan

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: 21/2/2016													
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.	3	0.00	7	0.00			5	0.00	2	0.00	17	0.00
2	A	Corophium sp.									1	0.00	1	0.00
3	Ac	Balanoglossus sp.									2	0.02	2	0.02
4	B	Anisocorbula sp.					1	0.00					1	0.00
5	B	Dosinia sp.			1	0.00							1	0.00
6	B	Gari sp.	3	0.00					2	0.01	1	0.00	6	0.01
7	B	Orthoyoldia lepidula			1	0.00							1	0.00
8	B	Ruditapes philippinarum	1	0.00	1	0.00			1	0.00	2	0.00	5	0.00
9	B	Saccella sp.									1	0.00	1	0.00
10	B	Tellinides sp.									1	0.01	1	0.01
11	B	Theora lata			2	0.00	1	0.02					3	0.02
12	B	Timoclea lionota	1	0.00					3	0.03			4	0.03
13	Cn	Virgularia sp.					1	0.03					1	0.03
14	Co	Copepoda spp.					7	0.00	7	0.00	2	0.00	16	0.00
15	Cu	Eocuma sp.	3	0.00	3	0.00	1	0.00	2	0.00			9	0.00
16	Ec	Ophiura pteracantha	1	0.00	1	0.00							2	0.01
17	Eh	Arhynchite sp.			1	0.00							1	0.00
18	G	Acteocina sp.	4	0.00									4	0.00
19	G	Dentaliidae spp.	1	0.00									1	0.00
20	G	Monotygma sp.							1	0.01			1	0.01
21	G	Natica sp.	1	0.00									1	0.00
22	G	Philine sp.									2	0.00	2	0.00
23	Is	Isopoda spp.	3	0.00									3	0.00
24	N	Nemertea spp.	1	0.02	1	0.00	3	0.00			1	0.01	6	0.03
25	P	Aglaophamus dibranchis	3	0.00									3	0.00
26	P	Anobothrus sp.			3	0.00							3	0.00
27	P	Cirriformia sp.			3	0.00							3	0.00
28	P	Cossurella dimorpha							1	0.00			1	0.00
29	P	Ehlersileanira incisa hwanghaiensis			1	0.00							1	0.00
30	P	Glycinde gurjanovae			1	0.00			2	0.00	5	0.01	8	0.01
31	P	Lumbrineris shiinoi	4	0.00									4	0.00

Monitoring station: B4 Sampling date: 21/2/2016														
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.
32	P	Lumbrineris sp.							1	0.00			1	0.00
33	P	Lysidice ninetta			1	0.00			1	0.00			2	0.00
34	P	Mediomastus sp.	1	0.00	1	0.00							2	0.00
35	P	Neanthes sp.	4	0.01	1	0.00			3	0.00	1	0.00	9	0.01
36	P	Otopsis sp.							1	0.00			1	0.00
37	P	Pectinaria conchilega			1	0.00							1	0.00
38	P	Phylo ornatus	1	0.00			2	0.00			1	0.00	4	0.00
39	P	Poecilochaetus sp.			1	0.00	1	0.00					2	0.00
40	P	Prionospio malmgreni			1	0.00					1	0.00	2	0.00
41	P	Sigambra hanaokai	3	0.00							1	0.00	4	0.00
42	P	Sternaspis scutata	1	0.00	6	0.00			3	0.00	1	0.00	11	0.00
43	P	Tharyx sp.	2	0.00					2	0.00			4	0.00
		column sum	41	0.05	38	0.02	17	0.05	35	0.05	25	0.04	156	0.21

A = Amphipod, Ac = Acorn worm, B = Bivalve, Cn = Cnidarin, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, G = Gastropod, Is = Isopod, N = Nemertean, 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: 21/2/2016													
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.			5	0.00	8	0.00	4	0.00	4	0.00	21	0.00
2	A	Corophium sp.			2	0.00			3	0.00			5	0.00
3	B	Gari sp.	2	0.00									2	0.00
4	B	Paratapes undulatus			1	0.01							1	0.01
5	B	Ruditapes philippinarum			1	0.00							1	0.00
6	B	Tellina minuta			2	0.01	1	0.00	2	0.01			5	0.01
7	B	Theora lata	1	0.00	1	0.00							2	0.00
8	B	Timoclea lionota			2	0.01							2	0.01
9	Cn	Stachyptilum sp.							1	0.01			1	0.01
10	Co	Copepoda spp.							1	0.00			1	0.00
11	Cu	Eocuma sp.			2	0.00	1	0.00	1	0.00	1	0.00	5	0.00
12	Ec	Ophiura pteracantha							1	0.00			1	0.00
13	Ec	Salmacis sphaeroides			1	0.00	1	0.03					2	0.03
14	F	Odontamblyopus rubicundus					1	0.06					1	0.06
15	F	Paratrypauchen microcephalus									1	0.06	1	0.06
16	G	Philine sp.	2	0.00	1	0.00					1	0.00	4	0.00
17	N	Nemertea spp.	1	0.00			1	0.00	1	0.00			3	0.00
18	P	Aglaophamus dibranchis	2	0.00					3	0.01	1	0.00	6	0.01
19	P	Bhawania brevis	1	0.00							1	0.00	2	0.00
20	P	Chaetozone sp.	1	0.00	2	0.00							3	0.00
21	P	Cirriformia sp.					1	0.00	1	0.00			2	0.00
22	P	Diopatra chiliensis					1	0.00					1	0.00
23	P	Ehlersileanira incisa hwanghaiensis					1	0.00	1	0.00			2	0.00
24	P	Glycera alba									1	0.00	1	0.00
25	P	Glycinde gurjanovae	2	0.01			1	0.00	1	0.00			4	0.01
26	P	Harmothoe sp.			1	0.00	1	0.00			1	0.00	3	0.00
27	P	Linopherus paucibranchiata									7	0.04	7	0.04
28	P	Lumbrineris sp.					1	0.01					1	0.01
29	P	Mediomastus sp.			3	0.00	2	0.00	1	0.00	1	0.00	7	0.00
30	P	Micronephtys sphaerocirrata	1	0.00	1	0.00							2	0.00
31	P	Minuspio cirrifera			1	0.00	1	0.00					2	0.00

Monitoring station: B5 Sampling date: 21/2/2016													
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.
32	P	Neanthes sp.	1	0.00	4	0.00	1	0.00			3	0.00	9	0.01
33	P	Notomastus sp.							2	0.00			2	0.00
34	P	Ophiodromus angustifrons									2	0.00	2	0.00
35	P	Paraprionospio pinnata					1	0.00			1	0.00	2	0.00
36	P	Phylo ornatus			1	0.00			1	0.00			2	0.00
37	P	Poecilochaetus sp.			2	0.00	2	0.01					4	0.01
38	P	Schistomeringos rudolphi									1	0.00	1	0.00
39	P	Sigambra hanaokai	2	0.00	1	0.00	1	0.00	2	0.00			6	0.00
40	P	Sternaspis scutata	3	0.00	3	0.00	1	0.00	2	0.00	6	0.00	15	0.00
41	P	Tharyx sp.	1	0.00			1	0.00	1	0.00	1	0.00	4	0.00
42	P	Sternaspis scutata	1	0.00	6	0.00			3	0.00	1	0.00	11	0.00
43	P	Tharyx sp.	2	0.00					2	0.00			4	0.00
		column sum	41	0.05	38	0.02	17	0.05	35	0.05	25	0.04	156	0.21

A = Amphipod, B = Bivalve, Cn = Cnidarin, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, F = Fish, G = Gastropod, N = Nemertean, 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: 21/2/2016													
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	4	0.00	4	0.00			5	0.00	14	0.00
2	B	Anisocorbula sp.							6	0.05			6	0.05
3	B	Paratapes undulatus			1	0.03							1	0.03
4	B	Saccella cuspidata	1	0.01	5	0.03	1	0.00	1	0.00	8	0.09	16	0.13
5	B	Tellina minuta	3	0.00	3	0.02			1	0.00	1	0.00	8	0.02
6	B	Timoclea lionota	1	0.00	2	0.01	3	0.02	1	0.00	1	0.01	8	0.04
7	C	Eucrate sp.					1	0.00					1	0.00
8	C	Typhlocarcinus villosus			1	0.36							1	0.36
9	Cn	Stachyptilum sp.	1	0.00									1	0.00
10	Co	Copepoda spp.	1	0.00	2	0.00							3	0.00
11	Cu	Eocuma sp.							1	0.00			1	0.00
12	Ec	Ophiura pteracantha			1	0.00			1	0.00			2	0.00
13	G	Cylichna biplicata	1	0.03									1	0.03
14	G	Natica sp.							1	0.00			1	0.00
15	G	Philine sp.	1	0.00			2	0.00					3	0.00
16	Is	Cyathura sp.			1	0.00							1	0.00
17	N	Nemertea spp.	1	0.00					1	0.00	1	0.00	3	0.00
18	P	Aglaophamus dibranchis	2	0.01									2	0.01
19	P	Aglaophamus sinensis	1	0.00									1	0.00
20	P	Anobothrus sp.	1	0.00									1	0.00
21	P	Chaetozone sp.									1	0.00	1	0.00
22	P	Glycera alba	1	0.00	1	0.00					1	0.00	3	0.00
23	P	Glycinde gurjanovae			2	0.00			1	0.01	1	0.00	4	0.01
24	P	Isolda sp.									1	0.00	1	0.00
25	P	Laonice cirrata			4	0.00							4	0.00
26	P	Linopherus paucibranchiata			2	0.00							2	0.00
27	P	Lumbrineris sp.			1	0.00	1	0.00			1	0.01	3	0.01
28	P	Malacoceros sp.									1	0.00	1	0.00
29	P	Mediomastus sp.	1	0.00	1	0.00			1	0.00			3	0.00
30	P	Micronephtys sphaerocirrata					2	0.00			1	0.00	3	0.00
31	P	Minuspio cirrifera	1	0.00							1	0.00	2	0.00

Monitoring station: B6 Sampling date: 21/2/2016													
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.
32	P	Neanthes sp.			1	0.00			1	0.00	1	0.00	3	0.00
33	P	Notomastus sp.					1	0.00	1	0.00			2	0.00
34	P	Ophiodromus angustifrons			1	0.00							1	0.00
35	P	Paralacydonia paradox			3	0.00			1	0.00	1	0.00	5	0.00
36	P	Poecilochaetus sp.					2	0.00			1	0.00	3	0.00
37	P	Prionospio malmgreni	1	0.00	1	0.00							2	0.00
38	P	Schistomeringos rudolphi							1	0.00			1	0.00
39	P	Sigambra hanaokai			1	0.00			3	0.00			4	0.00
40	P	Sternaspis scutata	9	0.00	9	0.00	3	0.00	5	0.00	6	0.00	32	0.01
41	P	Tharyx sp.					1	0.00			2	0.00	3	0.00
		column sum	28	0.06	47	0.45	21	0.04	27	0.06	35	0.12	158	0.72

