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**Attn:**  
**Mr. Ray Yan – Independent Environmental Checker**

**Contract No. HY/2013/04 Hong Kong-Zhuhai-Macao Bridge (HZMB)  
Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II  
(Southern Portion)**

**Our Reference**  
TC/GC/all/T355861/02/  
02/L129

**Monthly EM&A Report for September 2019**

3/F International Trade  
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24 October 2019

**By Email**

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mottmac.hk

Dear Sir,

In accordance with Condition 5.4 of the Environmental Permit (EP-353/2009/K) covering the captioned contract, we are pleased to submit the certified Monthly EM&A Report for September 2019 for your verification.

Yours faithfully  
For MOTT MACDONALD HONG KONG LIMITED



Gary Chow  
Environmental Team Leader

Encl.

cc.  
AECOM – Mr. Peter Lee (By Email)  
China State Construction Engineering (Hong Kong) Ltd. – Mr. Xavier Lam / Mr. Ng  
Ka Po (By Email)

24 October 2019

By Fax (3468 2076) and By Post

AECOM Asia Co. Ltd.  
The PRE's Office  
550 Cheung Tung Road, Lantau, Hong Kong

Attention: Mr. Peter Lee

Dear Sir,

**Re: Agreement No. CE 48/2011 (EP)  
Environmental Project Office for the  
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities, and  
Tuen Mun-Chek Lap Kok Link – Investigation**

**Contract No. HY/2013/04  
HZMB HKBCF – Infrastructure Works Stage II (Southern Portion)  
Monthly Environmental Monitoring & Audit Report for September 2019**

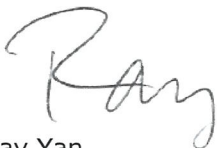
Reference is made to the Environmental Team's submission of the Monthly EM&A Report for September 2019 certified by the ET Leader (ET's ref.: "TC/GC/al/T355861/02/02/L129" dated 24 October 2019) and provided to us via e-mail on 22 October 2019.

We are pleased to inform you that we have no adverse comments on the captioned submission. We write to verify the captioned submission in accordance with Condition 5.4 of the Environmental Permit No. EP-353/2009/K (the EP).

The ET Leader is reminded that it is the ET's responsibility to ensure the report be timely submitted to the Director of Environmental Protection and the reported information be true, valid and correct as per Conditions 5.4 and 5.5 of the EP respectively.

Thank you very much for your attention and please feel free to contact the undersigned should you require further information.

Yours faithfully,  
For and on behalf of  
Ramboll Hong Kong Limited



Ray Yan  
Independent Environmental Checker  
HZMB HKBCF

c.c.	HyD	Mr. Cheng Pan	(By Fax: 3188 6614)
	HyD	Mr. Harry Louie	(By Fax: 3188 6614)
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	CSCE	Mr. Jason Chung	(By Fax: 2459 4336)



Internal: DY, YH, HW, ENPO Site

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Contract No. HY/2013/04 HZMB HKBCF –  
Infrastructure Works Stage II (Southern Portion)

Monthly EM&A Report for September 2019

October 2019

**Information class: Standard**

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# Executive summary

This Monthly Environmental Monitoring and Audit (EM&A) Report is prepared for Contract No. HY/2013/04 “Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)” (hereafter referred to as “the Contract”) for the Highways Department of Hong Kong Special Administrative Region (HKSAR). The Contract was awarded to China State Construction Engineering (Hong Kong) Limited (hereafter referred to as “the Contractor”) and Mott MacDonald Hong Kong Limited (MMHK) was appointed as the Environmental Team (ET) by the Contractor.

The Contract is part of the “Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities” (HZMB HKBCF) Project which is a “Designated Project” under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) and for which an EIA Report (Register No. AEIAR-145/2009) was prepared and approved. The current Environmental Permit (EP) for HKBCF, namely No. EP-353/2009/K, was issued on 11 April 2016. These documents are available through the EIA Ordinance Register. Commencement of the Contract took place on 13 March 2015 and the construction works commenced on 13 July 2015.

Mott MacDonald Hong Kong Limited has been appointed by the Contractor to implement the Environmental Monitoring & Audit (EM&A) programme for the Contract in accordance with the Updated EM&A Manual for HKBCF (Version 1.0) and will be providing environmental team services for the Contract.

This is the 51<sup>st</sup> Monthly EM&A Report for the Contract which summarises findings of the EM&A works during the reporting period from 1 to 30 September 2019 (the “reporting period”).

## Environmental Monitoring and Audit Progress

The monthly EM&A programme was undertaken in accordance with the Updated EM&A Manual for HKBCF (Version 1.0).

The remaining air quality, noise, water quality and dolphin monitoring works under Contract No. HY/2013/01 “HZMB HKBCF – Passenger Clearance Building” were temporarily suspended from 1 October 2018. The ET of Contract No. HY/2013/04 is required and continues the full implementation of environmental monitoring commencing on 1 October 2018.

Air quality monitoring stations AMS2, AMS3C and AMS7B are covered by this Contract. It should be noted that the air quality monitoring station AMS6 is covered by Contract No. HY/2011/03 “Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HZMB HKLR) – Section between Scenic Hill and HKBCF”. If the impact air quality monitoring at AMS6 is no longer covered under Contract No. HY/2011/03, it is required to continue such monitoring at AMS6 as part of EM&A programme. However, this is subject to ENPO’s final decision on which ET should carry out the monitoring work at these stations.

Noise monitoring stations NMS2 and NMS3C, water quality monitoring works and dolphin monitoring works under HZMB HKBCF are covered by this Contract.

A summary of the monitoring activities during the reporting period are listed below:

- 1-hour TSP Monitoring: 2, 7, 13, 19, 25 and 30 September 2019

- 24-hour TSP Monitoring: 2, 7, 13, 19, 25 and 30 September 2019
- Noise Monitoring: 2 September 2019<sup>#</sup>
- Water Quality Monitoring: 20 September 2019<sup>^</sup>
- Chinese White Dolphin Monitoring: 4, 11, 17 and 23 September 2019
- Environmental Site Inspection: 4, 11, 18 and 25 September 2019

Remarks:

- <sup>#</sup> A proposal to terminate impact monitoring for noise at NMS2 and NMS3C was justified by the ET Leader of this Contract and verified by the IEC on 13 August 2019, and approved by EPD on 3 September 2019. Therefore, the last noise monitoring event at NMS2 and NMS3C to be reported under this Contract was conducted on 2 September 2019.
- <sup>^</sup> Monthly impact operation phase water quality monitoring in accordance with Section 9.9 of the Updated EM&A Manual for HKBCF (Version 1.0) was conducted during the reporting month.
- <sup>\*</sup> Post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF was conducted during the reporting month.

### Breaches of Action and Limit Levels

A summary of environmental exceedances for the reporting period as recorded by the Environmental Team of this Contract are listed below:

Environmental Monitoring	Parameters	Action Level	Limit Level
Air Quality	1-hour TSP	-	-
	24-hour TSP	1	-
Noise	Leq (30 min)	-	-

One Action Level exceedance of 24-hour TSP for air quality at AMS7B was recorded and investigated by the ET of the Contract during the reporting period. It was concluded that the air quality exceedance was not due to the Contract.

### Complaint Log

There were no complaints received in relation to the environmental impact during the reporting period.

### Notifications of Summons and Successful Prosecutions

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

### Reporting Changes

A proposal to terminate impact monitoring for noise at NMS2 and NMS3C was justified by the ET Leader of this Contract and verified by the IEC on 13 August 2019, and approved by EPD on 3 September 2019. Therefore, the last noise monitoring event at NMS2 and NMS3C to be reported under this Contract was conducted on 2 September 2019.

### Future Key Issues

The future key issues to be undertaken in the upcoming month are:

- Erection of sign gantries (land-based)
- Construction of parapets for bridge structures (land-based)
- Construction of Retaining Wall RW16N and RW16S (land-based)
- Construction of Bridge Deck D16 in-situ deck (land-based)
- Construction of utilities cross-over frame under Bridge D9c (land-based)
- Backfilling of retaining walls and formation of fill slopes and road embankment (land-based)
- Drainage works and watermains laying (land-based)

- Roadworks and road furniture (land-based)
- Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and Tuen Mun – Chek Lap Kok Link Southern Connection (TM-CLKL-SC) (land-based)

# 1 Introduction

## 1.1 Background

On 13 March 2015, Mott MacDonald Hong Kong Limited (MMHK) was commissioned by China State Construction Engineering (Hong Kong) Limited (also referred to as “the Contractor”) to undertake the Environmental Team (ET) services (including environmental monitoring and audit (EM&A)) for Contract No. HY/2013/04 “Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)” (“the Contract”) for the Highways Department of Hong Kong Special Administrative Region (HKSAR).

The Contract is part of the “Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities” (HZMB HKBCF) Project which is a “Designated Project” under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) and for which an EIA Report (Register No. AEIAR-145/2009) was prepared and approved. The current Environmental Permit (EP) for HKBCF, namely No. EP-353/2009/K, was issued on 11 April 2016. These documents are available through the EIA Ordinance Register. Commencement of the Contract took place on 13 March 2015 and the construction works commenced on 13 July 2015. The works areas of the contract are shown in **Appendix A**.

This is the 51<sup>st</sup> Monthly EM&A Report summarising the findings of EM&A activities conducted under the Contract from 1 to 30 September 2019 (the “reporting period”) and is submitted to fulfil Condition 5.4 of the EP.

The Highways Department of HKSAR, the Contractor and MMHK consent to the requirements under the current EP for HZMB HKBCF to submit EM&A reports to the Environmental Protection Department (EPD) for public inspection.

## 1.2 Project Description

The Proposed works under this Contract comprise the following:

- Construction of vehicular bridge and at-grade roads at the southern portion of Hong Kong Boundary Crossing Facilities;
- Construction of associated street lighting, street furniture, road marking, road signage, box culverts and outfalls, drainage, sewerage, fresh water and flushing water supply, irrigation, landscape, electrical and mechanical (E&M), utilities and services works;
- Provisioning of civil engineering works and power supply for Traffic Control and Surveillance System (TCSS); and
- Other works in accordance with the Contract.

## 1.3 Project Organisation

The organisation chart and lines of communication with respect to the on-site environmental management structure together with the contact information of the key personnel are shown in **Appendix B**. The key personnel contact names and numbers are summarized in **Table 1.1**.

**Table 1.1: Contact Information of Key Personnel**

Party	Position	Name	Telephone	Fax
Engineer or Engineer's Representative (AECOM Asia Co. Ltd.)	Senior Resident Engineer	Peter Lee	3958 7465	3748 8900
Environmental Project Office / Independent Environmental Checker (Ramboll Hong Kong Limited)	Environmental Project Office Leader	Y H Hui	3465 2888	3465 2899
	Independent Environmental Checker	Ray Yan	3465 2836 / 5181 8401	3465 2899
	Environmental Site Supervisor	Harris Wong	3465 2805 / 5181 8709	3465 2899
Contractor (China State Construction Engineering (Hong Kong) Limited)	Site Agent	Jason Chung	9127 8369	2459 4336
	Environmental Officer	Xavier Lam	9493 2944	2459 4336
		K P Ng	9626 9961	2459 4336
Environmental Team (Mott MacDonald Hong Kong Limited)	Environmental Team Leader	Gary Chow	2828 5874	2827 1823
24-hour Complaint Hotline	-	-	5236 7111	-

## 1.4 Construction Programme

The Construction Works Programme of the Project is provided in **Appendix C**.

## 1.5 Construction Works undertaken during the Reporting Period

A summary of the construction activities undertaken during this reporting period is shown below:

- Erection of sign gantries
- Construction of parapets for bridge structures
- Construction of Retaining Wall RW16N and RW16S
- Construction of Bridge Deck D16 in-situ deck
- Construction of utilities cross-over frame under Bridge D9c
- Backfilling of retaining walls and formation of fill slopes and road embankment
- Drainage works and watermain laying
- Roadworks and road furniture
- Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and TM-CLKL-SC
- No marine-based segment delivery (all segments stored at segment storage yard on HKBCF island site)
- No generation of excavated marine sediment

During this reporting period, temporary soft landscaping works were conducted and marine-based outfall works had not commenced.

## 2 Air Quality Monitoring

### 2.1 Introduction

In accordance with the Contract Specific EM&A Manual, baseline 1-hour and 24-hour Total Suspended Particulates (TSP) levels at air quality monitoring stations AMS6 and AMS7 were established. Also, baseline 1-hour and 24-hour Total Suspended Particulates (TSP) levels at air quality monitoring stations AMS2 and AMS3 were established under other HKBCF contracts. Impact 1-hour TSP monitoring was conducted for at least three times every 6 days, while impact 24-hour TSP monitoring was carried out for at least once every 6 days.

### 2.2 Monitoring Locations

Monitoring locations AMS2, AMS3, AMS6 and AMS7 were set up at the proposed locations in accordance with the relevant Contract Specific EM&A Manual. For monitoring location AMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, approval for carrying out impact monitoring could not be obtained from the principal of the school. Permission on setting up and carrying out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact air quality monitoring was conducted at site boundary of the site office area in Works Area WA2 (AMS3B) before being relocated to Ying Tung Estate Market Rooftop (AMS3C) on 20 August 2018 under this Contract. The same baseline and Action Level for air quality, as derived from the baseline monitoring data recorded at Ho Yu College, was adopted for this alternative air quality location.

It should be noted that the air quality monitoring works for the Contract at AMS6 (Dragonair/CNAC (Group) Building) are covered by Contract No. HY/2011/03 “Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HZMB HKLR) – Section between Scenic Hill and HKBCF”.

The ET of the Contract or another ET of the HZMB project is required to conduct impact air quality monitoring at AMS6 as part of EM&A programme if this air quality monitoring station is no longer covered under Contract No. HY/2011/03.

**Table 2.1** describes the details of the monitoring stations and **Figure 2.1** shows the locations of air monitoring stations.

**Table 2.1: Construction Dust Monitoring Locations**

Identification No.	Location Description
AMS2	Tung Chung Development Pier
AMS3C	Ying Tung Estate Market Rooftop
AMS6 <sup>(1)</sup>	Dragonair/CNAC (Group) Building
AMS7B	3RS Site Offices

Remarks: (1) The ET of this Contract should conduct impact air quality monitoring at station AMS6 listed in the table as part of EM&A programme according to latest notification from ENPO when the monitoring station(s) is/are no longer covered by another ET of the HZMB project.

## 2.3 Monitoring Action and Limit Levels

The Action and Limit Levels for 1-hr TSP and 24-hr TSP are provided in **Table 2.2** and **Table 2.3** respectively. The same baseline and Action/Limit Levels for air quality, as derived from the baseline monitoring data recorded at and AMS3 and AMS7, apply with the abovementioned relocations to AMS3C and AMS7B respectively.

**Table 2.2: Action and Limit Levels for 1-hour TSP**

Monitoring Station	Action Level, $\mu\text{g}/\text{m}^3$	Limit Level, $\mu\text{g}/\text{m}^3$
AMS2 – Tung Chung Development Pier	374	500
AMS3C – Ying Tung Estate Market Rooftop	368	500
AMS6 – Dragonair / CNAC (Group) Building (HKIA)	360	500
AMS7B – 3RS Site Offices	370	500

**Table 2.3: Action and Limit Levels for 24-hour TSP**

Monitoring Station	Action Level, $\mu\text{g}/\text{m}^3$	Limit Level, $\mu\text{g}/\text{m}^3$
AMS2 – Tung Chung Development Pier	176	260
AMS3C – Ying Tung Estate Market Rooftop	167	260
AMS6 – Dragonair / CNAC (Group) Building (HKIA)	173	260
AMS7B – 3RS Site Offices	183	260

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

## 2.4 Monitoring Station AMS6

The monitoring requirements, monitoring equipment, monitoring parameters, frequency and duration, monitoring methodology and monitoring schedule for air quality monitoring station AMS6 are detailed in the monthly EM&A Reports prepared for Contract No. HY/2011/03.

## 2.5 Monitoring Schedule for the Reporting Period

The schedule for air quality monitoring at AMS2, AMS3C and AMS7B in the reporting period is presented in **Appendix I**.

## 2.6 Monitoring Equipment

24-hour TSP air quality monitoring was performed using High Volume Sampler (HVS) located at each designated monitoring station. The HVS meets all the requirements of the Contract Specific EM&A Manual. Portable direct reading dust meters were used to carry out the 1-hour TSP monitoring. Brand and model of the equipment used for air quality monitoring stations AMS2, AMS3C and AMS7B under this Contract is given in **Table 2.4**.

**Table 2.4: Air Quality Monitoring Equipment**

Equipment	Brand	Model No.
Portable direct reading dust meter (1-hour TSP)	Sibata Digital Dust Monitor	LD-3B
High Volume Sampler (24-hour TSP)	Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Sampler	TE-5170

## 2.7 Monitoring Methodology

### 24-hour TSP Monitoring

- a. The HVS was installed in the vicinity of the air sensitive receivers. The following criteria were considered in the installation of the HVS.
  - i. A horizontal platform with appropriate support to secure the sampler against gusty wind was provided.
  - ii. The distance between the HVS and any obstacles, such as buildings, was at least twice the height that the obstacle protrudes above the HVS.
  - iii. A minimum of 2 meters separation from walls, parapets and penthouse for rooftop sampler was provided.
  - iv. No furnace or incinerator flues are nearby.
  - v. Airflow around the sampler was unrestricted.
  - vi. Permission was obtained to set up the samplers and access to the monitoring stations.
  - vii. A secured supply of electricity was obtained to operate the samplers.
  - viii. The sampler was located more than 20 meters from any dripline.
  - ix. Any wire fence and gate, required to protect the sampler, did not obstruct the monitoring process.
  - x. Flow control accuracy was kept within  $\pm 2.5\%$  deviation over 24-hour sampling period.
- b. Preparation of Filter Papers
  - i. Glass fibre filters, G810 were labelled and sufficient filters that were clean and without pinholes were selected.
  - ii. All filters were equilibrated in the conditioning environment for 24 hours before weighing. The conditioning environment temperature was around 25 °C and not variable by more than  $\pm 3$  °C; the relative humidity (RH) was < 50% and not variable by more than  $\pm 5\%$ . A convenient working RH was 40%.
  - iii. All filter papers were prepared and analysed by ALS Technichem (HK) Pty Ltd., which is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes.
- c. Field Monitoring
  - i. The power supply was checked to ensure the HVS works properly.
  - ii. The filter holder and the area surrounding the filter were cleaned.
  - iii. The filter holder was removed by loosening the four bolts and a new filter, with stamped number upward, on a supporting screen was aligned carefully.
  - iv. The filter was properly aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter.
  - v. The swing bolts were fastened to hold the filter holder down to the frame. The pressure applied was sufficient to avoid air leakage at the edges.
  - vi. Then the shelter lid was closed and was secured with the aluminium strip.
  - vii. The HVS was warmed-up for about 5 minutes to establish run-temperature conditions.
  - viii. A new flow rate record sheet was set into the flow recorder.
  - ix. On site temperature and atmospheric pressure readings were taken and the flow rate of the HVS was checked and adjusted at around 1.1 m<sup>3</sup>/min, and complied with



the range specified in the Updated EM&A Manual for HKBCF (Version 1.0) (i.e. 0.6-1.7 m<sup>3</sup>/min).

- x. The programmable digital timer was set for a sampling period of 24 hours, and the starting time, weather condition and the filter number were recorded.
  - xi. The initial elapsed time was recorded.
  - xii. At the end of sampling, on site temperature and atmospheric pressure readings were taken and the final flow rate of the HVS was checked and recorded.
  - xiii. The final elapsed time was recorded.
  - xiv. The sampled filter was removed carefully and folded in half length so that only surfaces with collected particulate matter were in contact.
  - xv. It was then placed in a clean plastic envelope and sealed.
  - xvi. All monitoring information was recorded on a standard data sheet.
  - xvii. Filters were then sent to ALS Technichem (HK) Pty Ltd. for analysis.
- d. Maintenance and Calibration
- i. The HVS and its accessories were maintained in good working condition, such as replacing motor brushes routinely and checking electrical wiring to ensure a continuous power supply.
  - ii. 5-point calibration of the HVS was conducted using TE-5025A Calibration Kit prior to the commencement of baseline monitoring. Bi-monthly 5-point calibration of the HVS will be carried out during impact monitoring.
  - iii. Calibration certificate of the HVSs are provided in **Appendix J**.

### 1-hour TSP Monitoring

#### a. Measuring Procedures

The measuring procedures of the 1-hour dust meter were in accordance with the Manufacturer's Instruction Manual as follows:

- i. Turn the power on.
  - ii. Close the air collecting opening cover.
  - iii. Push the "TIME SETTING" switch to [BG].
  - iv. Push "START/STOP" switch to perform background measurement for 6 seconds.
  - v. Turn the knob at SENSI ADJ position to insert the light scattering plate.
  - vi. Leave the equipment for 1 minute upon "SPAN CHECK" is indicated in the display.
  - vii. Push "START/STOP" switch to perform automatic sensitivity adjustment. This measurement takes 1 minute.
  - viii. Pull out the knob and return it to MEASURE position.
  - ix. Push the "TIME SETTING" switch the time set in the display to 3 hours.
  - x. Lower down the air collection opening cover.
  - xi. Push "START/STOP" switch to start measurement.
- b. Maintenance and Calibration
- i. The 1-hour TSP meter was calibrated at 1-year intervals against a Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Air Sampler. Calibration certificates of the Laser Dust Monitors are provided in **Appendix J**.

## 2.8 Monitoring Results and Exceedance Investigation

The monitoring results for 1-hour and 24-hour TSP at AMS2, AMS3C and AMS7B are summarized in **Table 2.5** and **Table 2.6** respectively. Detailed impact air quality monitoring results are presented in **Appendix K**.

**Table 2.5: Summary of 1-hour TSP Monitoring Results During the Reporting Period**

Monitoring Station	Average, $\mu\text{g}/\text{m}^3$	Range, $\mu\text{g}/\text{m}^3$	Action Level, $\mu\text{g}/\text{m}^3$	Limit Level, $\mu\text{g}/\text{m}^3$
AMS2	23 – 89	44	374	500
AMS3C	20 – 160	61	368	500
AMS7B	20 – 119	47	370	500

**Table 2.6: Summary of 24-hour TSP Monitoring Results During the Reporting Period**

Monitoring Station	Average, $\mu\text{g}/\text{m}^3$	Range, $\mu\text{g}/\text{m}^3$	Action Level, $\mu\text{g}/\text{m}^3$	Limit Level, $\mu\text{g}/\text{m}^3$
AMS2	33 – 109	71	176	260
AMS3C	30 – 159	84	167	260
AMS7B	37 – 211	109	183	260

There was no Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level recorded at station AMS2 and AMS3C, and no Action and Limit Level exceedance of 1-hour TSP level recorded at station AMS7B, by the Environmental Team of this Contract during the reporting period.

One Action Level exceedance of 24-hour TSP for air quality at AMS7B was recorded and investigated by the ET of the Contract during the reporting period.

The monitoring results for AMS6 are reported in the monthly EM&A Reports prepared for Contract No. HY/2011/03.

Summary of Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

The wind data obtained from the on-site wind station (as shown in **Figure 2.1**) during the reporting period is provided in **Appendix M**.

Air quality exceedance recorded during the reporting period is summarised in **Table 2.7**.

**Table 2.7: Action and Limit Level Exceedance for Air Quality**

Date	Parameter	Station	Exceedance Recorded
30 Sep 2019	24-hour TSP	AMS7B	Action Level

The investigation findings into the exceedance are summarised below.

### 30 September 2019 (at AMS7B)

According to the Contractor of HY/2013/04, the major construction activities conducted under the Contract during the monitoring period included construction of parapets for bridge structures, construction of Retaining Wall RW16N and RW16S, construction of Bridge Deck D16 in-situ deck, construction of utilities cross-over frame under Bridge D9c, backfilling of retaining walls and formation of fill slopes and road embankment, drainage works and watermains laying, roadworks and road furniture.

As informed by the Contractor of HY/2013/04, watering of all main haul roads was provided in accordance with the HY/2013/04 site watering plan. This plan schedules water spraying for at least 8 times per day which follows the recommended mitigation measures in the EM&A Manual and Environmental Permit.

During ET's regular weekly site inspection on 25 September 2019 (between 09:30 and 10:30 a.m.), one air quality observation was recorded: namely, stockpiles and some exposed works areas were observed dry and dusty. The same observation was recorded during the next ET regular weekly site inspection on 2 October 2019 (between 14:15 and 15:00). Subsequently, the Contractor provided water spray for stockpiles and exposed works areas and the observation was closed during the subsequent ET regular weekly site inspection on 9 October 2019 (between 14:15 and 15:00). The remaining haul roads were observed to be watered and no fugitive dust generation from HY/2013/04 works was observed during this inspection. There was further no air quality observation associated with watering of site areas.

Photos relating to the abovementioned site inspections are presented in the investigation report (see **Appendix N**).

The wind data collected at the AMS3C wind station at Ying Tung Estate and the Hong Kong Observatory wind station at Chek Lap Kok during the abovementioned 24-hour monitoring period shows that winds were mostly from the south/southwest on the afternoon/evening of 30 September 2019 and west/northwest on the morning of 1 October 2019. This indicates that it was unlikely that the source of exceedance could be attributed to HY/2013/04.

Information available on EPD's Air Quality Health Index (AQHI) website shows that the short-term health risk of air pollution between 12:00 p.m. on 30 September 2019 and 12:00 p.m. on 1 October 2019 was low to serious in Tung Chung (with maximum AQHI of 10+ at 13:00-17:00 on 30 September 2019). This, combined with the winds recorded at the abovementioned wind stations, indicates that the background air pollution was relatively high during part of the monitoring period and may have contributed to the high level of TSP recorded. The AQHI data is available online at:

- [http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201909\\_Eng.csv](http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201909_Eng.csv)
- [http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201910\\_Eng.csv](http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201910_Eng.csv)

It was concluded that the exceedance was not due to HY/2013/04.

## 3 Noise Monitoring

### 3.1 Introduction

In accordance with the Contract Specific EM&A Manual, impact noise monitoring was conducted at least once per week for each noise monitoring location during the construction phase of the Contract.

### 3.2 Monitoring Locations

Approval for carrying out impact monitoring at NMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, could not be obtained from the principal of school. Permission on setting up and carry out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact noise monitoring was conducted at site boundary of the site office area in Works Area WA2 (NMS3B) before being relocated to Ying Tung Estate Market Rooftop (NMS3C) on 20 August 2018 under this Contract. The same baseline noise level (as derived from the baseline monitoring data recorded at Ho Yu College) and Limit Level were adopted for this alternative noise monitoring location.

A proposal to terminate impact monitoring for noise at NMS2 and NMS3C was justified by the ET Leader of this Contract and verified by the IEC on 13 August 2019, and approved by EPD on 3 September 2019. Therefore, the last noise monitoring event at NMS2 and NMS3C to be reported under this Contract was conducted on 2 September 2019.

**Table 3.1** describes the details of the monitoring stations and **Figure 3.1** shows the locations of noise monitoring stations.

**Table 3.1: Construction Noise Monitoring Locations**

Identification No.	Location Description
NMS2	Seaview Crescent
NMS3C <sup>(1)</sup>	Ying Tung Estate Refuse Collection Point

Remarks: (1) The Action and Limit Levels for schools will be applied for this alternative monitoring location.

### 3.3 Monitoring Parameters, Frequency and Duration

**Table 3.2** summarises the monitoring parameters, frequency and duration of impact TSP monitoring.

**Table 3.2: Noise Monitoring Parameters, Frequency and Duration**

Parameter	Frequency and Duration
30-minutes measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). $L_{eq}$ , $L_{10}$ and $L_{90}$ would be recorded.	At least once per week

### 3.4 Action and Limit Levels

The Action and Limit Levels for construction noise are defined in **Table 3.3**.

**Table 3.3: Action and Limit Level for Construction Noise**

Monitoring Station	Time Period	Action Level	Limit Level
NMS2	07:00 – 19:00 hours on normal weekdays	When one documented complaint is received	70 dB(A)
NMS3C			70/65 dB(A)*

Remark: Limit Level for schools will be applied for NMS3C. Day time noise Limit Level of 70 dB(A) applies to education institutions, while 65 dB(A) applies during the school examination period.

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

### 3.5 Monitoring Schedule for the Reporting Period

The schedule for noise monitoring in the reporting period is presented in **Appendix I**.

### 3.6 Monitoring Equipment

Noise monitoring was performed using sound level meters at each designed monitoring station. The sound level meters deployed comply with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Acoustic calibrator was deployed to check the sound level meters at a known sound pressure level. Brand and model of the equipment used for noise monitoring under this Contract is given in **Table 3.4**.

**Table 3.4: Noise Monitoring Equipment**

Equipment	Brand	Model No.
Integrated Sound Level Meter	Rion	NL-52
Acoustic Calibrator	Larson Davis	CAL200

### 3.7 Monitoring Methodology

#### 1. Monitoring Procedure

- a. The measurement at NMS3C was free-field measurement and NMS2 was façade measurement. A correction of +3dB(A) shall be made to the free-field measurement.
- b. The battery condition was checked to ensure the correct functioning of the meter.
- c. Parameters such as frequency weighting, the time weighting and the measurement time were set as follows:
  - i. frequency weighting: A
  - ii. time weighting: Fast
  - iii. time measurement:  $L_{eq}$  (30-minutes) during non-restricted hours i.e. 0700-1900 on normal workdays.
- d. Prior to and after each noise measurement, the meter was calibrated using the acoustic calibrator for 94dB(A) at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB(A), the measurement would be considered invalid and repeat of noise measurement would be required after re-calibration or repair of the equipment.
- e. During the monitoring period, the  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  were recorded. In addition, site conditions and noise sources were recorded on a standard record sheet.

- f. Noise measurement was paused during periods of high intrusive noise (e.g. dog barking, helicopter noise) if possible. Observations were recorded when intrusive noise was unavoidable.
  - g. Noise monitoring was cancelled in the presence of fog, rain, wind with a steady speed exceeding 5m/s, or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.
2. Maintenance and Calibration
- a. The microphone head of the sound level meter was cleaned with soft cloth at regular intervals.
  - b. The meter and calibrator were sent to the supplier or HOKLAS laboratory to check and calibrate at yearly intervals.
  - c. Calibration certificates of the sound level meters and acoustic calibrators are provided in **Appendix J**.

### 3.8 Monitoring Results

The monitoring results for construction noise are summarized in **Table 3.5**. Detailed impact noise monitoring results and relevant graphical plots are presented in **Appendix K**.

**Table 3.5: Summary of Construction Noise Monitoring Results During the Reporting Period**

Monitoring Station	Average, dB(A)	Range, dB(A)	Limit Level, dB(A)
	$L_{eq}$ (30 mins)	$L_{eq}$ (30 mins)	$L_{eq}$ (30 mins)
NMS2	64 <sup>#</sup>	64 – 64 <sup>#</sup>	75
NMS3C	65 <sup>#</sup>	65 – 65 <sup>#</sup>	70/65*

Remark: (<sup>#</sup>) Noise monitoring was conducted on 2 September 2019 only.

(\*) The Limit Level for schools will be applied for NMS3C. Daytime noise Limit Level of 70 dB(A) applies to education institutions, while 65 dB(A) applies during the school examination period.

No noise exceedances were recorded at stations NMS2 and NMS3C by the ET of this Contract during the reporting period.

School calendar of Ho Yu College was checked against noise monitoring days at NMS3C.

## 4 Water Quality Monitoring

### 4.1 Introduction

Upon completion of all marine-based construction activities, a post-project monitoring exercise on water quality shall be carried out for 4 weeks in the same manner as the Baseline monitoring and was conducted during May 2019. An impact operational phase monitoring exercise on water quality shall also be carried out monthly during the first year of Project operation at all designated monitoring stations including control stations; this was commenced in June 2019. For post-construction and impact operational phase water quality monitoring, measurement was taken in accordance with the Updated EM&A Manual for HKBCF (Version 1.0).

### 4.2 Monitoring Locations

During the reporting period, the impact operational phase water quality monitoring works were covered by this Contract. A total of four stations (two Sensitive Receiver Stations and two Control Stations) are covered for impact operational phase monitoring by the current EM&A programme.

The two Sensitive Receiver Stations (SR) were chosen as they are close to the key sensitive receivers and the two Control Stations (CS) were chosen to facilitate comparison of the water quality of the SR stations with less influence by the Project/ ambient water quality conditions.

During impact construction water quality monitoring, the water quality monitoring station at SR3 was not available for water sampling due to safety reason, thus, monitoring station was changed to SR3(N) (Coordinate: 810689E, 816591N) and was justified by the ET Leader of Contract No. HY/2013/01 on 8 November 2017 and verified by the IEC on 13 November 2017; and submitted to EPD on 29 November 2017 and it was approved by EPD on 22 December 2017. Also, the water quality monitoring station at CS2 (Coordinate: 805849E, 818780N) was occupied by the marine work of a designated project – “Expansion of Hong Kong International Airport into a Three-Runway System” (3RS Project) – thus, monitoring station was changed to CS2(A) (Coordinate: 805232E, 818606N) and was justified by the ET Leader of HZMB HLKR Contract No. HY/2011/09, and verified by the IEC; and submitted to EPD on 12 July 2017 and it was approved by EPD on 28 July 2017 for implementation with effect from 31 July 2017.

Application of the alternative water quality monitoring stations at SR3(N) and CS2(A) to impact operational phase water quality monitoring was justified by the ET Leader of this Contract on 14 May 2019, verified by the IEC on 15 May 2019 and submitted to EPD for record on 15 May 2019 for implementation with effect from June 2019.

**Table 4.1** and **Figure 4.1** shows the locations of water quality monitoring stations.

**Table 4.1: Impact Operational Phase Water Quality Monitoring Stations**

Station	Description	East	North
SR2(A)	Sensitive receivers (Sha Lo Wan)	807810	817189
SR3(N)	Sensitive receivers (San Tau SSSI)	810689	816591
CS2(A)	Control Station	805232	818606
CS(Mf)5	Control Station	817990	821129

### 4.3 Monitoring Parameters, Frequency and Duration

**Table 4.2** summarizes the monitoring parameters, frequency and monitoring depths of impact operational phase water quality monitoring in the Updated EM&A Manual for HKBCF (Version 1.0).

**Table 4.2: Impact Operational Phase Water Quality Monitoring Parameters and Frequency**

Monitoring Stations	Parameter, Unit	Frequency	No. of Depths Measured
<b>Control Stations:</b> CS2(A), CS(Mf)5 <b>Sensitive Receiver Stations:</b> SR2(A), SR3(N)	• Depth, m	Once monthly, during mid-ebb and mid-flood tides of the same monitoring day (within ±1.75 hour of the predicted time)	3 (1m below water surface, mid-depth and 1m above sea bed, except where the water depth is less than 6m, in which case the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored.)
	• Temperature, °C		
	• Salinity, ppt		
	• Dissolved Oxygen (DO), mg/L		
	• DO Saturation, %		
	• Turbidity, NTU		
	• pH		
• Suspended Solids (SS), mg/L			

### 4.4 Monitoring Action and Limit Levels

The Action and Limit Levels for impact water quality monitoring are provided in **Table 4.3** for reference.

**Table 4.3: Action and Limit Levels for Impact Water Quality Monitoring**

Parameters	Action	Limit
DO in mg L <sup>-1</sup> (Surface, Middle & Bottom)	Surface and Middle 5.0 Bottom 4.7	Surface and Middle 4.2 (except 5 mg/L for FCZ) Bottom 3.6
SS in mg L <sup>-1</sup> (depth-averaged) at all monitoring stations and control stations	23.5 and 120% of upstream control station's SS at the same tide of the same day*	34.4 and 130% of upstream control station's SS at the same tide of the same day and 10mg/L for WSD Seawater intakes*
Turbidity in NTU (depth-averaged)	27.5 and 120% of upstream control station's turbidity at the same tide of the same day*	47.0 and 130% of upstream control station's

Remarks:

\* Reference is made to EPD approval of adjustment of water quality assessment criteria issued and became effective on 18 February 2013.

Notes:

1. "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
2. For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
3. For turbidity, SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered as necessary.
5. The 1%-ile of baseline data for dissolved oxygen (surface and middle) and dissolved oxygen (bottom) are 4.2 mg/L and 3.6 mg/L respectively.

The event and action plan is provided in **Appendix D**.

### 4.5 Monitoring Schedule for the Reporting Period

Monthly impact operational phase water quality monitoring in accordance with Section 9.9 of the Updated EM&A Manual for HKBCF (Version 1.0) commenced in June 2019 and was conducted during the reporting month on 20 September 2019.



The schedule for impact operational phase water quality monitoring in the reporting period is presented in **Appendix I**.

## 4.6 Monitoring Equipment

**Table 4.4** summaries the equipment used in the impact operational phase water quality monitoring programme.

**Table 4.4: Water Quality Monitoring Equipment**

Equipment	Brand and Model	Serial Number
DO and Temperature Meter, Salinity Meter, Turbidity Meter & pH Meter	YSI ProDSS	17H105557 / 18A104824

## 4.7 Monitoring Methodology

### 4.7.1 Instrumentation

- a. The in-situ water quality parameters, viz. dissolved oxygen, temperature, salinity, turbidity and pH, were measured by multi-parameter meters and pH meter.

### 4.7.2 Operating/Analytical Procedures

- a. Digital Differential Global Positioning Systems (DGPS) were used to ensure that the correct location was selected prior to sample collection.
- b. Portable, battery-operated echo sounders were used for the determination of water depth at each designated monitoring station.
- c. All in-situ measurements were taken at 3 water depths, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth was less than 6m, in which case the mid-depth station was omitted. Should the water depth be less than 3m, only the mid-depth station was monitored.
- d. At each measurement/sampling depth, two consecutive in-situ monitoring (DO concentration and saturation, temperature, turbidity, pH, salinity) and water sample for SS. The probes were retrieved out of the water after the first measurement and then re-deployed for the second measurement. Where the difference in the value between the first and second readings of DO or turbidity parameters was more than 25% of the value of the first reading, the reading was discarded and further readings were taken.
- e. Duplicate samples from each independent sampling event were collected for SS measurement. Water samples were collected using the water samplers and the samples were stored in high density polythene bottles. Water samples collected were well-mixed in the water sampler prior to pre-rinsing and transferring to sample bottles. Sample bottles were pre-rinsed with the same water samples. The sample bottles were then be packed in cool-boxes (cooled at 4°C without being frozen), and delivered to ALS Technichem (HK) Pty Ltd. for the analysis of suspended solids concentrations. The laboratory determination work would be started within 24 hours after collection of the water samples. ALS Technichem (HK) Pty Ltd. is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes. For QA/QC procedures, one duplicate samples of every batch of 20 samples was analyzed.
- f. The analysis method and reporting and detection limit for SS is shown in **Table 4.5**.

**Table 4.5: Laboratory Analysis for Suspended Solids**

Parameters	Instrumentation	Analytical Method	Reporting Limit	Detection Limit
Suspended Solids (SS)	Weighting	APHA 2540-D	0.5 mg/L	0.5 mg/L

- g. Other relevant data were recorded, including monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena or work underway at the construction site in the field log sheet for information.

