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Report No.: 0041/17/ED/0544A

## Monthly EM&A Report April 2020

Client : Drainage Services Department

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

Report No.: : 0041/17/ED/0544A

Prepared by: Andy K. H. Choi

Reviewed by: Cyrus C. Y. Lai

Certified by:

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

Colin K. L. Yung  
Environmental Team Leader  
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Our Ref. 1458/20-0090



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**Attn: Mr. LAU Ka Kin, Marcus (E/CM16)**

13 May 2020

**By Post and E-mail**

Dear Sir,

**RE: CONTRACT NO. CM 13/2016  
INDEPENDENT ENVIRONMENTAL CHECKER FOR OPERATIONAL ENVIRONMENTAL MONITORING  
AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT WORKS (SHWSTW)  
MONTHLY ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REPORT (APRIL 2020)**

Reference is made to the submission of Monthly Environmental Monitoring and Audit (EM&A) Report for April 2020 (Report No.: 0041/17/ED/0544A) from the Environmental Team (ET), Fugro Technical Services Ltd., received on 13 May 2020 via email.

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

Should you have any queries, please feel free to contact the undersigned, or our Ms. Joanne NG at 2815 7028.

Yours faithfully,

For and on behalf of  
**Allied Environmental Consultants Ltd.**

A handwritten signature in black ink, appearing to be 'Grace M. H. Kwok', written in a cursive style.

Grace M. H. KWOK  
Independent Environmental Checker

GK/jn/dt

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

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

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

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## TABLE OF CONTENTS

	<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>1.</b>	<b>INTRODUCTION.....</b>	<b>3</b>
<b>2.</b>	<b>AIR QUALITY MONITORING .....</b>	<b>5</b>
<b>3.</b>	<b>WATER QUALITY MONITORING .....</b>	<b>10</b>
<b>4.</b>	<b>SEDIMENT QUALITY MONITORING AND BENTHIC SURVEY .....</b>	<b>20</b>
<b>5.</b>	<b>CHINESE WHITE DOLPHIN MONITORING .....</b>	<b>27</b>
<b>6.</b>	<b>ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES .....</b>	<b>28</b>
<b>7.</b>	<b>ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS .....</b>	<b>29</b>
<b>8.</b>	<b>SUMMARY OF EXCEEDANCE OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMITS .....</b>	<b>30</b>
<b>9.</b>	<b>SUMMARY OF ENVIRONMENTAL COMPLAINTS .....</b>	<b>31</b>
<b>10.</b>	<b>FUTURE KEY ISSUES .....</b>	<b>32</b>
<b>11.</b>	<b>CONCLUSION .....</b>	<b>33</b>

## FIGURE

- Figure 1      Monitoring Stations of Air Sensitive Receivers**
- Figure 2      Odour Patrol Points of Modified Odour Patrol**
- Figure 3      Monitoring Stations of Water Quality Monitoring, Sediment Quality Monitoring and Benthic Survey**
- Figure 4      Location of the Tide Gauge**

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Report No.: 0041/17/ED/0544A

## APPENDICES

- Appendix A** Project Organization Chart
- Appendix B** Monitoring Schedule for Present and Next Reporting Period
- Appendix C** Event and Action Plan for Air Quality Monitoring
- Appendix D** Results and Graphical Presentation of Air Quality Monitoring
- Appendix E** Copy of the Calibration Certificates for Water Quality Monitoring Equipment
- Appendix F** Results and Graphical Presentation of Water Quality Monitoring
- Appendix G** Tidal Data obtained from Ma Wan Marine Traffic Station
- Appendix H** Results and Graphical Presentation of Laboratory Analysis for Sediment Quality Monitoring and Benthic Survey
- Appendix I** Benthic Survey Report
- Appendix J** Photos of Grab Samplers
- Appendix K** Environmental Complaints Log and Incident Report
- Appendix L** Environmental Mitigation Implementation Schedule (EMIS)



## **EXECUTIVE SUMMARY**

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

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

In accordance with the EP, an approved operational EM&A Plan was submitted. According to the approved EM&A plan, air quality monitoring (i.e. H<sub>2</sub>S concentration monitoring, odour patrol monitoring and olfactometry analysis of H<sub>2</sub>S), in addition, water quality monitoring, sediment quality monitoring, benthic survey, Chinese White Dolphin (CWD) monitoring and waste management are the key environmental concern of the Project.

This is the Thirty-third Monthly EM&A Report for the Project which summarizes findings of the EM&A works during the reporting period from 1 April 2020 to 30 April 2020 (the “reporting period”).

### **Breaches of Action and Limit Levels**

Odour patrol monitoring was resumed from January 2020 and carried out on 6, 17, 23 and 29 April 2020. The modified odour patrol monitoring plan including updated Event and Action Plan was approved on March 2020, and modified odour patrol monitoring was commenced from 20 March 2020. No exceedances of Action/Limit levels at Air Sensitive Receivers (ASR) and odour patrol points were recorded and no non-compliance of odour monitoring at ASR were recorded in the reporting period.

Water quality monitoring, sediment quality monitoring and benthic survey were carried out on 6 April 2020. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

### **Complaint Log**

There were no complaints received in relation to 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.



## Summary of the Environmental Mitigations Measures

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

## Future Key Issues

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

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

According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). H<sub>2</sub>S measurement and olfactometry analysis conducted between August 2017 and May 2018 was considered as unlikely way to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspension on air quality monitoring was approved by EPD's memo dated 14 May 2018. In order to recommence the monitoring, a review on air quality monitoring had been carried out to determine reasonable odour-related criteria and was submitted to EPD for approval on 24 March 2020. Comments from EPD was received on 1 April 2020 and the review is currently under revision for further submission to the EPD.

## 1. INTRODUCTION

### 1.1 Background

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

### 1.2 Project Description

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

### 1.3 Project Organization

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

**Table 1.1 Contact Persons and Telephone Numbers of Key Personnel**

Organization	Role	Contact Person	Telephone No.	Fax No.
DSD	Project Proponent Representative	Mr. Marcus Lau	2594 7218	3104 6426
AECOM	Engineer Representative (ER)	Ms. Joanne Tsoi	3922 9423	3922 9797
AEC	Independent Environmental Checker (IEC)	Ms. Grace Kwok	2815 7028	2815 5399
FTS	ET Leader (ETL)	Mr. Colin Yung	3565 4114	2450 8032

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Report No.: 0041/17/ED/0544A

Page 4

### 1.4 Works Undertaken during the Reporting Period

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

- Perform comprehensive operation and maintenance services for the electrical, mechanical and electronic systems/equipment at SHWSTW.
- Alleviate as far as practicable the impact that the facilities and sewage systems imposed on the environment of Hong Kong.



## 2. AIR QUALITY MONITORING

### 2.1 Methodology of H<sub>2</sub>S Concentration Monitoring

2.1.1 15-min H<sub>2</sub>S concentration was measured using a Jerome 631-X analyzer. This analyzer is capable of measuring H<sub>2</sub>S concentration in the range of 1 ppb to 50 ppm with a resolution of 1 ppb and operates within a temperature range of 0°C to 40°C at an air flow rate of 0.15 L/min. Odour gas samples were drawn by built-in a suction pump of the analyzer and passed through a gold film sensor. The trace level of H<sub>2</sub>S of the samples were determined electrochemically on the gold film sensor. Meteorological conditions including temperature, wind speed, wind direction and relative humidity were also measured at the time of the monitoring. Table 2.1 summarizes the equipment used in H<sub>2</sub>S monitoring.

**Table 2.1 Equipment used for H<sub>2</sub>S Concentration Monitoring**

Equipment	Manufacturer / Model	Serial Number	Sensor Number
Gold Film Hydrogen Sulphide Analyzer	JEROME X631 0003	2966	14-11-23-R2D

### 2.2 Methodology of Modified Odour Patrol Monitoring

2.2.1 Due to the complaint case received on 28 November 2019, a modified version of odour patrol monitoring is proposed and approved on 13 March 2020. According to the approved proposal for odour patrol monitoring plan (0041/17/ED/0524G), a modified version of odour patrol monitoring was commenced on 20 March 2020 to ensure the mitigation measures are effectively implemented. The modified odour patrol conducted once per week by two independent trained personnel/competent persons (the "patrollists") patrolling and sniffing along the SHWSTW boundary and the air sensitive receivers (ASRs).

2.2.2 The odour monitoring should not be undertaken on rainy days. Subject to the prevailing weather forecast condition, odour patrol shall be conducted by two patrollists at the downwind locations. During the patrol, the sequence should start from less odourous locations to stronger odourous locations.

2.2.3 The two patrollists shall be satisfied the below requirements during odour patrol:

- Have their individual odour threshold of n-butanol in nitrogen gas in the range of 20 to 80 ppb/V required by the European Standard method: BS EN13725.
- Be free from any respiratory illnesses.
- Not be allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30min before and during odour patrol.
- Take great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics.
- Not communicate with each other about the results of their choices.

2.2.4 During the odour patrol monitoring, the meteorological and surrounding information are recorded as follows:

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

2.2.5 The perceived intensity is to be divided into 5 levels which are ranked in a descending order as follows:

**Table 2.2 Categories of Odour Intensity for Modified Odour Patrol Monitoring**

<b>Odour Level</b>	<b>Odour Intensity</b>	<b>Classification Criteria</b>
0	Not detected	No odour perceived or an odour so weak that it cannot be easily characterised or described.
1	Slight	Slight identifiable odour, and slight chance to have odour nuisance.
2	Moderate	Moderate identifiable odour, and moderate chance to have odour nuisance.
3	Strong	Strong identifiable, likely to have odour nuisance.
4	Extreme	Extreme severe odour, and unacceptable odour level.

## 2.3 Methodology of Odour Sampling and Olfactometry Analysis

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

## 2.4 Monitoring Location

- 2.4.1 H<sub>2</sub>S concentration monitoring and odour sampling at ASR, Cheung Tung Road near the Bus Depot at the west of the Siu Ho Wan Treatment Plant, were temporarily suspended from 14 May 2018. The location of ASR is shown in **Figure 1**.
- 2.4.2 9 odour patrol points is chosen to conduct the modified odour patrol for collecting more representative data and identify the particular source of odour in the site. The nine odour patrol points is as below:

**Table 2.3 Odour Patrol Point**

Odour Patrol Point	Description
OD1	Eastern Site Boundary
OD2	Southern Site Boundary
OD3	Western Site Boundary
OD4	Northern Site Boundary
OD5	Spur Road near Discovery Bay Tunnel Outlet
OD6	Cheung Tung Road near the Bus Depot
OD7	Cheung Tung Road near O-PARK1
OD8	Sham Shui Kok Dr near MTR Depot
OD9	Discovery Bay Tunnel Toll Plaza

Note:

As access permission from the company of Discovery Bay Tunnel is under requisition progress, OD5 (Spur Road near Discovery Bay Tunnel Outlet) was not covered in odour patrol monitoring in the reporting period temporarily.



2.4.3 The odour patrol points of modified odour patrol is shown in **Figure 2**.

**2.5 Monitoring Frequency and Duration**

2.5.1 The durations and frequencies of H<sub>2</sub>S concentration measurement, odour patrolling and odour sampling are summarized in **Table 2.4** below.

**Table 2.4 Durations and Frequencies of Air Quality Monitoring Programme**

	Duration	Frequency
H <sub>2</sub> S concentration monitoring	15 minutes	<sup>1</sup> Weekly basis for 6 months during the initial operation stage
Odour patrol		<sup>4</sup> Weekly basis
Odour sampling for olfactometry analysis	<sup>3</sup> 15 minutes	<sup>2</sup> First week of the odour patrol monitoring

Remark:

- 1) In case excessive odour nuisance was detected during the odour patrol monitoring or the standard of the 5 odour units cannot be complied with during the odour panel monitoring, the odour patrol monitoring and H<sub>2</sub>S concentration monitoring shall be extended for a period of three months to cater for the warm-up period of the functioning of the additional mitigation measures.
- 2) In case the relationship between H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>) cannot conclude from the correlation study carried out at the first week of the odour patrol monitoring due to invalid data, additional odour sampling for olfactometry analysis shall be carried out for the correlation study.
- 3) Sufficient air samples (approximate 60L) may be collected in less than 15 minutes during odour sampling.
- 4) As advice by EPD on the odour complaint received in November 2019, odour patrol monitoring was resumed on weekly basis from 15 January 2020.

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

**2.6 Event and Action Plan**

2.6.1 According to the approved proposal for odour patrol monitoring plan (0041/17/ED/0524G), updated Action and limit levels for air quality monitoring are presented in **Table 2.5**.

**Table 2.5 Action and Limit Levels for Air Quality Monitoring**

Parameter	Action	Limit
Odour Nuisance	One complaint received for specific odour event / Odour intensity of 2 or above is measured from odour patrol	Two or more independent complaints received for specific odour event in 3 months / Odour intensity of 3 or above is measured from odour patrol



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

**2.7 Quality Assurance and Quality Control**

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

2.7.2 Calibration of the analyzer is conducted every year at the laboratory of the manufacturer.

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

**2.8 Monitoring Results and Observations**

2.8.1 As advice by EPD on the odour complaint received in November 2019, odour patrol monitoring was resumed on weekly basis. The odour patrol monitoring was carried out on 6, 17, 23 and 29 April 2020. As access permission from the company of Discovery Bay Tunnel is under requisition progress, OD5 (Spur Road near Discovery Bay Tunnel Outlet) was not covered in odour patrol monitoring in the reporting period temporarily.

2.8.2 The meteorological data including temperature, wind speed and direction of the reporting period at ASR is summarised in **Table 2.6**.

**Table 2.6 Summary of Meteorological Data in Reporting Period**

Date	Location	Temperature (°C)	Relative Humidity (%)	Wind Direction	Wind Speed (m/s)
6 April 2020	OD1	18.0	77	E	0.4
	OD2			-	0.0
	OD3			-	0.0
	OD4			-	0.0
	OD6			E	2.1
	OD7			E	0.5
	OD8			NE	2.0
	OD9			NE	0.9
	17 April 2020			OD1	25.4
OD2		-	0.0		
OD3		N	0.8		
OD4		N	1.1		
OD6		N	0.9		
OD7		N	0.1		
OD8		N	0.2		
OD9		N	0.4		
23 April 2020		OD1	20.2	87	
	OD2	-			0.0
	OD3	-			0.0
	OD4	-			0.0
	OD6	-			0.0
	OD7	-			0.0
	OD8	NE			0.8



	OD9			-	0.0
29 April 2020	OD1	25.2	71	NE	0.7
	OD2			-	0.0
	OD3			NE	1.6
	OD4			NE	0.4
	OD6			NE	0.4
	OD7			NE	1.5
	OD8			NE	0.2
	OD9			NE	0.7

2.8.3 The monitoring results in the reporting period are summarised in **Table 2.7**. Graphical pots of results and details of monitoring data are shown in **Appendix D**.

**Table 2.7 Summary of Air Quality Monitoring Result in Reporting Period**

Monitoring Location	Monitoring Parameter
	Odour Patrol <sup>^</sup> (Odour Level)
	Range
OD1	0 - 0
OD2	0 - 0
OD3	0 - 0
OD4	0 - 0
OD6	0 - 0
OD7	0 - 0
OD8	0 - 0
OD9	0 - 0

Remark:

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

2.8.4 According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). H<sub>2</sub>S measurement and olfactometry analysis conducted between August 2017 and May 2018 was considered as unlikely way to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspension on air quality monitoring was approved by EPD’s memo dated 14 May 2018. In order to recommence the monitoring, a review on air quality monitoring had been carried out to determine reasonable odour-related criteria and was submitted to EPD for approval on 24 March 2020. Comments from EPD was received on 1 April 2020 and the review is currently under revision for further submission to the EPD.

2.8.5 No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period.

2.8.6 Odour mitigation measures such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment unit prior to stack exhaust were implemented during the reporting period.



**3. WATER QUALITY MONITORING**

**3.1 Monitoring Station**

3.1.1 In accordance with Section 5 of the EM&A Plan, water quality monitoring should be carried out at eight designated monitoring stations (two impact stations and six control stations) during the first five years of the operational phase of the Project. The monitoring stations shall be the same monitoring stations that were used for the baseline monitoring programme and have been approved by EPD. The coordinates of the monitoring stations are shown in **Table 3.1** and their locations are shown in **Figure 3**.

**Table 3.1 Location of Water Quality Monitoring**

Sampling Location		Easting	Northing
A	The Brothers, Control Station	816 100	822 500
B	The Brothers, Control Station	816 680	822 440
C	Siu Ho Wan Outfall, Impact Station	816 800	820 180
D	Siu Ho Wan Outfall, Impact Station	817 160	820 360
E	Cheung Sok, Control Station	819 817	821 655
F	Cheung Sok, Control Station	820 158	821 922
G	Tai Ching Chau, Control Station	822 214	822 692
H	Tai Ching Chau, Control Station	822 494	822 939

**3.2 Monitoring Parameter**

3.2.1 The monitoring parameters for water quality monitoring are summarized in **Table 3.2**.

**Table 3.2 Parameters for Water Quality Monitoring**

Monitoring Parameters	
In-situ Measurement	Laboratory Analysis
Dissolved oxygen (mg/L)	<i>E. coli</i> (cfu/100ml)
Temperature (degree Celsius)	5-day BOD (mg/l)
pH value	Suspended Solids (mg/l)
Water depth (m)	Ammonia as N (mg/l)
Salinity (ppt)	Nitrate as N (mg/l)
Turbidity (NTU)	Nitrite as N (mg/l)
Current Speed (m/s)	Total inorganic nitrogen (mg/l)
Current Direction (degree magnetic)	Total phosphorus (soluble and particulate) (mg/l)

3.2.2 Apart from the parameters listed in the **Table 3.2**, other relevant supplementary information such as monitoring location, time, weather conditions and any special phenomena will be also recorded.

3.2.3 The tidal data will be obtained from the tide gauge installed in Ma Wan Marine Traffic Station, managed by the Hydrographic Office of Marine Department. Location of the tide gauge is shown in **Figure 4**.

**3.3 Monitoring Equipment**

3.3.1 A multifunctional meter (YSI 6920 V2/ Aqua TROLL 600) will be used to measure dissolved oxygen (DO), concentration, DO saturation, temperature, salinity, pH and turbidity, simultaneously at the same location and water depth. An Acoustic Doppler Current Profiler (ADCP) integrated with echo sounder function will be used to measure water depth, current velocity (speed and direction). The data measured by ADCP will then be downloaded on site to computer on-board. The water depth data measured by the ADCP shall be electronically logged and available for output. All measurement data from the multiparameter monitoring device and ADCP will be integrated with the GPS data from the DGPS logging device, so that data collected at a specific time and location can be shown. The water sampler will be equipped with a multiparameter monitoring device (with water depth probe to determine the exact sampling depth at which a sample is collected). The equipment employed for the monitoring and sampling and their specifications are presented in **Table 3.3**. **Table 3.4** summarizes the equipment used in water quality monitoring. Copy of the calibration certificates for water quality monitoring equipment are presented in **Appendix E**.

**Table 3.3 Water Quality Monitoring and Sampling Equipment**

Parameter	Equipment	Model	Range	Equipment Accuracy
Temperature, Dissolved Oxygen, salinity, pH, Turbidity, Sampling Depth	Water Quality Monitoring Device	1) YSI 6920V2-2-M Sonde 2) Aqua TROLL 600 Multiparameter Sonde	Temp: -5 to 50°C DO: 0-50mg/L DO%: 0-500% Sal: 0 to 70 ppt pH: 0 to 14 pH units Turb: 0-1000NTU Depth: 0-61 meters	Temp: ±0.15°C DO: ±0.1mg/L or 1% (whichever greater) for 0-20mg/L; ±15% for 20-50mg/L (with correction for salinity and temperature) Sal: ±1% or 0.1ppt (whichever greater) pH: ±0.2 units Turb: ±2% or 0.3NTU (whichever greater) Depth: ±0.12m
Water Depth, Current Speed, Current Direction	Acoustic Doppler Current Profiler	RiverSurveyor M9	Water Depth: 0-80m	Water Depth: 1% Current speed: ±0.25% of measured velocity or ±0.2cm/s Current direction: ±2degree magnetic
Positioning	DGPS	Simrad MX521B Smart Antenna with Simrad MX610 CDU	NA	GPS: ±1m
Water Sampling	Water Sampler	Aquatic Research Transparent PC Vertical Water Sampler 2.2L / 3L / 5L	NA	NA





**Table 3.4 Equipment used for Water Quality Monitoring**

Equipment	Manufacturer / Model	Serial Number
Water Quality Monitoring Device	Aqua TROLL 600 Multiparameter Sonde	490113
Acoustic Doppler Current Profiler	RiverSurveyor M9	5906

3.3.2 Apart from the equipment mentioned in Section 3.3.1, a Class III commercially licensed vessel will be used as survey vessel. DGPS logging device with accuracy of  $\pm 1\text{m}$  at 95% confidence level will be installed on the survey vessel to ascertain that measurement can be made accurately on the specific transects. All GPS data collected during the whole survey will be automatically and electronically logged. Powered winch will be used on-board the Survey Vessel to assist the monitoring. Experienced supervisor will be present all throughout the monitoring activities on-board the survey vessel.

3.3.3 Water samples will be collected by water sampler and stored in high density polythene bottles and sterilized glass bottles (for bacterial analysis), packed in ice (cooled to  $4^{\circ}\text{C}$  without being frozen), and delivered to the laboratory on the same day of collection for analysis. All sampling bottles will be pre-rinsed with the same water samples. The sampling bottles will then be taken to a HOKLAS accredited laboratory for analysis of *E. coli*, BOD<sub>5</sub>, Suspended Solids, NH<sub>3</sub>-N, NO<sub>3</sub>-N, NO<sub>2</sub>-N, Total inorganic nitrogen, Total phosphorus (soluble and particulate).

**3.4 Laboratory Measurement and Analysis**

3.4.1 ALS Technichem (HK) Pty Ltd (HOKLAS Reg. No. 066), is the appointed laboratory for analysis of water samples. The methods adopted by the laboratory and the reporting limits are detailed in **Table 3.5**.

**Table 3.5 Laboratory Measurement/Analysis Methods and Reporting Limits**

Analysis Description	Method	Reporting limits
<i>E. coli</i>	DoE Section 7.8, 7.9.4.2& 7.9.4.4 plus in situ urease test	1 cfu/100mL
5-day Biochemical Oxygen Demand	APHA 5210B	1 mg/L
Total Suspended Solid	APHA 2540D	0.5 mg/L
Ammonia as N	APHA 4500 NH3: G	0.005 mg/L
Nitrate as N	APHA 4500 NO3: I	0.005 mg/L
Nitrite as N	APHA 4500 NO2 B&H	0.005 mg/L
Total Inorganic Nitrogen	By Calculation	0.01 mg/L
Total phosphorus (soluble and particulate)	APHA 4500 P: J	0.01 mg/L



**3.5 Monitoring Frequency and Duration**

- 3.5.1 The water quality monitoring programme will be carried out once per two months for a period of five years of the operational phase of the Project.
- 3.5.2 Water quality monitoring for two tides at eight designated stations will be carried out for each monitoring event. For each station at each tide, duplicate samples for in-situ parameter and laboratory analysis at three designated water depths (1 m below water surface, mid-depth and 1 m above the seabed) will be taken and analyzed.
- 3.5.3 The monitoring schedule for the present and next reporting period is provided in **Appendix B**.

**3.6 Quality Assurance / Quality Control**

- 3.6.1 The equipment is in compliance with the requirements set out in the EM&A Plan. All in-situ monitoring instruments were calibrated by a HOKLAS-accredited laboratory or by standard solutions. Calibration of temperature, DO, salinity, pH and turbidity is conducted in three month interval.
- 3.6.2 During the measurements of DO concentration, DO saturation, salinity, turbidity, pH and temperature, duplicate readings will be taken. If the difference between the first and second readings of DO or turbidity is more than 25% of the value of the first reading, the reading was discarded and further readings will be taken.
- 3.6.3 The laboratory incorporates a variety of QA/QC monitoring programme into their testing system. Where applicable or available, the quality of the analysis will be monitored by conducting the following QC analysis:

For each batch of 20 samples:

- A minimal of 1 laboratory method blank will be analyzed;
- A minimal of 1 sample duplicate will be analyzed;
- A minimal of 1 sample matrix spike will be analyzed.

**3.7 Event and Action Plan**

- 3.7.1 Since the purpose of the water quality monitoring is to collect data for future propose, no specific event and action has to be followed.

**3.8 Monitoring Results and Observations**

- 3.8.1 Water quality monitoring is carried out was 6 April 2020. A summary of the in-situ water quality monitoring results are presented in **Table 3.6** (Mid-ebb) and **Table 3.7** (Mid-flood) respectively. The complete record and graphical presentation of the in-situ water quality monitoring results is given in **Appendix F**.

Table 3.6 Summary of In-situ Monitoring Results (Mid-ebb)

Monitoring Station	Water Depth (m)	Sampling Depth (m)	Dissolved oxygen (mg/L)	Temperature (degree Celsius)	pH	Salinity (ppt)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
A	17	S 1	6.87	20.91	7.38	30.60	3.9	0.36	289.3

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Report No.: 0041/17/ED/0544A

Page 15

Monitoring Station	Water Depth (m)	Sampling Depth (m)	Dissolved oxygen (mg/L)	Temperature (degree Celsius)	pH	Salinity (ppt)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
		S 1	6.71	21.10	7.43	30.47	4.0	0.36	270.6
		M 8.5	6.40	21.33	7.57	30.86	5.4	0.27	308.1
		M 8.5	6.38	21.33	7.59	30.87	5.5	0.29	305.4
		B 16	6.32	21.34	7.64	31.27	8.1	0.29	297.4
		B 16	6.28	21.33	7.65	31.38	8.6	0.26	291.5
B	14	S 1	6.87	21.05	7.71	30.52	3.8	0.11	108.3
		S 1	6.71	21.21	7.75	30.42	3.9	0.11	109.5
		M 7	6.40	21.36	7.75	30.80	5.3	0.15	131.5
		M 7	6.38	21.37	7.75	30.84	5.6	0.15	136.9
		B 13	6.32	21.36	7.75	31.23	7.4	0.08	122.6
		B 13	6.28	21.35	7.75	31.34	7.8	0.09	128.0
C	12	S 1	6.68	21.21	7.78	29.75	4.2	0.09	158.4
		S 1	6.66	21.20	7.78	29.70	4.2	0.10	157.3
		M 6	6.52	21.32	7.77	30.58	4.4	0.12	149.1
		M 6	6.47	21.35	7.77	30.73	4.6	0.13	143.2
		B 11	6.43	21.36	7.77	31.04	5.3	0.17	117.4
		B 11	6.33	21.38	7.78	31.14	5.5	0.16	120.9
D	13	S 1	6.56	21.38	7.78	29.70	4.7	0.21	219.4
		S 1	6.55	21.27	7.78	29.65	4.5	0.21	223.6
		M 6.5	6.43	21.21	7.78	30.27	4.8	0.14	205.1
		M 6.5	6.36	21.25	7.78	30.94	4.7	0.14	207.8
		B 12	6.30	21.34	7.79	31.05	5.2	0.25	192.5
		B 12	6.28	21.37	7.79	31.09	5.3	0.24	199.6
E	16	S 1	6.95	20.63	7.81	31.26	4.9	0.08	189.2
		S 1	6.69	21.21	7.81	31.03	4.6	0.08	185.3
		M 8	6.35	21.33	7.80	31.48	4.1	0.11	164.2
		M 8	6.32	21.34	7.80	31.47	4.3	0.11	162.7
		B 15	6.26	21.34	7.80	31.51	4.7	0.07	145.3
		B 15	6.29	21.34	7.80	31.58	4.5	0.07	148.9
F	23	S 1	6.26	20.94	7.81	31.22	3.9	0.08	64.6
		S 1	6.29	21.13	7.81	31.05	4.2	0.09	72.4
		M 11.5	6.32	21.25	7.81	31.27	4.1	0.06	59.2
		M 11.5	6.33	21.28	7.81	31.37	4.1	0.06	56.6
		B 22	6.28	21.34	7.81	31.49	4.4	0.11	83.4
		B 22	6.26	21.34	7.81	31.53	4.6	0.11	86.1
G	22	S 1	6.70	21.34	7.79	31.08	5.7	0.11	90.2
		S 1	6.61	21.33	7.79	30.96	5.4	0.11	84.1
		M 11	6.53	21.35	7.79	31.11	4.8	0.16	106.3
		M 11	6.48	21.36	7.79	31.28	5.0	0.16	108.1
		B 21	6.32	21.36	7.79	31.44	7.2	0.16	80.6
		B 21	6.33	21.36	7.79	31.49	7.2	0.16	82.1
H	19	S 1	6.32	21.34	7.79	31.21	5.1	0.20	110.2
		S 1	6.30	21.34	7.79	31.20	5.3	0.21	118.2
		M 9.5	6.37	21.33	7.80	31.40	5.1	0.22	129.3
		M 9.5	6.34	21.31	7.80	31.40	5.1	0.23	128.7
		B 18	6.29	21.35	7.80	31.49	9.7	0.22	131.5
		B 18	6.28	21.35	7.80	31.49	9.9	0.22	136.3



**Table 3.7 Summary of In-situ Monitoring Results (Mid-flood)**

Monitoring Station	Water Depth (m)	Sampling Depth (m)	Dissolved oxygen (mg/L)	Temperature (degree Celsius)	pH	Salinity (ppt)	Turbidity (NTU)	Current speed (m/s)	Current velocity (degree magnetic)
A	15	S 1	6.66	21.07	7.85	28.68	5.2	0.04	35.2
		S 1	6.68	21.06	7.85	28.68	5.1	0.04	36.4
		M 7.5	6.65	21.12	7.85	29.14	5.5	0.06	59.1
		M 7.5	6.57	21.17	7.85	29.29	5.6	0.05	57.0
		B 14	6.53	21.22	7.85	29.84	5.8	0.06	49.8
		B 14	6.49	21.22	7.85	29.88	5.8	0.06	44.4
B	14	S 1	6.52	21.17	7.85	28.92	5.4	0.22	274.2
		S 1	6.59	21.15	7.85	28.90	5.3	0.22	277.5
		M 7	6.62	21.15	7.85	28.93	5.5	0.22	206.8
		M 7	6.61	21.17	7.85	29.02	5.4	0.25	207.7
		B 13	6.56	21.20	7.85	29.33	6.0	0.19	259.3
		B 13	6.53	21.22	7.85	29.61	6.0	0.18	253.0
C	12	S 1	6.56	21.22	7.85	29.06	5.4	0.19	140.1
		S 1	6.59	21.19	7.85	28.90	5.2	0.18	126.4
		M 6	6.62	21.16	7.85	28.96	5.3	0.12	138.7
		M 6	6.61	21.14	7.85	29.05	5.7	0.13	135.1
		B 11	6.53	21.23	7.85	29.53	6.1	0.07	120.1
		B 11	6.52	21.22	7.85	29.64	5.8	0.08	146.4
D	14	S 1	6.55	21.20	7.85	29.13	5.6	0.12	28.4
		S 1	6.57	21.18	7.85	29.00	5.6	0.13	29.1
		M 7	6.61	21.15	7.85	28.97	5.8	0.10	50.6
		M 7	6.61	21.16	7.85	29.03	5.9	0.11	47.2
		B 13	6.54	21.21	7.85	29.47	6.0	0.09	44.5
		B 13	6.51	21.22	7.85	29.73	6.1	0.09	42.6
E	14	S 1	6.59	21.17	7.85	28.92	5.4	0.24	139.2
		S 1	6.61	21.15	7.85	28.88	5.2	0.23	133.6
		M 7	6.62	21.16	7.85	29.02	5.5	0.26	174.5
		M 7	6.61	21.15	7.85	29.07	5.6	0.26	175.2
		B 13	6.56	21.20	7.85	29.29	5.8	0.25	142.7
		B 13	6.54	21.21	7.85	29.43	5.8	0.24	140.9
F	18	S 1	6.55	21.20	7.83	29.08	5.7	0.05	259.3
		S 1	6.59	21.17	7.83	28.91	5.4	0.06	247.3
		M 9	6.63	21.14	7.84	28.96	5.4	0.07	286.1
		M 9	6.62	21.16	7.84	29.03	5.6	0.06	274.1
		B 17	6.54	21.22	7.84	29.51	6.2	0.10	290.0
		B 17	6.51	21.22	7.85	29.72	6.1	0.95	282.2
G	13	S 1	6.60	21.17	7.80	28.93	5.5	0.18	309.1
		S 1	6.63	21.15	7.81	28.94	5.3	0.17	292.5
		M 6.5	6.63	21.14	7.81	28.97	5.4	0.15	279.1
		M 6.5	6.62	21.16	7.81	29.06	5.8	0.16	284.2
		B 12	6.55	21.21	7.82	29.51	6.6	0.19	290.6
		B 12	6.52	21.22	7.82	29.71	6.5	0.19	289.1
H	19	S 1	6.70	21.07	7.74	28.89	5.2	0.06	193.5
		S 1	6.69	21.08	7.75	28.89	5.2	0.07	190.1
		M 9.5	6.67	21.11	7.76	29.02	5.5	0.09	168.4
		M 9.5	6.65	21.13	7.76	29.07	5.7	0.09	160.1
		B 18	6.53	21.22	7.78	29.74	6.1	0.08	177.9
		B 18	6.52	21.23	7.78	29.75	6.1	0.08	172.4



3.8.2 Results of laboratory analysis of water quality are presented in **Table 3.8** (Mid-ebb) and **Table 3.9** (Mid-flood) respectively. The complete record and graphical presentation of laboratory analysis results are given in **Appendix F**.

**Table 3.8 Summary of Laboratory Analysis Results (Mid-ebb)**

Monitoring Station	Water Depth (m)	Sampling Depth (m)	TSS (mg/L)	NH <sub>3</sub> as N (mg/L)	NO <sub>2</sub> <sup>-</sup> as N (mg/L)	NO <sub>3</sub> <sup>-</sup> as N (mg/L)	TIN (mg/L)	E.coli (cfu/100mL)	Total P (mg/L)	BOD <sub>5</sub> (mg/L)
A	17	S 1	5.1	0.104	0.016	0.286	0.407	33	0.02	<1.0
		S 1	6.0	0.102	0.027	0.276	0.405	38	0.02	<1.0
		M 8.5	5.3	0.101	0.016	0.297	0.413	32	0.02	<1.0
		M 8.5	6.2	0.104	0.020	0.284	0.407	40	0.02	<1.0
		B 16	6.1	0.102	0.019	0.291	0.411	46	0.02	<1.0
		B 16	7.0	0.105	0.020	0.282	0.408	39	0.03	<1.0
B	14	S 1	4.5	0.103	0.022	0.282	0.407	ND	0.02	<1.0
		S 1	5.4	0.104	0.022	0.286	0.412	ND	0.02	<1.0
		M 7	5.4	0.108	0.021	0.265	0.394	ND	0.02	<1.0
		M 7	5.6	0.102	0.028	0.273	0.404	ND	0.02	<1.0
		B 13	5.9	0.104	0.011	0.298	0.412	ND	0.02	<1.0
		B 13	5.6	0.104	0.013	0.297	0.413	ND	0.02	<1.0
C	12	S 1	4.2	0.091	0.031	0.335	0.456	ND	0.02	<1.0
		S 1	4.7	0.095	0.022	0.350	0.467	ND	0.02	<1.0
		M 6	5.6	0.090	0.025	0.343	0.458	ND	0.02	<1.0
		M 6	5.9	0.094	0.020	0.345	0.458	ND	0.02	<1.0
		B 11	5.0	0.095	0.022	0.335	0.452	ND	0.02	<1.0
		B 11	5.3	0.094	0.022	0.342	0.458	ND	0.02	<1.0
D	13	S 1	6.4	0.094	0.016	0.333	0.443	ND	0.02	<1.0
		S 1	5.8	0.091	0.012	0.346	0.448	ND	0.02	<1.0
		M 6.5	5.2	0.093	0.019	0.334	0.445	ND	0.02	<1.0
		M 6.5	4.8	0.095	0.027	0.326	0.448	ND	0.02	<1.0
		B 12	5.1	0.096	0.031	0.335	0.463	ND	0.02	<1.0
		B 12	4.6	0.096	0.018	0.345	0.459	ND	0.02	<1.0
E	16	S 1	4.6	0.104	0.023	0.262	0.389	17	0.02	<1.0
		S 1	3.9	0.102	0.016	0.290	0.408	14	0.02	<1.0
		M 8	3.7	0.102	0.017	0.281	0.399	14	0.02	<1.0
		M 8	4.5	0.105	0.009	0.285	0.398	18	0.02	<1.0
		B 15	4.1	0.107	0.018	0.260	0.385	11	0.02	<1.0
		B 15	5.0	0.102	0.016	0.278	0.396	12	0.02	<1.0
F	23	S 1	5.8	0.117	0.024	0.309	0.450	17	0.02	<1.0
		S 1	6.7	0.106	0.014	0.265	0.385	12	0.02	<1.0
		M 11.5	5.3	0.102	0.014	0.300	0.416	18	0.02	<1.0
		M 11.5	6.2	0.106	0.022	0.256	0.385	11	0.02	<1.0
		B 22	5.1	0.106	0.018	0.254	0.378	14	0.02	<1.0
		B 22	6.1	0.106	0.032	0.235	0.373	9	0.02	<1.0
G	22	S 1	5.4	0.106	0.021	0.255	0.382	5	0.02	<1.0
		S 1	5.4	0.108	0.013	0.258	0.379	6	0.02	<1.0
		M 11	6.6	0.108	0.011	0.249	0.368	6	0.02	<1.0
		M 11	7.2	0.103	0.012	0.256	0.371	4	0.02	<1.0
		B 21	7.2	0.107	0.026	0.236	0.370	6	0.02	<1.0
		B 21	6.3	0.105	0.023	0.256	0.384	9	0.02	<1.0
H	19	S 1	5.9	0.106	0.017	0.247	0.370	8	0.02	<1.0
		S 1	5.8	0.109	0.019	0.251	0.379	9	0.02	<1.0
		M 9.5	5.6	0.111	0.014	0.254	0.380	8	0.02	<1.0

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Monitoring Station	Water Depth (m)	Sampling Depth (m)	TSS (mg/L)	NH <sub>3</sub> as N (mg/L)	NO <sub>2</sub> <sup>-</sup> as N (mg/L)	NO <sub>3</sub> <sup>-</sup> as N (mg/L)	TIN (mg/L)	E.coli (cfu/100mL)	Total P (mg/L)	BOD <sub>5</sub> (mg/L)
		M 9.5	5.0	0.108	0.022	0.242	0.372	5	0.02	<1.0
		B 18	6.0	0.108	0.017	0.246	0.372	8	0.02	<1.0
		B 18	6.0	0.110	0.028	0.228	0.366	11	0.02	<1.0

Table 3.9 Summary of Laboratory Analysis Results (Mid-flood)

Monitoring Station	Water Depth (m)	Sampling Depth (m)	TSS (mg/L)	NH <sub>3</sub> as N (mg/L)	NO <sub>2</sub> <sup>-</sup> as N (mg/L)	NO <sub>3</sub> <sup>-</sup> as N (mg/L)	TIN (mg/L)	E.coli (cfu/100mL)	Total P (mg/L)	BOD <sub>5</sub> (mg/L)
A	15	S 1	6.2	0.104	0.018	0.415	0.538	14	0.02	<1.0
		S 1	5.8	0.104	0.022	0.408	0.533	10	0.02	<1.0
		M 7.5	5.7	0.108	0.028	0.397	0.534	5	0.02	<1.0
		M 7.5	6.0	0.103	0.017	0.418	0.538	7	0.02	<1.0
		B 14	7.0	0.104	0.024	0.402	0.529	4	0.02	<1.0
		B 14	6.5	0.102	0.028	0.400	0.530	3	0.02	<1.0
B	14	S 1	6.6	0.104	0.024	0.413	0.541	6	0.02	<1.0
		S 1	5.9	0.106	0.025	0.413	0.543	8	0.02	<1.0
		M 7	5.1	0.104	0.017	0.408	0.530	10	0.02	<1.0
		M 7	5.7	0.105	0.027	0.416	0.548	11	0.02	<1.0
		B 13	5.4	0.102	0.015	0.429	0.547	5	0.02	<1.0
		B 13	4.7	0.112	0.017	0.433	0.562	5	0.02	<1.0
C	12	S 1	6.8	0.103	0.030	0.404	0.537	2	0.02	<1.0
		S 1	6.2	0.099	0.022	0.416	0.537	2	0.02	<1.0
		M 6	7.2	0.102	0.019	0.415	0.536	3	0.02	<1.0
		M 6	6.3	0.106	0.039	0.394	0.539	3	0.02	<1.0
		B 11	7.4	0.102	0.024	0.413	0.538	2	0.02	<1.0
		B 11	6.5	0.102	0.027	0.422	0.551	1	0.02	<1.0
D	14	S 1	6.0	0.105	0.021	0.429	0.554	1	0.02	<1.0
		S 1	5.7	0.105	0.023	0.425	0.553	3	0.02	<1.0
		M 7	6.2	0.105	0.024	0.420	0.549	4	0.02	<1.0
		M 7	6.7	0.105	0.024	0.424	0.553	2	0.02	<1.0
		B 13	4.7	0.104	0.020	0.430	0.554	3	0.02	<1.0
		B 13	5.2	0.105	0.023	0.420	0.548	2	0.02	<1.0
E	14	S 1	8.2	0.104	0.023	0.421	0.548	3	0.02	<1.0
		S 1	7.4	0.106	0.034	0.405	0.545	1	0.02	<1.0
		M 7	6.6	0.107	0.017	0.417	0.541	1	0.02	<1.0
		M 7	6.1	0.111	0.024	0.413	0.549	1	0.02	<1.0
		B 13	5.5	0.106	0.025	0.412	0.543	3	0.02	<1.0
		B 13	5.2	0.113	0.034	0.404	0.551	5	0.02	<1.0
F	18	S 1	7.5	0.106	0.024	0.420	0.550	1	0.02	<1.0
		S 1	6.5	0.109	0.018	0.430	0.557	1	0.02	<1.0
		M 9	5.8	0.106	0.022	0.422	0.551	2	0.02	<1.0
		M 9	6.1	0.111	0.036	0.406	0.554	1	0.02	<1.0
		B 17	5.7	0.102	0.026	0.422	0.550	ND	0.02	<1.0
		B 17	5.2	0.102	0.024	0.426	0.552	ND	0.02	<1.0
G	13	S 1	6.8	0.103	0.024	0.420	0.547	1	0.02	<1.0
		S 1	5.9	0.105	0.023	0.421	0.549	3	0.02	<1.0
		M 6.5	6.4	0.105	0.011	0.434	0.551	ND	0.02	<1.0
		M 6.5	6.7	0.108	0.021	0.421	0.550	ND	0.02	<1.0
		B 12	6.7	0.105	0.027	0.408	0.540	ND	0.02	<1.0
		B 12	6.2	0.103	0.015	0.424	0.541	ND	0.02	<1.0

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Monitoring Station	Water Depth (m)	Sampling Depth (m)	TSS (mg/L)	NH <sub>3</sub> as N (mg/L)	NO <sub>2</sub> <sup>-</sup> as N (mg/L)	NO <sub>3</sub> <sup>-</sup> as N (mg/L)	TIN (mg/L)	E.coli (cfu/100mL)	Total P (mg/L)	BOD <sub>5</sub> (mg/L)	
H	19	S	1	8.0	0.104	0.019	0.417	0.540	5	0.02	<1.0
		S	1	9.0	0.104	0.021	0.402	0.526	7	0.02	<1.0
		M	9.5	8.0	0.104	0.025	0.398	0.527	13	0.02	<1.0
		M	9.5	8.3	0.104	0.014	0.414	0.532	17	0.02	<1.0
		B	18	7.1	0.104	0.018	0.417	0.538	8	0.02	<1.0
		B	18	6.4	0.104	0.019	0.413	0.535	12	0.02	<1.0

3.8.3 The tidal data is obtained from the tide gauge installed in Ma Wan Marine Traffic Station, managed by Hydrographic Office of Marine Department. Tidal data obtained from Ma Wan Marine Traffic Station is present in **Appendix G**.

3.8.4 Heavy marine traffic was observed nearby the Project site and its vicinity and may affect the water quality. The above conditions may affect monitoring results. The weather condition is summarized and presented in **Table 3.10**.

Table 3.10 Weather condition of water quality monitoring

Date	Air Temperature			Mean Relative Humidity (%)	Total Rainfall (mm)
	Maximum (deg. C)	Mean (deg. C)	Minimum (deg. C)		
6 April 2020	17.9	17.1	16.1	92	21.5

Source: Hong Kong Observatory

**4. SEDIMENT QUALITY MONITORING AND BENTHIC SURVEY**

**4.1 Monitoring Station**

4.1.1 In accordance with Section 6 of the EM&A Plan, sediment quality monitoring and benthic survey should be carried out at eight designated monitoring stations (two impact stations and six control stations) during the first five years of the operational phase of the Project. The proposed monitoring stations shall be the same monitoring stations that were used for the baseline monitoring programme and have been approved by EPD. The coordinates of the monitoring stations are shown in **Table 4.1** and their locations are shown in **Figure 3**.

**Table 4.1 Location of Sediment Quality Monitoring and Benthic Survey**

Sampling Location		Easting	Northing
A	The Brothers, Control Station	816 100	822 500
B	The Brothers, Control Station	816 680	822 440
C	Siu Ho Wan Outfall, Impact Station	816 800	820 180
D	Siu Ho Wan Outfall, Impact Station	817 160	820 360
E	Cheung Sok, Control Station	819 817	821 655
F	Cheung Sok, Control Station	820 158	821 922
G	Tai Ching Chau, Control Station	822 214	822 692
H	Tai Ching Chau, Control Station	822 494	822 939

**4.2 Monitoring Parameter**

4.2.1 The monitoring parameters for sediment quality monitoring and benthic survey are summarized in **Table 4.2**.

**Table 4.2 Parameters for Sediment Quality Monitoring and Benthic Survey**

Monitoring Parameters	
Sediment Quality Monitoring	Rinsate Blank for Benthic Survey
Grain size profile* (i.e. Particle Size Distribution) (%)	Cadmium (µg/L)
Total organic carbon* (%)	Chromium (µg/L)
pH value	Copper (µg/L)
Ammonia as N (mg-N/kg)	Lead (µg/L)
Total nitrogen (mg-N/kg)	Mercury ((µg/L)
Total phosphorus (mg-N/kg)	Nickel (µg/L)
Cadmium (mg/kg)	Zinc (µg/L)
Chromium (mg/kg)	Arsenic (µg/L)
Copper (mg/kg)	Silver (µg/L)
Lead (mg/kg)	
Mercury (mg/kg)	
Nickel (mg/kg)	
Zinc (mg/kg)	
Arsenic (mg/kg)	
Silver (mg/kg)	



\*Grain size profile and total organic carbon is determined from the sediment sampled collected for benthic survey.

4.2.2 Apart from the parameters listed in the Table 4.2, other relevant supplementary information such as monitoring location, time, weather conditions and any special phenomena will be also recorded.

4.2.3 The tidal data will be obtained from the tide gauge installed in Ma Wan Marine Traffic Station, managed by the Hydrographic Office of Marine Department. Location of the tide gauge is shown in **Figure 4**.

### 4.3 Sampling Equipment

4.3.1 Ponar grab sampler (capacity of ~ 1 litre) will be used for collection of samples for sediment analysis. The grab will be capable of collecting sufficient amount of surficial (top 5 cm) sediment for the required analysis in a single deployment at each sampling location. The grab will be constructed with non-contaminating material to prevent sample contamination. Photos of ponar grab sampler are shown in **Appendix J**.

4.3.2 A modified Van Veen grab sampler (capacity of ~ 11.3 litres) will be used for collecting sediment samples for benthic survey. The top of the grab will have openings to allow the easy flow of water through the grab as it descends. The openings will be covered with 0.5 mm mesh to prevent the loss of any benthic fauna once sediment samples are taken. In addition the top openings will be sealable by movable flaps which will close when the grab is hauled to surface. Photos of modified Van Veen grab sampler are shown in **Appendix J**.

4.3.3 Class III commercially licensed vessel will be used as survey vessel. DGPS logging device in the ADCP with accuracy of  $\pm 1\text{m}$  at 95% confidence level will be installed on the survey vessel to ascertain that measurement can be made accurately on the specific transects. All GPS data collected during the whole survey will be automatically and electronically logged. Powered winch will be used on-board the survey vessel to assist the monitoring. 4 fixed sieve stations will be equipped on survey vessel. Experienced supervisor will be present all throughout the monitoring activity on-board the survey vessel.

### 4.4 Sampling Procedure

#### Benthic Survey, Particle Size Distribution and TOC Analysis

4.4.1 A modified Van Veen grab sampler (capacity of ~ 11.3 litres) will be deployed using a winch at each of the benthic survey stations to collect single grab sample at each station. The grab sampler will be lowered through the water column slowly at a constant rate (approximately 30 cm/s) to prevent the formation of a pressure wave that may disturb surficial deposits. The grab will then be retrieved and evaluated on board of the survey vessel. Any sample showing uneven penetration or only partially filled with sediment shall be rejected. Samples will be placed in a plastic box with an identification card. Sub-samples (approximately 1 kg) will be splitted up for analysis of particle size distribution and TOC. The remaining sediment samples will be washed gently to separate the benthic organisms and the sediment using a watering hose with marine seawater supply, by a sieve stack (comprising 1 mm and 0.5 mm meshes). Benthic organisms remaining on the sieve will be removed into pre-labeled ziplock plastic bags. A 10% solution of buffered formalin containing Rose Bengal in seawater will be added to the bag to ensure tissue preservation. Samples will be sealed in plastic containers for transport to the laboratory for sorting and identification of benthic organisms.



Sediment Quality Monitoring (Except Particle Size Distribution and TOC Analysis)

4.4.2 Ponar grab sampler (capacity of ~ 1 litres) will be deployed at each of the benthic survey stations to collect single grab sample at each station. The grab sampler should be lowered through the water column slowly at a constant rate (approximately 30 cm/s) to prevent the formation of a pressure wave that may disturb surficial deposits. The grab will then be retrieved and evaluated on board of the survey vessel. Any sample showing uneven penetration or only partially filled with sediment will be rejected. Samples will be placed in a plastic box with an identification card. Sediment samples will be then transferred into brand new soil jars with QA/QC monitoring for laboratory analysis. Samples will be preserved and stored in accordance with approved SOP of HOKLAS accredited laboratory and the recommendations stipulated in ETWB TC (W) No. 34/2002.

4.4.3 Sediment samples shall be collected and packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory on the same day of collection for analysis.

**4.5 Laboratory Measurement and Analysis**

4.5.1 ALS Technichem (HK) Pty Ltd (HOKLAS Reg. No. 066), is the appointed laboratory for analysis of sediment samples. The methods adopted by the laboratory and the reporting limits are detailed in **Table 4.3**.

**Table 4.3 Laboratory Measurement/Analysis Methods and Reporting Limits**

Analysis Description	Method	Reporting limits
Particle Size Distribution	Geospec 3: 2001 Test method 8.1, 8.5 and 8.7 (Wet Sieve and Hydrometer Method)	1%
Total Organic Carbon	APHA 5310B	0.05%
pH value	APHA 4500H: B	0.1 pH unit
Ammonia as N	APHA 4500 NH3: B&G	0.5 mg/kg
Total Nitrogen	APHA 4500 Norg: D & APHA 4500 NO3: I	10 mg/kg
Total Phosphorus	APHA 4500P: B&H	10 mg/kg
Cadmium	USEPA 6020A Digestion method: 3051A	0.1 mg/kg
Chromium		0.5 mg/kg
Copper		0.2 mg/kg
Lead		0.2 mg/kg
Mercury		0.05 mg/kg
Nickel		0.2 mg/kg
Zinc		0.5 mg/kg
Arsenic		0.5 mg/kg
Silver		0.1 mg/kg

**4.6 Taxonomic Identification of Benthic Organism**

4.6.1 Taxonomic identification of benthic organisms will be performed using stereo dissecting and high-power compound microscopes where it is necessary. Benthic organisms will be counted and identified to lower taxonomic levels as far as practicable with biomass (wet weight, to 0.01gram) of each individual recorded. If breakage of soft-bodied organism occurs, only anterior portions of fragments will be counted, although all fragments will be retained and

weighted for biomass determinations (wet weight, to 0.01gram). Data of species abundance and biomass will be recorded.

4.6.2 Data collected during surveys will be presented and summarized in tables and graphics. Species/taxon richness and abundance of marine benthic fauna communities will be analyzed by Shannon-Weiner diversity and Pielou's Evenness.

#### **4.7 Monitoring Frequency and Duration**

4.7.1 The sediment quality monitoring and benthic survey programmed shall be carried out once per two months for a period of five years of the operational phase of the Project. Since the purpose of the sediment quality monitoring and benthic survey is to collect data for future reference, only a single round of sediment quality monitoring and benthic survey at 8 designated locations will be carried out for each monitoring event. For each location, only a single sample will be taken and analyzed.

#### **4.8 Quality Assurance / Quality Control**

4.8.1 A rinsate blank will be collected in each monitoring location before each sediment sampling for benthic survey, so as to monitor the effectiveness of field decontamination procedure.

4.8.2 The laboratory incorporates a variety of QA/QC monitoring programme into their testing system. Where applicable or available, the quality of the analysis will be monitored by conducting the following QC analysis:

For each batch of 20 samples:

- A minimal of 1 laboratory method blank will be analyzed;
- A minimal of 1 sample duplicate will be analyzed;
- A minimal of 1 sample matrix spike will be analyzed.

#### **4.9 Event and Action Plan**

4.9.1 Since the purpose of the sediment quality monitoring and benthic survey is to collect data for future purpose, no specific event and action has to be followed.

#### **4.10 Monitoring Results and Observations**

4.10.1 Sediment quality monitoring and benthic survey is carried out on 6 April 2020. A summary of laboratory analysis results for the sediment quality monitoring and benthic survey are presented in **Table 4.4** and **Table 4.5** respectively. The complete record and graphical presentation of the sediment quality monitoring results is given in **Appendix H**.

**Table 4.4 Summary of laboratory analysis results for sediment monitoring**

Monitoring Station	pH value	NH <sub>3</sub> as N (mg/L)	Total N (mg-N/kg)	Total P (mg-P/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Zn (mg/kg)	As (mg/kg)	Ag (mg/kg)
A	8.2	3	911	504	<0.10	38.0	29.7	43.1	0.14	22.4	93.9	16.1	0.22
B	8.3	2	984	529	0.14	46.0	60.6	48.4	0.14	25.9	112	15.1	0.48
C	7.9	18	1410	658	<0.10	43.6	40.0	42.3	0.12	27.0	119	13.0	0.32
D	7.7	8	868	431	<0.10	32.0	27.6	32.8	0.09	19.6	89.0	9.8	0.23
E	8.1	5	1280	600	<0.10	43.2	41.5	42.2	0.16	26.2	122	11.7	0.34
F	8.1	8	1210	547	0.10	49.4	48.2	50.4	0.14	30.7	138	14.5	0.39
G	8.4	80	1200	507	<0.10	41.0	52.8	38.9	0.14	23.2	142	11.6	0.37
H	8.2	6	1100	594	0.11	49.4	62.0	48.7	0.12	28.6	119	14.4	0.45

**Table 4.5 Summary of laboratory analysis results for benthic survey**

Monitoring Station	Total organic carbon (%)	Grain size profile (%)				Description
		Gravel	Sand	Silt	Clay	
A	0.68	3	41	32	24	Dark grey, sandy SILT/CLAY with shell fragments
B	0.82	3	20	50	27	Dark grey, slightly sandy SILT/CLAY with shell fragments
C	0.93	0	4	59	37	Dark grey, slightly sandy SILT/CLAY with shell fragments
D	0.74	1	18	52	29	Dark grey, slightly sandy SILT/CLAY with shell fragments
E	0.88	0	13	53	34	Dark grey, slightly sandy SILT/CLAY with shell fragments
F	0.94	0	7	58	35	Dark grey, slightly sandy SILT/CLAY with shell fragments
G	0.54	29	25	23	23	Dark grey, slightly sandy, slightly gravelly SILT/CLAY with shell fragments
H	0.75	0	5	56	39	Dark grey, slightly sandy SILT/CLAY with shell fragments

4.10.2 Rinsate blank was collected for chemical analysis. The laboratory data results are provided in **Appendix H**.

4.10.3 Construction works from expansion of Hong Kong International Airport was observed nearby the Project site and its vicinity and may affect the sediment quality. The above conditions may affect monitoring results. The weather condition is summarized and presented in **Table 4.6**.

**Table 4.6 Weather condition of water quality monitoring**

Date	Air Temperature			Mean Relative Humidity (%)	Total Rainfall (mm)
	Maximum (deg. C)	Mean (deg. C)	Minimum (deg. C)		
6 April 2020	17.9	17.1	16.1	92	21.5

Source: Hong Kong Observatory

4.10.4 The benthic survey data are summarized and presented in **Table 4.7**.

Table 4.7 Summary of benthic survey data on 6 April 2020

Monitoring Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	46	13.649	19	2.471	0.839
B	45	13.202	21	2.733	0.898
C	37	12.997	18	2.705	0.936
D	58	15.189	21	2.706	0.889
E	45	5.571	19	2.487	0.845
F	43	6.019	18	2.602	0.900
G	54	13.117	29	3.085	0.916
H	60	4.567	22	2.618	0.847
TOTAL	388	84.311			

4.10.5 The benthic survey results are analyzed and presented as below:

i) Abundance

A total of 388 macrobenthic organisms recorded from the eight monitoring stations, which is lower than that reported in baseline survey. The decrease is predominantly caused by the lower abundance of annelids recorded in this survey. The lowest abundance with 37 individuals (ind.) recorded in Station C and the highest (60 ind.) recorded in Station H. The results showed that the abundance in impact stations (Stations C and D) has no obvious difference with that in the reference stations. The sediments of impact sites and reference sites are all mainly composed of silt/clay with shell fragments. There is no significant difference between the impact sites and the reference sites. This observation is indicative of a point-source disturbance, which will be verified with continued monitoring.

ii) Biomass

The total wet biomass from eight monitoring stations is comprised of 84.311g. The highest total biomass was observed in Station D (15.189g), while Station H (4.567g) exhibited the lowest biomass. The relatively higher biomass observed in Station D contributed to the relatively higher biomass of the mollusca species, *Paphia undulate*. The biomass at the impact stations were generally lower compared to those of the reference stations in the baseline data (August 2004).

iii) Taxonomic Composition

Specimens were identified to family, genus and species level or to the lowest practicable taxon as possible. Fauchald (1977), Huang Z.G. (1994), Rouse & Pleijel (2001), and Xu et al. (2008) were used as the reference for taxonomic or species identification and nomenclature. A total of eight phyla comprising of 38 families and 54 genera were identified. The benthic fauna composition is dominated by Annelida (56.44%), Arthropoda (28.87%) and Mollusca (11.60%). Compared to the baseline study (August 2004), the most dominant groups were the *Capitellidae* polychaetes and *Veneridae* Bivalvia, typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000). Based on the recorded abundance, the percentage of mollusca decreased during monitoring period.



The dominant species (abundance > 10) were the Arthropoda, *Gammarus sp.1* and the Annelida *Paraprionospio*. Arthropoda, *Gammarus sp.1* with the abundance of 14 ind from Stations E and the abundance of 18 ind from Stations H in this survey. While Annelida *Paraprionospio* with the abundance of 15 ind from Station A. Compared to the baseline study (August 2004), the most dominant groups were the capitellid and cirratulid polychaetes, typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

Highest number of genera was recorded in Station G (29) and relatively lower in Station C & Station F (18). Similar to abundance and biomass, little differences in number of taxa was observed at impact stations compared to the reference stations.

iv) Diversity

Benthic diversity index ( $H'$ ) and evenness index ( $J$ ) ranged 2.705 – 2.706 and 0.889 – 0.936 in impact stations, and 2.471 – 3.085 and 0.839 – 0.916 among the reference stations as shown in data summary, which suggest that benthic faunal diversity is relatively richer at some of reference stations than those at impact stations. However, overall diversity in the eight monitoring stations was within the range of typical values in the impact stations and the reference stations, respectively. Compared with the baseline survey result, the diversity index and evenness index increased obviously.

The detailed benthic survey results are provided in **Appendix I**.

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Report No.: 0041/17/ED/0544A

Page 27

### 5. CHINESE WHITE DOLPHIN MONITORING

#### 5.1 Data Interpretation

5.1.1 In accordance with Section 4.1 of the EM&A Plan, relevant information on the distribution and abundance of CWDs in Hong Kong should be obtained from the Agriculture, Fisheries and Conservation Department (AFCD), and be reviewed on a bimonthly basis during the operational phase of the Project for a period of 5 years.

5.1.2 The latest AFCD's report dated 1 August 2019, "*Monitoring of Marine Mammals in Hong Kong Waters (2018-19)*", in terms of the distribution and abundance of CWDs, was reviewed in the Monthly EM&A report in August 2019. According to the advice from AFCD, the data of distribution and abundance of CWDs would only be available in the annual reports for Monitoring of Marine Mammals In Hong Kong Waters which cover monitoring data from 1 April to 31 March (next year). The updated status of the distribution and abundance of CWDs will be provided once the annual report (2019-20) is uploaded to AFCD's webpage.

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Report No.: 0041/17/ED/0544A

Page 28

### 6. ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

#### 6.1 Implementation Status

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





## **7. ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS**

7.1.1 SHWSTW is reminded to fully comply with EP conditions. All measures and recommendations in the EP, EIA Report and approved Waste Management Plan (WMP) shall be fully and properly implemented. During the reporting period, following measures in related to solid and liquid waste management were implemented:

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

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

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Report No.: 0041/17/ED/0544A

Page 30

### **8. SUMMARY OF EXCEEDANCE OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMITS**

- 8.1.1 Odour patrol monitoring was resumed and carried out on 6, 17, 23 and 29 April 2020. No exceedances of Action/Limit levels at ASRs were recorded.
- 8.1.2 Water quality monitoring, sediment quality monitoring and benthic survey were carried out on 6 April 2020. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

## 9. SUMMARY OF ENVIRONMENTAL COMPLAINTS

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

**Table 9.1 Cumulative Statistics on Complaints**

Environmental Parameters	Cumulative No. Brought Forward	No. of Complaints This Month	Cumulative Project-to-Date
Air	0	0	1
Noise	0	0	0
Water	0	0	0
Waste	0	0	0
Others	0	0	0
Total	0	0	0

**Table 9.2 Cumulative Statistics on Notification of Summons and Successful Prosecutions**

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

9.1.2 The cumulative complaint log and summaries of complaints are presented in **Appendix K**.



## 10. FUTURE KEY ISSUES

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

- i. Potential environmental impacts arising from the operation of SHWSTW are mainly associated with air quality, water quality, sediment quality, benthic ecology, waste management and distribution and abundance of CWDs.
- ii. According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). H<sub>2</sub>S measurement and olfactometry analysis conducted between August 2017 and May 2018 was considered as unlikely way to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspension on air quality monitoring was approved by EPD's memo dated 14 May 2018. In order to recommence the monitoring, a review on air quality monitoring had been carried out to determine reasonable odour-related criteria and was submitted to EPD for approval on 24 March 2020. Comments from EPD was received on 1 April 2020 and the review is currently under revision for further submission to the EPD.

## 11. CONCLUSION

- 11.1.1 Odour patrol monitoring was resumed from January 2020 and carried out on 6, 17, 23 and 29 April 2020. The modified odour patrol monitoring plan including updated Event and Action Plan was approved on March 2020, and odour patrol monitoring was commenced from 20 March 2020. No exceedances of Action/Limit levels at Air Sensitive Receivers (ASR) and odour patrol points were recorded and no non-compliance of odour monitoring at odour patrol points were recorded in the reporting period.
- 11.1.2 According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). H<sub>2</sub>S measurement and olfactometry analysis conducted between August 2017 and May 2018 was considered as unlikely way to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspension on air quality monitoring was approved by EPD's memo dated 14 May 2018. In order to recommence the monitoring, a review on air quality monitoring had been carried out to determine reasonable odour-related criteria and was submitted to EPD for approval on 24 March 2020. Comments from EPD was received on 1 April 2020 and the review is currently under revision for further submission to the EPD.
- 11.1.3 Water quality monitoring, sediment quality monitoring and benthic survey were conducted on 6 April 2020 to collect data for future reference in accordance with Section 5.5 and 6.5 of the Operational EM&A Plan. The details of methodology and results collected of the monitoring were presented in Section 3 and Section 4. Heavy marine traffic and construction works from expansion of Hong Kong International Airport were observed nearby the Project site and its vicinity and may affect the water and sediment quality The above conditions may affect monitoring results.
- 11.1.4 The latest AFCD's report dated 1 August 2019, "*Monitoring of Marine Mammals in Hong Kong Waters (2018-19)*" in terms of the distribution and abundance of CWDs was reviewed in the Monthly EM&A report in August 2019. According to the advice from AFCD, the data of distribution and abundance of CWDs would only be available in the annual reports for Monitoring of Marine Mammals In Hong Kong Waters which cover monitoring data from 1 April to 31 March (next year). The updated status of the distribution and abundance of CWDs will be provided once the annual report (2019-20) is uploaded to AFCD's webpage.
- 11.1.5 SHWSTW is reminded to fully *comply with EP conditions. All environmental mitigation measures* and recommendations in the EP, EIA Report and approved waste management plan shall be fully and properly implemented.
- 11.1.6 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to environmental impact during the report period.