A = Amphipod, B = Bivalve, C = Crab, Cn = Cnidarin, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, G = Gastropod, Is = Isopod, N = Nemertean,
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: 21/2/2016													
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.			2	0.00							2	0.00
2	A	Corophium sp.	1	0.00	1	0.00							2	0.00
3	B	Anisocorbula sp.			1	0.01							1	0.01
4	B	Ruditapes philippinarum	1	0.00							2	0.00	3	0.00
5	B	Tellina minuta			2	0.00	1	0.00					3	0.00
6	B	Theora lata	4	0.03							3	0.04	7	0.08
7	B	Timoclea lionota			1	0.01							1	0.01
8	C	Neoxenophthalmus obscurus							1	0.05			1	0.05
9	C	Typhlocarcinops denticarpus	1	0.01									1	0.01
10	Co	Copepoda spp.	4	0.00			4	0.00			5	0.00	13	0.00
11	Ec	Protankyra bidentata	2	0.49									2	0.49
12	G	Natica sp.									5	0.01	5	0.01
13	G	Philine sp.	2	0.00									2	0.00
14	N	Nemertea spp.	2	0.03	3	0.03	1	0.00			1	0.00	7	0.06
15	P	Aglaophamus dibranchis	1	0.00	1	0.00							2	0.00
16	P	Diopatra chiliensis	1	0.00	1	0.00							2	0.00
17	P	Ehlersileanira incisa hwanghaiensis	1	0.00									1	0.00
18	P	Glycera alba					1	0.00					1	0.00
19	P	Glycinde gurjanovae	2	0.00	2	0.00							4	0.00
20	P	Harmothoe sp.	1	0.01			1	0.01					2	0.02
21	P	Laonice cirrata	1	0.00					1	0.01			2	0.01
22	P	Linopherus paucibranchiata									2	0.02	2	0.02
23	P	Lumbrineris sp.			1	0.00	1	0.01					2	0.01
24	P	Mediomastus sp.	8	0.01	2	0.00	3	0.01	1	0.00			14	0.02
25	P	Micronephtys sphaerocirrata	3	0.00	3	0.00	1	0.00			1	0.00	8	0.01
26	P	Minuspio cirrifera	2	0.00									2	0.00
27	P	Ophiodromus angustifrons	1	0.00					1	0.00			2	0.00
28	P	Phylo ornatus			1	0.00							1	0.00
29	P	Poecilochaetus sp.	1	0.00									1	0.00
30	P	Polydora sp.			2	0.00							2	0.00
31	P	Prionospio ehlersi			2	0.00							2	0.00

Monitoring station: WSD1 Sampling date: 21/2/2016														
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.
32	P	Sigambra hanaokai	1	0.00					1	0.00	1	0.00	3	0.00
33	P	Tharyx sp.	3	0.00	1	0.00							4	0.00
34	Ph	Phoronida spp.							1	0.00			1	0.00
35	S	Leptochela sp.	1	0.00									1	0.00
		column sum	**44**	**0.60**	**26**	**0.07**	**13**	**0.04**	**6**	**0.06**	**20**	**0.08**	**109**	**0.83**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Ec = Echinoderm, G = Gastropod, N = Nemertean, P = Polychaete, Ph = Phoronid, S = Shrimp

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: 21/2/2016													
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.			6	0.00			1	0.00	2	0.00	9	0.00
2	A	Corophium sp.							1	0.00	1	0.00	2	0.00
3	B	Ruditapes philippinarum			1	0.00							1	0.00
4	B	Theora lata							3	0.01	1	0.00	4	0.01
5	B	Timoclea lionota			1	0.00	1	0.00					2	0.00
6	C	Hexapinus granuliferus									1	0.01	1	0.01
7	C	Neoxenophthalmus obscurus	4	0.02			1	0.00					5	0.02
8	Co	Copepoda spp.					7	0.00					7	0.00
9	Ec	Ophiura pteracantha			1	0.00							1	0.00
10	G	Nassarius hepaticus					1	1.94					1	1.94
11	G	Philine sp.			2	0.01			1	0.00	2	0.00	5	0.01
12	Is	Cyathura sp.					2	0.00			1	0.00	3	0.00
13	N	Nemertea spp.					2	0.03	1	0.00			3	0.03
14	P	Anobothrus sp.									1	0.00	1	0.00
15	P	Chaetozone sp.			1	0.00			1	0.00			2	0.00
16	P	Cirriformia sp.									2	0.00	2	0.00
17	P	Glycinde gurjanovae			3	0.00			1	0.00	1	0.00	5	0.00
18	P	Harmothoe sp.			1	0.00							1	0.00
19	P	Laonice cirrata									1	0.00	1	0.00
20	P	Leocrates chinensis							1	0.00			1	0.00
21	P	Mediomastus sp.	3	0.00	1	0.01	1	0.00					5	0.01
22	P	Micronephtys sphaerocirrata	1	0.00	2	0.00	3	0.01					6	0.01
23	P	Minuspio cirrifera									1	0.00	1	0.00
24	P	Neanthes sp.	2	0.00	2	0.00			3	0.00			7	0.00
25	P	Nereididae spp.									1	0.00	1	0.00
26	P	Notomastus sp.							1	0.01			1	0.01
27	P	Otopsis sp.							1	0.00			1	0.00
28	P	Paralacydonia paradox	1	0.00									1	0.00
29	P	Paraprionospio pinnata			1	0.00			1	0.00			2	0.00
30	P	Phyllodocidae spp.							1	0.00	1	0.00	2	0.00
31	P	Phylo ornatus	2	0.00							1	0.00	3	0.00

Monitoring station: WSD2 Sampling date: 21/2/2016													
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.
32	P	Poecilochaetus sp.					1	0.00					1	0.00
33	P	Prionospio ehlersi			3	0.00					2	0.00	5	0.00
34	P	Prionospio malmgreni			1	0.00			4	0.00	1	0.00	6	0.00
35	P	Samytha sp.							1	0.00			1	0.00
36	P	Sigambra hanaokai					1	0.00			1	0.00	2	0.00
37	P	Sternaspis scutata	1	0.00					1	0.00			2	0.00
38	P	Tharyx sp.	1	0.00	2	0.00	2	0.00	5	0.00	3	0.00	13	0.01
		column sum	15	0.02	28	0.03	22	1.99	28	0.03	24	0.02	117	2.09

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Ec = Echinoderm, G = Gastropod, Is = Isopod, N = Nemertean, 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: U2 Sampling date: 21/2/2016													
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.	12	0.01	7	0.01	7	0.00	14	0.00	12	0.01	52	0.03
2	A	Byblis sp.			1	0.00							1	0.00
3	A	Corophium sp.	1	0.00									1	0.00
4	B	Anisocorbula sp.			1	0.01	1	0.00	1	0.01			3	0.02
5	B	Anodontia sp.	5	0.24	3	0.38	2	0.10	5	0.14	1	0.05	16	0.91
6	B	Cryptopecten sp.					1	0.00					1	0.00
7	B	Ruditapes philippinarum	2	0.00	5	0.03	6	0.02	3	0.00	3	0.00	19	0.06
8	B	Solen dunkerianus	3	0.12	2	0.12	3	0.23	4	0.08	3	0.06	15	0.62
9	B	Tellina minuta	2	0.01	2	0.20							4	0.21
10	B	Timoclea lionota	4	0.03	8	0.07	3	0.05	5	0.04	7	0.05	27	0.24
11	C	Unidentified juvenile crab									1	0.23	1	0.23
12	C	Xenophthalmus pinnotheroides	1	0.21					1	0.29	1	0.00	3	0.51
13	Cn	Stachyptilum sp.	1	0.00									1	0.00
14	Co	Copepoda spp.	2	0.00	1	0.00	2	0.00	5	0.00	4	0.00	14	0.00
15	Cu	Eocuma sp.	2	0.00	1	0.00			2	0.00	1	0.00	6	0.00
16	Ec	Amphioplus sp.									3	0.04	3	0.04
17	Ec	Ophiura pteracantha					1	0.00					1	0.00
18	Eh	Arhynchite sp.	2	0.02	2	0.01			3	0.02			7	0.05
19	F	Cryptocentrus filifer	1	0.05									1	0.05
20	G	Calyptraea sp.	1	0.00			1	0.02			1	0.00	3	0.02
21	G	Clathrodrillia flavidula	1	0.02									1	0.02
22	G	Dentaliidae spp.			1	0.05							1	0.05
23	G	Nassarius sp.					1	0.05	1	0.05			2	0.10
24	G	Philine sp.	1	0.00			1	0.00					2	0.00
25	G	Turritella bacillum			1	18.02							1	18.02
26	Hc	Diogenes sp.			1	0.00							1	0.00
27	Is	Cyathura sp.	5	0.00	7	0.01			4	0.00	9	0.01	25	0.02
28	N	Nemertea spp.	4	0.01	3	0.00	1	0.00	2	0.00			10	0.01
29	P	Aglaophamus dibranchis	2	0.00									2	0.00
30	P	Cirriformia sp.	1	0.00	4	0.00			4	0.00	2	0.00	11	0.00
31	P	Decamastus sp.	1	0.00									1	0.00

Monitoring station: U2 Sampling date: 21/2/2016													
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.
32	P	Diopatra chiliensis	1	0.05									1	0.05
33	P	Glycera alba			2	0.00	2	0.01			2	0.00	6	0.01
34	P	Glycera chirori	2	0.01	1	0.03							3	0.04
35	P	Glycinde gurjanovae	6	0.01	3	0.00	2	0.00	2	0.01	5	0.00	18	0.02
36	P	Harmothoe sp.	1	0.00									1	0.00
37	P	Isolda sp.					3	0.02			1	0.00	4	0.02
38	P	Laonice cirrata	4	0.01	3	0.01							7	0.02
39	P	Linopherus paucibranchiata	1	0.00									1	0.00
40	P	Lygdamis sp.					1	0.00					1	0.00
41	P	Lysidice ninetta	1	0.00									1	0.00
42	P	Magelona sp.			4	0.00	1	0.00	1	0.00	2	0.00	8	0.00
43	P	Maldanidae spp.	1	0.00	2	0.00	2	0.00	3	0.01			8	0.01
44	P	Mediomastus sp.	4	0.01	3	0.00			2	0.00			9	0.01
45	P	Micronephtys sphaerocirrata	11	0.01	6	0.00	3	0.00	9	0.00	7	0.00	36	0.02
46	P	Nereididae spp.			1	0.00	2	0.00			1	0.00	4	0.01
47	P	Onuphis eremita	3	0.01	5	0.01	5	0.02	3	0.02	1	0.00	17	0.06
48	P	Owenia fusiformis	1	0.00	2	0.02							3	0.02
49	P	Paralacydonia paradox	6	0.00	8	0.01	9	0.01	8	0.00	8	0.00	39	0.02
50	P	Paraprionospio pinnata	4	0.02	1	0.00							5	0.02
51	P	Phyllodocidae spp.			2	0.00							2	0.00
52	P	Phylo ornatus	11	0.01	21	0.02	6	0.00	20	0.01	12	0.00	70	0.04
53	P	Poecilochaetus sp.	1	0.00			2	0.00	1	0.00			4	0.00
54	P	Polydora sp.	1	0.00	3	0.00	2	0.00	3	0.01	3	0.01	12	0.02
55	P	Prionospio ehlersi	8	0.01	9	0.01	1	0.00	5	0.00			23	0.02
56	P	Prionospio malmgreni	7	0.02	8	0.01	4	0.00	8	0.01	4	0.00	31	0.04
57	P	Sabellidae spp.	1	0.00			1	0.00			2	0.01	4	0.01
58	P	Samytha sp.			2	0.00							2	0.00
59	P	Spio sp.	1	0.00	2	0.00			1	0.00	1	0.00	5	0.01
60	P	Sternaspis scutata					1	0.00	2	0.00			3	0.00
61	P	Syllidae spp.			1	0.00							1	0.00
62	P	Tharyx sp.	4	0.00	1	0.00			1	0.00			6	0.00