#### 4.7.3 Maintenance and Calibration

- a. All in situ monitoring instruments would be calibrated and calibrated by ALS Technichem (HK) Pty Ltd. before use and at 3-monthly intervals throughout all stages of the water quality monitoring programme. Calibration details are provided in **Appendix J**.
- b. The dissolved oxygen probe of YSI 6820 was calibrated by wet bulb method. Before the calibration routine, the sensor for dissolved oxygen was thermally equilibrated in water-saturated air. Calibration cup is served as a calibration chamber and it was loosened from airtight condition before it is used for the calibration. Calibration at ALS Technichem (HK) Pty Ltd. was carried out once every three months in a water sample with a known concentration of dissolved oxygen. The sensor was immersed in the water and after thermal equilibration, the known mg/L value was keyed in and the calibration was carried out automatically.
- c. The turbidity probe of YSI 6820 is calibrated two times a month. A zero check in distilled water was performed with the turbidity probe of YSI 6820 once per monitoring day. The probe will be calibrated with a solution of known NTU at ALS Technichem (HK) Pty Ltd. once every three months.

#### 4.8 Monitoring Results

Impact operational phase water quality monitoring results and graphical plots are presented in **Appendix K**.

## 5 Dolphin Monitoring

### 5.1 Introduction

Vessel based surveys for the Chinese White Dolphin (CWD), *Sousa chinensis*, are to be conducted by a dedicated team comprising a qualified marine mammal ecologist and experienced marine mammal observers (MMOs). The purpose of the surveys is to evaluate the impact of the HKBCF reclamation and, if deemed detrimental, to take appropriate action as per the EM&A Manual. During the reporting period, the ET of Contract No. HY/2011/03 continued the implementation of dolphin monitoring and collection of monitoring data, with the reporting by the ET of this Contract.

### 5.2 Monitoring Locations

#### 5.2.1 Vessel-based Line-transect Survey

According to the requirement of the updated EM&A Manual, the dolphin monitoring programme should adopt line-transect vessel survey method. The survey follows pre-set and fixed transect lines in the two areas defined by AFCD as: Northeast Lantau (NEL) survey area; and Northwest Lantau (NWL) survey area.

**Table 5.1** shows the co-ordinates for the transect lines and layout map. The layout map showing the transect lines have been provided by AFCD and are shown in **Figure 5.1**.

**Table 5.1: Post-Construction Dolphin Monitoring Line Transect Co-ordinates (Provided by AFCD)**

Transect	HK Grid System		Long Lat in WGS84	
	X	Y	Long	Lat
1 <sup>#</sup>	804671	815456	113.870287	22.277678
	804671	831404	113.869975	22.421696
2 <sup>#</sup> ^	805476	820800	113.877995	22.325951
	805476	826654	113.877882	22.378815
3 <sup>^</sup>	806464	821150	114.030267	22.196697
	806464	822911	114.047344	22.196712
4 <sup>^</sup>	807518	821500	114.033651	22.206219
	807518	829230	114.108618	22.206267
5 <sup>^</sup>	808504	821850	114.037037	22.215126
	808504	828602	114.102523	22.215169
6 <sup>^</sup>	809490	822150	114.039938	22.224033
	809490	825352	114.070995	22.224056
7 <sup>#</sup> ^	810499	822000	114.038474	22.233143
	810499	824613	114.063820	22.233163
8 <sup>#</sup>	811508	821123	113.936539	22.328966
	811508	824254	113.936486	22.357241
9 <sup>#</sup>	812516	821303	113.946320	22.330606
	812516	824254	113.946279	22.357255

Transect	HK Grid System		Long Lat in WGS84	
10*	813525	820827	113.956112	22.326321
	813525	824657	113.956066	22.360908
11#	814556	818853	113.966155	22.304858
	814556	820992	113.966125	22.327820
12	815542	818807	113.975726	22.308109
	815542	824882	113.975647	22.362962
13	816506	819480	113.985072	22.314192
	816506	824859	113.985005	22.362771
14	817537	820220	113.995070	22.320883
	817537	824613	113.995018	22.360556
15	818568	820735	114.005071	22.325550
	818568	824433	114.005030	22.358947
16	819532	821420	114.014420	22.331747
	819532	824209	114.014390	22.356933
17	820451	822125	114.023333	22.338117
	820451	823671	114.023317	22.352084
18	821504	822371	114.033556	22.340353
	821504	823761	114.033544	22.352903
19	822513	823268	114.043340	22.348458
	822513	824321	114.043331	22.357971
20	823477	823402	114.052695	22.349680
	823477	824613	114.052686	22.360610
21	805476	827081	113.877878	22.382668
	805476	830562	113.877811	22.414103
22	806464	824033	113.887520	22.355164
	806464	829598	113.887416	22.405423
23	814559	821739	113.966142	22.334574
	814559	824768	113.966101	22.361920
24^	805476	815900	113.979368	22.187721
	805476	819100	114.010398	22.187756

## Remarks:

- (a) \* Due to the presence of deployed silt curtain systems at the site boundaries of the Contract, some of the transect lines shown in Figure 5.1 could not be fully surveyed during the regular survey. Transect 10 is reduced from 6.4km to approximately 3.6km in length due to the HKBCF construction site. Therefore, the total transect length for both NEL and NWL combined is reduced to approximately 108km.
- (b) # Coordinates for transect lines 1, 2, 7, 8, 9 and 11 have been updated in respect to the Proposal for Alteration of Transect Line for Dolphin Monitoring approved by EPD on 19 August 2015.
- (c) ^ Due to marine works of the Expansion of Hong Kong International Airport into a Three-Runway System (3RS Project), the change of transect lines 2, 3, 4, 5, 6 and 7 and new transect line 24 were justified and verified by the ET Leader for Contract No. HY/2010/02 and the IEC respectively on 24 March 2017 and it was approved by EPD on 12 May 2017.

The survey team used standard line-transect methods (Buckland *et al.*, 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 22 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung, 2017, 2018). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 Fuinon marine binoculars.

Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance travelled in each series (a continuous period of search effort) with the assistance of a handheld GPS (Garmin eTrex Legend).

Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.

When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines was labelled as “primary” survey effort, while the survey effort conducted along the connecting lines between parallel lines was labelled as “secondary” survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese white dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

Encounter rates of Chinese white dolphins (number of on-effort sightings per 100 km of survey effort and number of dolphins from all on-effort sightings per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for encounter rate analysis. Dolphin encounter rates were calculated using primary survey effort alone, as well as the combined survey effort from both primary and secondary lines.

### 5.2.2 Photo-identification Work

When a group of Chinese White Dolphins were sighted during the line-transect survey, the survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.

A professional digital camera (Canon EOS 7D model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up

photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.

Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson, 2000).

All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

### 5.3 Action and Limit Levels for Dolphin Monitoring

The Action and Limit Levels for Chinese White Dolphin Monitoring are provided in **Table 5.2** and **Table 5.3**, respectively.

**Table 5.2: Action and Limit Levels for Chinese White Dolphin Monitoring - Approach to Define Action Level (AL) and Limit Level (LL)**

	North Lantau Social Cluster	
	NEL	NWL
Action Level	(STG < 70% of baseline) & (ANI < 70% of baseline)	(STG < 70% of baseline) & (ANI < 70% of baseline)
Limit Level	[(STG < 40% of baseline) & (ANI < 40% of baseline)] AND [(STG < 40% of baseline) & (ANI < 40% of baseline)]	

**Table 5.3: Derived Value of Action Level (AL) and Limit Level (LL) for Chinese White Dolphin Monitoring**

	North Lantau Social Cluster	
	NEL	NWL
Action Level	(STG < 4.2) & (ANI < 15.5)	(STG < 6.9) & (ANI < 31.3)
Limit Level	[(STG < 2.4) & (ANI < 8.9)] AND [(STG < 3.9) & (ANI < 17.9)]	

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these survey transect(s) is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

### 5.4 Monitoring Schedule for the Reporting Period

Post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF commenced in March 2019 and was conducted during the reporting month.

The schedule for dolphin monitoring for the reporting period is provided in **Appendix I**.

## 5.5 Monitoring Results

### 5.5.1 Vessel-based Line-transect Survey

Two sets of systematic line-transect vessel surveys were conducted under the HKBCF dolphin monitoring programme on 4, 11, 17 and 23 September 2019, to cover all transect lines in NWL and NEL survey areas twice. The survey routes of each survey day are presented in **Figures 2 to 5 of Appendix L**.

However, during the first set of monitoring survey in the reporting period on 4 September 2019, some vessels performing construction works under other nearby projects were observed at the southern end of transect line no. 11. The survey team determined that it was unsafe to navigate through this area to conduct the usual vessel survey in full. The survey route performed on that day is presented in **Figure 2 of Appendix L**.

A total of 267.91 km of survey effort was collected, with 98.8% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility) during the reporting period's surveys (**Annex I of Appendix L**).

Among the two areas, 99.40 km and 168.51 km of survey effort were conducted respectively. The total survey effort conducted on primary and secondary lines were 193.93 km and 73.98 km respectively (**Annex I of Appendix L**).

During the two sets of monitoring surveys in the reporting period, only two groups of five Chinese White Dolphins were sighted (**Annex II of Appendix L**). Both dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL. Only one of the two dolphin sightings was sighted on primary line during on-effort search. Neither group was associated with any operating fishing vessel (**Annex II of Appendix L**).

Distribution of the two dolphin sightings made in the reporting period is shown in **Figure 6 of Appendix L**. They were made near Black Point and to the west of Sha Chau respectively (**Figure 6 of Appendix L**). Both sightings were located very far away from the HKBCF works site.

During the reporting period's surveys, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data made under favourable conditions (Beaufort 3 or below) are shown in **Table 5.4** and **Table 5.5**.

**Table 5.4: Dolphin encounter rates deduced from the two sets of HKBCF surveys (two surveys in each set) during the reporting period in Northeast (NEL) and Northwest Lantau (NWL)**

		Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)	Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)
		Primary Lines Only	Primary Lines Only
NEL	Set 1: September 4 <sup>th</sup> / 11 <sup>th</sup>	0.0	0.0
	Set 2: September 17 <sup>th</sup> / 23 <sup>rd</sup>	0.0	0.0
NWL	Set 1: September 4 <sup>th</sup> / 11 <sup>th</sup>	1.6	3.3
	Set 2: September 17 <sup>th</sup> / 23 <sup>rd</sup>	0.0	0.0

**Table 5.5: Overall dolphin encounter rates (sightings per 100 km of survey effort) from all four HKBCF surveys conducted during the reporting period on primary lines only as well as both primary lines and secondary lines in NEL and NWL**

	Encounter rate (STG)		Encounter rate (ANI)	
	(no. of on-effort dolphin sightings per 100 km of survey effort)		(no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Primary Lines Only	Both Primary and Secondary Lines	Primary Lines Only	Both Primary and Secondary Lines
NEL	0.0	0.0	0.0	0.0
NWL	0.8	1.2	1.7	3.0

The average group size of dolphins sighted during September's monitoring surveys was 2.5 individuals per group, as both dolphin groups were quite small with two and three animals respectively (**Annex II of Appendix L**).

### 5.5.2 Photo-identification Work

During the two sets of surveys conducted during the reporting period, only three of the five dolphins were identified as known individual dolphin from the photo-identification catalogue (**Annex III and IV of Appendix L**). Two of them (NL202 and NL286) were a mother-calf pair that have been sighted numerous times in previous monitoring surveys.



## 6 Environmental Site and Audit

### 6.1 Site Inspection

Site Inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control mitigation measures for the project. During the reporting period, site inspections were carried out on 4, 11, 18 and 25 September 2019.

When permanent soft landscaping works within the site boundaries of the Contract are commenced, construction phase landscape and visual mitigation measures would be implemented in accordance with the EP, EIA and EM&A Manual. Monitoring and audit of landscape and visual mitigation measures would be conducted bi-weekly in accordance with Section 14.2 of the Updated EM&A Manual for HKBCF (Version 1.0). Permanent soft landscaping works within the Contract site had not commenced during the reporting period.

Particular observations during the site inspections and corrective actions undertaken by the Contractor are described below.

#### 28 August 2019

- a. Plastic pipes were observed directly connected to storm drain. Subsequently, Aquased was provided to treat site effluent and eventually no discharge was observed. The observation was closed on 11 September 2019.

#### 4 September 2019

- a. A container inside chemical waste storage area was observed without chemical waste label. Subsequently, the container was removed from the chemical waste storage area. The observation was closed on 11 September 2019.

#### 11 September 2019

- a. The haul road and stockpiles onsite were observed dry and dusty. Subsequently, water spray was provided. The observation was closed on 18 September 2019.

#### 18 September 2019

- a. A generator was observed without display of NRMM label. Subsequently, the concerned generator was removed from site. The observation was closed on 25 September 2019.
- b. Food wastes were observed storing with other construction wastes in a waste skip. Subsequently, the food wastes were sorted and removed from the skip. The observation was closed on 25 September 2019.

#### 25 September 2019

- a. Stockpiles and some exposed works areas were observed dry and dusty. The Contractor should implement sufficient water spraying for dust suppression. Follow-up action for the outstanding observation will be inspected during the upcoming site inspections and reported in the coming reporting period.

### 6.2 Advice on the Solid and Liquid Waste Management Status

The Contractor registered as a chemical waste producer for the Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting. As a practical means, the

disposal operation is managed by a single HKBCF contractor who is also responsible for applying dumping permit and its subsequent extension applications from EPD. Contract No. HY/2013/03 has been assigned to coordinate and arrange for disposal of extracted marine sediment from this Contract.

There was no generation of excavated sediment for treatment during this reporting period. Any treatment of excavated marine sediment will be conducted using cement solidification/stabilization (Cement S/S) techniques and the treated sediment will be reused onsite for either backfilling or landscaping (e.g. berm material).

The monthly summary of waste flow table is detailed in **Appendix E**.

The Contractor was reminded that chemical waste containers should be properly treated and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packing, Labelling and Storage of Chemical Waste.

## 6.2.1 Disposal of Marine Sediment Extracted from Bored Piling Works

### 6.2.1.1 Background

After the acceptance of the review of the approved Sediment Quality Report (SQR) for this Project under EPD letter dated 19 August 2015, an approval to dispose the marine sediment extracted from bored piling for this Project was then approved under memo from Secretary, Marine Fill Committee of CEDD dated 20 August 2015 for the disposal of marine sediment extracted from bored piling works. The disposal sites allocated to this Project are the Mud Pit CMP2 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at the East of Sha Chau). As advised by CEDD in the memo dated 19 February 2016, from 00:00 on 22 March 2016 onward, the disposal space at CMP2 of the South of The Brothers is closed and all disposal of contaminated sediment is to be carried out at CMP Vd to the East of Sha Chau (ESC).

As Contract No. HY/2013/01 has commenced treatment of the extracted marine sediment, treatment will continue and the treated marine sediment will be re-used within the HKBCF Island. On the other hand, Contract Nos. HY/2013/02, HY/2013/03 and HY/2013/04 have not commenced the treatment of extracted marine sediment. Therefore, the marine sediment extracted from these three Contracts will be disposed to the allocated disposal sites directly without treatment. As a practical means, the disposal operation is managed by one contractor who is also responsible for applying dumping permit and its subsequent extension applications from EPD. Contract No. HY/2013/03 has been assigned to coordinate and arrange for disposal of extracted marine sediment from all three Contracts.

The SQR was further reviewed in mid-2016. EPD has no comment to extend the validity of the SQR to August 2017 under letter dated 18 August 2016.

Based on the actual piling operation, the estimated quantity of marine sediment to be extracted has been revised from 85,000 m<sup>3</sup> to 126,000 m<sup>3</sup> (bulk volume). EPD has no comments on the request as in the letter dated 20 October 2016. The Secretary of Marine Fill Committee, CEDD approved the increasing quantity in the memo dated 10 November 2016.

During the course of reviewing the SQR, it was noted that the contamination level of the marine sediment extracted from the inner part of the HKBCF Island was not identified during the previous sampling and testing. As requested by EPD, sampling and testing are required. The Sediment Sampling and Testing Proposal (SSTP) for the inner area of the HKBCF Island was approved by EPD on 2 June 2016.

As in the agreed SSTP for the inner area of the HKBCF Island, samples were taken from the seventeen batches of stockpiled marine sediments and from five boreholes each in one of the five sampling grids. After conducting chemical tests on samples, six batches of stockpiled samples under Contract No. HY/2013/03 and all eight batches of stockpiled samples under Contract No. HY/20013/04 are classified as Category L sediment. The Secretary of Marine Fill Committee of CEDD allocated disposal sites under memo dated 24 October 2016 and dated 22 November 2016 for disposal of a total of 9,500 m<sup>3</sup> in-situ volume of Category L sediment (using a bulk factor of 1.3). The Category L sediment was disposed in December 2016.

One sample from the batch of stockpiled marine sediment under Contract No. HY/2013/03 and samples from all five sampling grids had contamination levels exceeding the Lower Chemical Exceedance Levels (LCEL) and biological screenings were carried out. All samples passed the biological screenings and are classified as Category Mp sediment and to be disposed off site using Type II confined marine disposal method the same method used for marine sediment extracted from other part of the HKBCF Island.

#### 6.2.1.2 Dumping Arrangements

The barge for disposal of marine sediment will morn at the temporary loading and unloading at the east shore of the HKBCF Island, which has been being used by reclamation contractor (Contract No. HY/2010/02) for reclamation activities. In terms of safety consideration, each dumping date will be allocated to one Contract. The quantity of marine sediment disposed on the date is from one Contract.

During dumping, each Contractor is responsible for transporting the marine sediment from his site area to the barge. The estimated quantity of marine sediment in each truck is confirmed by Resident Site Staff of each Contract. The trip tickets for transportation and disposal of marine sediment are collected and checked. Contract No. HY/2013/03 as the dumping permit holder is responsible for reporting to EPD the quantity disposed of as the condition stipulated in the dumping permit.

#### 6.2.1.3 Reporting

AECOM has confirmed that the disposal of excavated marine sediments to allocated dumping site via Contract No. HY/2013/03 has been completed with the last batch disposal on 30 August 2017. The total quantities disposed are presented in the following table (**Table 6.1**):

**Table 6.1: Summary of Marine Sediment disposed to Dumping Site via Contract No. HY/2013/03**

	Type of Sediment and Quantity Disposed (m <sup>3</sup> )	
	Cat. L (in Type I)	Type II
Total	3,570	39,814

Note: For monthly breakdown of these quantities, please refer to the waste flow table in **Appendix E**.

### 6.3 Environmental Licenses and Permits

The valid environmental licenses and permits during the reporting period are summarized in **Appendix F**.

### 6.4 Implementation Status of Environmental Mitigation Measures

In response to the site audit findings, the Contractor carried out corrective actions.

A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in **Appendix G**. Most of the necessary mitigation measures were implemented properly.

Implementation status of the Regular Marine Travel Route Plan (RMTRP) was checked by ET. Training of marine travel route for marine vessel operator was given to relevant staff and relevant records were kept properly.

According to the Contractor of HY/2013/04, all marine-based segment deliveries were completed in January 2018 and no marine-based works were conducted under the contract during the reporting period. The localised silt curtains under this Contract were removed on 4 January 2019.

## 6.5 Summary of Exceedance of the Environmental Quality Performance Limit

### Air Quality

No Action and Limit Level exceedances of 1-hour and 24-hour TSP level were recorded at AMS2 and AMS3C during the reporting period. Also, no Action and Limit Level exceedances of 1-hour TSP level were recorded at AMS7B during the reporting period.

One Action Level exceedance of 24-hour TSP for air quality at AMS7B was recorded and investigated by the ET of the Contract during the reporting period. It was concluded that the air quality exceedance was not due to the Contract. The investigation findings are presented in Section 2.8 of this report.

Summary of Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

### Noise

No Action and Limit Level exceedances were recorded at NMS2 and NMS3C during the reporting period.

### Water Quality

Monthly impact operational phase water quality monitoring in accordance with Section 9.9 of the Updated EM&A Manual for HKBCF (Version 1.0) commenced in June 2019 and was conducted during the reporting month on 20 September 2019.

### Chinese White Dolphin

Post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF (Version 1.0) commenced in March 2019.

During the reporting period, dolphin surveys were conducted on 4, 11, 17 and 23 September 2019. However, part of the dolphin survey on 4 September 2019 could not be performed due to the presence of vessels performing construction works under other nearby projects at the southern end of transect line no. 11. A total of 267.91 km of survey effort was collected, with 98.8% of the total survey effort being conducted under favourable weather conditions. During the two sets of monitoring surveys in the reporting period, only two groups of five Chinese White Dolphins were sighted.

## 6.6 Summary of Complaints, Notification of Summons and Successful Prosecution

### Complaints

There were no complaints received in relation to the environmental impact during the reporting period.

### Notification of Summons and Successful Prosecution

No notification of summons or prosecutions was received during the reporting period.

Statistics on notifications of summons and successful prosecutions are summarized in **Appendix H**.

## 7 Future Key Issues

### 7.1 Construction Programme for the Coming Months

As informed by the Contractor, the major construction activities for October 2019 are summarized in **Table 7.1**.

**Table 7.1: Construction Activities for October 2019**

Site Area	Description of Activities
HKBCF	<ul style="list-style-type: none"> <li>● Erection of sign gantries (land-based)</li> <li>● Construction of parapets for bridge structures (land-based)</li> <li>● Construction of Retaining Wall RW16N and RW16S (land-based)</li> <li>● Construction of Bridge Deck D16 in-situ deck (land-based)</li> <li>● Construction of utilities cross-over frame under Bridge D9c (land-based)</li> <li>● Backfilling of retaining walls and formation of fill slopes and road embankment (land-based)</li> <li>● Drainage works and watermains laying (land-based)</li> <li>● Roadworks and road furniture (land-based)</li> <li>● Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and Tuen Mun – Chek Lap Kok Link Southern Connection (TM-CLKL-SC) (land-based)</li> </ul>

### 7.2 Environmental Site Inspection and Monitoring Schedule for the Coming Month

The tentative schedule for weekly site inspection and monitoring for air quality, water quality and Chinese White Dolphin for October 2019 is provided in **Appendix I**.

# 8 Conclusions

## 8.1 Conclusions

### General

Commencement of the Contract took place on 13 March 2015 and the construction works of the Contract commenced on 13 July 2015.

The air quality, noise, water quality and dolphin monitoring works under Contract No. HY/2013/01 were suspended on 1 October 2018. From 1 October 2018 onwards, the ET of Contract No. HY/2013/04 has continued the same implementation of air quality, noise and water quality environmental monitoring (including air quality and noise monitoring already under its implementation) while the ET of Contract No. HY/2011/03 has continued the same implementation of dolphin monitoring, with the reporting of all environmental monitoring continued by the ET of Contract No. HY/2013/04.

Monthly impact operational phase water quality monitoring in accordance with Section 9.9 of the Updated EM&A Manual for HKBCF (Version 1.0) commenced in June 2019 and was conducted during the reporting period on 20 September 2019.

Moreover, post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF (Version 1.0) commenced in March 2019 and was conducted during the reporting period.

### Breaches of Action and Limit Levels

#### *Air Quality*

No Action and Limit Level exceedances of 1-hour and 24-hour TSP level were recorded at AMS2 and AMS3C during the reporting period. Also, no Action and Limit Level exceedances of 1-hour TSP level were recorded at AMS7B during the reporting period.

One Action Level exceedance of 24-hour TSP for air quality at AMS7B was recorded and investigated by the ET of the Contract during the reporting period. It was concluded that the air quality exceedance was not due to the Contract.

Summary of Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

#### *Noise*

No Action and Limit Level exceedances were recorded at the NMS2 and NMS3C during the reporting period.

#### *Water Quality*

Monthly impact operational phase water quality monitoring in accordance with Section 9.9 of the Updated EM&A Manual for HKBCF (Version 1.0) commenced in June 2019 and was conducted during the reporting period on 22 July 2019.

### *Chinese White Dolphin*

Post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF (Version 1.0) commenced in March 2019 and was conducted during the reporting period.

During the reporting period, dolphin surveys were conducted on 4, 11, 17 and 23 September 2019. However, part of the dolphin survey on 4 September 2019 could not be performed due to the presence of vessels performing construction works under other nearby projects at the southern end of transect line no. 11. A total of 267.91 km of survey effort was collected, with 98.8% of the total survey effort being conducted under favourable weather conditions. During the two sets of monitoring surveys in the reporting period, only two groups of five Chinese White Dolphins were sighted.

### **Environmental Site Inspections**

Environmental site inspections were carried out on 4, 11, 18 and 25 September 2019. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site inspections.

### **Complaints**

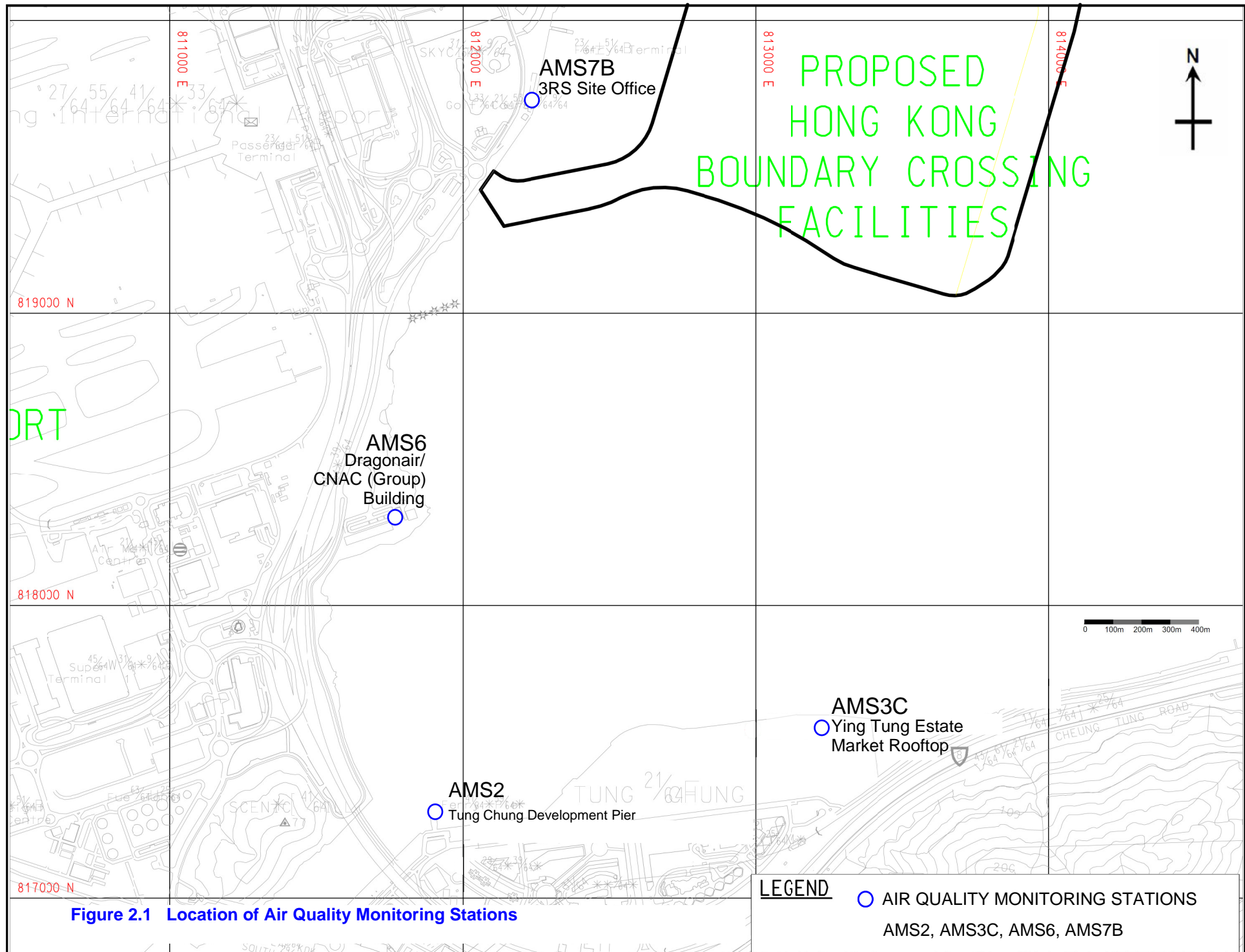
There were no complaints received in relation to the environmental impact during the reporting period.

### **Notifications of Summons and Successful Prosecutions**

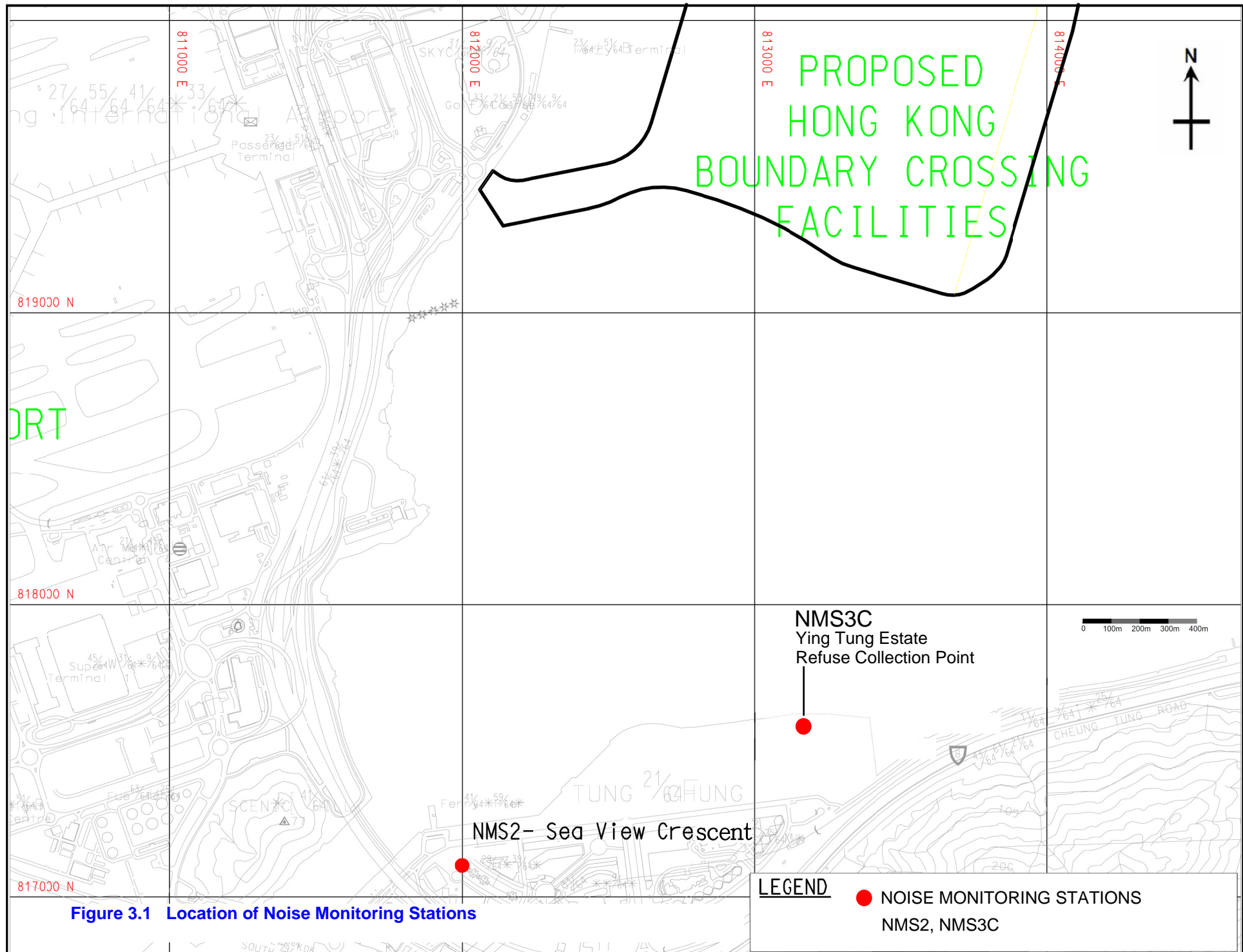
There were no notifications of summons or prosecutions received during the reporting period.



# Figures



**Figure 2.1** Location of Air Quality Monitoring Stations



**Figure 3.1 Location of Noise Monitoring Stations**



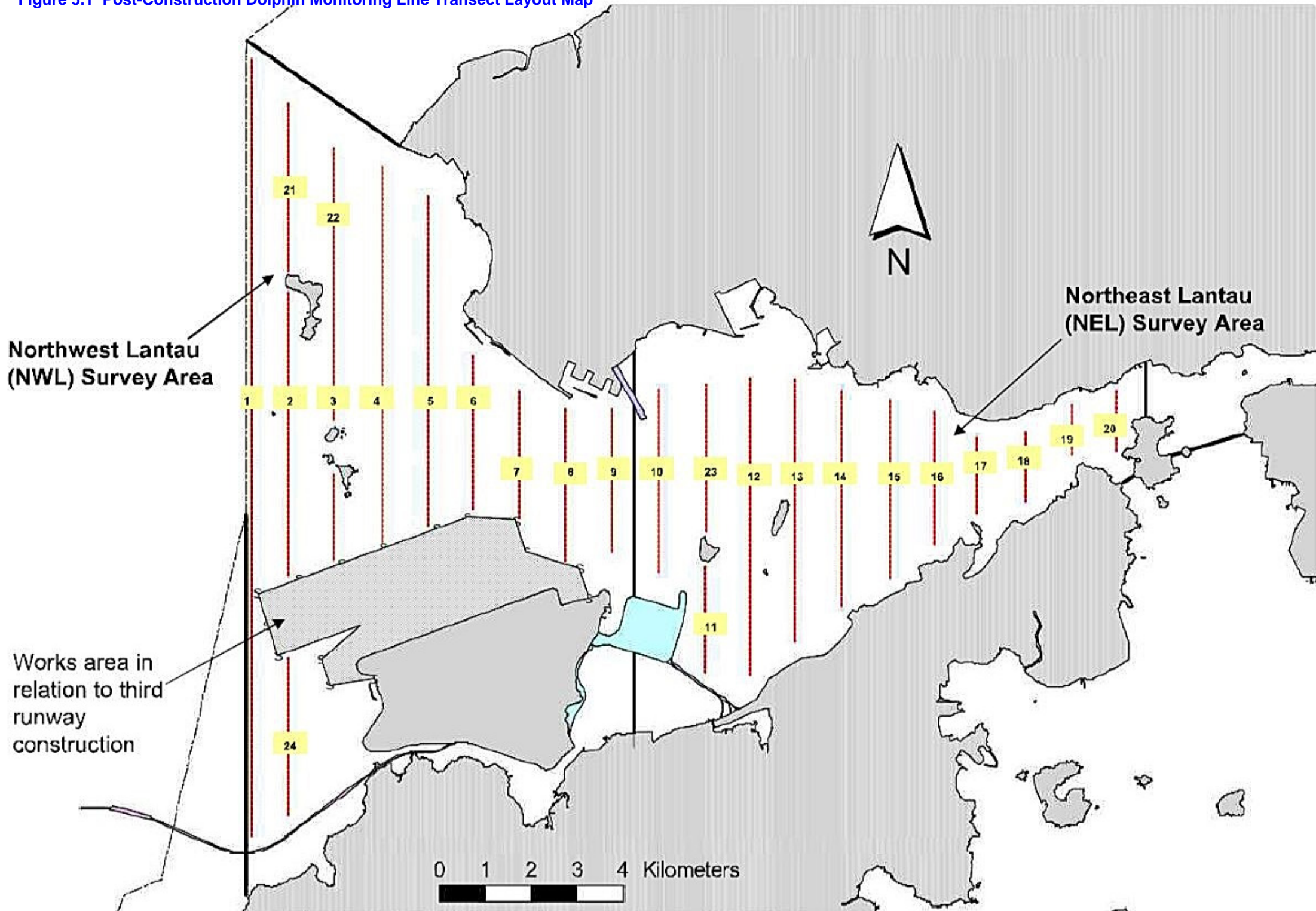
Station	East	North
SR2(A)	807810	817189
SR3(N)	810689	816591
CS2(A)	805232	818606
CS(Mf)5	817990	821129

FIGURE 4.1— LOCATION OF WATER QUALITY MONITORING STATIONS

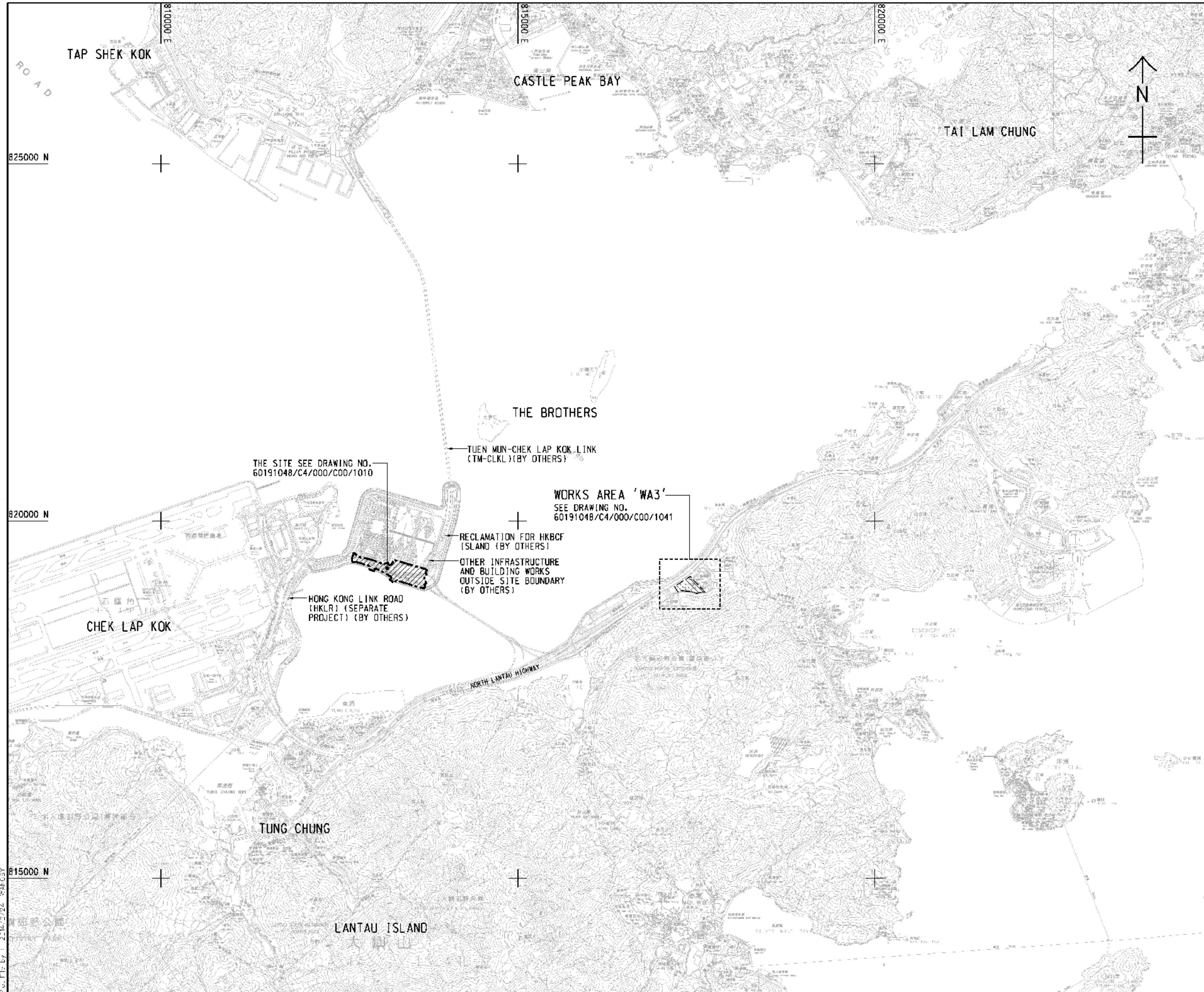
**LEGEND**

-  CS CONTROL STATIONS
-  SR SENSITIVE RECEIVERS STATIONS

Figure 5.1 Post-Construction Dolphin Monitoring Line Transect Layout Map



# Appendix A. Location of Works Areas



**NOTES:**

- 1. COORDINATES ARE RELATED TO HONG KONG METRIC GRID (1980).
- 2. DIMENSIONS ARE IN MILLIMETER AND CHAINAGE ARE IN METRES UNLESS OTHERWISE SHOWN.