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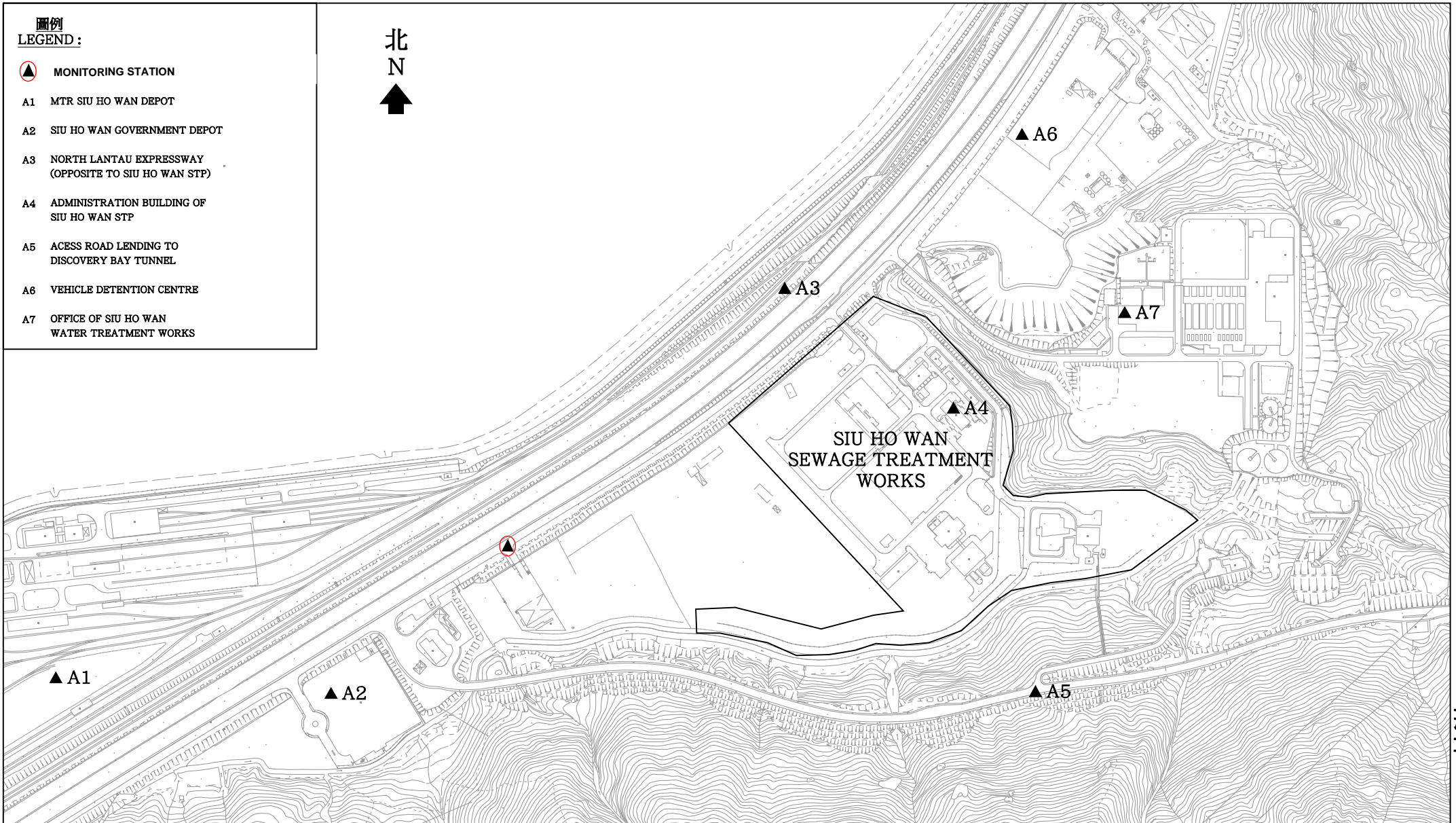
Report No.: 0041/17/ED/0544A

Figure 1

Monitoring Stations of Air Sensitive Receivers

**圖例**  
**LEGEND :**

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



圖則名稱 drawing title	繪畫 drawn	C.W. CHAN	日期 date	16-08-2006	圖則編號 drawing no.	DCM/2006/063	比例 scale	N.T.S.
	核對 checked	C.K. LAM	日期 date	16-08-2006	保留版權 COPYRIGHT RESERVED			
UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT OPTIONAL ENVIRONMENTAL MONITORING AND AUDIT PLAN ODOUR PATROL MONITORING STATIONS	批核 approved	S.K. WONG	日期 date	16-08-2006	香港特別行政區政府渠務署 DRAINAGE SERVICES DEPARTMENT GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION			
	部門 office	顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION						

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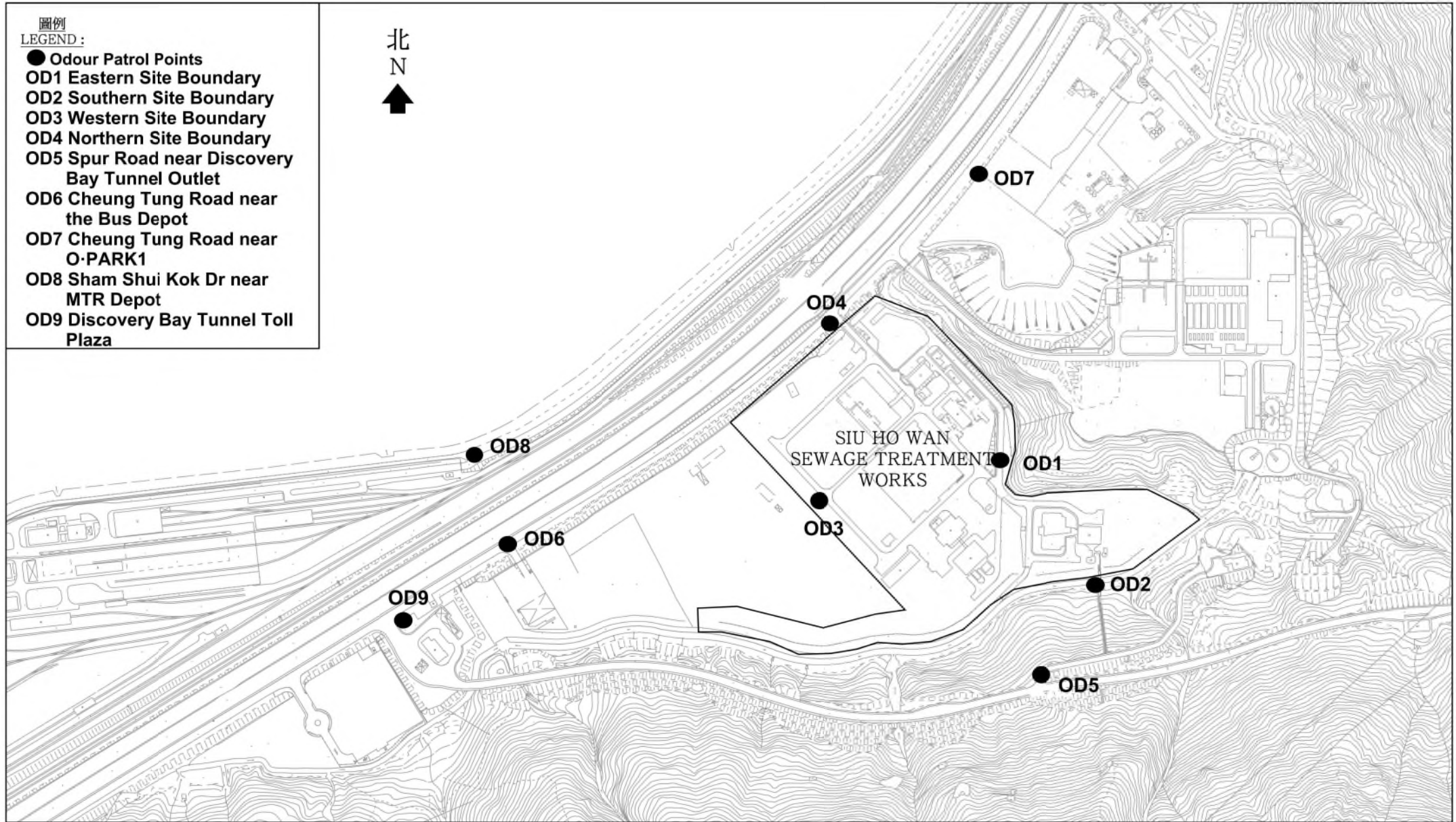
## Figure 2

### Odour Patrol Points of Modified Odour Patrol



圖例  
LEGEND :

- Odour Patrol Points
- OD1 Eastern Site Boundary
- OD2 Southern Site Boundary
- OD3 Western Site Boundary
- OD4 Northern Site Boundary
- OD5 Spur Road near Discovery Bay Tunnel Outlet
- OD6 Cheung Tung Road near the Bus Depot
- OD7 Cheung Tung Road near O-PARK1
- OD8 Sham Shui Kok Dr near MTR Depot
- OD9 Discovery Bay Tunnel Toll Plaza



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## Figure 3

Monitoring Stations of Water Quality Monitoring, Sediment Quality Monitoring and Benthic Survey



816000E

818000E

820000E

822000E

822000N

大小磨刀  
BROTHERS

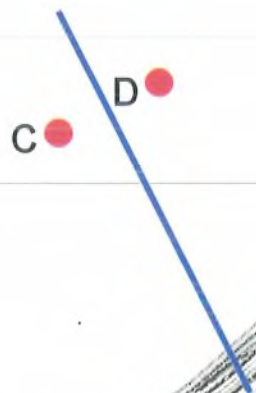
820000N

## CO-ORDINATES OF CONTROL STATIONS :

CONTROL STATION No.	CO-ORDINATES	
	NORTHING	EASTING
A	822500	816100
B	822440	816680
E	821655	819817
F	821922	820158
G	822692	822214
H	822939	822494

## CO-ORDINATES OF IMPACT STATIONS :

IMPACT STATION No.	CO-ORDINATES	
	NORTHING	EASTING
C	820180	816800
D	820360	817160

圖例  
LEGEND :

- IMPACT STATION
- ⊕ CONTROL STATION
- SUBMARINE OUTFALL

圖則名稱 drawing title

UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT  
BASELINE MONITORING - LOCATION OF MONITORING STATIONS

繪畫 drawn

H.K. LAI

日期 date  
06-02-2004

核對 checked

C.K. LAM

日期 date  
04-03-2004

批核 approved

S.K. WONG

日期 date  
04-03-2004

部門 office

顧問工程管理部

CONSULTANTS MANAGEMENT DIVISION

圖則編號 drawing no.

DCM/2004/002

比例 scale

N.T.S.

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DRAINAGE SERVICES DEPARTMENT  
GOVERNMENT OF THE  
HONG KONG  
SPECIAL ADMINISTRATIVE REGION

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Report No.: 0041/17/ED/0544A

Figure 4

Location of the Tide Gauge

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Location of the Tide Gauge

Source: Google Maps

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## Appendix A

### Project Organization Chart

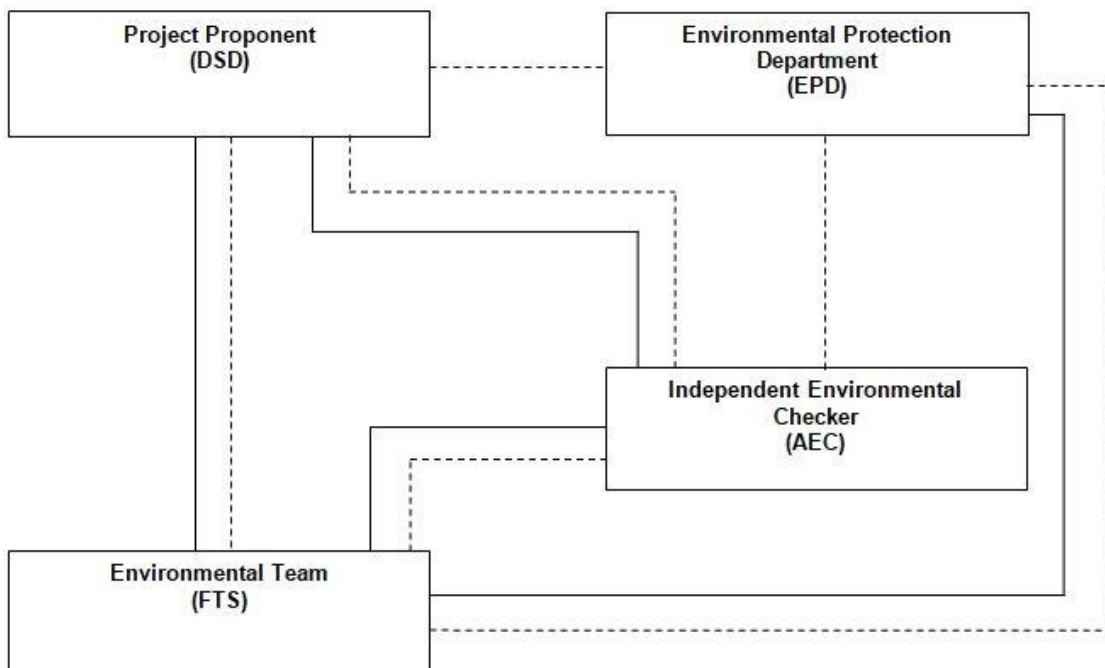
# FUGRO TECHNICAL SERVICES LIMITED

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Legend:  
— Line of Reporting  
- - - Line of Communication

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## Appendix B

### Monitoring Schedule for Present and Next Reporting Period



# FUGRO TECHNICAL SERVICES LIMITED

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Website : www.fugro.com



Report No.: 0041/17/ED/0544A

## Monitoring Schedule for the Present Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
			1 April	2	3	4
5	6 Odour Patrol  Water Quality Monitoring and Sediment Quality Monitoring and Benthic Survey Mid-Flood (11:28) Mid-Ebb (17:09)	7	8	9	10	11
12	13	14	15	16	17 Odour Patrol	18
19	20	21	22	23 Odour Patrol	24	25
26	27	28	29 Odour Patrol	30		

### Remarks

- Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.

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Report No.: 0041/17/ED/0544A

## Monitoring Schedule for the Next Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
					1 May	2
3	4	5 Odour Patrol	6	7	8	9
10	11 Odour Patrol	12	13	14	15	16
17	18	19	20	21	22 Odour Patrol	23
24	25	26	27	28 Odour Patrol	29	30
31						

### Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.

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## Appendix C

### Event and Action Plan for Air Quality Monitoring

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Report No.: 0041/17/ED/0544A

EVENT	ACTION		
	ET	IEC	*Operator
<b>Action Level</b>			
One complaint received for specific odour event / Odour intensity of 2 or above is measured from odour patrol	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance or odour complaints;</li> <li>2. Notify the IEC and Operator of exceedance;</li> <li>3. Repeat odour patrol to confirm finding;</li> <li>4. If exceedance continues, notify the IEC and Operator;</li> <li>5. Carry out investigation to identify the source/reason of exceedance or complaints;</li> <li>6. Check Operator's working methods; and</li> <li>7. Discuss with Operator on required remedial actions.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check odour patrol results submitted by ET;</li> <li>2. Discuss with ET and Operator on the possible remedial actions;</li> <li>3. Advise the Operator on the effectiveness of the proposed remedial measures;</li> <li>4. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the ET and IEC when receipt of odour complaint;</li> <li>2. Confirm receipt of notification of exceedance in writing;</li> <li>3. Identify/ confirm source with ET;</li> <li>4. Discuss with ET for remedial actions required;</li> <li>5. Ensure remedial actions properly implemented</li> <li>6. Rectify any unacceptable practice; and</li> <li>7. Amend operation methods if appropriate.</li> </ol>
<b>Limit Level</b>			
More than one complaint in 3 months / Odour intensity of 3 or above is measured from odour patrol	<ol style="list-style-type: none"> <li>1. Identify source/reason of exceedance or odour complaints;</li> <li>2. Notify the IEC and Operator of exceedance;</li> <li>3. Repeat odour patrol to confirm finding;</li> <li>4. If exceedance continues, notify the IEC and Operator;</li> <li>5. Carry out investigation to identify the source/reason of exceedance or complaints;</li> <li>6. Check Operator's working methods;</li> <li>7. Carry out analysis of Operator's working procedures to determine possible mitigation to be implemented;</li> <li>8. Arrange meeting with ET and EPD to discuss the remedial actions to be taken;</li> <li>9. Discuss with EPD and the</li> </ol>	<ol style="list-style-type: none"> <li>1. Check odour patrol results submitted by ET;</li> <li>2. Discuss amongst ET and the Operator on the potential remedial actions;</li> <li>3. Review the proposed remedial actions whenever necessary to assure their effectiveness and advise the Operator accordingly;</li> <li>4. Supervise implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the ET and IEC when receipt of odour complaint;</li> <li>2. Confirm receipt of notification of exceedance in writing;</li> <li>3. Identify/ confirm source with ET;</li> <li>4. Inform ET, IEC and EPD;</li> <li>5. Discuss with EPD and ET on the required remedial actions;</li> <li>6. Ensure remedial actions properly implemented;</li> <li>7. Take immediate action to avoid further exceedance;</li> <li>8. Implement the agreed proposals.</li> </ol>

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Report No.: 0041/17/ED/0544A

	<p>Operator on the required remedial actions;</p> <ol style="list-style-type: none"><li>10. Submit proposals for remedial actions within 3 working days of notification;</li><li>11. Assess effectiveness of Operator's remedial actions and keep EPD informed of the results;</li><li>12. Amend proposal if appropriate; and</li><li>13. Resubmit proposal if problem still not under control.</li></ol>		
--	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	--

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

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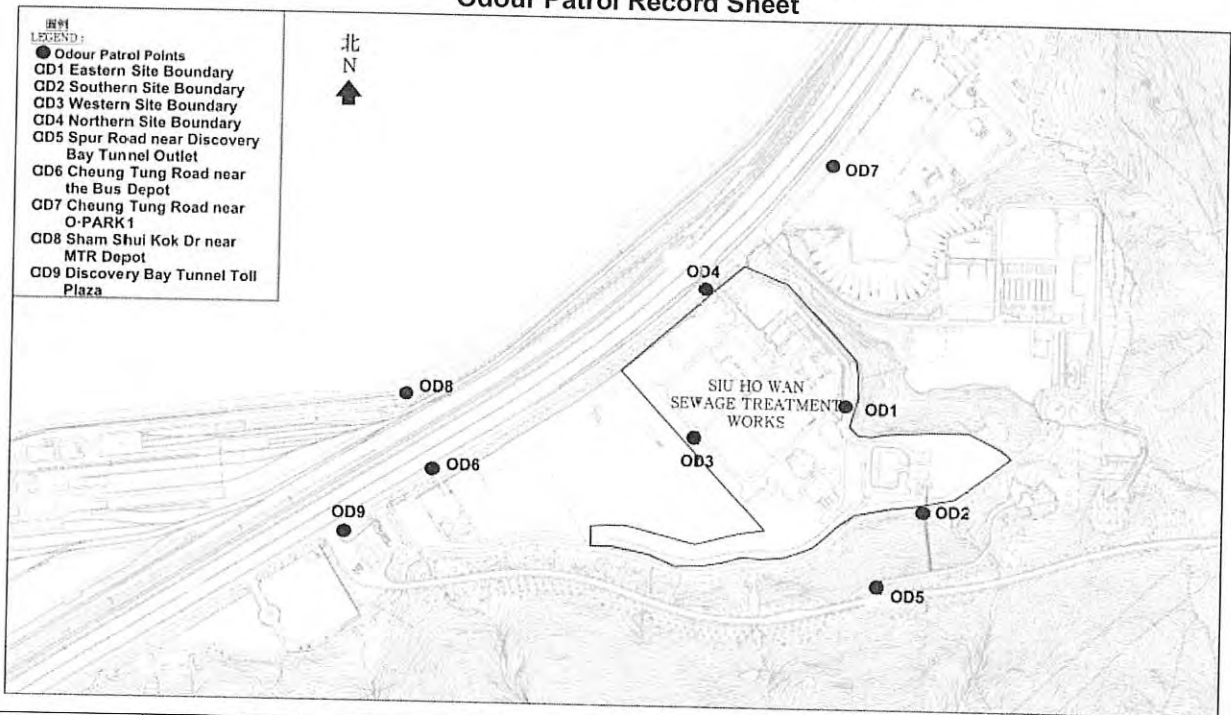
Report No.: 0041/17/ED/0544A

## Appendix D

### Results and Graphical Presentation of Air Quality Monitoring



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



Date		Weather		Temperature		Humidity	
6 Apr 2020		Cloudy		18°C		77%	
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics	
OD1	Eastern Site Boundary	09:54	E	0.4	0	/	
OD2	Southern Site Boundary	09:56	/	0	0	/	
OD3	Western Site Boundary	09:50	/	0	0	/	
OD4	Northern Site Boundary	09:46	/	0	0	/	
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/	
OD6	Cheung Tung Road near the Bus Depot	09:24	E	2.1	0	/	
OD7	Cheung Tung Road near O-PARK1	09:26	E	0.5	0	/	
OD8	Sham Shui Kok Dr near MTR Depot	09:15	NE	2.0	0	/	
OD9	Discovery Bay Tunnel Toll Plaza	09:21	NE	0.9	0	/	

**\*Classification Criteria:**

- Not detected : No odour perceived or an odour so weak that it cannot be easily characterised or described
- Slight : Slight identifiable odour, and slight chance to have odour nuisance
- Moderate : Moderate identifiable odour, and moderate chance to have odour nuisance
- Strong : Strong identifiable, likely to have odour nuisance
- Extreme : Extreme severe odour, and unacceptable odour level

Recorded by:       
Name: FONG KA CHUN  
Date: 6 Apr 2020

Checked by:       
Name: CHOL KAM HO  
Date: 6 April 2020

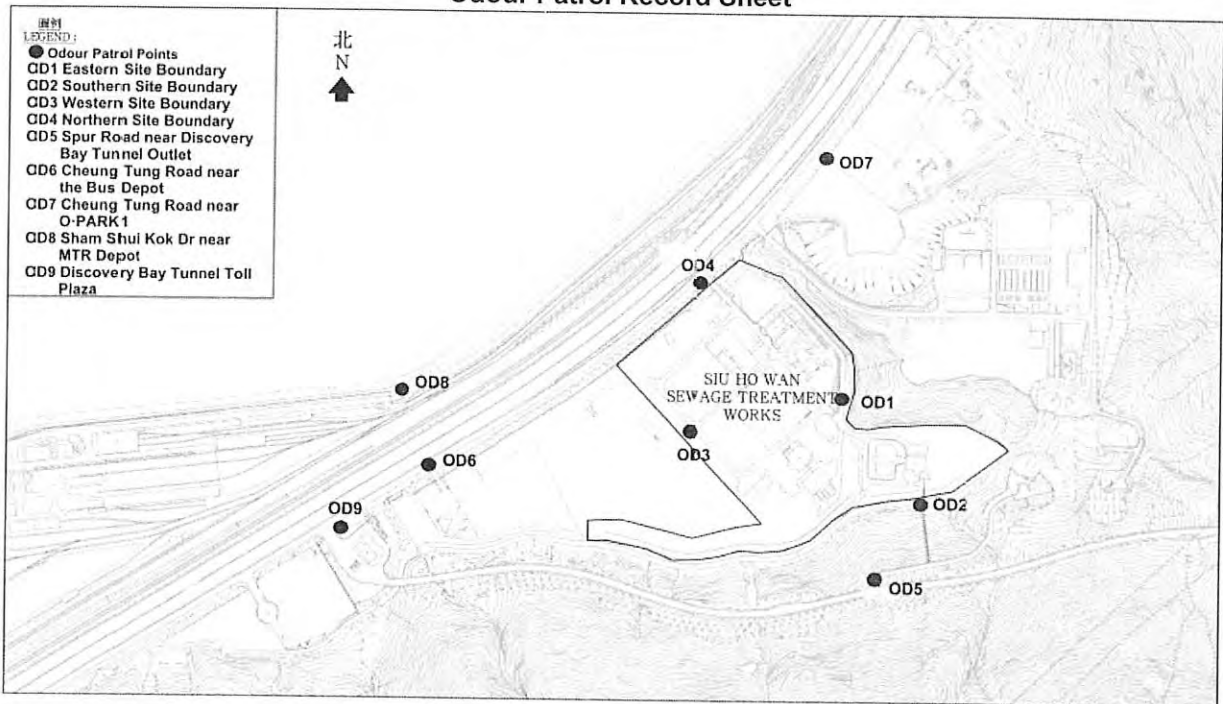
# FUGRO TECHNICAL SERVICES LIMITED

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Email : mcl@fugro.com.hk



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



Date		6/4/2020	Weather		Cloudy	Temperature		18°C	Humidity		77°C
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics					
OD1	Eastern Site Boundary	09:54	E	0.4	0	/					
OD2	Southern Site Boundary	09:58	/	0	0	/					
OD3	Western Site Boundary	09:50	/	0	0	/					
OD4	Northern Site Boundary	09:46	/	0	0	/					
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/					
OD6	Cheung Tung Road near the Bus Depot	09:24	E	2.1	0	/					
OD7	Cheung Tung Road near O-PARK1	09:26	E	0.5	0	/					
OD8	Sham Shui Kok Dr near MTR Depot	09:15	NE	2.0	0	/					
OD9	Discovery Bay Tunnel Toll Plaza	09:21	NE	0.4	0	/					

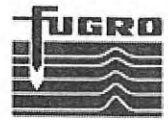
**\*Classification Criteria:**

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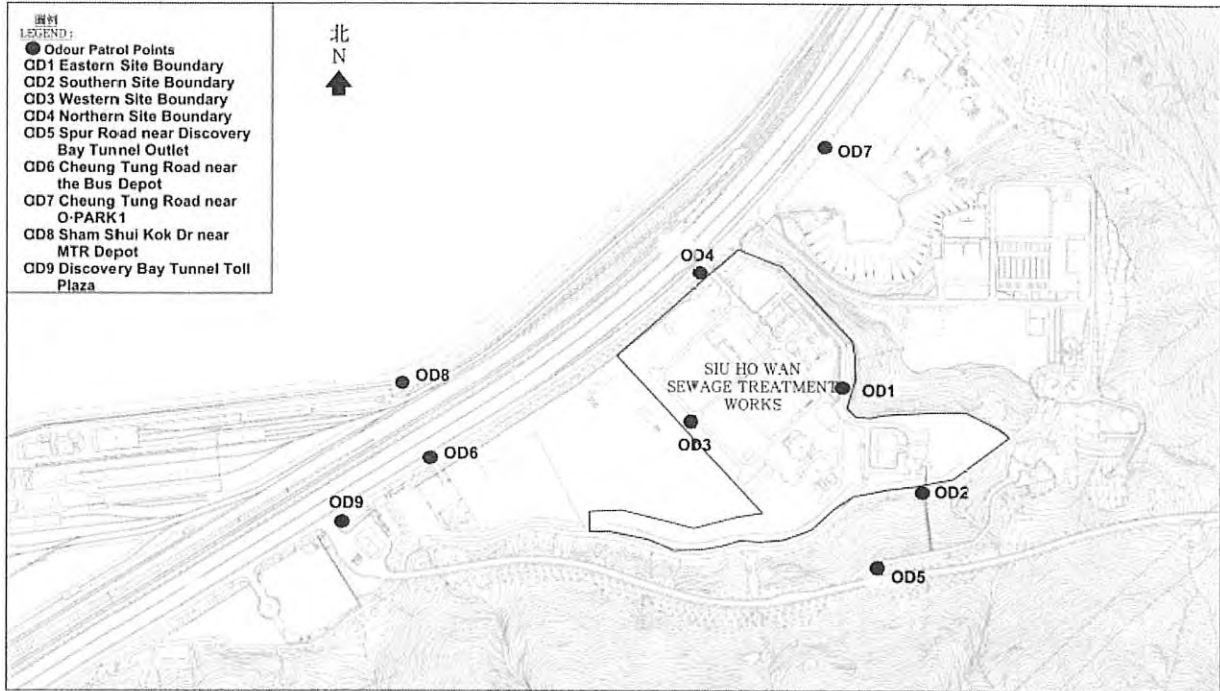
Recorded by: Ip Tsz Hin  
Name: Ip Tsz Hin  
Date: 6/4/2020

Checked by: [Signature]  
Name: CHUI KAM HO  
Date: 6 April 2020





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



Date	17 Apr 2020	Weather	Fine	Temperature	25.4°C	Humidity	67%
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics	
OD1	Eastern Site Boundary	10:08	N	0.1	0	/	
OD2	Southern Site Boundary	10:14	/	0	0	/	
OD3	Western Site Boundary	10:04	N	0.8	0	/	
OD4	Northern Site Boundary	10:00	N	1.1	0	/	
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/	
OD6	Cheung Tung Road near the Bus Depot	09:41	N	0.9	0	/	
OD7	Cheung Tung Road near O-PARK1	09:45	N	0.1	0	/	
OD8	Sham Shui Kok Dr near MTR Depot	09:30	N	0.2	0	/	
OD9	Discovery Bay Tunnel Toll Plaza	09:34	N	0.4	0	/	

**\*Classification Criteria:**

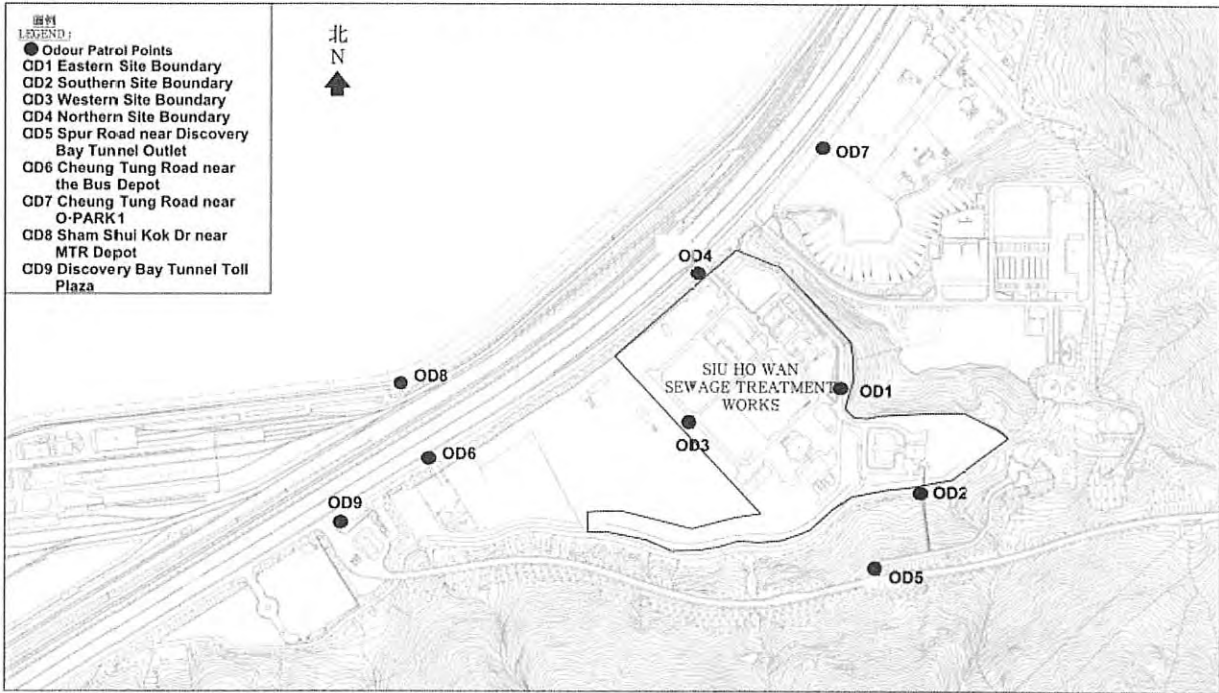
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- Slight : Slight identifiable odour, and slight chance to have odour nuisance
- Moderate : Moderate identifiable odour, and moderate chance to have odour nuisance
- Strong : Strong identifiable, likely to have odour nuisance
- Extreme : Extreme severe odour, and unacceptable odour level

Recorded by: Ip Tsz Him  
Name: Ip Tsz Him  
Date: 17/4/2020

Checked by: Ho Kam Ho  
Name: HOI KAM HO  
Date: 17 April 2020



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



Date	17/4/2020	Weather	Fine	Temperature	25.4°C	Humidity	67%
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics	
OD1	Eastern Site Boundary	10:06	N	0.1	0	/	
OD2	Southern Site Boundary	10:14	/	0	0	/	
OD3	Western Site Boundary	10:04	N	0.3	0	/	
OD4	Northern Site Boundary	10:00	N	1.1	0	/	
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/	
OD6	Cheung Tung Road near the Bus Depot	09:41	N	0.9	0	/	
OD7	Cheung Tung Road near O-PARK1	09:45	N	0.1	0	/	
OD8	Sham Shui Kok Dr near MTR Depot	09:30	N	0.2	0	/	
OD9	Discovery Bay Tunnel Toll Plaza	09:34	N	0.4	0	/	

**\*Classification Criteria:**

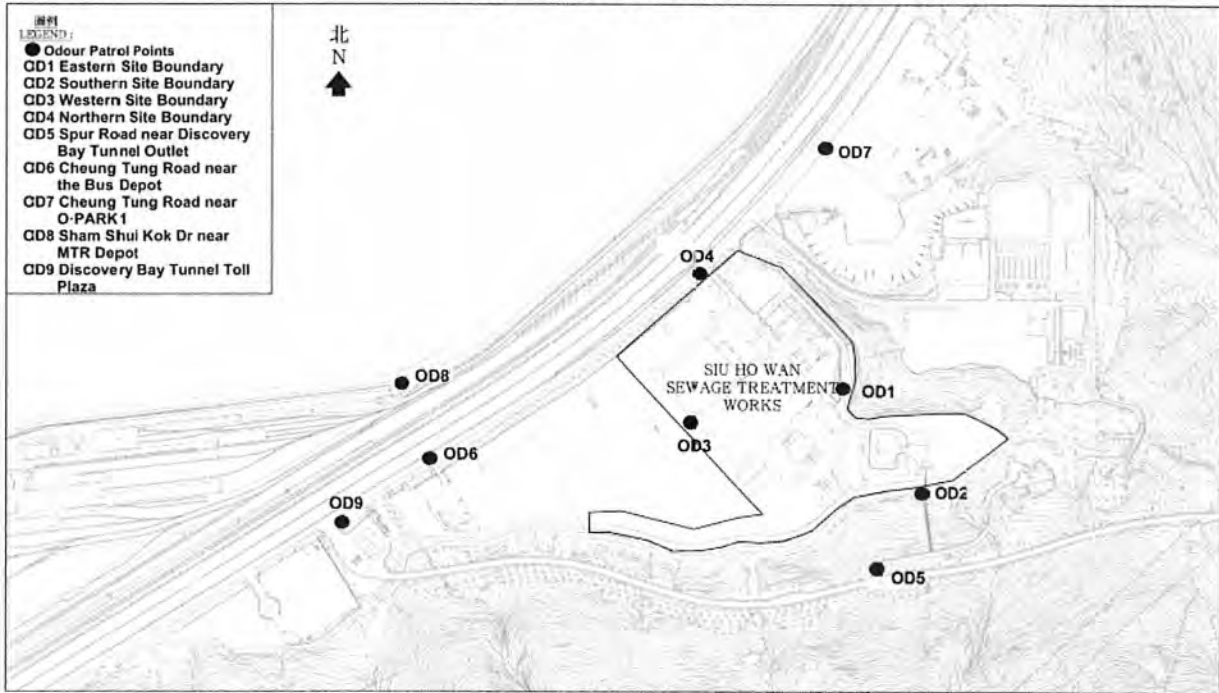
- Not detected : No odour perceived or an odour so weak that it cannot be easily characterised or described
- Slight : Slight identifiable odour, and slight chance to have odour nuisance
- Moderate : Moderate identifiable odour, and moderate chance to have odour nuisance
- Strong : Strong identifiable, likely to have odour nuisance
- Extreme : Extreme severe odour, and unacceptable odour level

Recorded by: Chan Ho Cheong  
Name: Chan Ho Cheong  
Date: 17/4/2020

Checked by: AK  
Name: CHOI KAM HO  
Date: 17 April 2020



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



Date	23/4/2020	Weather	Cloudy	Temperature	20.2°C	Humidity	87%
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics	
OD1	Eastern Site Boundary	10:09	/	0	0	/	
OD2	Southern Site Boundary	10:14	/	0	0	/	
OD3	Western Site Boundary	10:05	/	0	0	/	
OD4	Northern Site Boundary	10:01	/	0	0	/	
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/	
OD6	Cheung Tung Road near the Bus Depot	9:43	/	0	0	/	
OD7	Cheung Tung Road near O-PARK1	9:44	/	0	0	/	
OD8	Sham Shui Kok Dr near MTR Depot	9:34	NE	0.9	0	/	
OD9	Discovery Bay Tunnel Toll Plaza	9:40	/	0	0	/	

**\*Classification Criteria:**

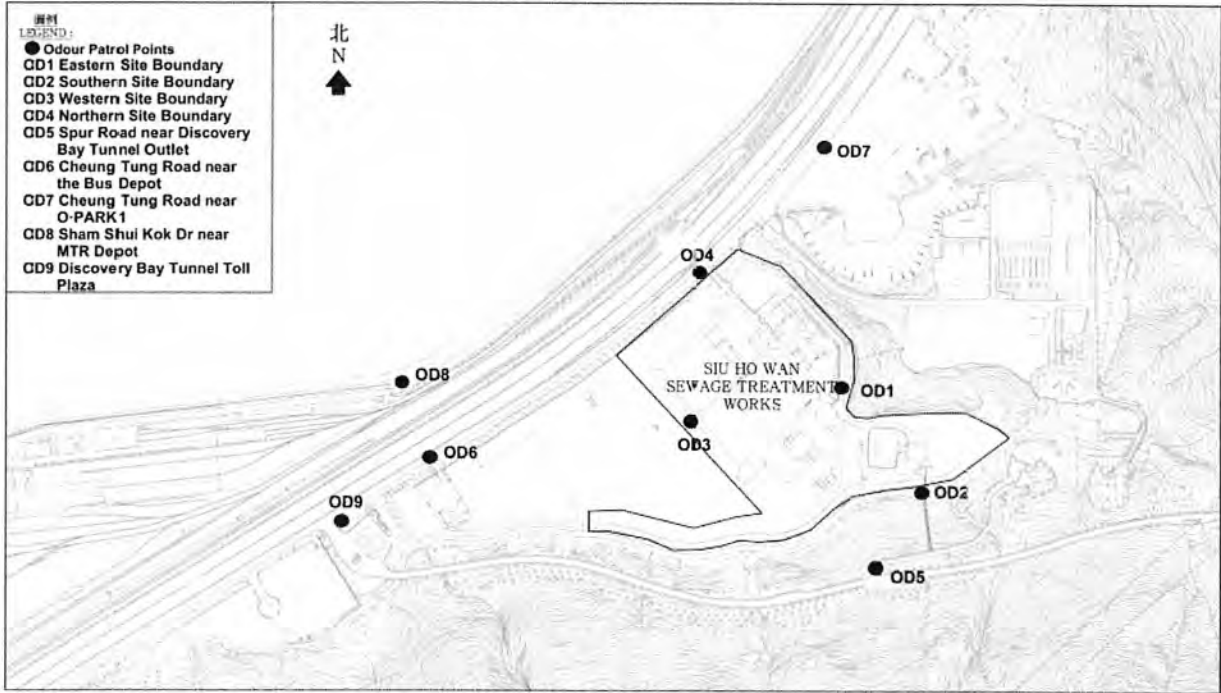
- Not detected : No odour perceived or an odour so weak that it cannot be easily characterised or described
- Slight : Slight identifiable odour, and slight chance to have odour nuisance
- Moderate : Moderate identifiable odour, and moderate chance to have odour nuisance
- Strong : Strong identifiable, likely to have odour nuisance
- Extreme : Extreme severe odour, and unacceptable odour level

Recorded by: KAN KUI TUNG  
Name: KAN KUI TUNG  
Date: 23/4/2020

Checked by: AY  
Name: CHUI KAM HO  
Date: 23 April 2020



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



Date	23/4/2020	Weather	Cloudy	Temperature	20.2°C	Humidity	87%
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics	
OD1	Eastern Site Boundary	10:09	/	0	0	/	
OD2	Southern Site Boundary	10:14	/	0	0	/	
OD3	Western Site Boundary	10:05	/	0	0	/	
OD4	Northern Site Boundary	10:01	/	0	0	/	
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/	
OD6	Cheung Tung Road near the Bus Depot	9:43	/	0	0	/	
OD7	Cheung Tung Road near O-PARK1	9:44	/	0	0	/	
OD8	Sham Shui Kok Dr near MTR Depot	9:34	NE	0.9	0	/	
OD9	Discovery Bay Tunnel Toll Plaza	9:40	/	0	0	/	

**\*Classification Criteria:**

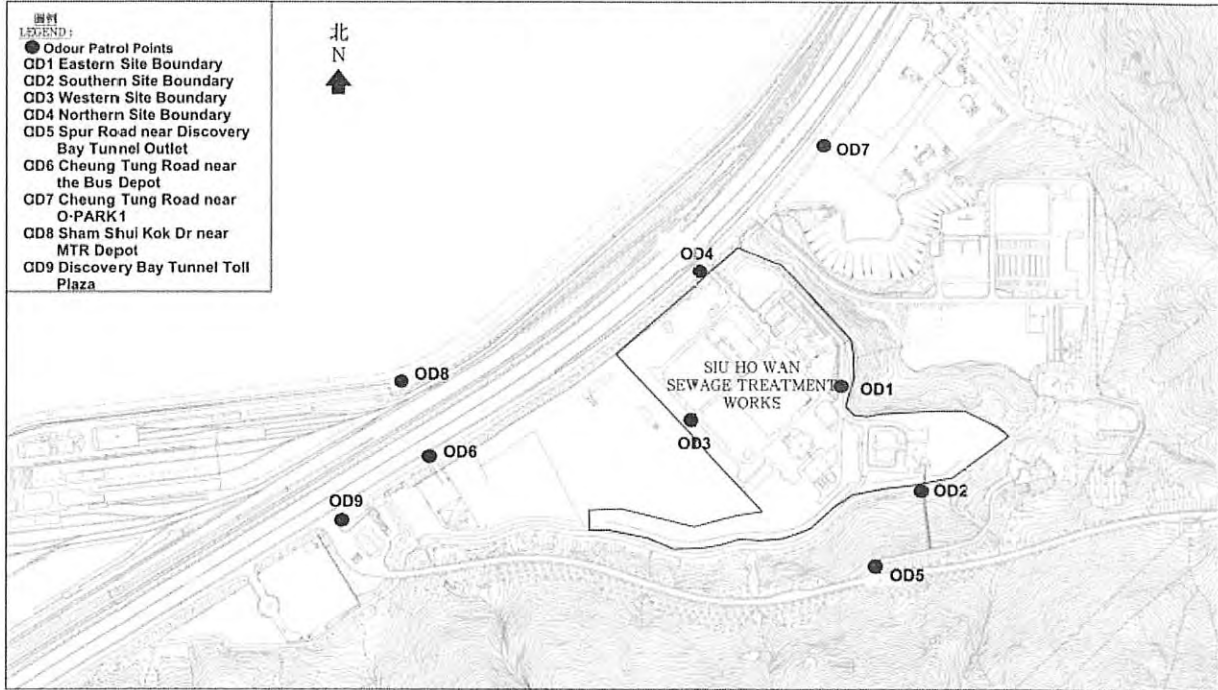
- Not detected : No odour perceived or an odour so weak that it cannot be easily characterised or described
- Slight : Slight identifiable odour, and slight chance to have odour nuisance
- Moderate : Moderate identifiable odour, and moderate chance to have odour nuisance
- Strong : Strong identifiable, likely to have odour nuisance
- Extreme : Extreme severe odour, and unacceptable odour level

Recorded by: Ip Tsz Hei  
Name: Ip Tsz Hei  
Date: 23/4/2020

Checked by: AY  
Name: CHOI KAM HO  
Date: 23 April 2020



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



Date	29/4/2020	Weather	Fine	Temperature	25.2°C	Humidity	71%
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics	
OD1	Eastern Site Boundary	10:26	NE	0.7	0	/	
OD2	Southern Site Boundary	10:30	/	0	0	/	
OD3	Western Site Boundary	10:21	NE	1.6	0	/	
OD4	Northern Site Boundary	10:17	NE	0.4	0	/	
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/	
OD6	Cheung Tung Road near the Bus Depot	9:26	NE	0.4	0	/	
OD7	Cheung Tung Road near O-PARK1	9:26	NE	1.5	0	/	
OD8	Sham Shui Kok Dr near MTR Depot	9:15	NE	0.2	0	/	
OD9	Discovery Bay Tunnel Toll Plaza	9:23	NE	0.7	0	/	

**\*Classification Criteria:**

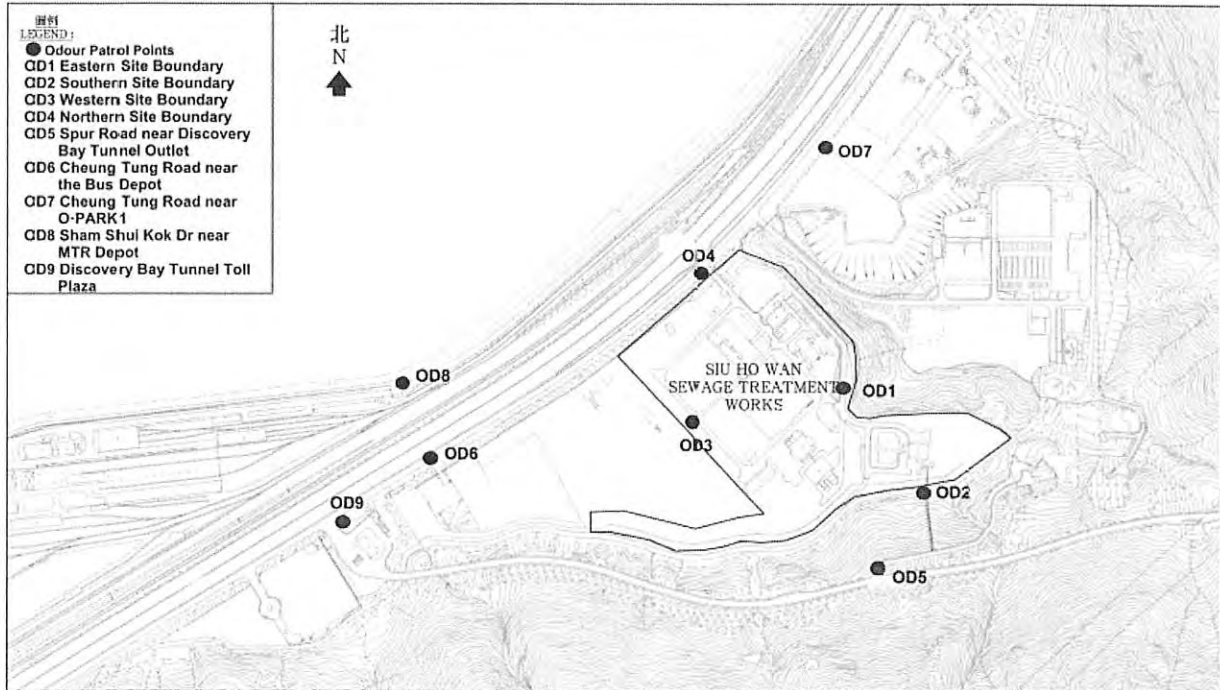
- Not detected : No odour perceived or an odour so weak that it cannot be easily characterised or described
- Slight : Slight identifiable odour, and slight chance to have odour nuisance
- Moderate : Moderate identifiable odour, and moderate chance to have odour nuisance
- Strong : Strong identifiable, likely to have odour nuisance
- Extreme : Extreme severe odour, and unacceptable odour level

Recorded by: WAN SIU WAI  
Name: WAN SIU WAI  
Date: 29/4/2020

Checked by: AS  
Name: CHOLKAM HO  
Date: 29 April 2020



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



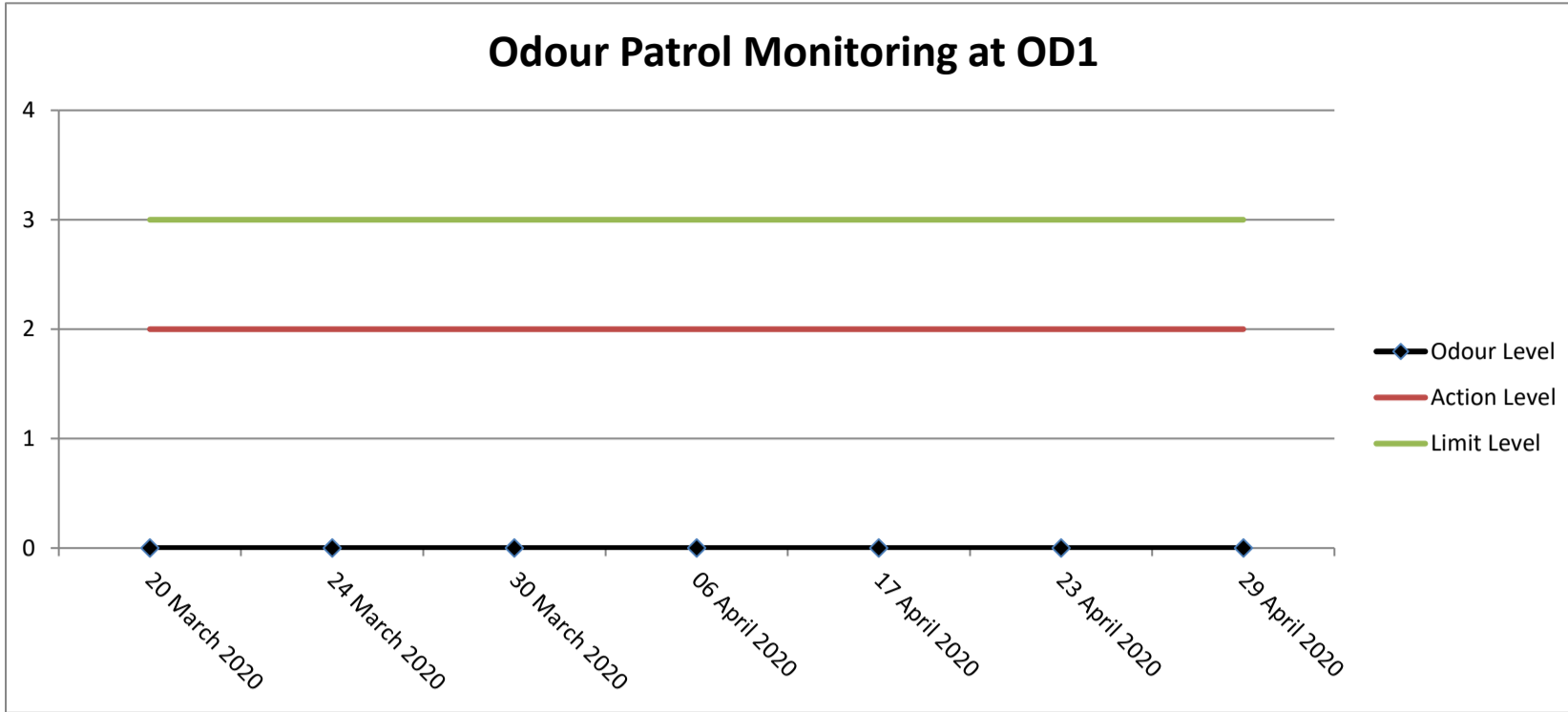
Date	29/4/2020	Weather	Fine	Temperature	25.2°C	Humidity	71%
ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour intensity	Odour Characteristics	
OD1	Eastern Site Boundary	10:26	NE	0.7	0	/	
OD2	Southern Site Boundary	10:30	/	0	0	/	
OD3	Western Site Boundary	10:21	NE	1.6	0	/	
OD4	Northern Site Boundary	10:17	NE	0.4	0	/	
OD5	Spur Road near Discovery Bay Tunnel Outlet	/	/	/	/	/	
OD6	Cheung Tung Road near the Bus Depot	9:26	NE	0.4	0	/	
OD7	Cheung Tung Road near O-PARK1	9:28	NE	1.5	0	/	
OD8	Sham Shui Kok Dr near MTR Depot	9:15	NE	0.2	0	/	
OD9	Discovery Bay Tunnel Toll Plaza	9:23	NE	0.7	0	/	

**\*Classification Criteria:**

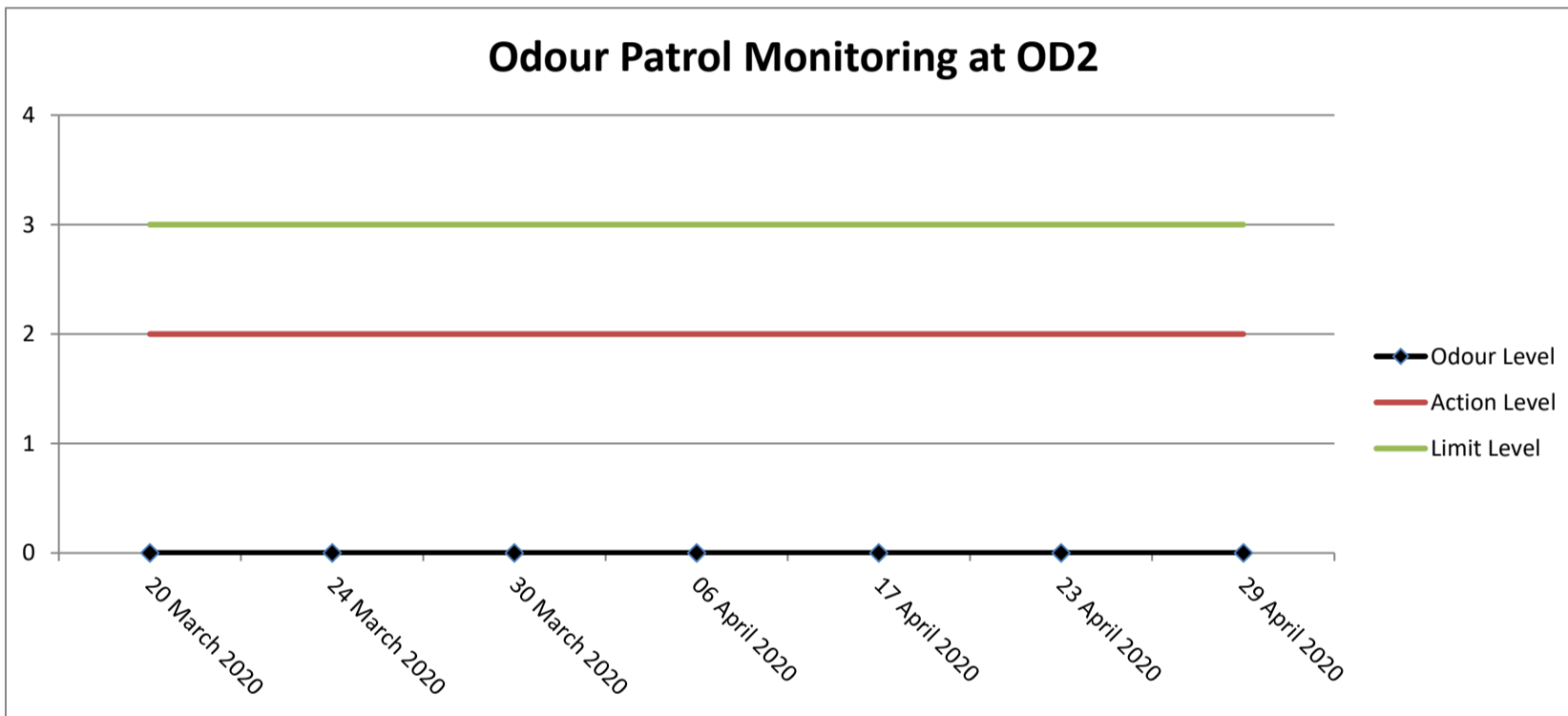
- Not detected : No odour perceived or an odour so weak that it cannot be easily characterised or described
- Slight : Slight identifiable odour, and slight chance to have odour nuisance
- Moderate : Moderate identifiable odour, and moderate chance to have odour nuisance
- Strong : Strong identifiable, likely to have odour nuisance
- Extreme : Extreme severe odour, and unacceptable odour level

Recorded by: [Signature]  
Name: KAN KUI TOM  
Date: 29/4/2020

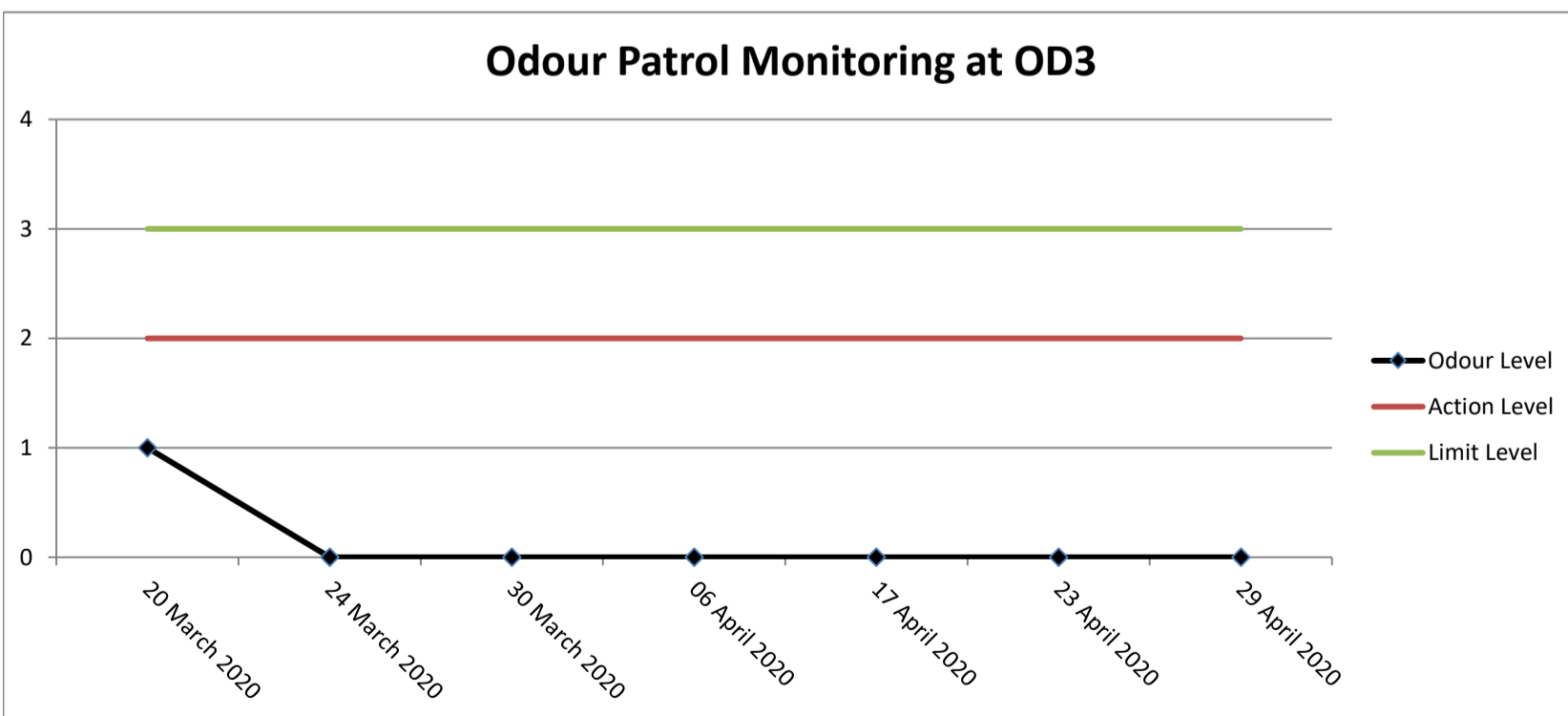
Checked by: [Signature]  
Name: CHOI KAM HO  
Date: 29 April 2020



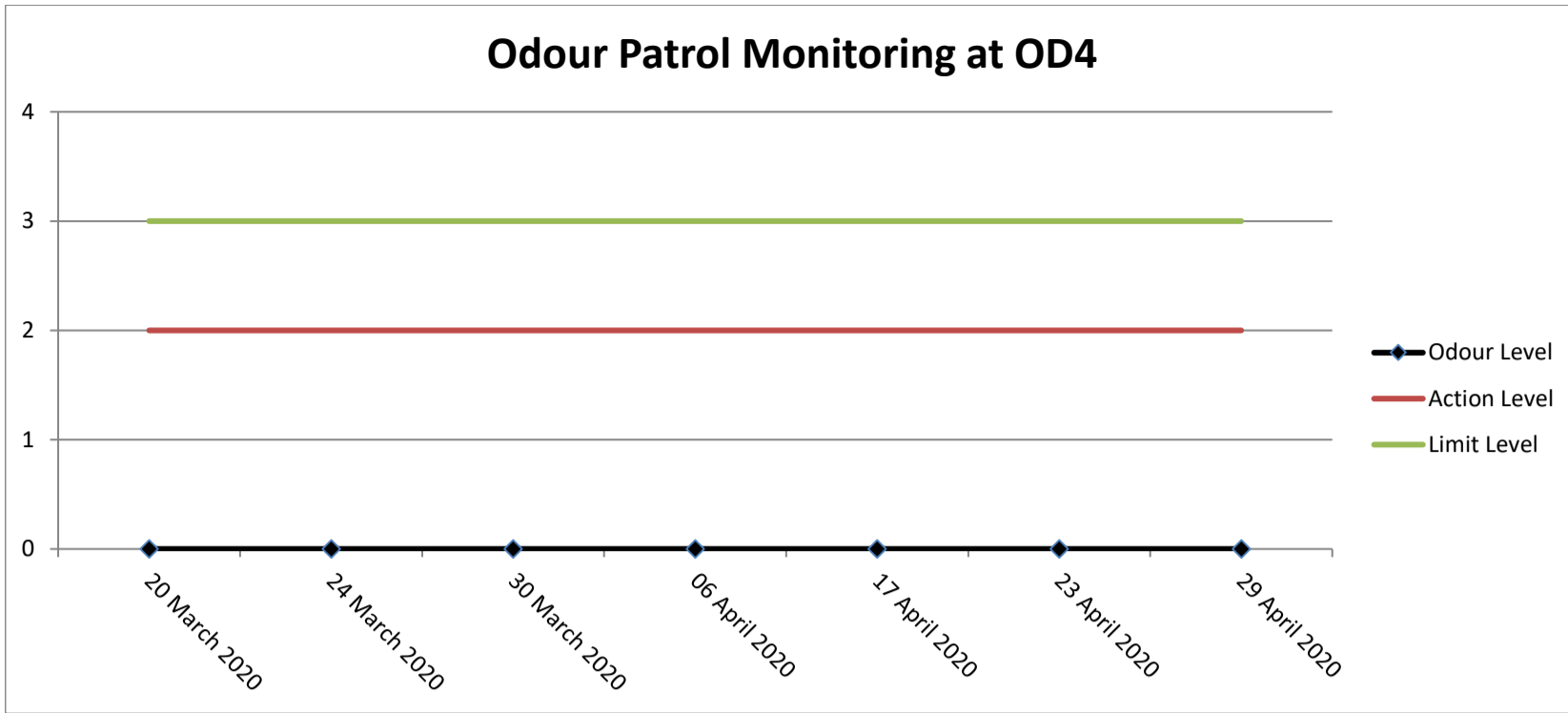
Note:  
Y-axis refers to the Odour Level: 0 - Not Detected; 1- Slight; 2 - Moderate; 3 - Strong; 4 - Extreme