Monitoring station: U2 Sampling date: 21/2/2016													
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.
63	S	Alpheus brevicristatus	1	0.03									1	0.03
		column sum	135	0.92	140	19.03	77	0.55	123	0.73	97	0.49	572	21.72

A = Amphipod, B = Bivalve, C = Crab, Cn = Cnidarin, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish, G = Gastropod, Hc = Hermit crab, Is = Isopod, N = Nemertean, P = Polychaete, S = Shrimp

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: NM1 Sampling date: 21/2/2016													
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	7	0.00	9	0.00	35	0.01	11	0.00	63	0.03
2	A	Corophium sp.	4	0.00	4	0.00	11	0.01	1	0.00	19	0.00	39	0.01
3	B	Angulus emarginatus			1	0.95	2	0.00					3	0.96
4	B	Anisocorbula sp.			3	0.01			1	0.00	2	0.07	6	0.08
5	B	Barbatia uwaensis					1	0.00			1	0.01	2	0.01
6	B	Cryptopecten bullatus			1	0.03	4	0.02					5	0.05
7	B	Pinna muricata	1	54.40									1	54.40
8	B	Ruditapes philippinarum	2	0.00			13	0.80	4	0.00	6	0.10	25	0.91
9	B	Tellina iridella	1	0.00	1	0.04					1	0.00	3	0.05
10	B	Tellina minuta					4	0.13					4	0.13
11	B	Timoclea lionota					1	0.03					1	0.03
12	C	Goneplax sp.	1	0.08			1	0.05					2	0.12
13	C	Neoxenophthalmus obscurus			1	0.00					2	0.01	3	0.01
14	C	Parapanope euagora	1	0.21									1	0.21
15	C	Typhlocarcinops denticarpus	1	2.10									1	2.10
16	C	Xenophthalmus pinnotheroides					1	0.05					1	0.05
17	Cn	Virgularia sp.					2	1.63	1	0.00			3	1.64
18	Co	Copepoda spp.							2	0.00			2	0.00
19	Cu	Eocuma sp.					1	0.01	2	0.00			3	0.01
20	Ec	Amphioplus laevis					4	0.05			1	0.05	5	0.10
21	Ec	Amphipholis squamata	1	0.00			1	0.00			1	0.04	3	0.04
22	Ec	Protankyra bidentata	1	3.71									1	3.71
23	Ec	Salmacis sphaeroides					2	0.01	1	0.00			3	0.01
24	G	Calyptraea sp.							1	0.00			1	0.00
25	G	Cylichna biplicata									1	0.01	1	0.01
26	G	Philine sp.							2	0.01			2	0.01
27	Is	Cyathura sp.					2	0.00			1	0.00	3	0.00
28	Le	Nebalia sp.							2	0.00	1	0.00	3	0.00
29	N	Nemertea spp.									2	0.01	2	0.01
30	P	Aglaophamus sinensis							1	0.04	2	0.01	3	0.04

Monitoring station: NM1 Sampling date: 21/2/2016													
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.
31	P	Bhawania brevis					1	0.00					1	0.00
32	P	Cirriformia sp.					1	0.00					1	0.00
33	P	Diopatra chiliensis	1	0.04	1	0.07	2	0.01					4	0.13
34	P	Ehlersileanira incisa hwanghaiensis	2	0.01	2	0.00	1	0.01	1	0.00	2	0.00	8	0.02
35	P	Eunice indica	5	0.02			9	0.13					14	0.15
36	P	Glycera alba	1	0.00					1	0.00			2	0.00
37	P	Glycinde gurjanovae	1	0.00	2	0.00	1	0.00	2	0.01	1	0.01	7	0.02
38	P	Harmothoe sp.					6	0.07					6	0.07
39	P	Lumbrineris nagae			1	0.00			1	0.00			2	0.00
40	P	Lumbrineris shiinoi					1	0.00					1	0.00
41	P	Lygdamis sp.	2	0.00									2	0.00
42	P	Lysippe sp.					1	0.00					1	0.00
43	P	Mediomastus sp.	2	0.00	3	0.01	6	0.01	2	0.00			13	0.02
44	P	Melinna sp.					1	0.01					1	0.01
45	P	Neanthes sp.			2	0.01							2	0.01
46	P	Nereididae spp.	3	0.00									3	0.00
47	P	Notomastus sp.					2	0.14					2	0.14
48	P	Onuphis eremita	1	0.01									1	0.01
49	P	Ophelina acuminata			1	0.06							1	0.06
50	P	Ophiodromus angustifrons					1	0.00					1	0.00
51	P	Paralacydonia paradox					1	0.00					1	0.00
52	P	Paraprionospio pinnata			1	0.00	1	0.00					2	0.00
53	P	Pectinaria conchilega	1	0.00			1	0.19					2	0.19
54	P	Piromis congoense					1	0.22					1	0.22
55	P	Pista sp.									1	0.00	1	0.00
56	P	Poecilochaetus sp.			2	0.00	2	0.01					4	0.01
57	P	Prionospio ehlersi			1	0.00					1	0.00	2	0.00
58	P	Prionospio malmgreni	1	0.00	7	0.02	8	0.02	1	0.01	1	0.00	18	0.04
59	P	Sigambra hanaokai			1	0.00	1	0.00					2	0.00
60	P	Tharyx sp.	2	0.00	1	0.00	6	0.00			1	0.00	10	0.00

Monitoring station: NM1 Sampling date: 21/2/2016													
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.
61	P	Thelepus sp.					4	0.12	4	0.01	2	0.01	10	0.13
62	P	Trichobranchus sp.	2	0.01	1	0.00							3	0.01
63	S	Alpheus digitalis					4	0.30					4	0.30
64	S	Nihonotrypaea japonica					1	0.01					1	0.01
65	S	Penaeidae spp.					1	0.01					1	0.01
66	Sp	Apionsoma trichocephalus	1	0.00									1	0.00
67	Sp	Phascolosoma esculenta			4	0.00			1	0.00	2	0.00	7	0.00
		column sum	39	60.61	48	1.22	123	4.06	66	0.10	62	0.31	338	66.30

A = Amphipod, B = Bivalve, C = Crab, C = Crab, Cn = Cnidarin, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, G = Gastropod, Is = Isopod, Le = Leptostracan, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan

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: NM6 Sampling date: 21/2/2016													
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.	13	0.00	4	0.00	4	0.00	14	0.00	6	0.00	41	0.01
2	A	Corophium sp.									14	0.02	14	0.02
3	B	Anisocorbula sp.	1	0.00	1	0.01	2	0.00	1	0.00	2	0.01	7	0.03
4	B	Barbatia uwaensis							1	0.04			1	0.04
5	B	Cryptopecten bullatus							1	0.04	1	0.03	2	0.07
6	B	Diplodonta sowerbyi	1	0.02			1	0.06	2	0.05	1	0.01	5	0.15
7	B	Gari lessoni			1	0.31							1	0.31
8	B	Ruditapes philippinarum	17	0.00	5	0.01	13	0.01	14	0.01	39	0.03	88	0.05
9	B	Tellina cygnus									7	0.01	7	0.01
10	B	Tellina iridella	4	0.05	1	0.04					2	0.00	7	0.09
11	B	Timoclea lionota			1	0.07			1	0.17			2	0.24
12	C	Hexapinus granuliferus	1	0.00					1	0.01			2	0.01
13	C	Neoxenophthalmus obscurus	1	0.00	1	0.00	1	0.00			1	0.16	4	0.16
14	C	Raphidopus ciliatus					1	0.01					1	0.01
15	C	Xenophthalmus pinnotheroides					1	0.30	4	0.33			5	0.63
16	Cn	Palythoa sp.			1	0.05			1	0.60			2	0.65
17	Cn	Virgularia sp.	1	0.01	3	0.00					7	0.01	11	0.02
18	Co	Copepoda spp.	18	0.01			8	0.00	1	0.00	4	0.00	31	0.01
19	Cu	Eocuma sp.									1	0.00	1	0.00
20	Ec	Amphioplus depressus	15	0.65	10	0.35	10	0.08	15	0.32	16	0.88	66	2.28
21	Eh	Arhynchite sp.									4	0.01	4	0.01
22	G	Calyptraea sp.									1	0.01	1	0.01
23	G	Dentaliidae spp.			1	0.00							1	0.00
24	G	Nassarius festivus			1	0.06					1	0.00	2	0.07
25	G	Nassarius olivaceus	1	0.02									1	0.02
26	Hc	Diogenes sp.					1	0.72					1	0.72
27	Is	Cyathura sp.	5	0.01					2	0.00	1	0.00	8	0.01
28	N	Nemertea spp.	1	0.00									1	0.00
29	P	Cirriformia sp.	1	0.00			1	0.00	3	0.00	2	0.00	7	0.00
30	P	Ehlersileanira incisa hwanghaiensis	1	0.00	1	0.00			1	0.00			3	0.00
31	P	Eunice indica					1	0.01	1	0.00	3	0.02	5	0.03

Monitoring station: NM6 Sampling date: 21/2/2016													
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.
32	P	Glycera alba	1	0.00					2	0.00			3	0.00
33	P	Glycinde gurjanovae							1	0.00			1	0.00
34	P	Harmothoe sp.	1	0.00	2	0.00			2	0.00	4	0.00	9	0.01
35	P	Lygdamis sp.	1	0.01					2	0.01	1	0.01	4	0.03
36	P	Lysidice ninetta					1	0.00					1	0.00
37	P	Maldanidae spp.									1	0.00	1	0.00
38	P	Mediomastus sp.	2	0.00	1	0.00	3	0.00	3	0.00	6	0.00	15	0.01
39	P	Micronephtys sphaerocirrata	1	0.00							1	0.00	2	0.00
40	P	Nereididae spp.	2	0.00	3	0.00	4	0.01	6	0.01	3	0.00	18	0.01
41	P	Notomastus sp.					1	0.00					1	0.00
42	P	Onuphis eremita	1	0.00	1	0.00	1	0.02			1	0.01	4	0.03
43	P	Ophiodromus angustifrons									1	0.00	1	0.00
44	P	Owenia fusiformis					1	0.01					1	0.01
45	P	Paralacydonia paradox	2	0.00	2	0.00	1	0.00	1	0.00	2	0.00	8	0.00
46	P	Pectinaria conchilega	1	0.00							1	0.00	2	0.00
47	P	Phyllodocidae spp.					1	0.00					1	0.00
48	P	Phylo ornatus	1	0.00					1	0.00			2	0.00
49	P	Poecilochaetus sp.							1	0.00			1	0.00
50	P	Prionospio ehlersi	4	0.00	2	0.00							6	0.00
51	P	Prionospio malmgreni	21	0.02	19	0.02	14	0.02	23	0.02	17	0.02	94	0.09
52	P	Tharyx sp.			1	0.00	6	0.00	8	0.00	6	0.00	21	0.01
53	P	Thelepus sp.									1	0.00	1	0.00
54	S	Alpheus sp.					1	0.01					1	0.01
55	S	Upogebia wushienweni									1	0.03	1	0.03
56	Sp	Apionsoma trichocephalus	1	0.00	5	0.01	5	0.01	6	0.01	4	0.00	21	0.04
57	Sp	Phascolosoma esculenta	1	0.00	1	0.00	2	0.04	1	0.00			5	0.04
		column sum	**121**	**0.81**	**68**	**0.96**	**85**	**1.31**	**120**	**1.64**	**163**	**1.28**	**557**	**6.00**