**LEGEND:**

- SITE BOUNDARY
- WORKS AREA



REV.	DESCRIPTION	DATE
1	TENDER DRAWING	FEB. 14

**路政處 HIGHWAYS DEPARTMENT**  
**港珠澳跨境通道工程營地處**  
 Hong Kong-Zhuhai-Macao Bridge Hong Kong Project Management Office

HONG KONG-ZHUHAI-MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - INFRASTRUCTURE WORKS STAGE 1 (SOUTHERN PORTION)

**SITE LOCATION PLAN**

**AECOM** +  
 Rogers Stirk Harbour + Partners  
 BURO HAPPOLD ATKINS ADI +

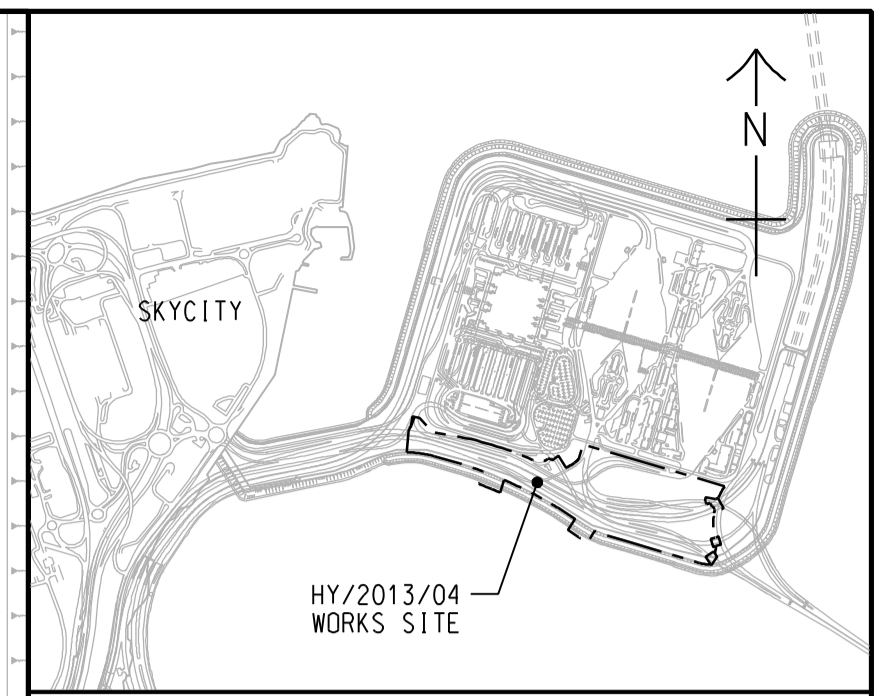
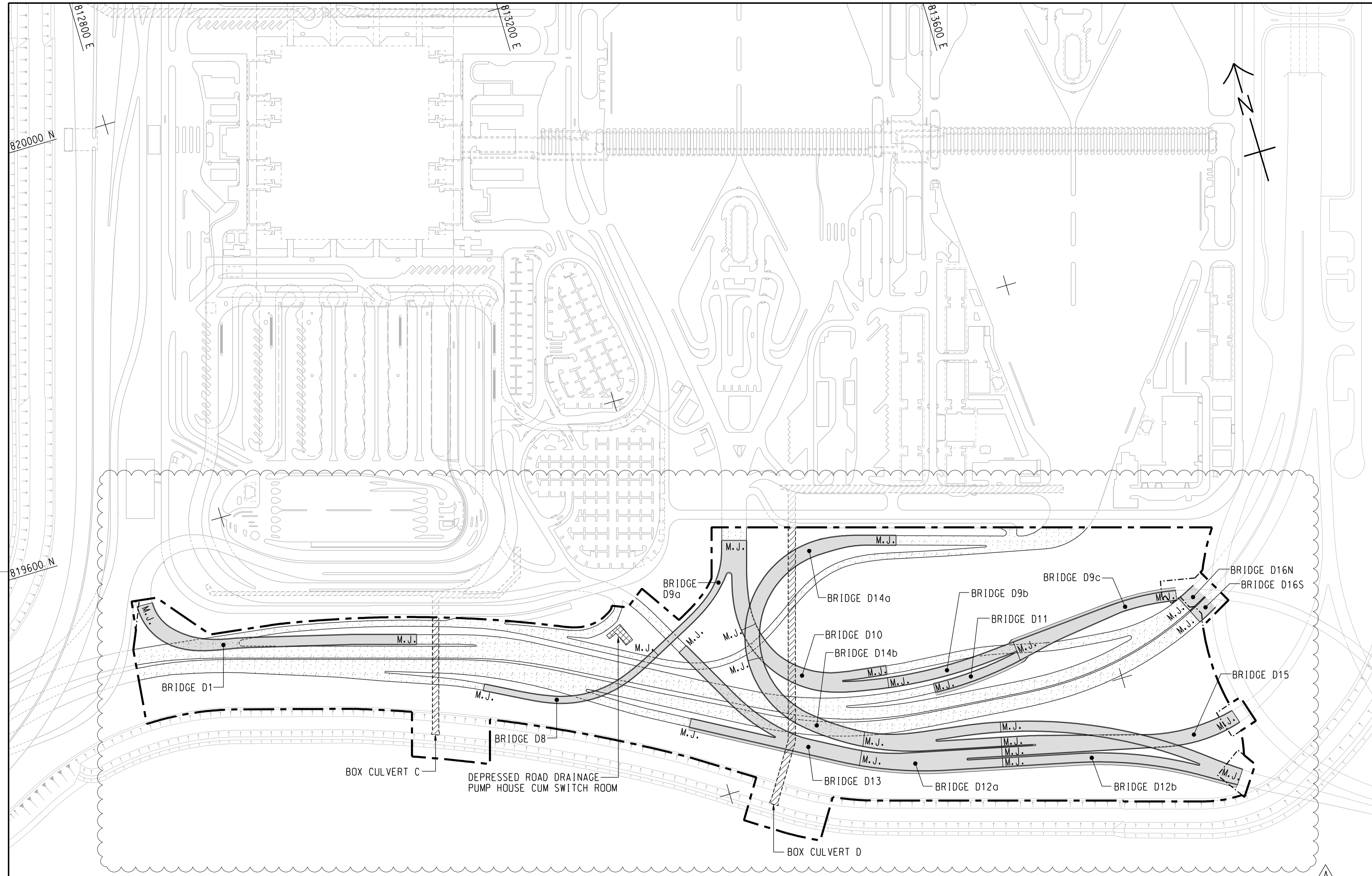
**Aedas**

DRG. NO. 60191048/C4/000/C00/1000  
 圖紙編號

DESIGNED BY BWC	CONTRACT NO. HY/2013/04	APPROVED BY TKH
DRAWN BY MSY	STATUS REV.	
SCALE 1:25000		

DIMENSIONS ARE IN METRES  
 © COPYRIGHT RESERVED  
 版權所 有

P. S. [T: By : 2.14.2024 9:46:03]



LOCATION PLAN  
SCALE 1 : 25000

**LEGEND:**

	SITE BOUNDARY
	AT-GRADE WORKS LIMIT
	MOVEMENT JOINT
	BRIDGE
	BUILDING/FACILITIES
	AT-GRADE ROAD
	BOX CULVERT

B	WORKING DRAWING	BWCW SCI	APR. 15
A	TENDER ADDENDUM NO. 3	BWCW SCI	MAY. 14
-	TENDER DRAWING	BWCW SCI	FEB. 14

路政署  
**HIGHWAYS DEPARTMENT**  
 港珠澳大橋香港工程管理有限公司  
 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

HONG KONG-ZHUHAI-MACAO BRIDGE  
 HONG KONG BOUNDARY CROSSING FACILITIES  
 - INFRASTRUCTURE WORKS STAGE II (SOUTHERN PORTION)

**GENERAL ARRANGEMENT**

**AECOM**  
 Rogers Stirk Harbour + Partners  
 BURO HAPPOLD ATKINS ADI  
**Aedas**

DRG. NO. 60191048/C4/000/C00/1002B  
圖紙編號

DESIGNED BY 設計	BWCW	CONTRACT NO. 合約編號	HY/2013/04	P. O. APPROVED 批准人	TKH
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DRAWN BY  
繪圖  
WSY  
STATUS  
階段  
**WORKING DRAWING**

SCALE  
比例  
A1 1 : 2000  
DIMENSIONS ARE IN  
尺寸單位  
METRES  
© COPYRIGHT RESERVED  
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Plot File by : 2014/5/7 WANGSY



SETTING OUT POINT

POINT	EASTING	NORTHING
301	817467.265	819162.683
302	817314.741	819069.828
303	817327.338	819049.295
304	817440.865	819117.811
305	817340.825	819027.314
306	817387.350	819023.403
307	817387.861	819043.396
308	817466.133	819091.047
309	817469.783	819087.181
310	817513.449	819113.764
311	817347.717	819016.082
312	817620.269	819000.620
313	817445.362	819013.131
314	817450.595	819032.307
315	817495.828	819059.595
316	817522.110	819075.388
317	817566.404	819028.472
318	817568.506	819008.526
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320	817533.346	818991.306

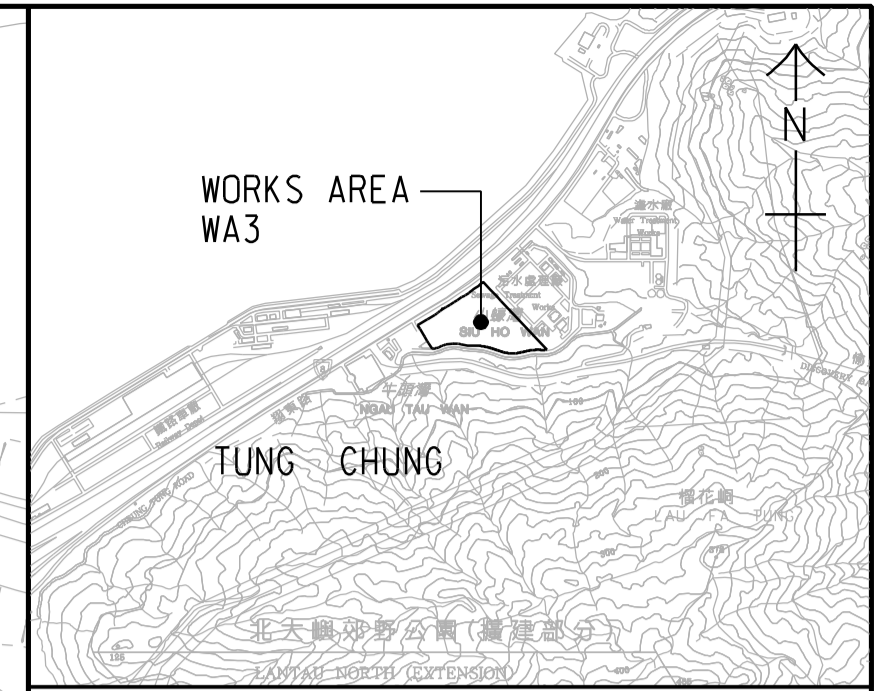
81200 E

81400 E

81600 E

819200 N

819000 N



LOCATION PLAN  
SCALE 1 : 25000

NOTES:

- COORDINATES ARE RELATED TO HONG KONG METRIC GRID (1980).
- DIMENSIONS ARE IN MILLIMETER AND CHAINAGE ARE IN METRES UNLESS OTHERWISE SHOWN.

LEGEND:

	WORKS AREA BOUNDARY
	PORTION 3.1
	PORTION 3.2
	PORTION 3.3
	PORTION 3.4
	PORTION 3.5
	PORTION 3.6
	PORTION 3.7
	PORTION 3.8
	PORTION 3.9
	PORTION 3.10

10m WIDE COMMON ACCESS TO BE MAINTAINED BY CONTRACT NO. HY/2010/02

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2010/02

10m WIDE COMMON ACCESS TO BE CONSTRUCTED AND INITIALLY MAINTAINED BY CONTRACT NO. HY/2013/01. UPON COMMENCEMENT OF CONTRACT NO. HY/2013/03, THE MAINTENANCE RESPONSIBILITY SHALL BE TRANSFERRED FROM CONTRACT NO. HY/2013/01 TO CONTRACT NO. HY/2013/03.

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/04

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2014/05

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2011/09

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2011/03

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/02

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/01

WORKS AREA OCCUPIED BY CONTRACT NO. HY/2013/03

Plot File by : 2014/4/11 WANGSY

B	WORKING DRAWING	BWCW SCI	APR. 15
A	TENDER ADDENDUM NO. 2	BWCW SCI	APR. 14
-	TENDER DRAWING	BWCW SCI	FEB. 14
REV. 修改	DESCRIPTION 內容摘要	CHK. 校核	DATE 日期

HONG KONG-ZHUHAI-MACAO BRIDGE  
HONG KONG-BOUNDARY CROSSING FACILITIES  
- INFRASTRUCTURE WORKS STAGE II (SOUTHERN PORTION)

WORKS AREA WA3

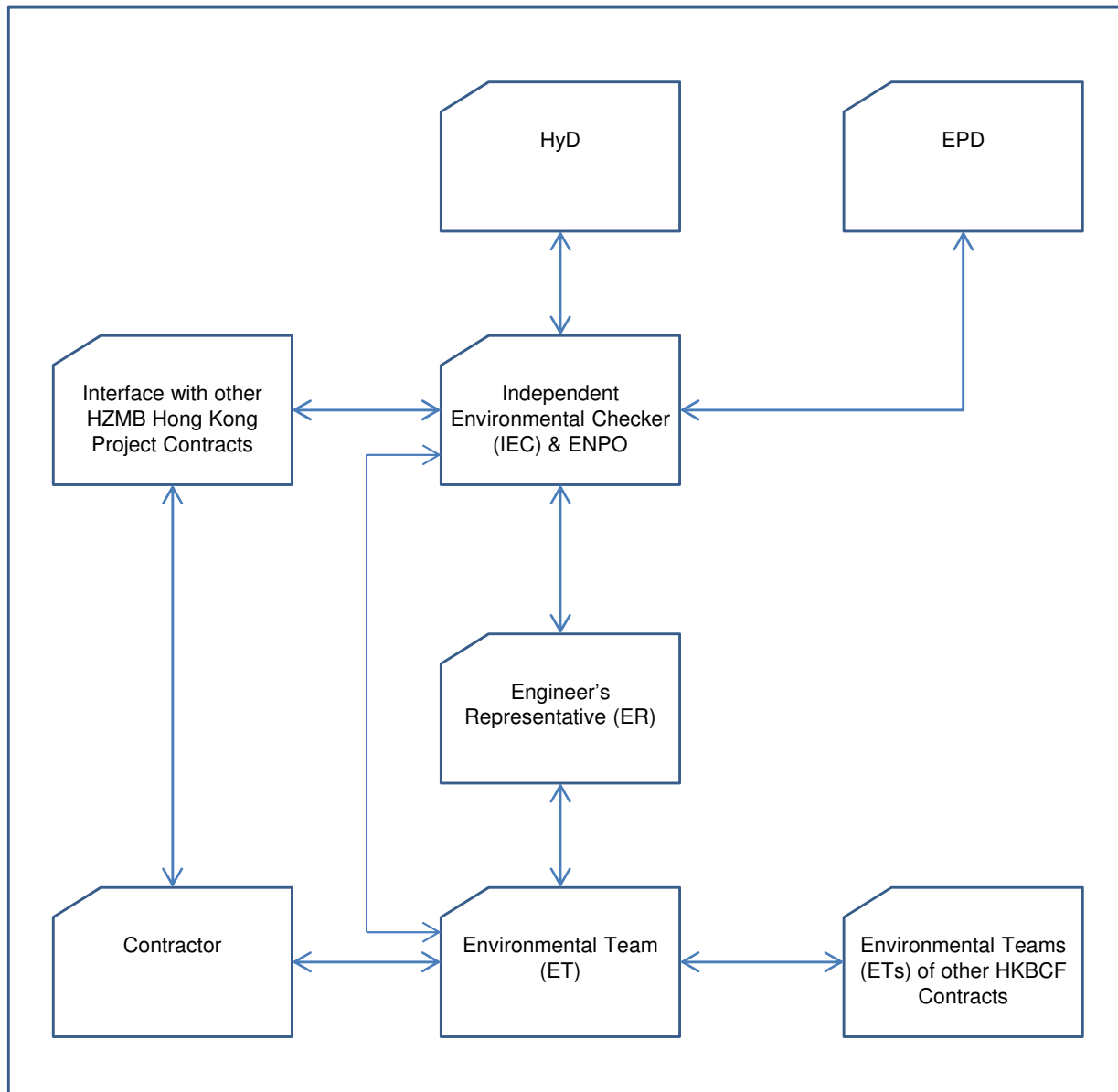
**AECOM** Aedas  
Rogers Stirk Harbour + Partners  
BURO HAPPOLD ATKINS ADI

DRG.NO. 60191048/C4/000/C00/1041B  
圖紙編號

DESIGNED BY 設計	BWCW	CONTRACT NO. 合約編號	HY/2013/04	P. Dir. APPROVED 批准人	TKH
DRAWN BY 繪圖	WSY	STATUS 階段	<b>WORKING DRAWING</b>		
SCALE 比例	A1 1 : 1000				
DIMENSIONS ARE IN 尺寸單位	METRES		© COPYRIGHT RESERVED 版權所 有		

# Appendix B. Project Organization for Environmental Works

## Project Organisation for Environmental Works



↔ Line of Communication

# Appendix C. Construction Programme





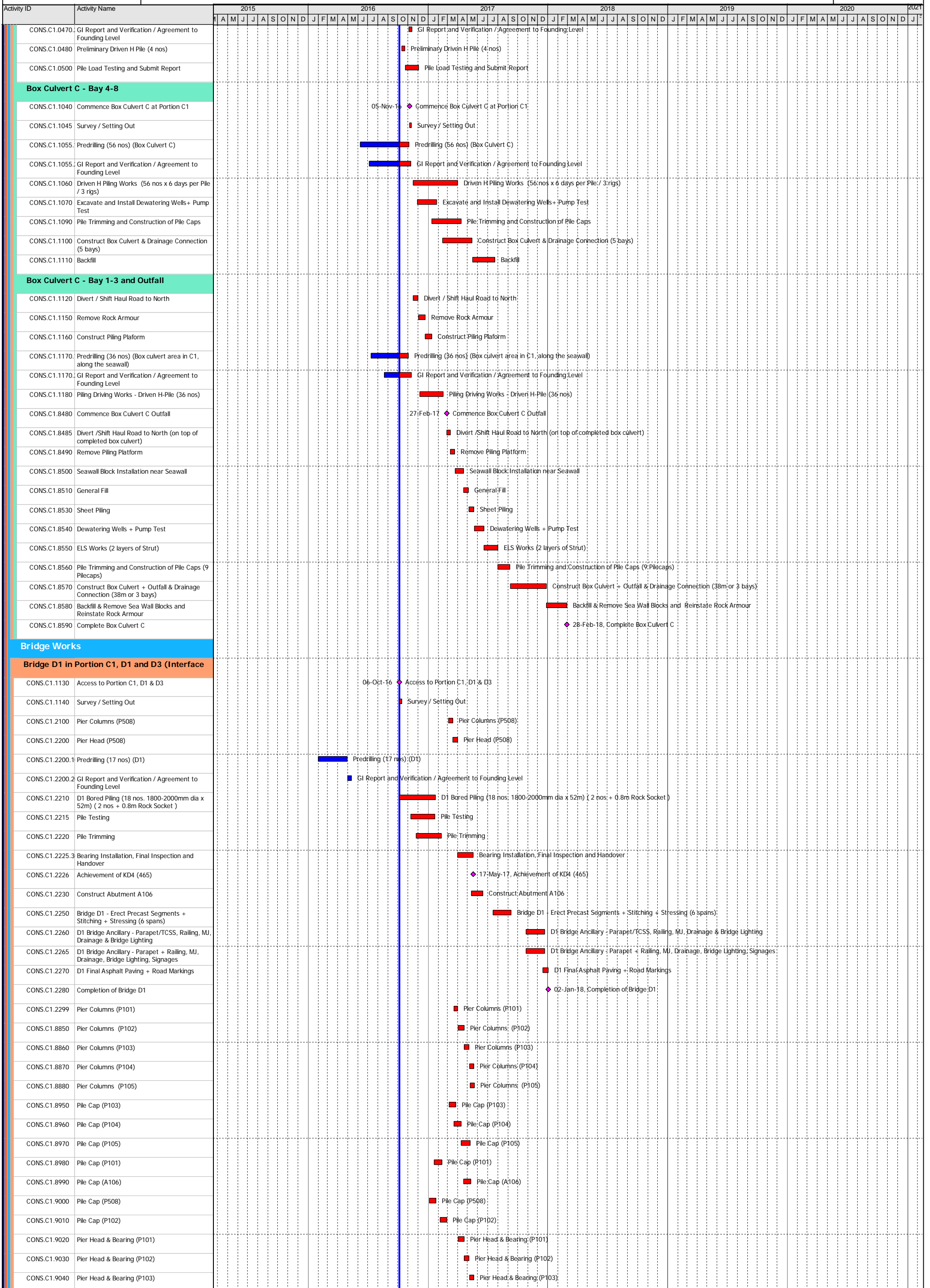
















































# Appendix D. Event and Action Plan

## Event/Action Plan for Air Quality Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
<b>ACTION LEVEL</b>				
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform IEC and ER;</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency to daily.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Rectify any unacceptable practice;</li> <li>2. Amend working methods if appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Identify source;</li> <li>2. Inform IEC and ER;</li> <li>3. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>4. Repeat measurements to confirm findings;</li> <li>5. Increase monitoring frequency to daily;</li> <li>6. Discuss with IEC and Contractor on remedial actions required;</li> <li>7. If exceedance continues, arrange meeting with IEC and ER;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise Implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit proposals for remedial to ER within 3 working days of notification;</li> <li>2. Implement the agreed proposals;</li> <li>3. Amend proposal if appropriate.</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
<b>LIMIT LEVEL</b>				
1. Exceedance for one sample	<ol style="list-style-type: none"> <li>1. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>2. Inform ER, Contractor and EPD;</li> <li>3. Repeat measurement to confirm finding;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET;</li> <li>2. Check Contractor's working method;</li> <li>3. Discuss with ET and Contractor on possible remedial measures;</li> <li>4. Advise the ER on the effectiveness of the proposed remedial measures;</li> <li>5. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Ensure remedial measures properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Amend proposal if appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> <li>1. Notify IEC, ER, Contractor and EPD;</li> <li>2. Identify source;</li> <li>3. Repeat measurement to confirm findings;</li> <li>4. Increase monitoring frequency to daily;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

## Event / Action Plan for Construction Noise Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Level	<ol style="list-style-type: none"> <li>1. Notify IEC and Contractor;</li> <li>2. Identify source, investigate the causes of exceedance and propose remedial measures;</li> <li>3. Report the results of investigation to the IEC, ER and Contractor;</li> <li>4. Discuss with the Contractor and formulate remedial measures;</li> <li>5. Increase monitoring frequency to check mitigation effectiveness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Review the analysed results submitted by the ET;</li> <li>2. Review the proposed remedial measures by the Contractor and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to IEC;</li> <li>2. Implement noise mitigation proposals.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Inform IEC, ER, EPD and Contractor;</li> <li>2. Identify source;</li> <li>3. Repeat measurements to confirm findings;</li> <li>4. Increase monitoring frequency;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Inform IEC, ER and EPD the causes and actions taken for the exceedances;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

## Event / Action Plan for Water Quality Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat in situ measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, contractor and ER;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Repeat measurement on next day of exceedance to confirm findings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working methods;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of non-compliance in writing;</li> <li>2. Discuss with IEC on the proposed mitigation measures;</li> <li>3. Make agreement on mitigation measures to be implemented;</li> <li>4. Ensure mitigation measures are properly implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER;</li> <li>5. Implement the agreed mitigation measures.</li> <li>6. Amend working methods if appropriate.</li> </ol>
Action level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat in situ measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor and ER;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Action level;</li> <li>8. Repeat measurement on next day of exceedance to confirm findings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of non-compliance in writing;</li> <li>2. Discuss with IEC on the proposed mitigation measures;</li> <li>3. Make agreement on mitigation measures to be implemented;</li> <li>4. Ensure mitigation measures are properly implemented;</li> <li>5. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the Engineer and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER within 3 working days of notification;</li> <li>5. Implement the agreed mitigation measures;</li> <li>6. Amend working methods if appropriate.</li> </ol>



EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> <li>1. Repeat <i>in-situ</i> measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, Contractor, ER and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>4. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li> <li>3. Request Contractor to critically review the working methods;</li> <li>4. Ensure mitigation measures are properly implemented;</li> <li>5. Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Rectify unacceptable practice;</li> <li>3. Check all plant and equipment and consider changes of working methods;</li> <li>4. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER;</li> <li>5. Implement the agreed mitigation measures;</li> <li>6. Amend working methods if appropriate.</li> </ol>
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> <li>1. Repeat <i>in-situ</i> measurement to confirm findings;</li> <li>2. Identify source(s) of impact;</li> <li>3. Inform IEC, contractor, ER and EPD;</li> <li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>5. Discuss mitigation measures with IEC, ER and Contractor;</li> <li>6. Ensure mitigation measures are implemented;</li> <li>7. Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor's working method;</li> <li>2. Discuss with ET and Contractor on possible remedial actions;</li> <li>3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li> <li>3. Request Contractor to critically review the working methods;</li> <li>4. Make agreement on the mitigation measures to be implemented;</li> <li>5. Ensure mitigation measures are properly implemented;</li> <li>6. Assess the effectiveness of the implemented mitigation measures;</li> <li>7. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER and confirm notification of the non-compliance in writing;</li> <li>2. Take immediate action to avoid further exceedance;</li> <li>3. Rectify unacceptable practice;</li> <li>4. Check all plant and equipment and consider changes of working methods;</li> <li>5. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER;</li> <li>6. Implement the agreed mitigation measures;</li> <li>7. Resubmit proposals of mitigation measures if problem still not under control;</li> <li>8. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li> </ol>

## Event / Action Plan for Dolphin Monitoring

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action Level	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>3. Identify source(s) of impact;</li> <li>4. Inform the IEC, ER/SOR and Contractor;</li> <li>5. Check monitoring data.</li> <li>6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and finding with the ET and the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss monitoring with the IEC and any other measures proposed by the ET;</li> <li>2. If ER/SOR is satisfied with the proposal of any other measures, ER/SOR to signify the agreement in writing on the measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER/SOR and confirm notification of the non-compliance in writing;</li> <li>2. Discuss with the ET and the IEC and propose measures to the IEC and the ER/SOR;</li> <li>3. Implement the agreed measures.</li> </ol>

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Limit Level	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>3. Identify source(s) of impact;</li> <li>4. Inform the IEC, ER/SOR and Contractor of findings;</li> <li>5. Check monitoring data;</li> <li>6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> <li>7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, ER/SOR and Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to modify the perimeter silt curtain or consider to control/temporarily stop relevant construction activity etc.) and submit to IEC a proposal of additional dolphin monitoring and/or mitigation measures where necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and findings with the ET and the Contractor;</li> <li>3. Attend the meeting to discuss with ET, ER/SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>4. Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and advise ER/SOR of the results and findings accordingly.</li> <li>5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise ER/SOR the results and findings accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>2. If ER/SOR is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, ER/SOR to signify the agreement in writing on such proposals and any other mitigation measures.</li> <li>3. Supervise the implementation of additional monitoring and/or any other mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER/SOR and confirm notification of the non-compliance in writing;</li> <li>2. Attend the meeting to discuss with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary.</li> <li>4. Implement the agreed additional dolphin monitoring and/or any other mitigation measures.</li> </ol>

# Appendix E. Waste Flow Table

**Monthly Summary Waste Flow Table for 2019**

Month	Actual Quantities of Inert C&D Materials Generated Monthly						Actual Quantities of C&D Wastes Generated Monthly				
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Transported to other Projects (Note 2)	Disposed as Public Fill	Imported Fill	Metals	Paper/ cardboard packaging	Plastics (Note 1)	Chemical Waste	Others, e.g. general refuse
	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000m <sup>3</sup> )
Jan	4.2740	0	0	0	4.2740	0	0	0	0	0	0.1046
Feb	0.9927	0	0	0	0.9927	0	0	0	0	0	0.0864
Mar	1.4638	0	0	0	1.4638	0	0	0	0	0	0.0843
Apr	0.1044	0	0	0	0.1044	0	0	0	0	0	0.0688
May	0.9415	0	0	0	0.9415	0	0	0	0	0	0.0745
Jun	0.6075	0	0	0	0.6075	0	0	0	0	0	0.0176
Sub-total	8.3839	0	0	0.000	8.3839	0	0	0	0	0	0.4362
Jul	0.1456	0	0	0	0.1456	0	0	0	0	0	0.0873
Aug	1.4485	0	0	0	1.4485	0	0	0	0	0	0.0383
Sep	0.6110	0	0	0	0.6110	0	0	0	0	0	0.0526
Oct											
Nov											
Dec											
Total	10.5890	0	0	0.000	10.5890	0	0	0	0	0	0.6144

Note: (1) Plastics refer to plastic bottles / containers, plastic sheets / foam from packaging material

(2) "Other Projects" refers to HKBCF Contract No. HY/2013/03

**Monthly Summary of Excavated Marine Sediment for 2019**

Month	a. Estimated Volume of Excavated Marine Sediment Generated	b. Estimate Volume of Accumulated Excavated Marine Sediment Treated	c. Reused in the Contract	d. Estimated Volume of Excavated Marine Sediment Transported to Other Projects (Note 1)	e. Estimated Volume of Treated Excavated Marine Sediment Stored on Site (Unused)
	(in m <sup>3</sup> )	(in m <sup>3</sup> )	(in m <sup>3</sup> )	(in m <sup>3</sup> )	(in m <sup>3</sup> )
Jan	0	0	0	0	0
Feb	0	0	0	0	0
Mar	0	0	0	0	0
Apr	0	0	0	0	0
May	0	0	0	0	0
Jun	0	0	0	0	0
Sub-total	0	0	0	0	0
Jul	0	0	0	0	0
Aug	0	0	0	0	0
Sep	0	0	0	0	0
Oct					
Nov					
Dec					
Total	0	0	0	0	0

Note: (1) "Other Projects" refers to HKBCF Contract No. HY/2013/03. The disposal of excavated marine sediments to allocated dumping site via Contract No. HY/2013/03 has been completed with the last batch disposal on 30 August 2017.

# Appendix F. Environmental Licences and Permits

## Environmental Licences and Permits

Item No.	Type of Permit / Licence	Reference No.	Application Date	Valid from	Valid until	Remark
1	Environmental Permit under EIAO	EP-353/2009/K	24 Mar 2016	11 Apr 2016	N/A	Issued
2	Further Environmental Permit under EIAO	FEP-01/353/2009/K	29 Nov 2018	27 Dec 2018	N/A	Issued
3	Construction Dust Notification (HKBCF Southern Portion)	387156	26 Mar 2015	1 Apr 2015	N/A	Notified
4	Construction Waste Disposal Account	7022038	16 Mar 2015	1 Apr 2015	N/A	Account approved
5	Registration as a Chemical Waste Producer (HKBCF Southern Portion)	Waste Producer Number (WPN): 5213-951-C3952-01	27 Mar 2015	27 Apr 2015	N/A	Registration completed
6	Discharge Licence under WPCO (Works Area WA3)	WT00022316-2015	1 Jun 2015	14 Aug 2015	31 Aug 2020	Issued
7	Discharge Licence under WPCO (HKBCF Works Area)	WT00028782-2017	25 May 2017	19 Jul 2017	31 Jul 2022	Issued
8	Construction Noise Permit	GW-RS0181-19	19 Feb 2019	30 Mar 2019	29 Sep 2019	Expired during reporting month
9	Construction Noise Permit	GW-RS0713-19	19 Jul 2019	30 Sep 2019	4 Mar 2020	Issued



# **Appendix G. Implementation Schedule for Environmental Mitigation Measures (EMIS)**

## Appendix G – Implementation Schedule of Environmental Mitigation Measures (EMIS)

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
<b>Air Quality</b>				
S5.5.6.1	A1	1) The Contractor shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation	All construction sites	V
S5.5.6.2	A2	2) Proper watering of exposed spoil should be undertaken throughout the construction phase: <ul style="list-style-type: none"> <li>• Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;</li> <li>• Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;</li> <li>• A stockpile of dusty material should not be extend beyond the pedestrian barriers, fencing or traffic cones;</li> <li>• The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;</li> <li>• Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;</li> </ul>	All construction sites	V
S5.5.6.2	A2	<ul style="list-style-type: none"> <li>• When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;</li> <li>• The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;</li> <li>• Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;</li> <li>• Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;</li> <li>• Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;</li> <li>• Any skip hoist for material transport should be totally enclosed by impervious sheeting;</li> <li>• Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides</li> </ul>	All construction sites	V
S5.5.6.2	A2	<ul style="list-style-type: none"> <li>• Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed;</li> <li>• Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system; and</li> <li>• Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.</li> </ul>	All construction sites	V
S5.5.6.3	A3	3) The Contractor should undertake proper watering on all exposed spoil (with at least 8 times per day) throughout the construction phase.	All construction sites	V
S5.5.6.4	A4	4) Engineer to incorporate the controlled measures into the Particular Specification (PS) for the civil work. The PS should also draw the Contractor's attention to the relevant latest Practice Notes issued by EPD.	All construction sites	V
S5.5.6.4	A5	5) Implement regular dust monitoring under EM&A programme during the construction stage.	Selected representative dust monitoring station	V (impact air quality monitoring, covered by Contract No. HY/2013/04 (AMS2, AMS3C, AMS7B) & HY/2011/03 (AMS6))