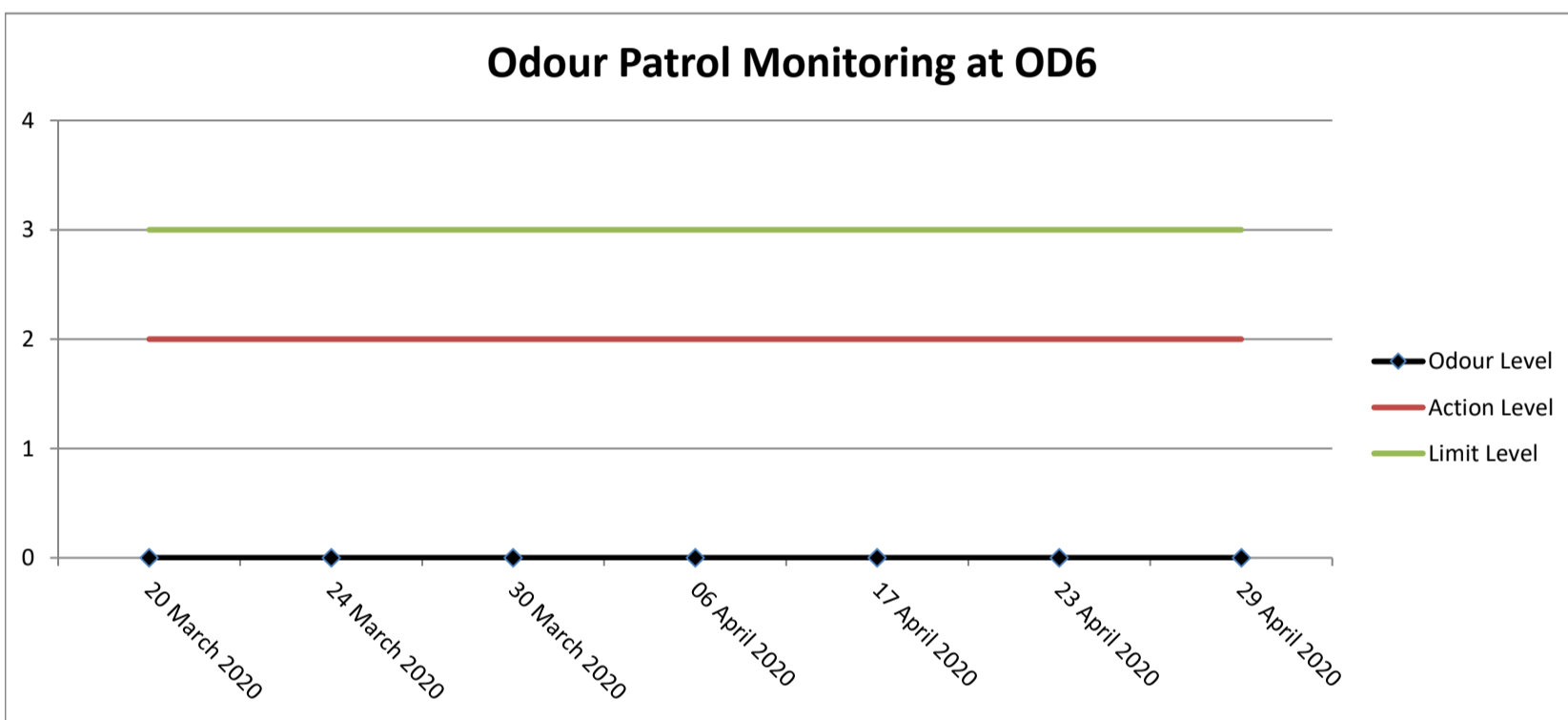
Note:  
Y-axis refers to the Odour Level: 0 - Not Detected; 1- Slight; 2 - Moderate; 3 - Strong; 4 - Extreme



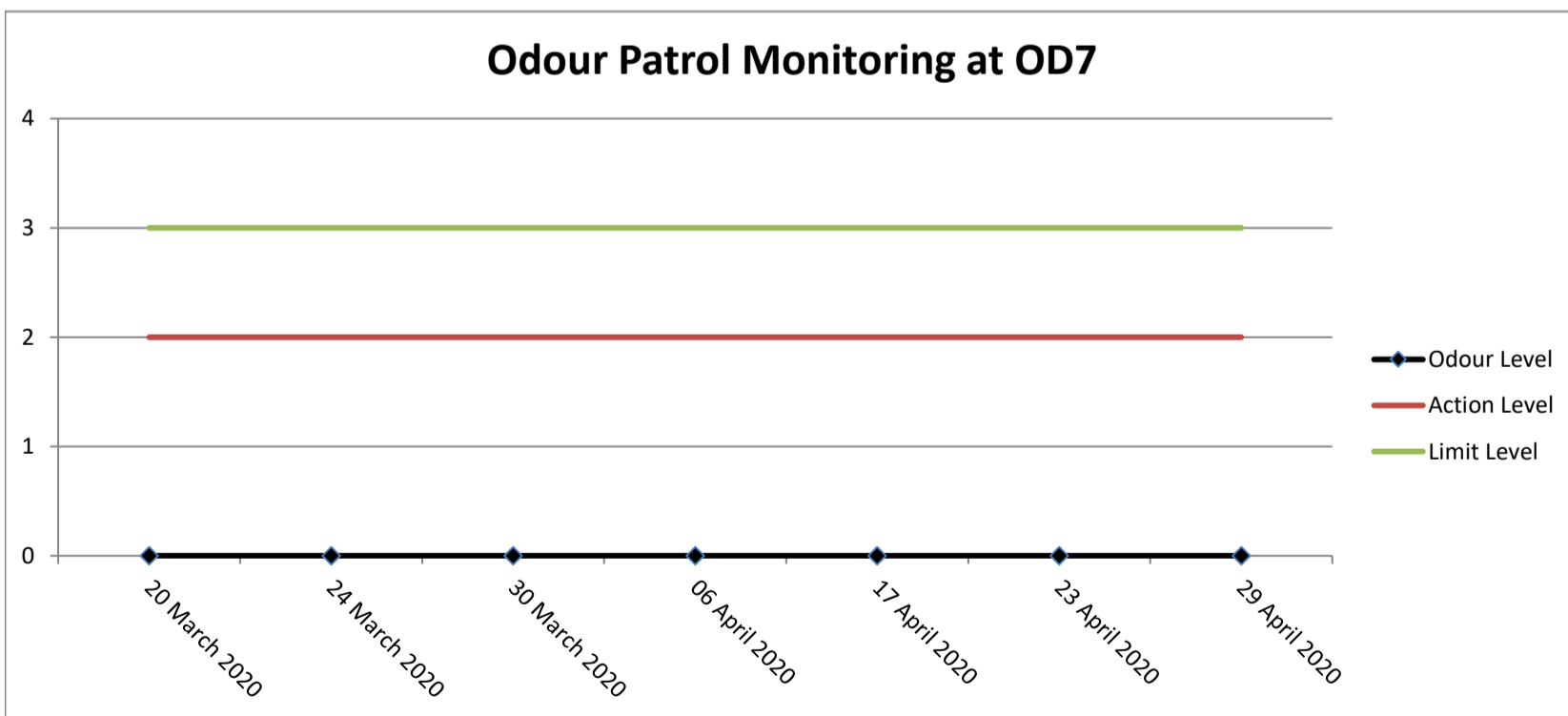
Note:  
Y-axis refers to the Odour Level: 0 - Not Detected; 1- Slight; 2 - Moderate; 3 - Strong; 4 - Extreme



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

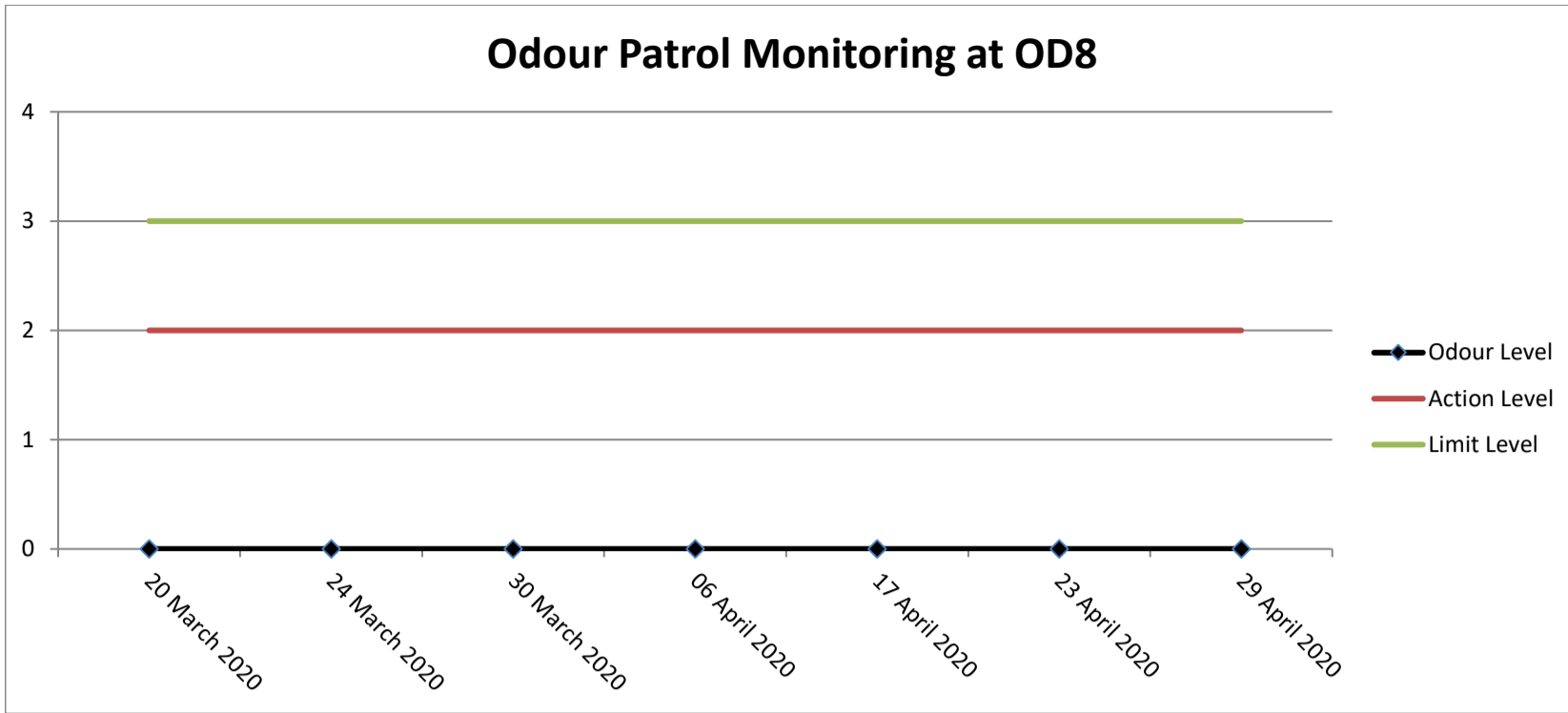


Note:  
Y-axis refers to the Odour Level: 0 - Not Detected; 1- Slight; 2 - Moderate; 3 - Strong; 4 - Extreme

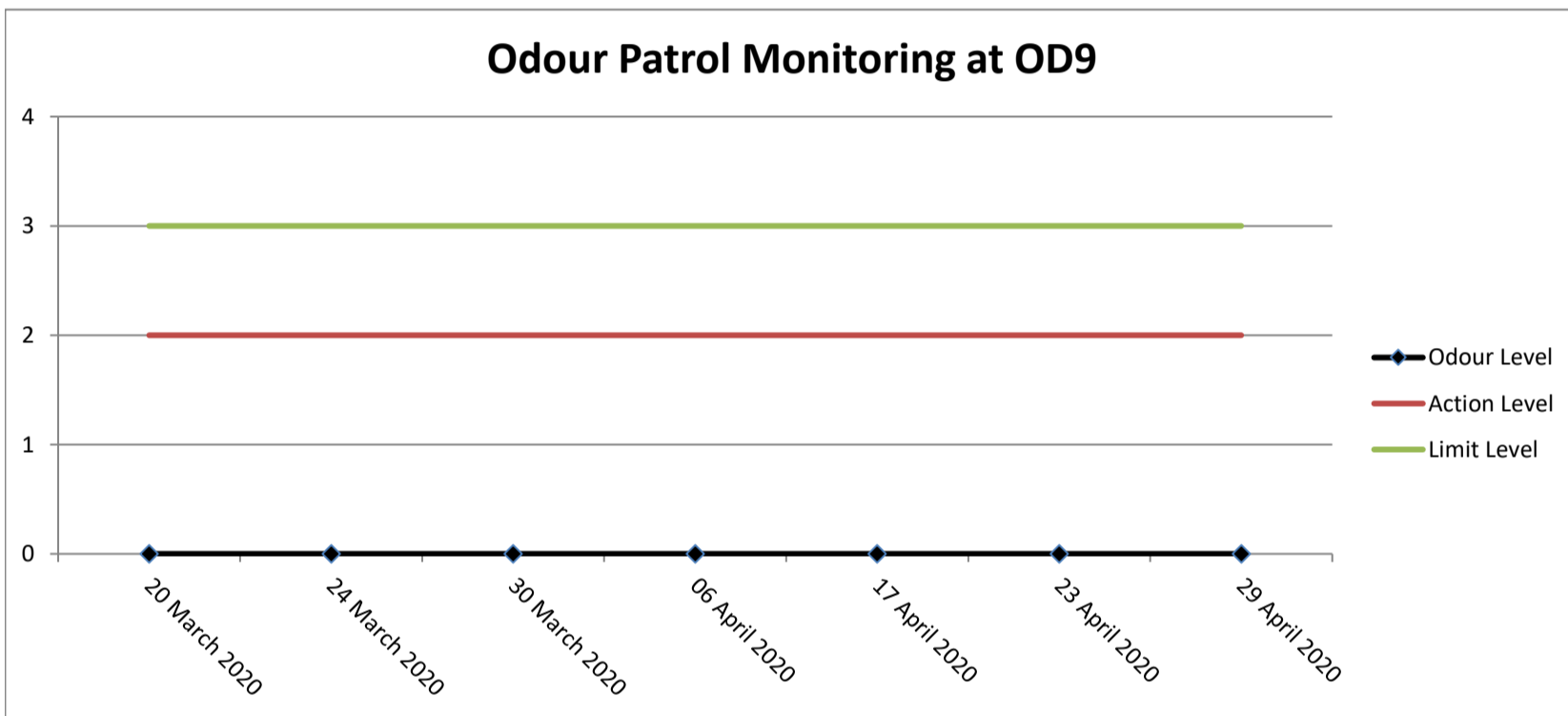


Note:  
Y-axis refers to the Odour Level: 0 - Not Detected; 1- Slight; 2 - Moderate; 3 - Strong; 4 - Extreme





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



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

Remark:  
As access permission from the company of Discovery Bay Tunnel is under requisition progress, the odour patrol monitoring will not cover OD5 (Spur Road near Discovery Bay Tunnel Outlet) temporarily.

## **FUGRO TECHNICAL SERVICES LIMITED**

Fugro Development Centre,  
5 Lok Yi Street, Tai Lam,  
Tuen Mun, N.T.,  
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Fax : +852 2450 6138  
E-mail : matlab@fugro.com  
Website : www.fugro.com



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Report No.: 0041/17/ED/0544A

### Appendix E

#### Copy of the Calibration Certificates for Water Quality Monitoring Equipment

Report No. : 142626WA200529



Page 1 of 3

**Report on Calibration of Aqua Troll 600 Multi-parameter Water Quality Meter****Information Supplied by Client**

Client : MaterialLab Consultants Limited

Client's address : Rm. 723-726, 7/F, Profit Industrial Building, No. 1-15,  
Kwai Fung Crescent, Kwai Chung, N.T.

Sample description : One Aqua Troll 600 Multi-parameter Water Quality Meter

Client sample ID : Serial No. 490113

Test required : Calibration of the Aqua Troll 600 Multi-parameter Water Quality  
Meter

**Laboratory Information**

Lab. sample ID : WA200529/1

Date of calibration : 23/03/2020

Next calibration date : 22/06/2020

Test method used : In-house comparison method

*Note : This report refers only to the sample(s) tested.*

Report No. : 142626WA200529

Page 2 of 3

**Results :**
**A. pH calibration**

pH reading at 25°C for Q.C. solution(6.86) and at 25°C for Q.C. solution(9.18)		
Theoretical	Measured	Deviation
9.18	9.17	-0.01
6.86	6.87	+0.01

**B. Salinity calibration**

Salinity, ppt			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
10	10.03	+0.03	± 0.5
20	20.05	+0.05	± 1.0
30	29.82	-0.18	± 1.5
40	39.88	-0.12	± 2.0

**C. Dissolved Oxygen calibration**

Trial No.	Dissolved oxygen content, mg/L	
	By calibrated D.O. meter	By D.O. meter
1	7.36	7.36
2	7.37	7.36
3	7.37	7.37
Average	7.37	7.36

Differences of D.O. Content between calibrated D.O. meter and D.O. meter should be less than 0.4mg/L

Certified by :   
 Approved Signatory : CHAN Hoi Yan, Winnie  
 Assistant Manager

Date : 

*Note : This report refers only to the sample(s) tested.*

Report No. : 142626WA200529

Page 3 of 3

**Results :**
**D. Temperature calibration**

Thermometer reading, °C	Meter reading, °C
25.01	25.04

**E. Turbidity calibration**

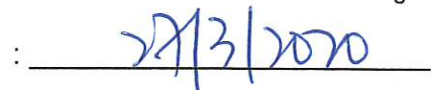
Turbidity, N.T.U.			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
0	-	-	± 0.5
4	4.07	+0.08	± 0.6
8	8.09	+0.09	± 0.8
40	39.68	-0.32	± 3.0
80	79.58	-0.42	± 4.0

Certified by :



 Approved Signatory : CHAN Hoi Yan, Winnie  
 Assistant Manager

Date :



\*\* End of Report \*\*

*Note : This report refers only to the sample(s) tested.*



a xylem brand

9940 Summers Ridge Road  
San Diego, CA 92121  
Tel: (858) 546-8327  
support@sontek.com

### Certificate of Calibration

#### TEST REPORT

Serial Number	5906
System Type	M9
System Orientation	Down
Compass Type	Sontek
Compass Offset (degrees)	N/A
Communications Output	RS232
Recorder Size (GB)	14.9
Firmware Version	4.02
Date Tested	05/23/2017

#### POWER TEST

Command Mode (W):	0.17	Range : 0.00 – 0.30
Sleep Mode (W):	N/A	Range : N/A
Ping Mode - 18V (W):	2.67	Range : 1.50 – 3.50
Power Check		PASS

#### NOISE TEST

Beam 1 – 3.0 MHz (counts)	95
Beam 2 – 1.0 MHz (counts)	96
Beam 3 – 3.0 MHz (counts)	95
Beam 4 – 1.0 MHz (counts)	101
Beam 5 – 3.0 MHz (counts)	93
Beam 6 – 1.0 MHz (counts)	95
Beam 7 – 3.0 MHz (counts)	91
Beam 8 – 1.0 MHz (counts)	100
Beam Vertical – 500KHz (counts)	88
Noise Test	PASS

## VERIFICATION

Velocity Check	PASS
Transmit Output	PASS
Sensitivity	PASS
Temperature Sensor	PASS
Compass Heading Check	PASS
Compass Level Check	PASS
Burn-in (24 hrs)	PASS
Load Default Parameters	DONE

## OPTIONS

Bottom Track	Installed
SmartPulse HD <sup>TM</sup>	Enabled
Stationary	Disabled
GPS Compass Integration	Disabled
RiverSurveyor	Enabled
HydroSurveyor	Disabled

Verified by: **ainthasane**

This report was generated on 5/24/2017.

ATTENTION: New Warranty Terms as of March 4, 2013:

This system is covered under a two year limited warranty that extends to all parts and labor for any malfunction due to workmanship or errors in the manufacturing process. The warranty is valid only if you properly maintain and operate this system under normal use as outlined in the User's Manual. The warranty does not cover shortcomings that are due to the design, or any incidental damages as a result of errors in the measurements.

SonTek will repair and/or replace, at its sole option, any product established to be defective with a product of like type. CLAIMS FOR LABOR COSTS AND/OR OTHER CHARGES RESULTING FROM THE USE OF SonTek GOODS AND/OR PRODUCTS ARE NOT COVERED BY THIS LIMITED WARRANTY.

SonTek DISCLAIMS ALL EXPRESS WARRANTIES OTHER THAN THOSE CONTAINED ABOVE AND ALL IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE. SonTek DISCLAIMS AND WILL NOT BE LIABLE, UNDER ANY CIRCUMSTANCE, IN CONTRACT, TORT OR WARRANTY, FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, INCLUDING BUT NOT LIMITED TO LOST PROFITS, BUSINESS INTERRUPTION LOSSES, LOSS OF GOODWILL, OR LOSS OF BUSINESS OR CUSTOMER RELATIONSHIPS.

If your system is not functioning properly, first try to identify the source of the problem. If additional support is required, we encourage you to contact us immediately. We will work to resolve the problem as quickly as possible.

If the system needs to be returned to the factory, please contact SonTek to obtain a Service Request (SR) number. We reserve the right to refuse receipt of shipments without SRs. We require the system to be shipped back in the original shipping container using the original packing material with all delivery costs covered by the customer (including all taxes and duties). If the system is returned without appropriate packing, the customer will be required to cover the cost of a new packaging crate and material.

The warranty for repairs performed at an authorized SonTek Service Center is one year.

# FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,  
5 Lok Yi Street, Tai Lam,  
Tuen Mun, N.T.,  
Hong Kong.

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Fax : +852 2450 6138  
E-mail : matlab@fugro.com  
Website : www.fugro.com



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Report No.: 0041/17/ED/0544A

## Appendix F

### Results and Graphical Presentation of Water Quality Monitoring











### CERTIFICATE OF ANALYSIS

Client	: FUGRO TECHNICAL SERVICES LIMITED	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 28
Contact	: MR CYRUS LAI	Contact	: Richard Fung	Work Order	: HK2012472
Address	: ROOM 723 & 725, 7/F, BLOCK B, PROFIT INDUSTRIAL BUILDING, 1-15 KWAI FONG CRESCENT, KWAI FONG, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: c.lai@fugro.com	E-mail	: richard.fung@alsglobal.com		
Telephone	: +852 3565 4374	Telephone	: +852 2610 1044		
Facsimile	: ---	Facsimile	: +852 2610 2021		
Project	: CONTRACT NO. CM 14/2016 ENVIRONMENTAL TEAM FOR OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT PLANT	Date Samples Received	: 06-Apr-2020		
Order number	: 0041/17	Quote number	: HKE/1654/2017_R1	Issue Date	: 22-Apr-2020
C-O-C number	: ---			No. of samples received	: 96
Site	: ---			No. of samples analysed	: 96

This report may not be reproduced except with prior written approval from the testing laboratory.

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

<u>Signatories</u>	<u>Position</u>	<u>Authorised results for</u>
		
Fung Lim Chee, Richard	Managing Director	Inorganics
		
Ng Sin Kou, May	Laboratory Manager	Microbiology_ENV



### **General Comments**

This report supersedes any previous report(s) with this reference. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. Testing period is from 06-Apr-2020 to 22-Apr-2020.

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

### **Specific Comments for Work Order: HK2012472**

Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in chilled condition. The result(s) related only to the item(s) tested.

Sample information (Project name, Sample ID, Sampling date/time, etc., if any) is provided by client.

Microbiological sample(s) was/ were collected in 125mL sterile plastic bottles containing sodium thiosulfate. Sample(s) arrived at the laboratory at 19:40.

NOT DETECTED denotes result(s) is (are) less than the Limit of Report (LOR).

EK063A - Total Inorganic Nitrogen is the sum of the Total Oxidizable Nitrogen and Ammonical Nitrogen.

EP030 - The accredited LOR of Biochemical Oxygen Demand is 2mg/L. Results reported below 2mg/L and the decimal value of the results were for reference only.



**Analytical Results**

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				A/S/E	A/S/E/Dup	A/M/E	A/M/E/Dup	A/B/E
				06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-001	HK2012472-002	HK2012472-003	HK2012472-004	HK2012472-005
<b>EA/ED: Physical and Aggregate Properties</b>								
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.1	6.0	5.3	6.2	6.1
<b>ED/EK: Inorganic Nonmetallic Parameters</b>								
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.104	0.102	0.101	0.104	0.102
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.016	0.027	0.016	0.020	0.019
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.286	0.276	0.297	0.284	0.291
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.407	0.405	0.413	0.407	0.411
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02
<b>EP: Aggregate Organics</b>								
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0
<b>EM: Microbiological Testing</b>								
EM002: E. coli	----	1	CFU/100mL	33	38	32	40	46



Sub-Matrix: WATER				Client sample ID	A/B/E/Dup	B/S/E	B/S/E/Dup	B/M/E	B/M/E/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-006	HK2012472-007	HK2012472-008	HK2012472-009	HK2012472-010	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	7.0	4.5	5.4	5.4	5.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.105	0.103	0.104	0.108	0.102	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.020	0.022	0.022	0.021	0.028	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.282	0.282	0.286	0.265	0.273	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.408	0.407	0.412	0.394	0.404	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	39	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	B/B/E	B/B/E/Dup	C/S/E	C/S/E/Dup	C/M/E
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-011	HK2012472-012	HK2012472-013	HK2012472-014	HK2012472-015	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.9	5.6	4.2	4.7	5.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.104	0.104	0.091	0.095	0.090	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.011	0.013	0.031	0.022	0.025	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.298	0.297	0.335	0.350	0.343	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.412	0.413	0.456	0.467	0.458	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	C/M/E/Dup	C/B/E	C/B/E/Dup	D/S/E	D/S/E/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-016	HK2012472-017	HK2012472-018	HK2012472-019	HK2012472-020	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.9	5.0	5.3	6.4	5.8	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.094	0.095	0.094	0.094	0.091	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.020	0.022	0.022	0.016	0.012	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.345	0.335	0.342	0.333	0.346	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.458	0.452	0.458	0.443	0.448	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	





Sub-Matrix: WATER				Client sample ID	D/M/E	D/M/E/Dup	D/B/E	D/B/E/Dup	E/S/E
Client sampling date / time				06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-021	HK2012472-022	HK2012472-023	HK2012472-024	HK2012472-025	HK2012472-025
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.2	4.8	5.1	4.6	4.6	4.6
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.093	0.095	0.096	0.096	0.104	0.104
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.019	0.027	0.031	0.018	0.023	0.023
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.334	0.326	0.335	0.345	0.262	0.262
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.445	0.448	0.463	0.459	0.389	0.389
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	0.02
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	0.02
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	17



Sub-Matrix: WATER				Client sample ID	E/S/E/Dup	E/M/E	E/M/E/Dup	E/B/E	E/B/E/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-026	HK2012472-027	HK2012472-028	HK2012472-029	HK2012472-030	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	3.9	3.7	4.5	4.1	5.0	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.102	0.102	0.105	0.107	0.102	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.016	0.017	0.009	0.018	0.016	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.290	0.281	0.285	0.260	0.278	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.408	0.399	0.398	0.385	0.396	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	14	14	18	11	12	



Sub-Matrix: WATER				Client sample ID	F/S/E	F/S/E/Dup	F/M/E	F/M/E/Dup	F/B/E
Client sampling date / time				06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-031	HK2012472-032	HK2012472-033	HK2012472-034	HK2012472-035	HK2012472-035
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.8	6.7	5.3	6.2	5.1	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.117	0.106	0.102	0.106	0.106	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.024	0.014	0.014	0.022	0.018	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.309	0.265	0.300	0.256	0.254	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.450	0.385	0.416	0.385	0.378	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	17	12	18	11	14	



Sub-Matrix: WATER				Client sample ID	F/B/E/Dup	G/S/E	G/S/E/Dup	G/M/E	G/M/E/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-036	HK2012472-037	HK2012472-038	HK2012472-039	HK2012472-040	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	6.1	5.4	5.4	6.6	7.2	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.106	0.106	0.108	0.108	0.103	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.032	0.021	0.013	0.011	0.012	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.235	0.255	0.258	0.249	0.256	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.373	0.382	0.379	0.368	0.371	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	9	5	6	6	4	



Sub-Matrix: WATER				Client sample ID	G/B/E	G/B/E/Dup	H/S/E	H/S/E/Dup	H/M/E
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-041	HK2012472-042	HK2012472-043	HK2012472-044	HK2012472-045	HK2012472-045
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	7.2	6.3	5.9	5.8	5.6	5.6
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.107	0.105	0.106	0.109	0.111	0.111
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.026	0.023	0.017	0.019	0.014	0.014
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.236	0.256	0.247	0.251	0.254	0.254
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.370	0.384	0.370	0.379	0.380	0.380
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	0.02
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	0.02
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	6	9	8	9	8	8



Sub-Matrix: WATER				Client sample ID	H/M/E/Dup	H/B/E	H/B/E/Dup	A/S/F	A/S/F/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-046	HK2012472-047	HK2012472-048	HK2012472-049	HK2012472-050	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.0	6.0	6.0	6.2	5.8	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.108	0.108	0.110	0.104	0.104	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.022	0.017	0.028	0.018	0.022	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.242	0.246	0.228	0.415	0.408	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.372	0.372	0.366	0.538	0.533	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	5	8	11	14	10	



Sub-Matrix: WATER				Client sample ID	A/M/F	A/M/F/Dup	A/B/F	A/B/F/Dup	B/S/F
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-051	HK2012472-052	HK2012472-053	HK2012472-054	HK2012472-055	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.7	6.0	7.0	6.5	6.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.108	0.103	0.104	0.102	0.104	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.028	0.017	0.024	0.028	0.024	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.397	0.418	0.402	0.400	0.413	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.534	0.538	0.529	0.530	0.541	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	5	7	4	3	6	



Sub-Matrix: WATER				Client sample ID	B/S/F/Dup	B/M/F	B/M/F/Dup	B/B/F	B/B/F/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-056	HK2012472-057	HK2012472-058	HK2012472-059	HK2012472-060	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.9	5.1	5.7	5.4	4.7	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.106	0.104	0.105	0.102	0.112	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.025	0.017	0.027	0.015	0.017	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.413	0.408	0.416	0.429	0.433	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.543	0.530	0.548	0.547	0.562	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	8	10	11	5	5	





Sub-Matrix: WATER				Client sample ID	C/S/F	C/S/F/Dup	C/M/F	C/M/F/Dup	C/B/F
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-061	HK2012472-062	HK2012472-063	HK2012472-064	HK2012472-065	HK2012472-065
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	6.8	6.2	7.2	6.3	7.4	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.103	0.099	0.102	0.106	0.102	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.030	0.022	0.019	0.039	0.024	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.404	0.416	0.415	0.394	0.413	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.537	0.537	0.536	0.539	0.538	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	2	2	3	3	2	



Sub-Matrix: WATER				Client sample ID	C/B/F/Dup	D/S/F	D/S/F/Dup	D/M/F	D/M/F/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-066	HK2012472-067	HK2012472-068	HK2012472-069	HK2012472-070	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	6.5	6.0	5.7	6.2	6.7	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.102	0.105	0.105	0.105	0.105	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.027	0.021	0.023	0.024	0.024	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.422	0.429	0.425	0.420	0.424	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.551	0.554	0.553	0.549	0.553	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	1	1	3	4	2	



Sub-Matrix: WATER				Client sample ID	D/B/F	D/B/F/Dup	E/S/F	E/S/F/Dup	E/M/F
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-071	HK2012472-072	HK2012472-073	HK2012472-074	HK2012472-075	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	4.7	5.2	8.2	7.4	6.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.104	0.105	0.104	0.106	0.107	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.020	0.023	0.023	0.034	0.017	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.430	0.420	0.421	0.405	0.417	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.554	0.548	0.548	0.545	0.541	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	3	2	3	1	1	



Sub-Matrix: WATER				Client sample ID	E/M/F/Dup	E/B/F	E/B/F/Dup	F/S/F	F/S/F/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-076	HK2012472-077	HK2012472-078	HK2012472-079	HK2012472-080	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	6.1	5.5	5.2	7.5	6.5	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.111	0.106	0.113	0.106	0.109	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.024	0.025	0.034	0.024	0.018	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.413	0.412	0.404	0.420	0.430	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.549	0.543	0.551	0.550	0.557	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	1	3	5	1	1	



Sub-Matrix: WATER				Client sample ID	F/M/F	F/M/F/Dup	F/B/F	F/B/F/Dup	G/S/F
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-081	HK2012472-082	HK2012472-083	HK2012472-084	HK2012472-085	HK2012472-085
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.8	6.1	5.7	5.2	6.8	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.106	0.111	0.102	0.102	0.103	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.022	0.036	0.026	0.024	0.024	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.422	0.406	0.422	0.426	0.420	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.551	0.554	0.550	0.552	0.547	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	2	1	NOT DETECTED	NOT DETECTED	1	



Sub-Matrix: WATER				Client sample ID	G/S/F/Dup	G/M/F	G/M/F/Dup	G/B/F	G/B/F/Dup
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-086	HK2012472-087	HK2012472-088	HK2012472-089	HK2012472-090	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	5.9	6.4	6.7	6.7	6.2	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.105	0.105	0.108	0.105	0.103	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.023	0.011	0.021	0.027	0.015	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.421	0.434	0.421	0.408	0.424	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.549	0.551	0.550	0.540	0.541	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	3	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	



Sub-Matrix: WATER				Client sample ID	H/S/F	H/S/F/Dup	H/M/F	H/M/F/Dup	H/B/F
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012472-091	HK2012472-092	HK2012472-093	HK2012472-094	HK2012472-095	HK2012472-095
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	8.0	9.0	8.0	8.3	7.1	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.104	0.104	0.104	0.104	0.104	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.019	0.021	0.025	0.014	0.018	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.417	0.402	0.398	0.414	0.417	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.540	0.526	0.527	0.532	0.538	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	5	7	13	17	8	



Sub-Matrix: WATER				Client sample ID	H/B/F/Dup	---	---	---	---
				Client sampling date / time	06-Apr-2020	---	---	---	---
Compound	CAS Number	LOR	Unit	HK2012472-096	---	---	---	---	---
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	---	0.5	mg/L	6.4	---	---	---	---	---
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.104	---	---	---	---	---
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.019	---	---	---	---	---
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.413	---	---	---	---	---
EK063A: Inorganic Nitrogen as N	---	0.010	mg/L	0.535	---	---	---	---	---
EK067P: Total Phosphorus as P	---	0.01	mg/L	0.02	---	---	---	---	---
EK067P: Total Phosphorus - Filtered	---	0.01	mg/L	0.02	---	---	---	---	---
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	---	1.0	mg/L	<1.0	---	---	---	---	---
<b>EM: Microbiological Testing</b>									
EM002: E. coli	---	1	CFU/100mL	12	---	---	---	---	---





**Laboratory Duplicate (DUP) Report**

Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958537)</b>								
HK2012472-001	A/S/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	5.1	5.1	0.00
HK2012472-011	B/B/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	5.9	6.6	11.2
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958538)</b>								
HK2012472-021	D/M/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	5.2	6.0	14.7
HK2012472-031	F/S/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	5.8	5.1	12.4
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958539)</b>								
HK2012472-041	G/B/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	7.2	7.0	2.80
HK2012472-051	A/M/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	5.7	6.6	13.9
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958540)</b>								
HK2012472-061	C/S/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	6.8	6.4	5.30
HK2012472-071	D/B/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	4.7	5.4	14.4
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958541)</b>								
HK2012472-081	F/M/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	5.8	6.4	9.05
HK2012472-091	H/S/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	8.0	8.8	10.4
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957994)</b>								
HK2012472-020	D/S/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957995)</b>								
HK2012472-020	D/S/E/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957996)</b>								
HK2012472-040	G/M/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957997)</b>								
HK2012472-040	G/M/E/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957998)</b>								
HK2012472-060	B/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957999)</b>								
HK2012472-060	B/B/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958000)</b>								
HK2012472-080	F/S/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958001)</b>								
HK2012472-080	F/S/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.00



Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958002)</b>								
HK2012472-096	H/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958003)</b>								
HK2012472-096	H/B/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.02	0.02	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959125)</b>								
HK2012472-020	D/S/E/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.091	0.098	7.54
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959126)</b>								
HK2012472-040	G/M/E/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.103	0.110	6.49
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959127)</b>								
HK2012472-060	B/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.112	0.107	4.57
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959128)</b>								
HK2012472-080	F/S/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.109	0.109	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959129)</b>								
HK2012472-096	H/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.104	0.112	7.85
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959553)</b>								
HK2012472-020	D/S/E/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.012	0.013	9.13
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959555)</b>								
HK2012472-040	G/M/E/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.012	0.011	12.1
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959557)</b>								
HK2012472-060	B/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.017	0.016	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959559)</b>								
HK2012472-080	F/S/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.018	0.019	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959561)</b>								
HK2012472-096	H/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.019	0.019	0.00

**Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report**

Matrix: WATER				Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report					
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)		
						LCS	DCS	Low	High	Value	Control Limit	
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958537)</b>												
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	104	----	85.9	117	----	----	
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958538)</b>												



Matrix: WATER		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
		LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
Method: Compound	CAS Number					LCS	DCS	Low	High	Value	Control Limit
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958538) - Continued</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	100	----	85.9	117	----	----
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958539)</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	106	----	85.9	117	----	----
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958540)</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	93.0	----	85.9	117	----	----
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2958541)</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	93.5	----	85.9	117	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957994)</b>											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	96.4	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957995)</b>											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	97.6	----	93.6	102	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957996)</b>											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.4	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957997)</b>											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	99.0	----	93.6	102	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957998)</b>											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	96.9	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957999)</b>											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	98.5	----	93.6	102	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958000)</b>											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.8	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958001)</b>											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	97.9	----	93.6	102	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958002)</b>											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.8	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958003)</b>											
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	97.8	----	93.6	102	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959125)</b>											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	96.6	----	85.0	115	----	----



Matrix: WATER		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
		LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
Method: Compound	CAS Number					LCS	DCS	Low	High	Value	Control Limit
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959126)</b>											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	103	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959127)</b>											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	106	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959128)</b>											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	106	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959129)</b>											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	108	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959553)</b>											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	104	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959555)</b>											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	103	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959557)</b>											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	104	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959559)</b>											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	98.0	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959561)</b>											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	106	----	85.0	115	----	----
<b>EP: Aggregate Organics (QC Lot: 2960884)</b>											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	97.0	----	81.0	115	----	----
<b>EP: Aggregate Organics (QC Lot: 2960885)</b>											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	93.5	----	81.0	115	----	----
<b>EP: Aggregate Organics (QC Lot: 2960886)</b>											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	93.0	----	81.0	115	----	----
<b>EP: Aggregate Organics (QC Lot: 2960887)</b>											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	94.5	----	81.0	115	----	----
<b>EP: Aggregate Organics (QC Lot: 2960888)</b>											
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	96.5	----	81.0	115	----	----



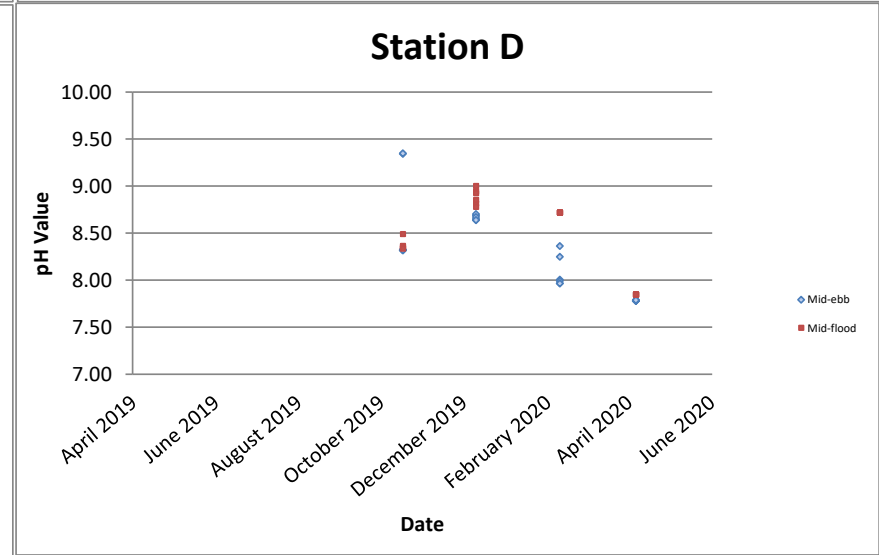
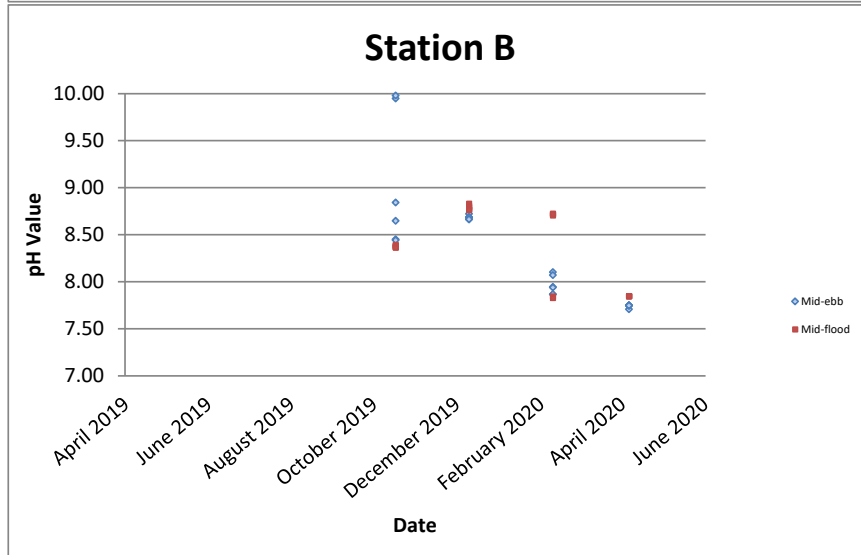
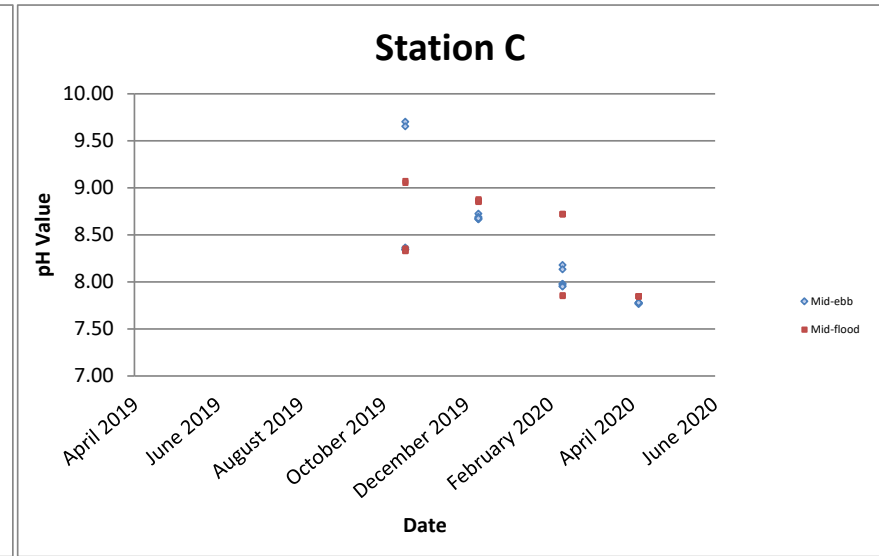
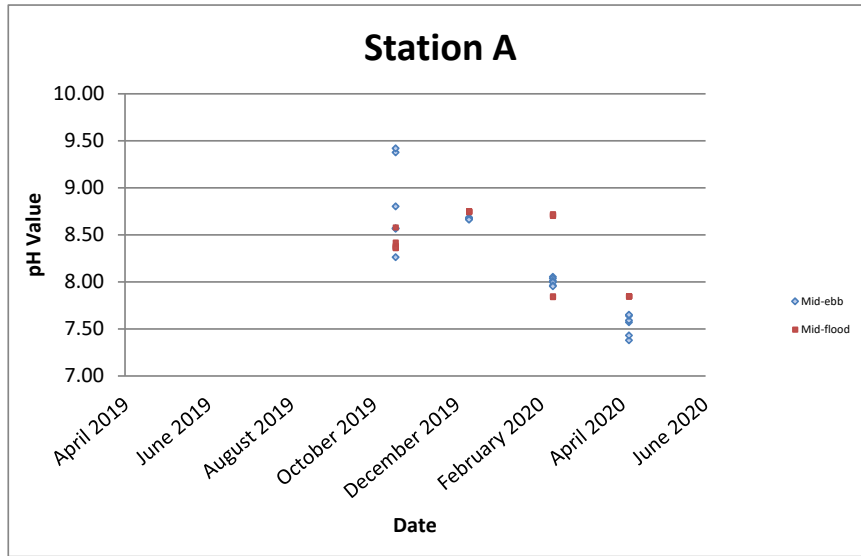
**Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report**

Matrix: WATER					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
					MS	MSD	Low	High	Value	Control Limit	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957994)											
HK2012472-020	D/S/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	95.0	----	75.0	125	----	25	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957995)											
HK2012472-020	D/S/E/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	97.1	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957997)											
HK2012472-040	G/M/E/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	99.2	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957998)											
HK2012472-060	B/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	96.4	----	75.0	125	----	25	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2957999)											
HK2012472-060	B/B/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	92.1	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958000)											
HK2012472-080	F/S/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	95.4	----	75.0	125	----	25	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958001)											
HK2012472-080	F/S/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	90.8	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958002)											
HK2012472-096	H/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	96.8	----	75.0	125	----	25	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2958003)											
HK2012472-096	H/B/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	86.4	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959125)											
HK2012472-020	D/S/E/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	107	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959126)											
HK2012472-040	G/M/E/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	102	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959127)											
HK2012472-060	B/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	98.8	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959128)											
HK2012472-080	F/S/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	96.1	----	75.0	125	----	----	
ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959129)											

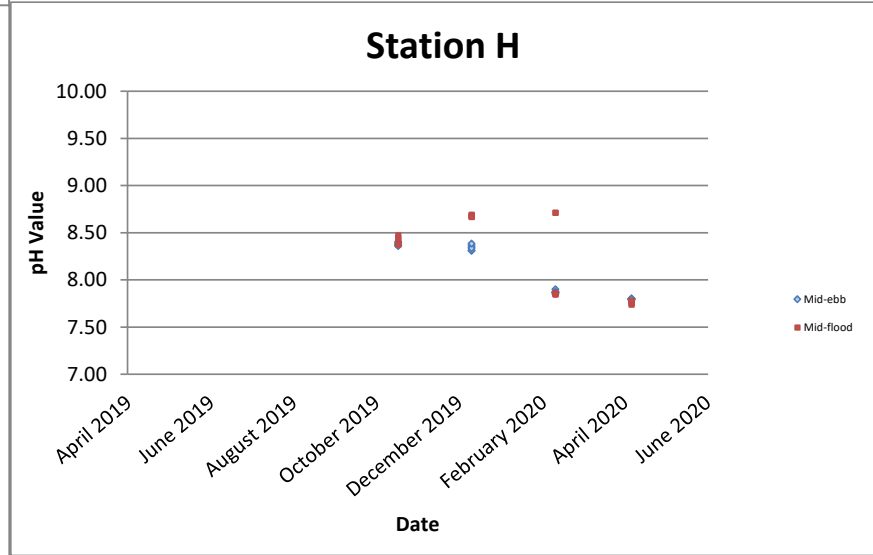
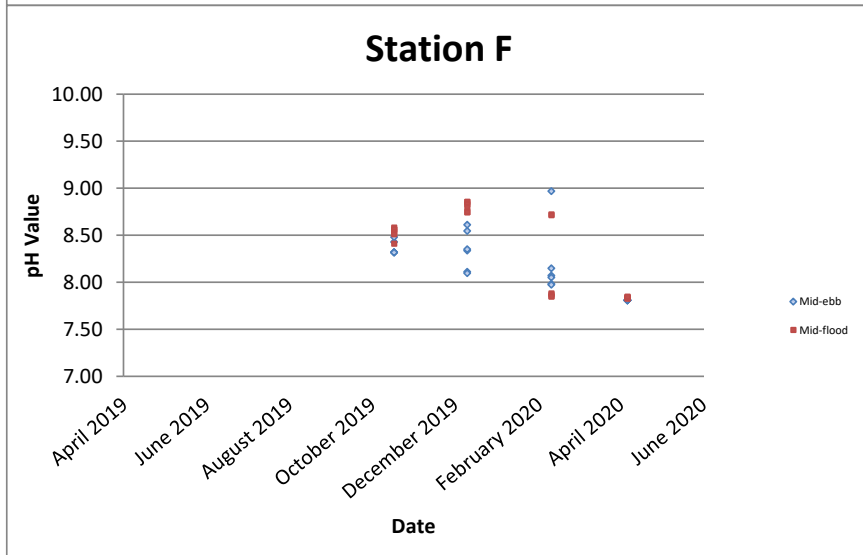
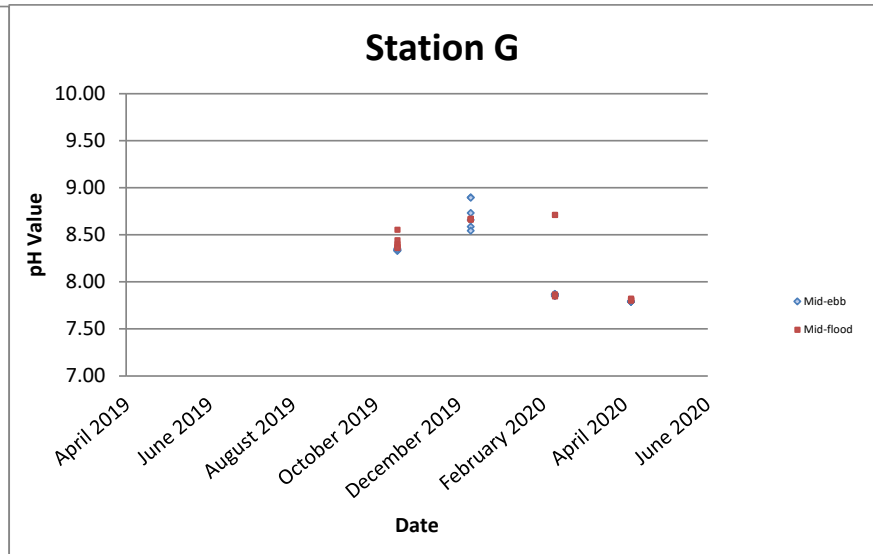
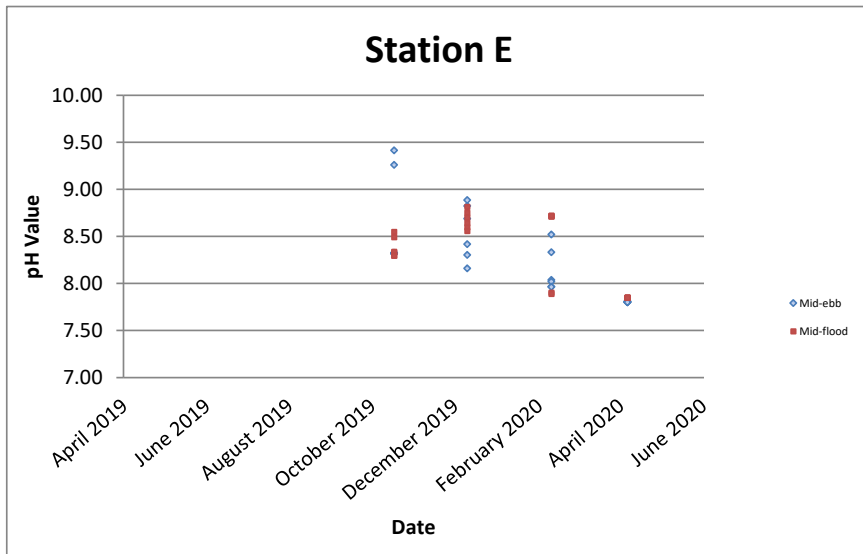


Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959129) - Continued</b>										
HK2012472-096	H/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	98.4	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959553)</b>										
HK2012472-020	D/S/E/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	106	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959555)</b>										
HK2012472-040	G/M/E/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	104	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959557)</b>										
HK2012472-060	B/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	105	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959559)</b>										
HK2012472-080	F/S/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	103	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2959561)</b>										
HK2012472-096	H/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	105	----	75.0	125	----	----

pH value

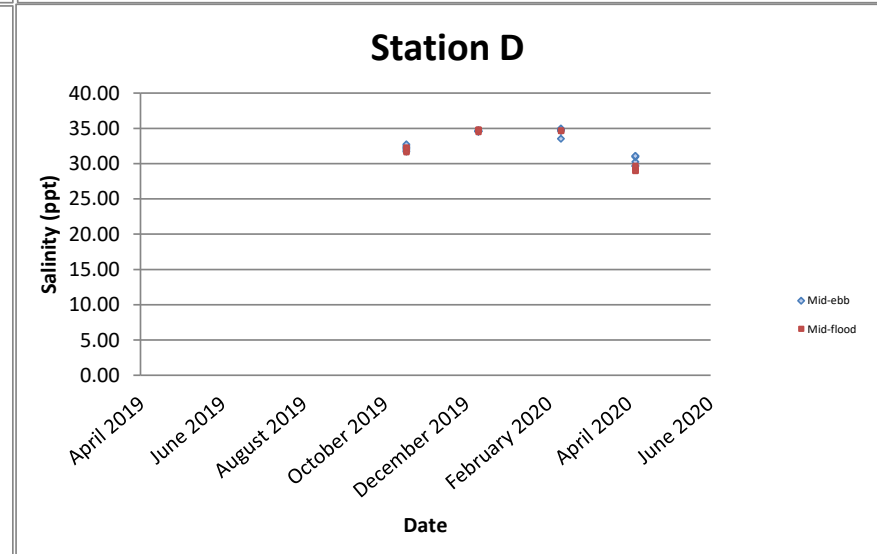
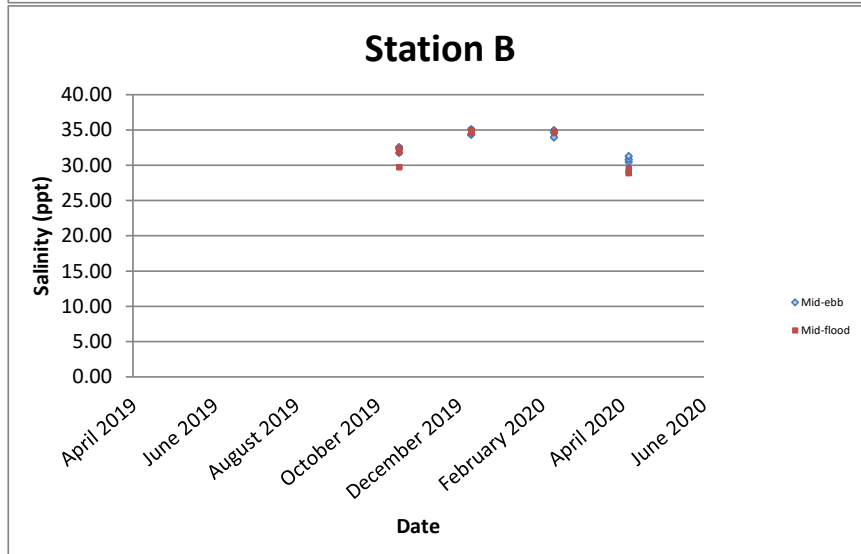
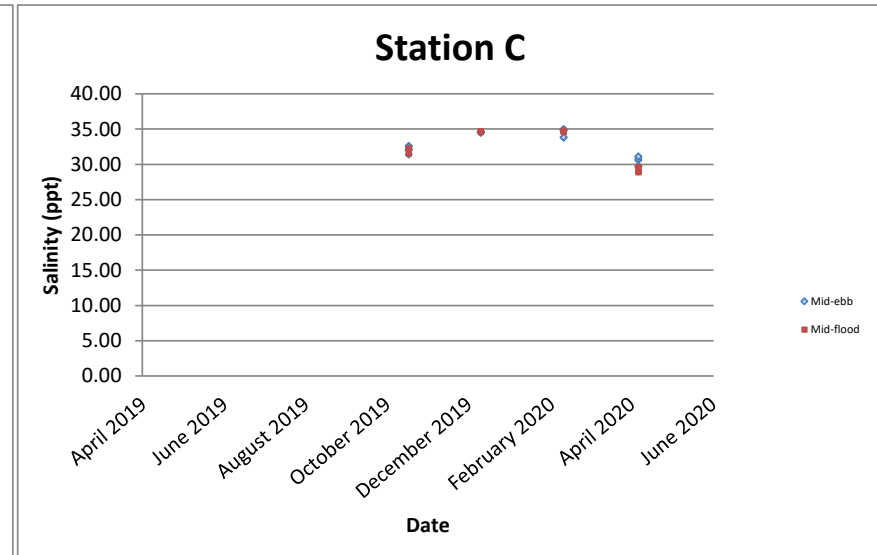
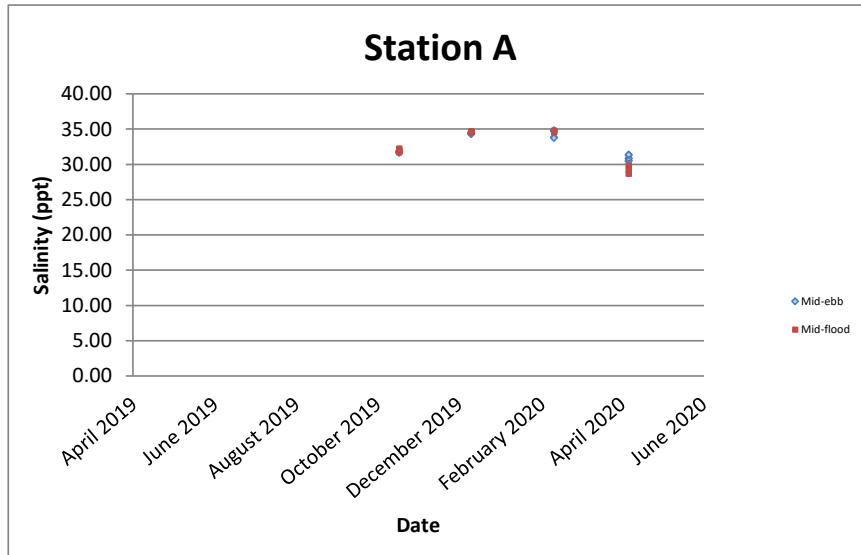


pH value

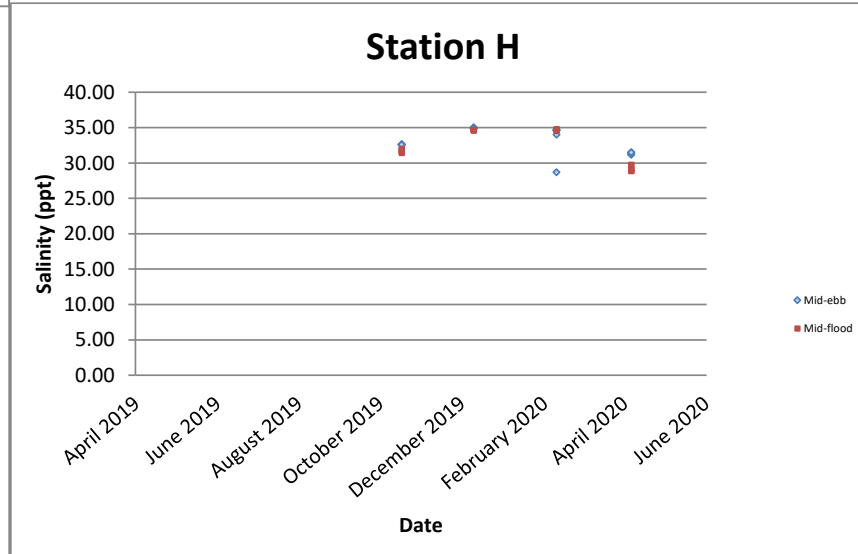
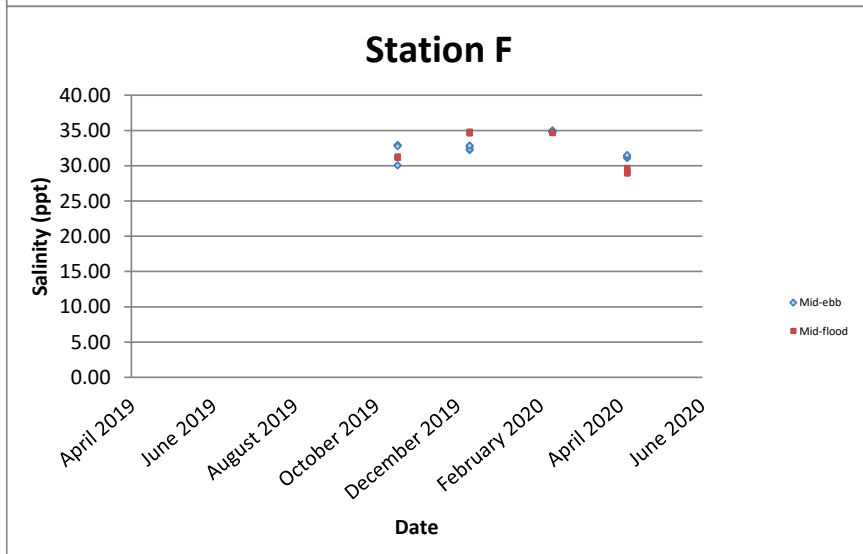
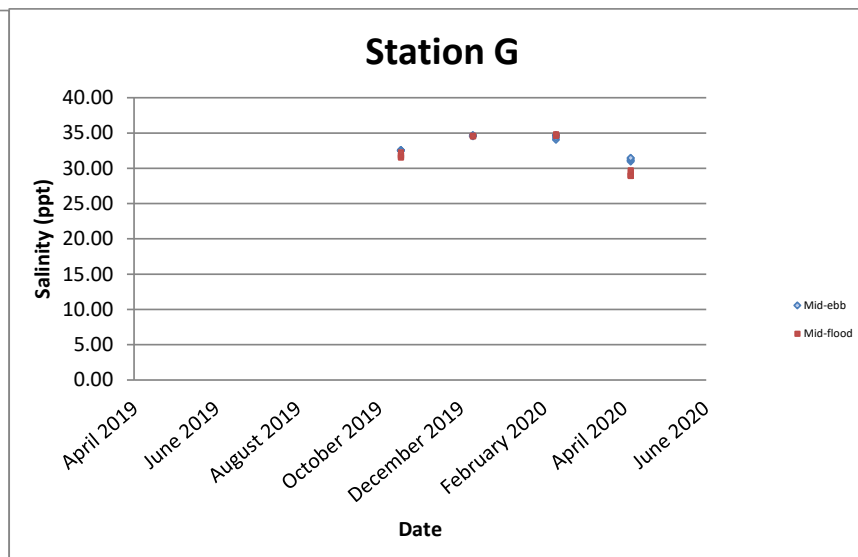
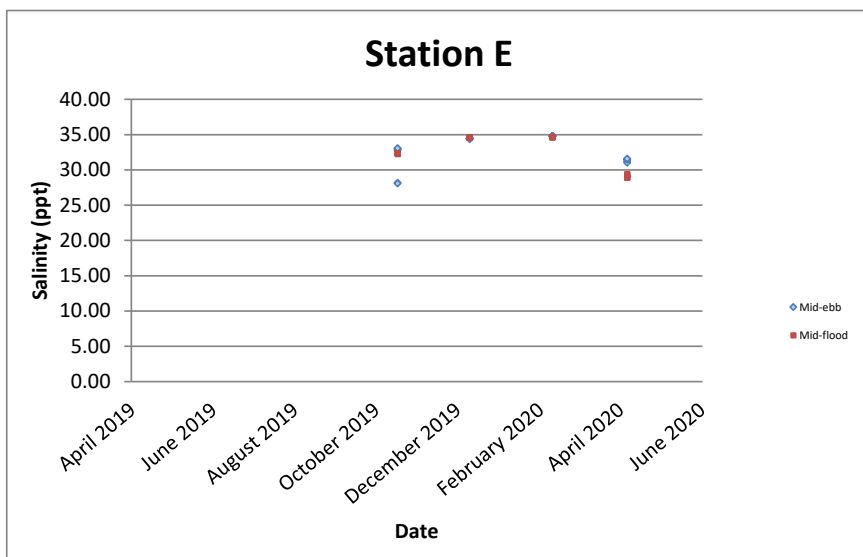