A = Amphipod, B = Bivalve, C = Crab, Cn = Cnidarin, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, G = Gastropod, Hc = Hermit crab, Is = Isopod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan

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

Test Report of PPWQM Ecotoxicological Assessment

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Technology Park, 18 On Lai Street,
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TEST REPORT

APPLICANT: **ATAL-Degremont Joint Venture**
Pillar Point STWS,
No 101, Lung Mun Road,
MongHauShek, TuenMun, N.T

ATTN: **Mr. Norman Cheng**

Laboratory No.:	24375-V1
Date of Issue:	2016-05-12
Date Received:	2016-02-04
Date Tested:	2016-02-05
Date Completed:	2016-02-20
Page:	1 of 25

Sample Description: **Flow-weighted Composite Water Sample** (which was composited by Wellab Staff, from 24 water samples as received from customer said to be effluent samples from Pillar Pillar Point Wastewater Treatment Plant)

Sampling Date: Effluent water samples were collected between 2016-02-03 and 2016-02-04

Sample Received Date: 2016-02-04

Sample No.: 24375-25

Test Requested & Methodology:

Item	Parameter	Ref. Method	Limit of Reporting
I	7-Days Dinoflagellate Growth Inhibition Test Using *Prorocentrumdentatum*	EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test, February 2009	N/A
II	4-Days Settlement Test of Barnacle (*Balanusamphitrite*) Cypris Larvae		N/A
III	14-Days Survival and Growth Test Using the Marine Medaka (*Oryziasmelastigma*)		N/A

Remarks: 1) Uncertainty is calculated as 2S.D.
2) N/A = Not Applicable
3) This report supersedes the one dated 2016-03-18 with certificate number 24375

****

PREPARED AND CHECKED BY:
For and On Behalf of **WELLAB Ltd.**

Dr. Choy Wai Fun, Priscilla
Laboratory Director

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TEST REPORT

Laboratory No.:	24375-V1
Date of Issue:	2016-05-12
Date Received:	2016-02-04
Date Tested:	2016-02-05
Date Completed:	2016-02-20

1. SAMPLE INFORMATION

1.1 Sample Information, Receiving and Storage Conditions

Sample Description:	24 water samples as received from customer said to be effluent			
Sampling Date	2016-02-03 and 2016-02-04			
Sample Receive Date	2016-02-04			
Sample Pretreatment	24 water samples were composited in Wellab			
Sample Composite Date:	2016-02-04			
Sample No. & Sample ID:	24375-1)	2016/2/3 10:00	24375-13)	2016/2/3 22:00
	24375-2)	2016/2/3 11:00	24375-14)	2016/2/3 23:00
	24375-3)	2016/2/3 12:00	24375-15)	2016/2/4 00:00
	24375-4)	2016/2/3 13:00	24375-16)	2016/2/4 01:00
	24375-5)	2016/2/3 14:00	24375-17)	2016/2/4 02:00
	24375-6)	2016/2/3 15:00	24375-18)	2016/2/4 03:00
	24375-7)	2016/2/3 16:00	24375-19)	2016/2/4 04:00
	24375-8)	2016/2/3 17:00	24375-20)	2016/2/4 05:00
	24375-9)	2016/2/3 18:00	24375-21)	2016/2/4 06:00
	24375-10)	2016/2/3 18:00	24375-22)	2016/2/4 07:00
	24375-11)	2016/2/3 20:00	24375-23)	2016/2/4 08:00
	24375-12)	2016/2/3 21:00	24375-24)	2016/2/4 09:00
Temperature of Sample(s) at Receipt:	2-6°C			
Sampling Container:	24 20-L plastic bottle			
Composite Sample Volume:	300L			
Composite Sample No & Sample ID:	24375-25 Flow-weighted composite sample			
Test Sample:	24375-25 only			
Sample Storage Condition after Receipt:	Store in dark at 4 ± 2°C until testing			

Remark: This report supersedes the one dated 2016-03-18 with certificate number 24375

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TEST REPORT

Laboratory No.:	24375-V1
Date of Issue:	2016-05-12
Date Received:	2016-02-04
Date Tested:	2016-02-05
Date Completed:	2016-02-20

2. 7-Days Dinoflagellate Growth Inhibition Test using *Prorocentrumdentatum*

2.1 Test Method

This 7-day toxicity test on water sample with *Prorocentrumdentatum* was conducted using the EPD WETTStandard Operating Procedure (2009) "Standard Operating Procedures for Whole Effluent Toxicity Test (WETT)". *Prorocentrumdentatum*was exposed to the five concentrations of test sample for a 7-day test period. The endpoints were cell density and specific growth rate.

2.2 Summary ofTest Sample - Dinoflagellate7-Days Growth Inhibition TestParticulars

Type ofTest	Static Non-Renewal
Test Start and End Date (Time)	Start: 2016-02-05 (11:00) End: 2016-02-12 (11:00)
Test Organism:	*Prorocentrumdentatum*
Source:	NIEAStock Culture
Stock Culture Cultivation:	Stock Culture were Cultured in Same Conditions as Testing Conditions
Test Duration:	7Days
Temperature:	22 ± 1°C
Salinity:	30± 2ppt
Dissolved Oxygen:	>5mg/L
pH:	7.5-8.5
Lightand Light Intensity:	"Cool White"Spectrum Fluorescent Light, 3500-4200lx
Light Cycle:	12h Light, 12h Dark
Test Chambers:	150mL Erlenmyer flask
Test Solution Volume:	25mL
Dilution Water:	Seawater collected in SaiKung Adjusted to 30 ± 2 ppt, filter through a 0.45μm filter and UV sterilized
Age of Test Organisms:	5 days Log PhaseGrowing Cell atDensity of 7.5 x 10^5 cell /mL
Initial Density of Test Organisms per Chamber:	3 x 10^4 cell /mL
Number of Replicate Chambers per Treatment:	3
Renewal of Test Solution:	None
Aeration:	None

Remark: This report supersedes the one dated 2016-03-18 with certificate number 24375

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TEST REPORT

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Date of Issue:	2016-05-12
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Date Tested:	2016-02-05
Date Completed:	2016-02-20

2.3 Summary of Test Sample Dinoflagellate 7-Days Growth Inhibition Test Particulars (Cont.)

Observations:	Colour and Appearance of Culture
Physical / Chemical Data:	Temperature, Dissolved Oxygen, pH, Salinity
Nutrient Regime:	f/2 Medium without Silicate
Effect:	Cell density and Specific Growth Rate
Endpoints:	NOEC, LOEC and EC50
Test Acceptability Criteria:	Negative control cell density shall have increased by 16 times in 7 days Coefficient of variation of average growth in control replicate <20%
Deviation from Test Method:	No Deviation from Test Method
Statistical Analysis	Comparisons were made according to EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test. Data reported as percentages were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Shapiro-Wilk test and equality of variance using Barlett's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. Calculate EC50 using CETIS, data were analyzed according to USEPA requirement (version1.8.7.16)

2.4 Summary of Reference Toxicant Dinoflagellate 7-Days Growth Inhibition Test Particulars

Reference Toxicant	Cadmium ion (from Anhydrous Cadmium Chloride)
Stock Solution Concentration	20000mg/L Cd^{2+}
Statistical Analysis	7-Day EC50 for cadmium determinedby CETIS (version1.8.7.16)
Number of Replicate Chambers per Treatment:	5
Other Test Conditions	Same as Test SampleToxicity Test

Remark: This report supersedes the one dated 2016-03-18 with certificate number 24375

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Date Tested:	2016-02-05
Date Completed:	2016-02-20

2.5 Test Results (Dinoflagellate 7-Days Growth Inhibition Test)

- - Cell Density on Day 0, Day 1, Day 3 and Day 7

24375-25 Test Concentration (%)	Replicate	Cell Density (cell/mL)			
		Day 0	Day 1	Day 3	Day 7
0 (Negative Control)	1	33,000	34,000	99,000	750,000
	2	33,000	36,000	105,000	860,000
	3	31,000	33,000	91,000	710,000
6.25	1	32,000	33,000	93,000	760,000
	2	34,000	35,000	97,000	780,000
	3	35,000	36,000	100,000	830,000
12.5	1	31,000	34,000	95,000	810,000
	2	33,000	36,000	107,000	820,000
	3	35,000	36,000	96,000	760,000
25	1	33,000	35,000	114,000	880,000
	2	32,000	36,000	96,000	790,000
	3	31,000	34,000	95,000	750,000
50	1	34,000	35,000	65,000	180,000
	2	36,000	39,000	49,000	190,000
	3	32,000	34,000	55,000	220,000
100	1	31,000	36,000	51,000	60,000
	2	31,000	38,000	44,000	72,000
	3	32,000	33,000	43,000	73,000

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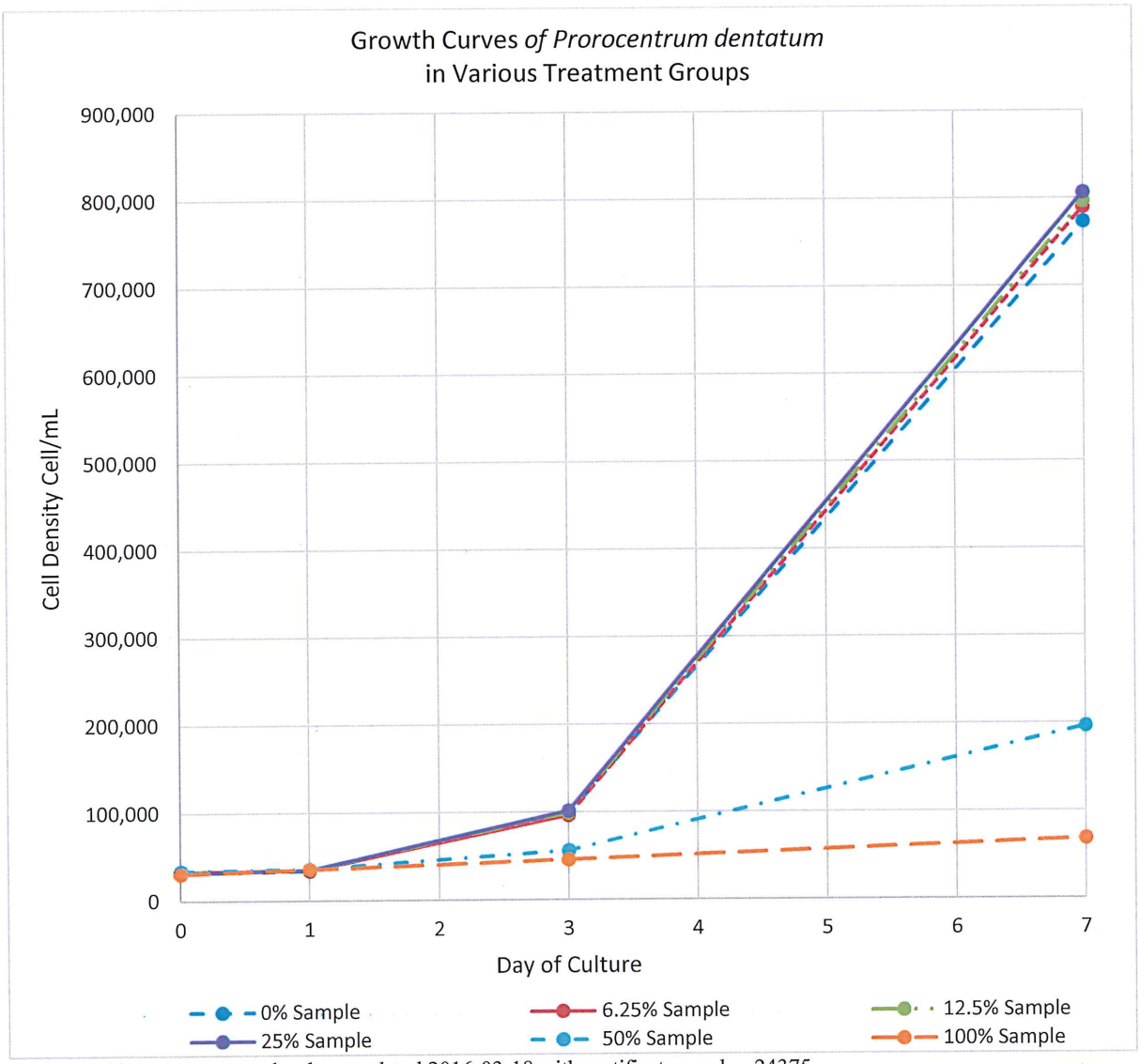
2.6 Graph 1: Growth Curve *of Prorocentrumdentatum*in Various Treatment Groups