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
S5.5.7.1	A6	<p>The following mitigation measures should be adopted to prevent fugitive dust emissions for concrete batching plant:</p> <ul style="list-style-type: none"> <li>• Loading, unloading, handling, transfer or storage of any dusty materials should be carried out in totally enclosed system;</li> <li>• All dust-laden air or waste gas generated by the process operations should be properly extracted and vented to fabric filtering system to meet the emission limits for TSP;</li> <li>• Vents for all silos and cement/pulverised fuel ash (PFA) weighing scale should be fitted with fabric filtering system;</li> <li>• The materials which may generate airborne dusty emissions should be wetted by water spray system;</li> <li>• All receiving hoppers should be enclosed on three sides up to 3m above unloading point;</li> <li>• All conveyor transfer points should be totally enclosed;</li> <li>• All access and route roads within the premises should be paved and wetted; and</li> <li>• Vehicle cleaning facilities should be provided and used by all concrete trucks before leaving the premises to wash off any dust on the wheels and/or body.</li> </ul>	Selected representative dust monitoring station	N/A
S5.5.2.7	A7	<p>The following mitigation measures should be adopted to prevent fugitive dust emissions at barging point:</p> <ul style="list-style-type: none"> <li>• All road surface within the barging facilities will be paved;</li> <li>• Dust enclosures will be provided for the loading ramp;</li> <li>• Vehicles will be required to pass through designated wheels wash facilities; and</li> <li>• Continuous water spray at the loading points.</li> </ul>	All construction sites	N/A
<b>Construction Noise (Air borne)</b>				
S6.4.10	N1	<p>1) Use of good site practices to limit noise emissions by considering the following:</p> <ul style="list-style-type: none"> <li>• only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;</li> <li>• machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;</li> <li>• plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;</li> <li>• silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;</li> <li>• mobile plant should be sited as far away from NSRs as possible and practicable;</li> <li>• material stockpiles, mobile container site office and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.</li> </ul>	All construction sites	V
S6.4.11	N2	<p>2) Install temporary hoarding located on the site boundaries between noisy construction activities and NSRs. The conditions of the hoardings shall be properly maintained throughout the construction period.</p>	All construction sites	V
S6.4.12	N3	<p>3) Install movable noise barriers (typically density @ 14kg/m<sup>2</sup>), acoustic mat or full enclosure close to noisy plants including air compressor, generators, saw.</p>	For plant items listed in Appendix 6D of the EIA report at all construction sites	V
S6.4.13	N4	<p>4) Select "Quiet plants" which comply with the BS 5228 Part 1 or TM standards.</p>	For plant items listed in Appendix 6D of the EIA report at all construction sites	V
S6.4.14	N5	<p>5) Sequencing operation of construction plants where practicable.</p>	All construction sites where practicable	V
	N6	<p>6) Implement a noise monitoring under EM&amp;A programme.</p>	Selected representative noise monitoring station	V (impact noise monitoring, covered by Contract No. HY/2013/04, was terminated during Sep 2019)
<b>Sediment</b>				
S7.3	S1	<p>1) The requirements as recommended in ETWB TC(W) 34/2002 Management of Dredged/Excavated Sediment shall be included in the Particular Specification as appropriate.</p>	All construction sites	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
<b>Waste Management (Construction Noise)</b>				
S8.3.8	WM1	<p><u>Construction and Demolition Material</u></p> <p>The following mitigation measures should be implemented in handling the waste:</p> <ul style="list-style-type: none"> <li>• Maintain temporary stockpiles and reuse excavated fill material for backfilling and reinstatement;</li> <li>• Carry out on-site sorting;</li> <li>• Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate;</li> <li>• Adopt 'Selective Demolition' technique to demolish the existing structures and facilities with a view to recovering broken concrete effectively for recycling purpose, where possible;</li> <li>• Implement a trip-ticket system for each works contract to ensure that the disposal of C&amp;D materials are properly documented and verified; and</li> <li>• Implement an enhanced Waste Management Plan similar to ETWB TC(W) No. 19/2005 – "Environmental Management on Construction Sites" to encourage on-site sorting of C&amp;D materials and to minimize their generation during the course of construction.</li> <li>• In addition, disposal of the C&amp;D materials onto any sensitive locations such as agricultural lands, etc. should be avoided. The Contractor shall propose the final disposal sites to the Project Proponent and get its approval before implementation.</li> </ul>	All construction sites	V
S8.3.9- S8.3.11	WM2	<p><u>C&amp;D Waste</u></p> <ul style="list-style-type: none"> <li>• Standard formwork or pre-fabrication should be used as far as practicable in order to minimise the arising of C&amp;D materials. The use of more durable formwork or plastic facing for the construction works should be considered. Use of wooden hoardings should not be used, as in other projects. Metal hoarding should be used to enhance the possibility of recycling. The purchasing of construction materials will be carefully planned in order to avoid over ordering and wastage.</li> <li>• The Contractor should recycle as much of the C&amp;D materials as possible on-site. Public fill and C&amp;D waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. Where practicable, concrete and masonry can be crushed and used as fill. Steel reinforcement bar can be used by scrap steel mills. Different areas of the sites should be considered for such segregation and storage.</li> </ul>	All construction sites	V
S8.2.12- S8.3.15	WM3	<p><u>Chemical Waste</u></p> <ul style="list-style-type: none"> <li>• Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handled in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.</li> <li>• Containers used for the storage of chemical wastes should be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed; have a capacity of less than 450 liters unless the specification has been approved by the EPD; and display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the regulation.</li> <li>• The storage area for chemical wastes should be clearly labelled and used solely for the storage of chemical waste; enclosed on at least 3 sides; have an impermeable floor and bunding of sufficient capacity to accommodate 110% of the volume of the largest container or 20 % of the total volume of waste stored in that area, whichever is the greatest; have adequate ventilation; covered to prevent rainfall entering; and arranged so that incompatible materials are adequately separated.</li> <li>• Disposal of chemical waste should be via a licensed waste collector; be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Centre which also offers a chemical waste collection service and can supply the necessary storage containers; or be to a reuser of the waste, under approval from the EPD.</li> </ul>	All construction sites	V
S8.3.16	WM4	<p><u>Sewage</u></p> <ul style="list-style-type: none"> <li>• Adequate numbers of portable toilets should be provided for the workers. The portable toilets should be maintained in a state, which will not deter the workers from utilizing these portable toilets. Night soil should be collected by licensed collectors regularly.</li> </ul>	All construction sites	V
S8.3.17	WM5	<p><u>General Refuse</u></p> <ul style="list-style-type: none"> <li>• General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical wastes.</li> <li>• A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.</li> <li>• Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated and made easily accessible. Separate labelled bins for their</li> </ul>	All construction sites	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		<p>deposit should be provided if feasible.</p> <ul style="list-style-type: none"> <li>• Office wastes can be reduced through the recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered by the Contractor. In addition, waste separation facilities for paper, aluminium cans, plastic bottles etc., should be provided.</li> <li>• Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including reduction, reuse and recycling of wastes.</li> </ul>		
<b>Water Quality (Construction Phase)</b>				
S9.11.1.1	W1	<p><u>Mitigation during the marine works to reduce impacts to within acceptable levels have been recommended and will comprise a series of measures that restrict the method and sequencing of dredging/backfilling, as well as protection measures. Details of the measures are provided below.</u></p> <ul style="list-style-type: none"> <li>• Floating type perimeter silt curtains shall be around the HKBCF site before the commencement of marine works.</li> <li>• Silt curtain shall be fully maintained throughout the works.</li> </ul>	Marine works	N/A
S9.11.1.7	W2	<p><u>Land Works</u></p> <p>General construction activities on land should also be governed by standard good working practice. Specific measures to be written into the works contracts should include:</p> <ul style="list-style-type: none"> <li>• wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters;</li> <li>• sewage effluent and discharges from on-site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the W PCO or collected for disposal offsite. The use of soakaways shall be avoided;</li> <li>• storm drainage shall be directed to storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks;</li> <li>• silt removal facilities, channels and manholes shall be maintained and any deposited silt and grit shall be removed regularly, including specifically at the onset of and after each rainstorm;</li> <li>• temporary access roads should be surfaced with crushed stone or gravel;</li> <li>• rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities;</li> <li>• measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system;</li> <li>• open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms;</li> <li>• manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers;</li> <li>• discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system;</li> <li>• all vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit;</li> <li>• wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain;</li> <li>• the section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel;</li> <li>• wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects;</li> <li>• vehicle and plant servicing areas, vehicle wash bays and lubrication facilities shall be located under roofed areas. The drainage in these covered areas shall be connected to foul sewers via a petrol interceptor in accordance with the requirements of the W PCO or collected for off site disposal;</li> <li>• the Contractors shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately;</li> <li>• waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance;</li> <li>• all fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. The storage areas should be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank; and</li> </ul>	Land-based works areas	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		<ul style="list-style-type: none"> <li>• surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.</li> </ul>		
S9.14	W3	Implement a water quality monitoring programme	At identified monitoring locations	V (impact operational phase water quality monitoring programme, covered by Contract No. HY/2013/04)
<b>Ecology (Construction Phase)</b>				
S10.7	E2	<ul style="list-style-type: none"> <li>• Install silt curtain during the construction.</li> <li>Limit dredging and works fronts.</li> <li>• Good site practices.</li> <li>• Site runoff control.</li> </ul>	Marine works and Land-based works areas	N/A
S10.7	E4	Watering to reduce dust generation; prevention of siltation of freshwater habitats; Site runoff should be desilted, to reduce the potential for suspended sediments, organics and other contaminants to enter streams and standing freshwater	Land-based works areas	V
S10.7	E5	Good site practices, including strictly following the permitted works hours, using quieter machines where practicable, and avoiding excessive lightings during night time	Land-based works areas	V
S10.7	E6	<ul style="list-style-type: none"> <li>• Dolphin Exclusion Zone;</li> <li>• Dolphin watching plan</li> </ul>	Marine works	N/A
S10.7	E7	<ul style="list-style-type: none"> <li>• Decouple compressors and other equipment on working vessels</li> <li>• Avoidance of percussive piling</li> </ul>	Marine works	N/A
S10.7	E8	<ul style="list-style-type: none"> <li>• Control vessel speed</li> <li>• Skipper training</li> <li>• Predefined and regular routes for working vessels; avoid Brother Islands.</li> </ul>	Marine Traffic	N/A
S10.10	E9	<ul style="list-style-type: none"> <li>• Dolphin vessel monitoring</li> </ul>	North Lantau and West Lantau	V (post-construction dolphin monitoring, covered by Contract No. HY/2011/03)
<b>Fisheries</b>				
S11.7	F4	<ul style="list-style-type: none"> <li>• Maritime Oil Spill Response Plan (MOSRP);</li> <li>• Contingency plan.</li> </ul>	HKBCF	V
<b>Landscape &amp; Visual (Detailed Design Phase)</b>				
S14.3.3.1	LV1	<p>General design measures include:</p> <ul style="list-style-type: none"> <li>• Roadside planting and planting along the edge of the HKBCF Island is proposed;</li> <li>• Transplanting of mature trees in good health and amenity value where appropriate and reinstatement of areas disturbed during construction by compensatory hydro-seeding and planting;</li> <li>• Protection measures for the trees to be retained during construction activities;</li> <li>• Optimizing the sizes and spacing of the bridge columns; Fine-tuning the location of the bridge columns to avoid visually-sensitive locations;</li> <li>• Maximizing new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed;</li> <li>• Providing planting area around peripheral of HKBCF for tree planting screening effect;</li> <li>• Providing salt-tolerant native trees along the planter strip at affected seawall and newly reclaimed coastline;</li> <li>• For HKBCF, providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonious atmosphere of the HKBCF; and</li> <li>• Fine-tuning the sizes of the structural members to minimize the bulkiness of buildings and adjustment of building arrangement to minimise disturbance to surrounding vegetation in the HKBCF.</li> </ul>	HKBCF	V
<b>Landscape &amp; Visual (Construction Phase)</b>				
S14.3.3.3	LV2	<p><u>Mitigate both Landscape and Visual Impacts</u></p> <p>G1. Grass-hydroseed bare soil surface and stock pile areas.</p> <p>G2. Add planting strip and automatic irrigation system if appropriate at some portions of bridge footbridge to screen bridge and traffic.</p>	HKBCF	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		<p>G3. Not applicable as this is for HKLR.</p> <p>G4. For HKBCF, providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonious atmosphere of the HKBCF</p> <p>G5. Vegetation reinstatement and upgrading to disturbed areas</p> <p>G6. Maximizing new tree shrub and other vegetation planting to compensate tree felled and vegetation removed</p> <p>G7. Providing planting area around peripheral of HKBCF for tree planting screening effect;</p> <p>G8. Plant salt-tolerant native and shrubs etc along the planter strip at affected seawall.</p> <p>G9. Reserve of loose natural granite rocks for re-use. Provide new coastline to adopt "natural-look" by means of using armour rocks in the form of natural rock materials and planting strip area accommodating screen buffer to enhance "natural-look" of the new coastline.</p>		
S14.3.3.3	LV3	<p><u>Mitigate Visual Impacts</u></p> <p>V1. Minimize time for construction activities during construction period.</p> <p>V2. Provide screen hoarding at the portion of the project site / works areas / storage areas near VSRs who have close low-level views to the Project during HKBCF construction.</p>		V
<b>EM&amp;A</b>				
S15.2.2	EM1	An Independent Environmental Checker needs to be employed as per the EM&A Manual.	All construction sites	V
S15.5 - S15.6	EM2	<p>1) An Environmental Team needs to be employed as per the EM&amp;A Manual.</p> <p>2) Prepare a systematic Environmental Management Plan to ensure effective implementation of the mitigation measures.</p> <p>3) An environmental impact monitoring needs to be implementing by the Environmental Team to ensure all the requirements given in the EM&amp;A Manual are fully complied with.</p>	All construction sites	V
Legend: V = implemented; x = not implemented; N/A = not applicable				

# **Appendix H. Statistics on Environmental Complaints, Notification of Summons and Successful Prosecutions**



## Statistics on Environmental Complaints, Notifications of Summons and Successful Prosecutions

Reporting Period	Complaints	Notifications of Summons	Successful Prosecutions
This reporting period	0	0	0
From commencement date of construction to end of reporting month	11	0	0

# Appendix I. Environmental Site Inspection and Monitoring Schedule

**Impact Environmental Monitoring Schedule for September 2019** by Mott MacDonald monitoring team

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C					AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP
			Dolphin Monitoring Weekly Site Audit			
8						14
			Dolphin Monitoring Weekly Site Audit		AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	
15						21
		Dolphin Monitoring	Weekly Site Audit	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	Water Quality Monitoring	
22						28
			AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C			
	Dolphin Monitoring		Weekly Site Audit			
29						
	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C					

**Notes:**

Air Quality Monitoring Station - AMS2, AMS3C, AMS7B

Noise Monitoring Station - NMS2, NMS3C

WQ - Water Quality Monitoring (impact operational phase, monthly)

CWD - Chinese White Dolphin (post-construction phase, monthly); monitoring conducted and data collected by HZMB HKLR Contract No. HY/2011/03

Weekly Site Audit

Tentative Impact Environmental Monitoring Schedule for October 2019 by Mott MacDonald monitoring team

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5 AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP
6	7	8 Dolphin Monitoring	9 Dolphin Monitoring Weekly Site Audit	10	11 AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP	12
13	14	15	16 Weekly Site Audit	17 AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP	18	19
20	21 Weekly Site Audit	22	23 AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP Water Quality Monitoring Dolphin Monitoring	24	25	26
27	28 Dolphin Monitoring	29 AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP	30 Weekly Site Audit	31		

Notes:

Air Quality Monitoring Station - AMS2, AMS3C, AMS7B

WQ - Water Quality Monitoring (impact operational phase, monthly)

CWD - Chinese White Dolphin (post-construction phase, monthly); monitoring conducted and data collected by HZMB TM-CLKL Contract No. HY/2012/08

Weekly Site Audit

# Appendix J. Calibration Certificates



## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

### SUB-CONTRACTING REPORT

CONTACT	: MR K.W. FAN	WORK ORDER	: <b>HK1864495</b>
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 11-DEC-2018
		DATE OF ISSUE	: 28-DEC-2018
PROJECT	: ----	NO. OF SAMPLES	: 1
		CLIENT ORDER	: ----

#### General Comments

- Sample(s) were received in ambient condition.
- Sample(s) analysed and reported on as received basis.
- Calibration was subcontracted to and analysed by Action United Enviro Services.

#### Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories

Position

Richard Fung

General Manager

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.

ALS Technichem (HK) Pty Ltd  
Part of the ALS Laboratory Group

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Tel. +852 2610 1044 Fax +852 2610 2021 [www.alsglobal.com](http://www.alsglobal.com)

WORK ORDER : HK1864495  
SUB-BATCH : 1  
CLIENT : ENVIROTECH SERVICES CO.  
PROJECT : ---



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK1864495-001	S/N: 235780	Equipments	11-Dec-2018	S/N: 235780

## Equipment Verification Report (TSP)

### Equipment Calibrated:

Type: Laser Dust monitor  
 Manufacturer: Sibata LD-3B  
 Serial No. 235780  
 Equipment Ref: Nil  
 Job Order HK1864495

### Standard Equipment:

Standard Equipment: Higher Volume Sampler  
 Location & Location ID: AUES office (calibration room)  
 Equipment Ref: HVS 018  
 Last Calibration Date: 21 September 2018

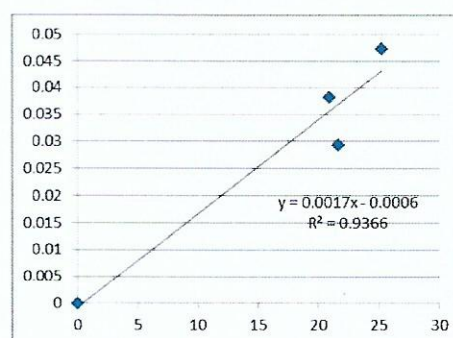
### Equipment Verification Results:

Testing Date: 17&18 December 2018

Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m <sup>3</sup> (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr03min	12:20 ~ 14:23	18.0	1022.2	0.038	2557	20.9
2hr14min	09:11 ~ 11:25	18.1	1022.2	0.029	2891	21.6
2hr14min	11:33 ~ 13:47	18.1	1022.2	0.047	3379	25.3

### Linear Regression of Y or X

Slope (K-factor): 0.0017  
 Correlation Coefficient 0.9678  
 Date of Issue 28 December 2018



### Remarks:

- Strong** Correlation ( $R > 0.8$ )
  - Factor 0.0017 should be applied for TSP monitoring
- \*if  $R < 0.5$ , repair or re-verification is required for the equipment

Operator : Fai So Signature :  Date : 28 December 2018

QC Reviewer : Ben Tam Signature :  Date : 28 December 2018



## TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location :	Gold King Industrial Building, Kwai Chung	Date of Calibration: 21-Sep-18
Location ID :	Calibration Room	Next Calibration Date: 21-Dec-18

### CONDITIONS

Sea Level Pressure (hPa)	1011.6	Corrected Pressure (mm Hg)	758.7
Temperature (°C)	29.2	Temperature (K)	302

### CALIBRATION ORIFICE

Make->	TISCH	Qstd Slope ->	2.02017
Model->	5025A	Qstd Intercept ->	-0.03691
Calibration Date->	13-Feb-18	Expiry Date->	13-Feb-19

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.4	5.4	10.8	1.632	56	55.56	Slope = 37.2548 Intercept = -5.5606 Corr. coeff. = 0.9970
13	4.3	4.3	8.6	1.459	48	47.62	
10	3.3	3.3	6.6	1.280	43	42.66	
8	2.1	2.1	4.2	1.025	34	33.73	
5	1.3	1.3	2.6	0.810	24	23.81	

**Calculations :**

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K )

Pstd = actual pressure during calibration ( mm Hg )

**For subsequent calculation of sampler flow:**

$$1/m(( I )[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

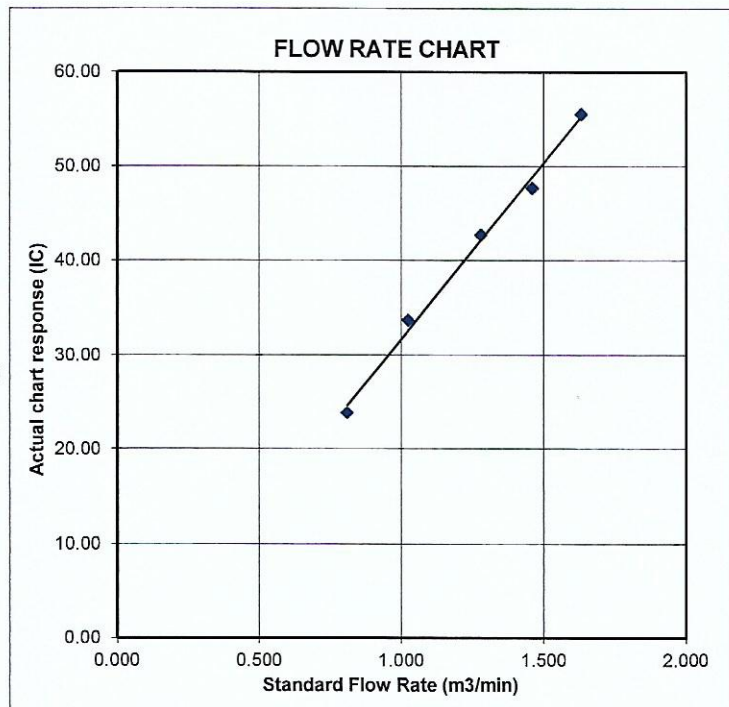
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



# Certificate of Calibration

Calibration Certification Information			
Cal. Date: February 13, 2018	Rootsmeter S/N: 438320	Ta: 293	°K
Operator: Jim Tisch		Pa: 763.3	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: <b>1612</b>		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3970	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8900	7.9	5.00
4	7	8	1	0.8440	8.7	5.50
5	9	10	1	0.7010	12.6	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H (Ta/Pa)}$ (y-axis)
1.0172	0.7281	1.4293	0.9958	0.7128	0.8762
1.0130	1.0130	2.0213	0.9917	0.9917	1.2392
1.0109	1.1358	2.2599	0.9896	1.1120	1.3854
1.0098	1.1964	2.3702	0.9886	1.1713	1.4530
1.0046	1.4331	2.8586	0.9835	1.4030	1.7524
<b>QSTD</b>	<b>m=</b>	<b>2.02017</b>	<b>QA</b>	<b>m=</b>	<b>1.26500</b>
	<b>b=</b>	<b>-0.03691</b>		<b>b=</b>	<b>-0.02263</b>
	<b>r=</b>	<b>0.99988</b>		<b>r=</b>	<b>0.99988</b>

Calculations	
Vstd= $\Delta Vol \left( \frac{Pa - \Delta P}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)$	Va= $\Delta Vol \left( \frac{Pa - \Delta P}{Pa} \right)$
Qstd= $Vstd / \Delta Time$	Qa= $Va / \Delta Time$
For subsequent flow rate calculations:	
Qstd= $1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa= $1/m \left( \left( \sqrt{\Delta H (Ta/Pa)} \right) - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH: calibrator manometer reading (in H2O)	
ΔP: rootsmeter manometer reading (mm Hg)	
Ta: actual absolute temperature (°K)	
Pa: actual barometric pressure (mm Hg)	
b: intercept	
m: slope	

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

# ALS Technichem (HK) Pty Ltd



## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

### SUB-CONTRACTING REPORT

CONTACT	: MR K.W. FAN	WORK ORDER	: <b>HK1864496</b>
CLIENT	: ENVIROTECH SERVICES CO.		
ADDRESS	: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 11-DEC-2018
		DATE OF ISSUE	: 28-DEC-2018
PROJECT	: ----	NO. OF SAMPLES	: 1
		CLIENT ORDER	: ----

#### General Comments

- Sample(s) were received in ambient condition.
- Sample(s) analysed and reported on as received basis.
- Calibration was subcontracted to and analysed by Action United Enviro Services.

#### Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories

Position

Richard Fung

General Manager

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.

**ALS Technichem (HK) Pty Ltd**  
Part of the **ALS Laboratory Group**

11/F Chung Shun Knitting Centre 1 - 3 Wing Yip Street Kwai Chung N.T. Hong Kong  
Tel. +852 2610 1044 Fax. +852 2610 2021 [www.alsglobal.com](http://www.alsglobal.com)

WORK ORDER : HK1864496  
SUB-BATCH : 1  
CLIENT : ENVIROTECH SERVICES CO.  
PROJECT : ----



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK1864496-001	S/N: 6Z7784	Equipments	11-Dec-2018	S/N: 6Z7784

## Equipment Verification Report (TSP)

### Equipment Calibrated:

Type: Laser Dust monitor  
Manufacturer: Sibata LD-3B  
Serial No. 6Z7784  
Equipment Ref: Nil  
Job Order HK1864496

### Standard Equipment:

Standard Equipment: Higher Volume Sampler  
Location & Location ID: AUES office (calibration room)  
Equipment Ref: HVS 018  
Last Calibration Date: 21 September 2018

### Equipment Verification Results:

Testing Date: 17&18 December 2018

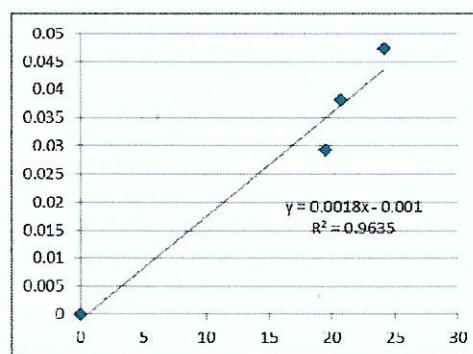
Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m <sup>3</sup> (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr03min	12:20 ~ 14:23	18.0	1022.2	0.038	2533	20.7
2hr14min	09:11 ~ 11:25	18.1	1022.2	0.029	2601	19.4
2hr14min	11:33 ~ 13:47	18.1	1022.2	0.047	3232	24.2

### Linear Regression of Y or X

Slope (K-factor): 0.0018  
Correlation Coefficient 0.9816  
Date of Issue 28 December 2018

### Remarks:

- Strong** Correlation ( $R > 0.8$ )
  - Factor 0.0018 should be applied for TSP monitoring
- \*If  $R < 0.5$ , repair or re-verification is required for the equipment



Operator: Fai So Signature:  Date: 28 December 2018

QC Reviewer: Ben Tam Signature:  Date: 28 December 2018

## TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location :	Gold King Industrial Building, Kwai Chung	Date of Calibration: 21-Sep-18
Location ID :	Calibration Room	Next Calibration Date: 21-Dec-18

### CONDITIONS

Sea Level Pressure (hPa)	1011.6	Corrected Pressure (mm Hg)	758.7
Temperature (°C)	29.2	Temperature (K)	302

### CALIBRATION ORIFICE

Make->	TISCH	Qstd Slope ->	2.02017
Model->	5025A	Qstd Intercept ->	-0.03691
Calibration Date->	13-Feb-18	Expiry Date->	13-Feb-19

### CALIBRATION

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC corrected	LINEAR REGRESSION
18	5.4	5.4	10.8	1.632	56	55.56	Slope = 37.2548 Intercept = -5.5606 Corr. coeff. = 0.9970
13	4.3	4.3	8.6	1.459	48	47.62	
10	3.3	3.3	6.6	1.280	43	42.66	
8	2.1	2.1	4.2	1.025	34	33.73	
5	1.3	1.3	2.6	0.810	24	23.81	

#### Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

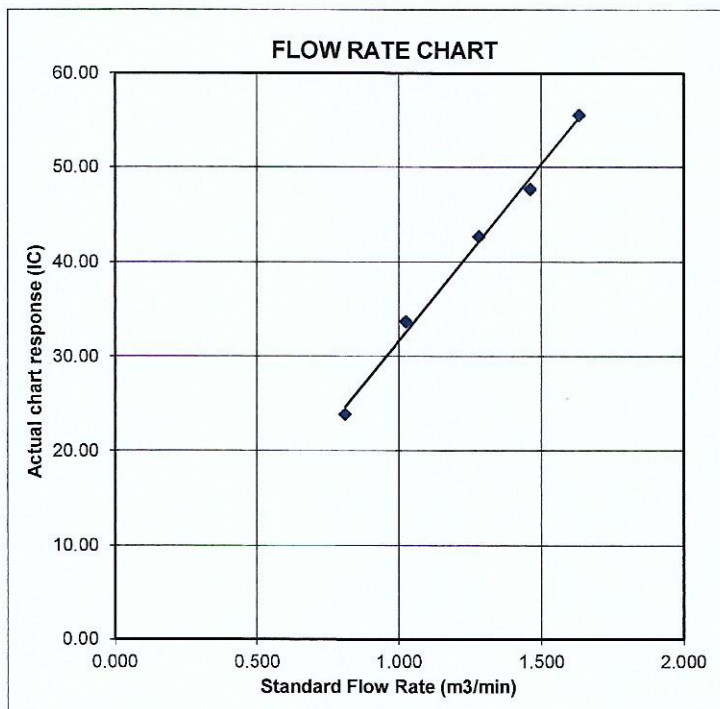
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate  
 IC = corrected chart responses  
 I = actual chart response  
 m = calibrator Qstd slope  
 b = calibrator Qstd intercept  
 Ta = actual temperature during calibration ( deg K )  
 Pstd = actual pressure during calibration ( mm Hg )

#### For subsequent calculation of sampler flow:

$$1/m((I) [\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

m = sampler slope  
 b = sampler intercept  
 I = chart response  
 Tav = daily average temperature  
 Pav = daily average pressure



# Certificate of Calibration

Calibration Certification Information			
Cal. Date: February 13, 2018	Rootsmeter S/N: 438320	Ta: 293	°K
Operator: Jim Tisch		Pa: 763.3	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: <b>1612</b>		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3970	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8900	7.9	5.00
4	7	8	1	0.8440	8.7	5.50
5	9	10	1	0.7010	12.6	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H (Ta/Pa)}$ (y-axis)
1.0172	0.7281	1.4293	0.9958	0.7128	0.8762
1.0130	1.0130	2.0213	0.9917	0.9917	1.2392
1.0109	1.1358	2.2599	0.9896	1.1120	1.3854
1.0098	1.1964	2.3702	0.9886	1.1713	1.4530
1.0046	1.4331	2.8586	0.9835	1.4030	1.7524
<b>QSTD</b>	m=	<b>2.02017</b>	<b>QA</b>	m=	<b>1.26500</b>
	b=	<b>-0.03691</b>		b=	<b>-0.02263</b>
	r=	<b>0.99988</b>		r=	<b>0.99988</b>

Calculations			
Vstd=	$\Delta Vol \left( \frac{Pa - \Delta P}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)$	Va=	$\Delta Vol \left( \frac{Pa - \Delta P}{Pa} \right)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime
For subsequent flow rate calculations:			
Qstd=	$1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa=	$1/m \left( \left( \sqrt{\Delta H (Ta/Pa)} \right) - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

**ENVIROTECH SERVICE CO.**

High-Volume TSP Sampler  
5-Point Calibration Record

Location : AMS2 (Tung Chung Pier)  
Calibrated by : P.F.Yeung  
Date : 18/08/2019

Sampler

Model : TE-5170  
Serial Number : S/N 1060

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454  
Service Date : 25 February 2019  
Slope (m) : 2.07076  
Intercept (b) : -0.02917  
Correlation Coefficient(r) : 1.00000

Standard Condition

Pstd (hpa) : 1013  
Tstd (K) : 298.18

Calibration Condition


Pa (hpa) : 1006  
Ta (K) : 302

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	12.0	3.429	1.670	55	54.45
2   13 holes	9.4	3.035	1.480	50	49.50
3   10 holes	6.6	2.543	1.242	45	44.55
4   7 holes	4.5	2.100	1.028	37	36.63
5   5 holes	2.4	1.534	0.755	30	29.70

Notes:  $Z = \sqrt{dH(Pa/Pstd)(Tstd/Ta)}$ ,  $X = Z/m - b$ ,  $Y(\text{Corrected Flow}) = IC * \{\sqrt{Pa/Pstd}(Tstd/Ta)\}$

Sampler Calibration Relationship

Slope(m): 27.333      Intercept(b): 9.206      Correlation Coefficient(r): 0.9967

Checked by:   
Magnum Fan

Date: 21/08/2019



**ENVIROTECH SERVICE CO.**

High-Volume TSP Sampler  
5-Point Calibration Record

Location : AMS3C (Ying Tung Estate)  
Calibrated by : P.F.Yeung  
Date : 18/08/2019

Sampler

Model : TE-5170  
Serial Number : S/N 3977

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454  
Service Date : 25 February 2019  
Slope (m) : 2.07076  
Intercept (b) : -0.02917  
Correlation Coefficient(r) : 1.00000

Standard Condition

Pstd (hpa) : 1013  
Tstd (K) : 298.18

Calibration Condition


Pa (hpa) : 1006  
Ta (K) : 302

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	12.0	3.429	1.670	54	53.46
2   13 holes	9.2	3.003	1.464	50	49.50
3   10 holes	6.7	2.562	1.251	45	44.55
4   7 holes	4.5	2.100	1.028	38	37.62
5   5 holes	2.4	1.534	0.755	28	27.72

Notes:  $Z = \sqrt{dH(Pa/Pstd)(Tstd/Ta)}$ ,  $X = Z/m - b$ ,  $Y(\text{Corrected Flow}) = IC * \{\sqrt{Pa/Pstd}(Tstd/Ta)\}$

Sampler Calibration Relationship

Slope(m): 28.153      Intercept(b): 7.834      Correlation Coefficient(r): 0.9917

Checked by:   
Magnum Fan

Date: 21/08/2019

**ENVIROTECH SERVICE CO.**

High-Volume TSP Sampler  
5-Point Calibration Record

Location : AMS7B  
Calibrated by : P.F.Yeung  
Date : 18/08/2019

Sampler

Model : TE-5170  
Serial Number : S/N 3976

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454  
Service Date : 25 February 2019  
Slope (m) : 2.07076  
Intercept (b) : -0.02917  
Correlation Coefficient(r) : 1.00000

Standard Condition

Pstd (hpa) : 1013  
Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1006  
Ta (K) : 302

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC (chart)	Y (corrected)
1   18 holes	11.8	3.400	1.656	54	53.46
2   13 holes	9.2	3.003	1.464	49	48.51
3   10 holes	6.5	2.524	1.233	44	43.56
4   7 holes	4.2	2.029	0.994	37	36.63
5   5 holes	2.5	1.565	0.770	30	29.70

Notes:  $Z = \sqrt{dH(Pa/Pstd)(Tstd/Ta)}$ ,  $X = Z/m - b$ ,  $Y(\text{Corrected Flow}) = IC * \{\sqrt{Pa/Pstd}(Tstd/Ta)\}$

Sampler Calibration Relationship

Slope(m): 26.506      Intercept(b): 9.941      Correlation Coefficient(r): 0.9977

Checked by:   
Magnum Fan

Date: 21/08/2019



RECALIBRATION

DUE DATE:

February 25, 2020

# Certificate of Calibration

## Calibration Certification Information

Cal. Date: February 25, 2019      Rootsmeter S/N: 438320      Ta: 294      °K  
 Operator: Jim Tisch      Pa: 762.0      mm Hg  
 Calibration Model #: TE-5025A      Calibrator S/N: 2454

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4400	3.2	2.00
2	3	4	1	1.0200	6.4	4.00
3	5	6	1	0.9120	7.9	5.00
4	7	8	1	0.8700	8.8	5.50
5	9	10	1	0.7180	12.8	8.00

## Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis)
1.0120	0.7028	1.4257	0.9958	0.6915	0.8784
1.0077	0.9880	2.0162	0.9916	0.9722	1.2423
1.0057	1.1028	2.2542	0.9896	1.0851	1.3889
1.0045	1.1546	2.3642	0.9885	1.1362	1.4567
0.9992	1.3916	2.8513	0.9832	1.3694	1.7569
<b>QSTD</b>	<b>m= 2.07076</b>		<b>QA</b>	<b>m= 1.29667</b>	
	<b>b= -0.02917</b>			<b>b= -0.01797</b>	
	<b>r= 1.00000</b>			<b>r= 1.00000</b>	

## Calculations

$Vstd = \Delta Vol \left( \frac{Pa - \Delta P}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)$	$Va = \Delta Vol \left( \frac{Pa - \Delta P}{Pa} \right)$
$Qstd = Vstd / \Delta Time$	$Qa = Va / \Delta Time$
For subsequent flow rate calculations:	
$Qstd = 1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$	$Qa = 1/m \left( \left( \sqrt{\Delta H \left( \frac{Ta}{Pa} \right)} \right) - b \right)$

## Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
<b>Key</b>	
ΔH: calibrator manometer reading (in H2O)	
ΔP: rootsmeter manometer reading (mm Hg)	
Ta: actual absolute temperature (°K)	
Pa: actual barometric pressure (mm Hg)	
b: intercept	
m: slope	

## RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

**ENVIROTECH SERVICES CO.**

**Calibration Report of Wind Meter**

Date of Calibration : 24 July 2019

Brand of Test Meter: Davis

Model: Vantage Pro 2 ( s/n: BB180328020)

Location : AMS3C

Procedures :

- 1. Wind Still Test: The wind speed sensor was hold by hand until it keep still
- 2.Wind Speed Test: The wind meter was on-site calibrated against the Anemometer
- 3.Wind Direction Test : The wind meter was on-site calibrated against the marine compass at four directions

Results:

Wind Still Test


Wind Speed (m/s)
0.00


Wind Speed Test

Davis (m/s)	Anemometer (m/s)
1.3	1.4
2.2	1.9
4.5	5.1

Wind Direction Test

Davis (o)	Marine Compass (o)
271	270
1	0
89	90
180	180

Calibrated by:   
Yeung Ping Fai  
(Technical Officer)

Checked by :   
Ho Kam Fat  
(Senior Technical Officer)



輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

# Certificate of Calibration

## 校正證書

Certificate No. : C193443

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC19-1283)

Date of Receipt / 收件日期 : 21 June 2019

Description / 儀器名稱 : Anemometer

Manufacturer / 製造商 : Lutron

Model No. / 型號 : AM-4201

Serial No. / 編號 : AF.27513

Supplied By / 委託者 : Envirotech Services Co.

Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,  
New Territories, Hong Kong

### TEST CONDITIONS / 測試條件

Temperature / 溫度 :  $(23 \pm 2)^{\circ}\text{C}$

Relative Humidity / 相對濕度 :  $(50 \pm 25)\%$

Line Voltage / 電壓 : ---

### TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期 : 2 July 2019

### TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.

The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- Testo Industrial Services GmbH, Germany

Tested By

測試

T F Lee

Assistant Engineer

Certified By

核證

H C Chan

Engineer

Date of Issue

簽發日期

5 July 2019

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗室書面批准。

Sun Creation Engineering Limited - Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

輝創工程有限公司 - 校正及檢測實驗室

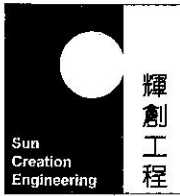
c/o 香港新界屯門興安里一號四樓

Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com



# Certificate of Calibration

## 校正證書

Certificate No. : C193443  
證書編號

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.
- The results presented are the mean of 10 measurements at each calibration point.
- Test equipment :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
CL386	Multi-function Measuring Instrument	S16493

4. Test procedure : MA130N.

5. Results :

### Air Velocity

Applied Value (m/s)	UUT Reading (m/s)	Measured Correction		
		Value (m/s)	Measurement Uncertainty	
			Expanded Uncertainty (m/s)	Coverage Factor
2.0	1.8	+0.2	0.2	2.0
4.0	3.8	+0.2	0.3	2.0
6.0	5.8	+0.2	0.3	2.0
8.1	7.9	+0.2	0.3	2.0
10.1	10.0	+0.1	0.4	2.0

Remarks : - The Measured Corrections are defined as :  
Value = Applied Value - UUT Reading

- The expanded uncertainties are for a level of confidence of 95 %.

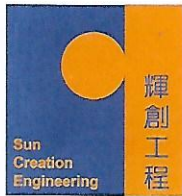
### Note :

Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗室書面批准。



輝創工程有限公司

Sun Creation Engineering Limited

Calibration & Testing Laboratory

# Certificate of Calibration 校正證書

Certificate No. : C185974

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC18-2206)      Date of Receipt / 收件日期 : 29 October 2018

Description / 儀器名稱 : Sound Level Meter

Manufacturer / 製造商 : Rion

Model No. / 型號 : NL-52

Serial No. / 編號 : 00643049

Supplied By / 委託者 : Envirotech Services Co.

Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,  
New Territories, Hong Kong

## TEST CONDITIONS / 測試條件

Temperature / 溫度 :  $(23 \pm 2)^{\circ}\text{C}$

Relative Humidity / 相對濕度 :  $(50 \pm 25)\%$

Line Voltage / 電壓 : ---

## TEST SPECIFICATIONS / 測試規範

Calibration

DATE OF TEST / 測試日期 : 4 November 2018

## TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.

The results do not exceed manufacturer's specification. (after adjustment)

The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- The Bruel & Kjaer Calibration Laboratory, Denmark
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

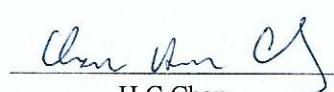
Tested By :

測試

  
K C Lee  
Engineer

Certified By :

核證

  
H C Chan  
Engineer

Date of Issue :

簽發日期

7 November 2018

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗所書面批准。

Sun Creation Engineering Limited - Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

輝創工程有限公司 - 校正及檢測實驗室

c/o 香港新界屯門興安里一號四樓

Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com

# Certificate of Calibration

## 校正證書

Certificate No. : C185974  
證書編號

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours, and switched on to warm up for over 10 minutes before the commencement of the test.
2. Self-calibration using the internal standard (After Adjustment) was performed before the test 6.1.1.2 to 6.3.2.
3. The results presented are the mean of 3 measurements at each calibration point.
4. Test equipment :

Equipment ID	Description	Certificate No.
CL280	40 MHz Arbitrary Waveform Generator	C180024
CL281	Multifunction Acoustic Calibrator	CDK1806821

5. Test procedure : MA101N.

6. Results :

- 6.1 Sound Pressure Level

- 6.1.1 Reference Sound Pressure Level

- 6.1.1.1 Before Adjustment

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 130	L <sub>A</sub>	A	Fast	94.00	1	* 98.6	± 1.1

\* Out of IEC 61672 Class 1 Spec.

- 6.1.1.2 After Adjustment

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 130	L <sub>A</sub>	A	Fast	94.00	1	94.0	± 1.1

- 6.1.2 Linearity

UUT Setting				Applied Value		UUT Reading (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	
30 - 130	L <sub>A</sub>	A	Fast	94.00	1	94.0 (Ref.)
				104.00		104.0
				114.00		114.0

IEC 61672 Class 1 Spec. : ± 0.6 dB per 10 dB step and ± 1.1 dB for overall different.

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗所書面批准。



# Certificate of Calibration

## 校正證書

Certificate No. : C185974  
證書編號

### 6.2 Time Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
30 - 130	L <sub>A</sub>	A	Fast	94.00	1	94.0	Ref.
			Slow			94.0	± 0.3

### 6.3 Frequency Weighting

#### 6.3.1 A-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L <sub>A</sub>	A	Fast	94.00	63 Hz	67.7	-26.2 ± 1.5
					125 Hz	77.8	-16.1 ± 1.5
					250 Hz	85.3	-8.6 ± 1.4
					500 Hz	90.7	-3.2 ± 1.4
					1 kHz	94.0	Ref.
					2 kHz	95.2	+1.2 ± 1.6
					4 kHz	95.0	+1.0 ± 1.6
					8 kHz	92.9	-1.1 (+2.1 ; -3.1)
					12.5 kHz	89.6	-4.3 (+3.0 ; -6.0)

#### 6.3.2 C-Weighting

UUT Setting				Applied Value		UUT Reading (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.		
30 - 130	L <sub>C</sub>	C	Fast	94.00	63 Hz	93.1	-0.8 ± 1.5
					125 Hz	93.8	-0.2 ± 1.5
					250 Hz	94.0	0.0 ± 1.4
					500 Hz	94.0	0.0 ± 1.4
					1 kHz	94.0	Ref.
					2 kHz	93.8	-0.2 ± 1.6
					4 kHz	93.2	-0.8 ± 1.6
					8 kHz	91.0	-3.0 (+2.1 ; -3.1)
					12.5 kHz	87.6	-6.2 (+3.0 ; -6.0)

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗室所書面批准。



# Certificate of Calibration

## 校正證書

Certificate No. : C185974  
證書編號

- Remarks : - UUT Microphone Model No. : UC-59 & S/N : 12128
- Mfr's Spec. : IEC 61672 Class 1
- Uncertainties of Applied Value :
- |        |                  |                          |
|--------|------------------|--------------------------|
| 94 dB  | : 63 Hz - 125 Hz | : ± 0.35 dB              |
|        | 250 Hz - 500 Hz  | : ± 0.30 dB              |
|        | 1 kHz            | : ± 0.20 dB              |
|        | 2 kHz - 4 kHz    | : ± 0.35 dB              |
|        | 8 kHz            | : ± 0.45 dB              |
|        | 12.5 kHz         | : ± 0.70 dB              |
| 104 dB | : 1 kHz          | : ± 0.10 dB (Ref. 94 dB) |
| 114 dB | : 1 kHz          | : ± 0.10 dB (Ref. 94 dB) |
- The uncertainties are for a confidence probability of not less than 95 %.