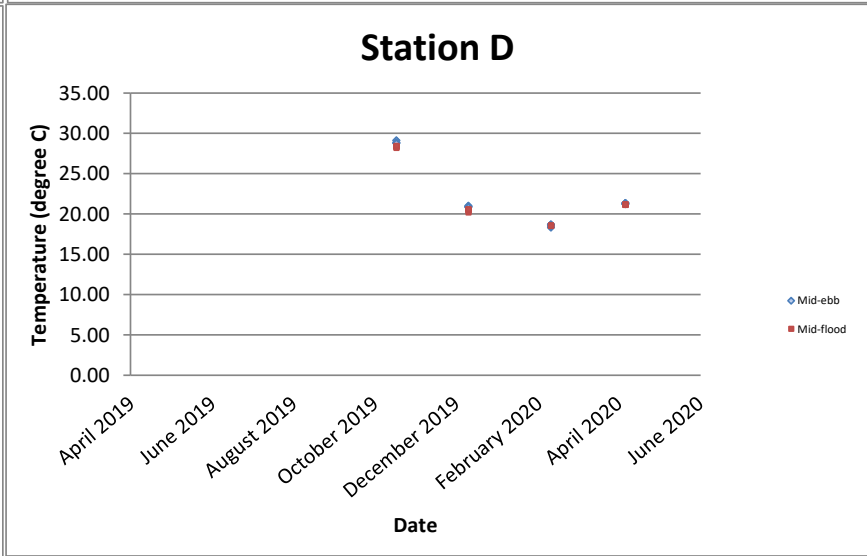
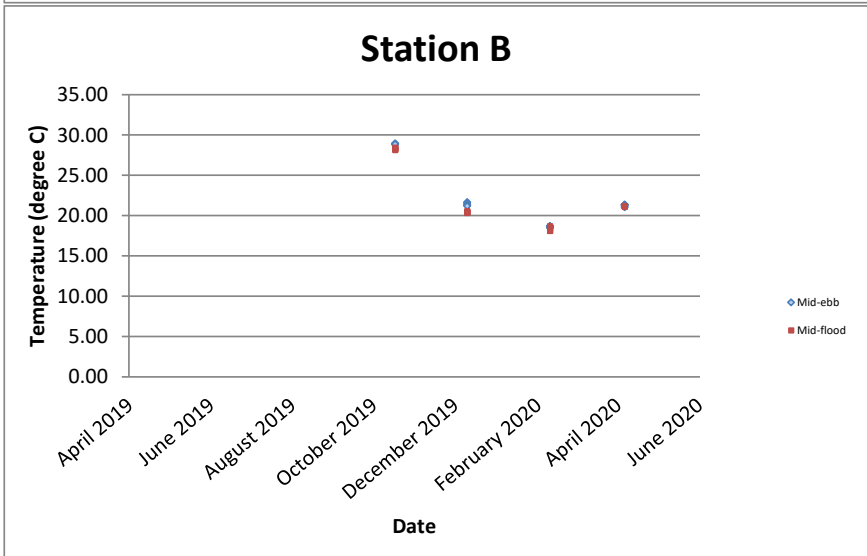
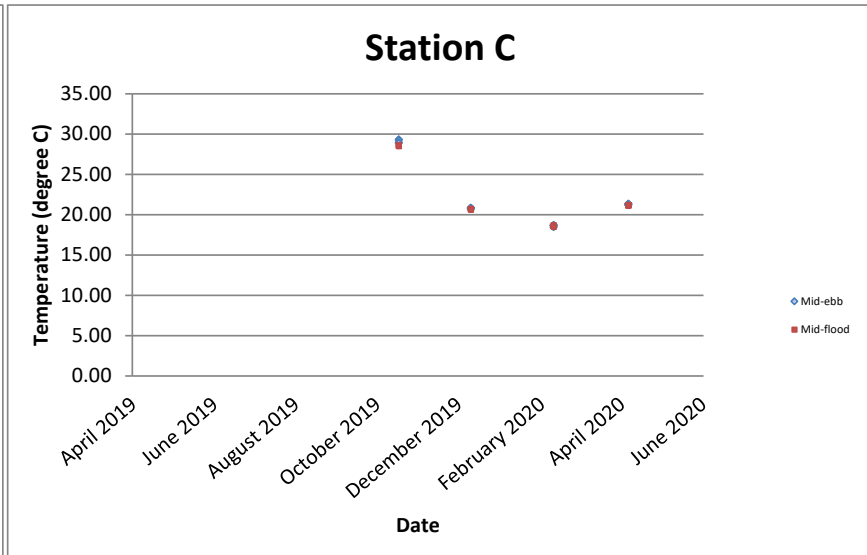
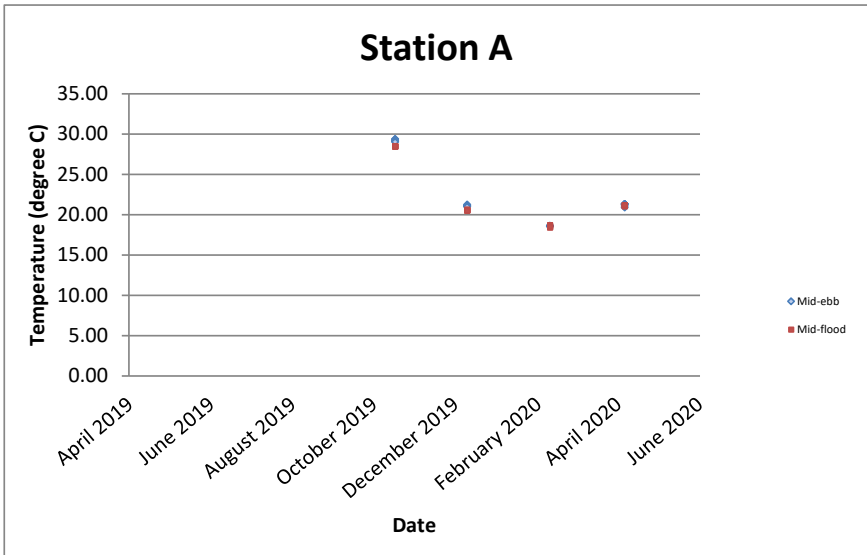
# Salinity (ppt)



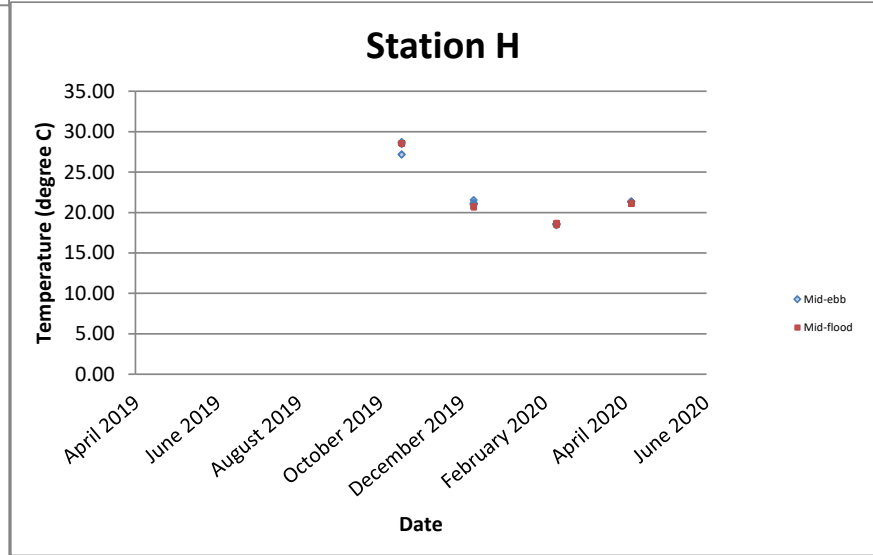
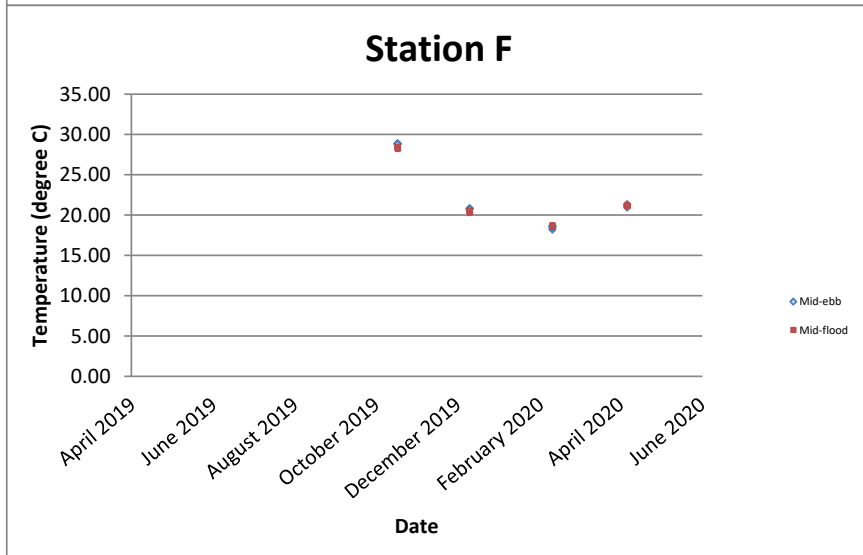
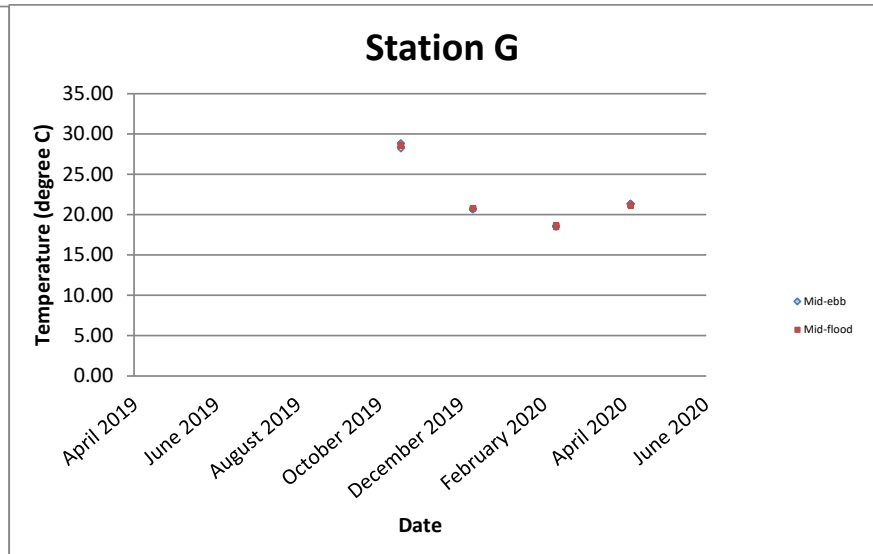
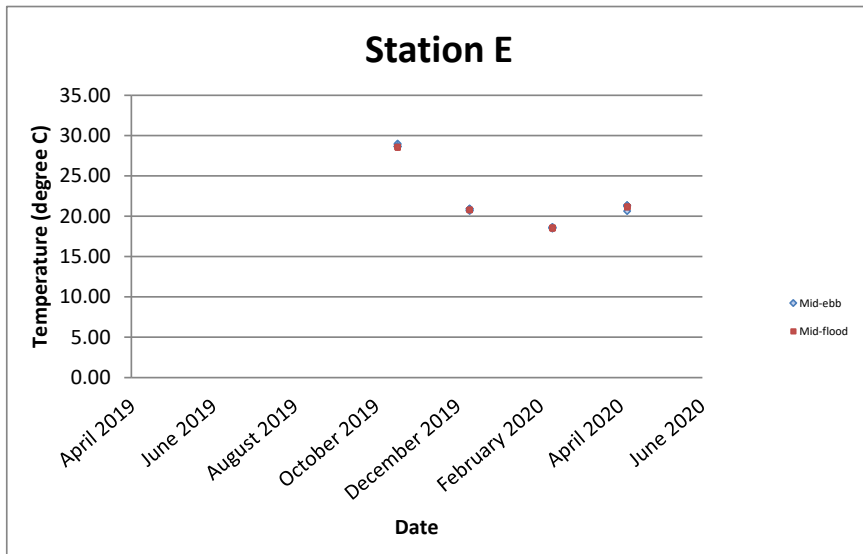
# Salinity (ppt)



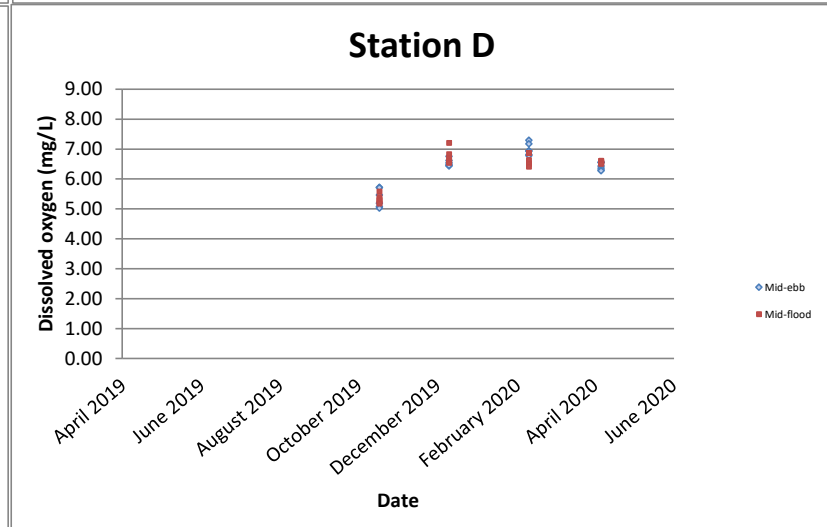
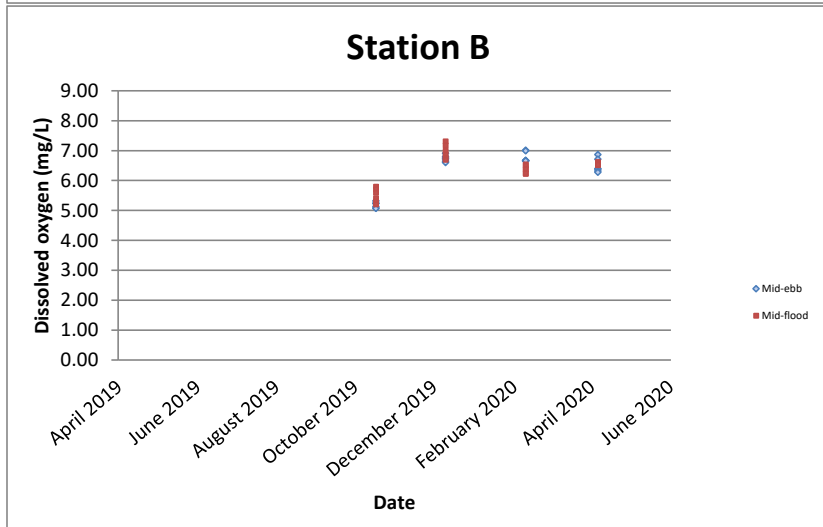
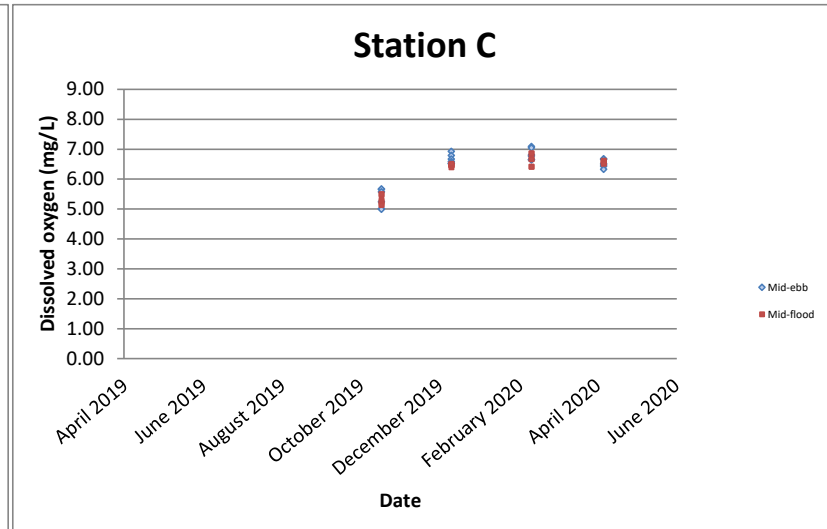
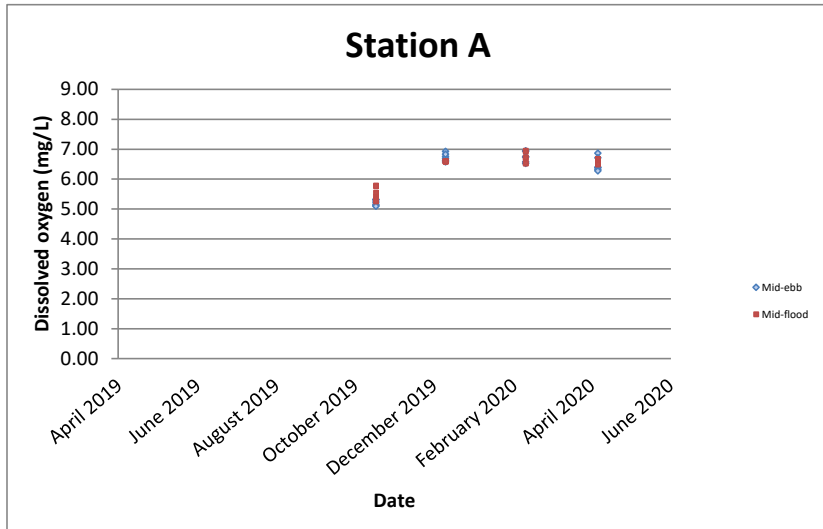
Temperature (degree C)



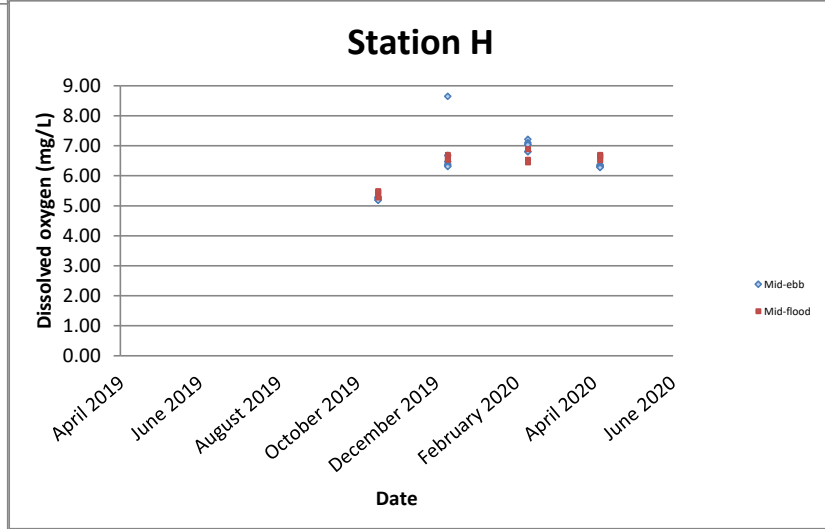
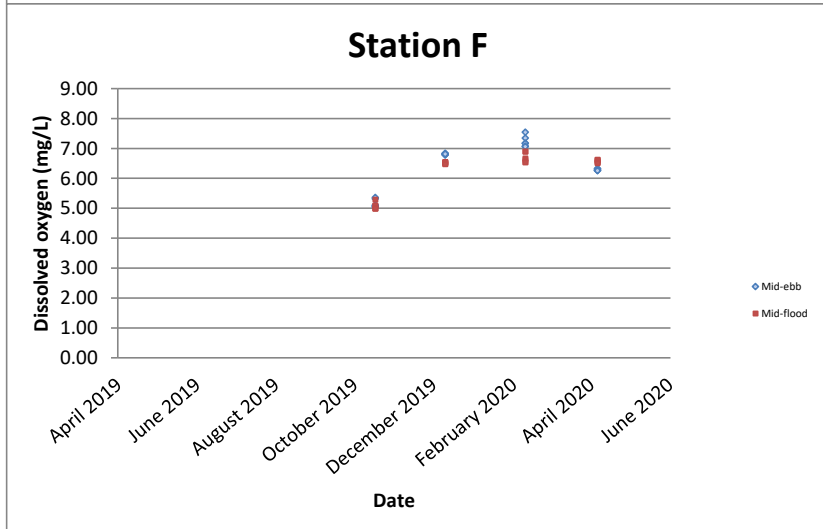
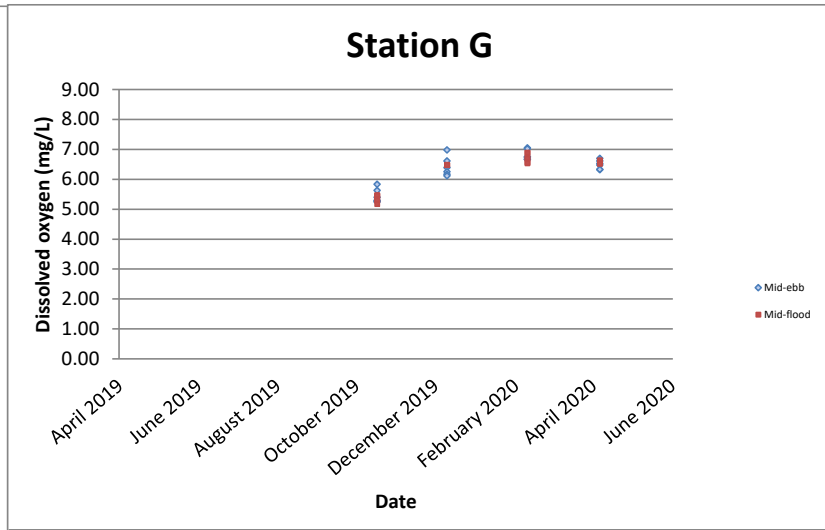
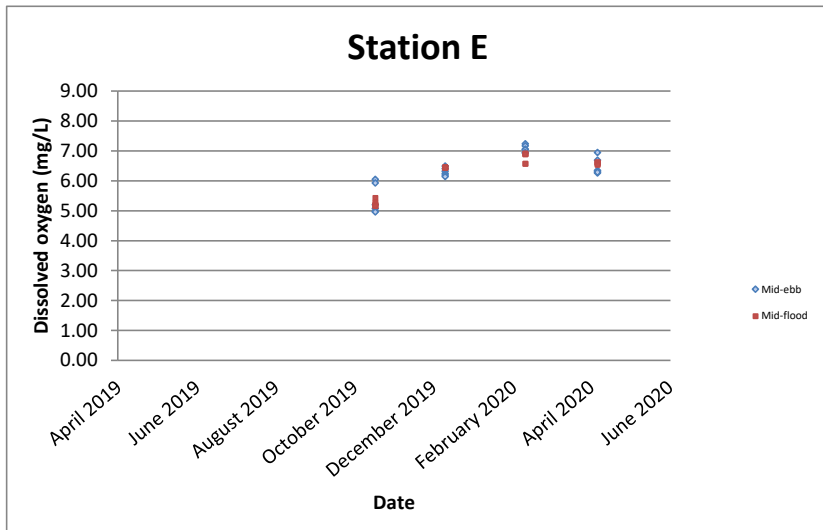
Temperature (degree C)



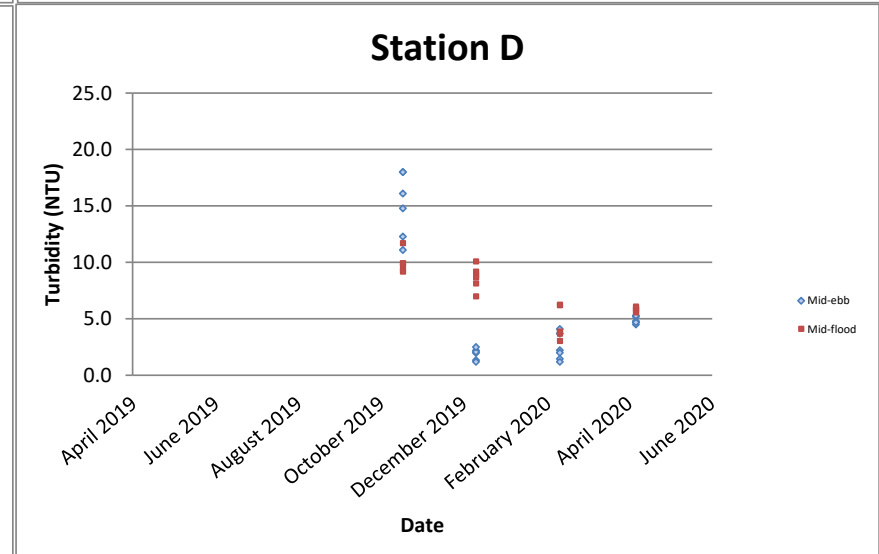
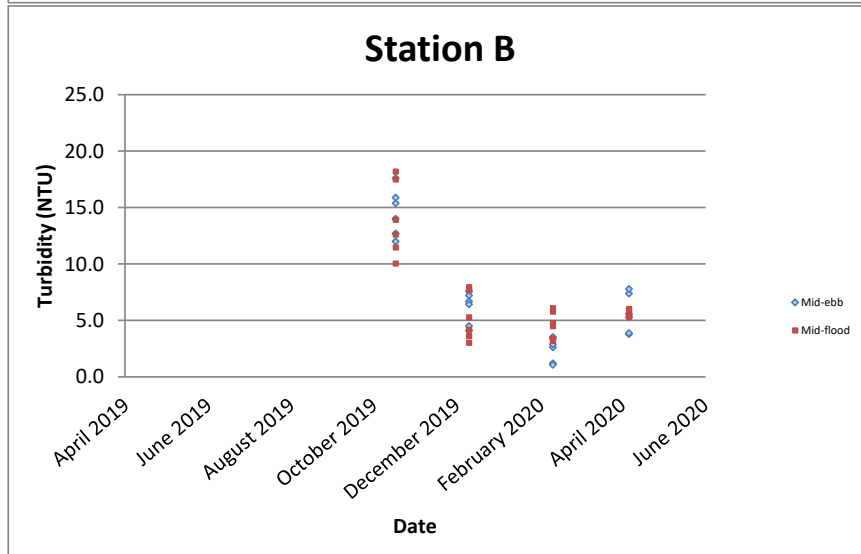
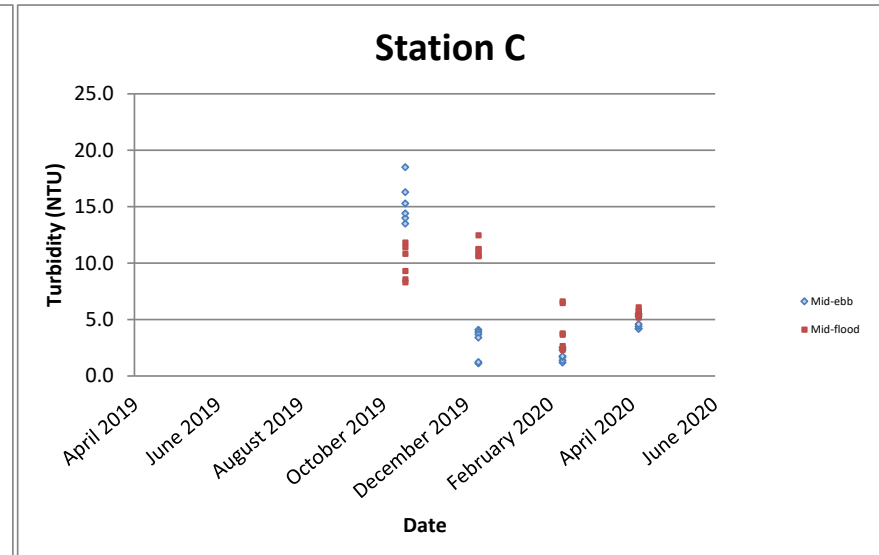
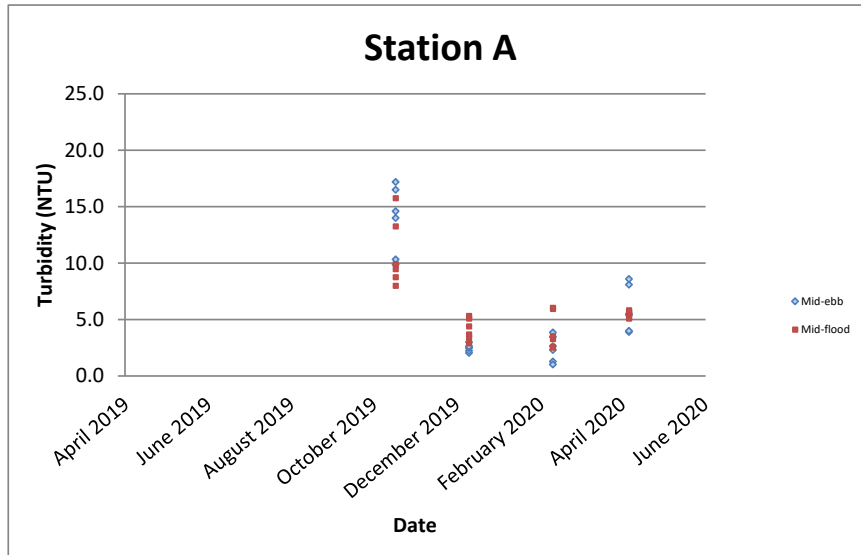
Dissolved oxygen (mg/L)



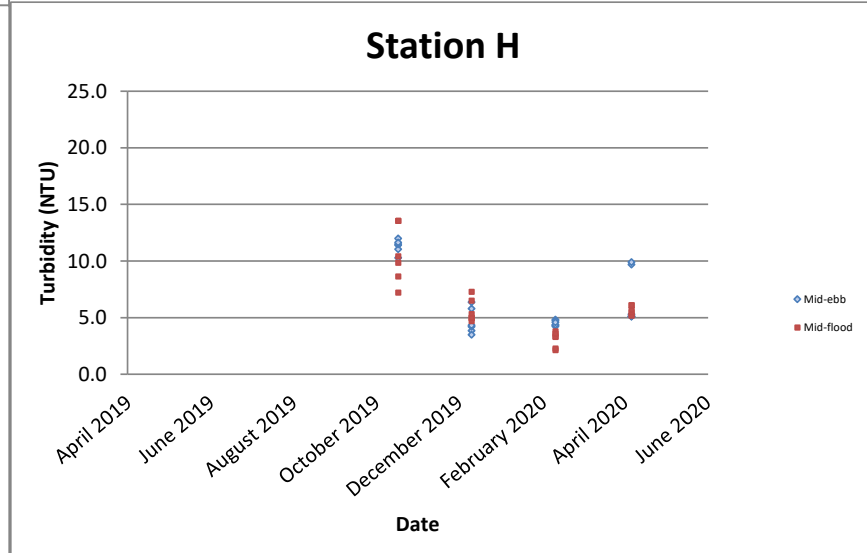
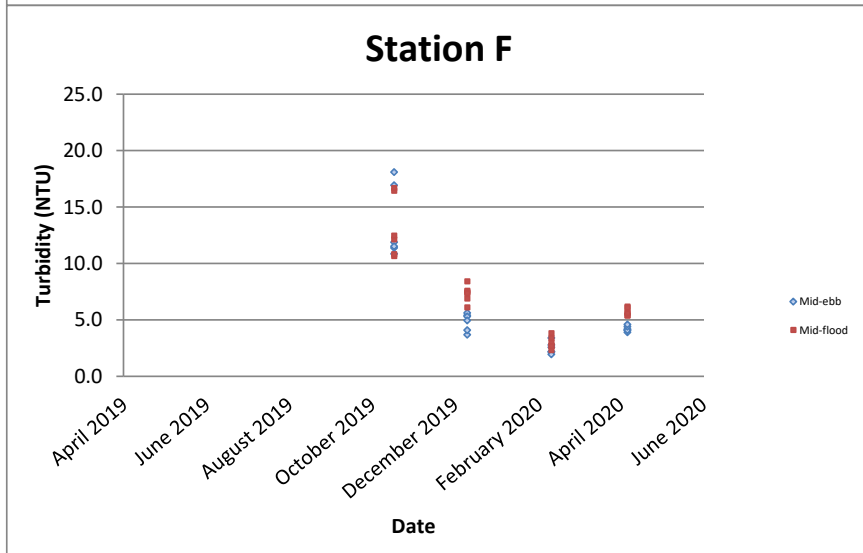
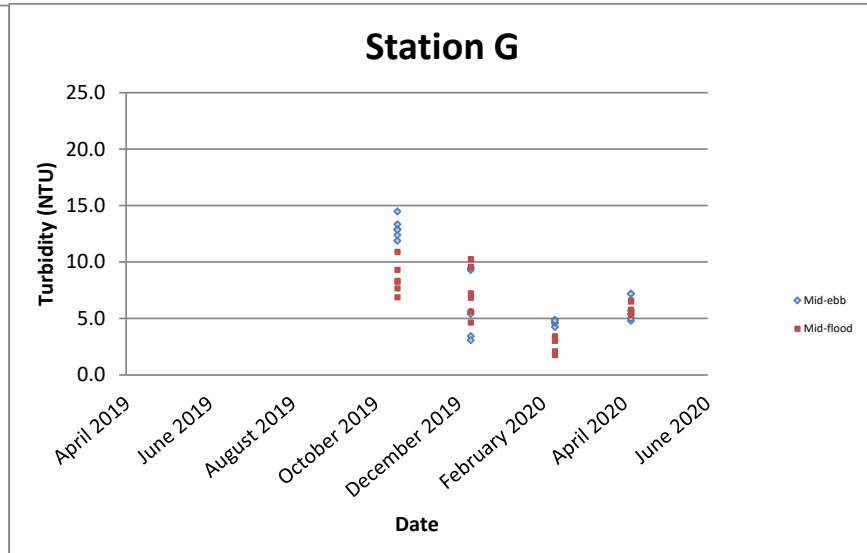
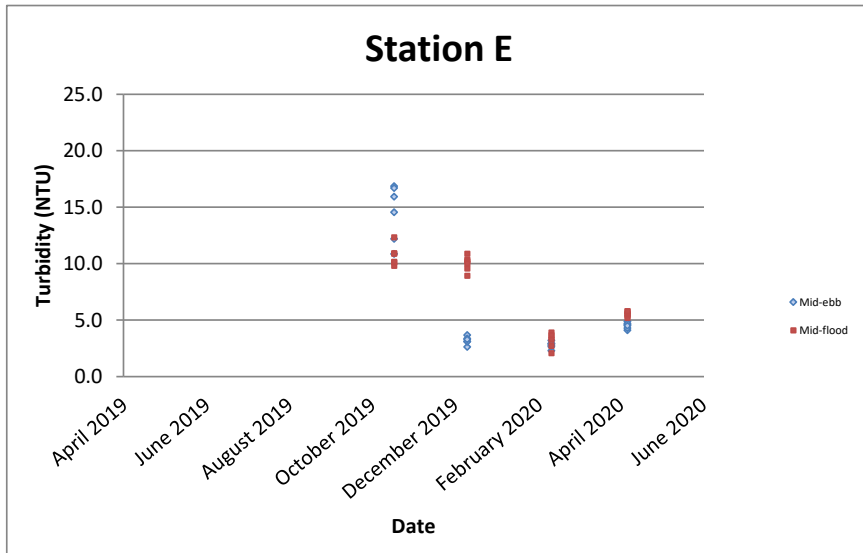
# Dissolved oxygen (mg/L)



# Turbidity (NTU)

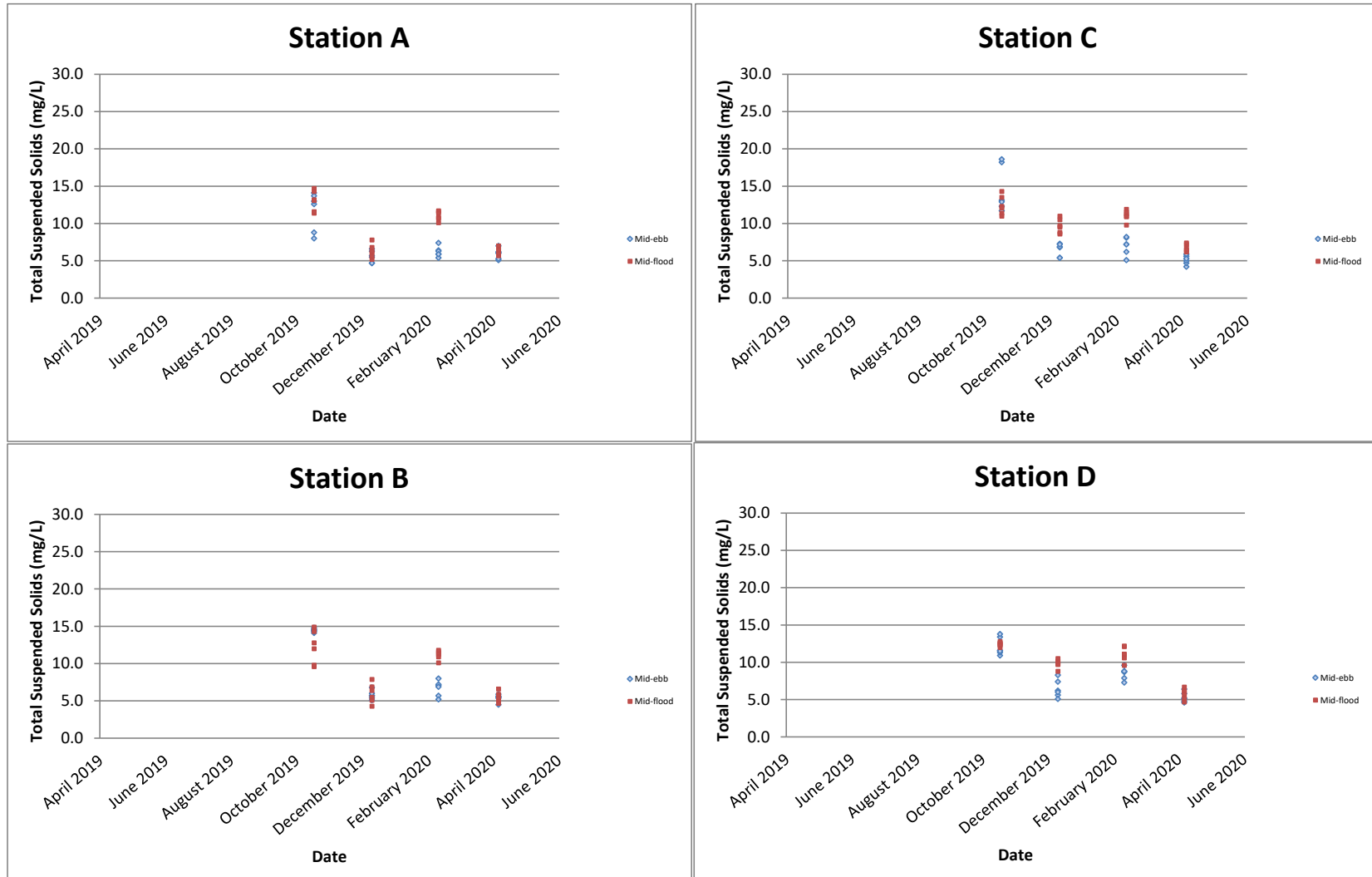


# Turbidity (NTU)



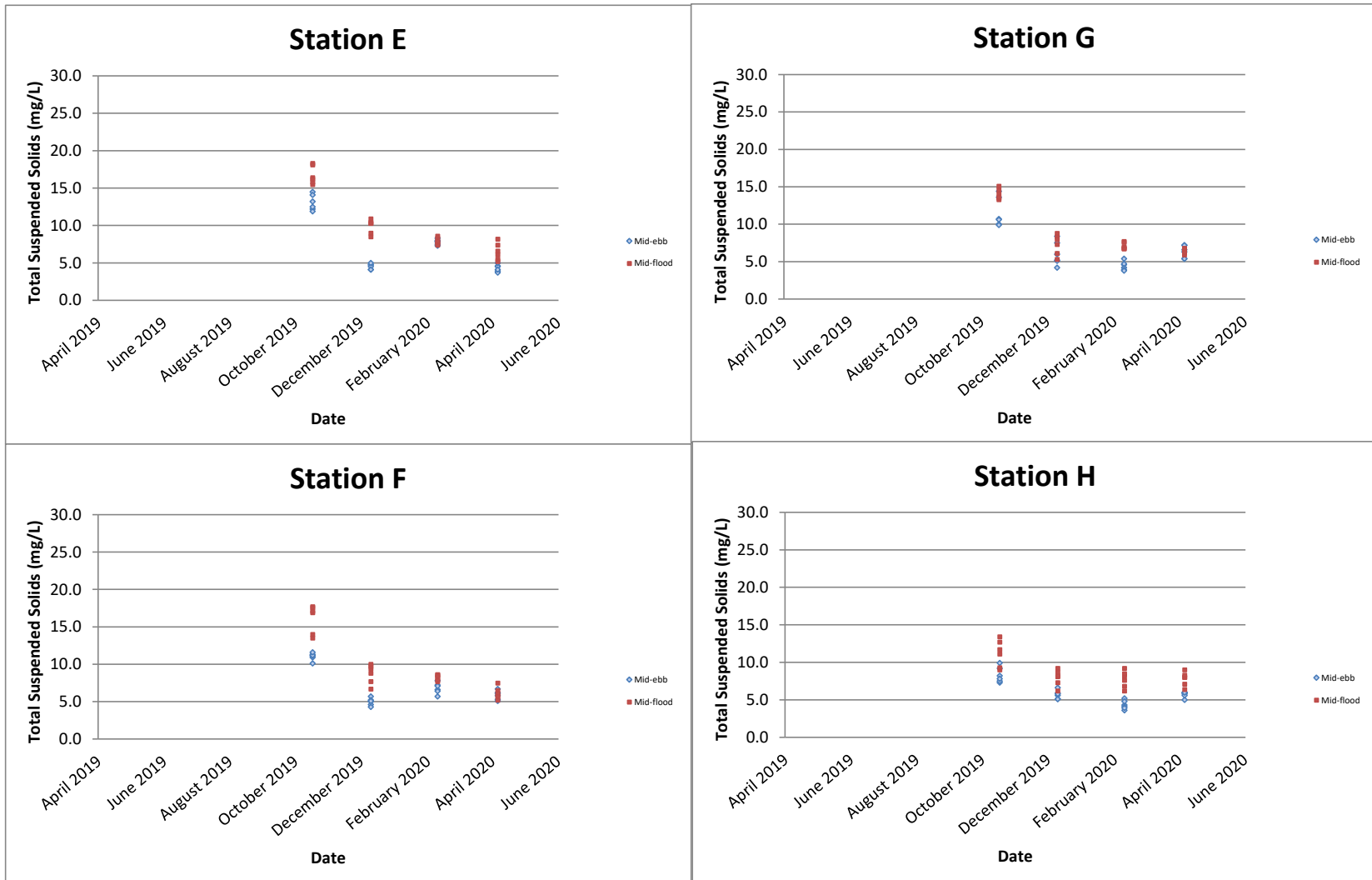


Total Suspended Solids (mg/L)



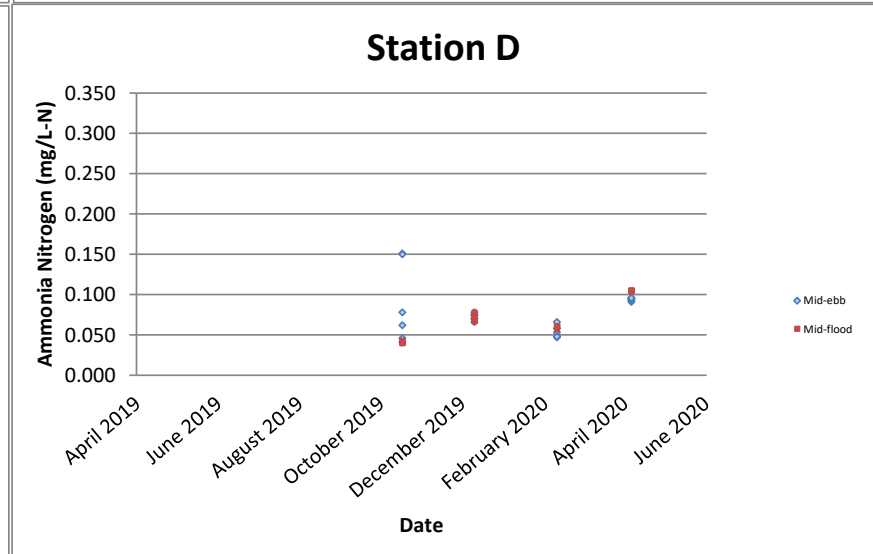
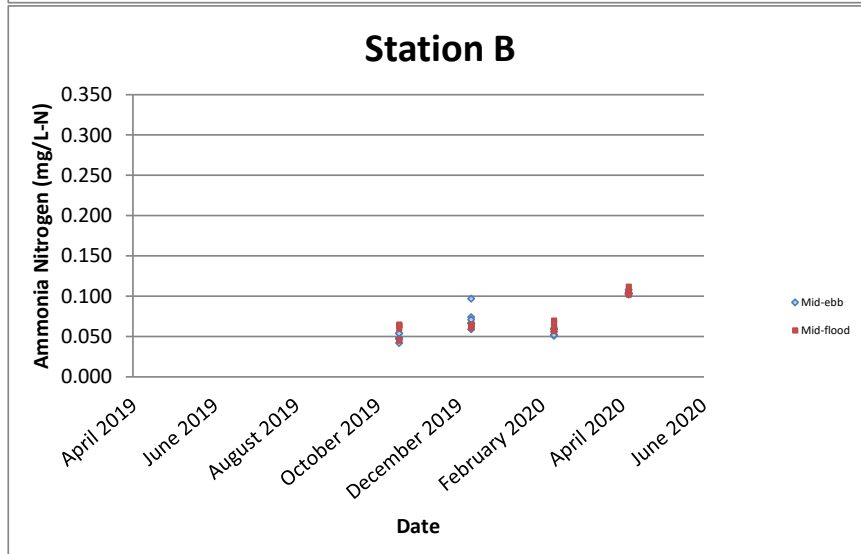
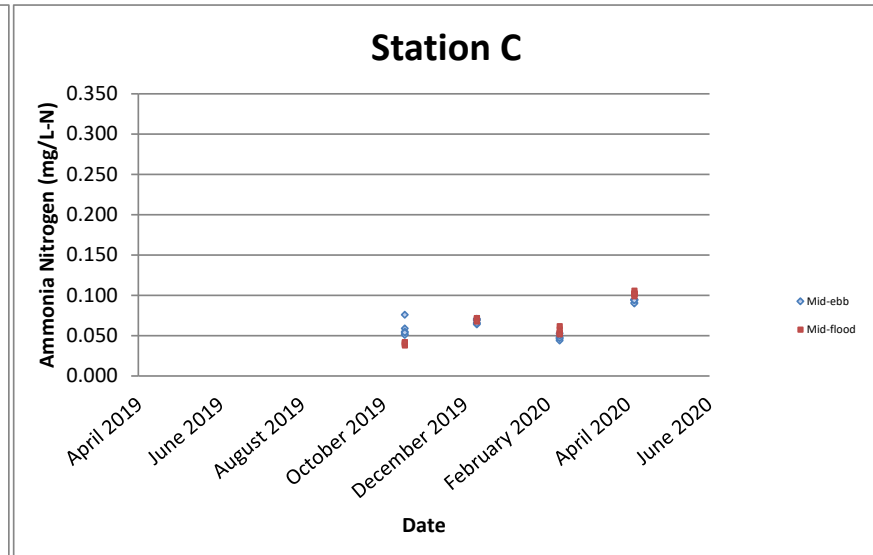
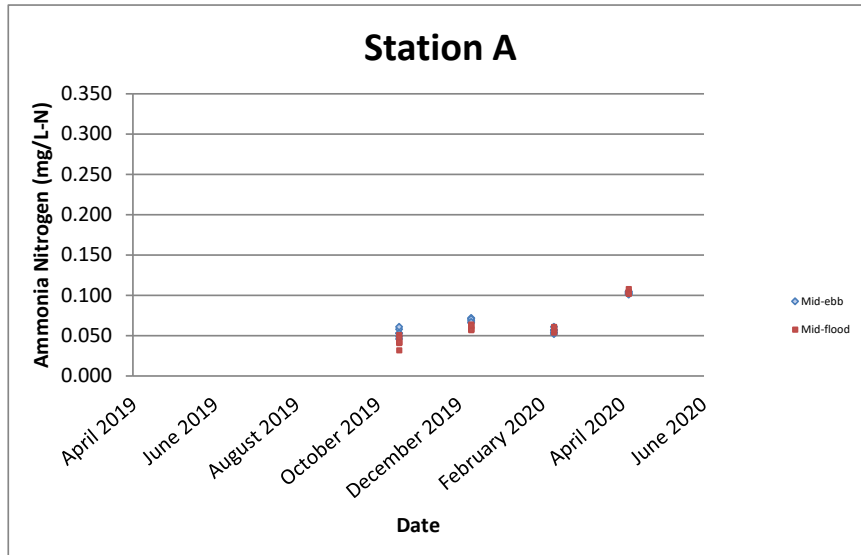
Remark: All below the Limit of Report sample results (<0.5 mg/L) for Total Suspended Solids is regarded as 0.5 mg/L in graphical presentation.

Total Suspended Solids (mg/L)



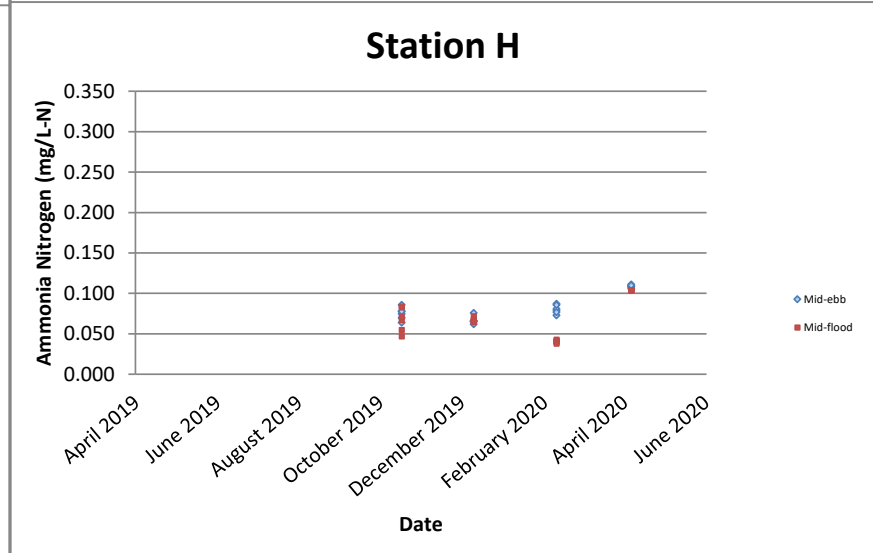
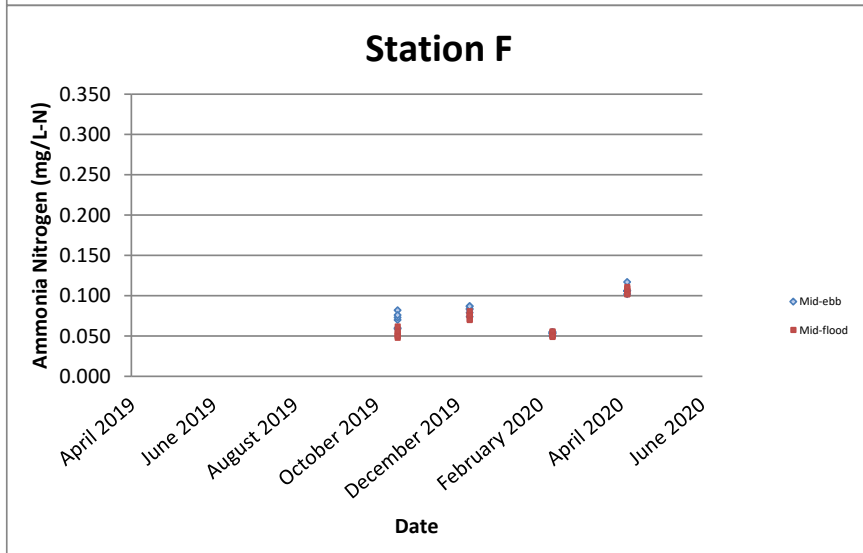
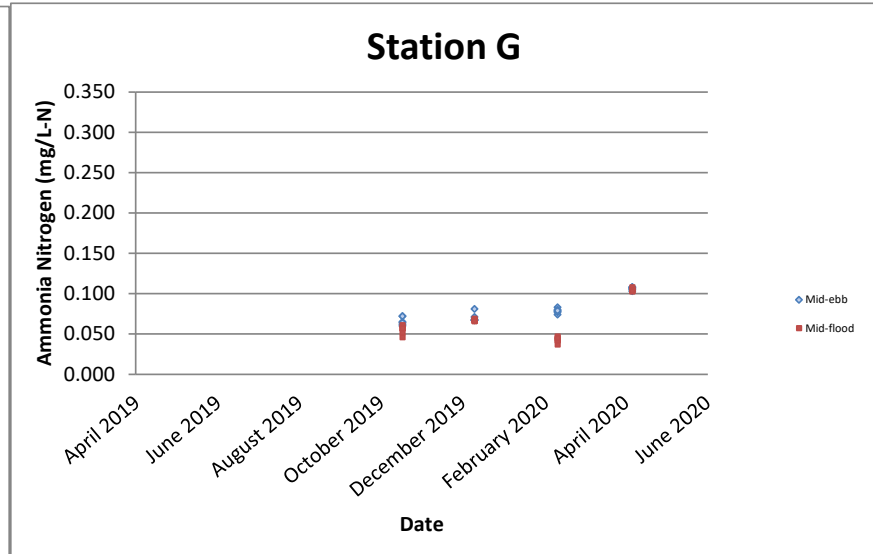
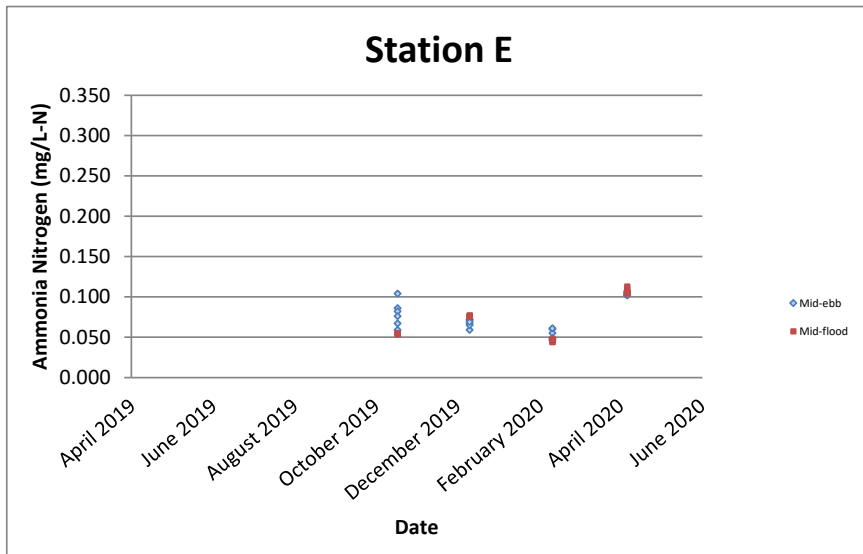
Remark: All below the Limit of Report sample results (<0.5 mg/L) for Total Suspended Solids is regarded as 0.5 mg/L in graphical presentation.

## Ammonia Nitrogen (mg/L-N)



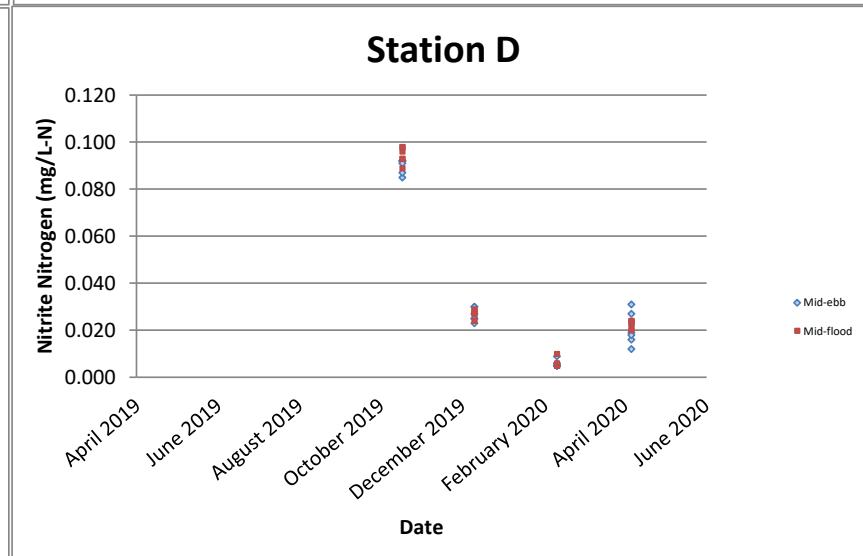
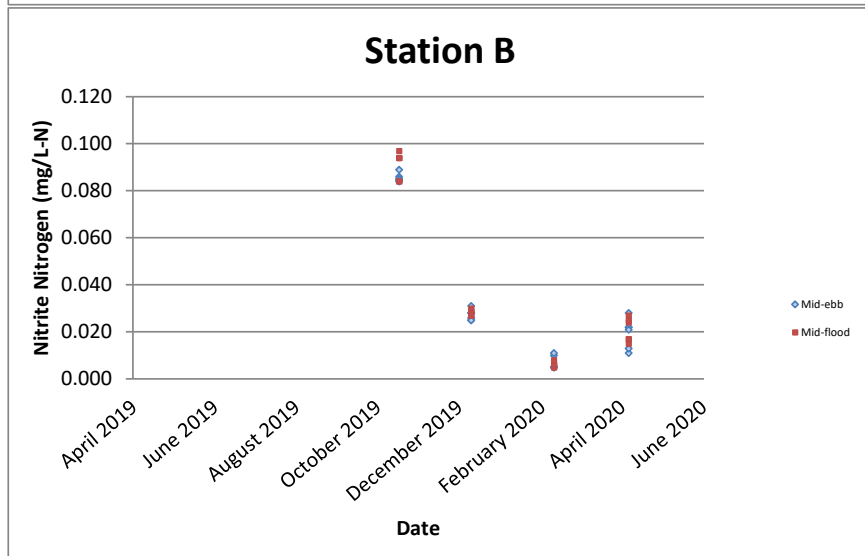
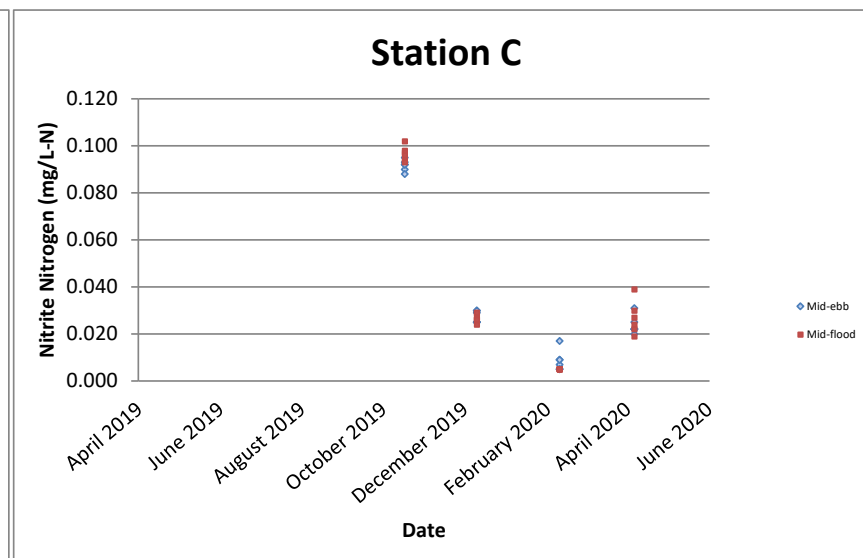
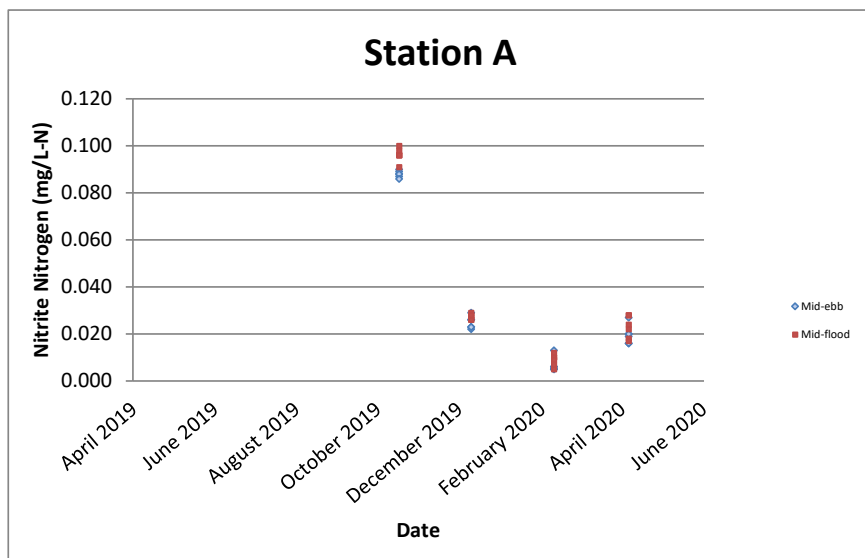
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Ammonia Nitrogen is regarded as 0.005 mg/L in graphical presentation.

## Ammonia Nitrogen (mg/L-N)



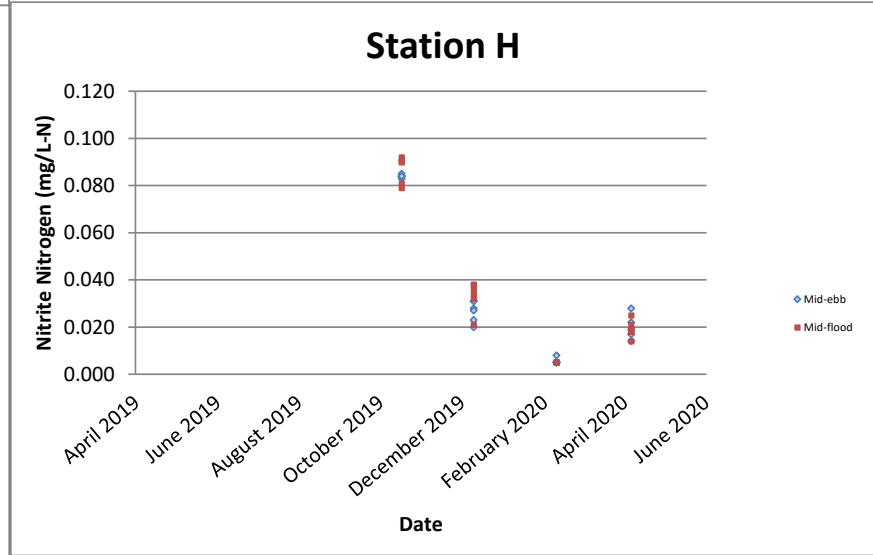
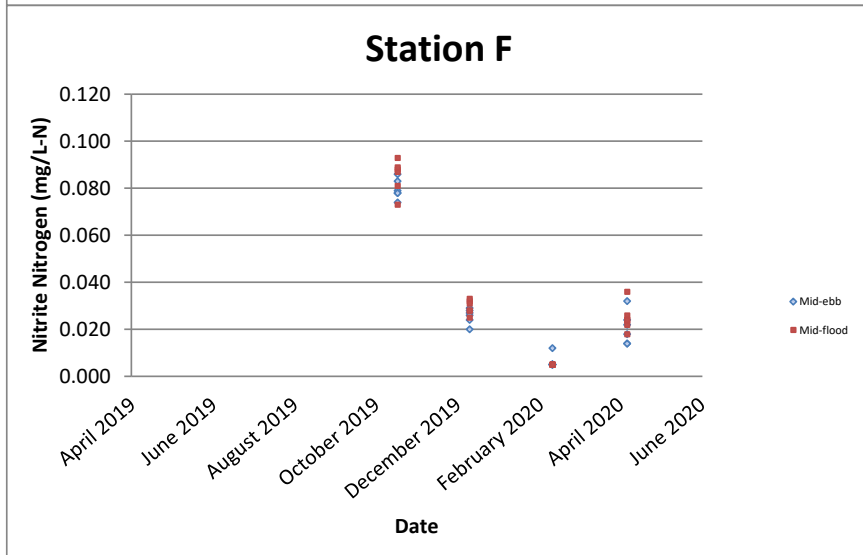
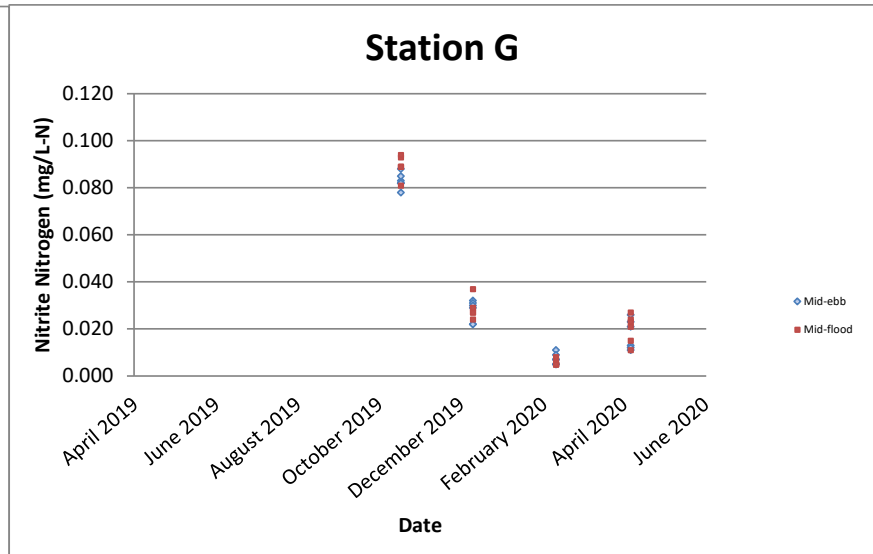
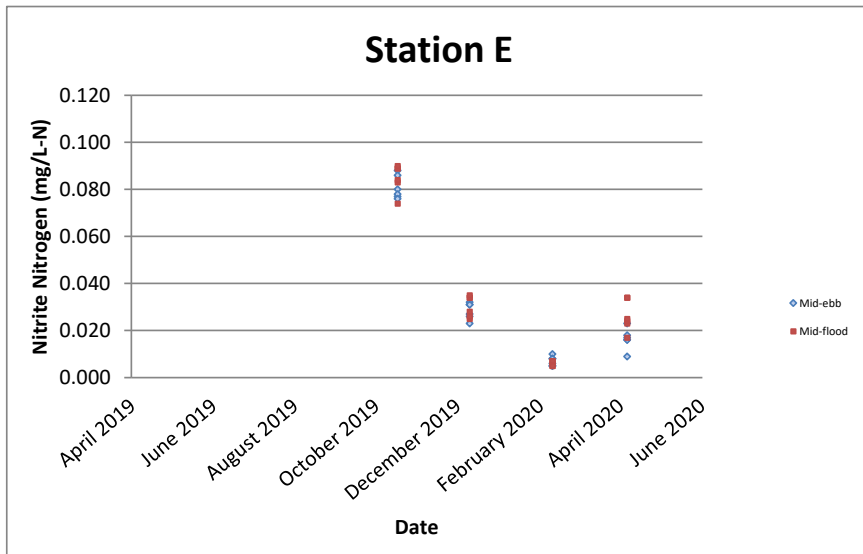
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Ammonia Nitrogen is regarded as 0.005 mg/L in graphical presentation.