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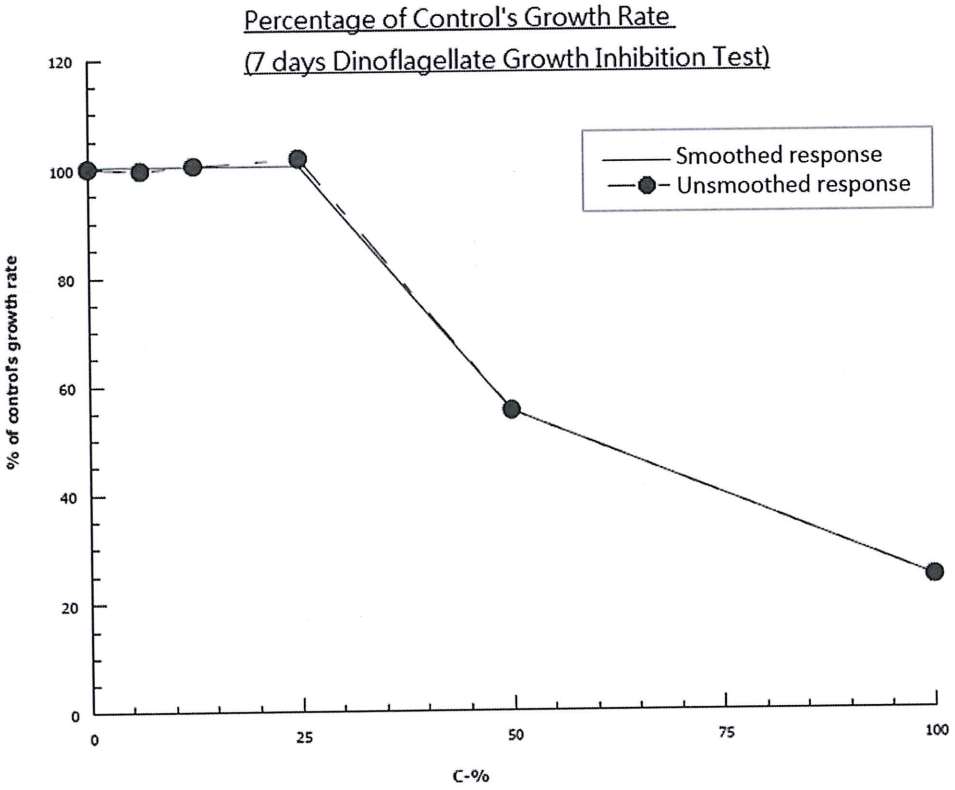
Date Completed:	2016-02-20

2.7 Percentage of Control's Growth Rate (Dinoflagellate 7-Days Growth Inhibition Test)



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Date Completed:	2016-02-20

2.8 Test Result Summary (Dinoflagellate 7-Days Growth Inhibition Test)

24375-25 Test Concentration (%)	Replicate	Day 7 Specific Growth Rate	Day 7 Percentage Inhibition of Growth Rate	Replicate Mean (%)
0 (Negative Control)	1	0.446	1.5%	0.00%
	2	0.466	-2.8%	
	3	0.447	1.3%	
6.25	1	0.453	0.1%	0.51%
	2	0.448	1.2%	
	3	0.452	0.2%	
12.5	1	0.466	-2.9%	-0.41%
	2	0.459	-1.3%	
	3	0.440	3.0%	
25	1	0.469	-3.5%	-1.69%
	2	0.458	-1.1%	
	3	0.455	-0.5%	
50	1	0.238	47.5%	44.74%
	2	0.238	47.6%	
	3	0.275	39.2%	
100	1	0.094	79.2%	75.54%
	2	0.120	73.4%	
	3	0.118	74.0%	

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Date Completed:	2016-02-20

2.9 Test Result Summary and Interpretation of Dinoflagellate 7-Days Growth Inhibition Test

24375-25 Test Concentration (%)	Day 7 Percentage Inhibition of Growth Rate		
	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control
0 (Negative Control)	1.5%	0.00%	No
	-2.8%		
	1.3%		
6.25	0.1%	0.51%	No
	1.2%		
	0.2%		
12.5	-2.9%	-0.41%	No
	-1.3%		
	3.0%		
25	-3.5%	-1.69%	No
	-1.1%		
	-0.5%		
50	47.5%	44.74%	Yes
	47.6%		
	39.2%		
100	79.2%	75.54%	Yes
	73.4%		
	74.0%		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration (LOEC)	50%		
EC50 (Upper, Lower Confidence Level)	56.0% (48.2%, 66.7%)		

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Date Completed:	2016-02-20

2.10 QC Records - Dinoflagellate 7-Days Growth Inhibition Test, TestSampleand Reference Toxicant Test Validity Criteria

- Test Organism Performance

Parameters		Results	Control Limit
Dinoflagellate 7-Days Growth Inhibition Test	Negative Control 7-Days Growth Rate	0.453	>0.4
	Coefficient of variation of Average Growth of Negative Control	2.4%	<20%
	96-h EC50	4.46mg/L	3.16-4.62mg/L
	95% Confidence Interval	3.72-5.12mg/L	N/A

2.11 Dinoflagellate 7-Days Growth Inhibition Test Validity Criteria (Water Quality)

24375-25 Test Concentration (%)	Salinity (ppt)		Dissolved Oxygen (mg/L)		pH (pH unit)		Light Intensity (lx)		Temperature (°C)	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
0 (Negative Control)	30	28	8.3	6.1	8.0	7.8	4100	3700	29	27
6.25	29	28	7.9	6.3	7.9	7.8				
12.5	30	28	8.1	6.2	7.9	7.8				
25	29	28	8.0	5.9	7.9	7.9				
50	29	28	7.2	6.1	7.8	7.8				
100	29	28	6.6	6.4	7.9	7.8				
Acceptance criteria	28-32		>5mg/L		7.5-8.5		3500-4200lx		26-30°C	

Remarks: 1) < = less than, > = more than
2) N/A = Not Applicable
3) This report supersedes the one dated 2016-03-18 with certificate number 24375

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Date Completed:	2016-02-20
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3. 4-Days Settlement Test of Barnacle (*Balanusamphitrite*) Cypris Larvae

3.1 Test Method

This 4-day toxicity test on water sample with *Balanusamphitrite*cypris Larvae was conducted using the EPD WETT Standard Operating Procedure (2009) "Standard Operating Procedures for Whole Effluent Toxicity Test (WETT)". *Balanusamphitrite*cypris larvae was exposed to the five concentrations of test sample for a 4-day test period. The endpoint was percentage settlement.

3.2 Summary of Test Sample 4-Days Settlement Barnacle Cypris Larvae Test Particulars

Type of Test	Static Renewal
Test Start and End Date (Time)	Start: 2016-02-05 (17:00) End: 2016-02-09 (17:00)
Test Organism:	*Balanusamphirite*
Source:	Field Collection
Test Duration:	4 days
Temperature:	25 ± 1°C
Salinity:	30± 2ppt
Dissolved Oxygen:	>5mg/L
pH:	8.0± 2
Light and light intensity:	Full Spectrum Fluorescent Light
Light Cycle:	15h Light, 9h Dark
Test Chambers:	Sterilized 6-well Tissue Culture Plates, Non Treated Surface
Test Chamber size:	Well Volume:15.5mL, Surface Area:9.6cm^2
Test Solution Volume:	10mL
Dilution Water:	Seawater collected in SaiKung Adjusted to 30 ± 2 ppt, filter through a 0.45μm filter and UV sterilized
Age of Test Organisms:	Cypris Larvae
Number of Test Organisms per Chamber:	20
Number of Replicate Chambers per Treatment:	3
Renewal of Test Solution:	90% every 24h
Aeration:	None

Remark: This report supersedes the one dated 2016-03-18 with certificate number 24375

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Date Tested:	2016-02-05
Date Completed:	2016-02-20

3.3 Summary of Test Sample 4-Days Settlement Barnacle Cypris Larvae Test Particulars (Cont.)

Physical / Chemical Data:	Temperature, Dissolved Oxygen, pH, Salinity
Feeding	None
Effect:	Settlement
Endpoints:	NOEC, LOEC and EC50
Test Acceptability Criteria:	Negative Control Mean Percentage Settlement >50%
Deviation from Test Method:	No Deviation from Test Method
Statistical Analysis	Comparisons were made according to EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test. Data reported as percentages were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Shapiro-Wilk test and equality of variance using Barlett's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. Calculate EC50 using CETIS (version1.8.7.16), data were analyzed according to USEPA requirement

3.4 Summary of Reference Toxicant 4-Days Settlement Barnacle Cypris Larvae Test Particulars

Reference Toxicant	Cadmium ion (from Anhydrous Cadmium Chloride)
Stock Solution Concentration	20000mg/L Cd^{2+}
Statistical Analysis	4-Day EC50 for Cadmium Determined by CETIS (version1.8.7.16)
Number of Replicate Chambers per Treatment:	5
Other Test Conditions	Same as Test Sample Toxicity Test

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3.5 Test Results

- Test Result Summary (4-Days Settlement Barnacle Cypris Larvae Test)