Note :

Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

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# Certificate of Calibration 校正證書

Certificate No. : C192695  
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC19-0995)      Date of Receipt / 收件日期 : 17 May 2019  
Description / 儀器名稱 : Precision Acoustic Calibrator  
Manufacturer / 製造商 : LARSON DAVIS  
Model No. / 型號 : CAL200  
Serial No. / 編號 : 11333  
Supplied By / 委託者 : Envirotech Services Co.  
Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,  
New Territories, Hong Kong

## TEST CONDITIONS / 測試條件

Temperature / 溫度 :  $(23 \pm 2)^{\circ}\text{C}$       Relative Humidity / 相對濕度 :  $(50 \pm 25)\%$   
Line Voltage / 電壓 : ---

## TEST SPECIFICATIONS / 測試規範

Calibration check

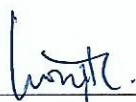
DATE OF TEST / 測試日期 : 26 May 2019

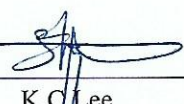
## TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.  
The results do not exceed manufacturer's specification.  
The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via :

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- The Bruel & Kjaer Calibration Laboratory, Denmark
- Agilent Technologies / Keysight Technologies
- Fluke Everett Service Center, USA

Tested By :   
測試 : \_\_\_\_\_  
H T Wong  
Technical Officer

Certified By :   
核證 : \_\_\_\_\_  
K O Lee  
Engineer

Date of Issue : 29 May 2019  
簽發日期

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

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# Certificate of Calibration

## 校正證書

Certificate No. : C192695  
證書編號

- The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.
- The results presented are the mean of 3 measurements at each calibration point.
- Test equipment :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
CL130	Universal Counter	C183775
CL281	Multifunction Acoustic Calibrator	CDK1806821
TST150A	Measuring Amplifier	C181288

- Test procedure : MA100N.

- Results :

### 5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Mfr's Spec. (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	93.8	± 0.2	± 0.2
114 dB, 1 kHz	113.8		

### 5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Spec.	Uncertainty of Measured Value (Hz)
1	1.000	1 kHz ± 1 %	± 1

Remark : The uncertainties are for a confidence probability of not less than 95 %.

Note :

Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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Sun Creation Engineering Limited – Calibration & Testing Laboratory

c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong

輝創工程有限公司 – 校正及檢測實驗室

c/o 香港新界屯門興安里一號四樓

Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com



專業化驗有限公司  
QUALITY PRO TEST-CONSULT LIMITED

Unit 10, 14/F, Wah Wai Centre, 38-40 Au Pui Wan St., Fotan, Hong Kong  
Email: info@qualityprotest.com; Website: www.qualityprotest.com  
Tel: (852) 3956 8717; Fax: (852) 3956 3928

## REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AI080035  
Date of Issue : 06 Aug, 2019  
Page No. : 1 of 2

### PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.  
Flat 2207, Yu Fun House,  
Yu Chui Court, Shatin  
New Territories, Hong Kong  
Attn: Mr. Thomas WONG

### PART B – DESCRIPTION

Name of Equipment : YSI 6920V2 (Multi-Parameters)  
Manufacturer : YSI (a xylem brand)  
Serial Number : 18A104824  
Date of Received : Aug 02, 2019  
Date of Calibration : Aug 02, 2019  
Date of Next Calibration<sup>(a)</sup> : Nov 02, 2019

### PART C – REFERENCE METHODS/ DOCUMENTS FOR THE CALIBRATION

<u>Parameter</u>	<u>Reference Method</u>
pH at 25°C	APHA 21e 4500-H <sup>+</sup> B
Dissolved Oxygen	APHA 21e 4500-O G
Conductivity at 25°C	APHA 21e 2510 B
Salinity	APHA 21e 2520 B
Turbidity	APHA 21e 2130 B
Temperature	Section 6 of international Accreditation New Zealand Technical Guide no. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

### PART D – CALIBRATION RESULTS<sup>(b,c)</sup>

#### (1) pH at 25°C

Target (pH unit)	Displayed Reading <sup>(d)</sup> (pH Unit)	Tolerance <sup>(e)</sup> (pH Unit)	Results
4.00	4.01	0.01	Satisfactory
7.42	7.44	0.02	Satisfactory
10.01	10.00	-0.01	Satisfactory

Tolerance of pH should be less than  $\pm 0.20$  (pH unit)

#### (2) Temperature


Reading of Ref. thermometer (°C)	Displayed Reading (°C)	Tolerance (°C)	Results
11.5	11.4	-0.1	Satisfactory
26.0	25.9	-0.1	Satisfactory
51.5	52.0	0.5	Satisfactory

Tolerance limit of temperature should be less than  $\pm 2.0$  (°C)

~ CONTINUED ON NEXT PAGE ~

#### Remark(s): -

- <sup>(a)</sup> The "Date of Next Calibration" is recommended according to best practice principals as practiced by QPT or quoted from relevant international standards.  
<sup>(b)</sup> The results relate only to the calibrated equipment as received  
<sup>(c)</sup> The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.  
<sup>(d)</sup> "Displayed Reading" denotes the figure shown on item under calibration/ checking regardless of equipment precision or significant figures.  
<sup>(e)</sup> The "Tolerance Limit" mentioned is referenced to YSI product specifications.

  
LEE Chun-ning, Desmond  
Senior Chemist



## REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AI080035  
Date of Issue : 06 Aug, 2019  
Page No. : 2 of 2

### PART D – CALIBRATION RESULTS (Cont'd)

#### (3) Dissolved Oxygen

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)	Results
0.01	0.26	0.25	Satisfactory
1.68	1.82	0.14	Satisfactory
4.52	4.83	0.21	Satisfactory
7.84	8.04	0.20	Satisfactory

Tolerance limit of dissolved oxygen should be less than  $\pm 0.50$  (mg/L)

#### (4) Conductivity at 25°C

Conc. of KCl (M)	Expected Reading ( $\mu\text{S}/\text{cm}$ )	Displayed Reading ( $\mu\text{S}/\text{cm}$ )	Tolerance (%)	Results
0.001	146.9	144.3	-1.8	Satisfactory
0.01	1412	1394	-1.3	Satisfactory
0.1	12890	12677	-1.7	Satisfactory
0.5	58670	58642	0.0	Satisfactory
1.0	111900	112012	0.1	Satisfactory

Tolerance limit of conductivity should be less than  $\pm 10.0$  (%)

#### (5) Salinity

Expected Reading (g/L)	Displayed Reading (g/L)	Tolerance (%)	Results
10	10.06	0.6	Satisfactory
20	20.22	1.1	Satisfactory
30	30.17	0.6	Satisfactory

Tolerance limit of salinity should be less than  $\pm 10.0$  (%)

#### (6) Turbidity

Expected Reading (NTU)	Displayed Reading <sup>(1)</sup> (NTU)	Tolerance <sup>(2)</sup> (%)	Results
0	0.01	--	Satisfactory
10	10.04	0.4	Satisfactory
20	20.09	0.4	Satisfactory
100	100.19	0.2	Satisfactory
800	801.44	0.2	Satisfactory

Tolerance limit of turbidity should be less than  $\pm 10.0$  (%)

~ END OF REPORT ~

#### Remark(s): -

<sup>(1)</sup> "Displayed Reading" presents the figures shown on item under calibration/ checking regardless of equipment precision or significant figures.

<sup>(2)</sup> The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.



# REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AI080036  
 Date of Issue : 06 Aug, 2019  
 Page No. : 1 of 2

## PART A – CUSTOMER INFORMATION

Enovative Environmental Service Ltd.  
 Flat 2207, Yu Fun House,  
 Yu Chui Court, Shatin  
 New Territories, Hong Kong  
 Attn: Mr. Thomas WONG

## PART B – DESCRIPTION

Name of Equipment : YSI 6920V2 (Multi-Parameters)  
 Manufacturer : YSI (a xylem brand)  
 Serial Number : 17H105557  
 Date of Received : Aug 02, 2019  
 Date of Calibration : Aug 02, 2019  
 Date of Next Calibration<sup>(a)</sup> : Nov 02, 2019

## PART C – REFERENCE METHODS/ DOCUMENTS FOR THE CALIBRATION

Parameter	Reference Method
pH at 25°C	APHA 21e 4500-H <sup>+</sup> B
Dissolved Oxygen	APHA 21e 4500-O G
Conductivity at 25°C	APHA 21e 2510 B
Salinity	APHA 21e 2520 B
Turbidity	APHA 21e 2130 B
Temperature	Section 6 of international Accreditation New Zealand Technical Guide no. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

## PART D – CALIBRATION RESULTS<sup>(b,c)</sup>

### (1) pH at 25°C

Target (pH unit)	Displayed Reading <sup>(d)</sup> (pH Unit)	Tolerance <sup>(e)</sup> (pH Unit)	Results
4.00	3.98	-0.02	Satisfactory
7.42	7.40	-0.02	Satisfactory
10.01	10.01	0.00	Satisfactory

Tolerance of pH should be less than ±0.20 (pH unit)

### (2) Temperature


Reading of Ref. thermometer (°C)	Displayed Reading (°C)	Tolerance (°C)	Results
11.5	11.3	-0.2	Satisfactory
26.0	25.9	-0.1	Satisfactory
51.5	52.0	0.5	Satisfactory

Tolerance limit of temperature should be less than ±2.0 (°C)

~ CONTINUED ON NEXT PAGE ~

#### Remark(s): -

- <sup>(a)</sup> The "Date of Next Calibration" is recommended according to best practice principals as practiced by QPT or quoted from relevant international standards.  
<sup>(b)</sup> The results relate only to the calibrated equipment as received  
<sup>(c)</sup> The performance of the equipment stated in this report is checked with independent reference material and results compared against a calibrated secondary source.  
<sup>(d)</sup> "Displayed Reading" denotes the figure shown on item under calibration/ checking regardless of equipment precision or significant figures.  
<sup>(e)</sup> The "Tolerance Limit" mentioned is referenced to YSI product specifications.

  
 LEE Chun-ning, Desmond  
 Senior Chemist



## REPORT OF EQUIPMENT PERFORMANCE CHECK/ CALIBRATION

Report No. : AI080036  
Date of Issue : 06 Aug, 2019  
Page No. : 2 of 2

### PART D – CALIBRATION RESULTS (Cont'd)

#### (3) Dissolved Oxygen

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)	Results
0.01	0.27	0.26	Satisfactory
1.68	1.75	0.07	Satisfactory
4.52	4.81	0.29	Satisfactory
7.84	8.00	0.16	Satisfactory

Tolerance limit of dissolved oxygen should be less than  $\pm 0.50$  (mg/L)

#### (4) Conductivity at 25°C

Conc. of KCl (M)	Expected Reading ( $\mu\text{S}/\text{cm}$ )	Displayed Reading ( $\mu\text{S}/\text{cm}$ )	Tolerance (%)	Results
0.001	146.9	152.6	3.9	Satisfactory
0.01	1412	1389	-1.6	Satisfactory
0.1	12890	12452	-3.4	Satisfactory
0.5	58670	58588	-0.1	Satisfactory
1.0	111900	111882	0.0	Satisfactory

Tolerance limit of conductivity should be less than  $\pm 10.0$  (%)

#### (5) Salinity

Expected Reading (g/L)	Displayed Reading (g/L)	Tolerance (%)	Results
10	10.08	0.8	Satisfactory
20	20.35	1.8	Satisfactory
30	30.00	0.0	Satisfactory

Tolerance limit of salinity should be less than  $\pm 10.0$  (%)

#### (6) Turbidity

Expected Reading (NTU)	Displayed Reading <sup>(f)</sup> (NTU)	Tolerance <sup>(g)</sup> (%)	Results
0	0.00	--	Satisfactory
10	10.03	0.3	Satisfactory
20	20.11	0.5	Satisfactory
100	100.07	0.1	Satisfactory
800	800.35	0.0	Satisfactory

Tolerance limit of turbidity should be less than  $\pm 10.0$  (%)

~ END OF REPORT ~

#### Remark(s): -

<sup>(f)</sup> "Displayed Reading" presents the figures shown on item under calibration/ checking regardless of equipment precision or significant figures.

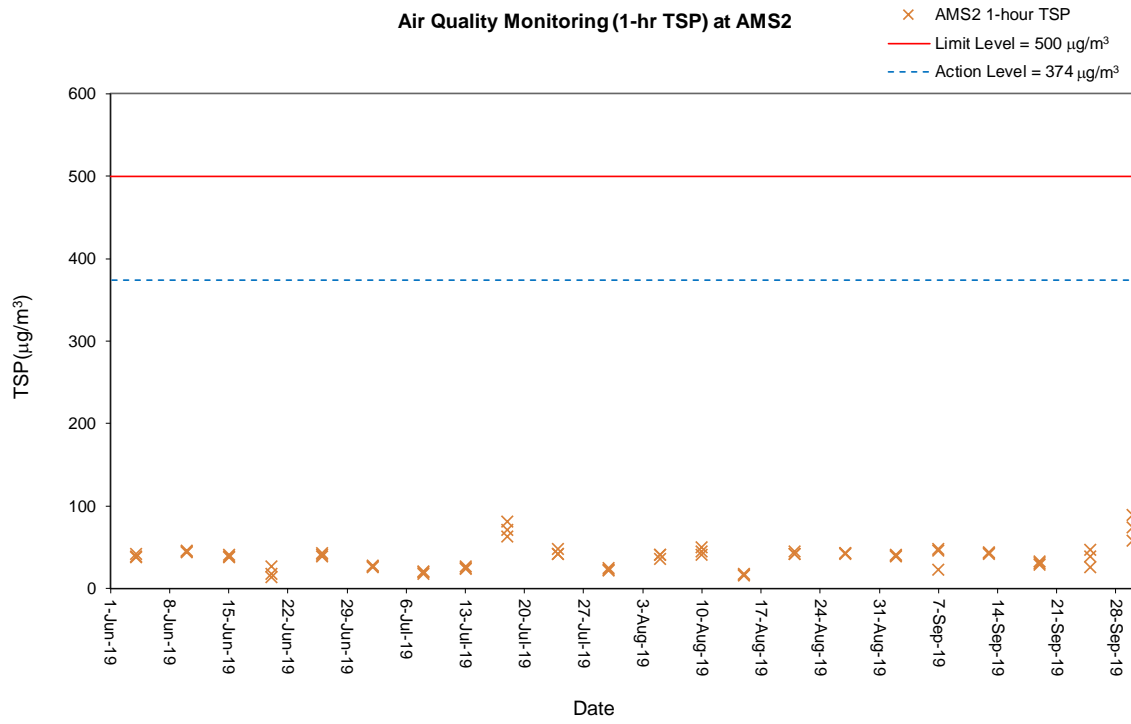
<sup>(g)</sup> The "Tolerance Limit" mentioned is the acceptance criteria applicable for similar equipment used by Quality Pro Test-Consult Ltd. or quoted from relevant international standards.



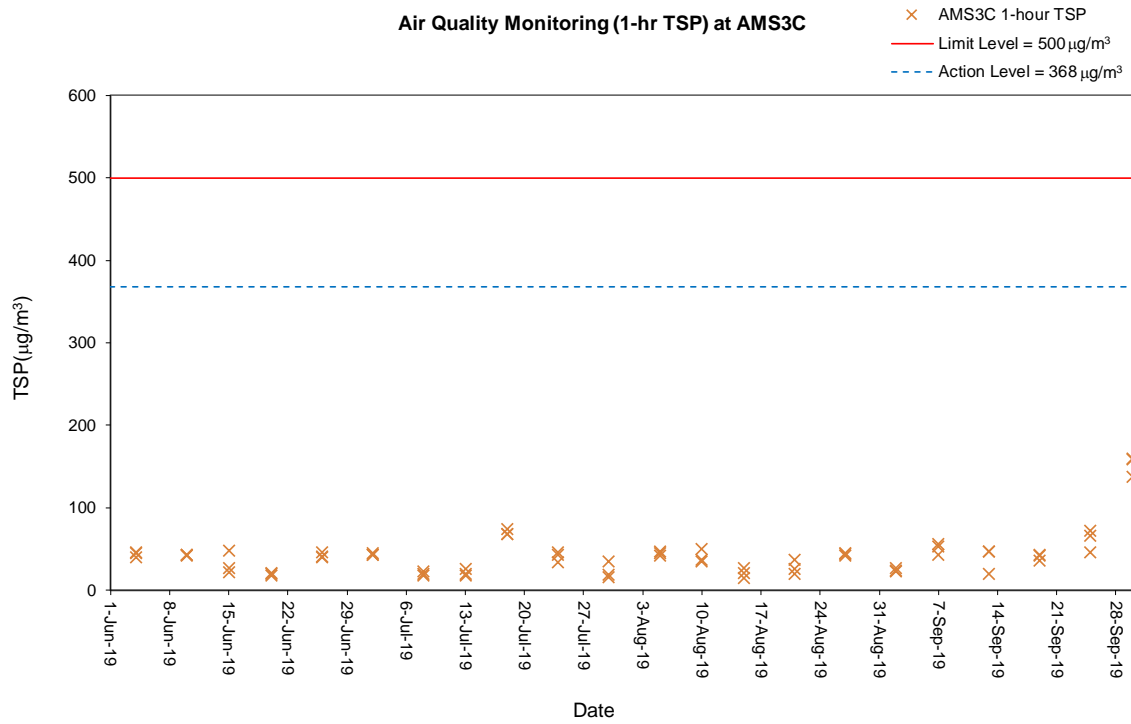
# **Appendix K. Monitoring Data and Graphical Plots (Air Quality, Noise and Water Quality)**

Project	Contract	Station	Date	Parameter	Start Time	Result	Unit
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	02-Sep-19	1-hr TSP	09:16	40	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	02-Sep-19	1-hr TSP	10:16	39	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	02-Sep-19	1-hr TSP	11:16	41	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	07-Sep-19	1-hr TSP	08:58	46	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	07-Sep-19	1-hr TSP	09:58	48	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	07-Sep-19	1-hr TSP	10:58	23	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	13-Sep-19	1-hr TSP	09:01	43	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	13-Sep-19	1-hr TSP	10:01	42	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	13-Sep-19	1-hr TSP	11:01	44	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	19-Sep-19	1-hr TSP	09:15	33	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	19-Sep-19	1-hr TSP	10:15	29	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	19-Sep-19	1-hr TSP	11:15	31	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	25-Sep-19	1-hr TSP	09:20	26	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	25-Sep-19	1-hr TSP	10:20	39	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	25-Sep-19	1-hr TSP	11:20	47	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	30-Sep-19	1-hr TSP	13:00	89	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	30-Sep-19	1-hr TSP	14:00	74	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	30-Sep-19	1-hr TSP	15:00	58	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	02-Sep-19	1-hr TSP	13:40	23	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	02-Sep-19	1-hr TSP	14:40	24	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	02-Sep-19	1-hr TSP	15:40	27	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	07-Sep-19	1-hr TSP	12:51	43	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	07-Sep-19	1-hr TSP	13:51	56	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	07-Sep-19	1-hr TSP	14:51	53	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	13-Sep-19	1-hr TSP	12:33	47	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	13-Sep-19	1-hr TSP	13:33	20	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	13-Sep-19	1-hr TSP	14:33	47	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	19-Sep-19	1-hr TSP	13:00	36	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	19-Sep-19	1-hr TSP	14:00	43	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	19-Sep-19	1-hr TSP	15:00	42	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	25-Sep-19	1-hr TSP	13:02	66	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	25-Sep-19	1-hr TSP	14:02	72	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	25-Sep-19	1-hr TSP	15:02	46	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	30-Sep-19	1-hr TSP	08:10	137	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	30-Sep-19	1-hr TSP	09:10	159	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	30-Sep-19	1-hr TSP	10:10	160	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	02-Sep-19	1-hr TSP	08:34	25	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	02-Sep-19	1-hr TSP	09:34	29	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	02-Sep-19	1-hr TSP	10:34	22	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	07-Sep-19	1-hr TSP	08:04	55	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	07-Sep-19	1-hr TSP	09:04	47	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	07-Sep-19	1-hr TSP	10:04	33	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	13-Sep-19	1-hr TSP	08:17	47	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	13-Sep-19	1-hr TSP	09:17	45	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	13-Sep-19	1-hr TSP	10:17	20	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	19-Sep-19	1-hr TSP	08:15	36	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	19-Sep-19	1-hr TSP	09:15	33	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	19-Sep-19	1-hr TSP	10:15	31	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	25-Sep-19	1-hr TSP	08:15	25	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	25-Sep-19	1-hr TSP	09:15	28	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	25-Sep-19	1-hr TSP	10:15	47	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	30-Sep-19	1-hr TSP	12:18	119	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	30-Sep-19	1-hr TSP	13:18	113	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	30-Sep-19	1-hr TSP	14:18	88	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	02-Sep-19	24-hr TSP	09:30	33	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	07-Sep-19	24-hr TSP	09:08	72	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	13-Sep-19	24-hr TSP	09:08	41	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	19-Sep-19	24-hr TSP	09:26	88	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	25-Sep-19	24-hr TSP	09:28	80	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	30-Sep-19	24-hr TSP	13:10	109	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	02-Sep-19	24-hr TSP	13:39	30	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	07-Sep-19	24-hr TSP	12:57	76	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	13-Sep-19	24-hr TSP	12:45	39	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	19-Sep-19	24-hr TSP	13:12	112	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	25-Sep-19	24-hr TSP	13:14	85	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	30-Sep-19	24-hr TSP	08:17	159	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	02-Sep-19	24-hr TSP	17:33	37	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	07-Sep-19	24-hr TSP	08:09	102	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	13-Sep-19	24-hr TSP	08:16	47	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	19-Sep-19	24-hr TSP	08:27	127	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	25-Sep-19	24-hr TSP	08:22	128	µg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	30-Sep-19	24-hr TSP	12:17	211	µg/m <sup>3</sup>

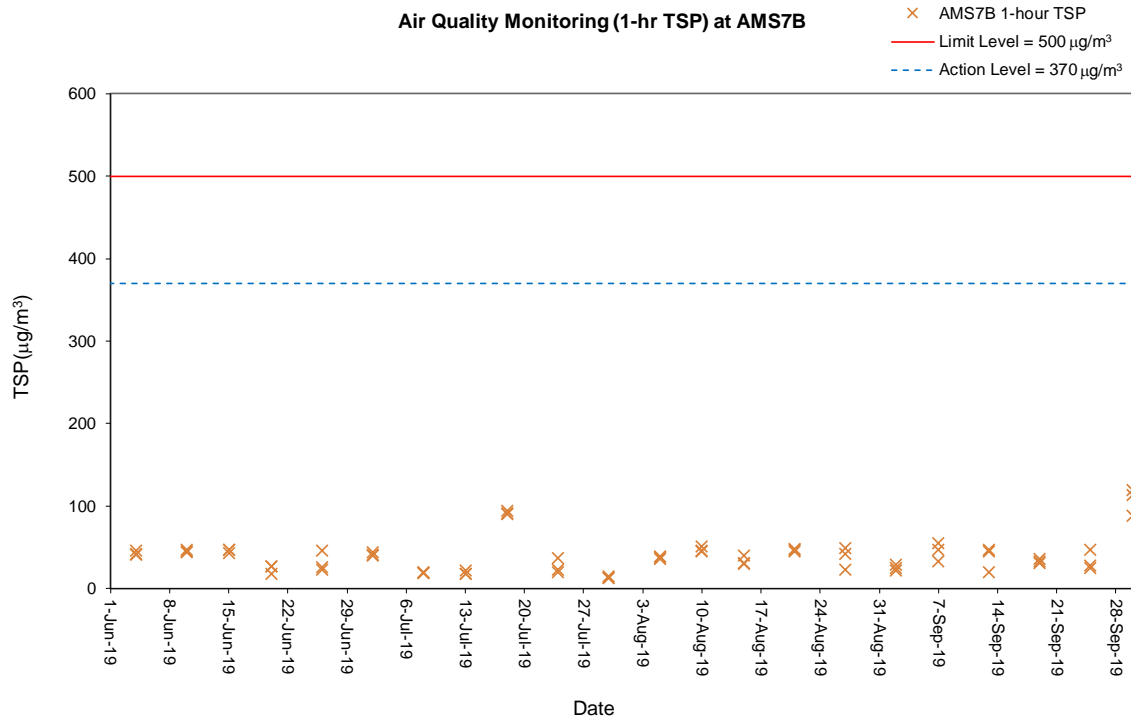
### Air Quality Monitoring (1-hr TSP) at AMS2



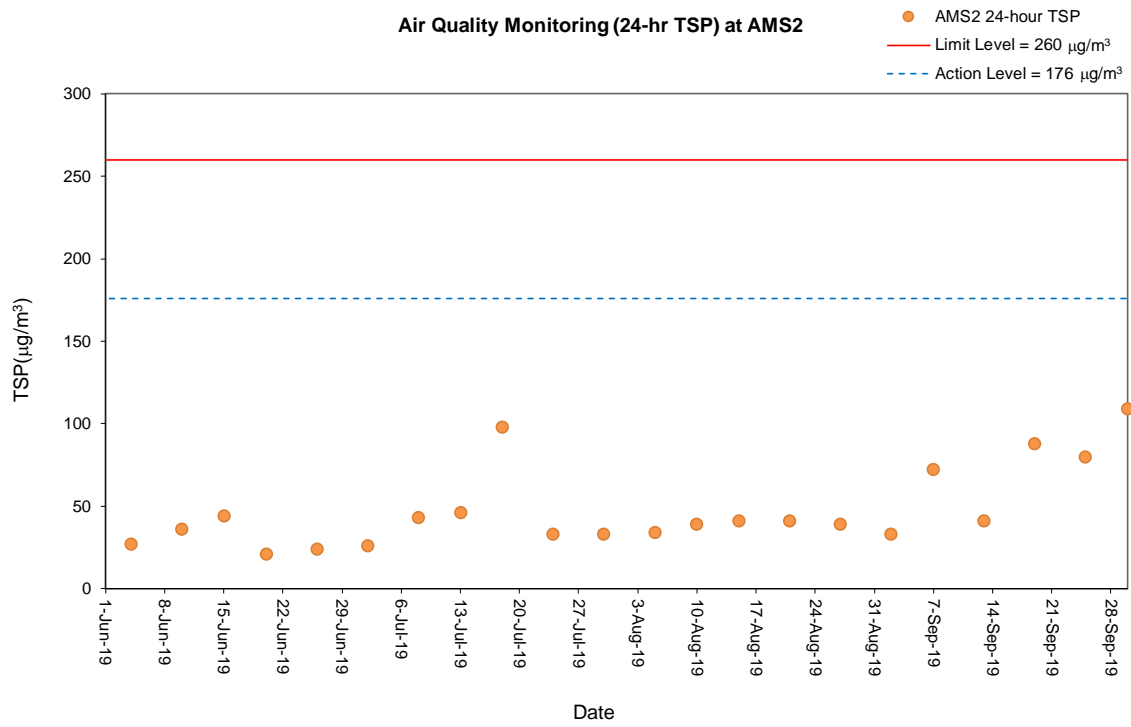
### Air Quality Monitoring (1-hr TSP) at AMS3C



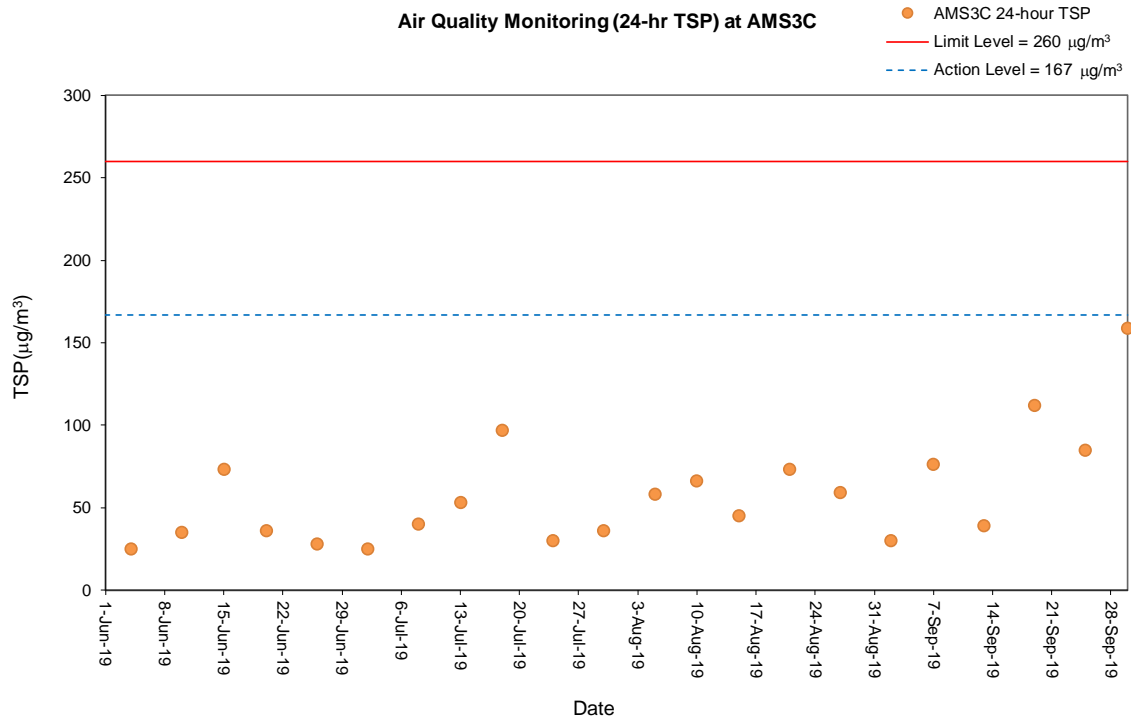
### Air Quality Monitoring (1-hr TSP) at AMS7B



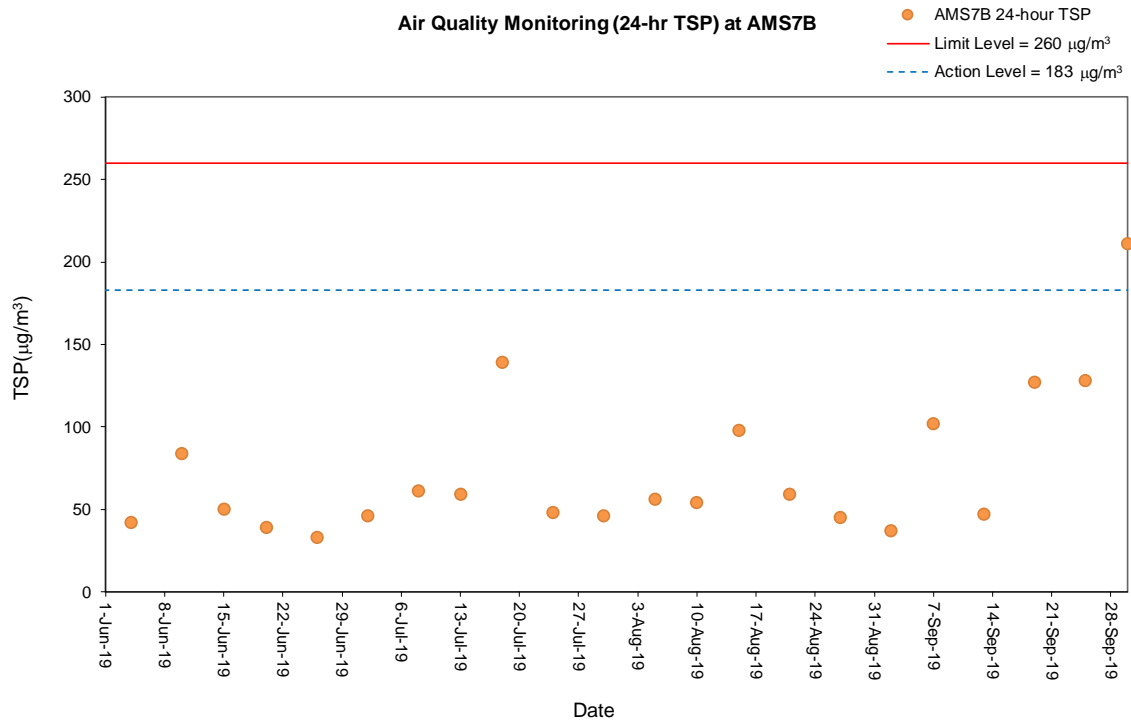
### Air Quality Monitoring (24-hr TSP) at AMS2



### Air Quality Monitoring (24-hr TSP) at AMS3C



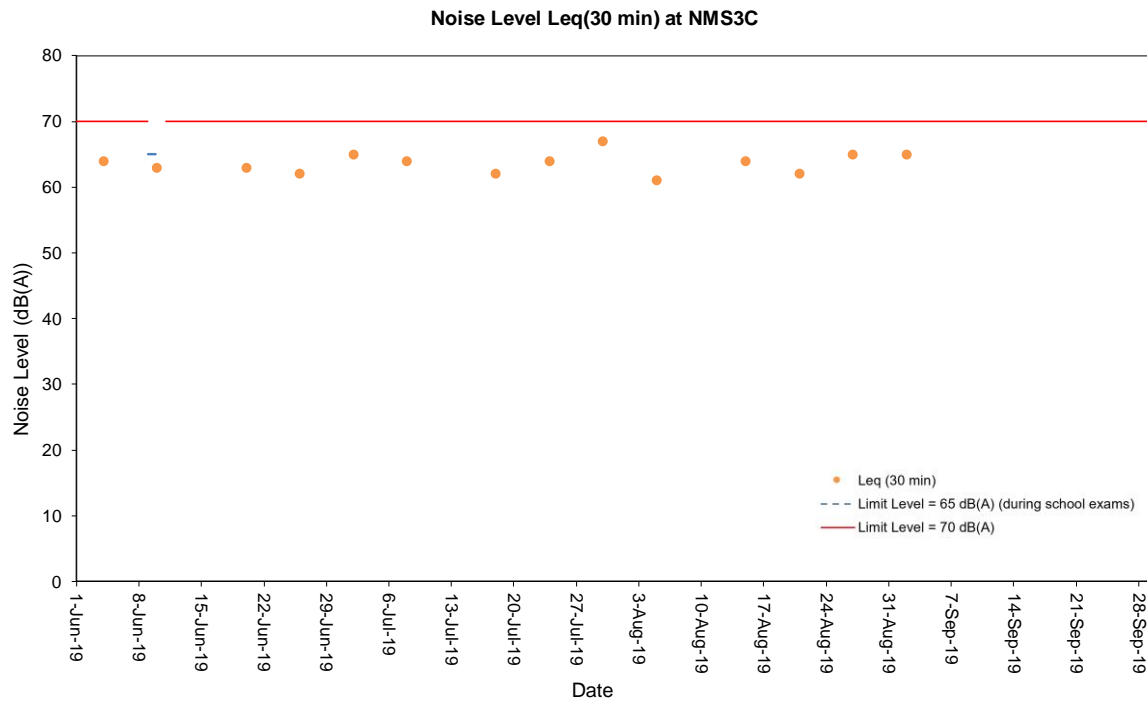
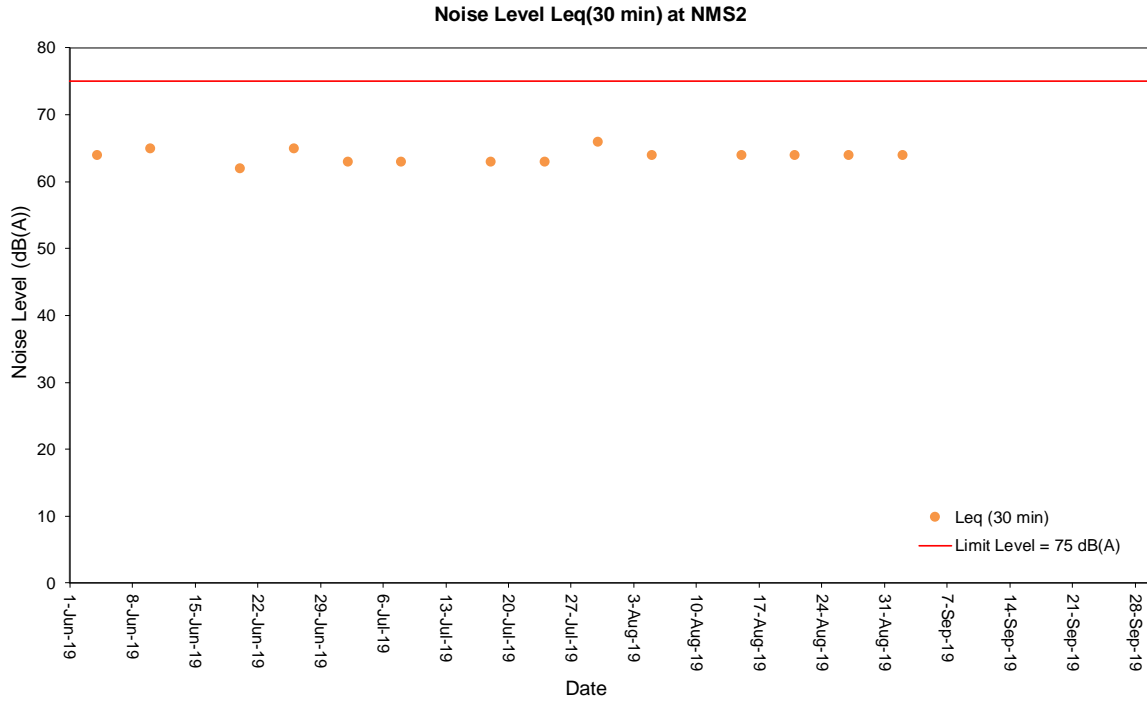
### Air Quality Monitoring (24-hr TSP) at AMS7B



Project	Contract	Date	Station	Start Time	Noise Level for 30 min, dB(A)			Weather	Wind Speed, m/s	Facade / Free Field	Limit Level, dB(A)
					L <sub>eq</sub>	L <sub>10</sub>	L <sub>90</sub>				
HKBCF	HY/2013/04	02-Sep-19	NMS2 Seaview Crescent	10:32	64	67	61	Cloudy	<5	Facade	75
HKBCF	HY/2013/04	02-Sep-19	NMS3C Ying Tung Estate Refuse Collection Point	14:29	65	67	62	Cloudy	<5	Free Field *	70

Remark: \* Free field measurement; noise level shown includes +3dB(A) correction factor

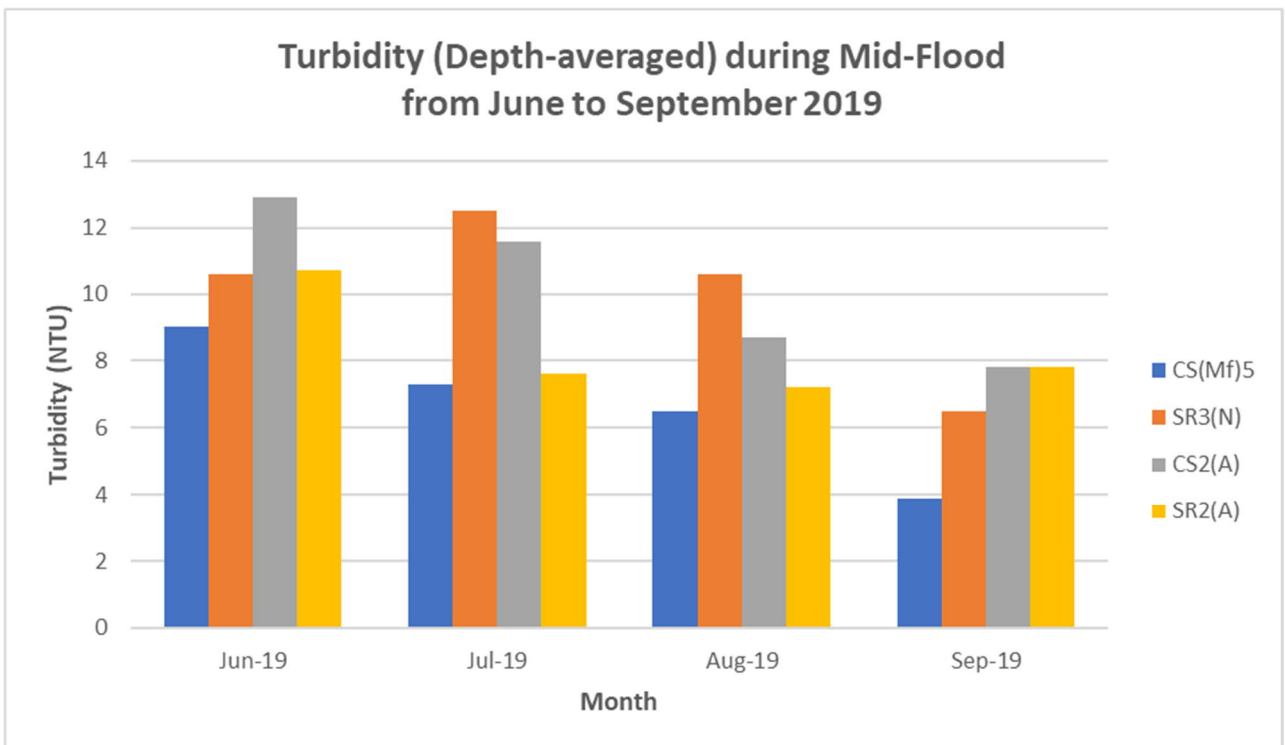
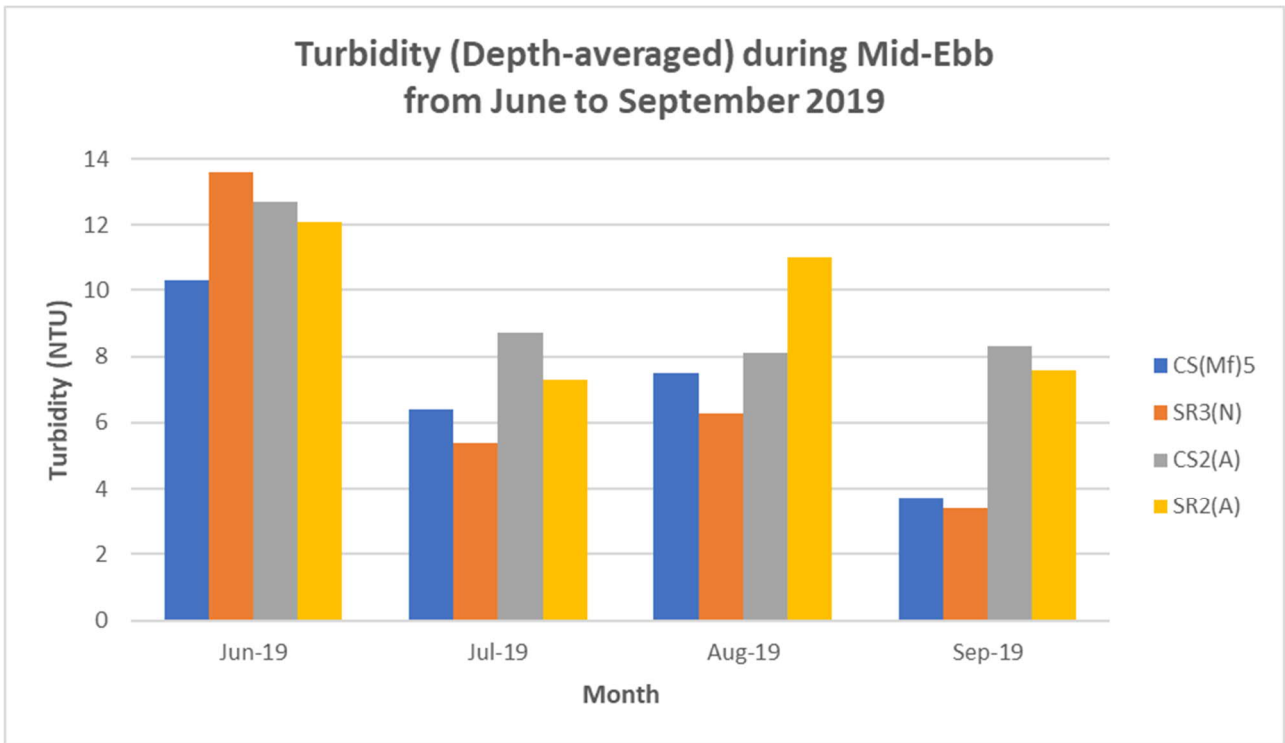
A proposal to terminate impact monitoring for noise at NMS2 and NMS3C was justified by the ET Leader of this Contract and verified by the IEC on 13 August 2019, and approved by EPD on 3 September 2019. Therefore, the last impact noise monitoring event for this Contract was conducted on 2 September 2019.