## Nitrite Nitrogen (mg/L-N)



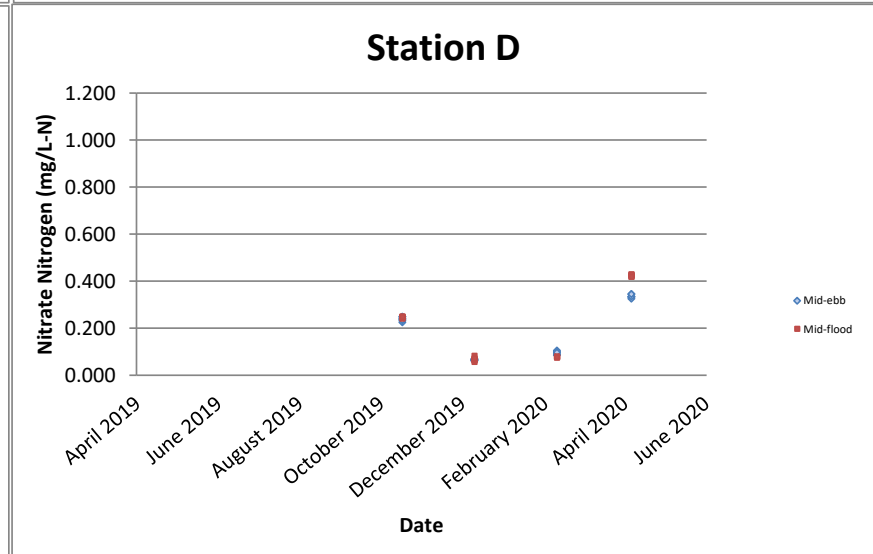
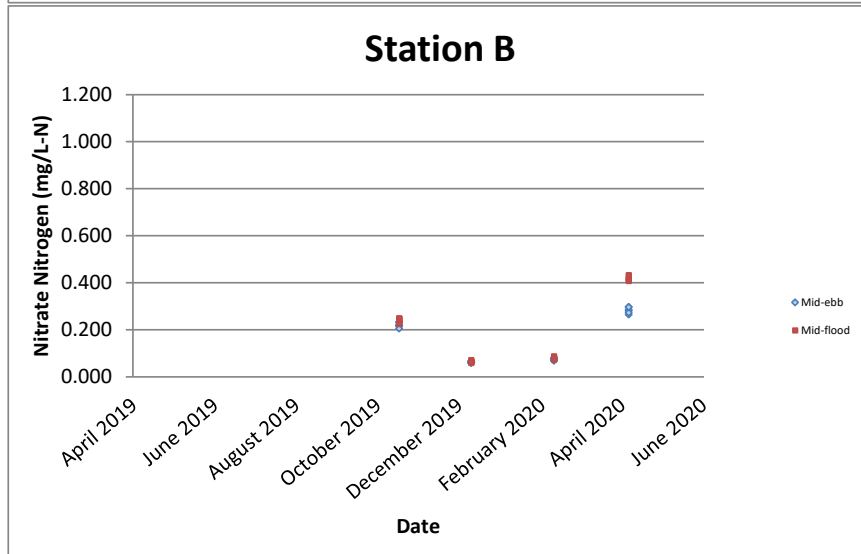
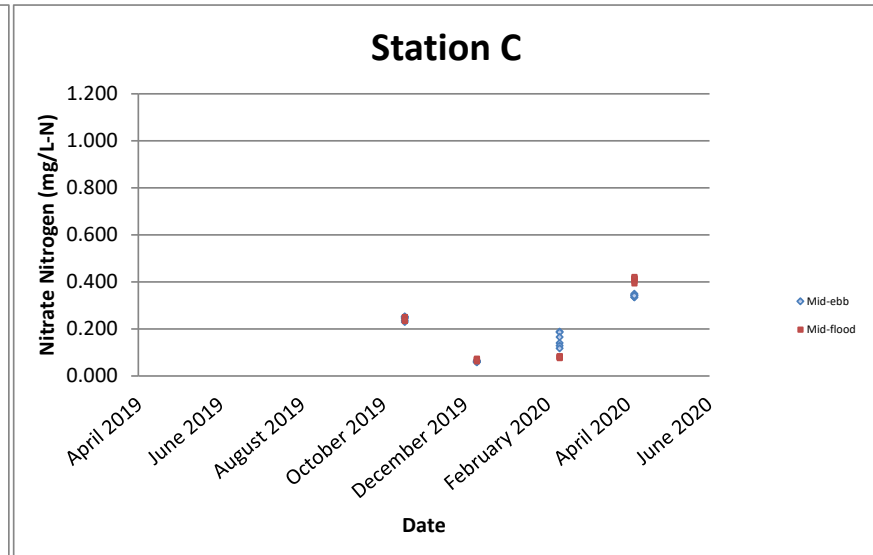
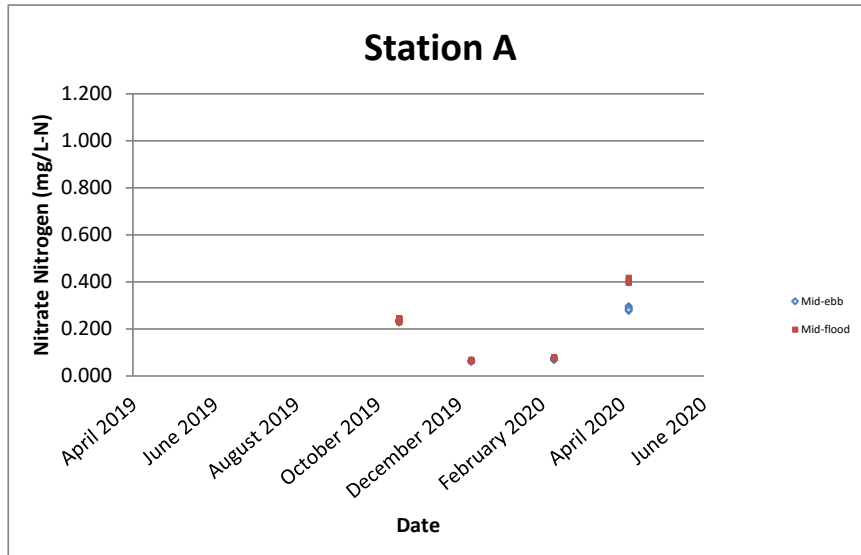
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Nitrite Nitrogen is regarded as 0.005 mg/L in graphical presentation.

Nitrite Nitrogen (mg/L-N)



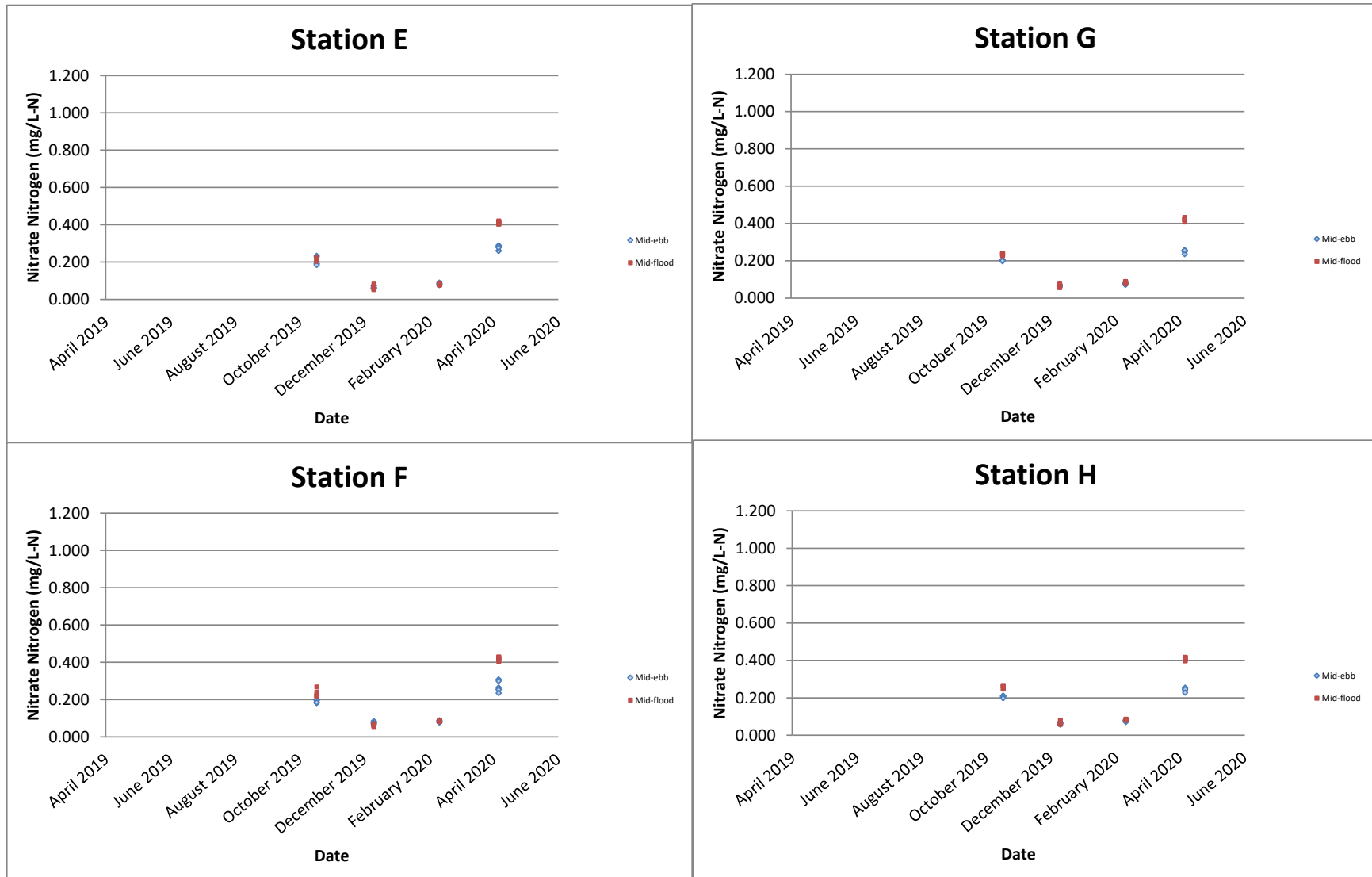
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Nitrite Nitrogen is regarded as 0.005 mg/L in graphical presentation.

Nitrate Nitrogen (mg/L-N)



Remark: All below the Limit of Report sample results (<0.005 mg/L) for Nitrate Nitrogen is regarded as 0.005 mg/L in graphical presentation.

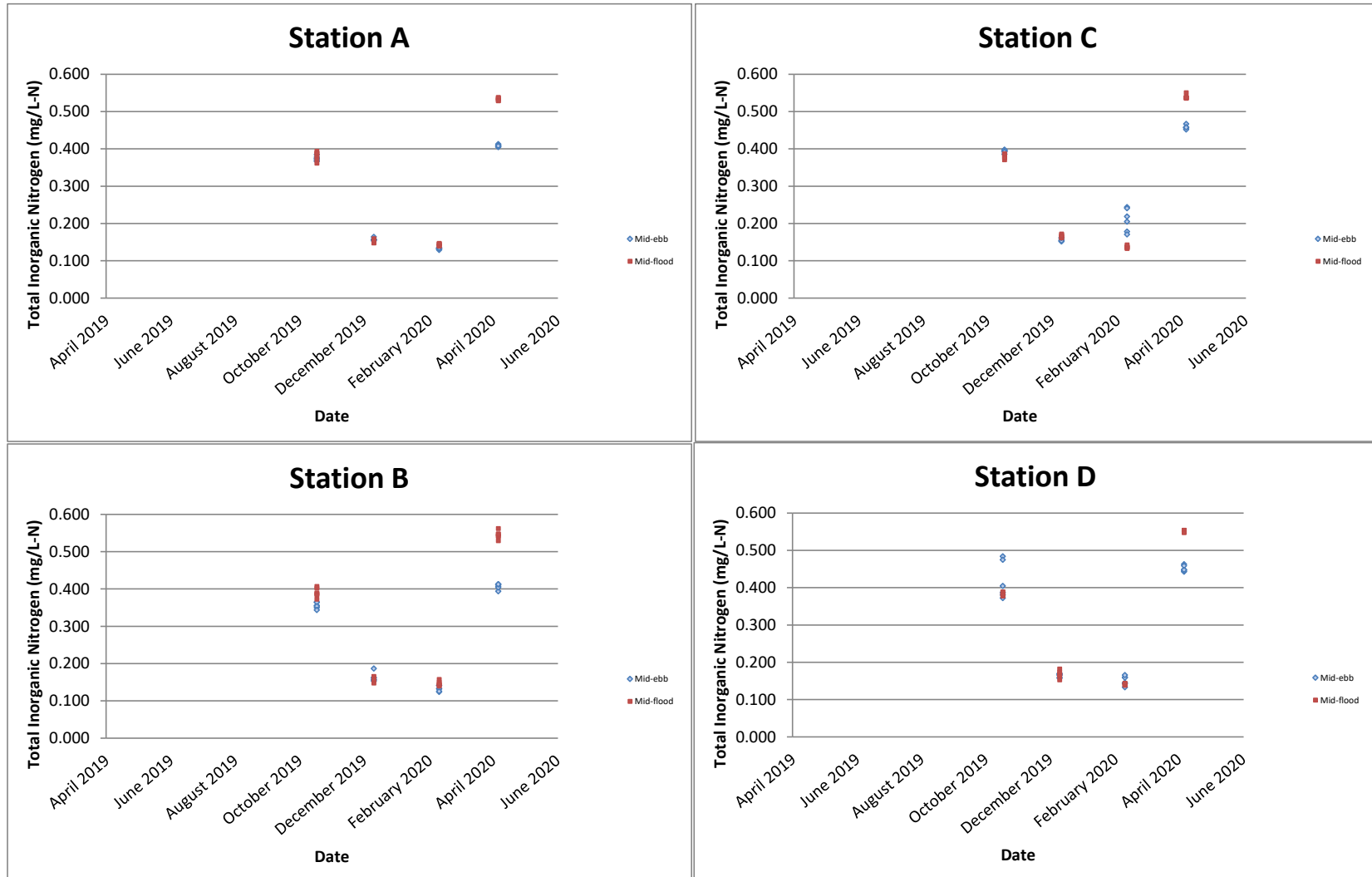
## Nitrate Nitrogen (mg/L-N)



Remark: All below the Limit of Report sample results (<0.005 mg/L) for Nitrate Nitrogen is regarded as 0.005 mg/L in graphical presentation.

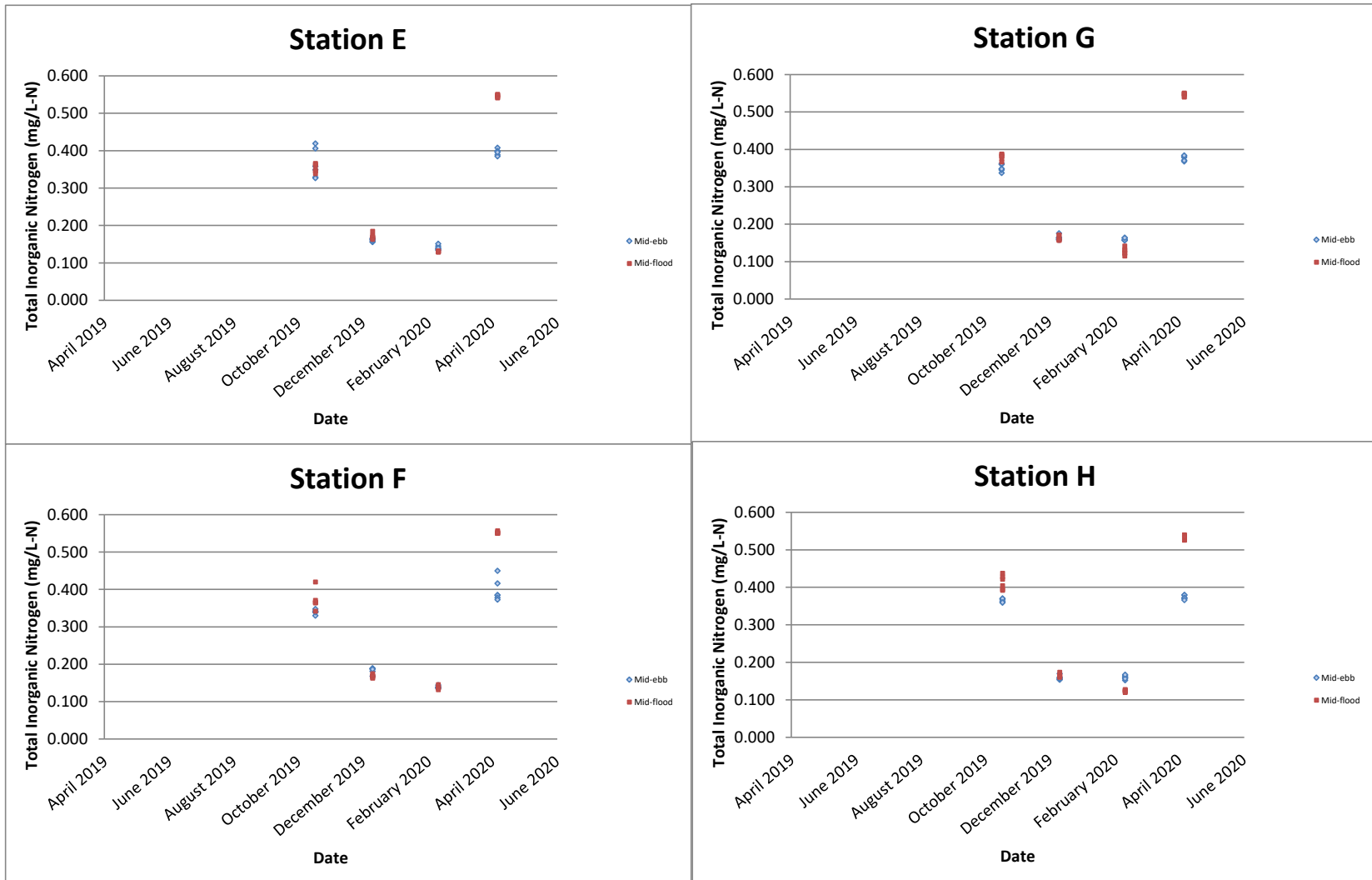


Total Inorganic Nitrogen (mg/L-N)



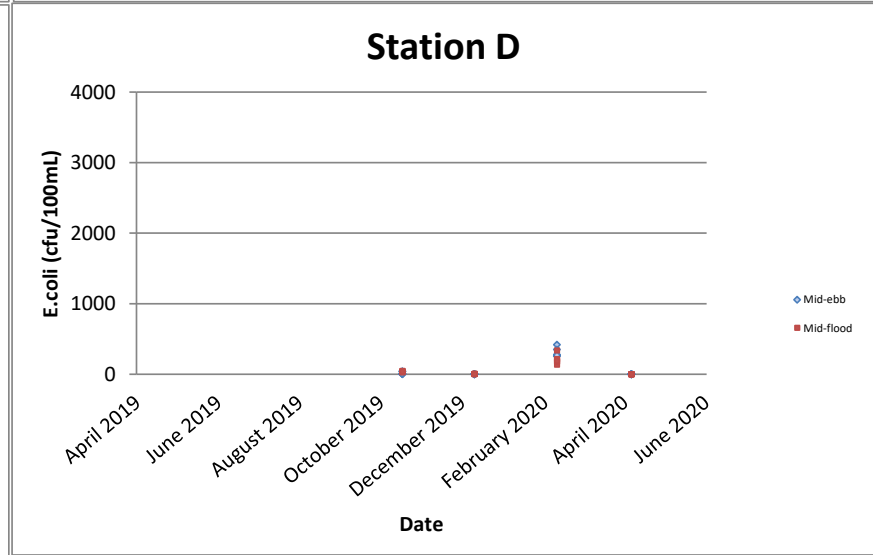
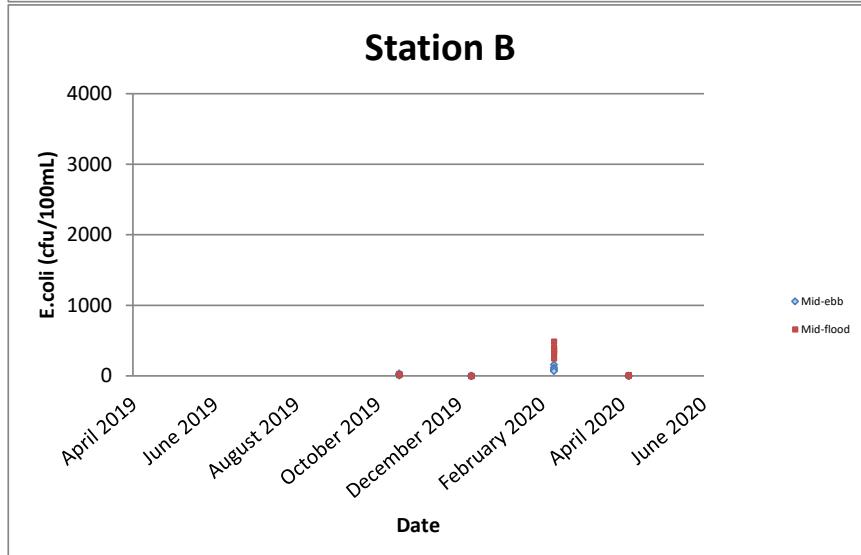
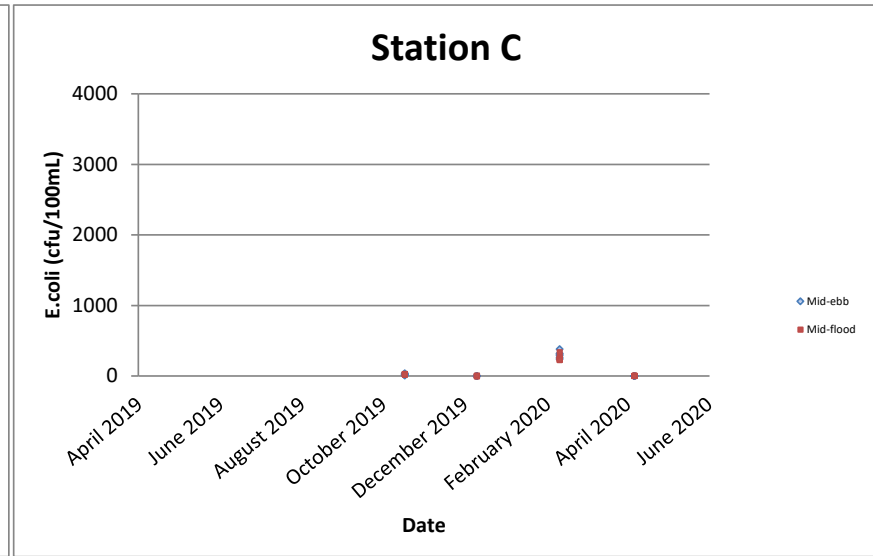
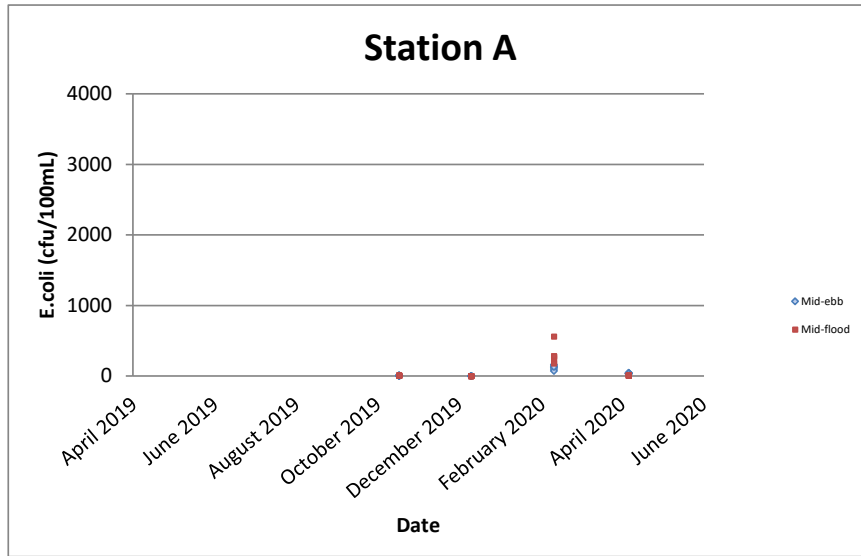
Remark: All below the Limit of Report sample results (<0.010 mg/L) for Total Inorganic Nitrogen is regarded as 0.010 mg/L in graphical presentation.

Total Inorganic Nitrogen (mg/L-N)



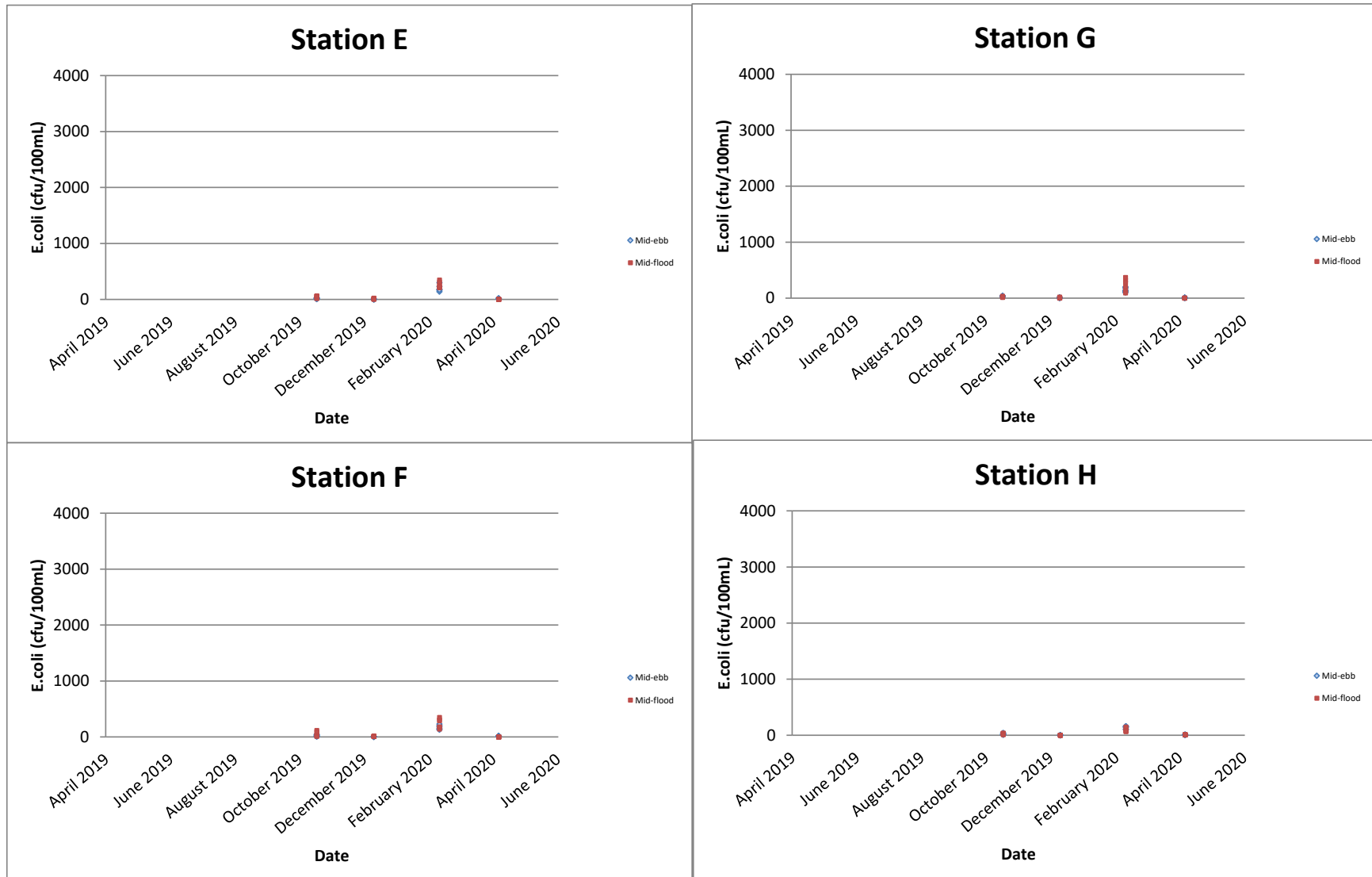
Remark: All below the Limit of Report sample results (<0.010 mg/L) for Total Inorganic Nitrogen is regarded as 0.010 mg/L in graphical presentation.

E.coli (cfu/100mL)



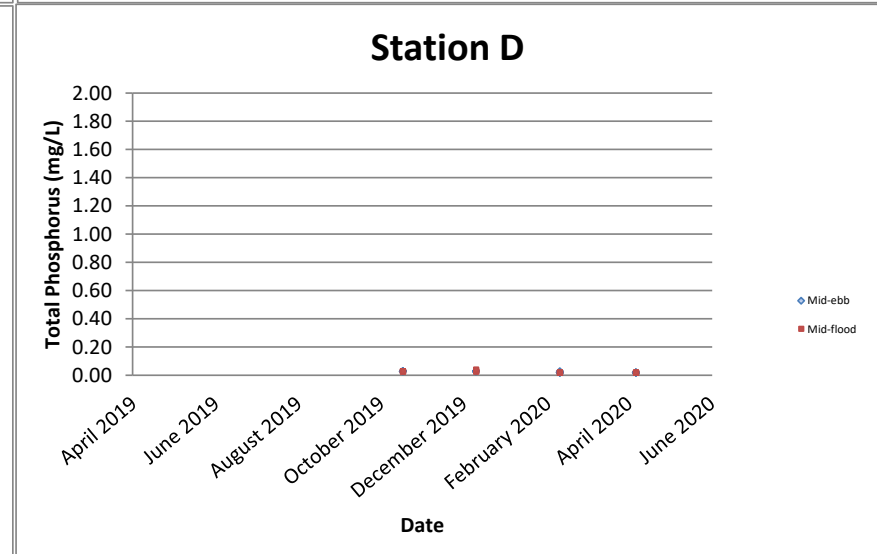
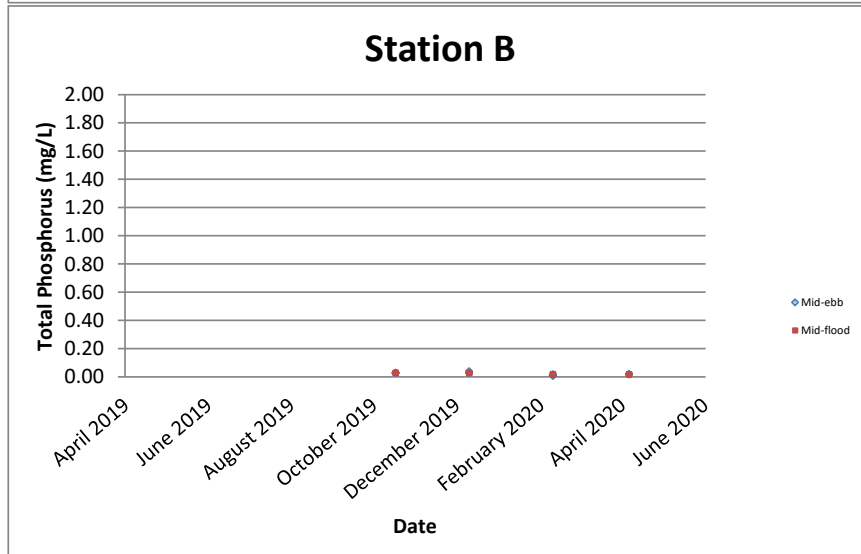
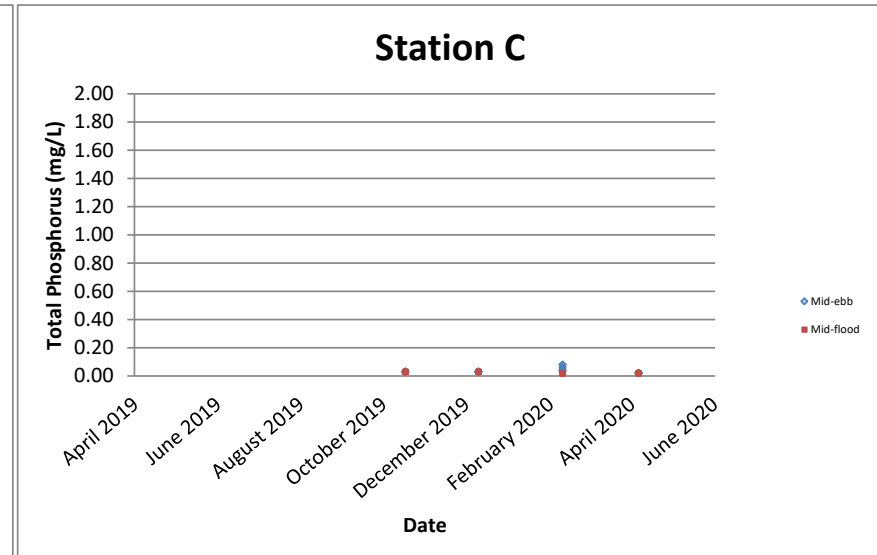
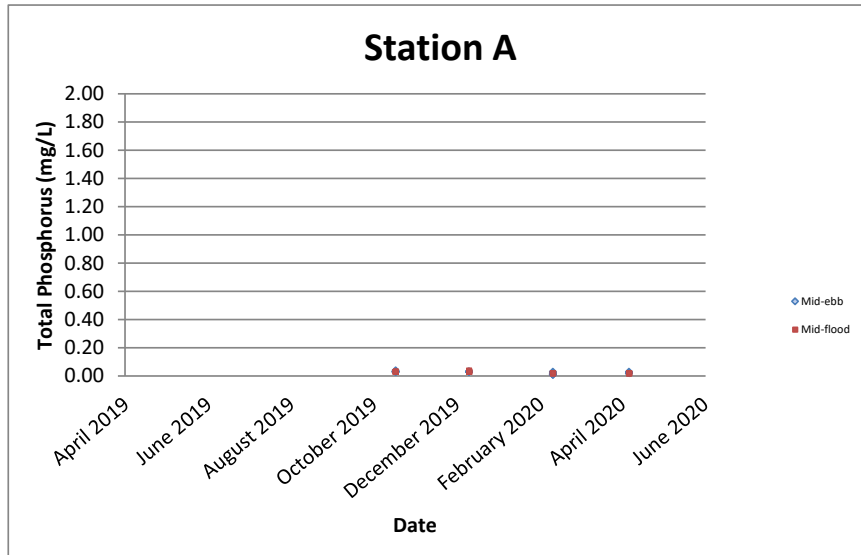
Remark: All below the Limit of Report sample results (<1 CFU/100mL) for E.coli is regarded as 1 CFU/100mL in graphical presentation.

E.coli (cfu/100mL)



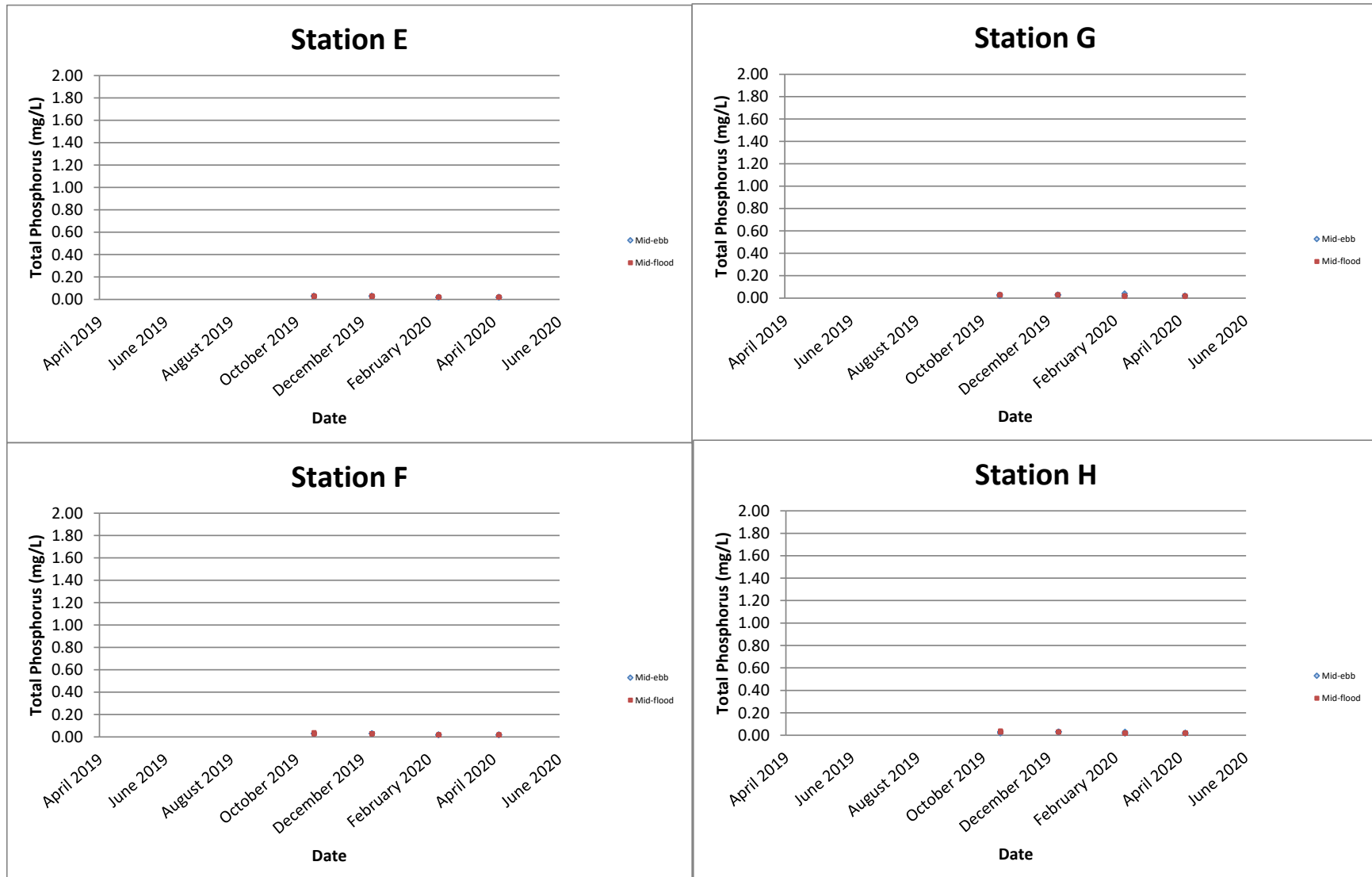
Remark: All below the Limit of Report sample results (<1 CFU/100mL) for E.coli is regarded as 1 CFU/100mL in graphical presentation.

Total Phosphorus (soluble and particulate) (mg/L)



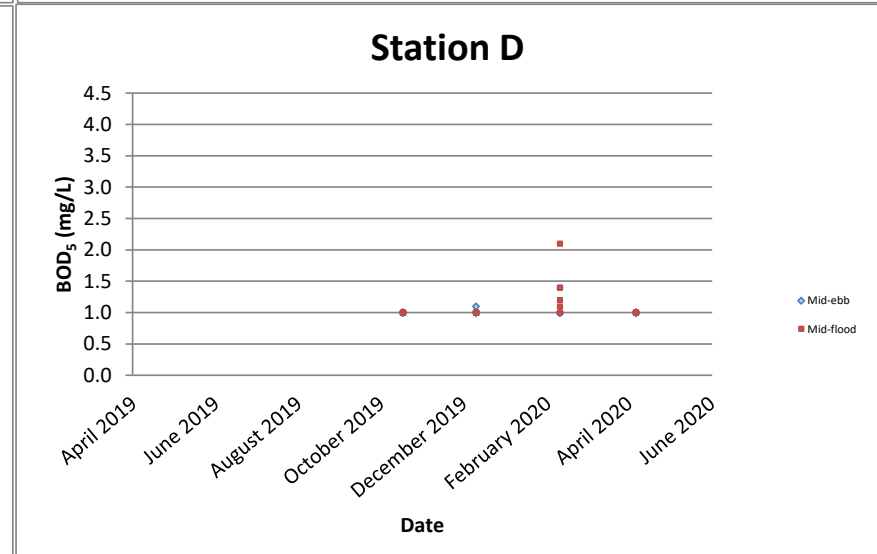
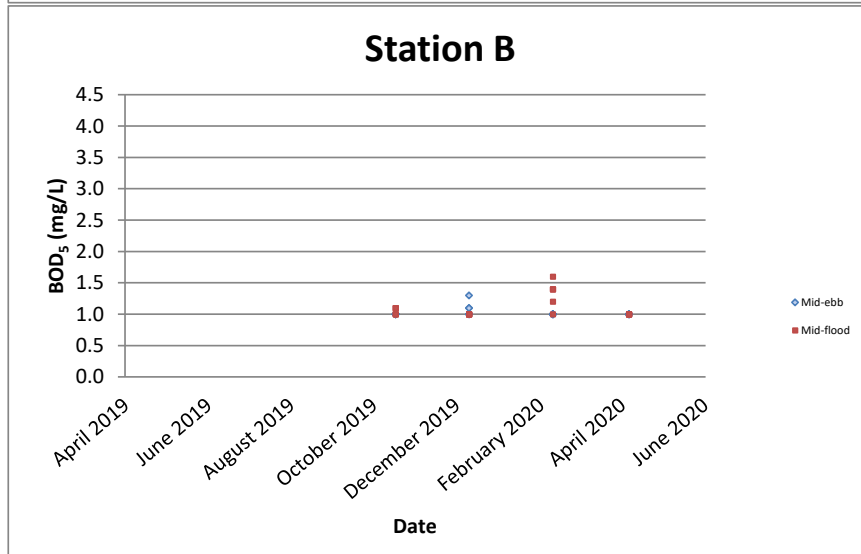
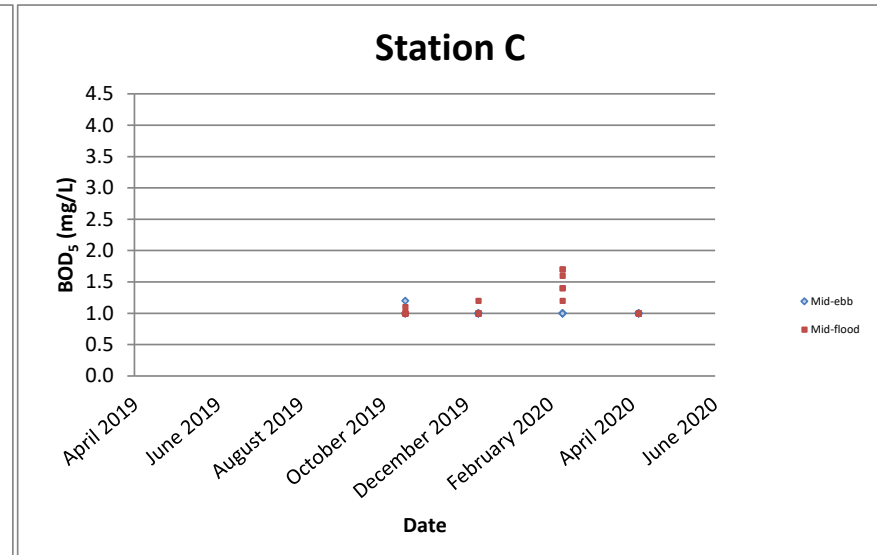
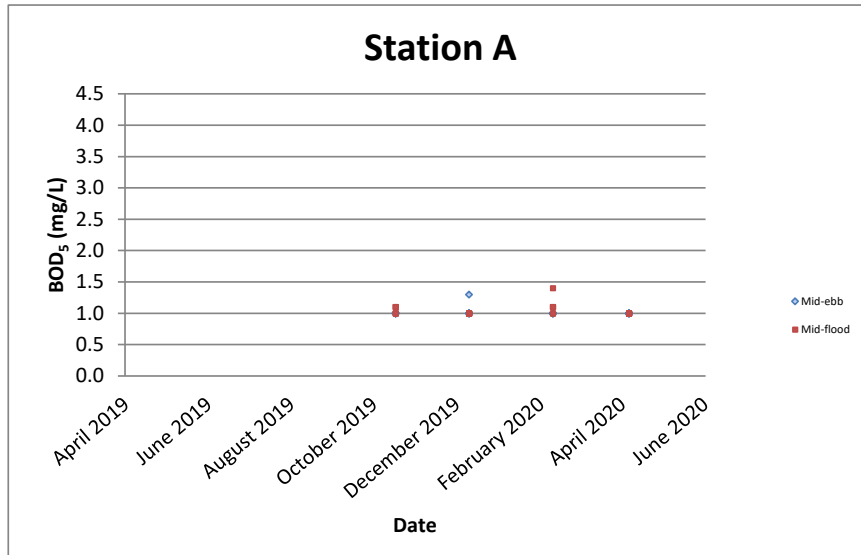
Remark: All below the Limit of Report sample results (<0.01 mg/L) for Total Phosphorus is regarded as 0.01 mg/L in graphical presentation.

Total Phosphorus (soluble and particulate) (mg/L)



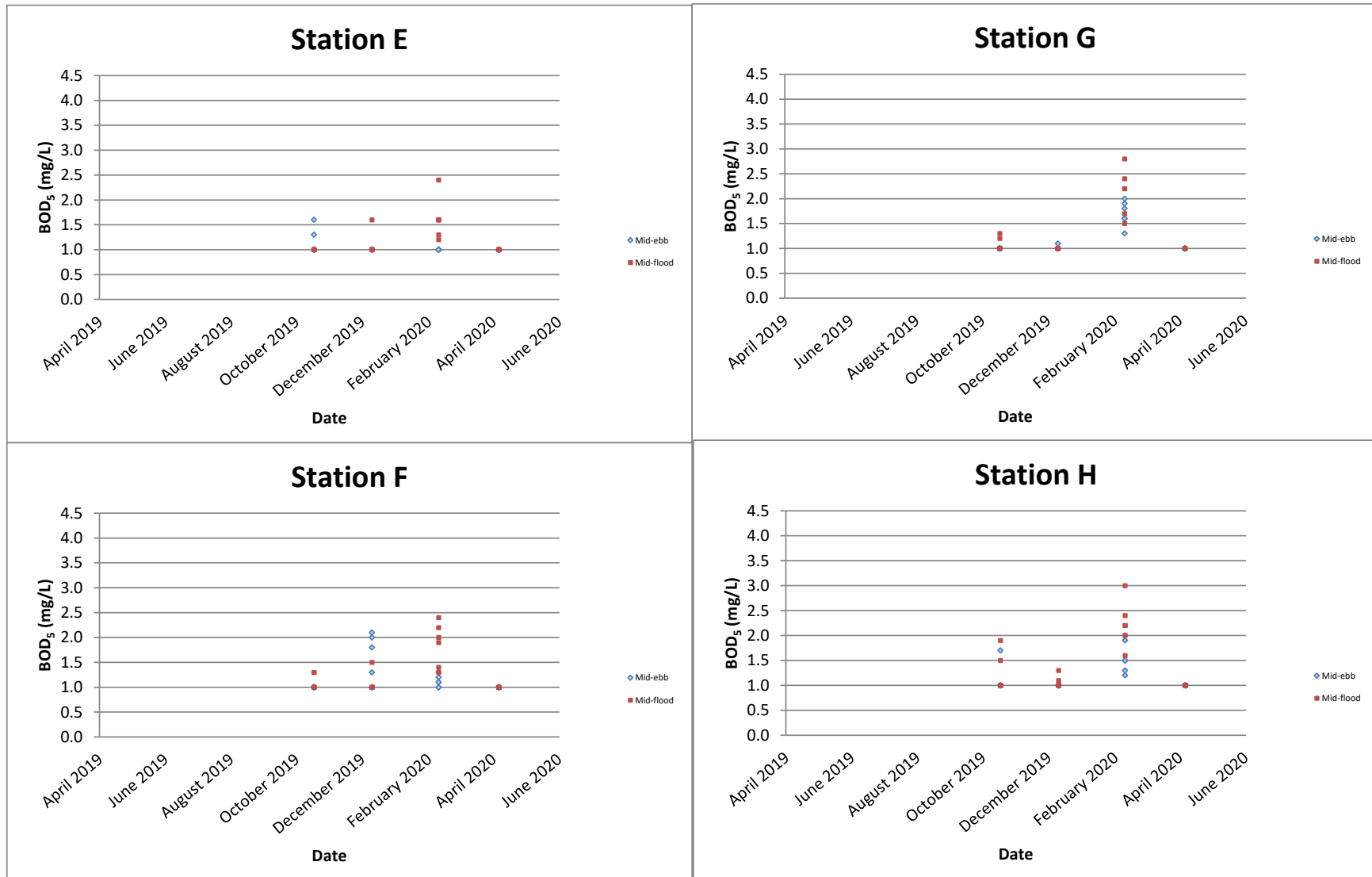
Remark: All below the Limit of Report sample results (<0.01 mg/L) for Total Phosphorus is regarded as 0.01 mg/L in graphical presentation.

BOD<sub>5</sub> (mg/L)



Remark: All below the Limit of Report sample results (<1.0 mg/L) for BOD<sub>5</sub> is regarded as 1.0 mg/L in graphical presentation.

BOD<sub>5</sub> (mg/L)



Remark: All below the Limit of Report sample results (<1.0 mg/L) for BOD<sub>5</sub> is regarded as 1.0 mg/L in graphical presentation.



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Report No.: 0041/17/ED/0544A

## Appendix G

Tidal Data obtained from Ma Wan Marine Traffic Station

# FUGRO TECHNICAL SERVICES LIMITED

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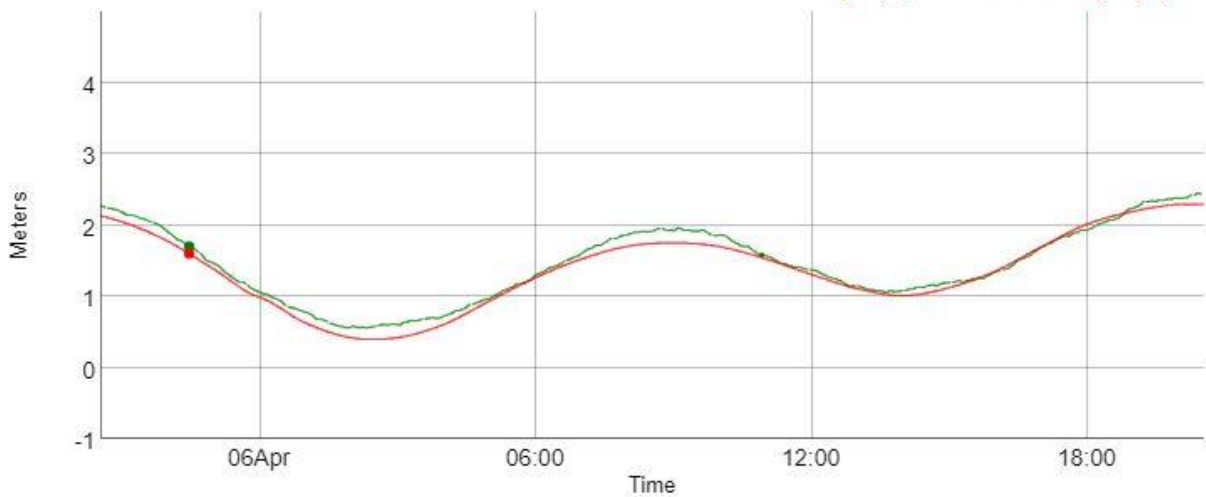
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Report No.: 0041/17/ED/0544A

Ma Wan - Height of Tide Above Chart Datum: 2.44 M AT HKT 2020-04-06 20:32

2020/04/05 22:29: Measured Height (m):1.7 Predicted Height (m):1.6



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Report No.: 0041/17/ED/0544A

## Appendix H

### Results and Graphical Presentation of Laboratory Analysis for Sediment Quality Monitoring and Benthic Survey

Monitoring Location	Date	Weather	Sea Condition	Time	Sediment Monitoring												
					pH	Ammonia as N (mg-N/kg)	Total Nitrogen (mg-N/kg)	Total Phosphorus (mg-P/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Arsenic (mg/kg)	Silver (mg/kg)
A	6/4/2020	Fine	Moderate	13:39	8.2	3	911	504	<0.10	38.0	29.7	43.1	0.14	22.4	93.9	16.1	0.22
B	6/4/2020	Fine	Moderate	13:57	8.3	2	984	529	0.14	46.0	60.6	48.4	0.14	25.9	112	15.1	0.48
C	6/4/2020	Fine	Moderate	14:18	7.9	18	1410	658	<0.10	43.6	40.0	42.3	0.12	27.0	119	13.0	0.32
D	6/4/2020	Fine	Moderate	14:34	7.7	8	868	431	<0.10	32.0	27.6	32.8	0.09	19.6	89.0	9.8	0.23
E	6/4/2020	Fine	Moderate	14:57	8.1	5	1280	600	<0.10	43.2	41.5	42.2	0.16	26.2	122	11.7	0.34
F	6/4/2020	Fine	Moderate	15:13	8.1	8	1210	547	0.10	49.4	48.2	50.4	0.14	30.7	138	14.5	0.39
G	6/4/2020	Fine	Moderate	15:33	8.4	80	1200	507	<0.10	41.0	52.8	38.9	0.14	23.2	142	11.6	0.37
H	6/4/2020	Fine	Moderate	15:49	8.2	6	1100	594	0.11	49.4	62.0	48.7	0.12	28.6	119	14.4	0.45

Monitoring Location	Date	Weather	Sea Condition	Time	Benthic Survey				
					Total Organic Carbon (%)	Particle Size Distribution			
						Gravel (%)	Sand (%)	Silt (%)	Clay (%)
A	6/4/2020	Fine	Moderate	13:39	0.68	3	41	32	24
B	6/4/2020	Fine	Moderate	13:57	0.82	3	20	50	27
C	6/4/2020	Fine	Moderate	14:18	0.93	0	4	59	37
D	6/4/2020	Fine	Moderate	14:34	0.74	1	18	52	29
E	6/4/2020	Fine	Moderate	14:57	0.88	0	13	53	34
F	6/4/2020	Fine	Moderate	15:13	0.94	0	7	58	35
G	6/4/2020	Fine	Moderate	15:33	0.54	29	25	23	23
H	6/4/2020	Fine	Moderate	15:49	0.75	0	5	56	39





### CERTIFICATE OF ANALYSIS

Client	: FUGRO TECHNICAL SERVICES LIMITED	Laboratory	: ALS Technichem (HK) Pty Ltd	Page	: 1 of 13
Contact	: MR CYRUS LAI	Contact	: Richard Fung	Work Order	: HK2012460
Address	: ROOM 723 & 725, 7/F, BLOCK B, PROFIT INDUSTRIAL BUILDING, 1-15 KWAI FONG CRESCENT, KWAI FONG, HONG KONG	Address	: 11/F., Chung Shun Knitting Centre, 1 - 3 Wing Yip Street, Kwai Chung, N.T., Hong Kong		
E-mail	: c.lai@fugro.com	E-mail	: richard.fung@alsglobal.com		
Telephone	: +852 3565 4374	Telephone	: +852 2610 1044		
Facsimile	: ---	Facsimile	: +852 2610 2021		
Project	: CONTRACT NO. CM 14/2016 ENVIRONMENTAL TEAM FOR OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT PLANT	Date Samples Received	: 06-Apr-2020		
Order number	: 0041/17	Quote number	: HKE/1654/2017_R1	Issue Date	: 22-Apr-2020
C-O-C number	: ---			No. of samples received	: 24
Site	: ---			No. of samples analysed	: 24

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

<u>Signatories</u>	<u>Position</u>	<u>Authorised results for</u>
		
Fung Lim Chee, Richard	Managing Director	Inorganics
		
Fung Lim Chee, Richard	Managing Director	Metals_ENV



### **General Comments**

This report supersedes any previous report(s) with this reference. All pages of this report have been checked and approved for release. When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes. Testing period is from 06-Apr-2020 to 22-Apr-2020.

Key: LOR = Limit of reporting; CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

#### **Specific Comments for Work Order: HK2012460**

Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in chilled condition. The result(s) related only to the item(s) tested.

Result(s) of soil/sediment sample(s) was / were reported on dry weight basis.

Sample information (Project name, Sample ID, Sampling date/time, etc., if any) is provided by client.

Particle Size Distribution was subcontracted to and analysed by Gammon Construction Limited.

Sample digested by In-house method E-3005 prior to the determination of total metals. The In-house method is developed based on USEPA method 3005.

EA002SOIL - pH value is reported as at 25°C.

EK055S - Ammoniacal Nitrogen was determined and reported on a 1:5 soil / 1M KCl solution extract.

EK059A - Nitrate and Nitrite were determined and reported on a 1:5 soil / 1M KCl solution extract.

Sample(s) as received, digested by In-house method E-3051A prior to the determination of metals. The In-house method is developed based on USEPA method 3051A.

EA002SOIL - Soil sample(s) analysed on as air-dry weight basis. pH value determined and reported on a 1:5 soil / water extract.

EA002SOIL - Calibration range of pH value is 4.0 - 10.0. Results exceeding this range is for reference only.

EK062A - Total Nitrogen is the sum of Total Oxidizable (NOx) and Total Kjeldahl Nitrogen.