24375-25 Test Concentration (%)	Replicate	Number Exposed	Number Settled	Percentage Settlement (%)	Mean Percentage Settlement (%)
0 (Negative Control)	1	20	13	65	61.7
	2	20	12	60	
	3	20	12	60	
6.25	1	20	12	60	60.0
	2	20	13	65	
	3	20	11	55	
12.5	1	20	13	65	61.7
	2	20	12	60	
	3	20	12	60	
25	1	20	13	65	61.7
	2	20	13	65	
	3	20	11	55	
50	1	20	5	25	21.7
	2	20	4	20	
	3	20	4	20	
100	1	20	1	5	1.7
	2	20	0	0	
	3	20	0	0	

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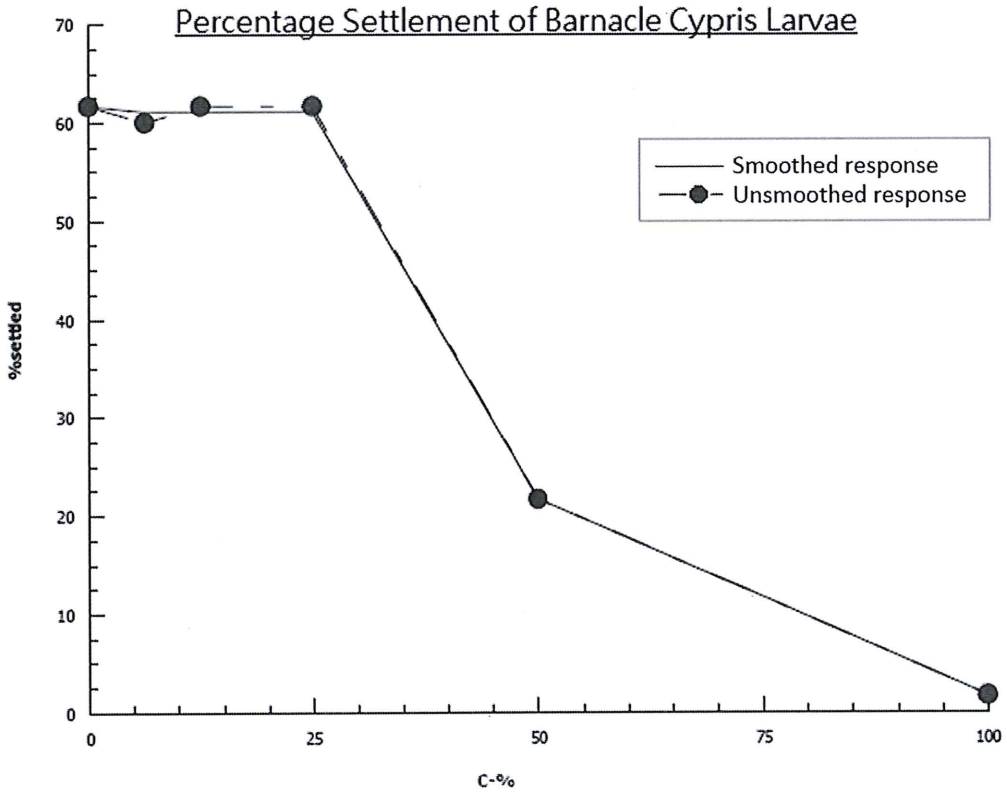
3.6 Graph 3: 4-Days Barnacle Cypris Larvae Settlement Test, Percentage Settlement



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3.7 Test Result Summary and Interpretation of 4-Days Barnacle Cypris Larvae Settlement Test

24375-25 Test Concentration (%)	Day 4 Percentage Settlement (%)		
	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control
0 (Negative Control)	65 60 60	61.7	No
6.25	60 65 55	60.0	No
12.5	65 60 60	61.7	No
25	65 65 55	61.7	No
50	25 20 20	21.7	Yes
100	5 0 0	1.7	Yes
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration (LOEC)	50%		
EC50 (Upper, Lower Confidence Level)	42.6% (38.4%, 47.1%)		

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3.8 QC Records (4-Days Settlement Barnacle Cypris Larvae Test)

- 4-Days Barnacle Cypris Larvae Settlement Test, Test Sample and Reference Toxicant Test Validity Criteria (Test Organism Performance)

Parameters		Results	Control Limit
4-Days Barnacle Cypris Larvae Settlement Test	Negative Control 4-Days Mean Percentage Settlement	61.7%	>50%
	96-h EC50	0.39mg/L	0.19-0.81mg/L
	95% Confidence Interval	0.31-0.46mg/L	N/A

3.9 4-Days Barnacle Cypris Larvae Settlement Test (Water Quality)

24375-25 Test Concentration (%)	Salinity (ppt)		Dissolved Oxygen (mg/L)		pH (pH unit)		Temperature (°C)	
	Max	Min	Max	Min	Max	Min	Max	Min
0 (Negative Control)	29	28	6.4	6.1	8.0	7.9	26	24
6.25	29	28	7.1	6.3	8.0	7.8		
12.5	28	28	6.8	6.1	7.9	7.8		
25	29	28	6.9	5.9	8.0	7.8		
50	29	28	7.0	6.2	7.9	7.8		
100	29	28	6.6	5.6	7.9	7.8		
Acceptance Criteria	28-32		>5mg/L		7.8-8.2		23-27	

Remarks: 1) < = less than, > = more than
2) N/A = Not Applicable
3) This report supersedes the one dated 2016-03-18 with certificate number 24375

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4. 14-Days Survival and Growth Test Using the Marine Medaka (*Oryziasmelastigma*)

4.1 Test Method

This 14-day toxicity test on water sample with *Oryziasmelastigma* was conducted using the EPD WETT Standard Operating Procedure (2009) "Standard Operating Procedures for Whole Effluent Toxicity Test (WETT)". *Oryziasmelastigma* was exposed to the five concentrations of test sample for a 14-day test period. The endpoints were mortality, growth and growth rate.

4.2 Summary of Test Sample Marine Medaka 14-Days Survival and Growth Test Particulars

Type of Test	Static Renewal, 1/2 Water Change Every 2 Days
Test Start and End Date (Time)	Start: 2016-02-05 (12:00) End: 2016-02-19 (12:00)
Test Organism:	*Oryziasmelastigma*
Source:	NBRP Stock Culture
Test Duration:	14 Days
Temperature:	28 ± 2°C
Salinity:	30± 2ppt
Dissolved Oxygen:	>5mg/L
pH:	8.0± 0.2
Light:	Full Spectrum Fluorescent Light
Light Cycle:	12h Light, 12h Dark
Test Chambers:	30L Glass Tank
Test Solution Volume:	10L
Dilution Water:	Seawater collected in SaiKung Adjusted to 30 ± 2 ppt, filter through a 0.45μm filter and UV sterilized
Age of Test Organisms:	6-8 weeks Post Hatched, Length 0.9-1.3cm
Number of Test Organisms per Chamber:	10
Number of Replicate Chambers per Treatment:	3
Renewal of Test Solution:	1/2 Test Solution Volume Every 48h
Aeration:	Gentle

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4.3 Summary of Test Sample 14-Days Survival and Growth Test Particulars (Cont.)

Observations:	Fish Behavior and Mortality
Physical / Chemical Data:	Temperature, Dissolved Oxygen, pH, Salinity
Feeding / Feeding Regime:	Feed to Satiation Three Times per Day (TetraBits in the Morning and Evening and Brine Shrimp Larvae in the Afternoon)
Effect:	Mortality, Growth and Growth Rate
Endpoints:	NOEC, LOEC and EC50
Test Acceptability Criteria:	Mean Control Mortality ≤ 15% Significant Increase in Body Weight in Seawater Control at the end of the 14 Days Test
Deviation from Test Method:	No Deviation from Test Method
Statistical Analysis	Comparisons were made according to EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test. Data reported as percentages were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Shapiro-Wilk test and equality of variance using Barlett's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. Calculate EC50 using CETIS(version1.8.7.16), data were analyzed according to USEPA requirement

4.4 Summary of Reference Toxicant 14-Days Survival and Growth Test Particulars

Reference Toxicant	Cadmium ion (from Anhydrous Cadmium Chloride)
Stock Solution Concentration	20000mg/L Cd^{2+}
Statistical Analysis	14 days EC50 for Cadmium Determined by CETIS (version1.8.7.16)
Test Solution Volume:	20L
Number of Test Organisms per Chamber:	20
Number of Replicate Chambers per Treatment:	5
Other Test Conditions	Same as Test Sample Toxicity Test

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4.5 Test Results (Marine Medaka 14-Days Survival and Growth Test)

- Fish Weight on Day 0 (mg)

24375-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Weight on Day 0 (mg)										Mean (mg)	Replicate Mean (mg)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	13.0	12.4	13.5	12.8	13.3	13.2	13.3	13.1	13.0	12.8	13.0	13.01
	2	10	13.1	12.9	13.0	13.1	13.5	12.8	13.2	13.3	12.7	13.1	13.1	
	3	10	13.3	12.6	13.1	13.0	13.1	12.7	12.7	13.1	12.4	13.3	12.9	
6.25	1	10	13.7	12.8	13.5	13.1	12.8	13.8	13.5	13.3	13.5	12.8	13.3	12.81
	2	10	12.3	12.4	12.8	12.6	13.3	13.1	12.9	12.7	13.2	13.1	12.8	
	3	10	12.2	12.6	12.4	12.2	12.6	12.1	12.6	12.5	11.7	12.3	12.3	
12.5	1	10	12.9	13.3	13.8	13.6	12.8	13.4	13.7	13.3	13.3	13.5	13.4	13.05
	2	10	13.3	12.9	12.7	12.8	12.6	13.1	13.5	13.4	13.5	13.0	13.1	
	3	10	12.4	13.0	13.2	12.2	12.7	12.8	12.3	13.3	12.5	12.8	12.7	
25	1	10	13.7	13.6	13.9	13.8	13.5	13.7	13.8	13.8	14.3	13.4	13.8	13.33
	2	10	13.7	13.9	13.5	13.6	13.1	13.2	13.4	13.3	12.9	13.9	13.5	
	3	10	13.1	12.9	12.9	12.4	12.9	13.3	12.4	12.7	12.4	12.9	12.8	
50	1	10	12.2	12.7	12.1	12.5	13	12.9	12.7	12.3	12.9	12.8	12.6	12.76
	2	10	12.9	13.1	13.1	12.6	13.2	13	12.7	12.3	12.4	12.9	12.8	
	3	10	12.9	13.1	13.0	12.4	13.3	12.6	12.9	12.9	12.7	12.7	12.9	
100	1	10	13.2	12.9	13.1	13.0	12.8	13.3	12.7	13.2	12.7	13.4	13.0	12.68
	2	10	12.1	12.4	12.2	12.6	12.6	11.8	11.4	12.9	11.8	11.4	12.1	
	3	10	12.4	12.5	13.2	12.9	13.6	12.5	12.6	13.0	13.1	13.0	12.9	

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4.6 Fish Length on Day 0 (mm)