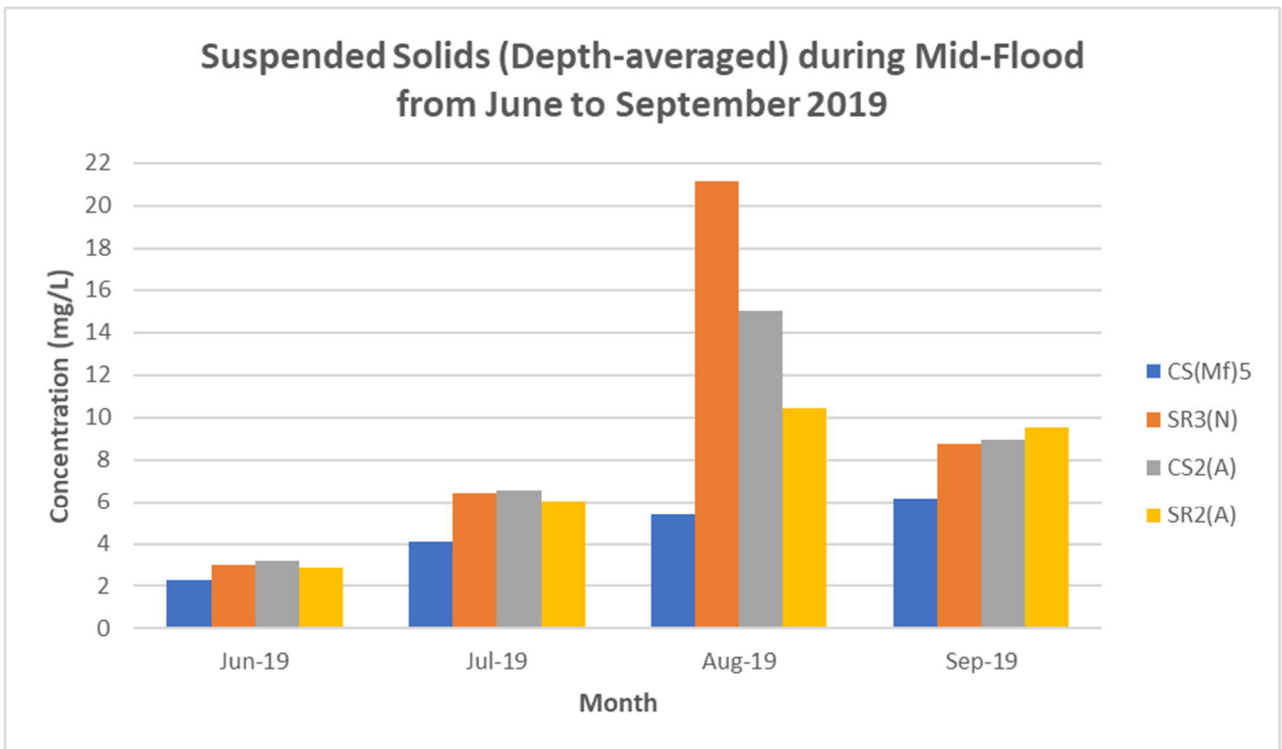
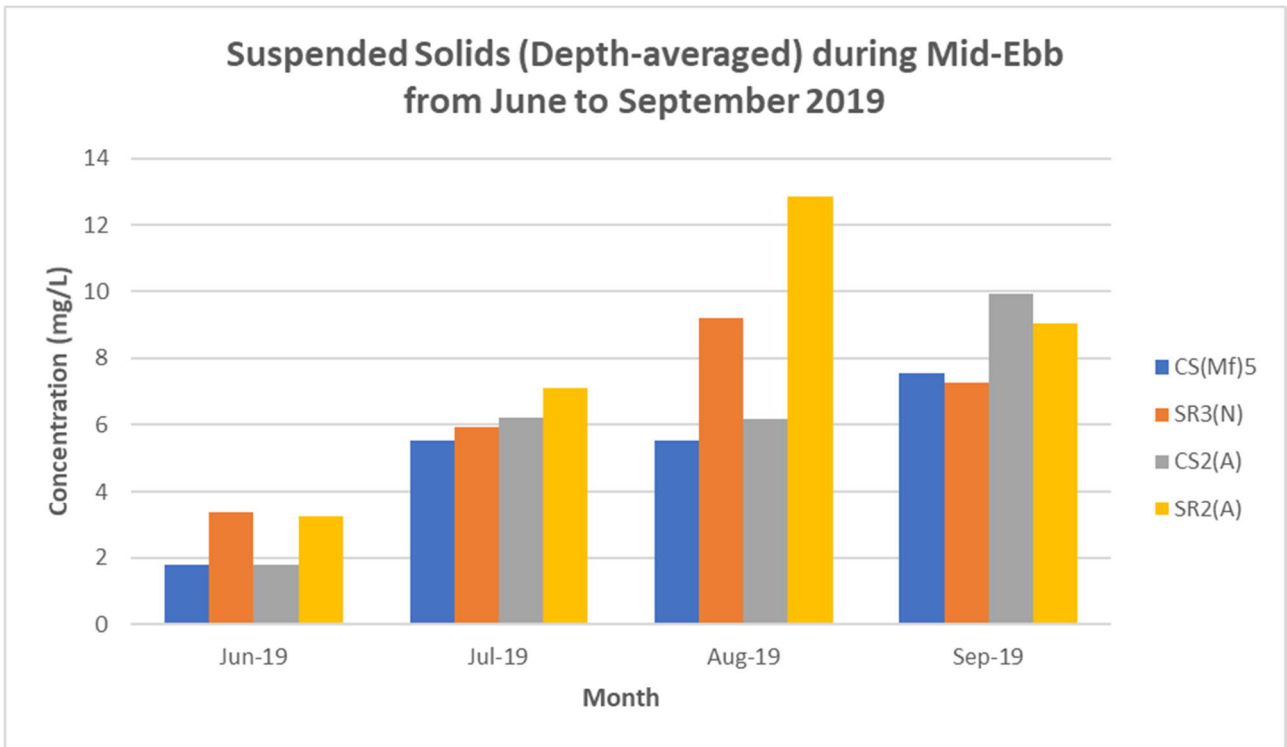


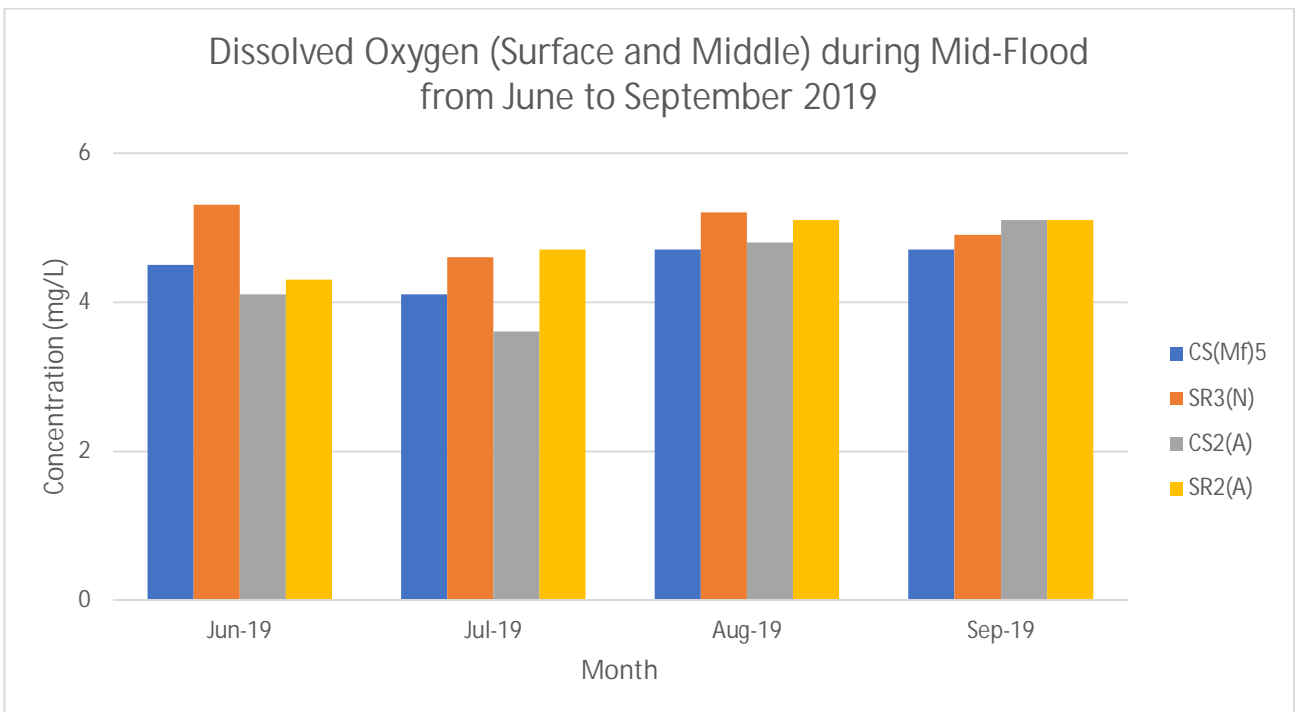
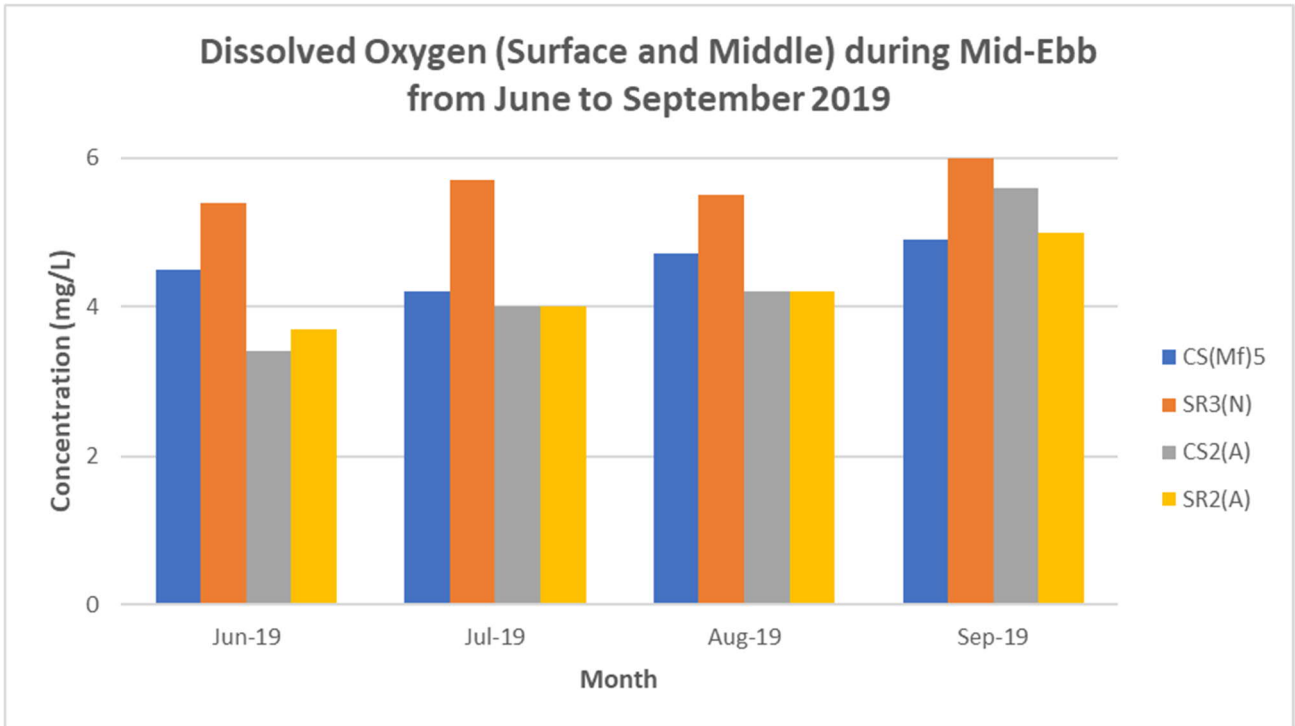
Remark: A proposal to terminate impact monitoring for noise at NMS2 and NMS3C was justified by the ET Leader of this Contract and verified by the IEC on 13 August 2019, and approved by EPD on 3 September 2019. Therefore, the last impact noise monitoring event under this Contract was conducted on 2 September 2019.

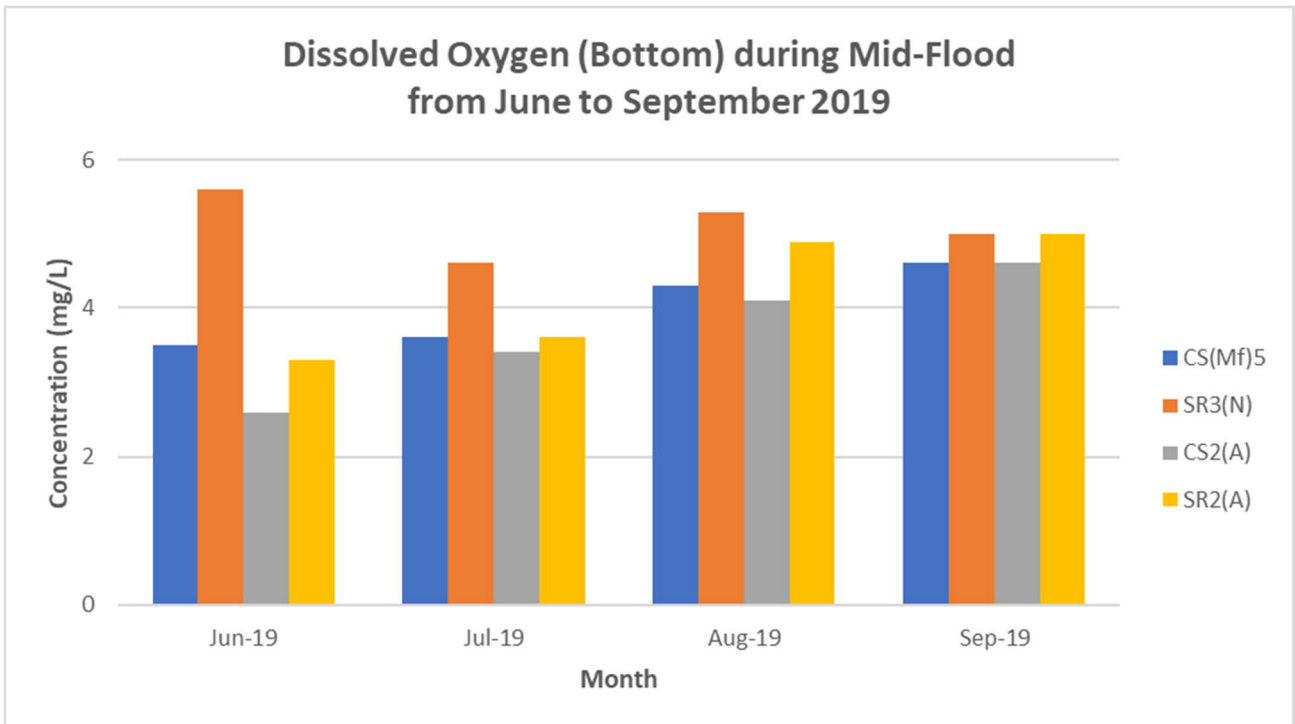
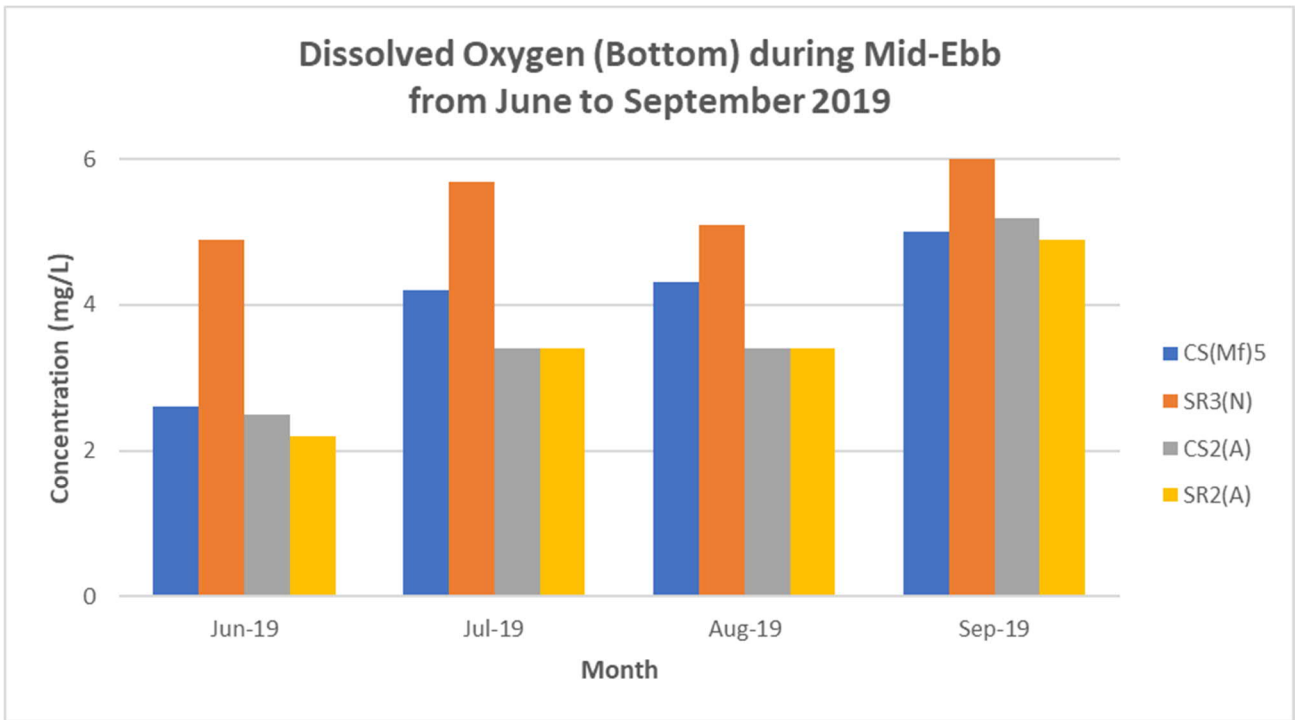
Date (yyyy-mm-dd)	Tide	Station	Weather	Sea condition	Sampling Time	Water Depth (m)	Sampling Water Level	Replicate	Water Temperature (°C)	pH	Salinity (ppt)	DO (mg/L)	Average of DO (mg/L)	DO Saturation (%)	Turbidity (NTU)	Turbidity (NTU) (depth-averaged)	SS	SS (mg/L) (depth-averaged)					
2019-09-20	Mid-Ebb	CS(M)5	Fine	Moderate	16:49:00	12.5	Surface	1st	30.0	7.8	25.2	5.2	4.9	78.8	3.6	3.7	8.4	7.5					
	Mid-Ebb	CS(M)5					Surface	2nd	30.0	7.8	25.2	5.3		79.9	3.6		9.4						
	Mid-Ebb	CS(M)5					Middle	1st	29.2	7.8	27.6	4.6	5.0	76.8	3.5		6.3						
	Mid-Ebb	CS(M)5					Middle	2nd	29.2	7.8	27.5	4.6		69.9	4.1		8.1						
	Mid-Ebb	CS(M)5					Bottom	1st	29.2	7.8	28.2	5.0		75.0	3.5		5.9						
	Mid-Ebb	CS(M)5					Bottom	2nd	29.2	7.8	28.2	4.9		91.2	3.9		7.7						
2019-09-20	Mid-Ebb	SR3(N)	Fine	Calm	15:32:00	4.4	Surface	1st	30.1	7.8	23.9	6.0	6.0	91.2	4.0	3.4	7.7	7.3					
	Mid-Ebb	SR3(N)					Surface	2nd	30.1	7.8	23.9	6.0		91.2	4.0		6.7						
	Mid-Ebb	SR3(N)					Middle	1st															
	Mid-Ebb	SR3(N)					Middle	2nd															
	Mid-Ebb	SR3(N)					Bottom	1st	30.1	7.8	24.1	6.4	6.4	97.2	2.7		7.6						
	Mid-Ebb	SR3(N)					Bottom	2nd	30.1	7.8	24.1	6.4		97.1	2.8		7.0						
2019-09-20	Mid-Ebb	CS2(A)	Fine	Moderate	14:59:00	7.2	Surface	1st	29.9	7.8	22.7	6.1	5.6	90.4	1.8	8.3	10.1	9.0					
	Mid-Ebb	CS2(A)					Surface	2nd	29.9	7.8	22.7	6.1		90.7	1.6		9.1						
	Mid-Ebb	CS2(A)					Middle	1st	29.3	7.8	27.5	5.2	5.2	78.3	7.7		9.2						
	Mid-Ebb	CS2(A)					Middle	2nd	29.3	7.8	27.5	5.1		78.1	7.5		9.5						
	Mid-Ebb	CS2(A)					Bottom	1st	29.2	7.8	27.9	5.2		78.8	15.8		7.6						
	Mid-Ebb	CS2(A)					Bottom	2nd	29.2	7.8	27.9	5.2		78.8	15.6		8.7						
2019-09-20	Mid-Ebb	SR2(A)	Fine	Moderate	15:16:00	7.7	Surface	1st	29.7	7.8	23.7	5.3	5.0	80.1	5.5	7.6	10.6	9.9					
	Mid-Ebb	SR2(A)					Surface	2nd	29.7	7.8	23.7	5.4		80.8	5.4		9.8						
	Mid-Ebb	SR2(A)					Middle	1st	29.3	7.8	26.6	4.7	4.9	71.5	7.9		10.3						
	Mid-Ebb	SR2(A)					Middle	2nd	29.3	7.8	26.6	4.7		71.5	7.5		9.9						
	Mid-Ebb	SR2(A)					Bottom	1st	29.2	7.8	27.1	4.9		74.2	9.9		9.2						
	Mid-Ebb	SR2(A)					Bottom	2nd	29.2	7.8	27.1	4.9		73.6	9.6		9.8						
2019-09-20	Mid-Flood	CS(M)5	Fine	Moderate	9:45:00	13.1	Surface	1st	29.9	7.8	25.3	4.9	4.7	74.1	1.3	3.9	5.9	6.2					
	Mid-Flood	CS(M)5					Surface	2nd	29.9	7.8	25.2	5.1		76.6	1.1		5.7						
	Mid-Flood	CS(M)5					Middle	1st	29.2	7.8	27.6	4.4	4.6	67.5	4.0		5.0						
	Mid-Flood	CS(M)5					Middle	2nd	29.2	7.8	27.6	4.4		67.0	3.8		5.2						
	Mid-Flood	CS(M)5					Bottom	1st	29.1	7.8	28.2	4.6		70.5	6.6		7.7						
	Mid-Flood	CS(M)5					Bottom	2nd	29.1	7.8	28.3	4.6		69.6	6.6		7.4						
2019-09-20	Mid-Flood	SR3(N)	Fine	Calm	11:19:00	4.2	Surface	1st	29.6	7.7	24.3	4.9	4.9	73.7	5.9	6.5	8.5	8.7					
	Mid-Flood	SR3(N)					Surface	2nd	29.6	7.7	24.3	4.9		73.7	5.7		9.5						
	Mid-Flood	SR3(N)					Middle	1st															
	Mid-Flood	SR3(N)					Middle	2nd															
	Mid-Flood	SR3(N)					Bottom	1st	29.6	7.7	24.3	5.0	5.0	75.3	7.2		8.0						
	Mid-Flood	SR3(N)					Bottom	2nd	29.6	7.7	24.3	5.0		75.4	7.3		8.9						
2019-09-20	Mid-Flood	CS2(A)	Fine	Moderate	11:55:00	7.4	Surface	1st	29.7	7.8	22.7	5.6	5.1	83.9	7.8	7.8	10.5	8.9					
	Mid-Flood	CS2(A)					Surface	2nd	29.7	7.8	22.7	5.6		83.8	7.8		10.2						
	Mid-Flood	CS2(A)					Middle	1st	29.3	7.8	26.8	4.6	4.6	70.3	7.8		9.0						
	Mid-Flood	CS2(A)					Middle	2nd	29.3	7.8	26.9	4.6		70.3	7.8		8.0						
	Mid-Flood	CS2(A)					Bottom	1st	29.3	7.8	27.0	4.6		70.1	7.8		8.4						
	Mid-Flood	CS2(A)					Bottom	2nd	29.3	7.8	27.0	4.6		69.9	7.8		7.4						
2019-09-20	Mid-Flood	SR2(A)	Fine	Calm	11:36:00	7.2	Surface	1st	29.5	7.8	23.1	5.2	5.1	77.0	7.8	7.8	9.4	9.5					
	Mid-Flood	SR2(A)					Surface	2nd	29.5	7.8	23.0	5.2		77.2	7.8		8.7						
	Mid-Flood	SR2(A)					Middle	1st	29.6	7.8	24.4	5.0	5.0	74.4	7.8		10.0						
	Mid-Flood	SR2(A)					Middle	2nd	29.6	7.8	24.5	5.0		74.7	7.8		9.0						
	Mid-Flood	SR2(A)					Bottom	1st	29.5	7.8	24.9	5.0		74.7	7.8		10.3						
	Mid-Flood	SR2(A)					Bottom	2nd	29.5	7.8	24.9	5.0		74.4	7.8		9.7						











# Appendix L. Dolphin Monitoring Results

**CONTRACT NO. HY/2013/04**

**Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing  
Facilities – Infrastructure Works Stage II (Southern Portion)  
Dolphin Monthly Monitoring (Operational Phase)**

*Seventh Monthly Progress Report (September 2019)*

*Submitted to Mott MacDonald Hong Kong Limited &  
China State Construction Engineering (Hong Kong) Limited*

Submitted by  
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**1. Introduction**

- 1.1. For the Hong Kong-Zhuhai-Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities (HKBCF), its operation requires the contractor (i.e. China State Construction Engineering (Hong Kong) Limited) and the associated Environmental Team, Mott MacDonald Hong Kong Limited, to implement the Environmental Monitoring and Audit (EM&A) programme during the operational phase.
- 1.2. According to the HKBCF EM&A Manual, monthly line-transect vessel surveys for Chinese White Dolphins should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas, which should be the same as in AFCD annual marine mammal monitoring programme. However, as such monitoring surveys have been undertaken by the HKLR03 EM&A project in the same areas (i.e. NWL and NEL), a combined monitoring approach is recommended by the Highways Department, that the HKBCF EM&A project should utilize the monitoring data collected by HKLR03 EM&A project to avoid any redundancy in monitoring effort.
- 1.3. In April 2019, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by the ET as the dolphin specialist for the operational phase of the HKBCF EM&A project. He is responsible for the dolphin monitoring study,

including the collection and collation of dolphin monitoring data from the HKLR03 EM&A project to examine any potential impacts of HKBCF during the operational phase on the dolphins. From the monitoring results, any changes in dolphin occurrence within the study area will be reviewed for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.

- 1.4. This seventh monthly progress report of the HKBCF operational phase dolphin monitoring programme is submitted to the environmental team and the contractor, summarizing the results of the survey findings during the month of September 2019 by utilizing the survey data collected from the HKLR03 EM&A project.

## 2. Monitoring Methodology

### 2.1. Vessel-based Line-transect Survey

- 2.1.1. According to the requirement of the updated EM&A manual, the dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire operational monitoring period. The co-ordinates of all transect lines are shown in Table 1.

Table 1. Co-ordinates of transect lines

Line No.	Easting	Northing		Line No.	Easting	Northing	
1	Start Point	804671	815456	13	Start Point	816506	819480
1	End Point	804671	831404	13	End Point	816506	824859
2	Start Point	805476	820800	14	Start Point	817537	820220
2	End Point	805476	826654	14	End Point	817537	824613
3	Start Point	806464	821150	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	821500	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	821850	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	822150	18	Start Point	821504	822371

6	End Point	809490	825352		18	End Point	821504	823761
7	Start Point	810499	822000		19	Start Point	822513	823268
7	End Point	810499	824613		19	End Point	822513	824321
8	Start Point	811508	821123		20	Start Point	823477	823402
8	End Point	811508	824254		20	End Point	823477	824613
9	Start Point	812516	821303		21	Start Point	805476	827081
9	End Point	812516	824254		21	End Point	805476	830562
10	Start Point	813525	821176		22	Start Point	806464	824033
10	End Point	813525	824657		22	End Point	806464	829598
11	Start Point	814556	818853		23	Start Point	814559	821739
11	End Point	814556	820992		23	End Point	814559	824768
12	Start Point	815542	818807		24	Start Point	805476	815900
12	End Point	815542	824882		24	End Point	805476	819100

2.1.2. The HKLR03 survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 22 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2017, 2018). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fujinon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

2.1.4. During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility),



and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).

- 2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.
- 2.1.7. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as “primary” survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as “secondary” survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese White Dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.
- 2.1.8. Encounter rates of Chinese White Dolphins (number of on-effort sightings per 100 km of survey effort and number of dolphins from all on-effort sightings per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for encounter rate analysis. Dolphin encounter rates were calculated using primary survey effort alone, as well as the combined survey effort from both primary and secondary lines.

## 2.2. *Photo-identification Work*

- 2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the HKLR03 survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.
- 2.2.2. A professional digital camera (*Canon EOS 7D model*), equipped with long telephoto

lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

- 2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.
- 2.2.4. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000).
- 2.2.5. All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

### 3. Monitoring Results

#### 3.1. Vessel-based Line-transect Survey

- 3.1.1. Under the HKLR03 dolphin monitoring programme, two sets of systematic line-transect vessel surveys were conducted on the 4<sup>th</sup>, 11<sup>th</sup>, 17<sup>th</sup> and 23<sup>rd</sup> of September 2019, to cover all transect lines in NWL and NEL survey areas twice during the monitoring month. The survey routes of each survey day are presented in Figures 2-5.
- 3.1.2. From the two sets of HKLR03 monitoring surveys conducted in September, 267.91 km of survey effort was collected, with 98.8% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility) (Appendix I).
- 3.1.3. Among the NEL and NWL survey areas, 99.40 km and 168.51 km of survey effort were conducted respectively. Moreover, the total survey effort conducted on primary and secondary lines were 193.93 km and 73.98 km respectively (Appendix I).
- 3.1.4. Only two groups of five Chinese White Dolphins were sighted during the two sets of HKLR03 monitoring surveys conducted in September 2019 (Appendix II). Both

dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL. Only one of the two dolphin sightings was sighted on primary line during on-effort search. Neither group was associated with any operating fishing vessel (Appendix II).

- 3.1.5. Distribution of the two dolphin sightings made in this monitoring month is shown in Figure 6. They were made near Black Point and to the west of Sha Chau respectively (Figure 6). Both sightings were located very far away from the HKBCF work site.
- 3.1.6. From the HKLR03 surveys conducted in September 2019, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data made under favourable conditions (Beaufort 3 or below) are shown in Tables 2 & 3.

Table 2. Dolphin encounter rates deduced from the two sets of HKLR03 surveys (two surveys in each set) conducted in September 2019 in Northeast (NEL) and Northwest Lantau (NWL)

		Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
		Primary Lines Only		Primary Lines Only	
NEL	Set 1: September 4 <sup>th</sup> / 11 <sup>th</sup>	0.0		0.0	
	Set 2: September 17 <sup>th</sup> / 23 <sup>rd</sup>	0.0		0.0	
NWL	Set 1: September 4 <sup>th</sup> / 11 <sup>th</sup>	1.6		3.3	
	Set 2: September 17 <sup>th</sup> / 23 <sup>rd</sup>	0.0		0.0	

Table 3. Overall dolphin encounter rates (sightings per 100 km of survey effort) from the two sets of HKLR03 surveys conducted in September 2019 on primary lines only as well as both primary lines and secondary lines in Northeast (NEL) and Northwest Lantau (NWL)

	Encounter rate (STG) (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI) (no. of dolphins from all on-effort sightings per 100 km of survey effort)	
	Primary Lines Only	Both Primary and Secondary Lines	Primary Lines Only	Both Primary and Secondary Lines
Northeast Lantau	0.0	0.0	0.0	0.0
Northwest Lantau	0.8	1.2	1.7	3.0

- 3.1.7. The average group size of dolphins sighted during September's monitoring surveys was 2.5 individuals per group, as both dolphin groups were quite small with two and three animals respectively (Appendix II).

### 3.2. *Photo-identification Work*

3.2.1. During the two sets of HKLR03 monitoring surveys conducted in September 2019, only three of the five dolphins were identified as known individual dolphin from the photo-identification catalogue (Appendices III and IV). Two of them (NL202 and NL286) were a mother-calf pair that have been sighted numerous times in previous HKLR03 monitoring surveys.

## 4. Conclusion

- 4.1. During this month of dolphin monitoring, no adverse impact from the operation of HKBCF on Chinese White Dolphins was noticeable from general observations.
- 4.2. Due to the monthly variation in dolphin occurrence within the study area, it would be more appropriate to draw conclusion on whether any impacts on dolphins have been detected in relation to the operation of HKBCF in the quarterly EM&A reports, where comparison on distribution, group size and encounter rates of dolphins between the quarterly operational monitoring period, impact monitoring period and baseline monitoring period will be made.

## 5. References

- Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.
- Hung, S. K. 2017. Monitoring of Marine Mammals in Hong Kong waters: final report (2016-17). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department, 162 pp.
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- Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.