**Analytical Results**

Sub-Matrix: SEDIMENT

Client sample ID

Client sampling date / time

				A/Sediment	B/Sediment	C/Sediment	D/Sediment	E/Sediment
				06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012460-001	HK2012460-002	HK2012460-003	HK2012460-004	HK2012460-005
<b>EA/ED: Physical and Aggregate Properties</b>								
EA002SOIL: pH Value	----	0.1	pH Unit	8.2	8.3	7.9	7.7	8.1
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	48.2	54.5	61.7	47.6	58.0
<b>ED/EK: Inorganic Nonmetallic Parameters</b>								
EK055S: Ammonia as N	7664-41-7	0.5	mg/kg	3	2	18	8	5
EK062A: Total Nitrogen as N	----	10	mg/kg	911	984	1410	868	1280
EK067A: Total Phosphorus as P	----	10	mg/kg	504	529	658	431	600
<b>EG: Metals and Major Cations</b>								
EG020: Arsenic	7440-38-2	0.5	mg/kg	16.1	15.1	13.0	9.8	11.7
EG020: Cadmium	7440-43-9	0.10	mg/kg	<0.10	0.14	<0.10	<0.10	<0.10
EG020: Chromium	7440-47-3	0.5	mg/kg	38.0	46.0	43.6	32.0	43.2
EG020: Copper	7440-50-8	0.20	mg/kg	29.7	60.6	40.0	27.6	41.5
EG020: Lead	7439-92-1	0.20	mg/kg	43.1	48.4	42.3	32.8	42.2
EG020: Mercury	7439-97-6	0.05	mg/kg	0.14	0.14	0.12	0.09	0.16
EG020: Nickel	7440-02-0	0.20	mg/kg	22.4	25.9	27.0	19.6	26.2
EG020: Silver	7440-22-4	0.10	mg/kg	0.22	0.48	0.32	0.23	0.34
EG020: Zinc	7440-66-6	0.5	mg/kg	93.9	112	119	89.0	122



Sub-Matrix: SEDIMENT				Client sample ID	F/Sediment	G/Sediment	H/Sediment	A/Benthic Survey	B/Benthic Survey
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012460-006	HK2012460-007	HK2012460-008	HK2012460-009	HK2012460-010	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA002SOIL: pH Value	----	0.1	pH Unit	8.1	8.4	8.2	---	---	
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	60.2	54.6	56.3	45.8	52.8	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055S: Ammonia as N	7664-41-7	0.5	mg/kg	8	80	6	---	---	
EK062A: Total Nitrogen as N	----	10	mg/kg	1210	1200	1100	---	---	
EK067A: Total Phosphorus as P	----	10	mg/kg	547	507	594	---	---	
<b>EG: Metals and Major Cations</b>									
EG020: Arsenic	7440-38-2	0.5	mg/kg	14.5	11.6	14.4	---	---	
EG020: Cadmium	7440-43-9	0.10	mg/kg	0.10	<0.10	0.11	---	---	
EG020: Chromium	7440-47-3	0.5	mg/kg	49.4	41.0	49.4	---	---	
EG020: Copper	7440-50-8	0.20	mg/kg	48.2	52.8	62.0	---	---	
EG020: Lead	7439-92-1	0.20	mg/kg	50.4	38.9	48.7	---	---	
EG020: Mercury	7439-97-6	0.05	mg/kg	0.14	0.14	0.12	---	---	
EG020: Nickel	7440-02-0	0.20	mg/kg	30.7	23.2	28.6	---	---	
EG020: Silver	7440-22-4	0.10	mg/kg	0.39	0.37	0.45	---	---	
EG020: Zinc	7440-66-6	0.5	mg/kg	138	142	119	---	---	
<b>EP: Aggregate Organics</b>									
EP005: Total Organic Carbon	----	0.05	%	---	---	---	0.68	0.82	





Sub-Matrix: SEDIMENT				Client sample ID	C/Benthic Survey	D/Benthic Survey	E/Benthic Survey	F/Benthic Survey	G/Benthic Survey
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012460-011	HK2012460-012	HK2012460-013	HK2012460-014	HK2012460-015	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	63.1	54.3	55.9	58.0	44.5	
<b>EP: Aggregate Organics</b>									
EP005: Total Organic Carbon	----	0.05	%	0.93	0.74	0.88	0.94	0.54	



Sub-Matrix: SEDIMENT				Client sample ID	H/Benthic Survey	---	---	---	---
				Client sampling date / time	06-Apr-2020	---	---	---	---
Compound	CAS Number	LOR	Unit	HK2012460-016	---	---	---	---	---
<b>EA/ED: Physical and Aggregate Properties</b>									
EA055: Moisture Content (dried @ 103°C)	---	0.1	%	54.2	---	---	---	---	---
<b>EP: Aggregate Organics</b>									
EP005: Total Organic Carbon	---	0.05	%	0.75	---	---	---	---	---



Sub-Matrix: WATER				Client sample ID	A/Rinsate Blank	B/Rinsate Blank	C/Rinsate Blank	D/Rinsate Blank	E/Rinsate Blank
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020	06-Apr-2020
Compound	CAS Number	LOR	Unit	HK2012460-017	HK2012460-018	HK2012460-019	HK2012460-020	HK2012460-021	
<b>EG: Metals and Major Cations - Total</b>									
EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	<10	<10	<10	
EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	
EG020: Chromium	7440-47-3	1	µg/L	1	5	1	5	4	
EG020: Copper	7440-50-8	1	µg/L	2	5	5	7	4	
EG020: Lead	7439-92-1	1	µg/L	2	4	<1	4	3	
EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	
EG020: Nickel	7440-02-0	1	µg/L	2	5	2	4	3	
EG020: Silver	7440-22-4	1	µg/L	<1	<1	<1	<1	<1	
EG020: Zinc	7440-66-6	10	µg/L	<10	20	<10	20	20	



Sub-Matrix: WATER				Client sample ID	F/Rinsate Blank	G/Rinsate Blank	H/Rinsate Blank	---	---
				Client sampling date / time	06-Apr-2020	06-Apr-2020	06-Apr-2020	----	----
Compound	CAS Number	LOR	Unit	HK2012460-022	HK2012460-023	HK2012460-024	-----	-----	
<b>EG: Metals and Major Cations - Total</b>									
EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	<10	---	---	
EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	---	---	
EG020: Chromium	7440-47-3	1	µg/L	<b>3</b>	<b>6</b>	<b>2</b>	---	---	
EG020: Copper	7440-50-8	1	µg/L	<b>4</b>	<b>8</b>	<b>2</b>	---	---	
EG020: Lead	7439-92-1	1	µg/L	<b>2</b>	<b>5</b>	<b>1</b>	---	---	
EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	<0.5	<0.5	---	---	
EG020: Nickel	7440-02-0	1	µg/L	<b>3</b>	<b>7</b>	<b>2</b>	---	---	
EG020: Silver	7440-22-4	1	µg/L	<1	<1	<1	---	---	
EG020: Zinc	7440-66-6	10	µg/L	<b>10</b>	<b>20</b>	<10	---	---	



**Laboratory Duplicate (DUP) Report**

Matrix: SOIL				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2961313)</b>								
HK2012083-012	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	15.8	16.2	2.15
HK2012225-001	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	18.1	18.7	3.72
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2961314)</b>								
HK2012460-002	B/Sediment	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	54.5	55.0	0.921
HK2012479-004	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	16.2	15.6	3.48
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2961321)</b>								
HK2012460-001	A/Sediment	EA002SOIL: pH Value	----	0.1	pH Unit	8.2	8.2	0.00
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2971456)</b>								
HK2012460-009	A/Benthic Survey	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	45.8	46.8	2.17
HK2012774-002	Anonymous	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	24.1	23.3	3.55
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2961319)</b>								
HK2012460-001	A/Sediment	EK055S: Ammonia as N	7664-41-7	1	mg/kg	3	3	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2968407)</b>								
HK2012460-001	A/Sediment	EK067A: Total Phosphorus as P	----	10	mg/kg	504	612	19.4
<b>EG: Metals and Major Cations (QC Lot: 2958047)</b>								
HK2012460-002	B/Sediment	EG020: Cadmium	7440-43-9	0.01	mg/kg	0.14	0.14	0.00
		EG020: Mercury	7439-97-6	0.02	mg/kg	0.14	0.15	0.00
		EG020: Copper	7440-50-8	0.05	mg/kg	60.6	60.8	0.305
		EG020: Lead	7439-92-1	0.05	mg/kg	48.4	46.4	4.21
		EG020: Nickel	7440-02-0	0.05	mg/kg	25.9	26.6	2.61
		EG020: Silver	7440-22-4	0.05	mg/kg	0.48	0.49	0.00
		EG020: Arsenic	7440-38-2	0.5	mg/kg	15.1	14.8	1.96
		EG020: Chromium	7440-47-3	0.5	mg/kg	46.0	47.6	3.39
		EG020: Zinc	7440-66-6	0.5	mg/kg	112	113	1.02
<b>EP: Aggregate Organics (QC Lot: 2980409)</b>								
HK2012460-009	A/Benthic Survey	EP005: Total Organic Carbon	----	0.05	%	0.68	0.76	9.86

Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
<b>EG: Metals and Major Cations - Total (QC Lot: 2958044)</b>								



Matrix: WATER				Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)
<b>EG: Metals and Major Cations - Total (QC Lot: 2958044) - Continued</b>								
HK2012460-018	B/Rinsate Blank	EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.00
		EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	<0.5	0.00
		EG020: Arsenic	7440-38-2	1	µg/L	<10	<10	0.00
		EG020: Chromium	7440-47-3	1	µg/L	5	6	0.00
		EG020: Copper	7440-50-8	1	µg/L	5	4	0.00
		EG020: Lead	7439-92-1	1	µg/L	4	4	0.00
		EG020: Nickel	7440-02-0	1	µg/L	5	4	0.00
		EG020: Silver	7440-22-4	1	µg/L	<1	<1	0.00
		EG020: Zinc	7440-66-6	10	µg/L	20	20	0.00

**Method Blank (MB), Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report**

Matrix: SOIL		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2961319)</b>											
EK055S: Ammonia as N	7664-41-7	1	mg/kg	<1	10 mg/kg	99.7	----	85.5	111	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2968407)</b>											
EK067A: Total Phosphorus as P	----	10	mg/kg	<10	695 mg/kg	88.0	----	82.7	97.7	----	----
<b>EG: Metals and Major Cations (QC Lot: 2958047)</b>											
EG020: Arsenic	7440-38-2	0.5	mg/kg	<0.5	5 mg/kg	99.5	----	85.0	110	----	----
EG020: Cadmium	7440-43-9	0.01	mg/kg	<0.01	0.25 mg/kg	90.1	----	85.0	115	----	----
EG020: Chromium	7440-47-3	0.5	mg/kg	<0.5	5 mg/kg	101	----	85.0	115	----	----
EG020: Copper	7440-50-8	0.05	mg/kg	<0.05	5 mg/kg	106	----	85.0	114	----	----
EG020: Lead	7439-92-1	0.05	mg/kg	<0.05	5 mg/kg	90.1	----	87.0	115	----	----
EG020: Mercury	7439-97-6	0.02	mg/kg	<0.02	0.1 mg/kg	102	----	85.0	115	----	----
EG020: Nickel	7440-02-0	0.05	mg/kg	<0.05	5 mg/kg	99.6	----	85.0	115	----	----
EG020: Silver	7440-22-4	0.05	mg/kg	<0.05	5 mg/kg	93.7	----	85.0	115	----	----
EG020: Zinc	7440-66-6	0.5	mg/kg	<0.5	5 mg/kg	106	----	85.0	115	----	----
<b>EP: Aggregate Organics (QC Lot: 2980409)</b>											
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	96.6	----	89.8	107	----	----



Matrix: WATER		Method Blank (MB) Report			Laboratory Control Spike (LCS) and Laboratory Control Spike Duplicate (DCS) Report						
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)		Recovery Limits(%)		RPD (%)	
						LCS	DCS	Low	High	Value	Control Limit
<b>EG: Metals and Major Cations - Total (QC Lot: 2958044)</b>											
EG020: Arsenic	7440-38-2	1	µg/L	<1	50 µg/L	99.1	----	85.0	110	----	----
EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	5 µg/L	94.0	----	85.0	109	----	----
EG020: Chromium	7440-47-3	1	µg/L	<1	50 µg/L	98.4	----	86.0	111	----	----
EG020: Copper	7440-50-8	1	µg/L	<1	50 µg/L	104	----	90.0	111	----	----
EG020: Lead	7439-92-1	1	µg/L	<1	50 µg/L	95.0	----	89.0	111	----	----
EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	2 µg/L	92.0	----	85.0	115	----	----
EG020: Nickel	7440-02-0	1	µg/L	<1	50 µg/L	107	----	87.0	110	----	----
EG020: Silver	7440-22-4	1	µg/L	<1	50 µg/L	104	----	85.0	114	----	----
EG020: Zinc	7440-66-6	10	µg/L	<10	50 µg/L	109	----	86.0	114	----	----



**Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report**

Matrix: SOIL

					<b>Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report</b>					
<b>Laboratory sample ID</b>	<b>Client sample ID</b>	<b>Method: Compound</b>	<b>CAS Number</b>	<b>Spike Concentration</b>	<b>Spike Recovery (%)</b>		<b>Recovery Limits (%)</b>		<b>RPD (%)</b>	
					<b>MS</b>	<b>MSD</b>	<b>Low</b>	<b>High</b>	<b>Value</b>	<b>Control Limit</b>
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2961319)</b>										
HK2012460-002	B/Sediment	EK055S: Ammonia as N	7664-41-7	10 mg/kg	91.5	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2968407)</b>										
HK2012460-001	A/Sediment	EK067A: Total Phosphorus as P	----	100 mg/kg	110	----	75.0	125	----	----
<b>EG: Metals and Major Cations (QC Lot: 2958047)</b>										
HK2012460-001	A/Sediment	EG020: Arsenic	7440-38-2	5 mg/kg	98.0	----	75.0	125	----	----
		EG020: Cadmium	7440-43-9	0.25 mg/kg	88.3	----	75.0	125	----	----
		EG020: Chromium	7440-47-3	5 mg/kg	77.2	----	75.0	125	----	----
		EG020: Copper	7440-50-8	5 mg/kg	79.6	----	75.0	125	----	----
		EG020: Lead	7439-92-1	5 mg/kg	# Not Determined	----	75.0	125	----	----
		EG020: Mercury	7439-97-6	0.1 mg/kg	90.4	----	75.0	125	----	----
		EG020: Nickel	7440-02-0	5 mg/kg	81.6	----	75.0	125	----	----
		EG020: Silver	7440-22-4	5 mg/kg	91.9	----	75.0	125	----	----
EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	----	75.0	125	----	----		
<b>EP: Aggregate Organics (QC Lot: 2980409)</b>										
HK2012460-009	A/Benthic Survey	EP005: Total Organic Carbon	----	40 %	96.5	----	75.0	125	----	----

Matrix: WATER

					<b>Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report</b>					
<b>Laboratory sample ID</b>	<b>Client sample ID</b>	<b>Method: Compound</b>	<b>CAS Number</b>	<b>Spike Concentration</b>	<b>Spike Recovery (%)</b>		<b>Recovery Limits (%)</b>		<b>RPD (%)</b>	
					<b>MS</b>	<b>MSD</b>	<b>Low</b>	<b>High</b>	<b>Value</b>	<b>Control Limit</b>
<b>EG: Metals and Major Cations - Total (QC Lot: 2958044)</b>										
HK2012460-017	A/Rinsate Blank	EG020: Arsenic	7440-38-2	50 µg/L	98.0	----	75.0	125	----	----
		EG020: Cadmium	7440-43-9	5 µg/L	93.8	----	75.0	125	----	----
		EG020: Chromium	7440-47-3	50 µg/L	86.4	----	75.0	125	----	----
		EG020: Copper	7440-50-8	50 µg/L	85.7	----	75.0	125	----	----
		EG020: Lead	7439-92-1	50 µg/L	75.8	----	75.0	125	----	----
EG020: Mercury	7439-97-6	2 µg/L	82.6	----	75.0	125	----	----		





Matrix: WATER

**Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
<b>EG: Metals and Major Cations - Total (QC Lot: 2958044) - Continued</b>										
HK2012460-017	A/Rinsate Blank	EG020: Nickel	7440-02-0	50 µg/L	86.3	----	75.0	125	----	----
		EG020: Silver	7440-22-4	50 µg/L	76.4	----	75.0	125	----	----
		EG020: Zinc	7440-66-6	50 µg/L	85.3	----	75.0	125	----	----



## ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

### SUB-CONTRACTING REPORT

CONTACT	: MR CYRUS LAI	WORK ORDER	: <b>HK2012460</b>
CLIENT	: <b>FUGRO TECHNICAL SERVICES LIMITED</b>		
ADDRESS	: ROOM 723 & 725, 7/F, BLOCK B, PROFIT INDUSTRIAL BUILDING, 1-15 KWAI FONG CRESCENT, KWAI FONG, HONG KONG	SUB-BATCH	: 1
		DATE RECEIVED	: 6-APR-2020
		DATE OF ISSUE	: 20-APR-2020
PROJECT	: CONTRACT NO. CM 14/2016	NO. OF SAMPLES	: 24
	ENVIRONMENTAL TEAM FOR OPERATIONAL ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT PLANT	CLIENT ORDER	: 0041/17

#### General Comments

- Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in chilled condition. The result(s) related only to the item(s) tested.
- Result(s) of soil/sediment sample(s) was / were reported on dry weight basis.
- Sample information (Project name, Sample ID, Sampling date/time, etc., if any) is provided by client.
- Particle Size Distribution was subcontracted to and analysed by Gammon Construction Limited.
- Sample digested by In-house method E-3005 prior to the determination of total metals. The In-house method is developed based on USEPA method 3005.
- EA002SOIL - pH value is reported as at 25°C.
- EK055S - Ammoniacal Nitrogen was determined and reported on a 1:5 soil / 1M KCl solution extract.
- EK059A - Nitrate and Nitrite were determined and reported on a 1:5 soil / 1M KCl solution extract.
- Sample(s) as received, digested by In-house method E-3051A prior to the determination of metals. The In-house method is developed based on USEPA method 3051A.
- EA002SOIL - Soil sample(s) analysed on as air-dry weight basis. pH value determined and reported on a 1:5 soil / water extract.
- EA002SOIL - Calibration range of pH value is 4.0 - 10.0. Results exceeding this range is for reference only.
- EK062A - Total Nitrogen is the sum of Total Oxidizable (NOx) and Total Kjeldahl Nitrogen.

#### Signatories

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

Signatories

Position

Richard Fung

Managing Director

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

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

WORK ORDER : HK2012460  
 SUB-BATCH : 1  
 CLIENT : FUGRO TECHNICAL SERVICES LIMITED  
 PROJECT : CONTRACT NO. CM 14/2016 ENVIRONMENTAL TEAM FOR OPERATIONAL  
 ENVIRONMENTAL MONITORING AND AUDIT FOR SIU HO WAN SEWAGE  
 TREATMENT PLANT



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2012460-001	A/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-002	B/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-003	C/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-004	D/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-005	E/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-006	F/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-007	G/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-008	H/Sediment	SEDIMENT	06-Apr-2020	
HK2012460-009	A/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-010	B/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-011	C/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-012	D/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-013	E/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-014	F/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-015	G/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-016	H/Benthic Survey	SEDIMENT	06-Apr-2020	J2999-272.70
HK2012460-017	A/Rinsate Blank	WATER	06-Apr-2020	
HK2012460-018	B/Rinsate Blank	WATER	06-Apr-2020	
HK2012460-019	C/Rinsate Blank	WATER	06-Apr-2020	
HK2012460-020	D/Rinsate Blank	WATER	06-Apr-2020	
HK2012460-021	E/Rinsate Blank	WATER	06-Apr-2020	
HK2012460-022	F/Rinsate Blank	WATER	06-Apr-2020	
HK2012460-023	G/Rinsate Blank	WATER	06-Apr-2020	
HK2012460-024	H/Rinsate Blank	WATER	06-Apr-2020	

**TEST CERTIFICATE  
SUMMARY OF SOIL CLASSIFICATION TEST RESULT  
GEOSPEC 3 : 2001**



Customer : ALS Technichem (HK) Pty Ltd

Job No. : 12999

Works Order No. : 272

Report No : 12999-272.70

Project : -

Contract No.:

Date : 08/04/2020

Sample ID	Sample		Δ Moisture Content (%)	Test 6.1 Liquid Limit (%)	Test 6.1 Plastic Limit (%)	Test 6.1 Plasticity Index (%)	Test 6.2 Liquidity Index (%)	Passing 425µm Sieve (%)	Preparation Method	Particle Size Distribution			Description	Sample Origin		
	No.	Type								Depth (m)	# Test Method	Gravel (%)			Sand (%)	Silt/Clay (%)
HK2012460-009	A/Benthic Survey	D								1.5,7	3	41	32	24	Dark grey, sandy SILT/CLAY with shell fragments	- †
HK2012460-010	B/Benthic Survey	D								1.5,7	3	20	50	27	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK2012460-011	C/Benthic Survey	D								1.5,7	0	4	59	37	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK2012460-012	D/Benthic Survey	D								1.5,7	1	18	52	29	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK2012460-013	E/Benthic Survey	D								1.5,7	0	13	53	34	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK2012460-014	F/Benthic Survey	D								1.5,7	0	7	58	35	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK2012460-015	G/Benthic Survey	D								1.5,7	29	25	23	23	Dark grey, slightly sandy, slightly gravelly SILT/CLAY with shell fragments	- †
HK2012460-016	H/Benthic Survey	D								1.5,7	0	5	56	39	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †

Legend : Δ = Test Method in accordance with GEOSPEC 3 : 2001 Test 5.1 Moisture Content at 45°C ± 5°C (A), Test 5.2 Moisture Content at 105°C ± 5°C (B), Test 5.3 Comparative Moisture Content 45/105°C ± 5°C (C)  
# = Test Method in accordance with GEOSPEC 3 : 2001 Test 8.1 (1), 8.2 (2), 8.3 (3), 8.4 (4), 8.5 (5), 8.6 (6), 8.7 (7).

Symbols: U - Undisturbed Sample; P - Piston Sample; N.P. - Non Plastic; A.D. - Air Dried; LB - Large Disturbed Sample; M - Mazier Sample; A.R. - As Received; O.D. - Oven Dried; BLK - Block Sample; D - Small Disturbed Sample; H.P. - Hand Picked; W.S. - Wet Sieved; SPTL - SPT Split-Barrel Sample; PT - Portable triple tube Sample; PT - Moisture Content for A.L. Test.

Notes: IS - Insufficient Sample; Tf - To Follow on supplementary Report.

Checked by: T K Lam  
Approved By: Chung Hui Wing  
Quality Manager

Date : 17/04/2020

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Technology Centre  
21 Chun Wang Street, Tseung Kwan O Industrial Estate,  
Tseung Kwan O, N.T. Tel: 26991980, Fax: 26917547

**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

Works Order No. : 272  
 Sample ID No. : HK2012460-009  
 Sample No. : A/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : †

Date Received : 08/04/2020  
 Tested Date : 14/04/2020

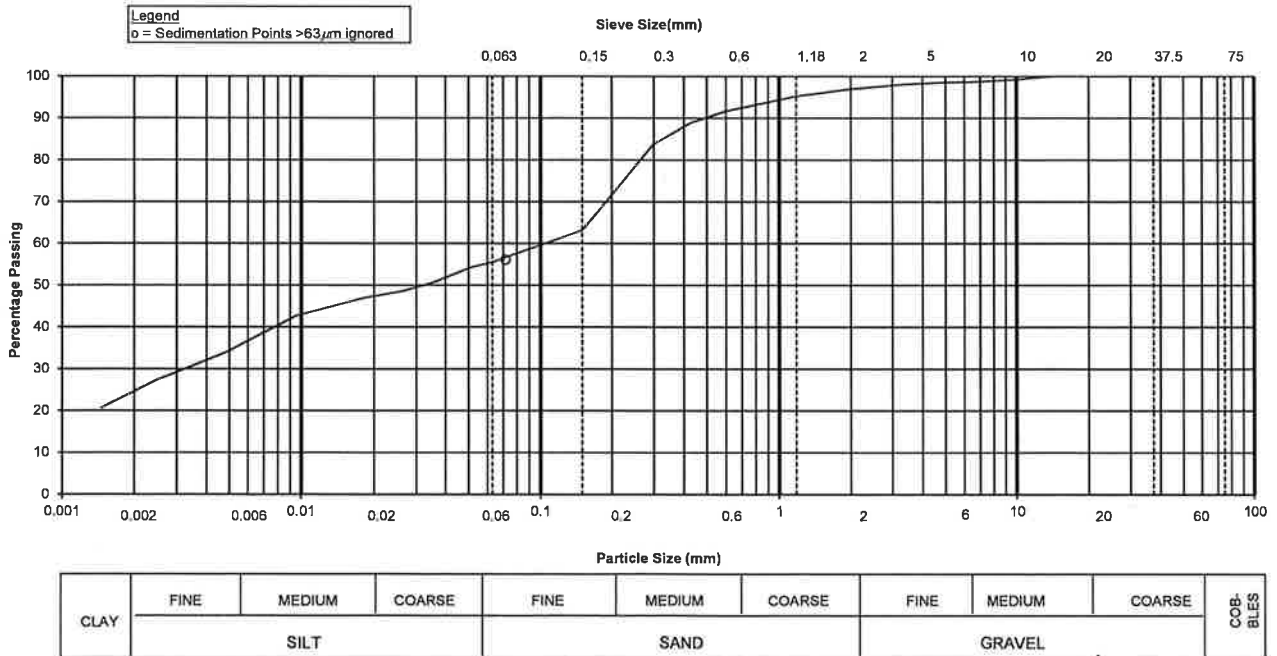
Description : Dark grey, sandy SILT/CLAY with shell fragments

Sieve Method : Method A      † Upon request      \* Delete as appropriate      ‡ Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-				
75.0 mm	100	-	-				
63.0 mm	100	-	-				
50.0 mm	100	-	-				
37.5 mm	100	-	-				
28.0 mm	100	-	-				
20.0 mm	100	-	-	0.0718	-	56	-
14.0 mm	100	-	-	0.0510	-	54	-
10.0 mm	99	-	-	0.0364	-	51	-
6.30 mm	99	-	-	0.0259	-	48	-
5.00 mm	99	-	-	0.0184	-	47	-
3.35 mm	98	-	-	0.0096	-	43	-
2.00 mm	97	-	-	0.0049	-	34	-
1.18 mm	95	-	-	0.0025	-	27	-
600 µm	92	-	-	0.0015	-	21	-
425 µm	89	-	-				
300 µm	84	-	-				
212 µm	73	-	-				
150 µm	63	-	-				
63 µm	56	-	-				
0 µm	0	-	-				

Specific Gravity (# if assumed) : 2.65 #  
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate  
 Sampling History : As received  
 The presence of any visible organic matter in the soil : None

**SUMMARY :**  
 Gravel (%) : 3  
 Sand (%) : 41  
 Silt (%) : 32  
 Clay (%) : 24



Technician : C M Yip  
 Date : 14/04/2020

Checked By : TK Lam  
 Date : 17/04/2020

Approved By : Chung Hei Wing  
 Date : 17/04/2020

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**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

Date Received : 08/04/2020  
 Tested Date : 14/04/2020

Works Order No. : 272  
 Sample ID No. : HK2012460-010  
 Sample No. : B/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : ‡

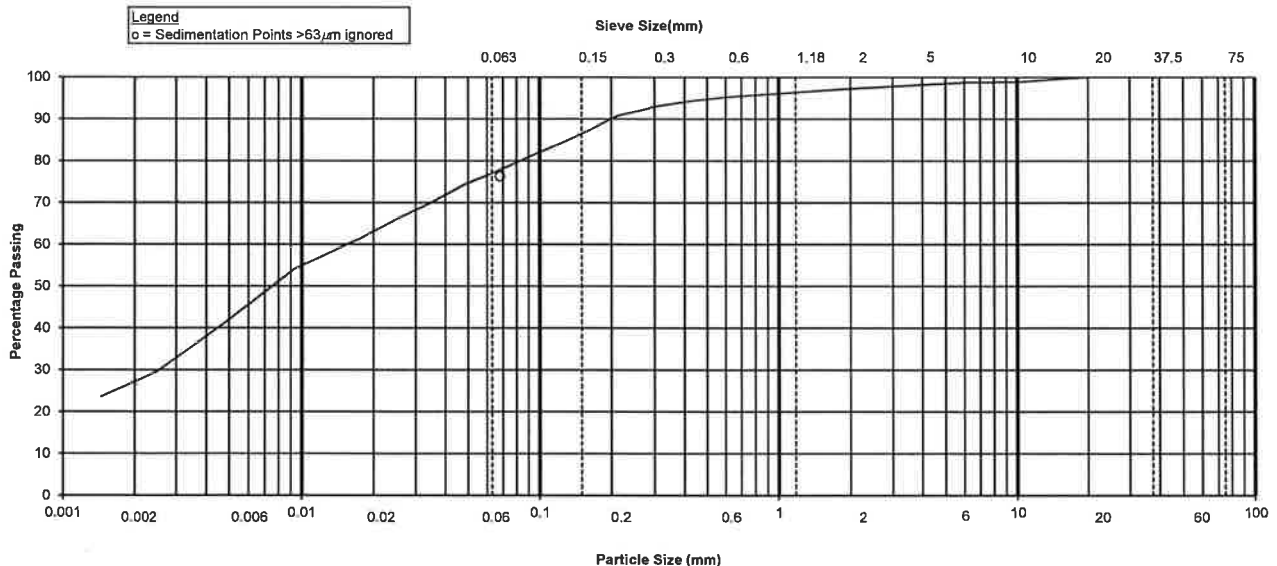
Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A      ^ Upon request      \* Delete as appropriate      ‡ Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-				
75.0 mm	100	-	-				
63.0 mm	100	-	-				
50.0 mm	100	-	-				
37.5 mm	100	-	-				
28.0 mm	100	-	-				
20.0 mm	100	-	-	0.0680	-	76	-
14.0 mm	99	-	-	0.0483	-	74	-
10.0 mm	99	-	-	0.0346	-	70	-
6.30 mm	99	-	-	0.0248	-	66	-
5.00 mm	98	-	-	0.0177	-	62	-
3.35 mm	98	-	-	0.0093	-	54	-
2.00 mm	97	-	-	0.0048	-	41	-
1.18 mm	96	-	-	0.0025	-	30	-
600 µm	95	-	-	0.0015	-	24	-
425 µm	94	-	-				
300 µm	93	-	-				
212 µm	91	-	-				
150 µm	87	-	-				
63 µm	77	-	-				
0 µm	0	-	-				

Specific Gravity (# if assumed) : 2.65 #  
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate  
 Sampling History : As received  
 The presence of any visible organic matter in the soil : None

**SUMMARY :**  
 Gravel (%) : 3  
 Sand (%) : 20  
 Silt (%) : 50  
 Clay (%) : 27



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COB- BLES
	SILT			SAND			GRAVEL			

Technician : CM Yip  
 Date : 14/04/2020

Checked By : TK Lam  
 Date : 17/04/2020

Approved By : Chung Hei Wing  
 Date : 17/04/2020

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**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

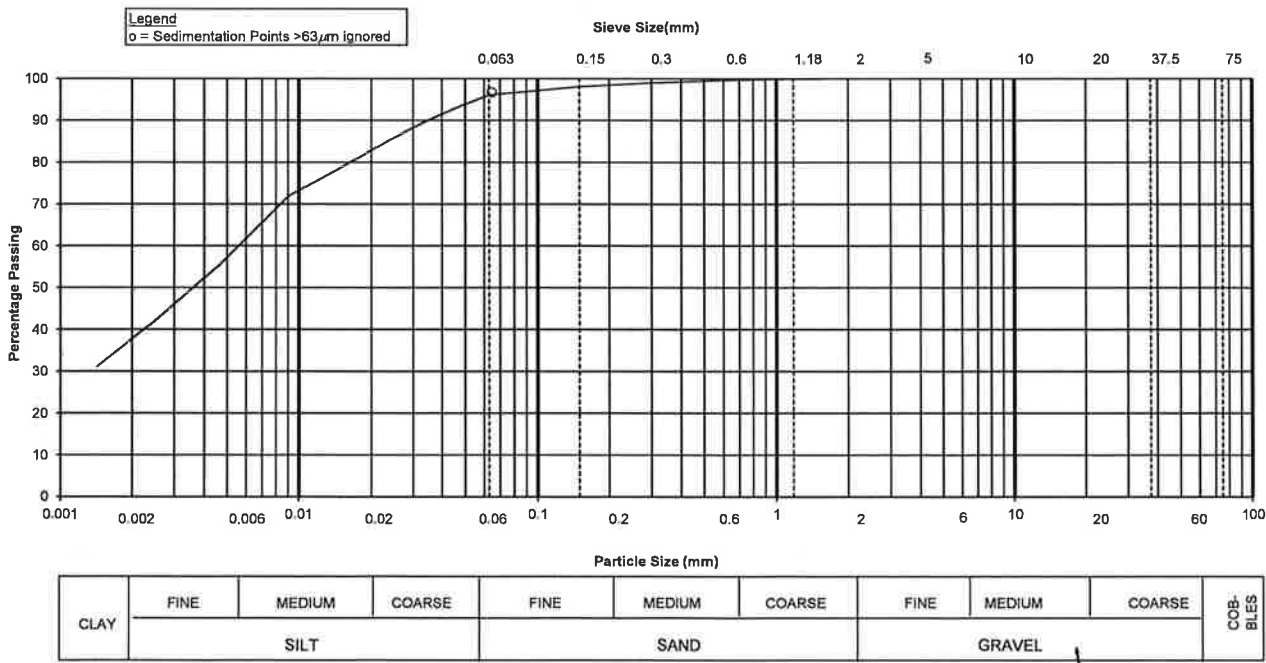
Date Received : 08/04/2020  
 Tested Date : 14/04/2020

Works Order No. : 272  
 Sample ID No. : HK2012460-011  
 Sample No. : C/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : - ‡

Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A      ^ Upon request      \* Delete as appropriate      ‡ Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :			
100.0 mm	100	-	-	2.65 #			
75.0 mm	100	-	-	Dispersant Details :	Sodium hexametaphosphate, Sodium carbonate		
63.0 mm	100	-	-	Sampling History :	As received		
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None			
37.5 mm	100	-	-	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
28.0 mm	100	-	-	0.0648	-	97	-
20.0 mm	100	-	-	0.0464	-	93	-
14.0 mm	100	-	-	0.0331	-	89	-
10.0 mm	100	-	-	0.0237	-	85	-
6.30 mm	100	-	-	0.0170	-	81	-
5.00 mm	100	-	-	0.0090	-	72	-
3.35 mm	100	-	-	0.0047	-	56	-
2.00 mm	100	-	-	0.0024	-	42	-
1.18 mm	100	-	-	0.0014	-	31	-
600 µm	100	-	-	<b>SUMMARY :</b>			
425 µm	99	-	-	Gravel (%) :	0		
300 µm	99	-	-	Sand (%) :	4		
212 µm	99	-	-	Silt (%) :	59		
150 µm	98	-	-	Clay (%) :	37		
63 µm	96	-	-				
0 µm	0	-	-				



Technician : C M Yip  
 Date : 14/04/2020

Checked By : TK Lam  
 Date : 17/04/2020

Approved By : Chung Hai Wing  
 Date : 17/04/2020

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Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

Date Received : 08/04/2020  
 Tested Date : 14/04/2020

Works Order No. : 272  
 Sample ID No. : HK2012460-012  
 Sample No. : D/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : - ‡

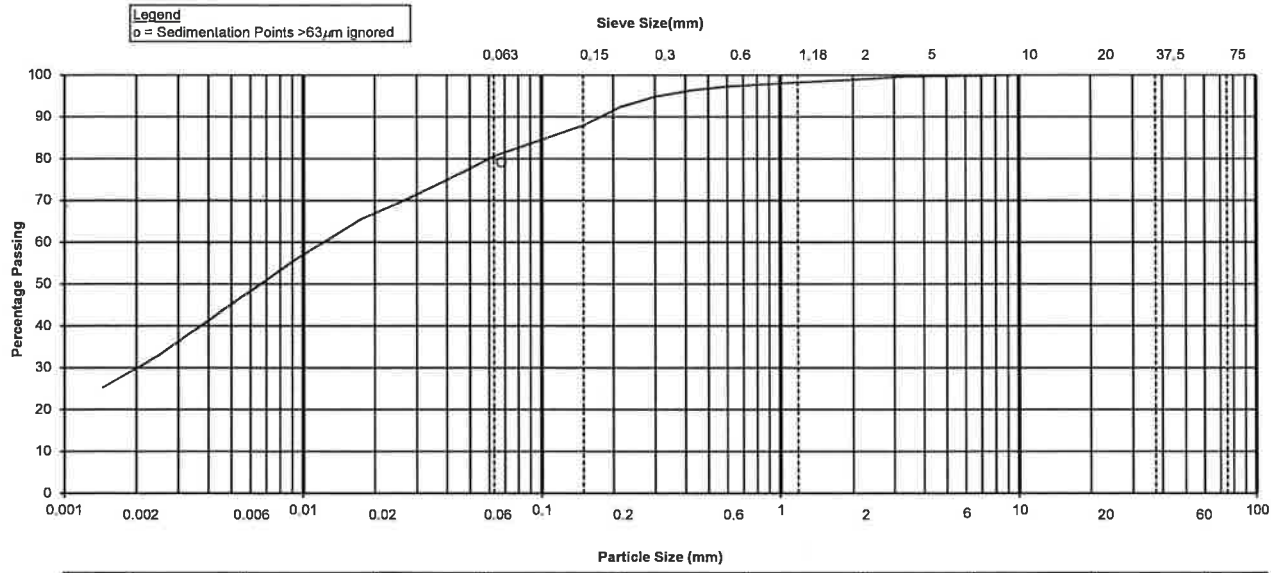
Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A      ^ Upon request      \* Delete as appropriate      ‡ Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-				
75.0 mm	100	-	-				
63.0 mm	100	-	-				
50.0 mm	100	-	-				
37.5 mm	100	-	-				
28.0 mm	100	-	-				
20.0 mm	100	-	-	0.0678	-	79	-
14.0 mm	100	-	-	0.0482	-	77	-
10.0 mm	100	-	-	0.0345	-	73	-
6.30 mm	100	-	-	0.0247	-	69	-
5.00 mm	100	-	-	0.0176	-	66	-
3.35 mm	100	-	-	0.0093	-	56	-
2.00 mm	99	-	-	0.0048	-	44	-
1.18 mm	98	-	-	0.0025	-	33	-
600 µm	97	-	-	0.0014	-	25	-
425 µm	96	-	-				
300 µm	95	-	-				
212 µm	92	-	-				
150 µm	88	-	-				
63 µm	81	-	-				
0 µm	0	-	-				

Specific Gravity (# if assumed) : 2.65 #  
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate  
 Sampling History : As received  
 The presence of any visible organic matter in the soil : None

**SUMMARY :**  
 Gravel (%) : 1  
 Sand (%) : 18  
 Silt (%) : 52  
 Clay (%) : 29



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Technician : C M Yip      Checked By : TK Lam      Approved By : Chung Hei Wing  
 Date : 14/04/2020      Date : 17/04/2020      Date : 17/04/2020

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**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

Date Received : 08/04/2020  
 Tested Date : 14/04/2020

Works Order No. : 272  
 Sample ID No. : HK2012460-013  
 Sample No. : E/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : †

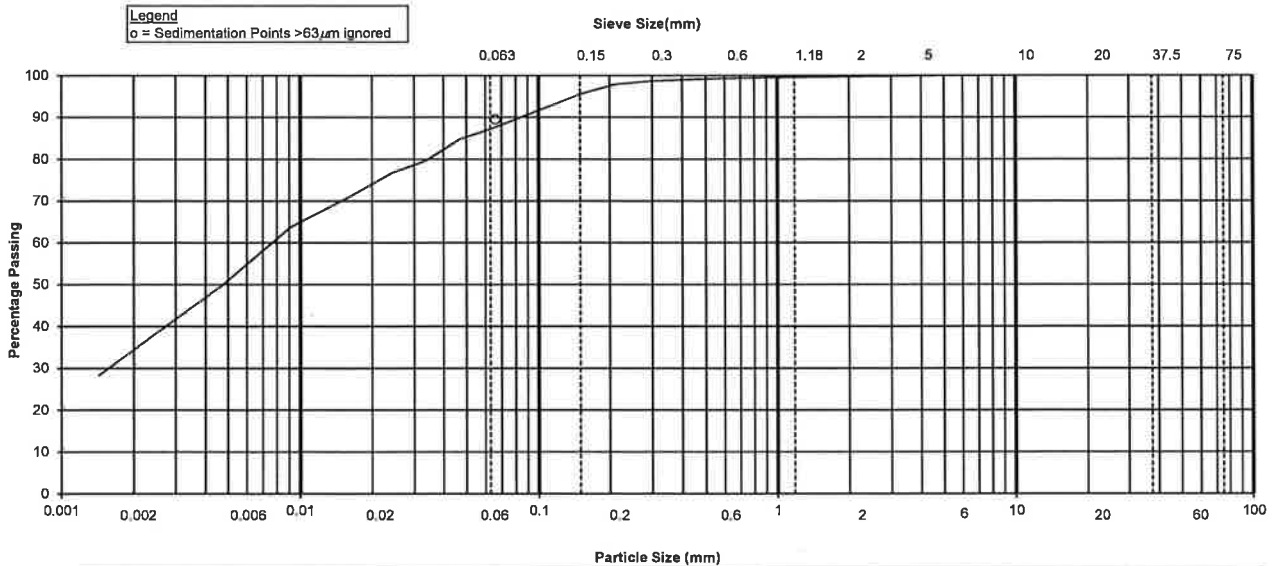
Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A      † Upon request      \* Delete as appropriate      † Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-	0.0661	-	90	-
75.0 mm	100	-	-	0.0474	-	85	-
63.0 mm	100	-	-	0.0340	-	80	-
50.0 mm	100	-	-	0.0243	-	77	-
37.5 mm	100	-	-	0.0174	-	72	-
28.0 mm	100	-	-	0.0092	-	64	-
20.0 mm	100	-	-	0.0047	-	50	-
14.0 mm	100	-	-	0.0024	-	38	-
10.0 mm	100	-	-	0.0014	-	28	-
6.30 mm	100	-	-				
5.00 mm	100	-	-				
3.35 mm	100	-	-				
2.00 mm	100	-	-				
1.18 mm	100	-	-				
600 µm	99	-	-				
425 µm	99	-	-				
300 µm	99	-	-				
212 µm	98	-	-				
150 µm	96	-	-				
63 µm	87	-	-				
0 µm	0	-	-				


Specific Gravity (# if assumed) : 2.65 #  
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate  
 Sampling History : As received  
 The presence of any visible organic matter in the soil : None

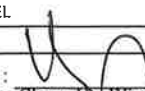
**SUMMARY :**  
 Gravel (%) : 0  
 Sand (%) : 13  
 Silt (%) : 53  
 Clay (%) : 34



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Technician : C M Yip  
 Date : 14/04/2020

Checked By :   
 Name : TK Lam  
 Date : 17/04/2020

Approved By :   
 Signatory : Chung Ho Wing  
 Date : 17/04/2020

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**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

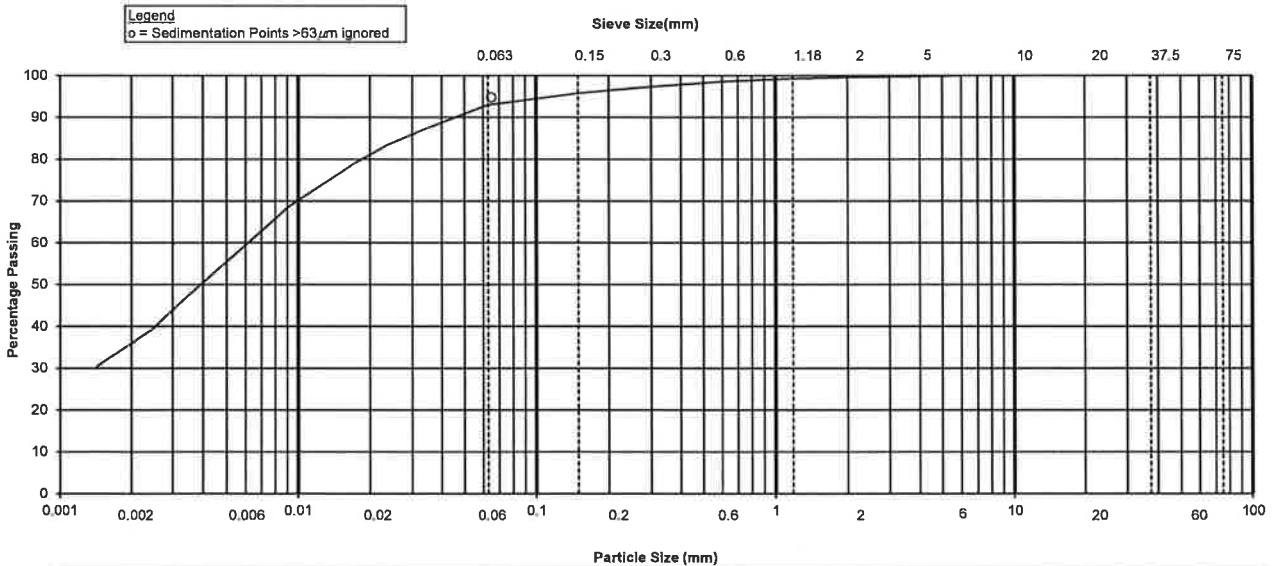
Date Received : 08/04/2020  
 Tested Date : 14/04/2020

Works Order No. : 272  
 Sample ID No. : HK2012460-014  
 Sample No. : F/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : †

Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A      † Upon request      \* Delete as appropriate      ‡ Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :			
100.0 mm	100	-	-	2.65 #			
75.0 mm	100	-	-	Dispersant Details :	Sodium hexametaphosphate, Sodium carbonate		
63.0 mm	100	-	-	Sampling History :	As received		
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None			
37.5 mm	100	-	-	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
28.0 mm	100	-	-	0.0651	-	95	-
20.0 mm	100	-	-	0.0467	-	90	-
14.0 mm	100	-	-	0.0333	-	87	-
10.0 mm	100	-	-	0.0238	-	83	-
6.30 mm	100	-	-	0.0171	-	79	-
5.00 mm	100	-	-	0.0091	-	69	-
3.35 mm	100	-	-	0.0047	-	54	-
2.00 mm	100	-	-	0.0024	-	39	-
1.18 mm	99	-	-	0.0014	-	30	-
600 µm	99	-	-	<b>SUMMARY :</b>			
425 µm	98	-	-	Gravel (%) :	0		
300 µm	97	-	-	Sand (%) :	7		
212 µm	97	-	-	Silt (%) :	58		
150 µm	96	-	-	Clay (%) :	35		
63 µm	93	-	-				
0 µm	0	-	-				



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Technician : C M Yip  
 Date : 14/04/2020

Checked By : TK Lam  
 Date : 17/04/2020

Approved By : Chung Hei Wing  
 Date : 17/04/2020

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**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

Date Received : 08/04/2020  
 Tested Date : 14/04/2020

Works Order No. : 272  
 Sample ID No. : HK2012460-015  
 Sample No. : G/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : †

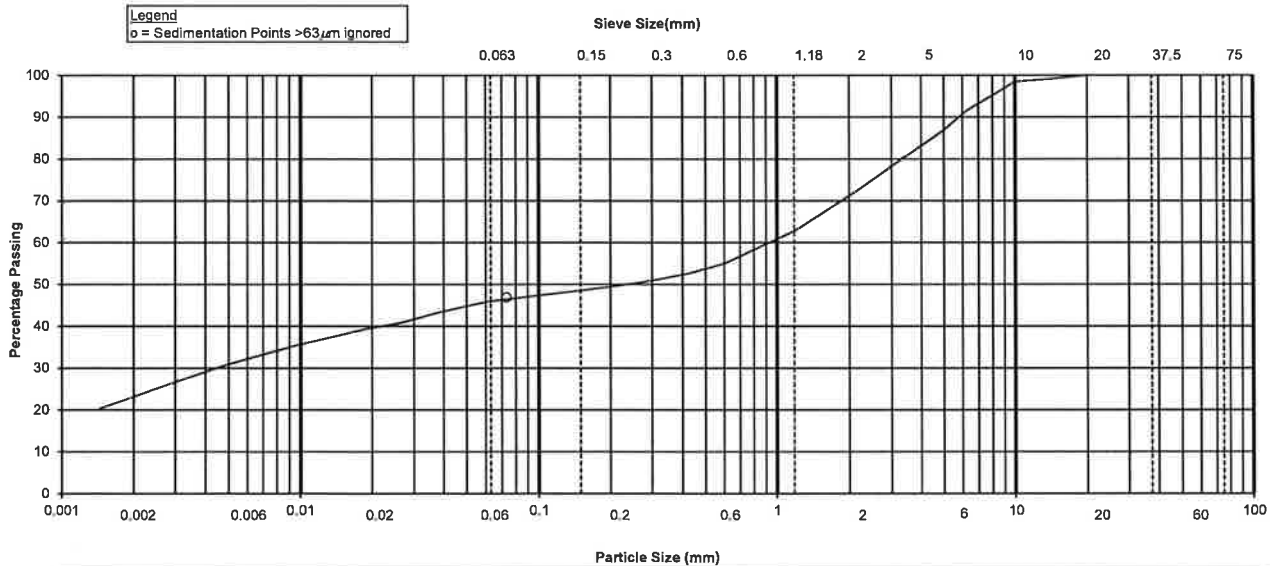
Description : Dark grey, slightly sandy, slightly gravelly SILT/CLAY with shell fragments  
 Sieve Method : Method A      † Upon request      \* Delete as appropriate

† Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-				
75.0 mm	100	-	-				
63.0 mm	100	-	-				
50.0 mm	100	-	-				
37.5 mm	100	-	-				
28.0 mm	100	-	-				
20.0 mm	100	-	-	0.0734	-	47	-
14.0 mm	99	-	-	0.0521	-	45	-
10.0 mm	98	-	-	0.0370	-	43	-
6.30 mm	92	-	-	0.0264	-	41	-
5.00 mm	87	-	-	0.0187	-	39	-
3.35 mm	80	-	-	0.0098	-	36	-
2.00 mm	71	-	-	0.0049	-	31	-
1.18 mm	63	-	-	0.0025	-	25	-
600 µm	55	-	-	0.0015	-	20	-
425 µm	53	-	-				
300 µm	51	-	-				
212 µm	50	-	-				
150 µm	49	-	-				
63 µm	46	-	-				
0 µm	0	-	-				

Specific Gravity (# if assumed) : 2.65 #  
 Dispersant Details : Sodium hexametaphosphate, Sodium carbonate  
 Sampling History : As received  
 The presence of any visible organic matter in the soil : None

SUMMARY :			
Gravel (%)	:	29	
Sand (%)	:	25	
Silt (%)	:	23	
Clay (%)	:	23	



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COBBLES
	SILT			SAND			GRAVEL			

Technician : C M Yip  
 Date : 14/04/2020

Checked By : TK Lam  
 Date : 17/04/2020

Approved By : Chung Hei Wing  
 Date : 17/04/2020

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**TEST REPORT**  
**DETERMINATION OF**  
**PARTICLE SIZE DISTRIBUTION**  
**GEOSPEC 3 : 2001 Test Method 8.1 / 8.2\*, 8.5 / 8.6\* and 8.7**  
**(Wet Sieve and Hydrometer Method)**

Job No. : J2999 Contract No. :  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Report No. : J2999-272.70

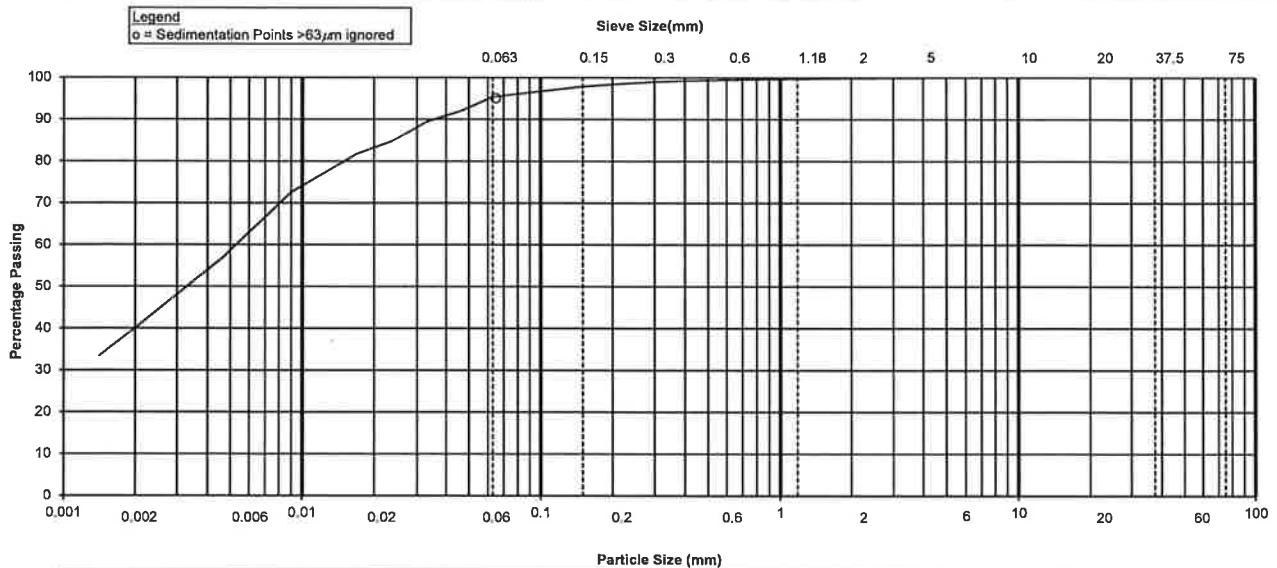
Works Order No. : 272  
 Sample ID No. : HK2012460-016  
 Sample No. : H/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : ‡

Date Received : 08/04/2020  
 Tested Date : 14/04/2020

Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

Sieve Method : Method A      ^ Upon request      \* Delete as appropriate      ‡ Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :			
100.0 mm	100	-	-	2.65 #			
75.0 mm	100	-	-	Dispersant Details :	Sodium hexametaphosphate, Sodium carbonate		
63.0 mm	100	-	-	Sampling History :	As received		
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None			
37.5 mm	100	-	-	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % finer than D (%)
28.0 mm	100	-	-	0.0649	-	95	-
20.0 mm	100	-	-	0.0464	-	92	-
14.0 mm	100	-	-	0.0330	-	89	-
10.0 mm	100	-	-	0.0237	-	85	-
6.30 mm	100	-	-	0.0169	-	82	-
5.00 mm	100	-	-	0.0090	-	72	-
3.35 mm	100	-	-	0.0047	-	57	-
2.00 mm	100	-	-	0.0024	-	44	-
1.18 mm	100	-	-	0.0014	-	33	-
600 µm	99	-	-	<b>SUMMARY :</b>			
425 µm	99	-	-	Gravel (%) :	0		
300 µm	99	-	-	Sand (%) :	5		
212 µm	98	-	-	Silt (%) :	56		
150 µm	98	-	-	Clay (%) :	39		
63 µm	95	-	-				
0 µm	0	-	-				



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	COB- BLES
	SILT			SAND			GRAVEL			

Technician : C M Yip  
 Date : 14/04/2020

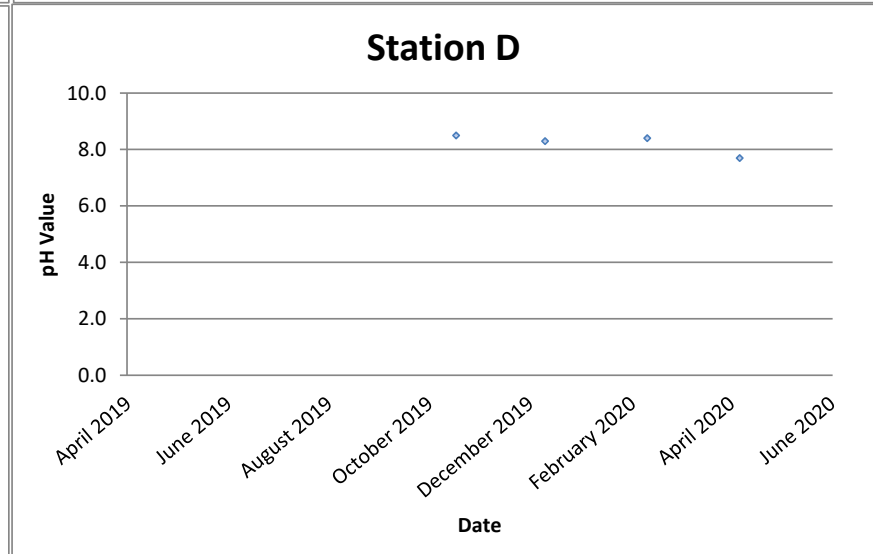
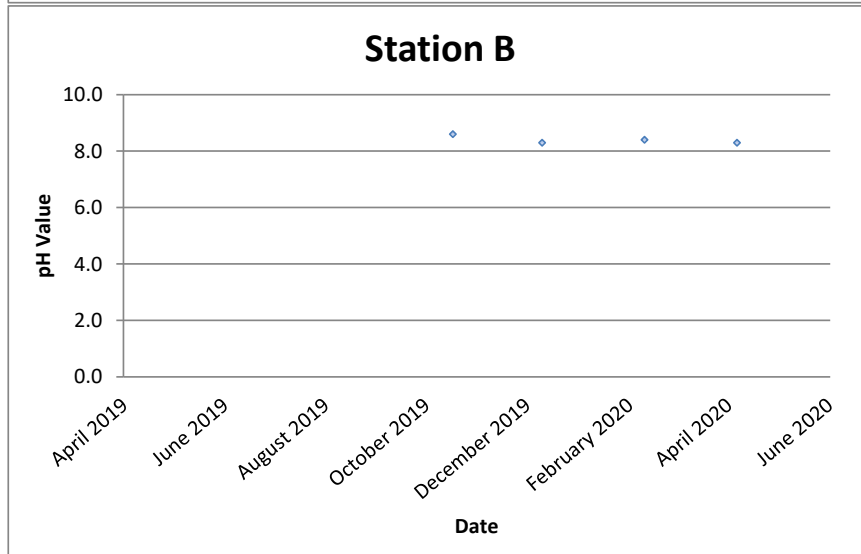
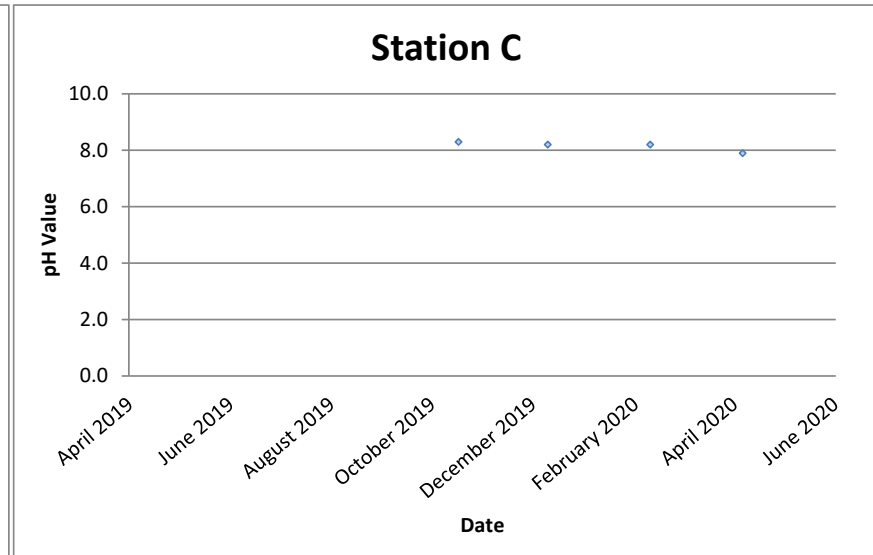
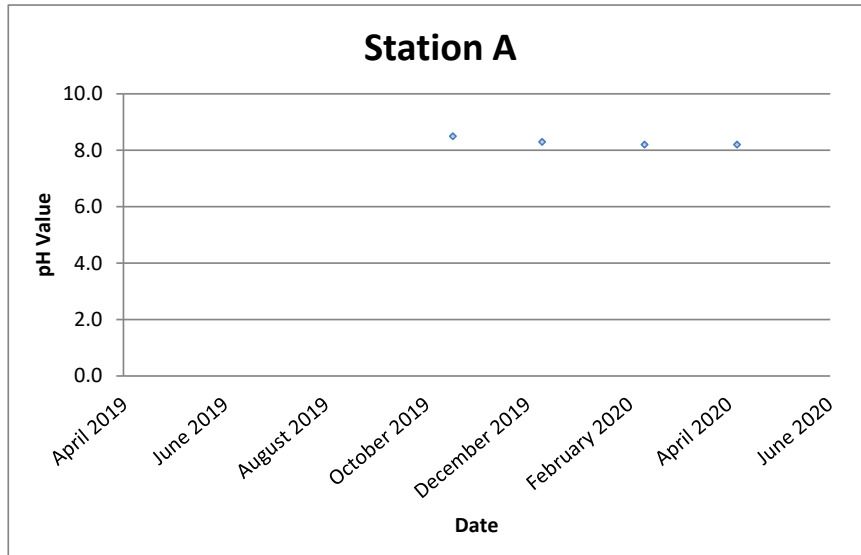
Checked By : TK Lam  
 Date : 17/04/2020

Approved By : Chung Hoi Wing  
 Date : 17/04/2020

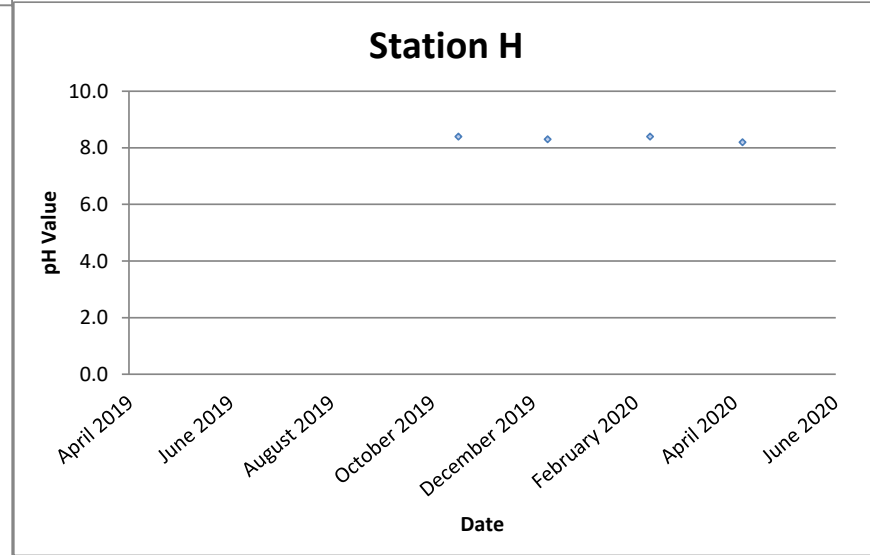
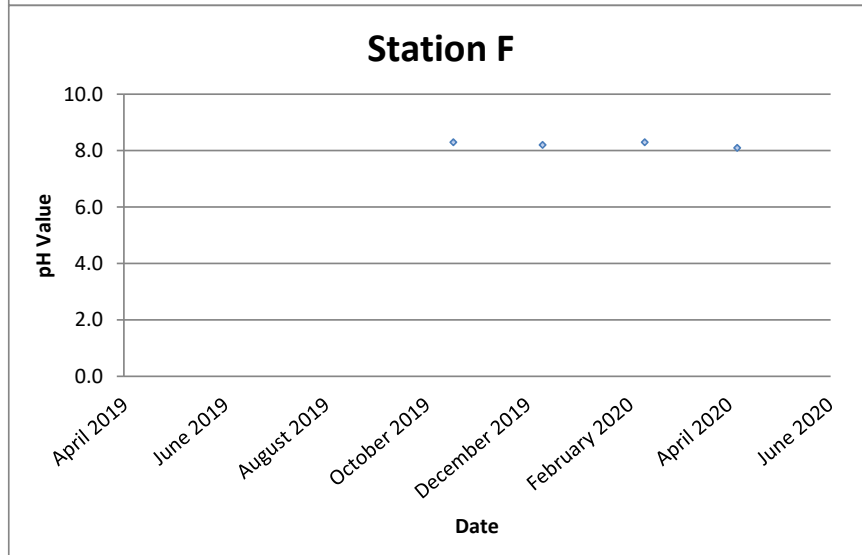
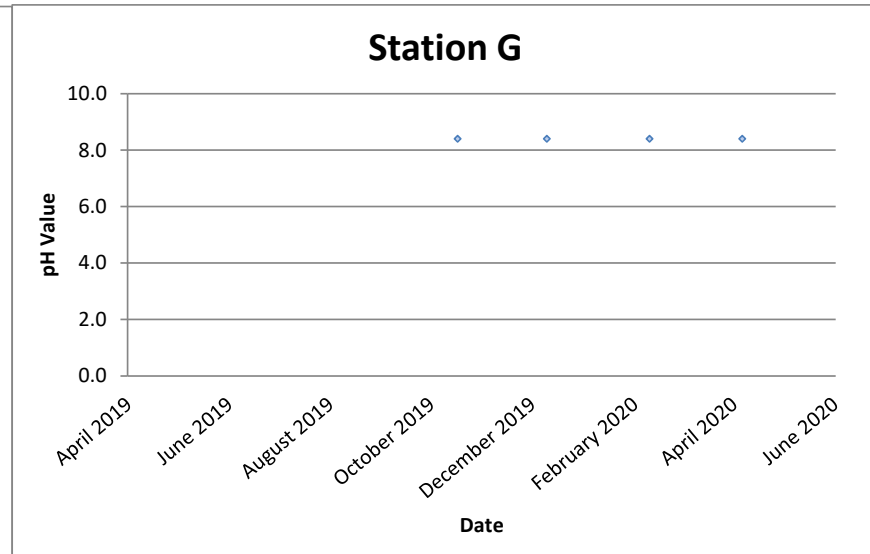
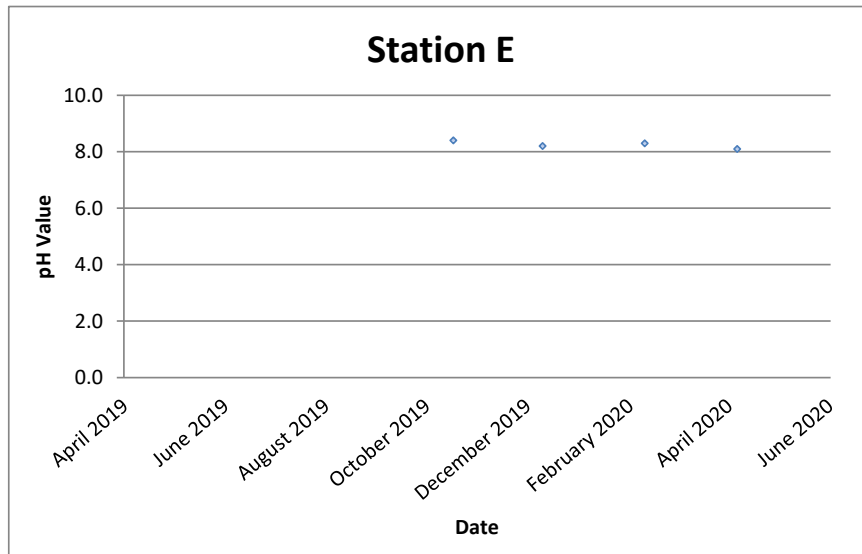
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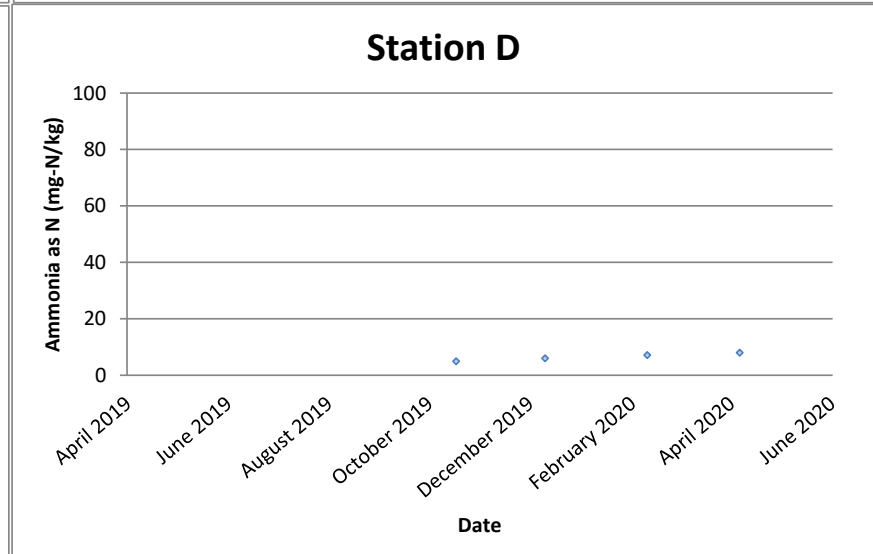
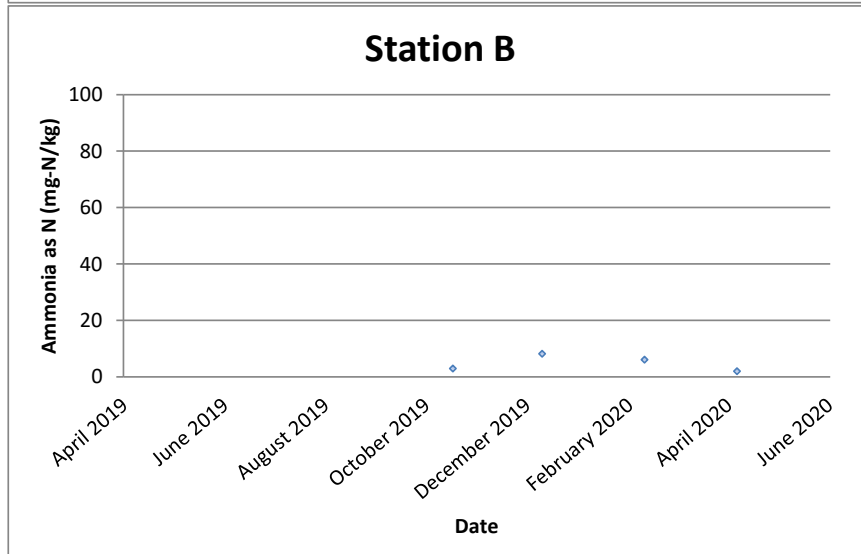
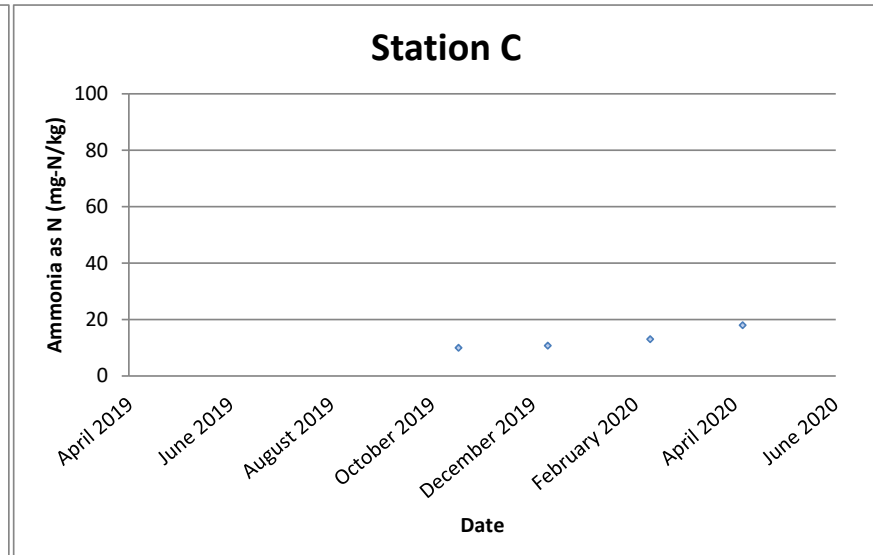
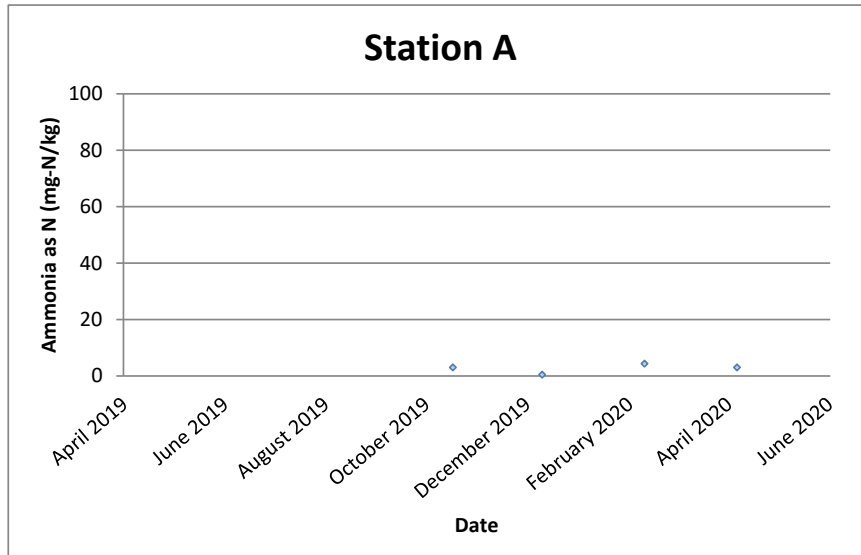
pH value