24375-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Length on Day 0 (mm)										Mean (mm)	Replicate Mean (mm)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	11	12	11	12	13	11	11	11	11	11	11.4	11.20
	2	10	11	11	11	11	11	12	10	12	10	11	11.0	
	3	10	11	10	12	11	11	11	11	11	12	12	11.2	
6.25	1	10	11	11	11	12	11	11	10	11	11	11	11.0	10.93
	2	10	10	12	11	11	12	11	11	11	10	11	11.0	
	3	10	10	12	10	11	11	10	11	11	12	10	10.8	
12.5	1	10	12	9	11	11	10	12	11	11	10	11	10.8	10.97
	2	10	12	10	11	12	10	11	11	12	12	11	11.2	
	3	10	11	12	12	11	10	10	12	9	11	11	10.9	
25	1	10	12	10	13	11	10	12	12	11	13	12	11.6	10.97
	2	10	11	12	11	9	11	11	9	11	11	12	10.8	
	3	10	11	10	11	12	9	10	10	10	11	11	10.5	
50	1	10	12	11	11	9	11	12	10	11	10	11	10.8	10.70
	2	10	11	9	12	11	10	11	11	11	9	12	10.7	
	3	10	11	11	10	9	10	9	12	11	12	11	10.6	
100	1	10	10	12	10	11	12	10	10	12	10	11	10.8	11.07
	2	10	11	11	12	11	11	10	12	11	11	12	11.2	
	3	10	13	10	11	11	10	12	11	11	12	11	11.2	

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4.7 Fish Weight on Day 14 (mg)

24375-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Weight on Day 14 (mg)										Mean (mg)	Replicate Mean (mg)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	47.2	45.0	38.7	39.9	43.2	38.1	35.8	38.8	38.6	45.8	41.1	41.06
	2	10	40.8	39.6	39.7	38.2	38.4	38.7	43.2	44.1	39.8	44.8	40.7	
	3	10	38.9	42.2	43.9	37.5	47.0	36.8	38.6	37.5	44.0	47.0	41.3	
6.25	1	10	37.4	42.8	43.8	46.7	48.6	38.5	35.6	36.2	41.8	39.8	41.1	41.47
	2	10	39.2	40.6	39.5	43.2	39.0	39.5	37.1	45.1	44.3	44.4	41.2	
	3	10	39.3	41.3	46.8	39.6	38.3	37.9	45.6	39.4	47.6	45.3	42.1	
12.5	1	10	42.6	44.7	42.9	40.9	39.7	37.5	44.3	39.4	39.0	43.6	41.5	41.51
	2	10	44.0	38.6	41.9	38.9	45.6	38.9	44.4	43.2	37.4	45.6	41.9	
	3	10	45.9	35.8	40.7	39.1	38.3	44.4	40.2	38.1	44.4	45.4	41.2	
25	1	10	41.3	35.6	43.4	43.0	38.7	37.9	41.9	35.4	48.8	42.7	40.9	40.74
	2	10	38.3	43.9	34.6	42.8	35.9	38.9	42.1	45.3	37.5	42.0	40.1	
	3	10	38.3	47.8	37.8	43.2	44.3	44.5	41.0	36.2	43.5	35.7	41.2	
50	1	10	44.7	46.4	32.4	36.0	47.1	44.2	38.7	42.9	40.3	38.8	41.2	41.01
	2	10	42.4	41.6	43.8	39.6	39.2	45.1	37.8	38.3	39.6	44.5	41.2	
	3	10	32.2	38.6	39.5	41.4	42.6	47.2	36.7	37.4	48.3	42.9	40.7	
100	1	10	34.3	34.2	35.1	37.5	34.8	29.4	32.8	37.0	34.5	36.4	34.6	35.16
	2	10	34.3	34.5	31.6	34.5	33.4	39.4	35.5	35.1	35.9	36.4	35.1	
	3	10	35.3	37.1	36.9	38.9	33.7	29.7	35.9	36.7	36.4	37.7	35.8	

4.8 Fish Length on Day 14 (mm)

24375-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Length on Day 14 (mm)										Mean (mm)	Replicate Mean (mm)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	18	17	17	18	17	18	16	18	16	18	17.3	17.23
	2	10	17	15	16	17	18	17	16	18	18	18	17.0	
	3	10	17	17	18	17	16	19	18	17	17	18	17.4	
6.25	1	10	18	18	16	17	18	18	16	18	19	17	17.5	17.30
	2	10	18	17	18	16	16	17	17	16	19	17	17.1	
	3	10	17	16	18	17	17	18	18	17	18	17	17.3	
12.5	1	10	17	17	17	18	17	17	17	16	18	19	17.3	17.03
	2	10	17	18	17	18	17	17	17	16	17	17	17.1	
	3	10	15	18	16	16	17	15	18	17	19	16	16.7	
25	1	10	17	17	17	16	15	18	17	16	17	18	16.8	17.10
	2	10	17	17	16	17	16	17	17	16	17	18	16.8	
	3	10	17	18	18	18	17	18	18	17	19	17	17.7	
50	1	10	17	18	17	17	18	17	18	19	18	17	17.6	17.37
	2	10	16	17	16	19	18	16	16	18	18	18	17.2	
	3	10	16	19	17	18	17	16	18	18	18	16	17.3	
100	1	10	16	16	15	17	16	16	16	17	15	17	16.1	16.03
	2	10	16	15	16	16	15	15	15	16	17	16	15.7	
	3	10	18	16	15	16	17	15	15	17	18	16	16.3	

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4.9 Test Result Summary (Marine Medaka 14-Days Survival and Growth Test)

24375-25 Test Concentration (%)	Replicate	Survival (%)	Mortality (%)	Average Growth Rate (mg/day)	Replicate Mean (mg)	Percentage Increase in Weight (%)	Replicate Mean (%)
0 (Negative Control)	1	100	0	2.01	2.00	215.3	215.5
	2	100	0	1.98		211.6	
	3	100	0	2.03		219.7	
6.25	1	100	0	1.99	2.05	209.6	224.1
	2	100	0	2.03		220.8	
	3	100	0	2.13		241.8	
12.5	1	100	0	2.01	2.03	210.3	218.1
	2	100	0	2.06		220.0	
	3	100	0	2.04		224.1	
25	1	100	0	1.94	1.96	197.2	206.0
	2	100	0	1.91		198.4	
	3	100	0	2.03		222.4	
50	1	100	0	2.04	2.02	226.3	221.4
	2	100	0	2.03		221.3	
	3	100	0	1.99		216.6	
100	1	100	0	1.54	1.61	165.5	177.7
	2	100	0	1.64		189.3	
	3	100	0	1.64		178.2	

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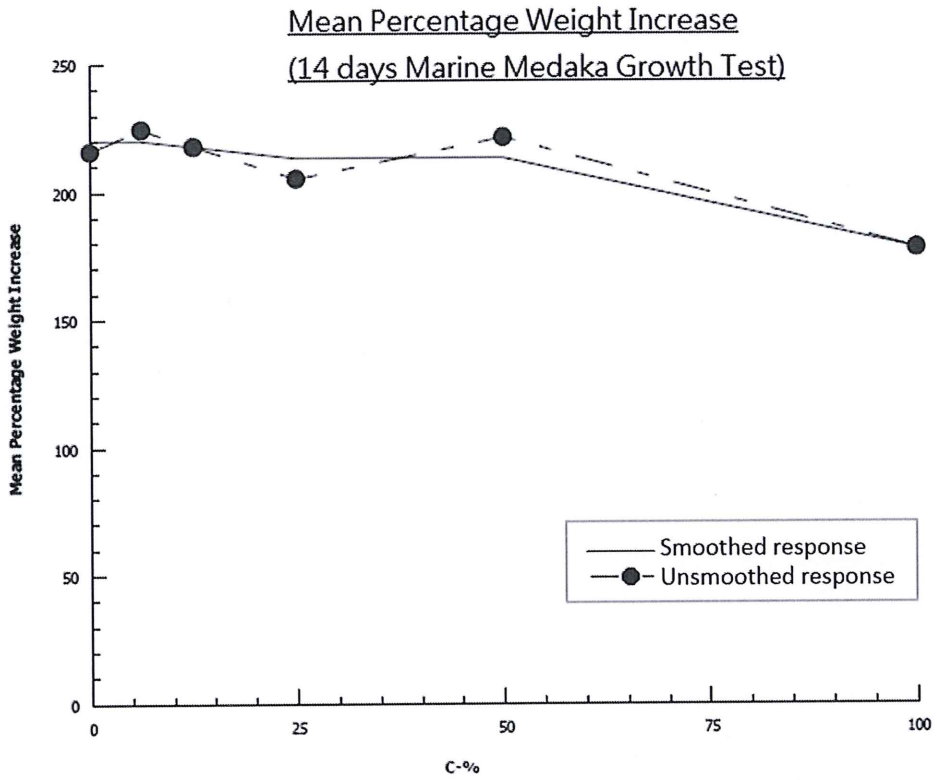
4.10 Graph 4: Marine Medaka 14-Days Survival and Growth Test Mean percentage Weight Increase



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Technology Park, 18 On Lai Street,
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Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Laboratory No.:	24375-V1
Date of Issue:	2016-05-12
Date Received:	2016-02-04
Date Tested:	2016-02-05
Date Completed:	2016-02-20

4.11 Test Result Summary and Interpretation of Marine Medaka 14-Days Survival and Growth Test

24375-25 Test Concentration (%)	Average Growth Rate (mg/day)			Percentage Increase in Weight (%)		
	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control
0 (Negative Control)	2.01	2.00	No	215.3	215.5	No
	1.98			211.6		
	2.03			219.7		
6.25	1.99	2.05	No	209.6	224.1	No
	2.03			220.8		
	2.13			241.8		
12.5	2.01	2.03	No	210.3	218.1	No
	2.06			220.0		
	2.04			224.1		
25	1.94	1.96	No	197.2	206.0	No
	1.91			198.4		
	2.03			222.4		
50	2.04	2.02	No	226.3	221.4	No
	2.03			221.3		
	1.99			216.6		
100	1.54	1.61	Yes	165.5	177.7	Yes
	1.64			189.3		
	1.64			178.2		
No Observable Effect Concentration (NOEC)	50%			50%		
Lowest Observed Effect Concentration (LOEC)	100%			100%		
EC50	>100%			>100%		
EC15 (Upper, Lower Confidence Level)	80.81% (68.8%, 94.9%)			83.5% (54.5%, NA)		

Remarks: 1) < = less than, > = more than
2) N/A = Not Applicable
3) This report supersedes the one dated 2016-03-18 with certificate number 24375

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
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4.12 QC Records

- Marine Medaka Sample and Reference Toxicant Test Validity Criteria (Test Organism Performance)

Parameters		Results	Control Limit
14-days Survival and Growth Toxicity Test	Initial Length	9-13mm	9-13mm
	Negative Control Survival	100%	Average≥85%
	Negative Control Growth	Significant Growth	Significant Growth
Reference Toxicant Test	Initial Length	5 length groups (9, 10, 11, 12, 13mm), 4 per tank	5 length groups (9, 10, 11, 12, 13mm), 4 per tank
	Negative Control Survival	100%	Average≥90%
	14-Days EC50	1.72mg/L	1.08-3.80mg/L
	95% Confidence Interval	1.55-1.82mg/L	N/A

4.13 Marine Medaka Survival and Growth Test Validity Criteria (Water Quality)

24375-25 Test Concentration (%)	Salinity (ppt)		Dissolved Oxygen (mg/L)		pH (pH unit)		Temperature (°C)	
	Max	Min	Max	Min	Max	Min	Max	Min
0 (Negative Control)	29	28	6.4	5.3	8.0	7.8	29	27
6.25	29	28	6.7	5.4	7.9	7.8		
12.5	29	28	6.4	5.8	7.9	7.8		
25	29	28	6.9	5.4	7.9	7.9		
50	29	28	6.5	5.5	7.8	7.8		
100	29	28	6.7	5.7	7.9	7.8		
Acceptance Criteria	28-32		>5mg/L		7.8-8.2		26-30°C	