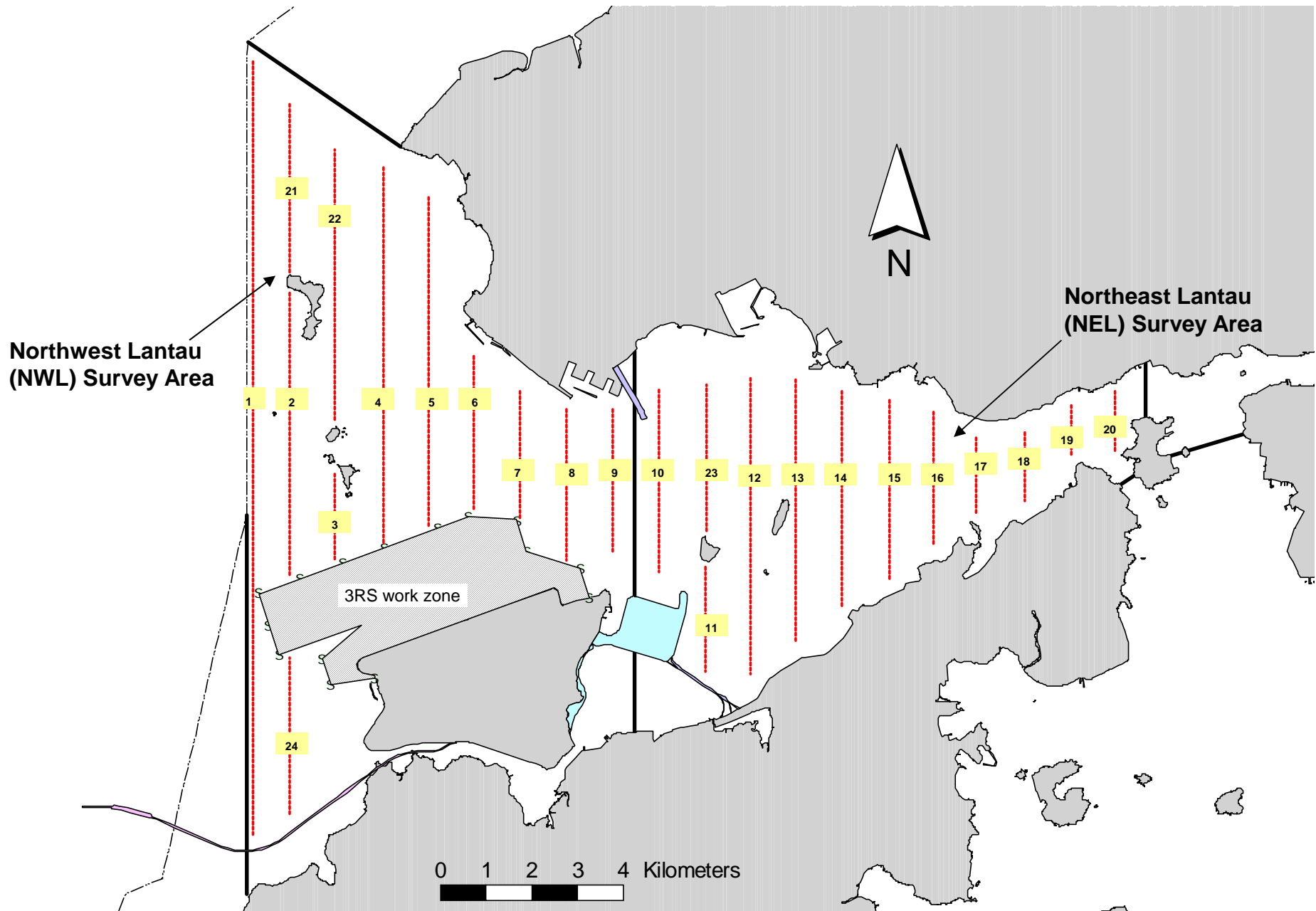


Figure 1. Transect Line Layout in Northwest and Northeast Lantau Survey Areas

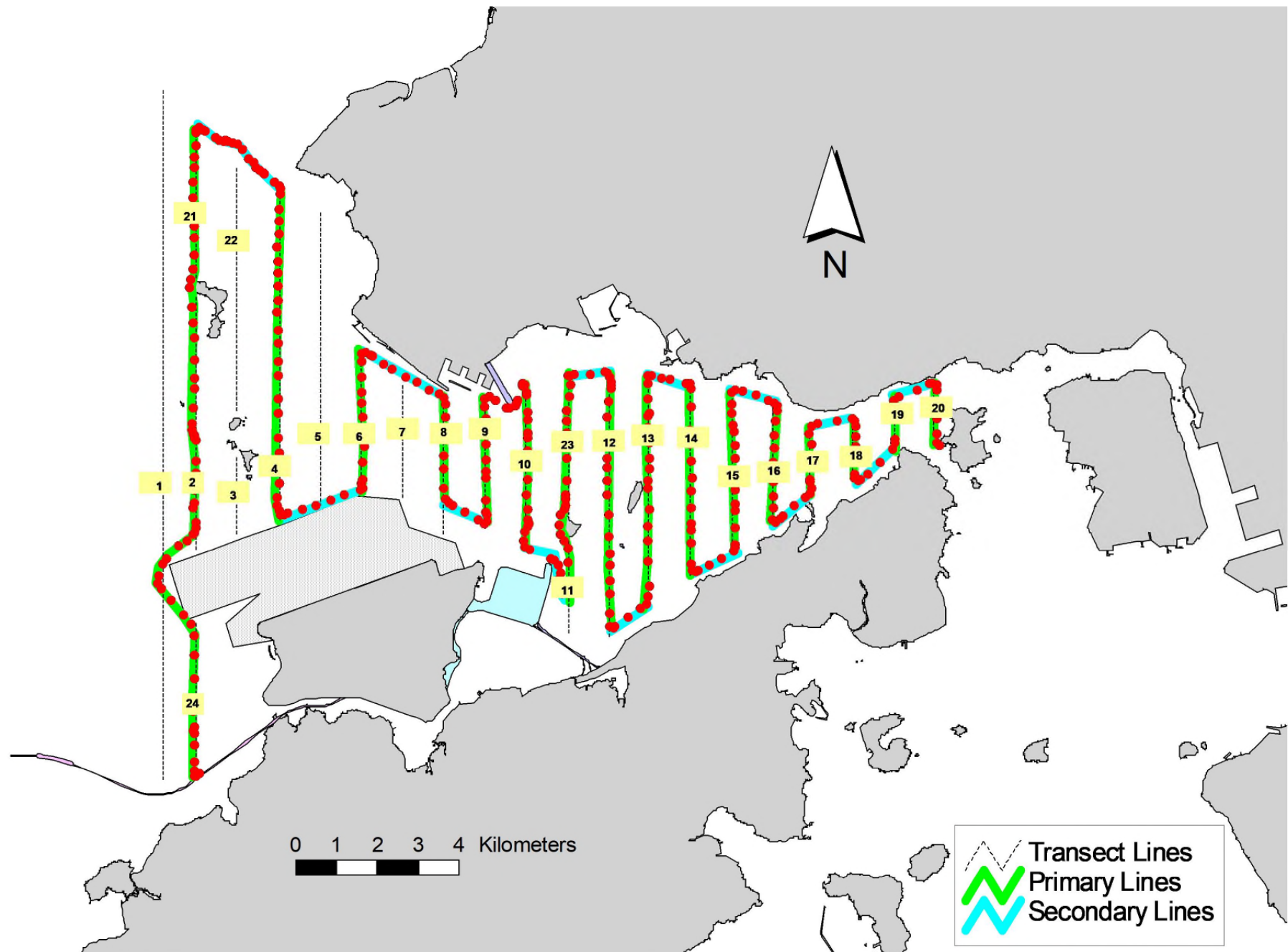


Figure 2. Survey Route on September 4<sup>th</sup>, 2019 (from HKLR03 project)

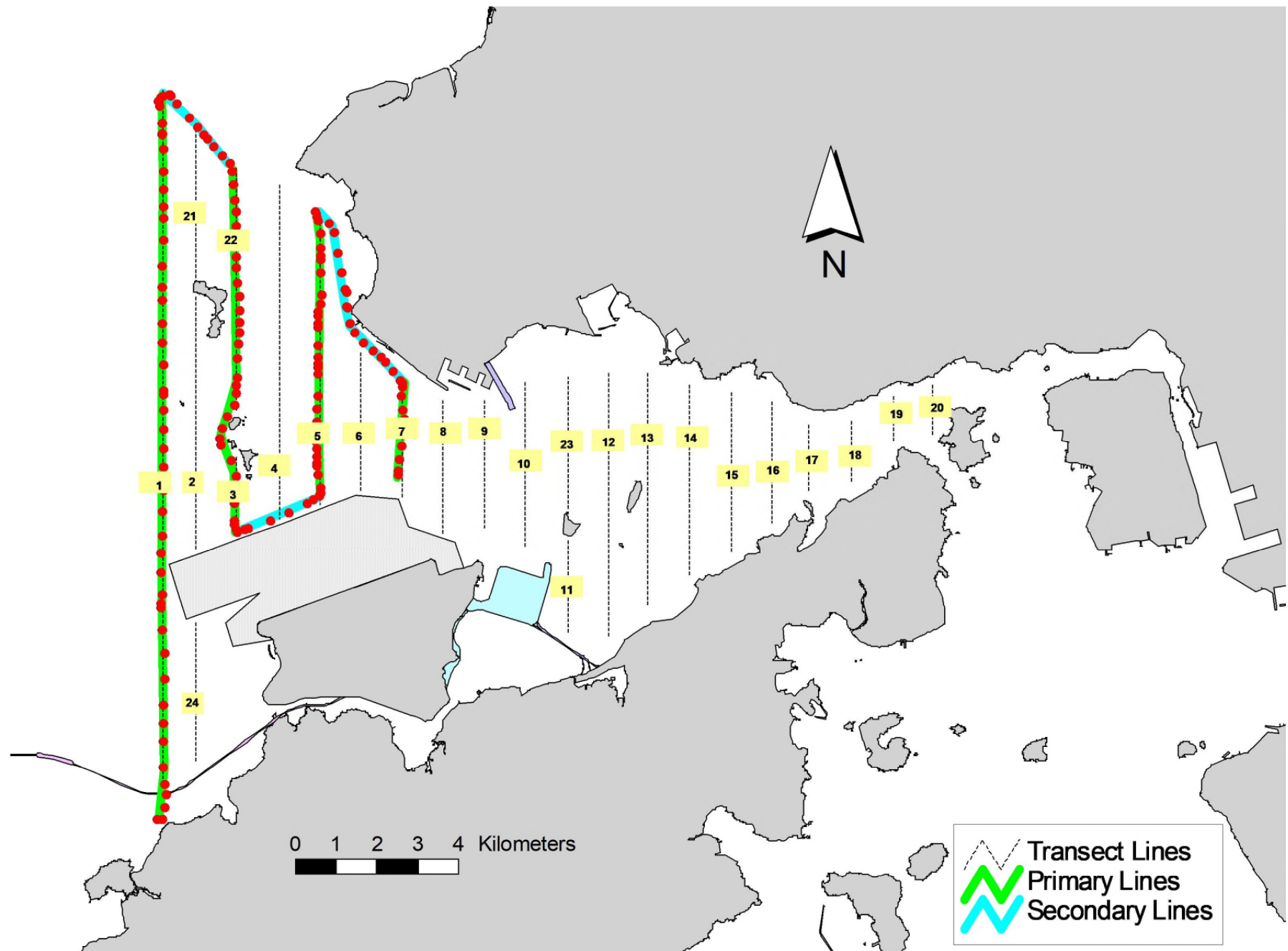


Figure 3. Survey Route on September 11<sup>th</sup>, 2019 (from HKLR03 project)

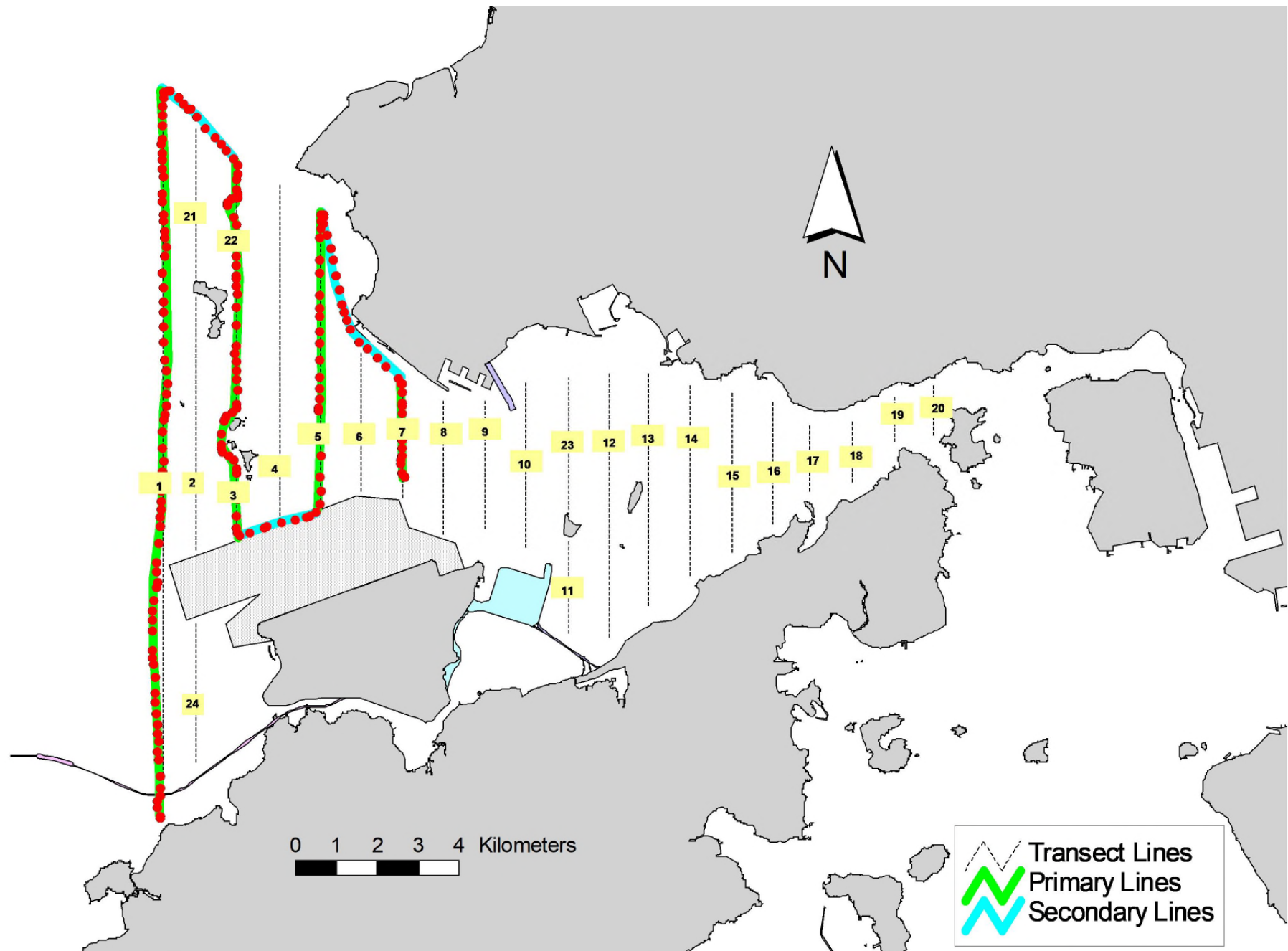


Figure 4. Survey Route on September 17<sup>th</sup>, 2019 (from HKLR03 project)



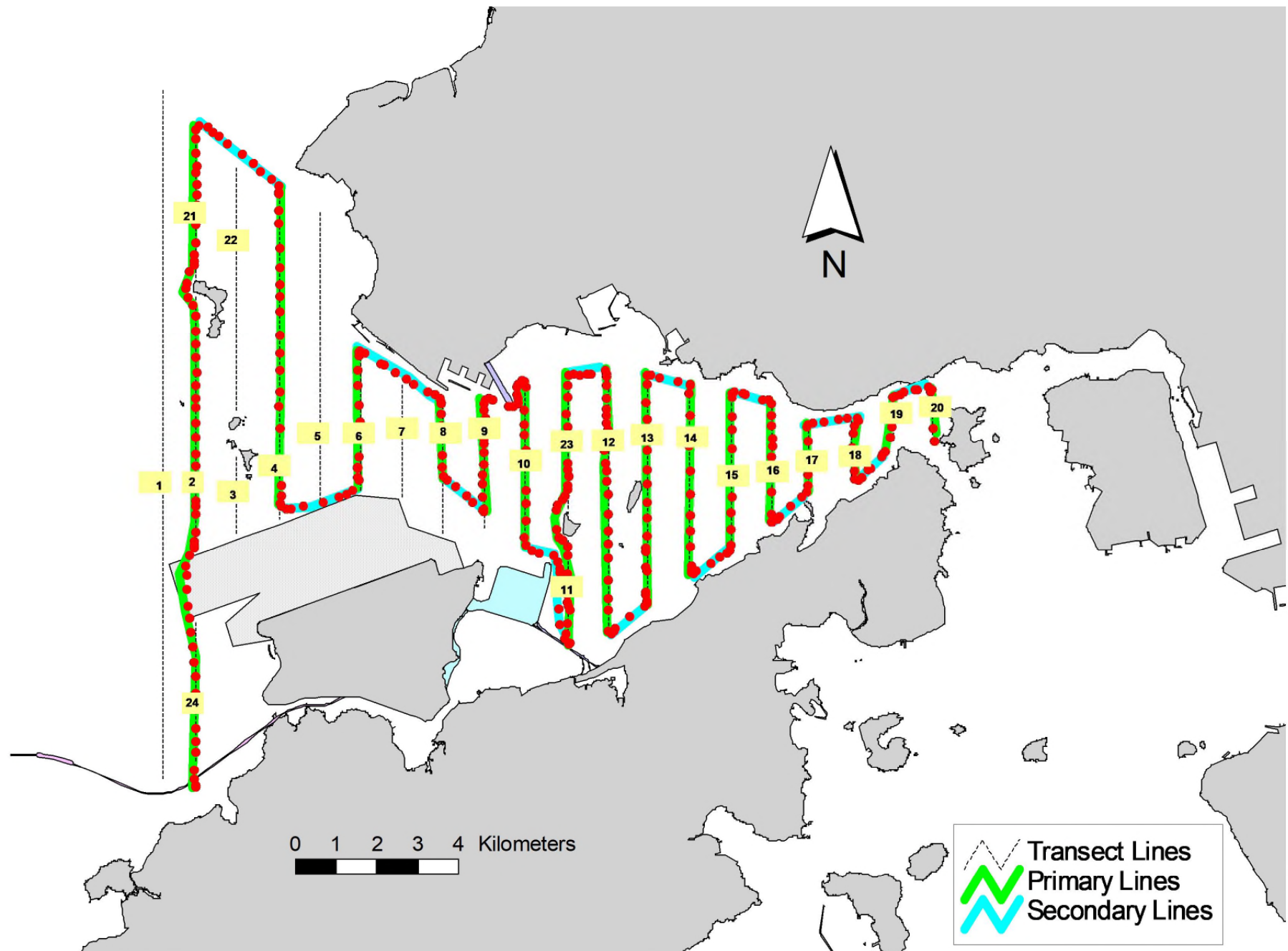


Figure 5. Survey Route on September 23<sup>rd</sup>, 2019 (from HKLR03 project)

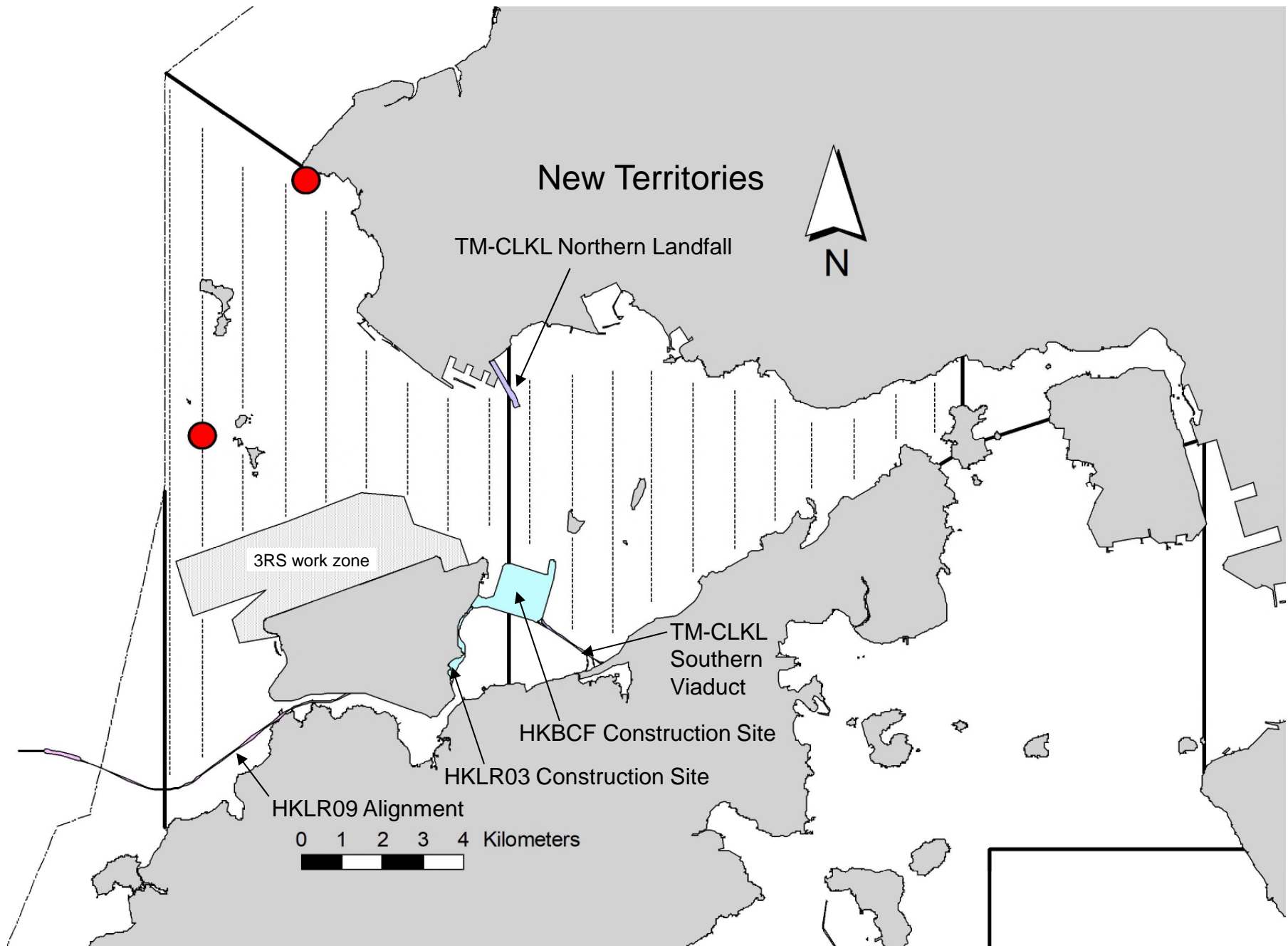


Figure 6. Distribution of Chinese White Dolphin Sightings during September 2019 HKLR03 Monitoring Surveys

## Appendix I. HKLR03 Survey Effort Database (September 2019)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
4-Sep-19	NW LANTAU	2	21.38	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NW LANTAU	3	6.40	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NW LANTAU	2	9.12	AUTUMN	STANDARD36826	HKLR	S
4-Sep-19	NW LANTAU	3	2.52	AUTUMN	STANDARD36826	HKLR	S
4-Sep-19	NE LANTAU	2	16.70	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NE LANTAU	3	18.83	AUTUMN	STANDARD36826	HKLR	P
4-Sep-19	NE LANTAU	2	7.75	AUTUMN	STANDARD36826	HKLR	S
4-Sep-19	NE LANTAU	3	5.12	AUTUMN	STANDARD36826	HKLR	S
11-Sep-19	NW LANTAU	1	1.60	AUTUMN	STANDARD36826	HKLR	P
11-Sep-19	NW LANTAU	2	29.50	AUTUMN	STANDARD36826	HKLR	P
11-Sep-19	NW LANTAU	3	2.10	AUTUMN	STANDARD36826	HKLR	P
11-Sep-19	NW LANTAU	1	1.40	AUTUMN	STANDARD36826	HKLR	S
11-Sep-19	NW LANTAU	2	8.99	AUTUMN	STANDARD36826	HKLR	S
17-Sep-19	NW LANTAU	2	8.96	AUTUMN	STANDARD36826	HKLR	P
17-Sep-19	NW LANTAU	3	22.90	AUTUMN	STANDARD36826	HKLR	P
17-Sep-19	NW LANTAU	4	1.90	AUTUMN	STANDARD36826	HKLR	P
17-Sep-19	NW LANTAU	2	4.54	AUTUMN	STANDARD36826	HKLR	S
17-Sep-19	NW LANTAU	3	4.90	AUTUMN	STANDARD36826	HKLR	S
17-Sep-19	NW LANTAU	4	1.20	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NW LANTAU	2	19.22	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NW LANTAU	3	7.79	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NW LANTAU	2	9.84	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NW LANTAU	3	4.25	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NE LANTAU	1	11.30	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NE LANTAU	2	25.35	AUTUMN	STANDARD36826	HKLR	P
23-Sep-19	NE LANTAU	1	3.61	AUTUMN	STANDARD36826	HKLR	S
23-Sep-19	NE LANTAU	2	10.74	AUTUMN	STANDARD36826	HKLR	S

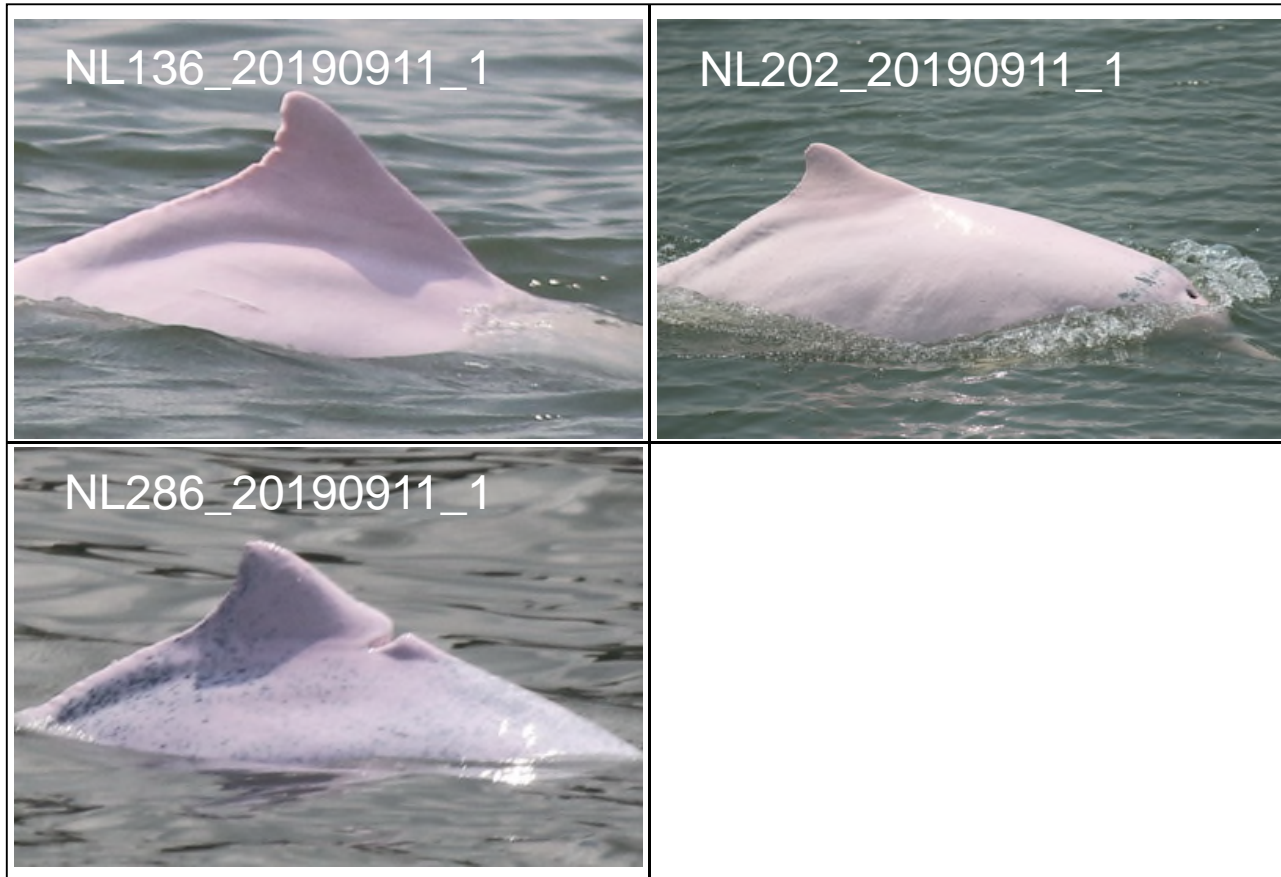
**Appendix II. HKLR03 Chinese White Dolphin Sighting Database (September 2019)**

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG #	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
4-Sep-19	1	1046	2	NW LANTAU	2	311	ON	HKLR	823375	805440	AUTUMN	NONE	P
11-Sep-19	1	1058	3	NW LANTAU	2	430	ON	HKLR	829316	807975	AUTUMN	NONE	S

**Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in (September 2019)**

<b>ID#</b>	<b>DATE</b>	<b>STG#</b>	<b>AREA</b>
NL136	11/09/19	1	NW LANTAU
NL202	11/09/19	1	NW LANTAU
NL286	11/09/19	1	NW LANTAU



Appendix IV. Photographs of Identified Individual Dolphins in September 2019 (HKLR03)

# Appendix M. Wind Data

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
01/09/2019	12:00 AM	0.4	NNE
01/09/2019	1:00 AM	0.9	NNE
01/09/2019	2:00 AM	0.4	NNE
01/09/2019	3:00 AM	0.4	NE
01/09/2019	4:00 AM	0.4	NNE
01/09/2019	5:00 AM	0.4	NE
01/09/2019	6:00 AM	0.4	NNE
01/09/2019	7:00 AM	0.4	NNE
01/09/2019	8:00 AM	1.8	NNE
01/09/2019	9:00 AM	1.3	NNE
01/09/2019	10:00 AM	1.8	NNE
01/09/2019	11:00 AM	2.2	NNE
01/09/2019	12:00 PM	1.8	NNE
01/09/2019	1:00 PM	1.8	NNE
01/09/2019	2:00 PM	2.2	E
01/09/2019	3:00 PM	3.6	E
01/09/2019	4:00 PM	2.7	ENE
01/09/2019	5:00 PM	2.2	NNE
01/09/2019	6:00 PM	1.3	NE
01/09/2019	7:00 PM	1.8	NNE
01/09/2019	8:00 PM	1.3	NNE
01/09/2019	9:00 PM	1.3	NNE
01/09/2019	10:00 PM	1.3	NNE
01/09/2019	11:00 PM	1.8	NNE
02/09/2019	12:00 AM	1.3	NNE
02/09/2019	1:00 AM	1.8	NNE
02/09/2019	2:00 AM	1.8	NNE
02/09/2019	3:00 AM	1.3	NNE
02/09/2019	4:00 AM	0.9	NNE
02/09/2019	5:00 AM	1.3	NNE
02/09/2019	6:00 AM	0.9	NE
02/09/2019	7:00 AM	1.3	NNE
02/09/2019	8:00 AM	1.3	NNE
02/09/2019	9:00 AM	1.8	NNE
02/09/2019	10:00 AM	1.3	NE
02/09/2019	11:00 AM	1.3	NNE
02/09/2019	12:00 PM	0.9	NNE
02/09/2019	1:00 PM	2.7	SE
02/09/2019	2:00 PM	1.3	NE
02/09/2019	3:00 PM	2.2	NE
02/09/2019	4:00 PM	2.5	NNE
02/09/2019	5:00 PM	2.3	NE
02/09/2019	6:00 PM	2.1	NE
02/09/2019	7:00 PM	2.7	NE
02/09/2019	8:00 PM	2.4	E
02/09/2019	9:00 PM	2.2	NNE
02/09/2019	10:00 PM	2.2	ENE
02/09/2019	11:00 PM	2.5	N
03/09/2019	12:00 AM	2.4	NNE
03/09/2019	1:00 AM	2.2	NE
03/09/2019	2:00 AM	2.3	N



### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
03/09/2019	3:00 AM	1.8	NNE
03/09/2019	4:00 AM	1.9	NNE
03/09/2019	5:00 AM	2.4	N
03/09/2019	6:00 AM	2.6	NE
03/09/2019	7:00 AM	2.4	NE
03/09/2019	8:00 AM	2.3	N
03/09/2019	9:00 AM	2.5	N
03/09/2019	10:00 AM	2.7	NE
03/09/2019	11:00 AM	2.2	N
03/09/2019	12:00 PM	2.6	NNE
03/09/2019	1:00 PM	2.4	NNE
03/09/2019	2:00 PM	3.6	N
03/09/2019	3:00 PM	2.7	SSE
03/09/2019	4:00 PM	3.1	NNW
03/09/2019	5:00 PM	2.7	N
03/09/2019	6:00 PM	1.8	NNW
03/09/2019	7:00 PM	2.2	NNW
03/09/2019	8:00 PM	1.8	N
03/09/2019	9:00 PM	1.3	NNW
03/09/2019	10:00 PM	1.3	NNW
03/09/2019	11:00 PM	1.3	NNW
04/09/2019	12:00 AM	0.9	N
04/09/2019	1:00 AM	1.8	SSE
04/09/2019	2:00 AM	1.3	E
04/09/2019	3:00 AM	0.9	E
04/09/2019	4:00 AM	0.9	N
04/09/2019	5:00 AM	0.9	NNE
04/09/2019	6:00 AM	0.9	E
04/09/2019	7:00 AM	1.3	E
04/09/2019	8:00 AM	1.3	SSE
04/09/2019	9:00 AM	1.3	ENE
04/09/2019	10:00 AM	0.9	NW
04/09/2019	11:00 AM	1.8	E
04/09/2019	12:00 PM	1.3	E
04/09/2019	1:00 PM	1.8	ENE
04/09/2019	2:00 PM	1.3	N
04/09/2019	3:00 PM	1.8	NNW
04/09/2019	4:00 PM	2.2	NNW
04/09/2019	5:00 PM	1.8	NNW
04/09/2019	6:00 PM	1.3	NNW
04/09/2019	7:00 PM	1.3	NNW
04/09/2019	8:00 PM	1.3	SSE
04/09/2019	9:00 PM	1.3	N
04/09/2019	10:00 PM	1.3	NW
04/09/2019	11:00 PM	1.3	N
05/09/2019	12:00 AM	1.3	NNW
05/09/2019	1:00 AM	1.3	NW
05/09/2019	2:00 AM	1.3	E
05/09/2019	3:00 AM	0.4	SE
05/09/2019	4:00 AM	0.9	ENE
05/09/2019	5:00 AM	0.9	E

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
05/09/2019	6:00 AM	0.4	ENE
05/09/2019	7:00 AM	0.9	E
05/09/2019	8:00 AM	1.3	ENE
05/09/2019	9:00 AM	1.8	ENE
05/09/2019	10:00 AM	1.8	NE
05/09/2019	11:00 AM	1.8	NE
05/09/2019	12:00 PM	1.8	ENE
05/09/2019	1:00 PM	1.8	NNW
05/09/2019	2:00 PM	1.8	NNW
05/09/2019	3:00 PM	2.2	NNW
05/09/2019	4:00 PM	2.7	NNW
05/09/2019	5:00 PM	1.8	N
05/09/2019	6:00 PM	1.8	NNW
05/09/2019	7:00 PM	1.3	NNW
05/09/2019	8:00 PM	1.8	NNW
05/09/2019	9:00 PM	2.2	NNW
05/09/2019	10:00 PM	1.3	NNW
05/09/2019	11:00 PM	0.9	NNW
06/09/2019	12:00 AM	0.9	E
06/09/2019	1:00 AM	0.9	E
06/09/2019	2:00 AM	0.9	NW
06/09/2019	3:00 AM	0.9	ENE
06/09/2019	4:00 AM	0.9	E
06/09/2019	5:00 AM	0.4	ENE
06/09/2019	6:00 AM	0.4	E
06/09/2019	7:00 AM	0.4	E
06/09/2019	8:00 AM	0.9	ENE
06/09/2019	9:00 AM	1.3	ENE
06/09/2019	10:00 AM	1.3	ENE
06/09/2019	11:00 AM	2.2	ENE
06/09/2019	12:00 PM	1.8	ENE
06/09/2019	1:00 PM	1.3	NNW
06/09/2019	2:00 PM	1.3	N
06/09/2019	3:00 PM	1.3	N
06/09/2019	4:00 PM	1.3	NNW
06/09/2019	5:00 PM	1.3	NNW
06/09/2019	6:00 PM	1.3	NNW
06/09/2019	7:00 PM	1.8	N
06/09/2019	8:00 PM	1.8	NNW
06/09/2019	9:00 PM	1.3	N
06/09/2019	10:00 PM	0.4	NE
06/09/2019	11:00 PM	0.4	ENE
07/09/2019	12:00 AM	0	E
07/09/2019	1:00 AM	0	ENE
07/09/2019	2:00 AM	0	ENE
07/09/2019	3:00 AM	0	ENE
07/09/2019	4:00 AM	0	ENE
07/09/2019	5:00 AM	0	ENE
07/09/2019	6:00 AM	0	ENE
07/09/2019	7:00 AM	0	ENE
07/09/2019	8:00 AM	0	ENE

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
07/09/2019	9:00 AM	0	NE
07/09/2019	10:00 AM	0.9	NE
07/09/2019	11:00 AM	0.9	NNW
07/09/2019	12:00 PM	0.9	NNW
07/09/2019	1:00 PM	1.3	NW
07/09/2019	2:00 PM	1.3	NW
07/09/2019	3:00 PM	0.9	NW
07/09/2019	4:00 PM	1.3	ENE
07/09/2019	5:00 PM	0.9	E
07/09/2019	6:00 PM	0.4	NW
07/09/2019	7:00 PM	0.4	N
07/09/2019	8:00 PM	0	N
07/09/2019	9:00 PM	0.4	ESE
07/09/2019	10:00 PM	0	ESE
07/09/2019	11:00 PM	0	ESE
08/09/2019	12:00 AM	0	ESE
08/09/2019	1:00 AM	0	ESE
08/09/2019	2:00 AM	0	ESE
08/09/2019	3:00 AM	0	ESE
08/09/2019	4:00 AM	0	ESE
08/09/2019	5:00 AM	0	ESE
08/09/2019	6:00 AM	0	ESE
08/09/2019	7:00 AM	0	ESE
08/09/2019	8:00 AM	0	ESE
08/09/2019	9:00 AM	0.4	ENE
08/09/2019	10:00 AM	0.9	ENE
08/09/2019	11:00 AM	0.9	NE
08/09/2019	12:00 PM	1.3	N
08/09/2019	1:00 PM	1.3	NW
08/09/2019	2:00 PM	1.3	NW
08/09/2019	3:00 PM	2.2	NE
08/09/2019	4:00 PM	1.8	NE
08/09/2019	5:00 PM	0.9	ENE
08/09/2019	6:00 PM	0.9	ENE
08/09/2019	7:00 PM	0.4	ENE
08/09/2019	8:00 PM	0.9	SSE
08/09/2019	9:00 PM	0.4	E
08/09/2019	10:00 PM	0.4	NE
08/09/2019	11:00 PM	0	NE
09/09/2019	12:00 AM	0	NE
09/09/2019	1:00 AM	0	ESE
09/09/2019	2:00 AM	0	ESE
09/09/2019	3:00 AM	0	S
09/09/2019	4:00 AM	0	S
09/09/2019	5:00 AM	0	S
09/09/2019	6:00 AM	0	S
09/09/2019	7:00 AM	0	S
09/09/2019	8:00 AM	0.4	ENE
09/09/2019	9:00 AM	1.3	ENE
09/09/2019	10:00 AM	1.3	NE
09/09/2019	11:00 AM	1.3	ENE