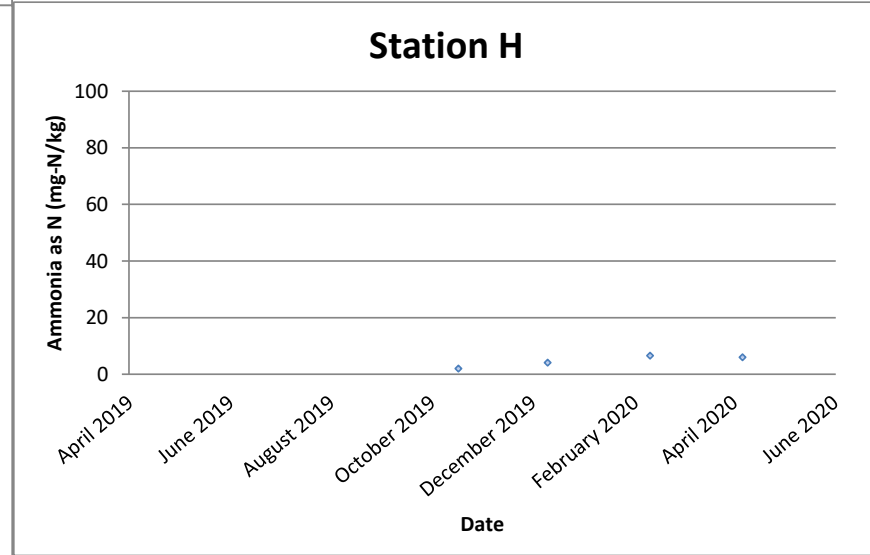
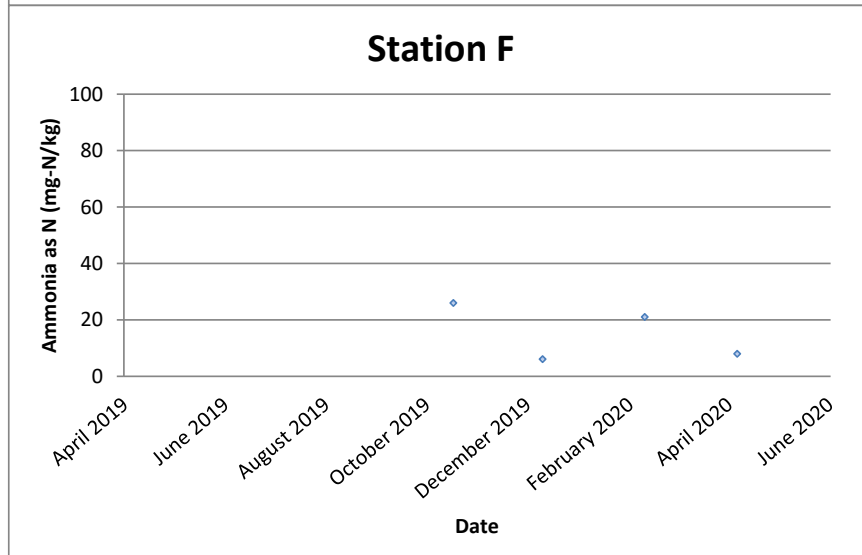
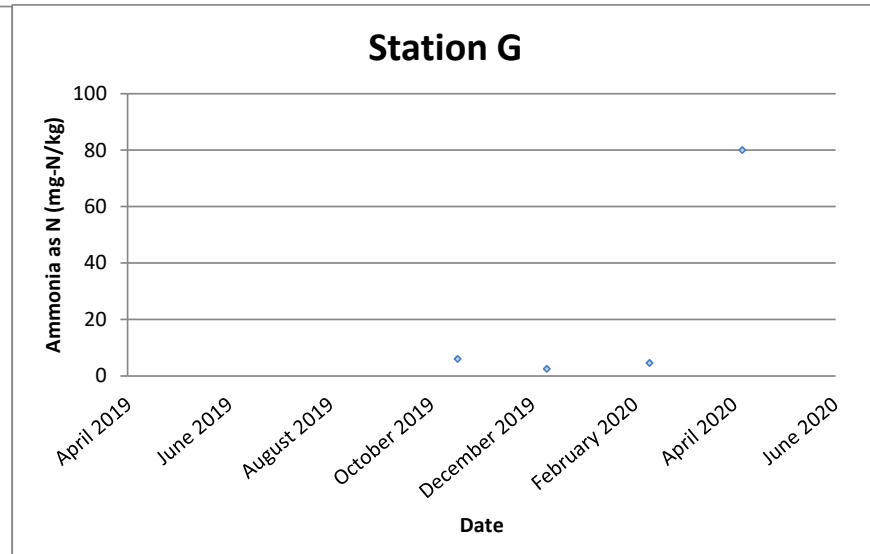
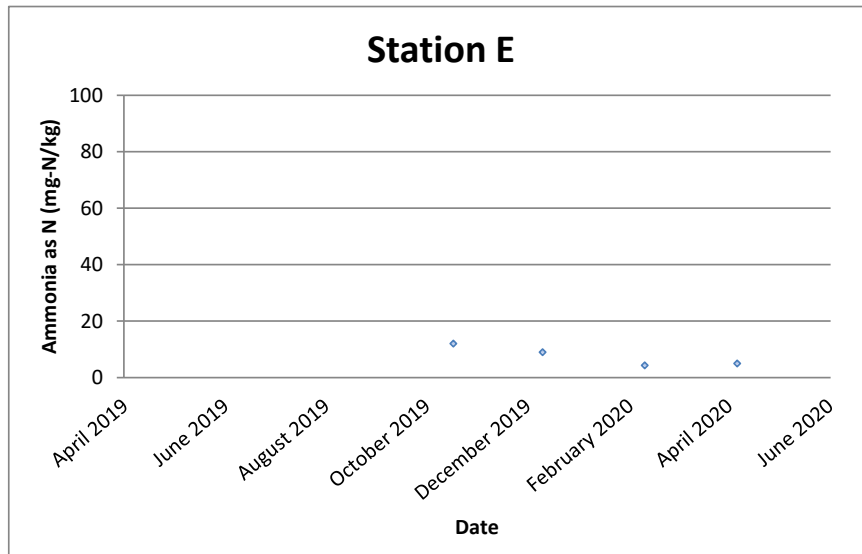
pH value



# Ammonia Nitrogen (mg-N/kg)

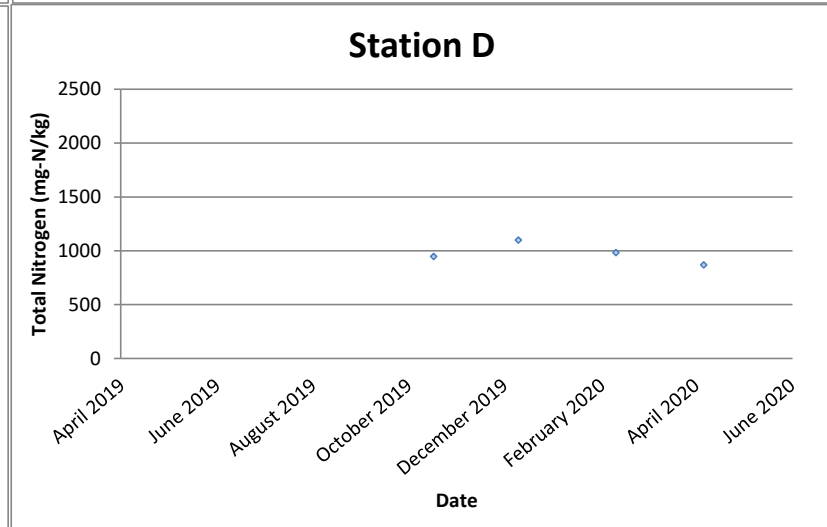
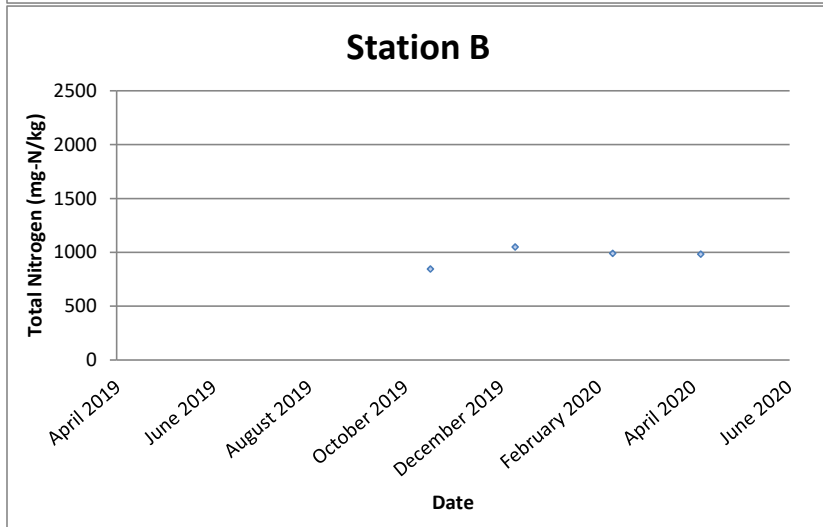
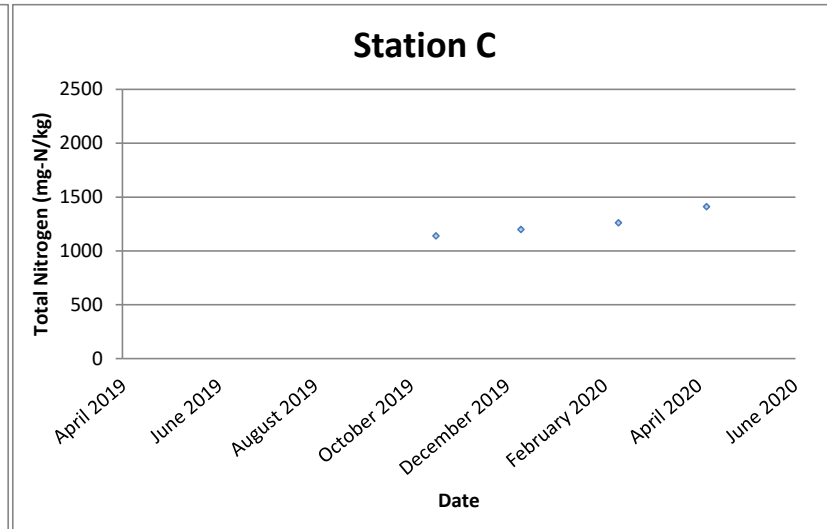
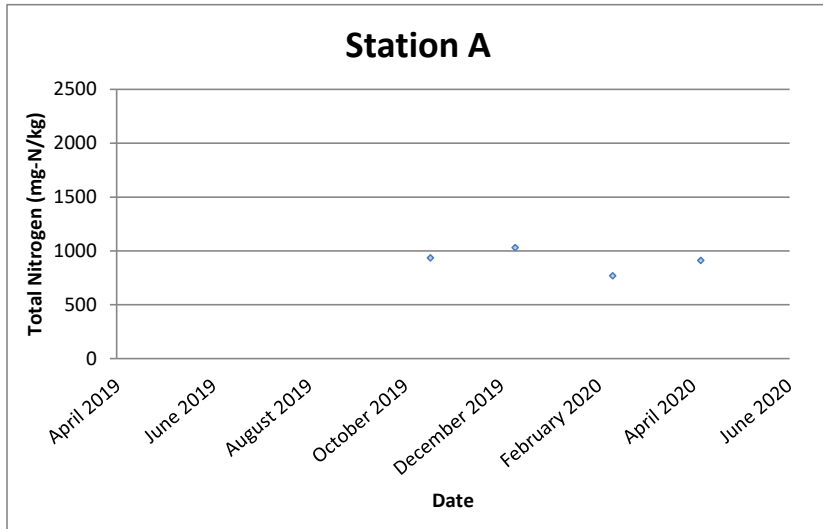


Ammonia Nitrogen (mg-N/kg)

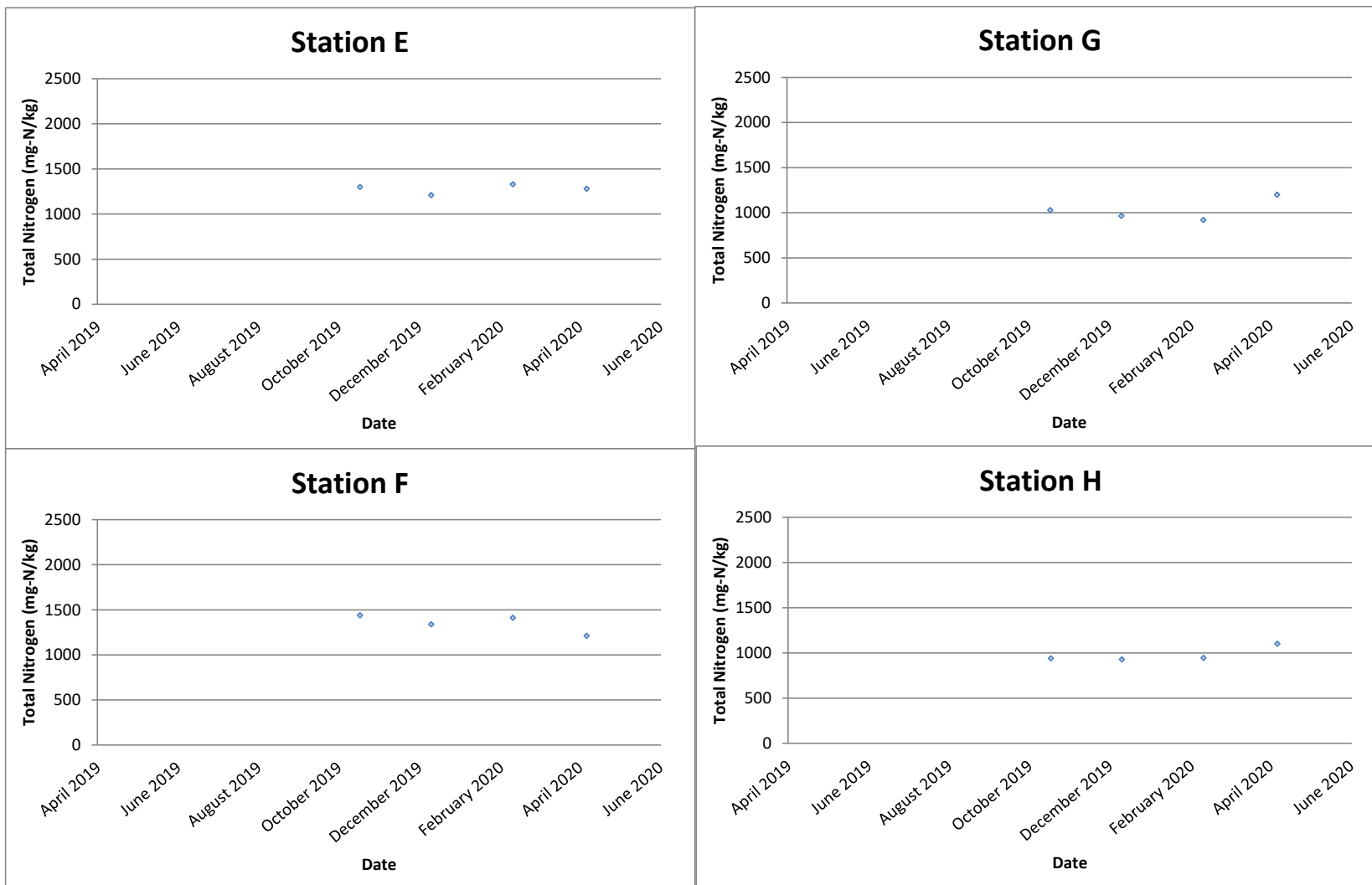




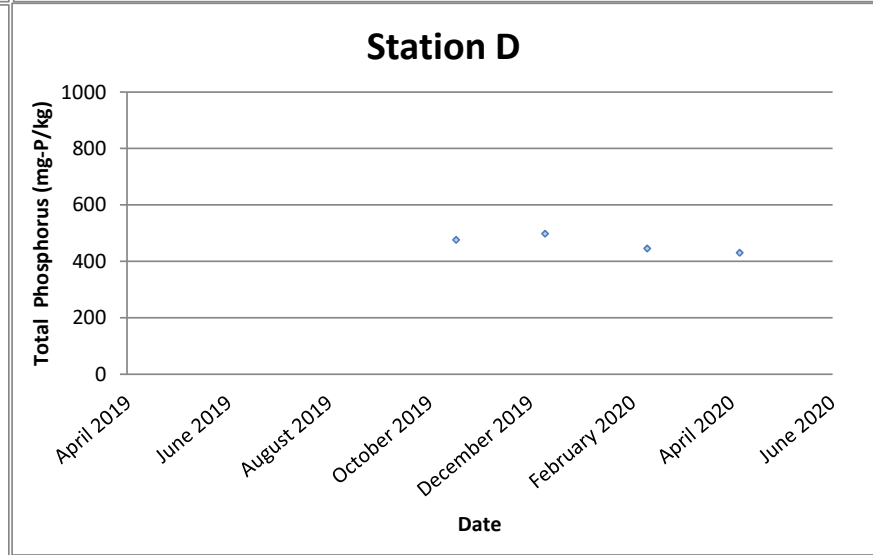
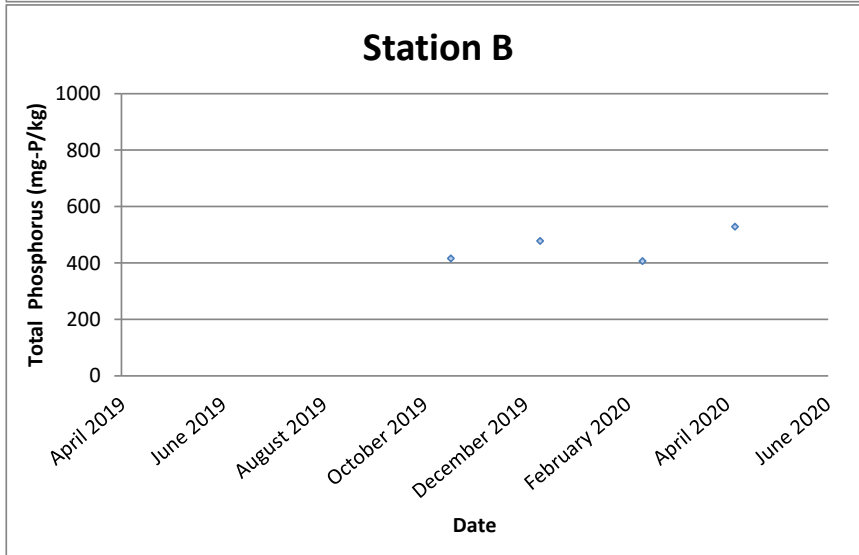
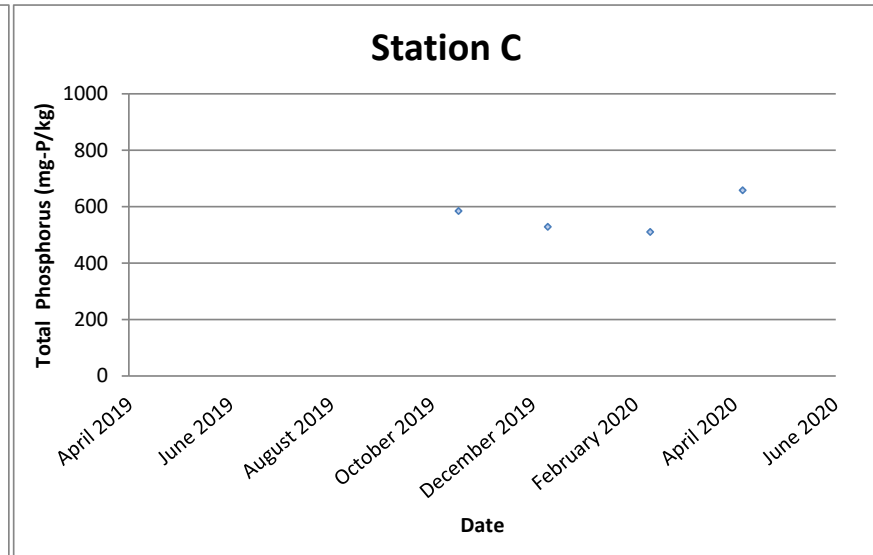
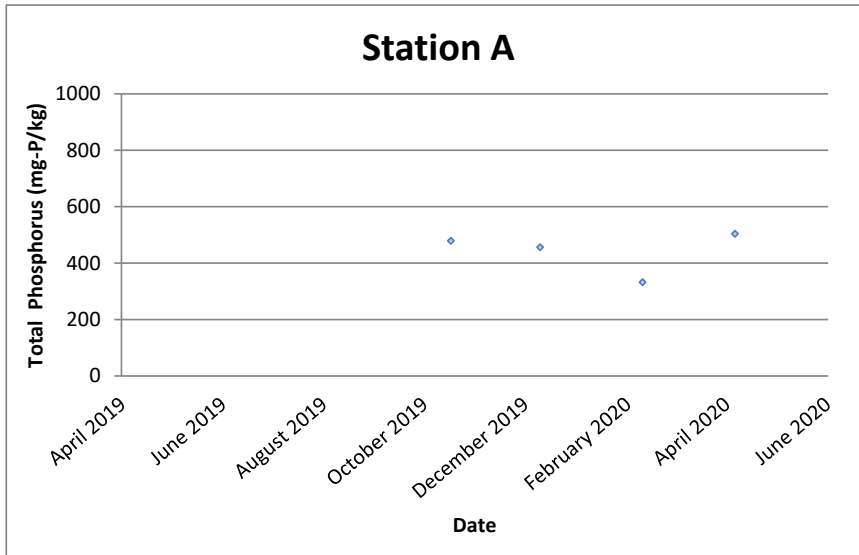
Total Nitrogen (mg-N/kg)



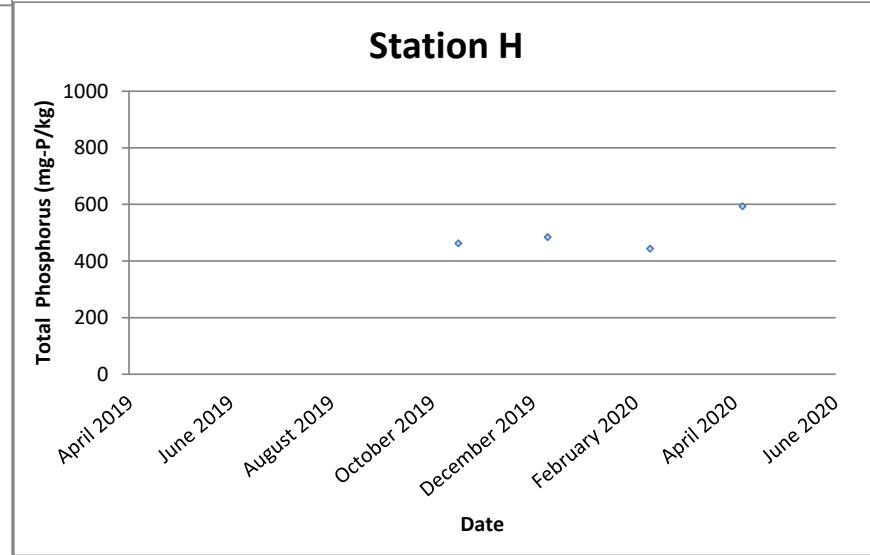
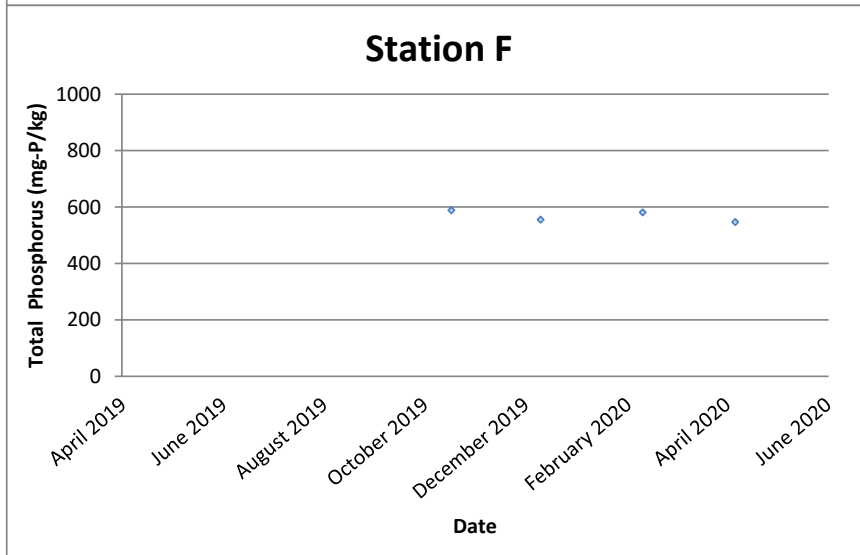
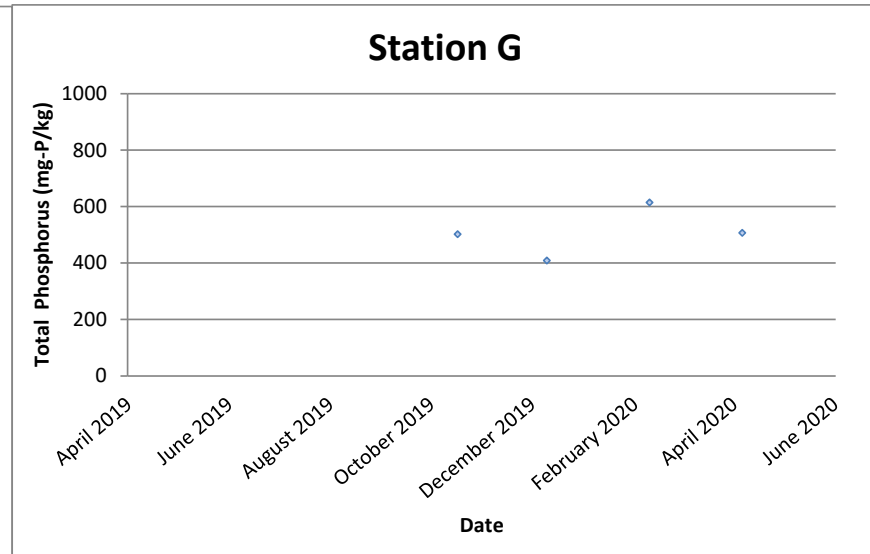
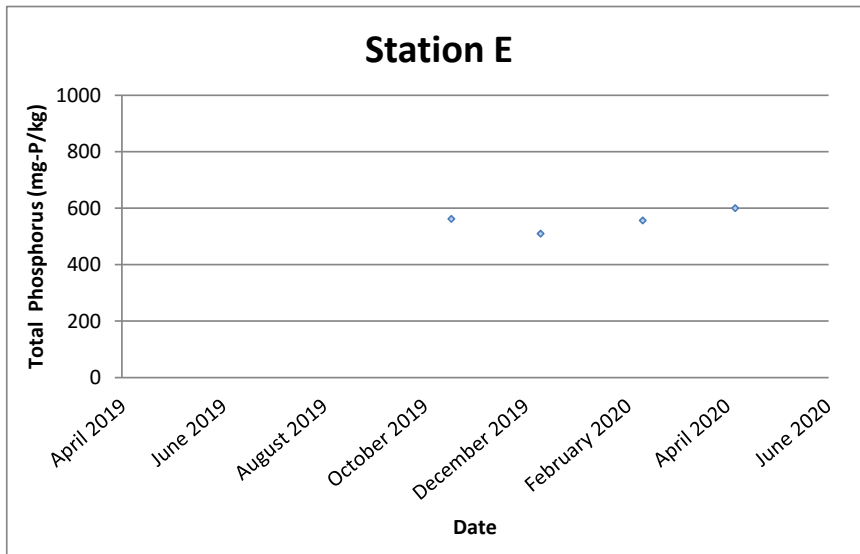
Total Nitrogen (mg-N/kg)



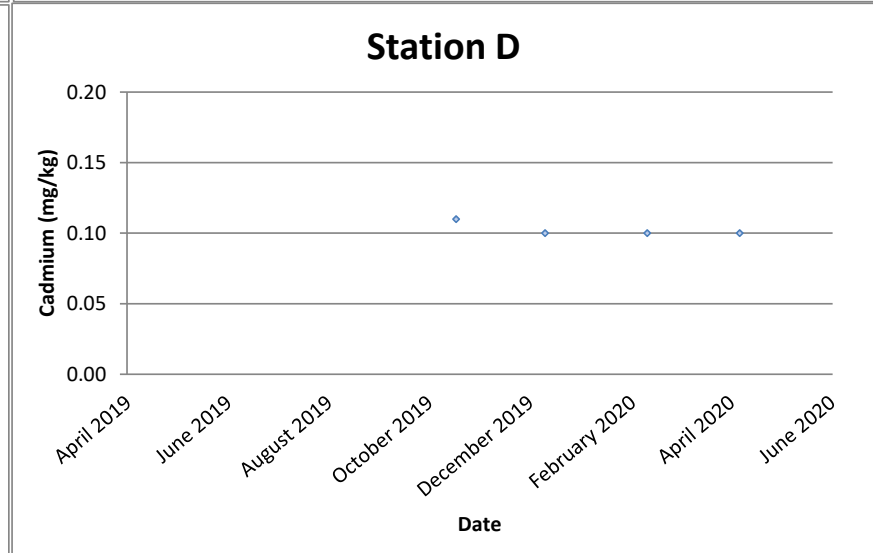
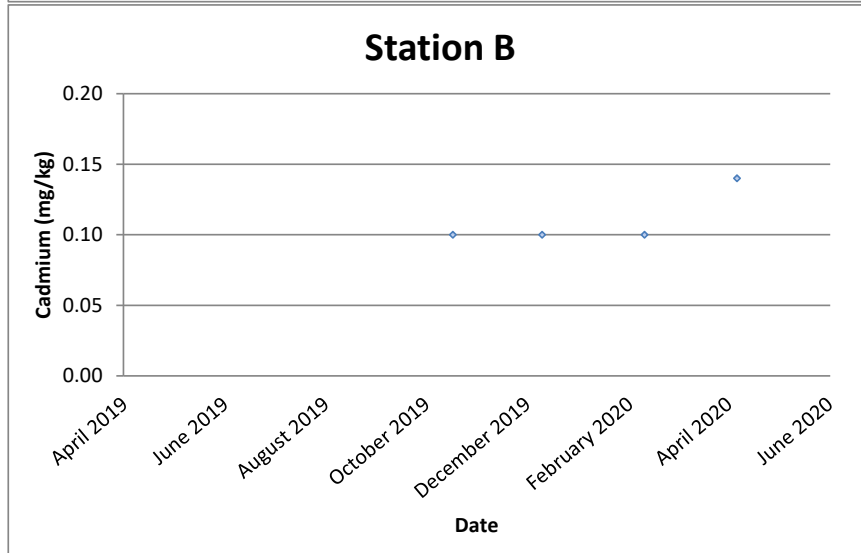
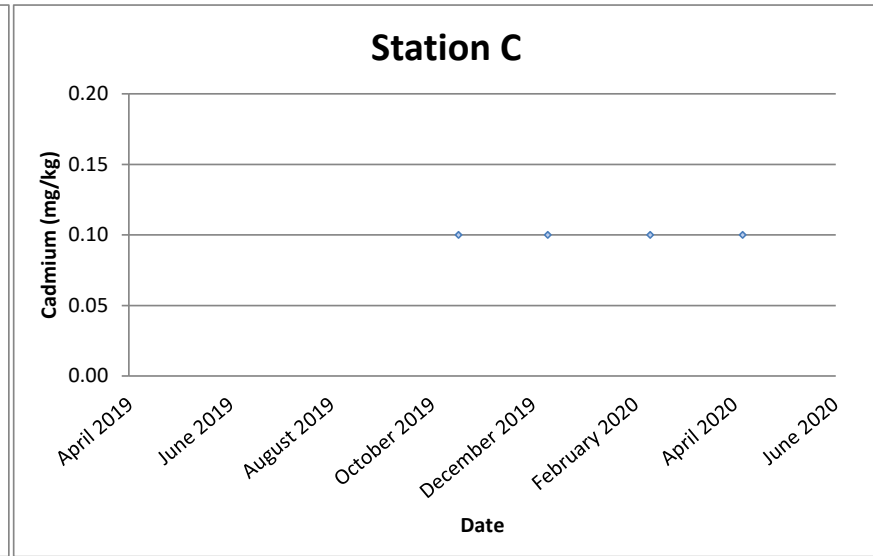
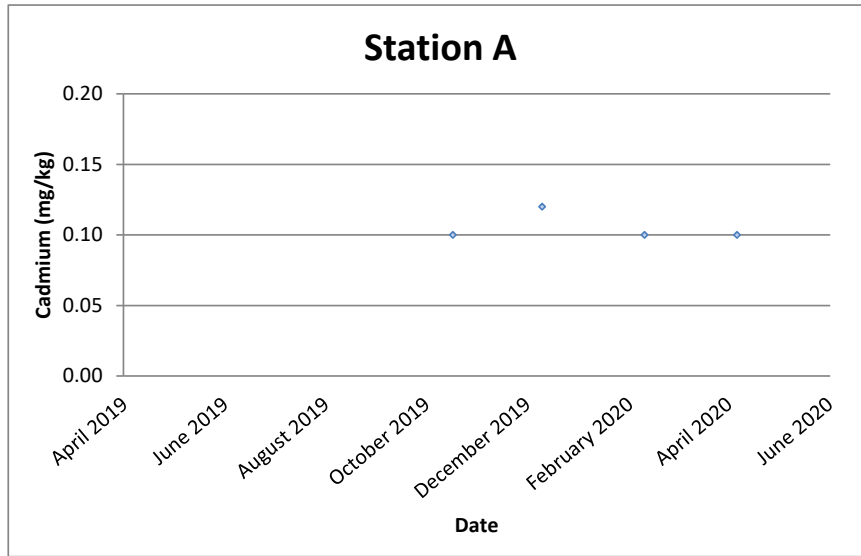
Total Phosphorus (mg-P/kg)



Total Phosphorus (mg-P/kg)

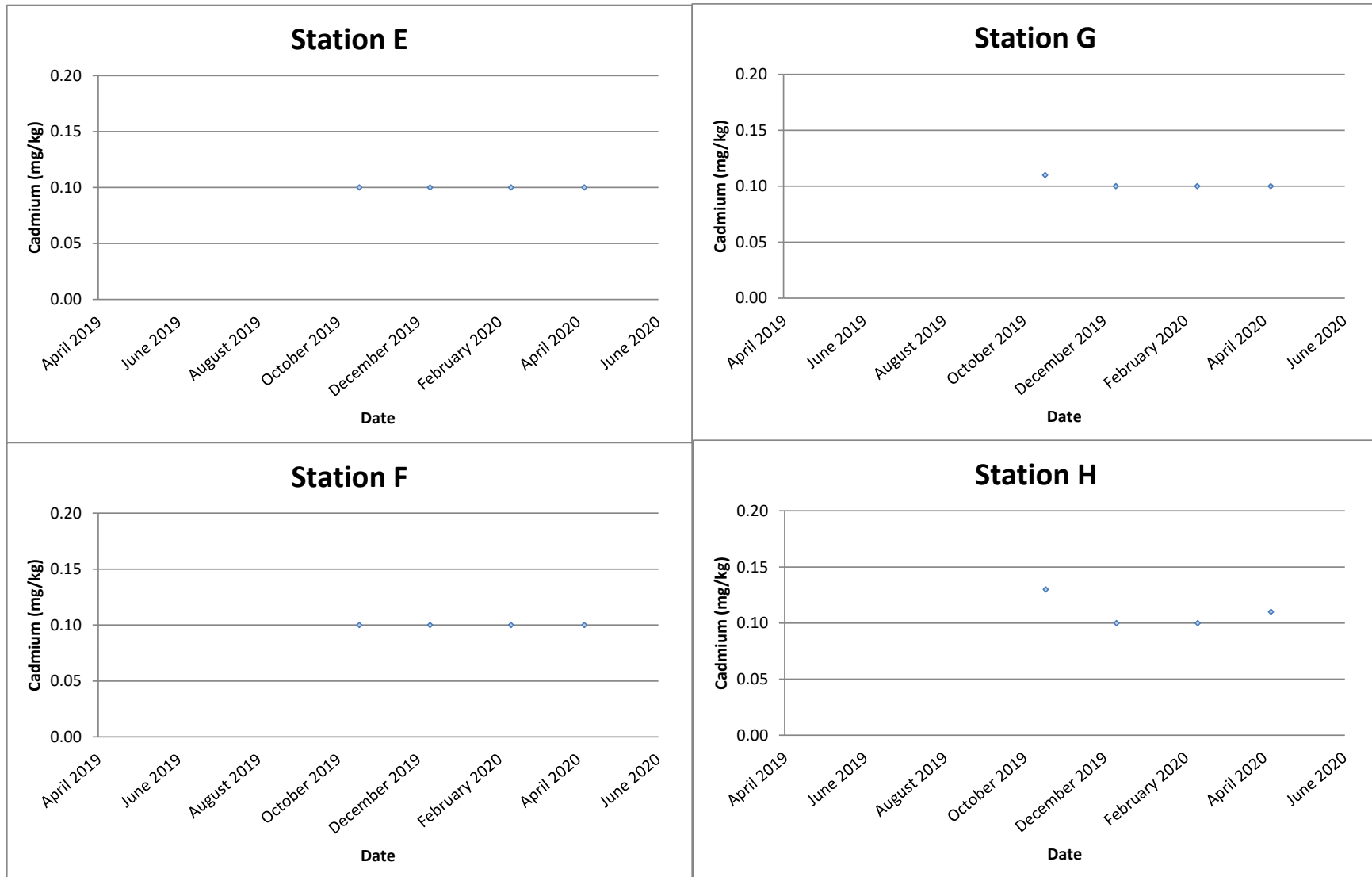


Cadmium (mg/kg)



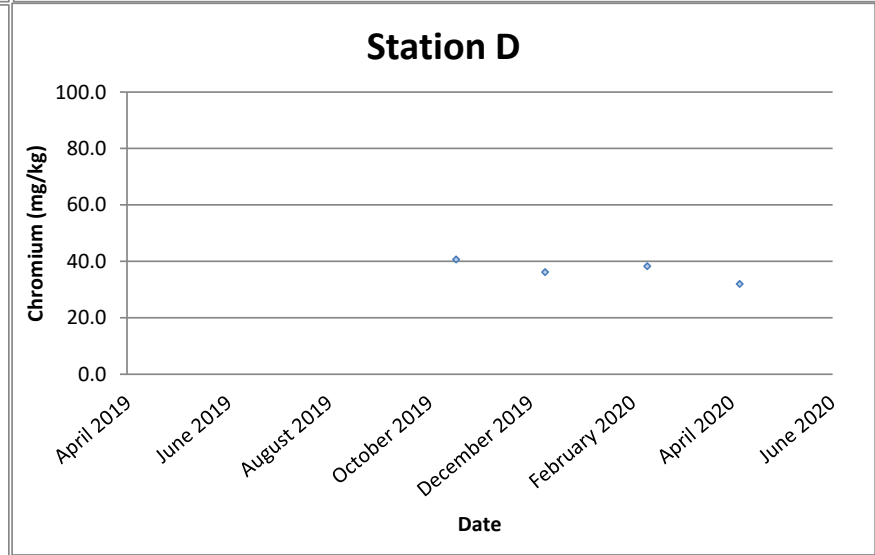
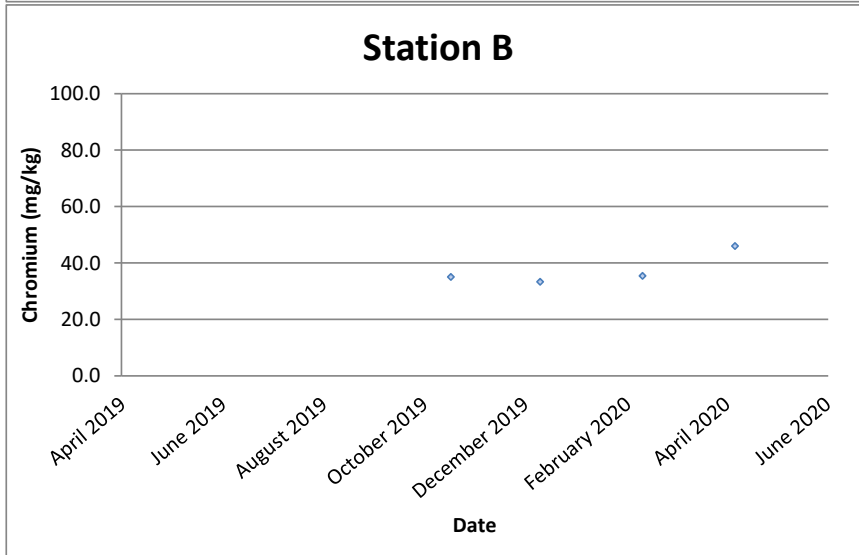
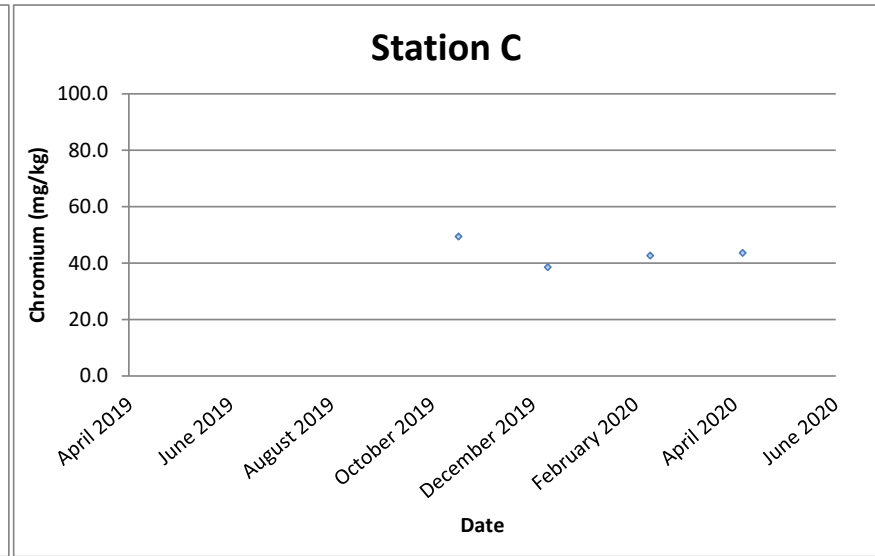
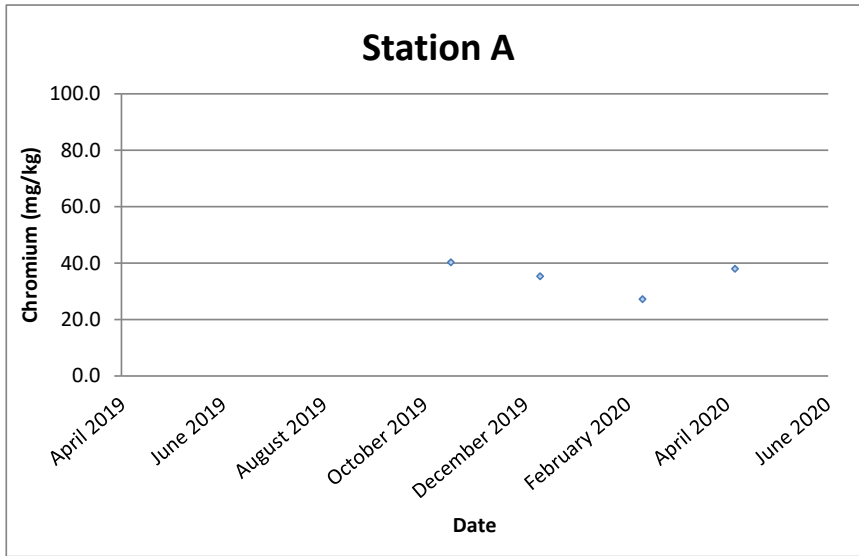
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# Cadmium (mg/kg)

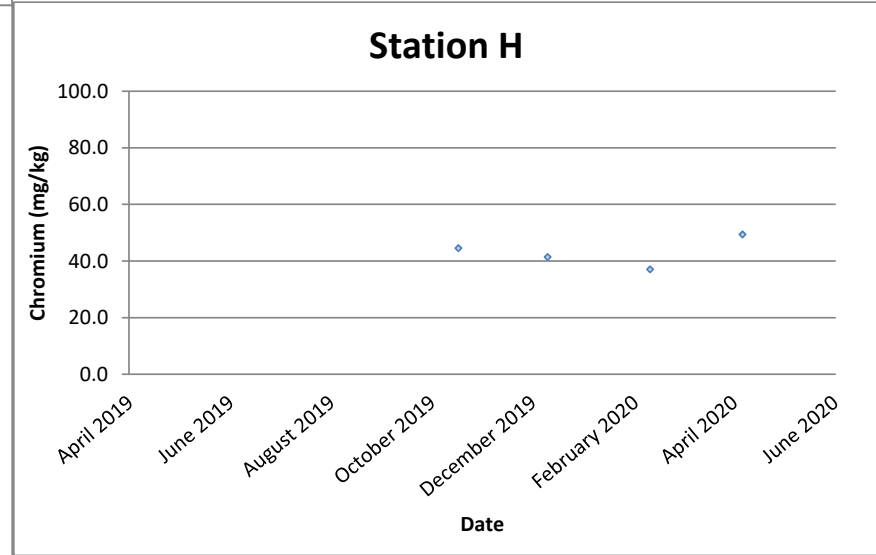
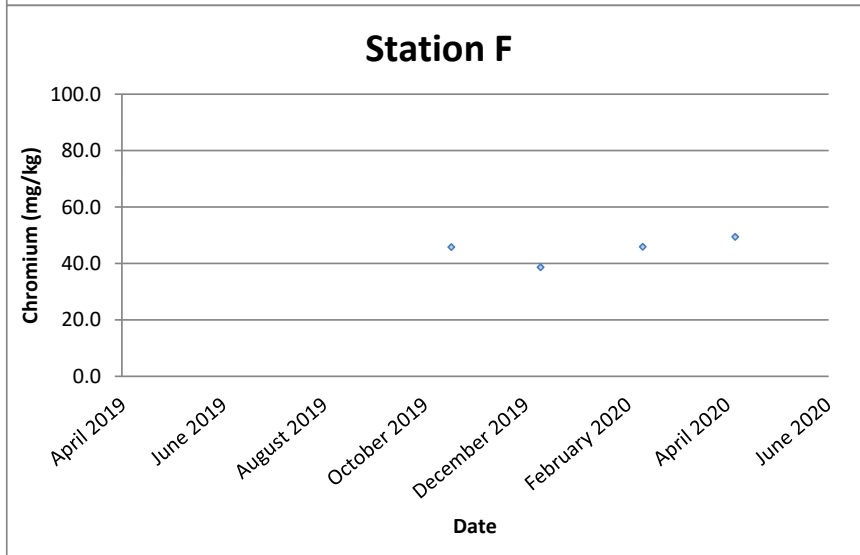
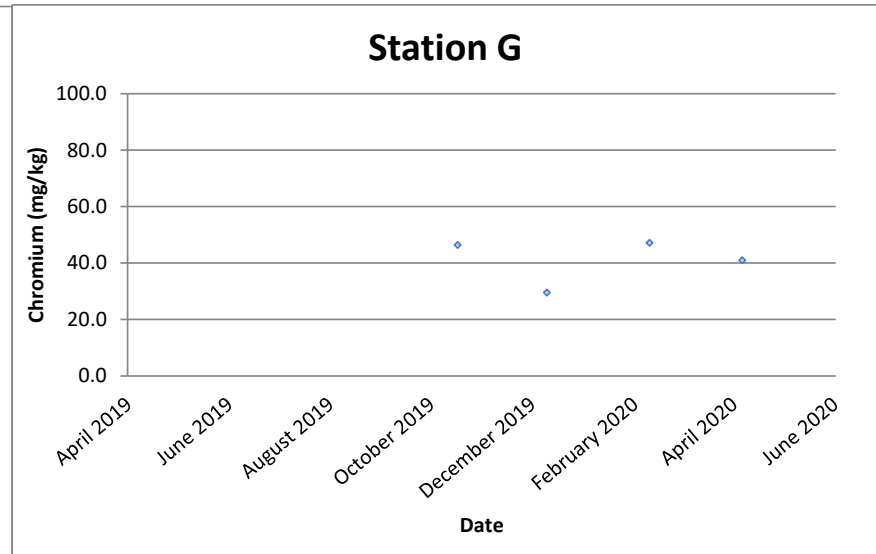
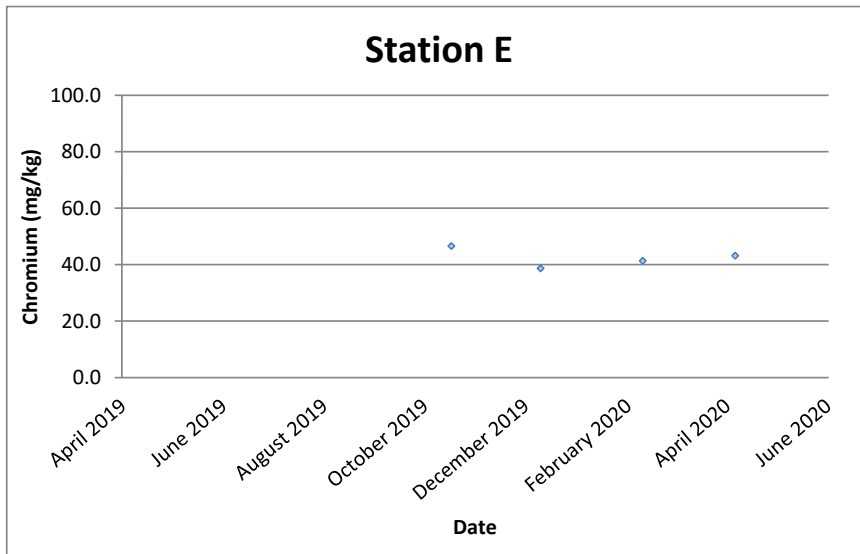


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Chromium (mg/kg)

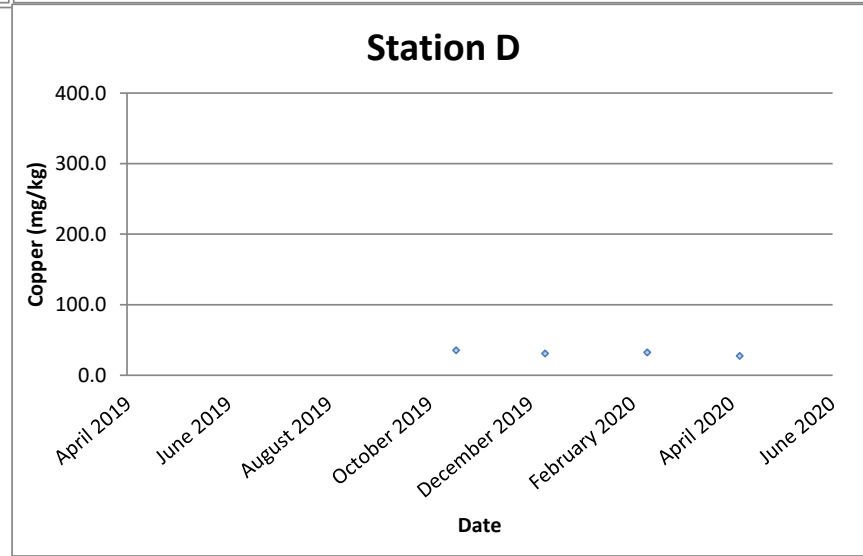
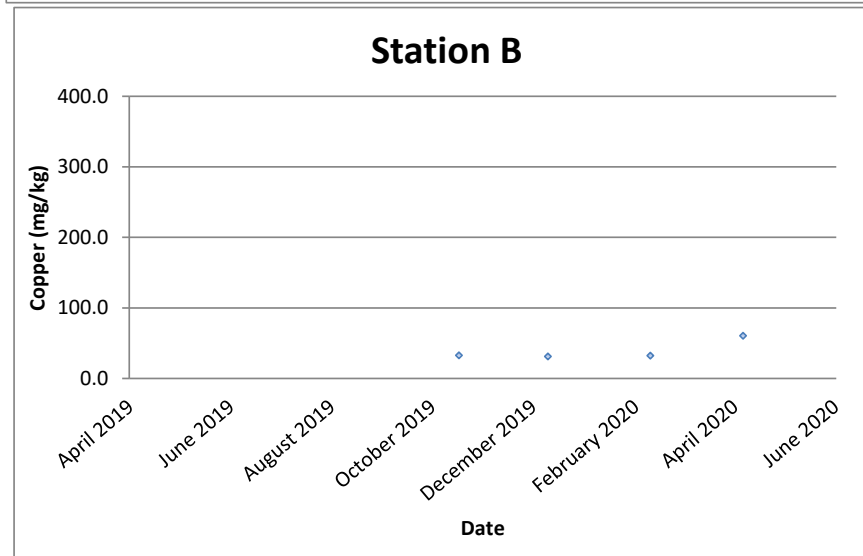
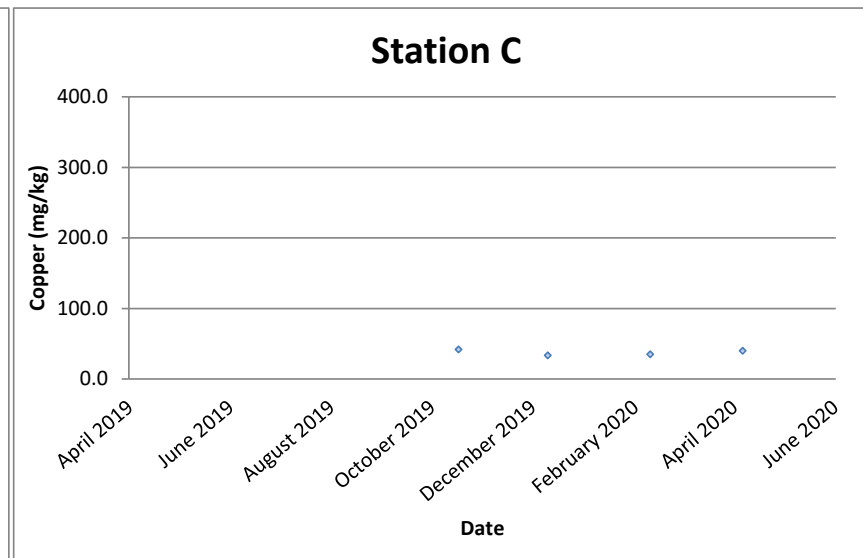
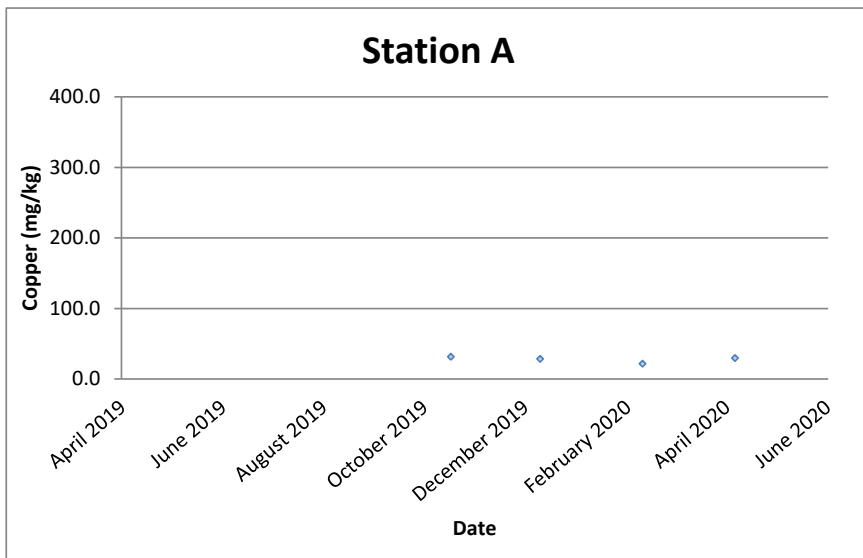


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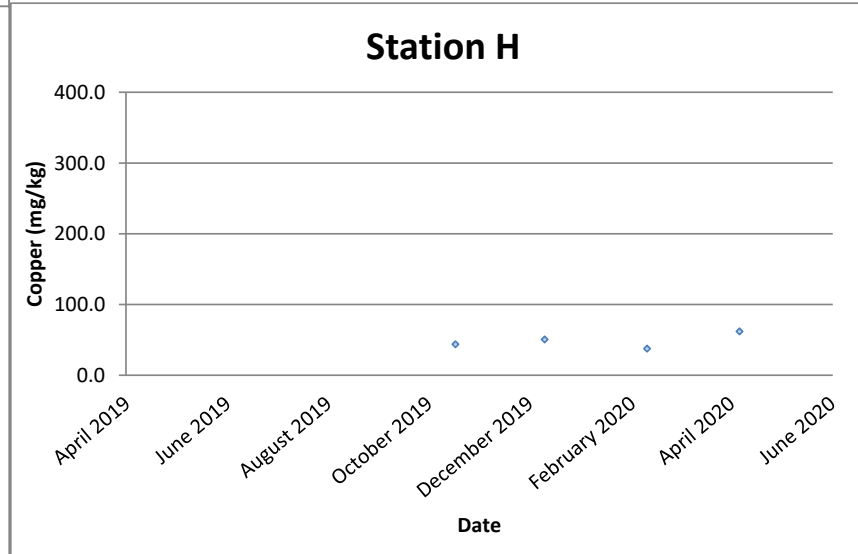
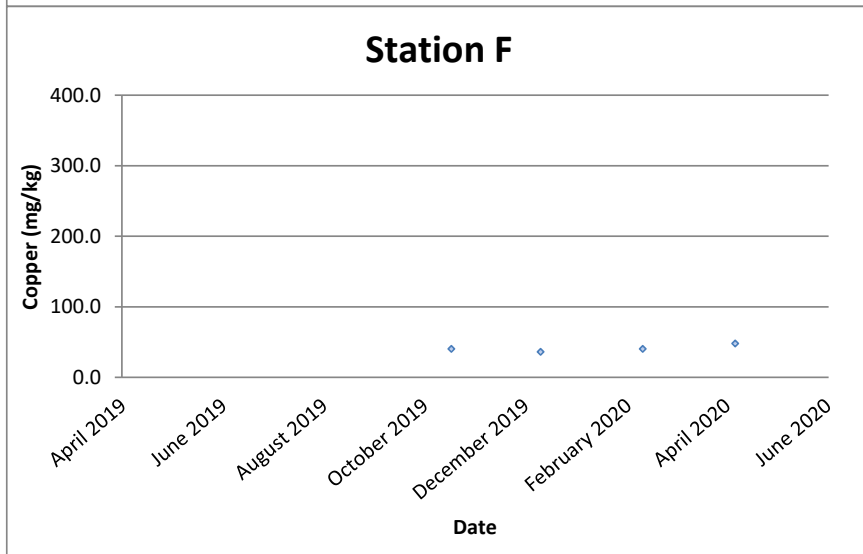
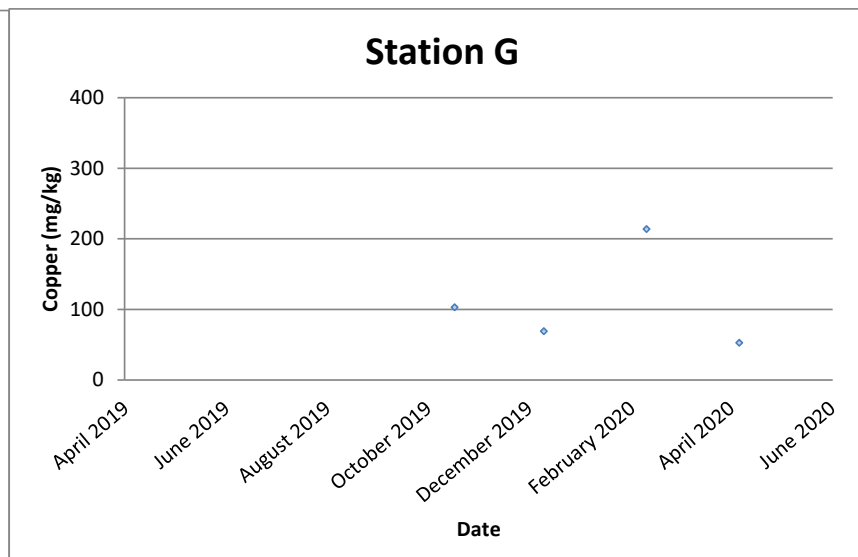
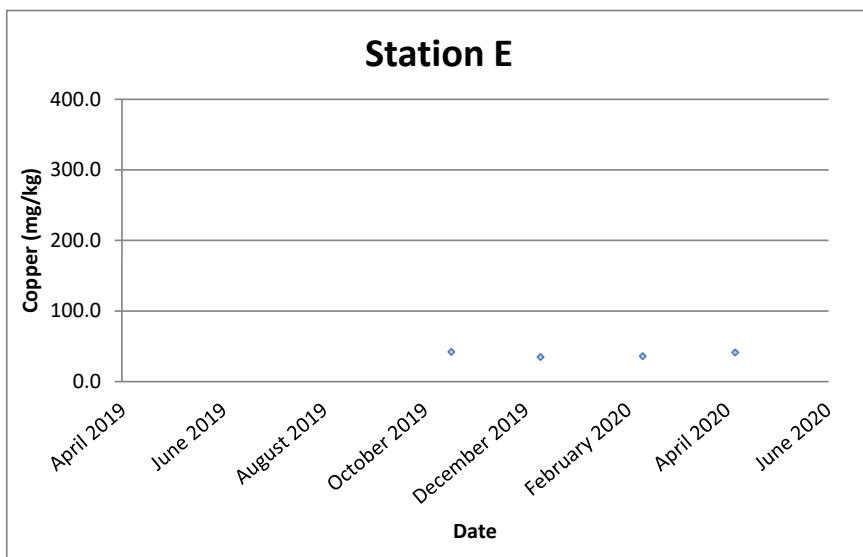