Remarks: 1) < = less than, > = more than
2) N/A = Not Applicable
3) This report supersedes the one dated 2016-03-18 with certificate number 24375

**********END OF REPORT**********

APPENDIX H

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 I

Weather Conditions

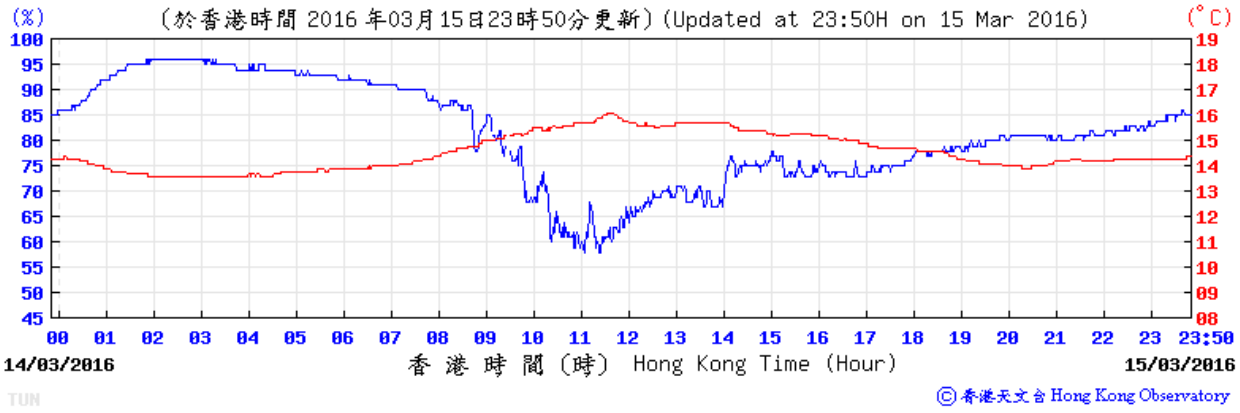
Daily Extract of Meteorological Observations, Mar 2016 – Tuen Mun Children and Juvenile Home

Day	Mean Pressure (hPa)	Air Temperature			Mean Dew Point (deg. C)	Mean Relative Humidity (%)	Total Rainfall (mm)	Prevailing Wind Direction (degrees)	Mean Wind Speed (km/h)
		Absolute Daily Max (deg. C)	Mean (deg.C)	Absolute Daily Min (deg. C)					
1	***	20.9	16.6	13.7	10.4	68.0	0.0	***	***
2	***	21.4	16.7	13.6	9.3	63.0	0.0	***	***
3	***	24.8	18.9	14.1	13.8	73.0	0.0	***	***
4	***	25.1	20.4	16.9	16.6	79.0	0.0	***	***
5	***	23.8	20.6	18.3	17.5	83.0	0.0	***	***
6	***	26.9	21.7	18.3	18.2	81.0	0.0	***	***
7	***	23.6	20.3	18.4	18.3	89.0	0.0	***	***
8	***	22.8	21.0	19.8	19.1	89.0	0.0	***	***
9	***	22.6	21.2	18.4	20.2	94.0	6.0	***	***
10	***	18.4	12.8	9.6	11.5	91.0	12.5	***	***
11	***	12.7	10.7	9.2	6.0	73.0	0.0	***	***
12	***	15.6	13.5	11.0	10.7	83.0	0.0	***	***
13	***	18.2	16.3	15.1	15.5	95.0	7.0	***	***
14	***	15.8	15.0	13.7	11.5	80.0	0.0	***	***
15	***	16.1	14.6	13.6	11.3	81.0	0.0	***	***
16	***	17.4	15.8	14.3	14.2	90.0	1.0	***	***
17	***	19.1	18.0	16.6	17.0	94.0	0.5	***	***
18	***	24.2	21.7	18.9	20.6	94.0	0.0	***	***
19	***	25.9	23.2	20.9	22.1	93.0	0.0	***	***
20	***	22.4	20.3	19.2	18.3	89.0	0.0	***	***
21	***	19.9	18.1	17.0	17.0	94.0	64.5	***	***
22	***	18.8	18.0	17.1	16.8	92.0	1.5	***	***
23	***	21.6	19.7	18.1	19.0	96.0	12.0	***	***
24	***	19.8	15.6	12.8	14.6	94.0	28.5	***	***
25	***	16.4	13.4	11.7	8.8	75.0	1.0	***	***
26	***	20.5	15.4	10.2	8.5	65.0	0.0	***	***
27	***	22.5	17.1	12.6	7.2	54.0	0.0	***	***
28	***	20.2	16.8	13.0	8.1	58.0	0.0	***	***
29	***	22.0	18.1	14.3	9.4	58.0	0.0	***	***
30	***	24.7	20.6	18.4	16.7	79.0	0.0	***	***
31	***	26.4	21.6	18.5	18.8	85.0	0.0	***	***

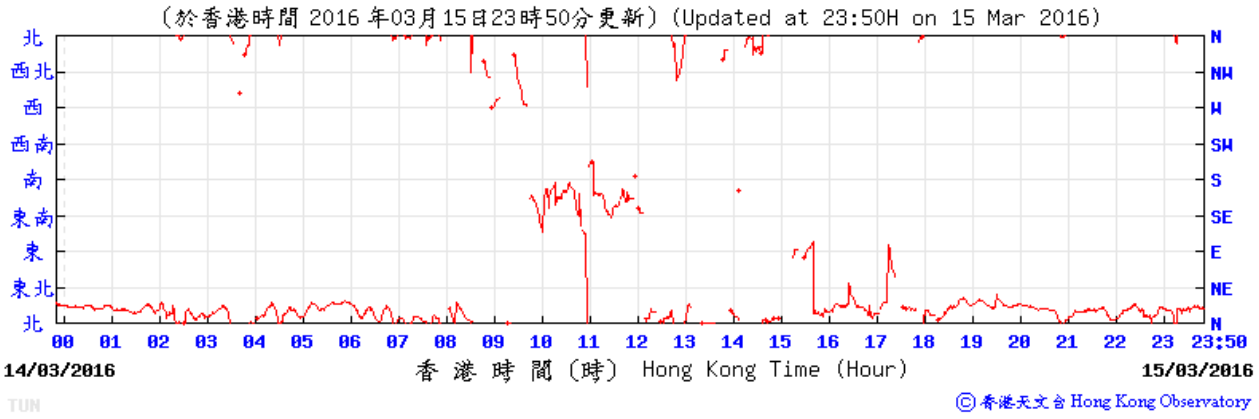
Note:
*** - information unavailable
Rainfall measured in increment of 0.5 mm. Amount of < 0.5 mm cannot be detected.

Hourly Meteorological Conditions on 15 March 2016 at Tuen Mun Station

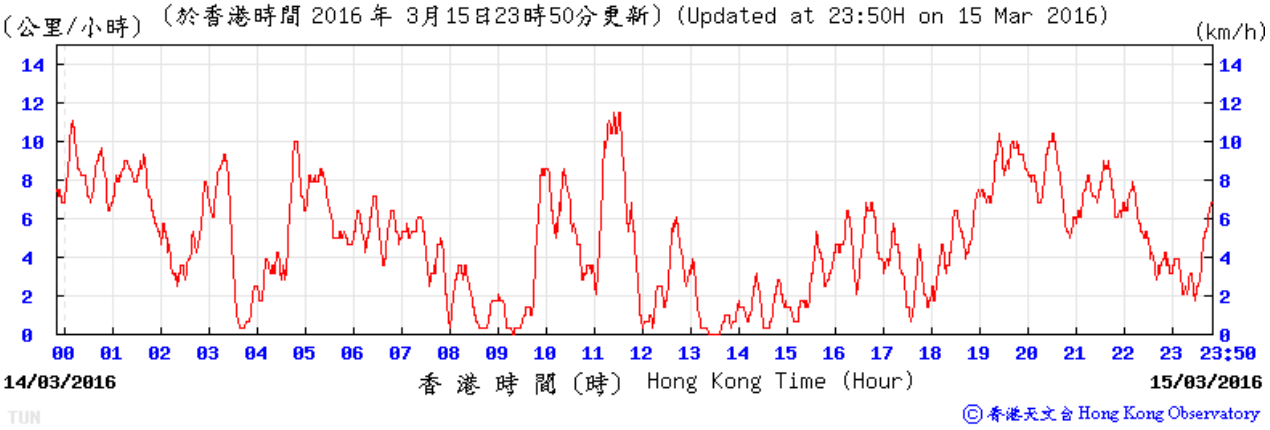
Temperature/ Humidity:



Wind Direction:



Wind Speed:



APPENDIX J

Landscape & Visual Impact Monitoring

Contract No. DC/2008/03
Design, Build and Operate Pillar Point Sewage Treatment Works
Establishment Period - 7th monthly L&V site audit

Site Inspection Date : 11 March 2016

Audited and Certified by:

Kenneth Ng (RLA No. 034 (99))

Area of Works	Items to be Monitored	Previous Observation	Establishment Works Stage	
			Observation	Recommendation/Action
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-07	Item #1	Tree nos. 131, 133, 129, R156, R157, T072, T077 and T079 in ground floor garden were observed in poor condition during this site inspection (Please see photo reference below)	It is strongly recommended to carry out additional maintenance works for the Trees. The Contractor would duly investigate the health conditions of the Trees and replace those Trees if necessary.
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Trees Area Photo no. G-08	Item #2	The non-abrasive nylon rope for securing the trees was observed to be too tight.	It is strongly recommended to release or replace that non-abrasive nylon rope in tight or poor condition for its health condition.

Area of Works	Items to be Monitored	Previous Observation	Establishment Works Stage	
			Observation	Recommendation/Action
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Area (Shrubs & Groundcover) in Photo no. G-09	-	Shrubs & Groundcover were observed in poor condition during this site inspection	It is recommended to provide sufficient watering and carry out necessary maintenance works for the Shrubs & Groundcover. It is also recommended that the approved maintenance programme for monitoring of health condition of the tree is required for the upcoming month. It is recommended to replace those trees in poor condition if no further improvement is observed for its health condition.

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

Existing wound was observed on the trunk

Dieback and dead branch was observed

Photo no. **G-02**: Tree tag no. **133** was observed in poor condition.

Dieback and dead branch was observed

Existing wound was observed on the trunk

Photo no. **G-03**: Tree tag no. **129** was observed in poor condition.

Dieback and dead branch was observed

Dieback and dead branch was observed

Photo no. **G-04**: Tree tag no. **R157** was observed in poor condition.

Dieback and dead branch was observed

Photo no. **G-04a**: Tree tag no. **R156** was observed in poor condition.

Few leaves were observed.

Photo no. **G-05**: Compensatory Tree tag no. **T072** was observed in poor condition.

Photo no. **G-06**: Compensatory Tree tag no. **T077** was observed in poor condition.

Photo no. **G-07**: Compensatory Tree tag no. **T079** was observed in poor condition.

Photo no. **G-08**: The non-abrasive nylon rope for securing the trees was observed to be too tight.

Photo no. **G-09**: Groundcover and Lawn were observed in poor condition during the site inspection.