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
09/09/2019	12:00 PM	0.9	NNW
09/09/2019	1:00 PM	1.8	NNE
09/09/2019	2:00 PM	1.8	ENE
09/09/2019	3:00 PM	1.8	NNW
09/09/2019	4:00 PM	1.3	NE
09/09/2019	5:00 PM	0.9	NNW
09/09/2019	6:00 PM	1.3	N
09/09/2019	7:00 PM	0.9	ENE
09/09/2019	8:00 PM	0.4	NW
09/09/2019	9:00 PM	0.9	NE
09/09/2019	10:00 PM	0.9	ENE
09/09/2019	11:00 PM	0.9	ENE
10/09/2019	12:00 AM	0.9	ENE
10/09/2019	1:00 AM	0.4	E
10/09/2019	2:00 AM	0.9	ENE
10/09/2019	3:00 AM	0.4	N
10/09/2019	4:00 AM	0.4	E
10/09/2019	5:00 AM	0.4	E
10/09/2019	6:00 AM	0.4	NNW
10/09/2019	7:00 AM	0.9	ENE
10/09/2019	8:00 AM	0.9	ENE
10/09/2019	9:00 AM	1.3	E
10/09/2019	10:00 AM	1.3	E
10/09/2019	11:00 AM	1.3	E
10/09/2019	12:00 PM	1.3	N
10/09/2019	1:00 PM	1.3	ENE
10/09/2019	2:00 PM	1.3	ENE
10/09/2019	3:00 PM	1.3	N
10/09/2019	4:00 PM	1.8	N
10/09/2019	5:00 PM	1.8	N
10/09/2019	6:00 PM	1.8	NNW
10/09/2019	7:00 PM	1.8	NNW
10/09/2019	8:00 PM	1.3	NNW
10/09/2019	9:00 PM	0.9	NNW
10/09/2019	10:00 PM	1.3	E
10/09/2019	11:00 PM	0.9	NNW
11/09/2019	12:00 AM	0.4	NE
11/09/2019	1:00 AM	0.4	NW
11/09/2019	2:00 AM	0.4	NNW
11/09/2019	3:00 AM	0.4	NNW
11/09/2019	4:00 AM	0.4	ENE
11/09/2019	5:00 AM	0.4	ENE
11/09/2019	6:00 AM	0.4	ENE
11/09/2019	7:00 AM	0.4	NW
11/09/2019	8:00 AM	0.9	NE
11/09/2019	9:00 AM	0.9	ENE
11/09/2019	10:00 AM	1.8	E
11/09/2019	11:00 AM	0.9	ENE
11/09/2019	12:00 PM	1.3	NE
11/09/2019	1:00 PM	1.8	NE
11/09/2019	2:00 PM	1.3	ENE

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
11/09/2019	3:00 PM	1.8	ENE
11/09/2019	4:00 PM	1.3	ENE
11/09/2019	5:00 PM	0.9	NW
11/09/2019	6:00 PM	0.9	NW
11/09/2019	7:00 PM	0.4	NW
11/09/2019	8:00 PM	0	NW
11/09/2019	9:00 PM	0	NW
11/09/2019	10:00 PM	0	NW
11/09/2019	11:00 PM	0	NW
12/09/2019	12:00 AM	0	NW
12/09/2019	1:00 AM	0	NW
12/09/2019	2:00 AM	0	NW
12/09/2019	3:00 AM	0	NW
12/09/2019	4:00 AM	0	NW
12/09/2019	5:00 AM	0	NW
12/09/2019	6:00 AM	0	NW
12/09/2019	7:00 AM	0	NW
12/09/2019	8:00 AM	0	NNE
12/09/2019	9:00 AM	0.9	NNE
12/09/2019	10:00 AM	1.3	NE
12/09/2019	11:00 AM	1.3	NE
12/09/2019	12:00 PM	1.3	NE
12/09/2019	1:00 PM	1.3	NNE
12/09/2019	2:00 PM	1.3	NNW
12/09/2019	3:00 PM	1.3	ENE
12/09/2019	4:00 PM	1.3	ENE
12/09/2019	5:00 PM	1.3	ENE
12/09/2019	6:00 PM	0.4	NNW
12/09/2019	7:00 PM	0.4	ENE
12/09/2019	8:00 PM	0.4	SSE
12/09/2019	9:00 PM	2.2	NNW
12/09/2019	10:00 PM	2.7	NNW
12/09/2019	11:00 PM	2.7	NNW
13/09/2019	12:00 AM	2.2	NNW
13/09/2019	1:00 AM	2.2	NNW
13/09/2019	2:00 AM	1.3	NNW
13/09/2019	3:00 AM	1.3	E
13/09/2019	4:00 AM	0.4	NW
13/09/2019	5:00 AM	0.9	E
13/09/2019	6:00 AM	0.4	E
13/09/2019	7:00 AM	0	E
13/09/2019	8:00 AM	0	E
13/09/2019	9:00 AM	0.9	ENE
13/09/2019	10:00 AM	1.3	ENE
13/09/2019	11:00 AM	1.8	NE
13/09/2019	12:00 PM	1.3	NW
13/09/2019	1:00 PM	1.3	E
13/09/2019	2:00 PM	1.8	N
13/09/2019	3:00 PM	1.3	NNE
13/09/2019	4:00 PM	1.3	NW
13/09/2019	5:00 PM	0.9	NE

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
13/09/2019	6:00 PM	0.9	NE
13/09/2019	7:00 PM	0	N
13/09/2019	8:00 PM	0	ENE
13/09/2019	9:00 PM	0	ENE
13/09/2019	10:00 PM	0.4	E
13/09/2019	11:00 PM	0	S
14/09/2019	12:00 AM	0	S
14/09/2019	1:00 AM	0.4	N
14/09/2019	2:00 AM	0.9	NNW
14/09/2019	3:00 AM	0.4	NNW
14/09/2019	4:00 AM	0	NNE
14/09/2019	5:00 AM	0	---
14/09/2019	6:00 AM	0	---
14/09/2019	7:00 AM	0	---
14/09/2019	8:00 AM	0.4	ENE
14/09/2019	9:00 AM	0.9	NNE
14/09/2019	10:00 AM	1.3	NE
14/09/2019	11:00 AM	1.3	NNW
14/09/2019	12:00 PM	0.9	NNW
14/09/2019	1:00 PM	0.9	N
14/09/2019	2:00 PM	0.9	S
14/09/2019	3:00 PM	1.8	ENE
14/09/2019	4:00 PM	0.9	NNW
14/09/2019	5:00 PM	0.9	NNW
14/09/2019	6:00 PM	0.4	E
14/09/2019	7:00 PM	0	NNE
14/09/2019	8:00 PM	0.4	NNW
14/09/2019	9:00 PM	0.9	NNE
14/09/2019	10:00 PM	1.3	N
14/09/2019	11:00 PM	0.9	NW
15/09/2019	12:00 AM	0.4	NNW
15/09/2019	1:00 AM	0.9	ENE
15/09/2019	2:00 AM	0.9	ENE
15/09/2019	3:00 AM	0	SSE
15/09/2019	4:00 AM	0	SSE
15/09/2019	5:00 AM	0	SSE
15/09/2019	6:00 AM	0	SSE
15/09/2019	7:00 AM	0.4	ENE
15/09/2019	8:00 AM	0.4	ENE
15/09/2019	9:00 AM	1.3	ENE
15/09/2019	10:00 AM	1.8	NW
15/09/2019	11:00 AM	1.3	NNW
15/09/2019	12:00 PM	1.3	E
15/09/2019	1:00 PM	1.8	ENE
15/09/2019	2:00 PM	1.8	ENE
15/09/2019	3:00 PM	1.3	NNE
15/09/2019	4:00 PM	0.9	NW
15/09/2019	5:00 PM	1.3	ENE
15/09/2019	6:00 PM	0.9	ENE
15/09/2019	7:00 PM	0.4	ENE
15/09/2019	8:00 PM	0	SSE

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
15/09/2019	9:00 PM	0	SSE
15/09/2019	10:00 PM	0	SSE
15/09/2019	11:00 PM	0	SSE
16/09/2019	12:00 AM	0	SSE
16/09/2019	1:00 AM	0	SSE
16/09/2019	2:00 AM	0	SSE
16/09/2019	3:00 AM	0	E
16/09/2019	4:00 AM	0.4	NNE
16/09/2019	5:00 AM	0.4	ENE
16/09/2019	6:00 AM	0	E
16/09/2019	7:00 AM	0	E
16/09/2019	8:00 AM	0.4	S
16/09/2019	9:00 AM	0.4	S
16/09/2019	10:00 AM	0.4	N
16/09/2019	11:00 AM	0.9	NNE
16/09/2019	12:00 PM	0.9	NNW
16/09/2019	1:00 PM	0.9	NW
16/09/2019	2:00 PM	1.3	NW
16/09/2019	3:00 PM	0.9	NW
16/09/2019	4:00 PM	0.9	SW
16/09/2019	5:00 PM	0.9	N
16/09/2019	6:00 PM	1.3	N
16/09/2019	7:00 PM	1.3	N
16/09/2019	8:00 PM	1.8	N
16/09/2019	9:00 PM	1.8	N
16/09/2019	10:00 PM	1.3	NNW
16/09/2019	11:00 PM	0.9	NNW
17/09/2019	12:00 AM	0.9	NW
17/09/2019	1:00 AM	0.9	E
17/09/2019	2:00 AM	0.4	ENE
17/09/2019	3:00 AM	0	ENE
17/09/2019	4:00 AM	0	ENE
17/09/2019	5:00 AM	0	ENE
17/09/2019	6:00 AM	0	ENE
17/09/2019	7:00 AM	0	ENE
17/09/2019	8:00 AM	0.4	ENE
17/09/2019	9:00 AM	1.3	NE
17/09/2019	10:00 AM	1.3	NE
17/09/2019	11:00 AM	0.9	E
17/09/2019	12:00 PM	1.8	N
17/09/2019	1:00 PM	1.8	N
17/09/2019	2:00 PM	0.4	NW
17/09/2019	3:00 PM	0.4	S
17/09/2019	4:00 PM	0.9	S
17/09/2019	5:00 PM	0	S
17/09/2019	6:00 PM	0.4	SSE
17/09/2019	7:00 PM	1.3	NNE
17/09/2019	8:00 PM	0.4	NNE
17/09/2019	9:00 PM	0.9	E
17/09/2019	10:00 PM	0	NE
17/09/2019	11:00 PM	0	NE

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
18/09/2019	12:00 AM	0	NE
18/09/2019	1:00 AM	0	NE
18/09/2019	2:00 AM	0	NE
18/09/2019	3:00 AM	0	NE
18/09/2019	4:00 AM	0	NE
18/09/2019	5:00 AM	0	NE
18/09/2019	6:00 AM	0	NE
18/09/2019	7:00 AM	0	NE
18/09/2019	8:00 AM	0.4	ENE
18/09/2019	9:00 AM	0.9	ENE
18/09/2019	10:00 AM	0.9	ENE
18/09/2019	11:00 AM	0.9	ENE
18/09/2019	12:00 PM	1.3	NE
18/09/2019	1:00 PM	0.9	NE
18/09/2019	2:00 PM	1.3	ENE
18/09/2019	3:00 PM	0.9	NW
18/09/2019	4:00 PM	1.3	NW
18/09/2019	5:00 PM	0.9	S
18/09/2019	6:00 PM	1.1	E
18/09/2019	7:00 PM	1.2	NE
18/09/2019	8:00 PM	0.9	NE
18/09/2019	9:00 PM	1.4	NE
18/09/2019	10:00 PM	0.8	E
18/09/2019	11:00 PM	1.1	NE
19/09/2019	12:00 AM	0.8	N
19/09/2019	1:00 AM	0.6	NNE
19/09/2019	2:00 AM	0.2	SE
19/09/2019	3:00 AM	0.1	S
19/09/2019	4:00 AM	0.3	SSE
19/09/2019	5:00 AM	0.5	ESE
19/09/2019	6:00 AM	0.4	E
19/09/2019	7:00 AM	0.5	SSE
19/09/2019	8:00 AM	0.3	SW
19/09/2019	9:00 AM	0.6	E
19/09/2019	10:00 AM	1.1	SSW
19/09/2019	11:00 AM	0.5	SW
19/09/2019	12:00 PM	0.7	SSW
19/09/2019	1:00 PM	0.4	SW
19/09/2019	2:00 PM	0.5	ESE
19/09/2019	3:00 PM	0.4	E
19/09/2019	4:00 PM	0.8	NE
19/09/2019	5:00 PM	0.4	SSW
19/09/2019	6:00 PM	0.3	W
19/09/2019	7:00 PM	0.5	WSW
19/09/2019	8:00 PM	0.6	WSW
19/09/2019	9:00 PM	0.2	WSW
19/09/2019	10:00 PM	0.1	WSW
19/09/2019	11:00 PM	0.3	W
20/09/2019	12:00 AM	0.5	W
20/09/2019	1:00 AM	0.6	W
20/09/2019	2:00 AM	1.2	W



### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
20/09/2019	3:00 AM	1	W
20/09/2019	4:00 AM	1.1	WSW
20/09/2019	5:00 AM	0.5	NW
20/09/2019	6:00 AM	0.4	WNW
20/09/2019	7:00 AM	0.3	NNW
20/09/2019	8:00 AM	0.5	NNW
20/09/2019	9:00 AM	0.6	NNW
20/09/2019	10:00 AM	0.7	N
20/09/2019	11:00 AM	0.5	N
20/09/2019	12:00 PM	0.5	NNW
20/09/2019	1:00 PM	0.3	NW
20/09/2019	2:00 PM	0.8	NNE
20/09/2019	3:00 PM	0.2	NNE
20/09/2019	4:00 PM	0.1	N
20/09/2019	5:00 PM	0.1	N
20/09/2019	6:00 PM	0.2	NNW
20/09/2019	7:00 PM	0.3	NNW
20/09/2019	8:00 PM	0.5	NNW
20/09/2019	9:00 PM	0.6	WNW
20/09/2019	10:00 PM	1.1	WNW
20/09/2019	11:00 PM	0.4	NNW
21/09/2019	12:00 AM	0.3	WNW
21/09/2019	1:00 AM	0.5	WNW
21/09/2019	2:00 AM	0.8	NNW
21/09/2019	3:00 AM	1.1	NNW
21/09/2019	4:00 AM	1.5	NNE
21/09/2019	5:00 AM	2.2	NNE
21/09/2019	6:00 AM	2.3	N
21/09/2019	7:00 AM	2.1	N
21/09/2019	8:00 AM	1.8	N
21/09/2019	9:00 AM	1.6	NNW
21/09/2019	10:00 AM	2	NE
21/09/2019	11:00 AM	2	NNE
21/09/2019	12:00 PM	2.3	NW
21/09/2019	1:00 PM	1.5	NNW
21/09/2019	2:00 PM	1.4	NW
21/09/2019	3:00 PM	1.1	NW
21/09/2019	4:00 PM	2.3	NNW
21/09/2019	5:00 PM	3.1	NNW
21/09/2019	6:00 PM	3.4	WNW
21/09/2019	7:00 PM	2.8	WNW
21/09/2019	8:00 PM	2.6	WNW
21/09/2019	9:00 PM	2.1	NNW
21/09/2019	10:00 PM	2.5	WNW
21/09/2019	11:00 PM	2.3	NNW
22/09/2019	12:00 AM	2.4	E
22/09/2019	1:00 AM	1.9	E
22/09/2019	2:00 AM	2.5	NNE
22/09/2019	3:00 AM	2.1	WSW
22/09/2019	4:00 AM	2.3	WNW
22/09/2019	5:00 AM	2.4	W

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
22/09/2019	6:00 AM	3.1	W
22/09/2019	7:00 AM	2.5	W
22/09/2019	8:00 AM	2.1	NNW
22/09/2019	9:00 AM	1.8	NNW
22/09/2019	10:00 AM	1.9	NNW
22/09/2019	11:00 AM	1.8	NNW
22/09/2019	12:00 PM	1.6	N
22/09/2019	1:00 PM	2.3	N
22/09/2019	2:00 PM	2.4	NNE
22/09/2019	3:00 PM	2.1	NNE
22/09/2019	4:00 PM	1.9	NNE
22/09/2019	5:00 PM	1.8	NNE
22/09/2019	6:00 PM	1.6	NNE
22/09/2019	7:00 PM	1.5	N
22/09/2019	8:00 PM	2.4	N
22/09/2019	9:00 PM	2.2	N
22/09/2019	10:00 PM	2.1	NNW
22/09/2019	11:00 PM	1.8	NNW
23/09/2019	12:00 AM	1.4	WNW
23/09/2019	1:00 AM	1.1	WNW
23/09/2019	2:00 AM	1.2	WSW
23/09/2019	3:00 AM	0.9	W
23/09/2019	4:00 AM	0.8	W
23/09/2019	5:00 AM	0.4	W
23/09/2019	6:00 AM	0.5	W
23/09/2019	7:00 AM	0.6	WNW
23/09/2019	8:00 AM	0.3	W
23/09/2019	9:00 AM	0.4	NNW
23/09/2019	10:00 AM	0.5	W
23/09/2019	11:00 AM	0.2	WNW
23/09/2019	12:00 PM	0.8	W
23/09/2019	1:00 PM	0.6	N
23/09/2019	2:00 PM	0.5	N
23/09/2019	3:00 PM	0.4	NNE
23/09/2019	4:00 PM	0.3	N
23/09/2019	5:00 PM	0.2	WNW
23/09/2019	6:00 PM	0.1	NNW
23/09/2019	7:00 PM	1.2	NNW
23/09/2019	8:00 PM	0.8	NNW
23/09/2019	9:00 PM	0.6	N
23/09/2019	10:00 PM	0.5	NNE
23/09/2019	11:00 PM	0.6	N
24/09/2019	12:00 AM	0.8	NNE
24/09/2019	1:00 AM	0.7	NNE
24/09/2019	2:00 AM	0.6	E
24/09/2019	3:00 AM	0.5	ENE
24/09/2019	4:00 AM	0.4	ENE
24/09/2019	5:00 AM	0.6	NE
24/09/2019	6:00 AM	0.8	NE
24/09/2019	7:00 AM	0.4	NE
24/09/2019	8:00 AM	0.5	NNE

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
24/09/2019	9:00 AM	1.1	E
24/09/2019	10:00 AM	1.2	E
24/09/2019	11:00 AM	0.9	E
24/09/2019	12:00 PM	0.7	NE
24/09/2019	1:00 PM	0.6	NE
24/09/2019	2:00 PM	0.5	NNE
24/09/2019	3:00 PM	0.5	NE
24/09/2019	4:00 PM	0.4	E
24/09/2019	5:00 PM	0.5	N
24/09/2019	6:00 PM	0.6	NE
24/09/2019	7:00 PM	0.2	E
24/09/2019	8:00 PM	0.8	E
24/09/2019	9:00 PM	0.6	E
24/09/2019	10:00 PM	0.9	E
24/09/2019	11:00 PM	0.7	E
25/09/2019	12:00 AM	0.5	NE
25/09/2019	1:00 AM	0.6	NNE
25/09/2019	2:00 AM	0.7	ENE
25/09/2019	3:00 AM	0.7	ENE
25/09/2019	4:00 AM	0.8	NE
25/09/2019	5:00 AM	0.8	N
25/09/2019	6:00 AM	1	ESE
25/09/2019	7:00 AM	1.1	E
25/09/2019	8:00 AM	1.2	E
25/09/2019	9:00 AM	0.9	NE
25/09/2019	10:00 AM	0.8	E
25/09/2019	11:00 AM	0.5	NNE
25/09/2019	12:00 PM	0.4	NE
25/09/2019	1:00 PM	0.8	NE
25/09/2019	2:00 PM	0.6	ESE
25/09/2019	3:00 PM	0.9	E
25/09/2019	4:00 PM	0.7	E
25/09/2019	5:00 PM	1.2	E
25/09/2019	6:00 PM	1.1	ESE
25/09/2019	7:00 PM	0.8	NE
25/09/2019	8:00 PM	0.6	NE
25/09/2019	9:00 PM	0.7	E
25/09/2019	10:00 PM	0.4	E
25/09/2019	11:00 PM	0.8	NE
26/09/2019	12:00 AM	0.6	NE
26/09/2019	1:00 AM	0.5	ESE
26/09/2019	2:00 AM	0.4	E
26/09/2019	3:00 AM	0.7	E
26/09/2019	4:00 AM	0.5	E
26/09/2019	5:00 AM	0.6	NE
26/09/2019	6:00 AM	0.5	ENE
26/09/2019	7:00 AM	0.4	ENE
26/09/2019	8:00 AM	0.4	ENE
26/09/2019	9:00 AM	0.7	NE
26/09/2019	10:00 AM	0.3	NE
26/09/2019	11:00 AM	0.3	NNE

**Wind Data**

Date	Time	Wind Speed (m/s)	Wind Direction
26/09/2019	12:00 PM	0.5	ESE
26/09/2019	1:00 PM	0.6	E
26/09/2019	2:00 PM	0.7	E
26/09/2019	3:00 PM	0.5	NE
26/09/2019	4:00 PM	0.8	ENE
26/09/2019	5:00 PM	1.1	ENE
26/09/2019	6:00 PM	0.2	S
26/09/2019	7:00 PM	0	SE
26/09/2019	8:00 PM	0.1	SSE
26/09/2019	9:00 PM	0.1	ESE
26/09/2019	10:00 PM	0.2	ESE
26/09/2019	11:00 PM	0.2	NE
27/09/2019	12:00 AM	0.3	ENE
27/09/2019	1:00 AM	0.2	E
27/09/2019	2:00 AM	0.2	ENE
27/09/2019	3:00 AM	0.1	E
27/09/2019	4:00 AM	0.1	E
27/09/2019	5:00 AM	0.2	ENE
27/09/2019	6:00 AM	0.1	ENE
27/09/2019	7:00 AM	0.2	NNE
27/09/2019	8:00 AM	0.2	ENE
27/09/2019	9:00 AM	0.1	NNE
27/09/2019	10:00 AM	0.3	ENE
27/09/2019	11:00 AM	0.4	NE
27/09/2019	12:00 PM	0.2	NE
27/09/2019	1:00 PM	0.3	NE
27/09/2019	2:00 PM	0.1	NNE
27/09/2019	3:00 PM	0.1	ENE
27/09/2019	4:00 PM	0.2	ENE
27/09/2019	5:00 PM	0.2	NE
27/09/2019	6:00 PM	0.3	NE
27/09/2019	7:00 PM	0.4	E
27/09/2019	8:00 PM	0.2	ESE
27/09/2019	9:00 PM	0.1	E
27/09/2019	10:00 PM	0.3	NNE
27/09/2019	11:00 PM	0.3	E
28/09/2019	12:00 AM	0.1	E
28/09/2019	1:00 AM	0.1	E
28/09/2019	2:00 AM	0.2	E
28/09/2019	3:00 AM	0.2	NE
28/09/2019	4:00 AM	0.1	NNE
28/09/2019	5:00 AM	0.3	NE
28/09/2019	6:00 AM	0.3	NE
28/09/2019	7:00 AM	0.2	NE
28/09/2019	8:00 AM	0.2	NNE
28/09/2019	9:00 AM	0.2	SE
28/09/2019	10:00 AM	0.1	SSE
28/09/2019	11:00 AM	0.2	ESE
28/09/2019	12:00 PM	0.1	ESE
28/09/2019	1:00 PM	0.3	ESE
28/09/2019	2:00 PM	0.2	E

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
28/09/2019	3:00 PM	0.3	E
28/09/2019	4:00 PM	0.2	ENE
28/09/2019	5:00 PM	0.4	NNE
28/09/2019	6:00 PM	0.2	ENE
28/09/2019	7:00 PM	0.3	ENE
28/09/2019	8:00 PM	0.2	ENE
28/09/2019	9:00 PM	0.2	NNE
28/09/2019	10:00 PM	0.4	NNE
28/09/2019	11:00 PM	0.4	NE
29/09/2019	12:00 AM	0.5	NE
29/09/2019	1:00 AM	0.2	ENE
29/09/2019	2:00 AM	0.2	NNE
29/09/2019	3:00 AM	0.2	ENE
29/09/2019	4:00 AM	0.1	E
29/09/2019	5:00 AM	0.1	E
29/09/2019	6:00 AM	0.4	SE
29/09/2019	7:00 AM	0.4	SE
29/09/2019	8:00 AM	0.4	SSE
29/09/2019	9:00 AM	0.4	SSE
29/09/2019	10:00 AM	0.5	S
29/09/2019	11:00 AM	0.2	SSE
29/09/2019	12:00 PM	0.3	SE
29/09/2019	1:00 PM	0.2	ESE
29/09/2019	2:00 PM	0.3	SE
29/09/2019	3:00 PM	0.4	ESE
29/09/2019	4:00 PM	0.5	ESE
29/09/2019	5:00 PM	0.6	ESE
29/09/2019	6:00 PM	0.5	SSE
29/09/2019	7:00 PM	0.4	SSE
29/09/2019	8:00 PM	0.3	SSE
29/09/2019	9:00 PM	0.4	S
29/09/2019	10:00 PM	0.4	S
29/09/2019	11:00 PM	0.4	S
30/09/2019	12:00 AM	0.5	S
30/09/2019	1:00 AM	0.4	SSW
30/09/2019	2:00 AM	0.4	SSE
30/09/2019	3:00 AM	0.2	SSW
30/09/2019	4:00 AM	0.3	SSW
30/09/2019	5:00 AM	0.5	WSW
30/09/2019	6:00 AM	0.4	WSW
30/09/2019	7:00 AM	0.4	WSW
30/09/2019	8:00 AM	0.4	SSW
30/09/2019	9:00 AM	0.5	WSW
30/09/2019	10:00 AM	0.3	SSW
30/09/2019	11:00 AM	0.3	WSW
30/09/2019	12:00 PM	0.2	SSW
30/09/2019	1:00 PM	0.1	S
30/09/2019	2:00 PM	0.2	S
30/09/2019	3:00 PM	0.3	S
30/09/2019	4:00 PM	0.4	S
30/09/2019	5:00 PM	0.5	WSW

### Wind Data

Date	Time	Wind Speed (m/s)	Wind Direction
30/09/2019	6:00 PM	0.4	WSW
30/09/2019	7:00 PM	0.3	WSW
30/09/2019	8:00 PM	0.4	WSW
30/09/2019	9:00 PM	0.3	W
30/09/2019	10:00 PM	0.5	W
30/09/2019	11:00 PM	0.3	W

# Appendix N. Investigation Report

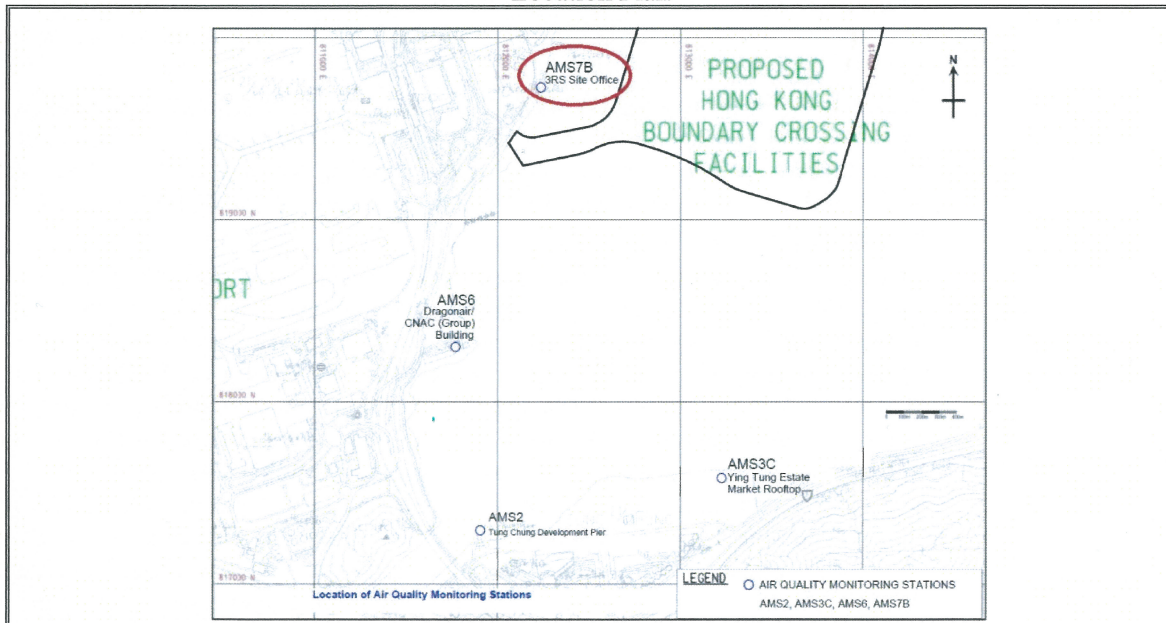
**Incident Report on Action Level or Limit Level Non-compliance**

Contract	Contract No. HY/2013/04 HZMB HKBCF – Infrastructure Works Stage II (Southern Portion)						
Ref. No.	E102						
Date	30 September 2019						
Time (hh:mm)	Start time: 12:17 (p.m.)						
Monitoring Location	AMS7B						
Parameter	Air Quality – 24-hour TSP ( $\mu\text{g}/\text{m}^3$ )						
Action Level	See below						
Limit Level	See below						
Measured Level	Action & Limit Level (AL & LL) / Measured Level:						
	Param.	Unit	Station ID	Description	Action Level	Limit Level	Measured Level
	24-hr TSP	$\mu\text{g}/\text{m}^3$	AMS7B	3RS Site Office	183	260	211
	Remarks: Bold means AL exceedance <u>Bold with underline</u> means LL exceedance						
Possible reason for Action or Limit Level Non-compliance	<p>According to the Contractor of HY/2013/04, the major construction activities conducted under the Contract during the monitoring period included construction of parapets for bridge structures, construction of Retaining Wall RW16N and RW16S, construction of Bridge Deck D16 in-situ deck, construction of utilities cross-over frame under Bridge D9c, backfilling of retaining walls and formation of fill slopes and road embankment, drainage works and watermains laying, roadworks and road furniture.</p> <p>As informed by the Contractor of HY/2013/04, watering of all main haul roads was provided in accordance with the HY/2013/04 site watering plan (as presented in <b>Attachment 1</b>). This plan schedules water spraying for at least 8 times per day which follows the recommended mitigation measures in the EM&amp;A Manual and Environmental Permit.</p> <p>During ET’s regular weekly site inspection on 25 September 2019 (between 09:30 and 10:30 a.m.), one air quality observation was recorded: namely, stockpiles and some exposed works areas were observed dry and dusty. The same observation was recorded during the next ET regular weekly site inspection on 2 October 2019 (between 14:15 and 15:00). Subsequently, the Contractor provided water spray for stockpiles and exposed works areas and the observation was closed during the subsequent ET regular weekly site inspection on 9 October 2019 (between 14:15 and 15:00). The remaining haul roads were observed to be watered and no fugitive dust generation from HY/2013/04 works was observed during this inspection. There was further no air quality observation associated with watering of site areas. Photos relating to the abovementioned site inspections are presented in <b>Attachment 2</b>.</p> <p>The wind data collected at the AMS3C wind station at Ying Tung Estate and the Hong Kong Observatory wind station at Chek Lap Kok during the abovementioned 24-hour monitoring period (as presented in <b>Attachment 3</b>) shows that winds were mostly from the south/southwest on the afternoon/evening of 30 September 2019 and west/northwest on the morning of 1 October 2019. This indicates that it was unlikely that the source of exceedance could be attributed to HY/2013/04.</p>						



	<p>Information available on EPD’s Air Quality Health Index (AQHI) website shows that the short-term health risk of air pollution between 12:00 p.m. on 30 September 2019 and 12:00 p.m. on 1 October 2019 was low to serious in Tung Chung (with maximum AQHI of 10+ at 13:00-17:00 on 30 September 2019). This, combined with the winds recorded at the abovementioned wind stations, indicates that the background air pollution was relatively high during part of the monitoring period and may have contributed to the high level of TSP recorded. The AQHI data is available online at:</p> <ul style="list-style-type: none"> <li>• <a href="http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201909_Eng.csv">http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201909_Eng.csv</a></li> <li>• <a href="http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201910_Eng.csv">http://www.aqhi.gov.hk/epd/ddata/html/history/2019/201910_Eng.csv</a></li> </ul> <p>It was concluded that the exceedance was not due to HY/2013/04.</p>
<p>Actions taken / to be taken</p>	<p>Although the exceedance was considered not due to HY/2013/04, the Contractor is reminded to properly implement site watering plan for the Contract and implement all necessary air quality mitigation measures identified in the EM&amp;A Manual.</p>
<p>Remarks</p>	<p>ET of HY/2013/04 issued notification of exceedance (NOE) as follows:</p> <ul style="list-style-type: none"> <li>• <u>24-hour TSP</u>: 9 October 2019 (Notification No. 20190930_Air_24hr).</li> </ul> <p>Attachments to this report are as follows:</p> <ol style="list-style-type: none"> <li>1. Site watering plan for HY/2013/04.</li> <li>2. Photos of site mitigation measures, air quality observation and Contractor’s follow-up action on 25 September, 2 October and 9 October 2019.</li> <li>3. Wind data during the 24-hour TSP monitoring period at AMS3C wind station at Ying Tung Estate and Hong Kong Observatory Chek Lap Kok wind station.</li> </ol>

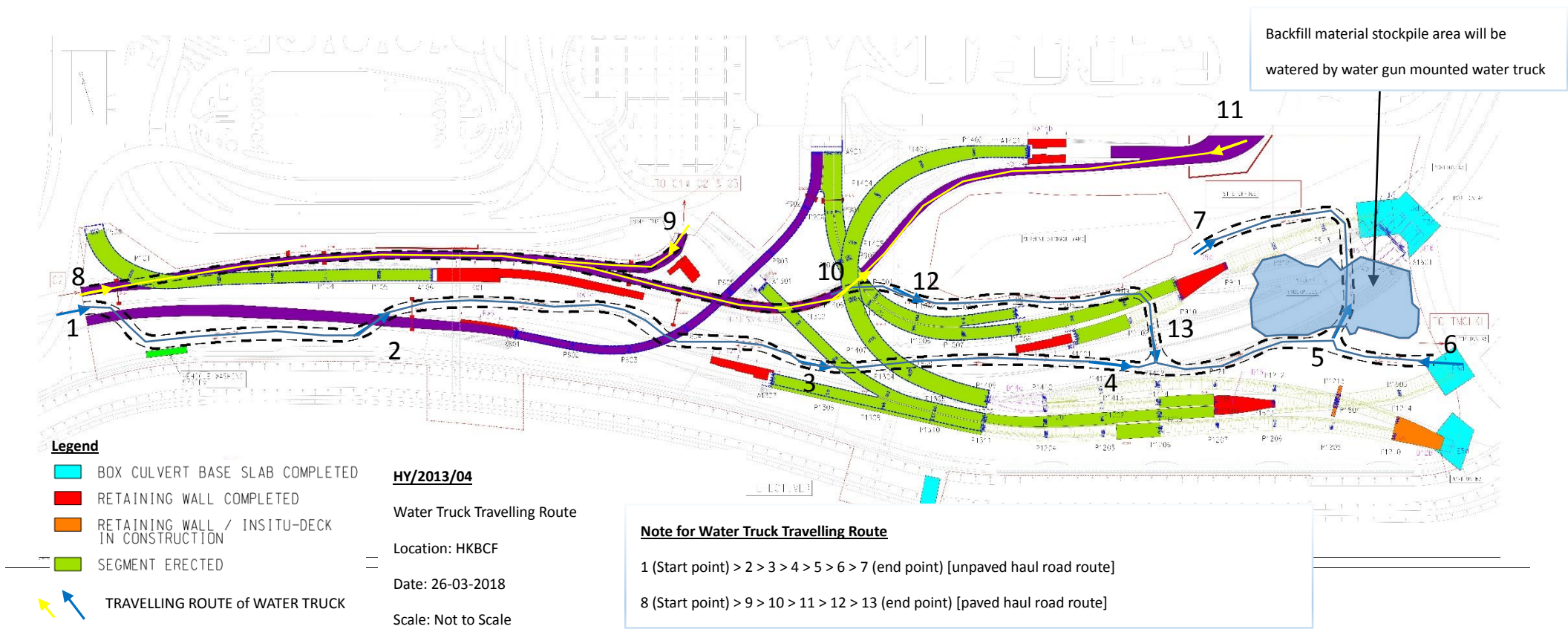
Location Plan



Prepared by: Gary Chow  
 Designation: Environmental Team Leader (Contract No. HY/2013/04)  
 Signature: *[Handwritten Signature]*

Date: 18 October 2019

## **Attachment 1**



# HY/2013/04 Water Truck Travelling Route

## **Attachment 2**

Photo record of site mitigation measures and air quality observations  
during weekly environmental site inspection

25 September 2019



1. Water spray provided for haul roads in the HY/2013/04 site area. No fugitive dust generation was observed.

2. Air quality observation: Stockpiles and some exposed works areas were observed dry and dusty.

Photo record of site mitigation measures and air quality observations during weekly environmental site inspection

2 October 2019



1. Air quality observation: Stockpiles and some exposed works areas were observed dry and dusty.

9 October 2019



1. Contractor's follow-up action: Water spray provided for haul roads in the HY/2013/04 site area. No fugitive dust generation and no air quality site observation was observed.

## **Attachment 3**

### Wind Data at AMS3C

Date	Time	Wind Speed (m/s)	Wind Direction
30/09/2019	12:00 PM	0.2	SSW
30/09/2019	1:00 PM	0.1	S
30/09/2019	2:00 PM	0.2	S
30/09/2019	3:00 PM	0.3	S
30/09/2019	4:00 PM	0.4	S
30/09/2019	5:00 PM	0.5	WSW
30/09/2019	6:00 PM	0.4	WSW
30/09/2019	7:00 PM	0.3	WSW
30/09/2019	8:00 PM	0.4	WSW
30/09/2019	9:00 PM	0.3	W
30/09/2019	10:00 PM	0.5	W
30/09/2019	11:00 PM	0.3	W
01/10/2019	12:00 AM	0.7	NW
01/10/2019	1:00 AM	1.1	NW
01/10/2019	2:00 AM	0.6	NW
01/10/2019	3:00 AM	0.7	W
01/10/2019	4:00 AM	0.8	W
01/10/2019	5:00 AM	0.7	NNW
01/10/2019	6:00 AM	1.2	NNW
01/10/2019	7:00 AM	0.4	NW
01/10/2019	8:00 AM	0.5	NW
01/10/2019	9:00 AM	0.6	NW
01/10/2019	10:00 AM	0.6	NW
01/10/2019	11:00 AM	0.5	W
01/10/2019	12:00 PM	0.4	W



**Wind Data at Chek Lap Kok Collected by the Hong Kong Observatory**

<b>Date &amp; Time</b>	<b>Wind Speed (km/h)</b>	<b>Wind Speed (m/s)</b>	<b>Wind Direction (degrees)</b>
30/09/2019 12:00	15.5	4.3	293
30/09/2019 13:00	15.1	4.2	262
30/09/2019 14:00	17.6	4.9	285
30/09/2019 15:00	13.3	3.7	252
30/09/2019 16:00	9.7	2.7	262
30/09/2019 17:00	9.4	2.6	250
30/09/2019 18:00	8.3	2.3	250
30/09/2019 19:00	7.2	2.0	243
30/09/2019 20:00	7.6	2.1	200
30/09/2019 21:00	16.6	4.6	224
30/09/2019 22:00	16.2	4.5	223
30/09/2019 23:00	13.3	3.7	217
01/10/2019 00:00	10.8	3.0	222
01/10/2019 01:00	9.0	2.5	197
01/10/2019 02:00	9.4	2.6	216
01/10/2019 03:00	6.8	1.9	204
01/10/2019 04:00	12.2	3.4	220
01/10/2019 05:00	7.6	2.1	202
01/10/2019 06:00	6.5	1.8	194
01/10/2019 07:00	3.2	0.9	variable
01/10/2019 08:00	9.0	2.5	356
01/10/2019 09:00	12.2	3.4	331
01/10/2019 10:00	13.7	3.8	340
01/10/2019 11:00	10.1	2.8	330
01/10/2019 12:00	9.7	2.7	266