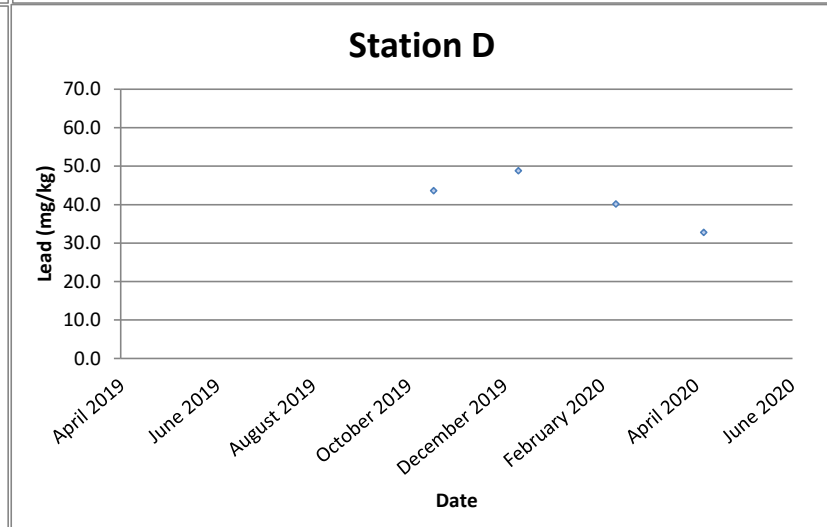
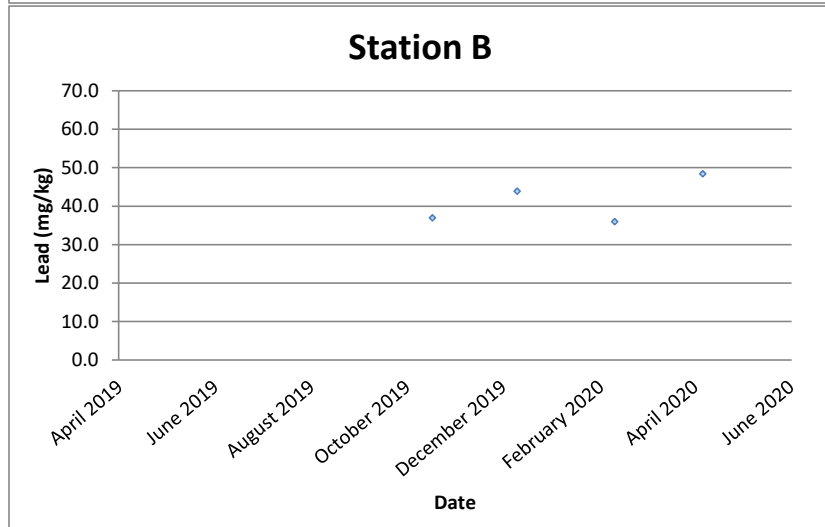
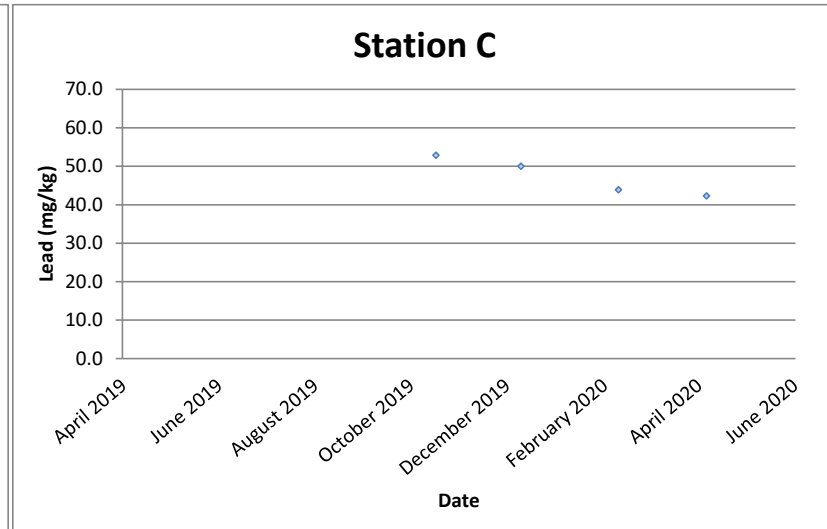
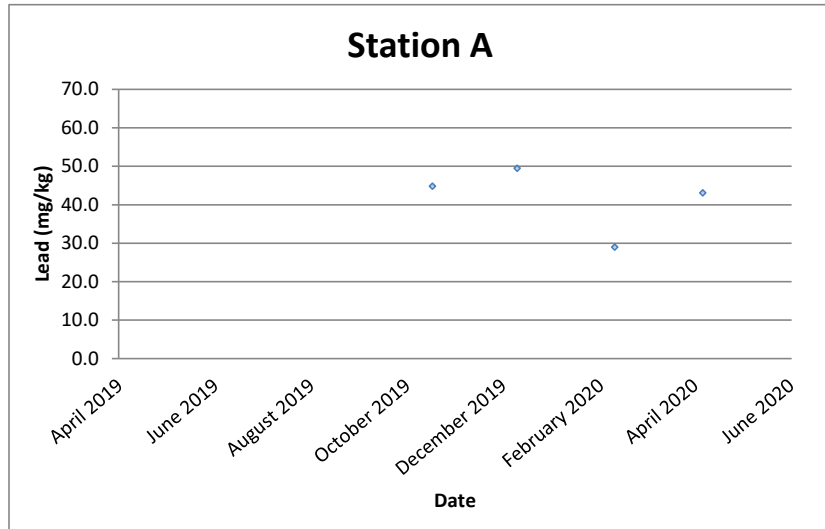
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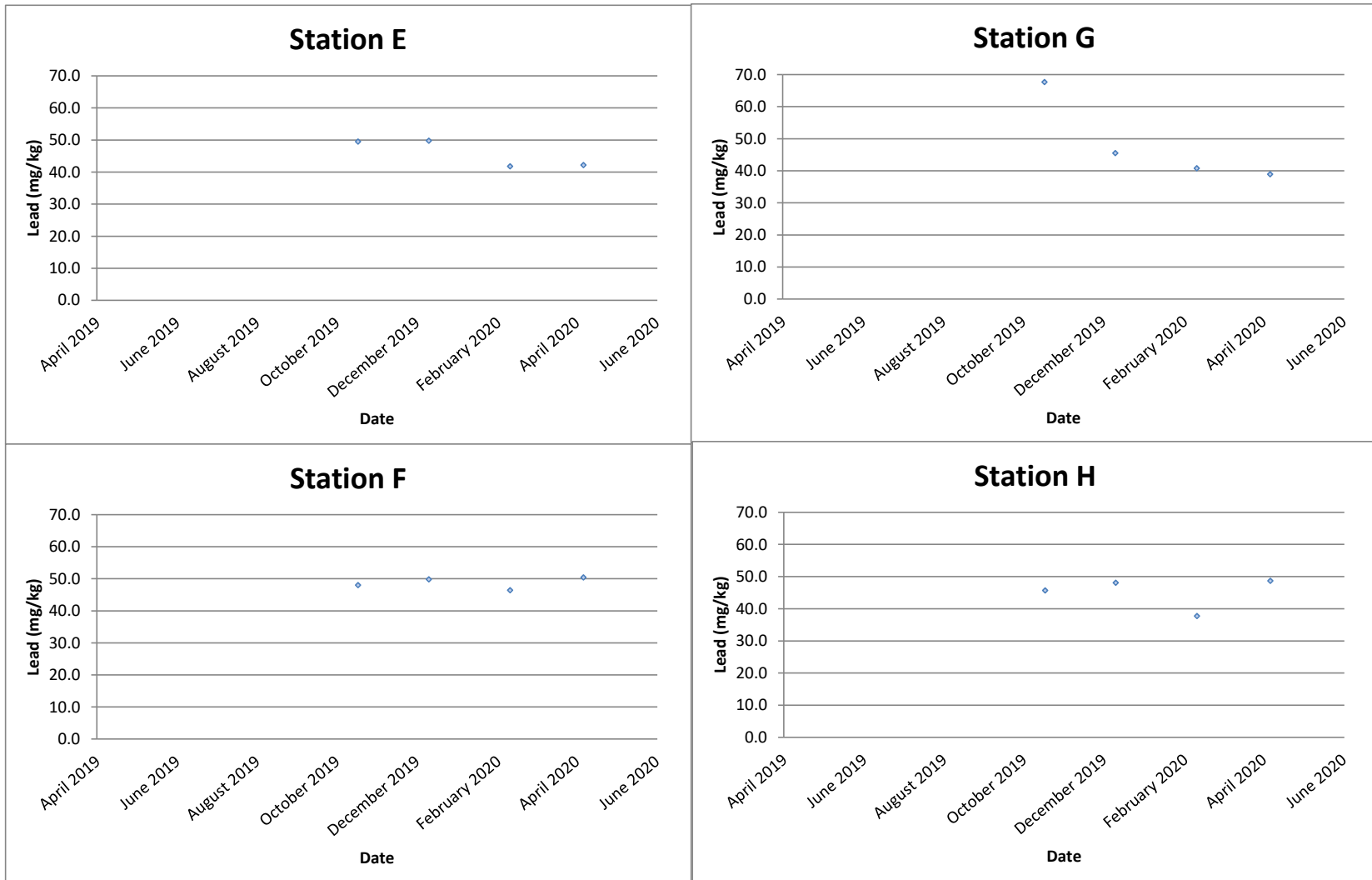
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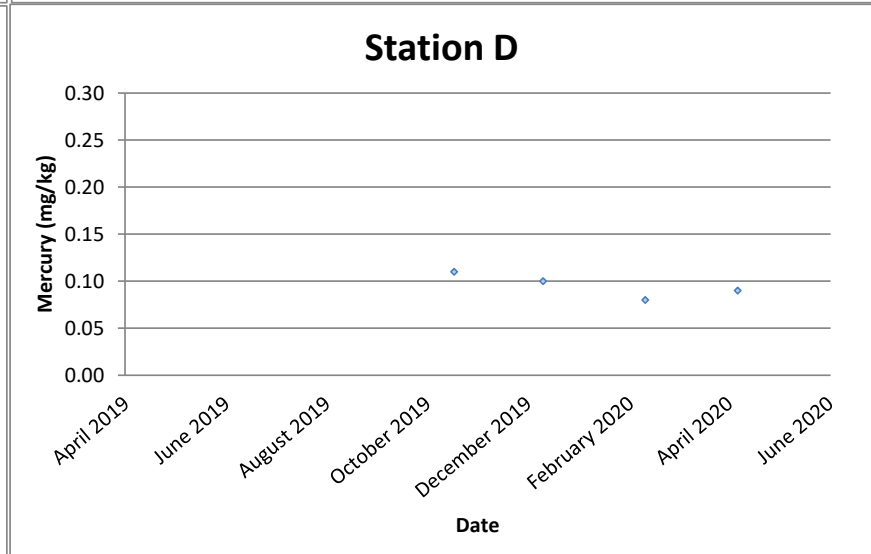
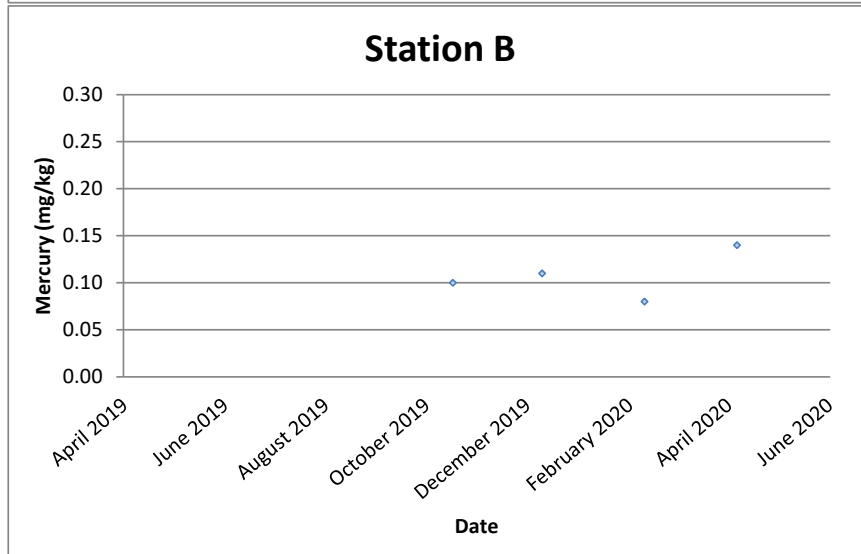
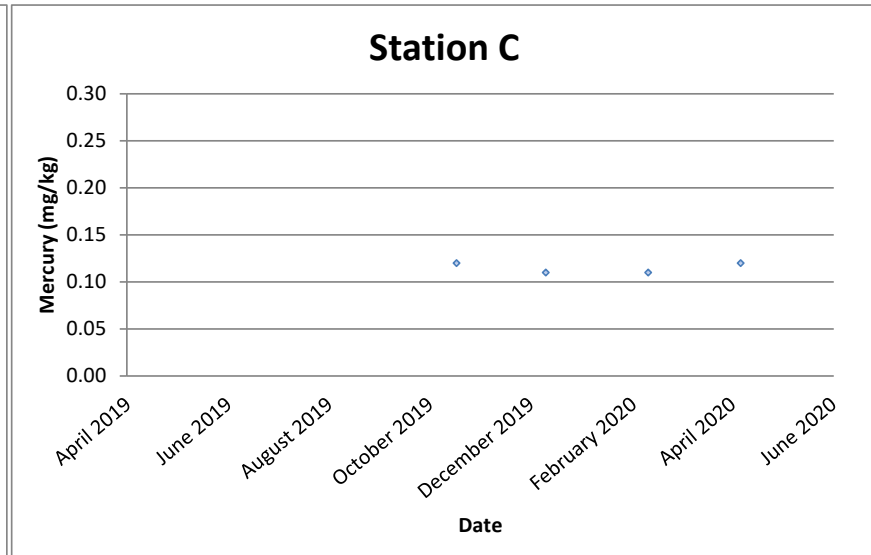
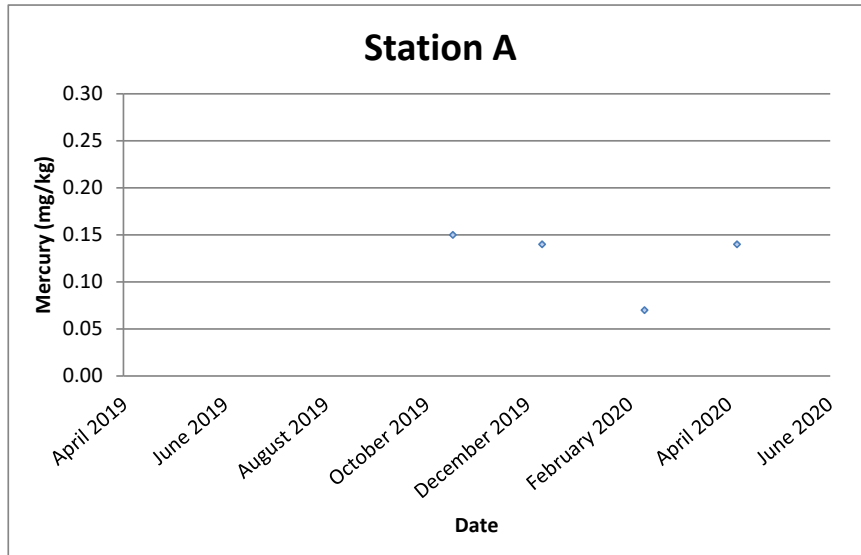
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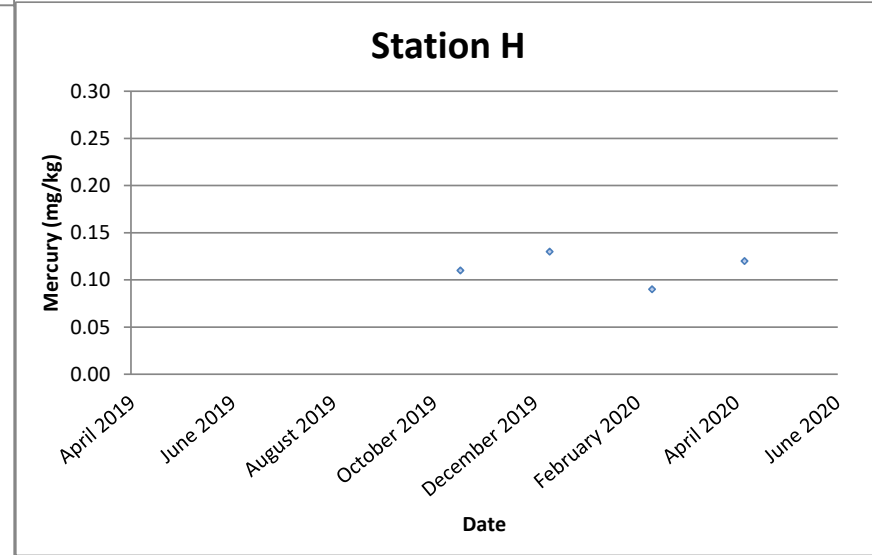
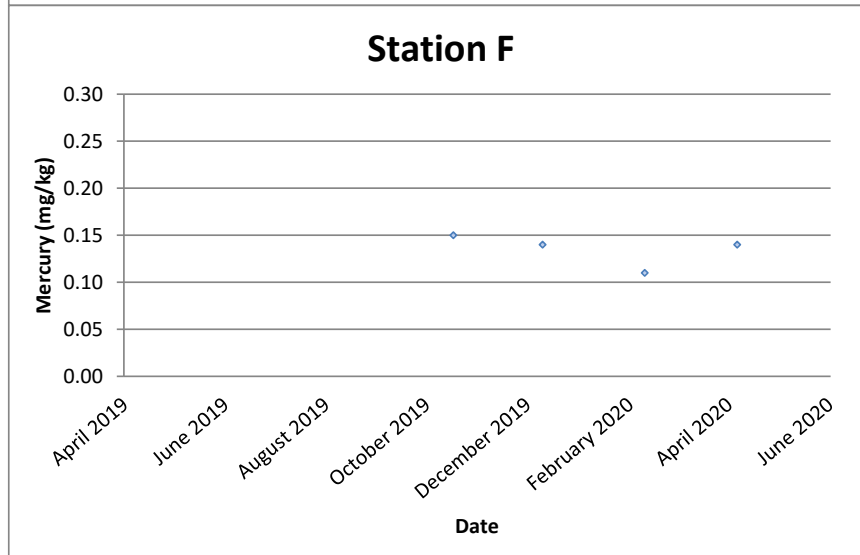
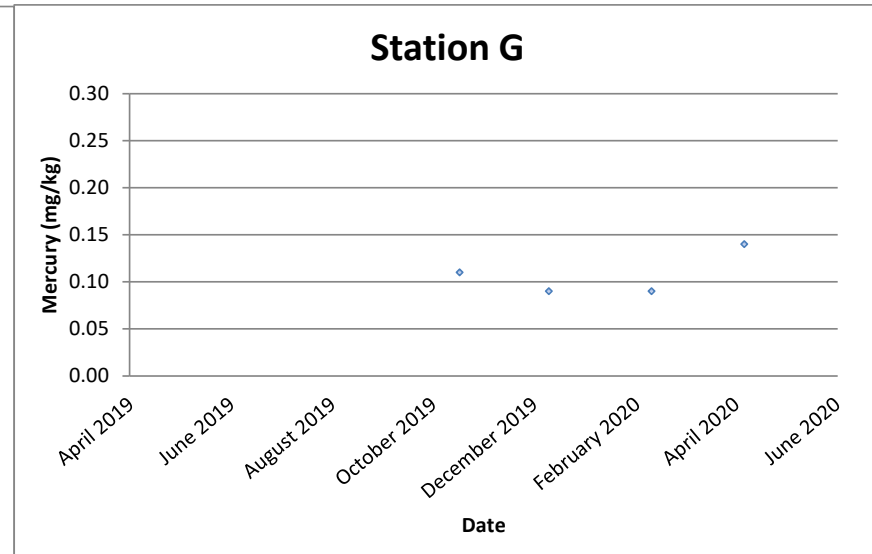
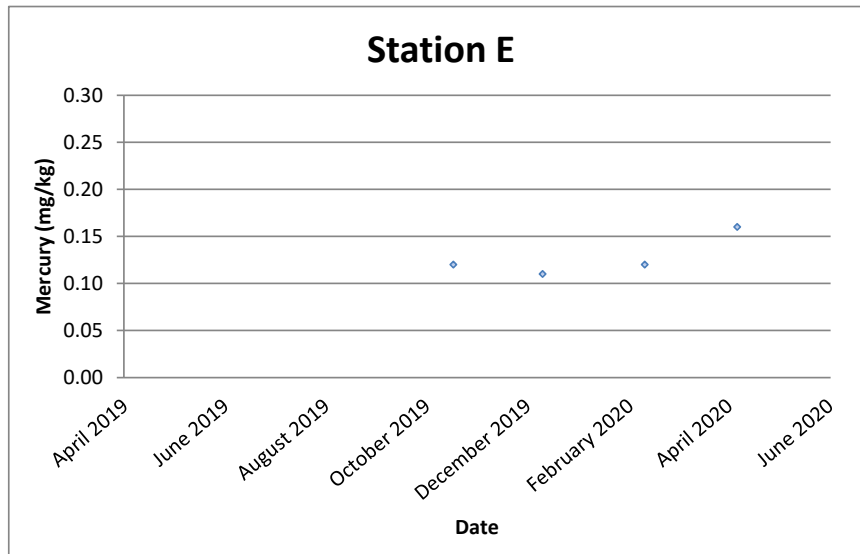
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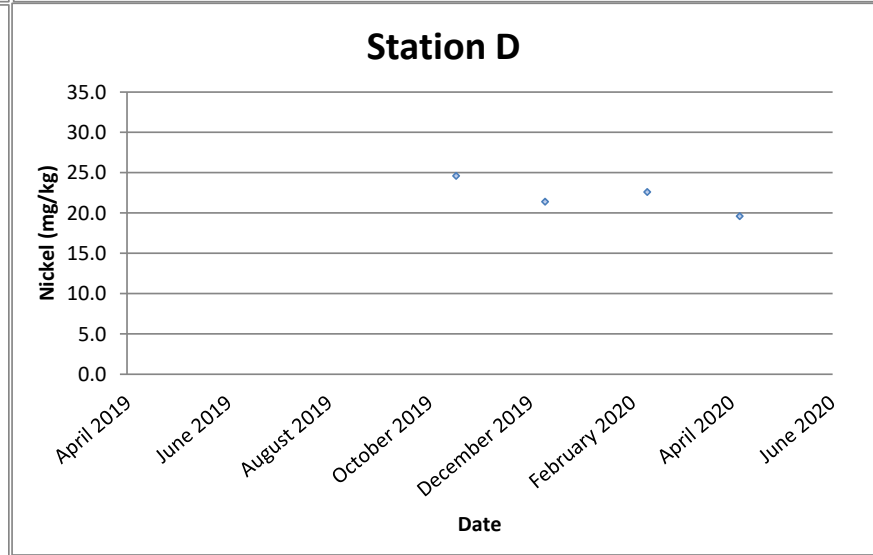
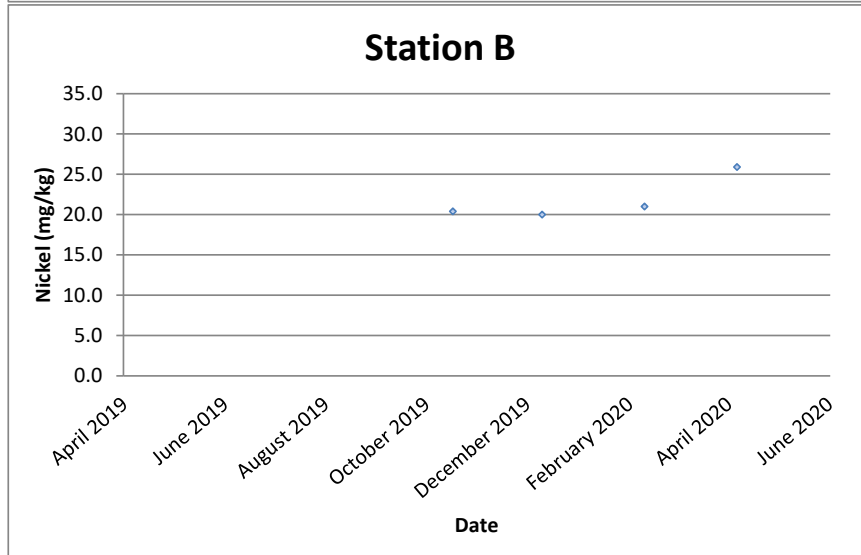
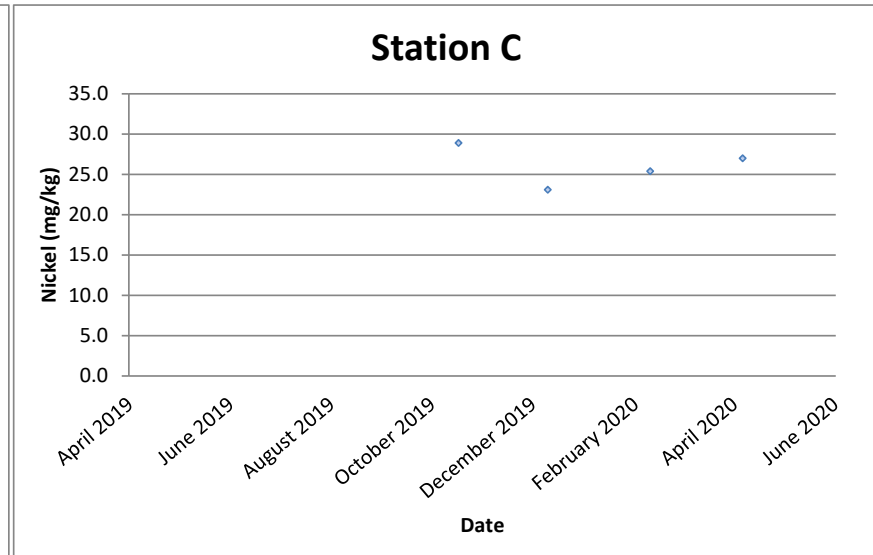
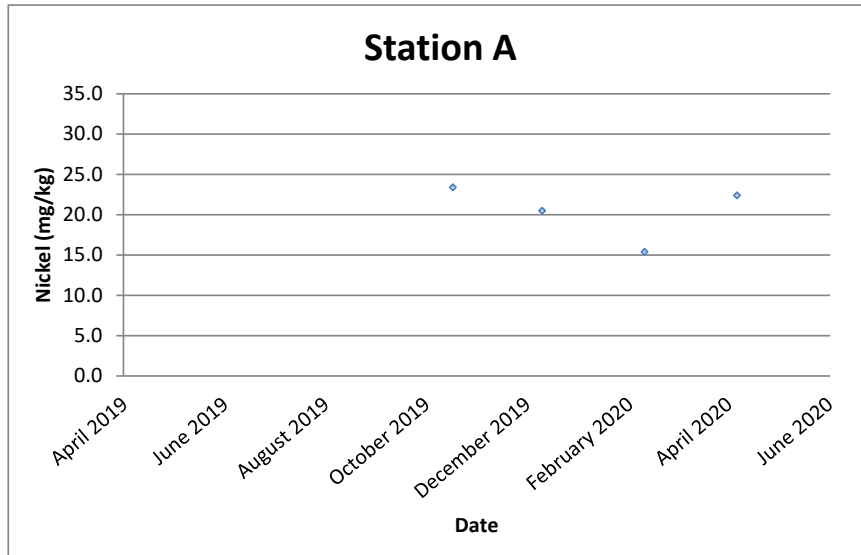
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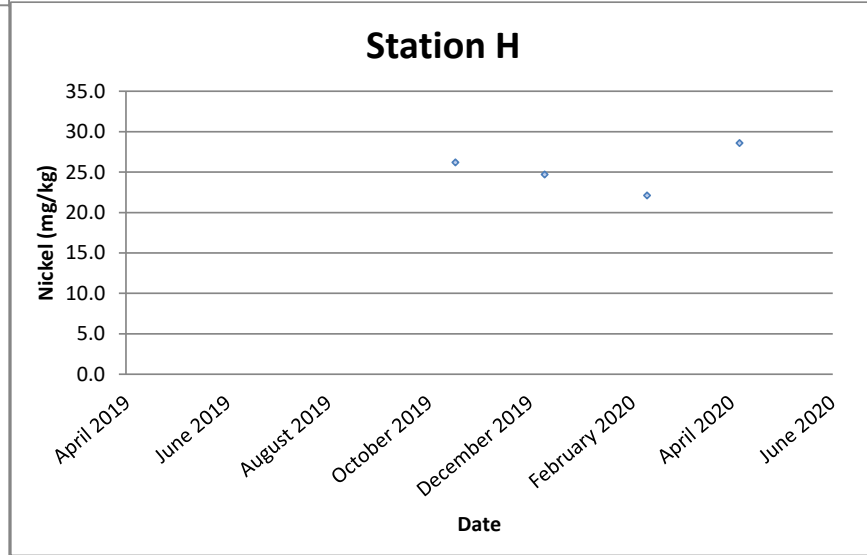
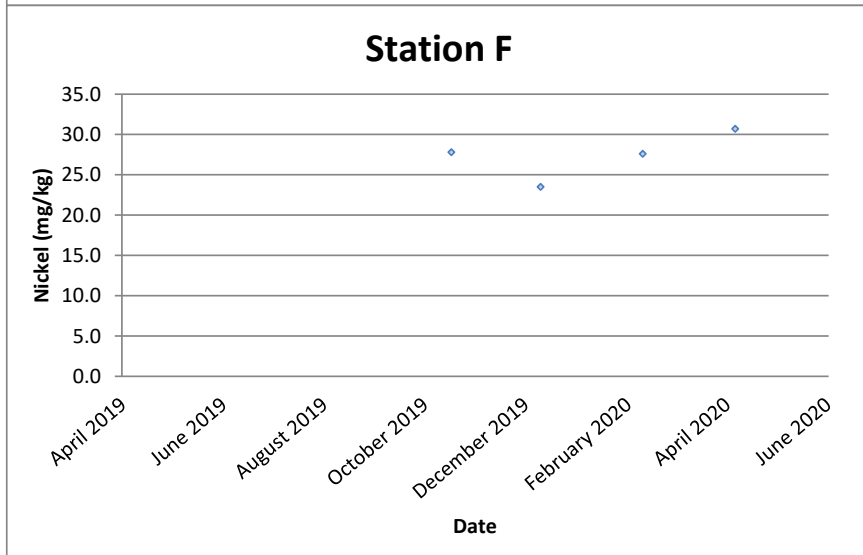
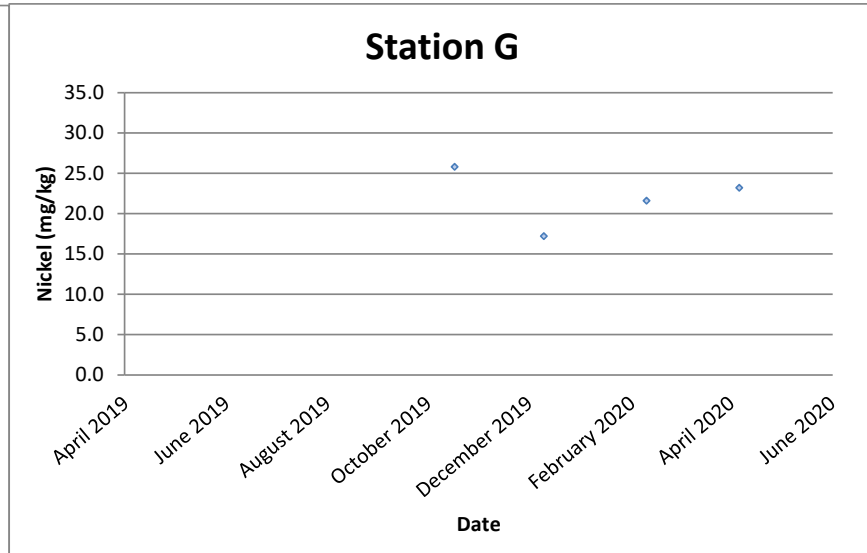
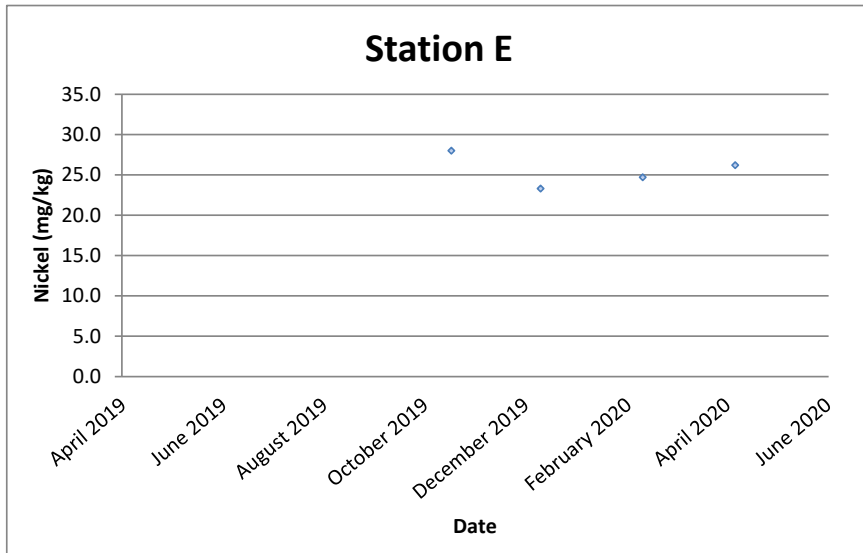
Mercury (mg/kg)



Nickel (mg/kg)

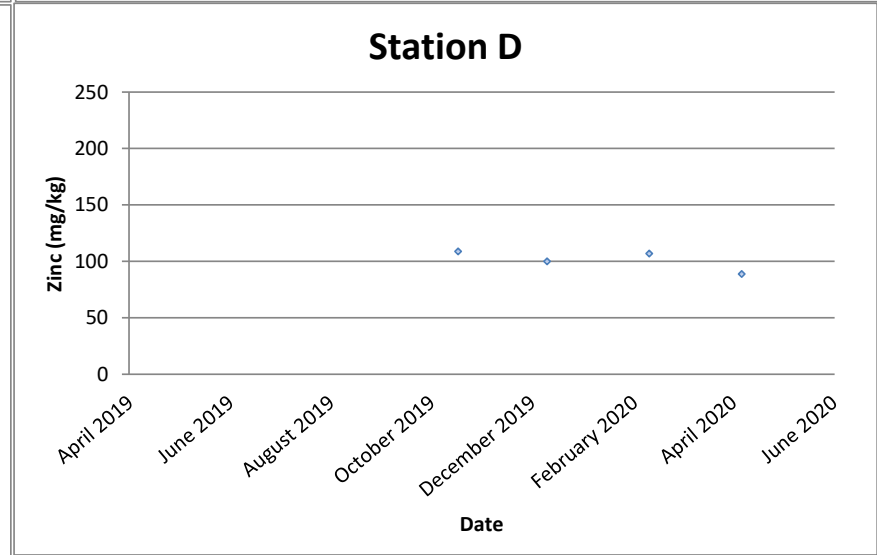
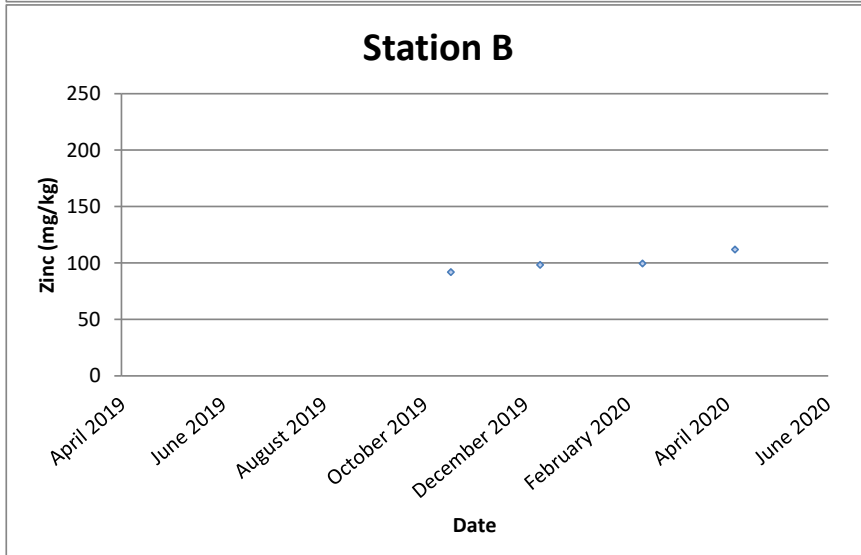
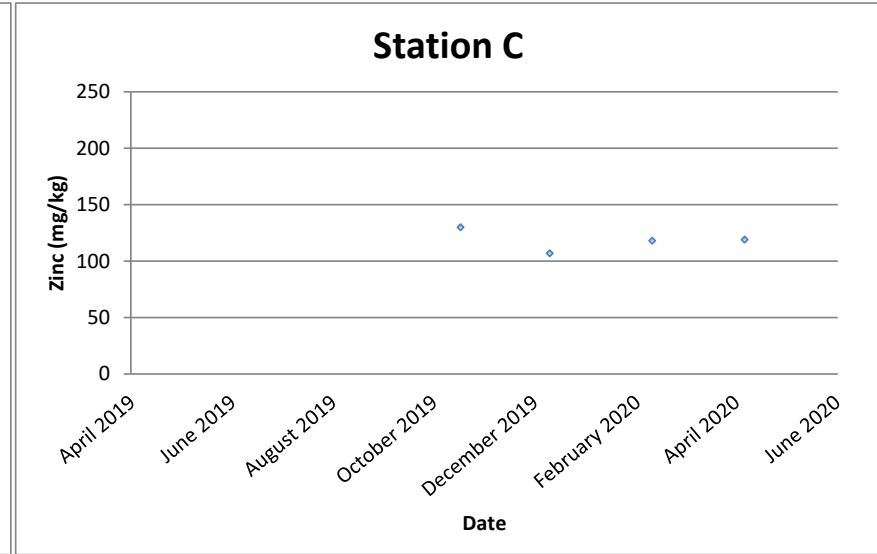
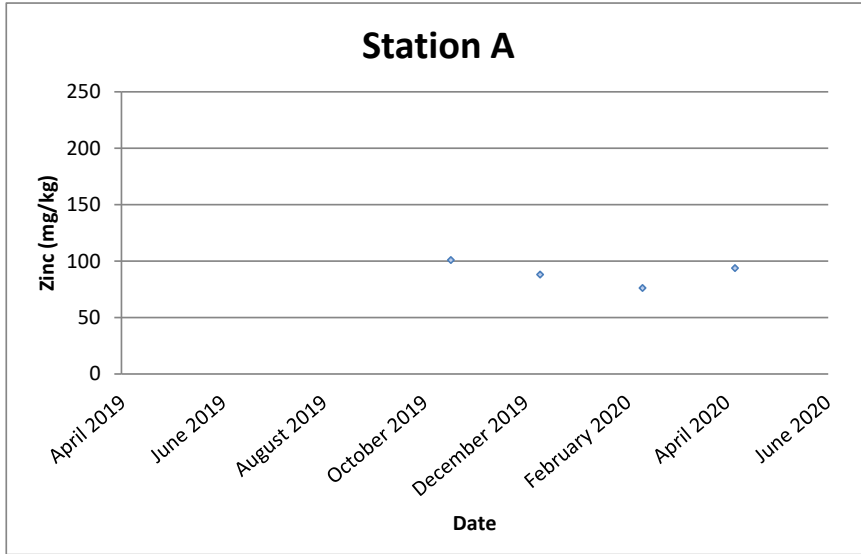


Nickel (mg/kg)

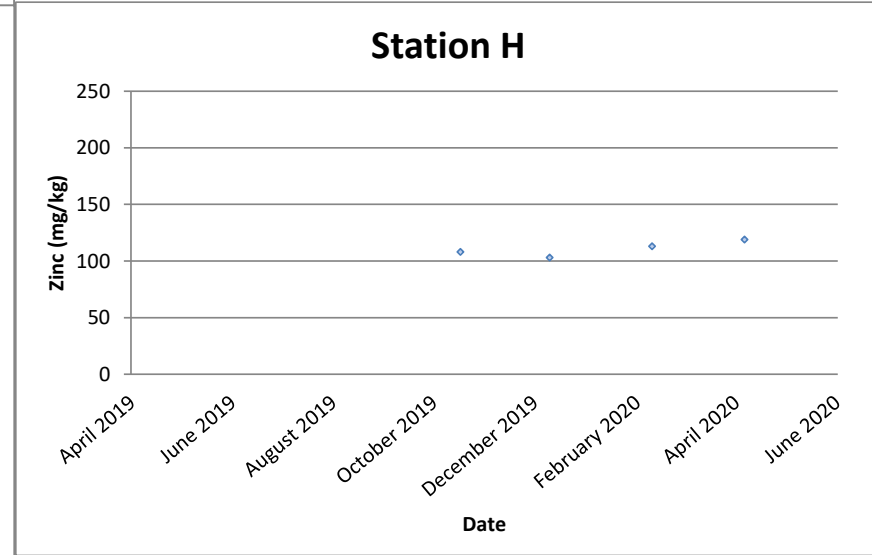
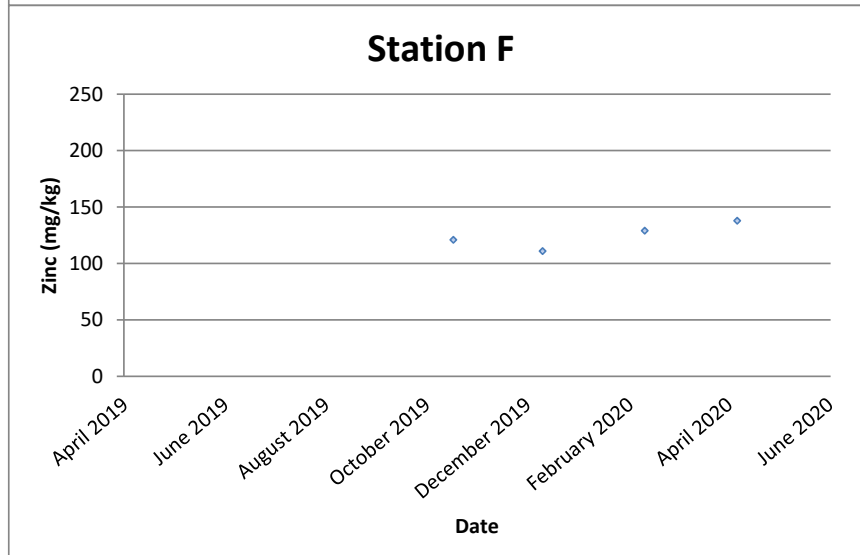
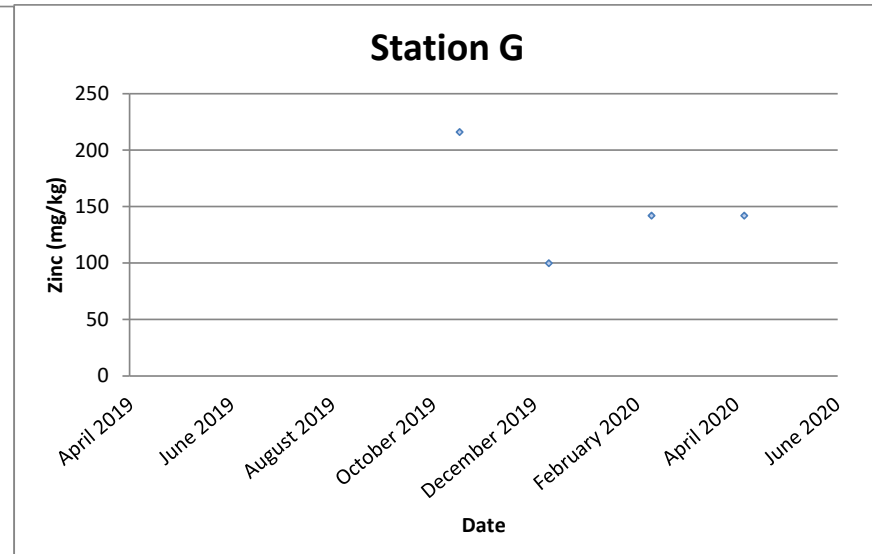
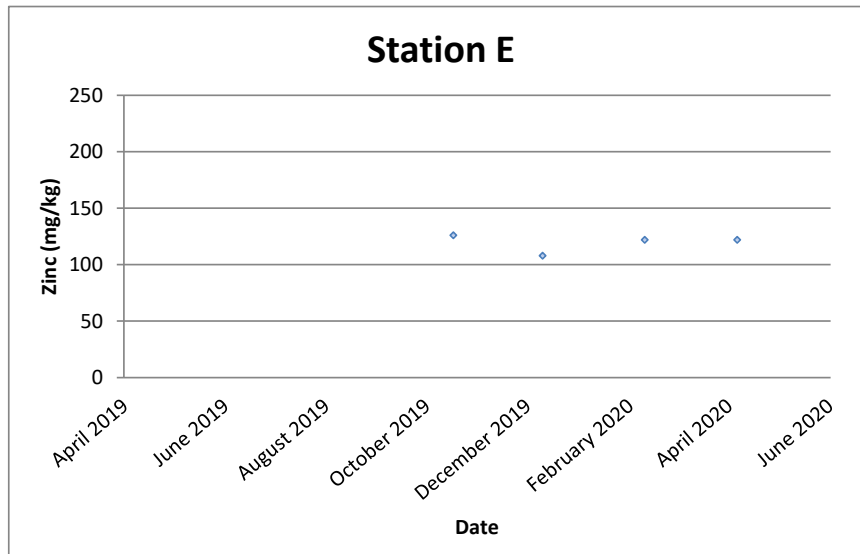




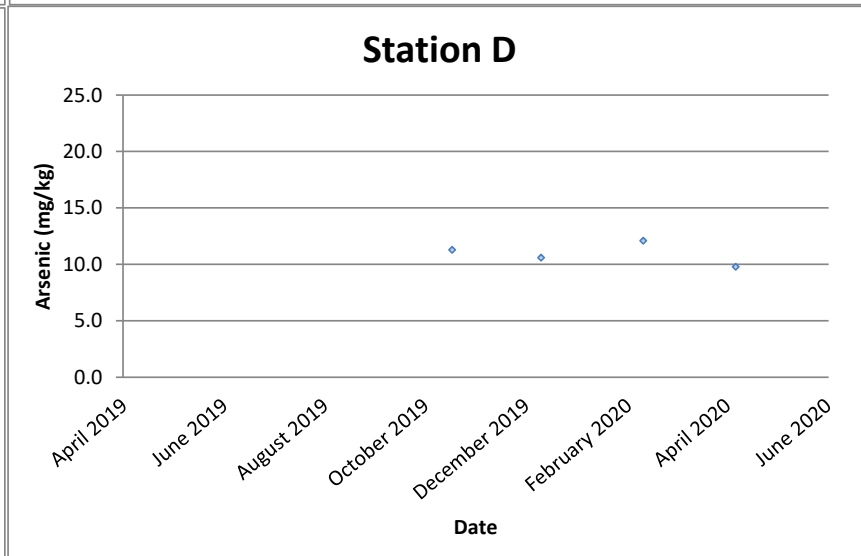
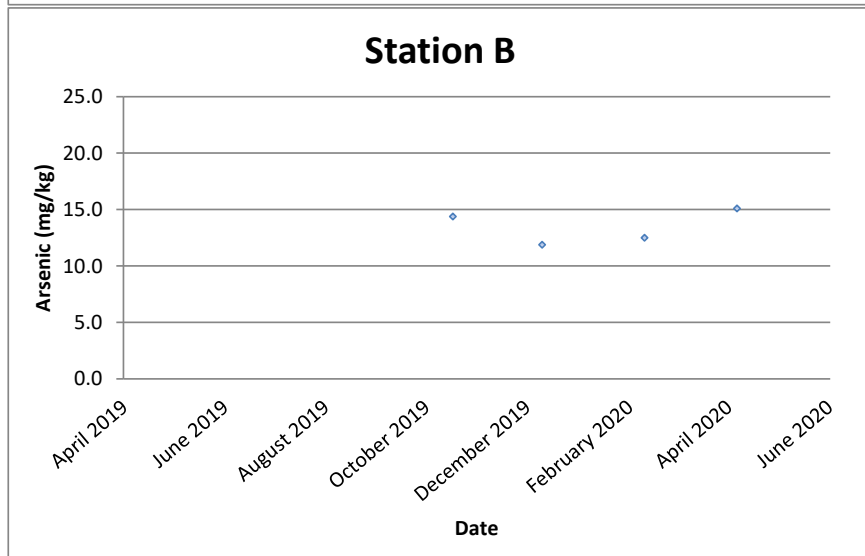
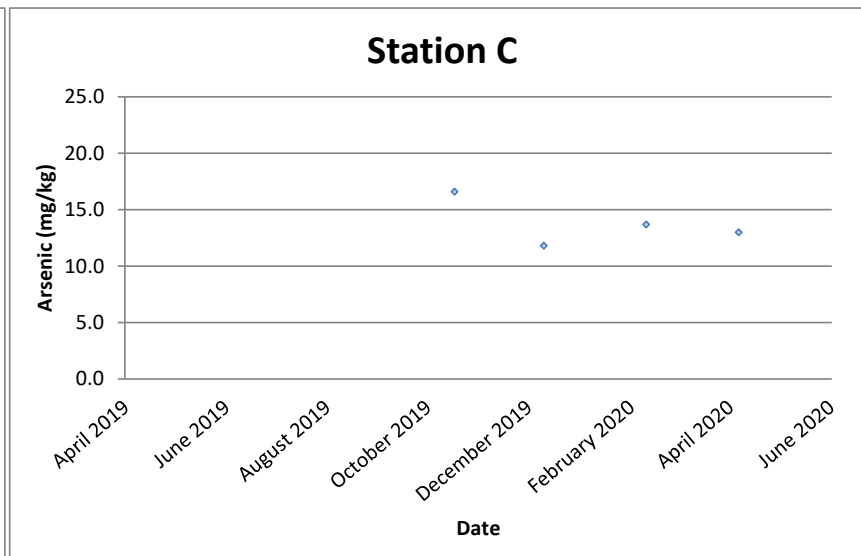
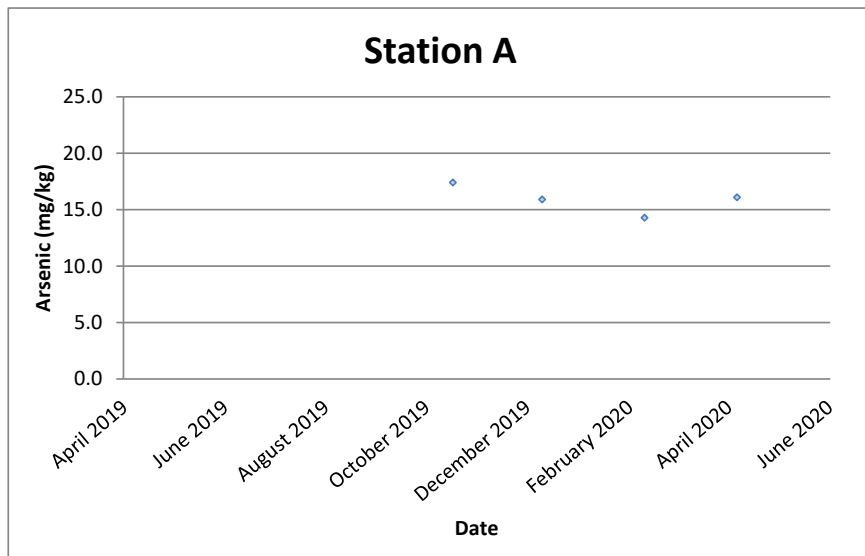
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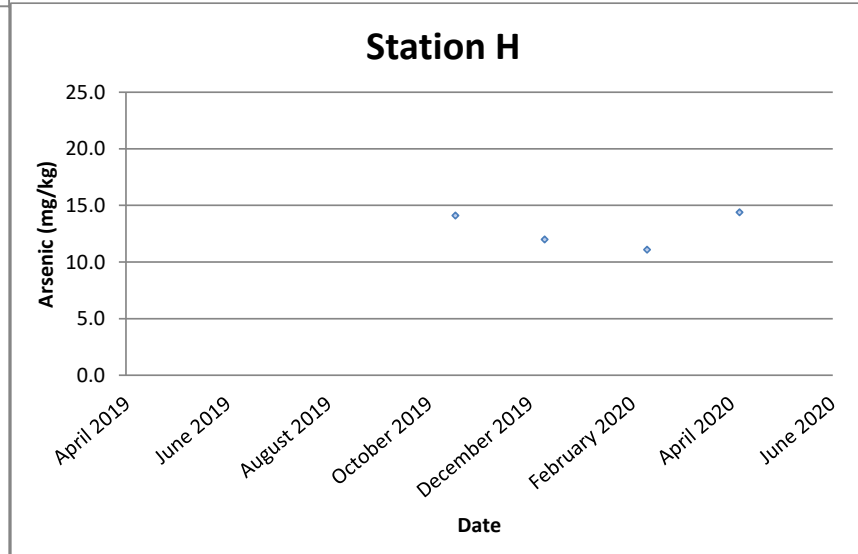
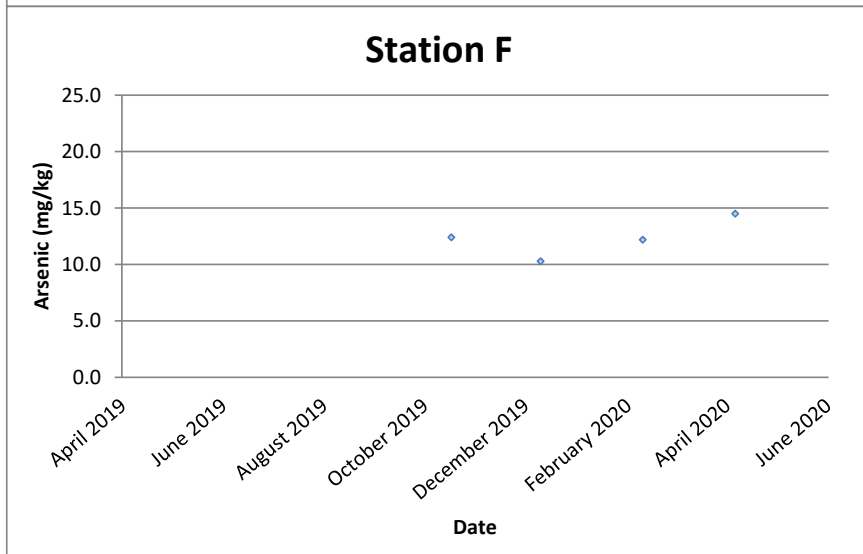
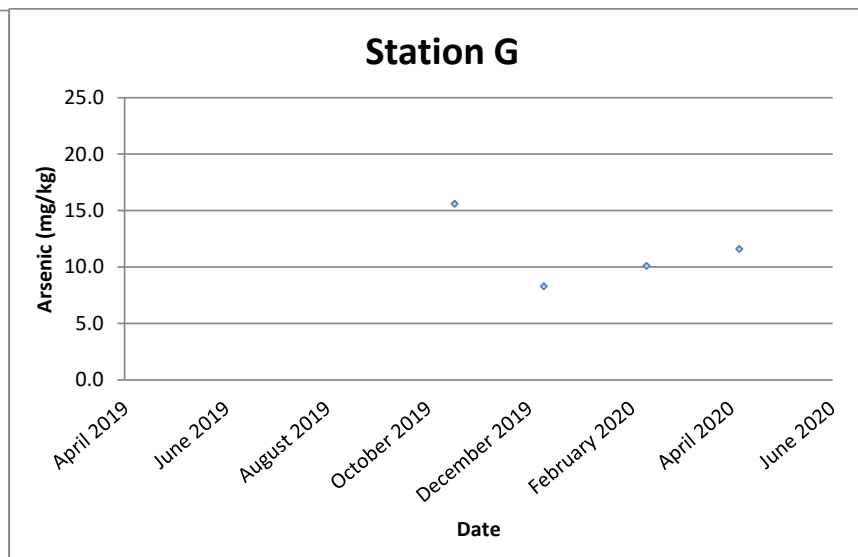
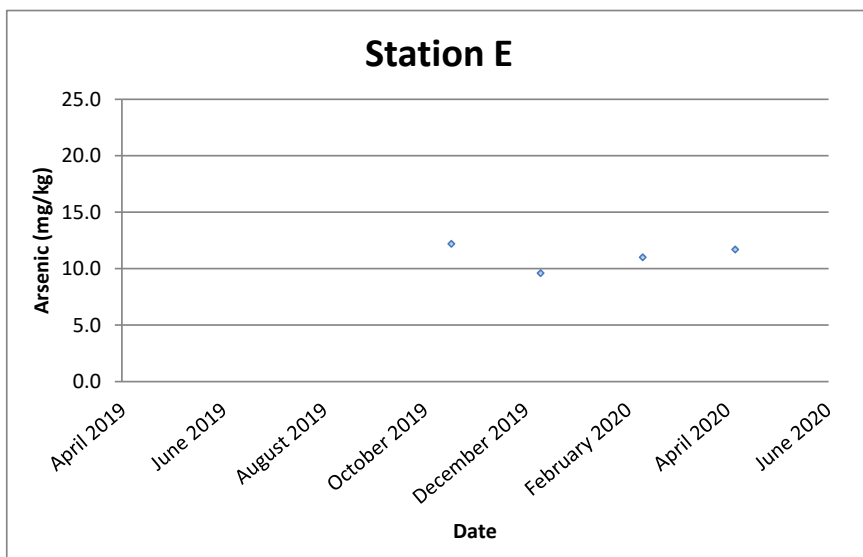
Zinc (mg/kg)



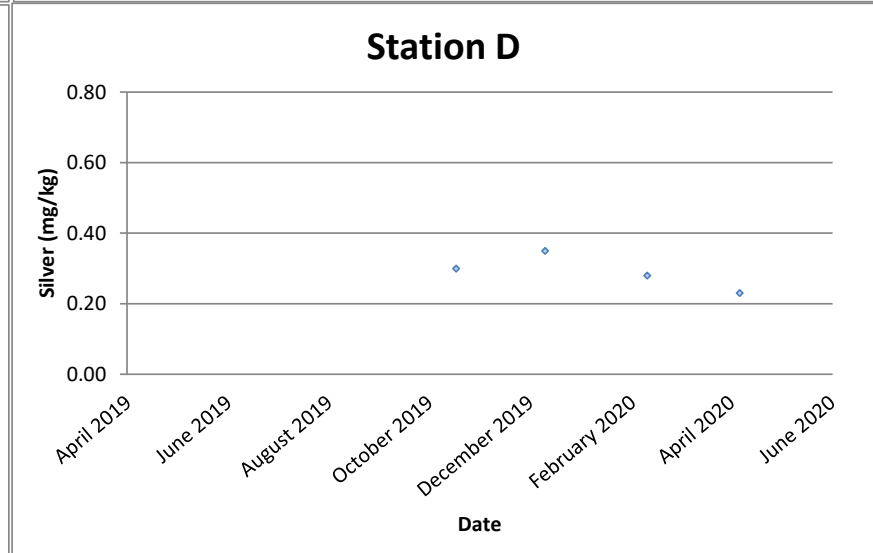
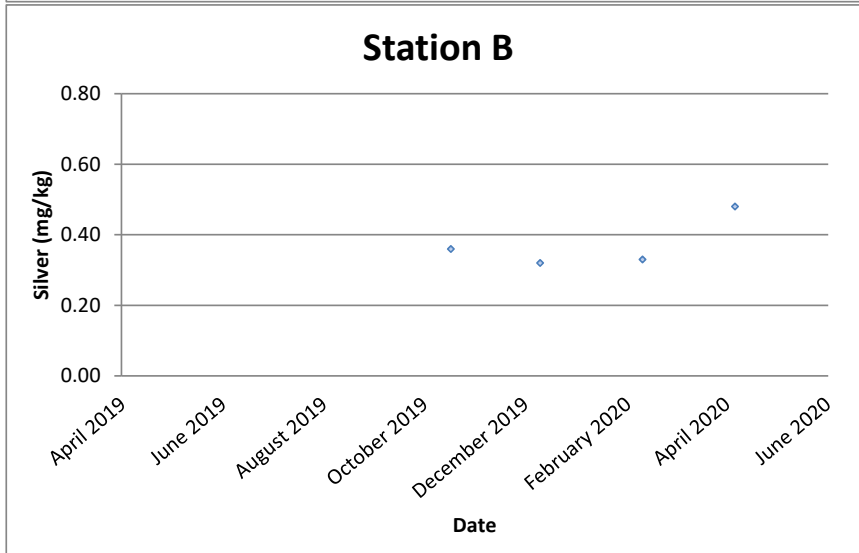
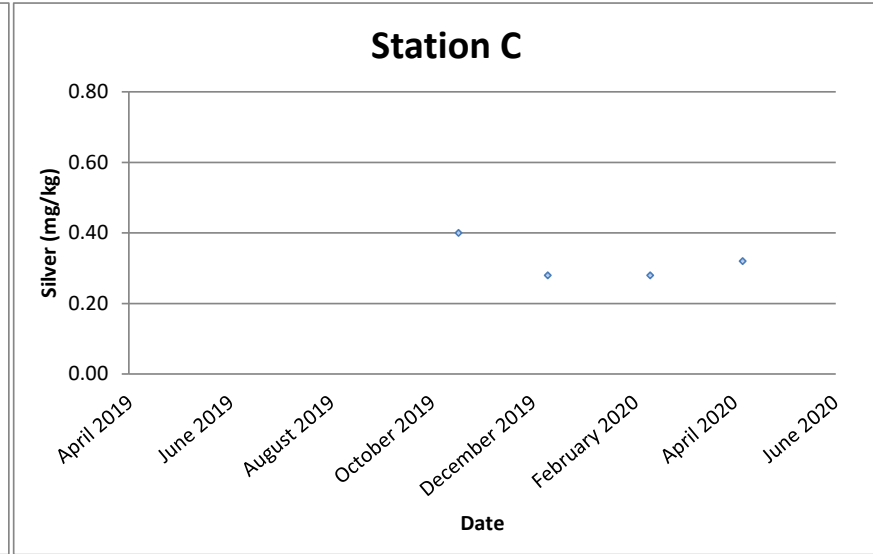
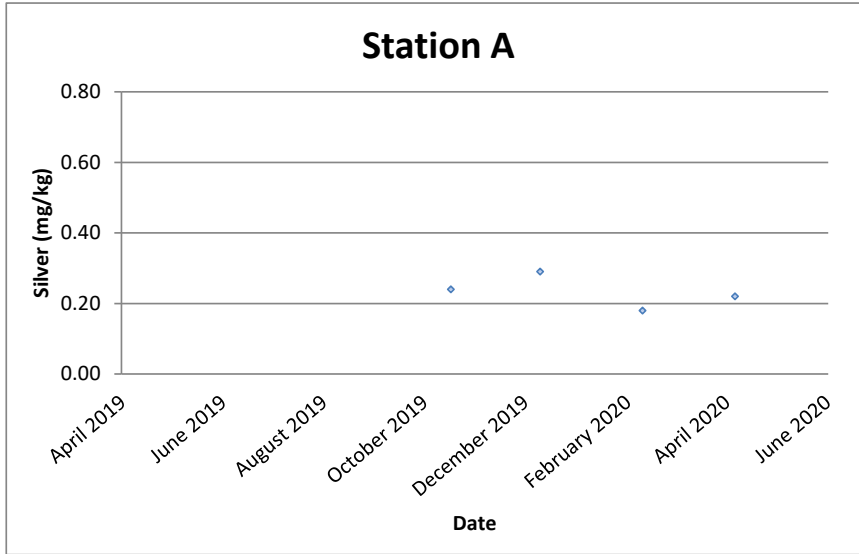
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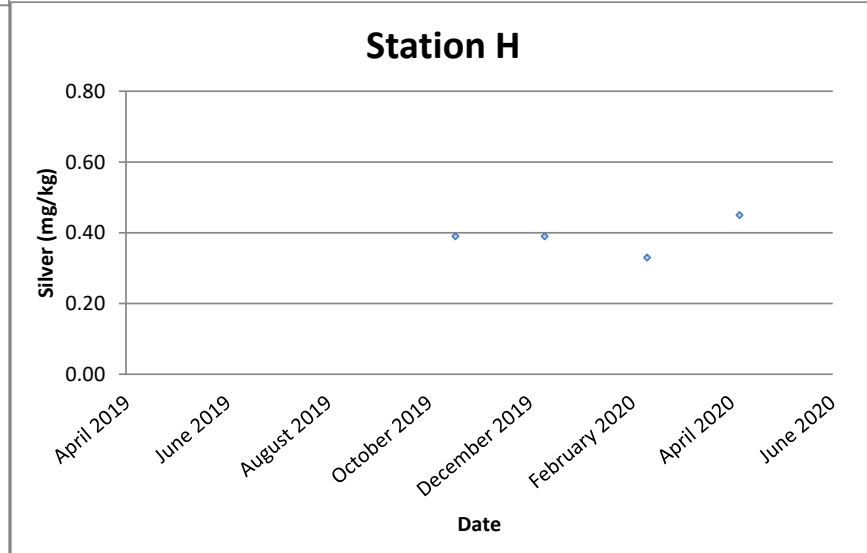
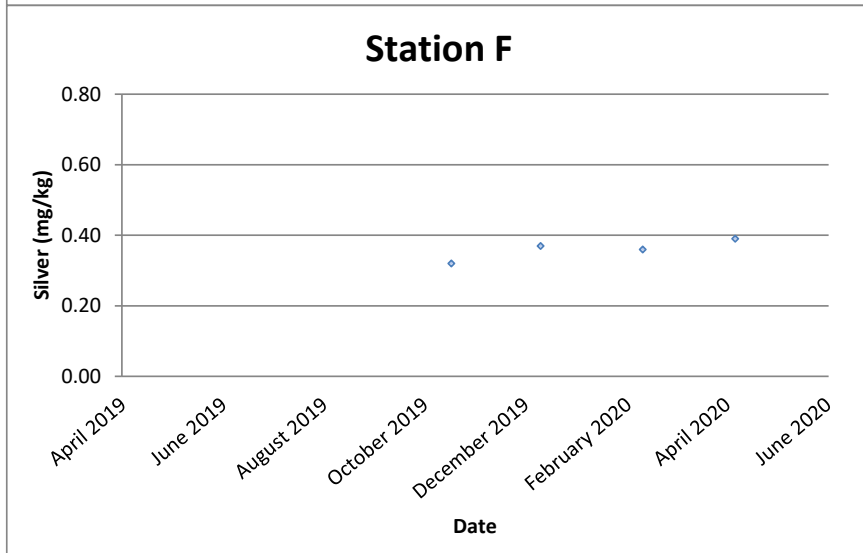
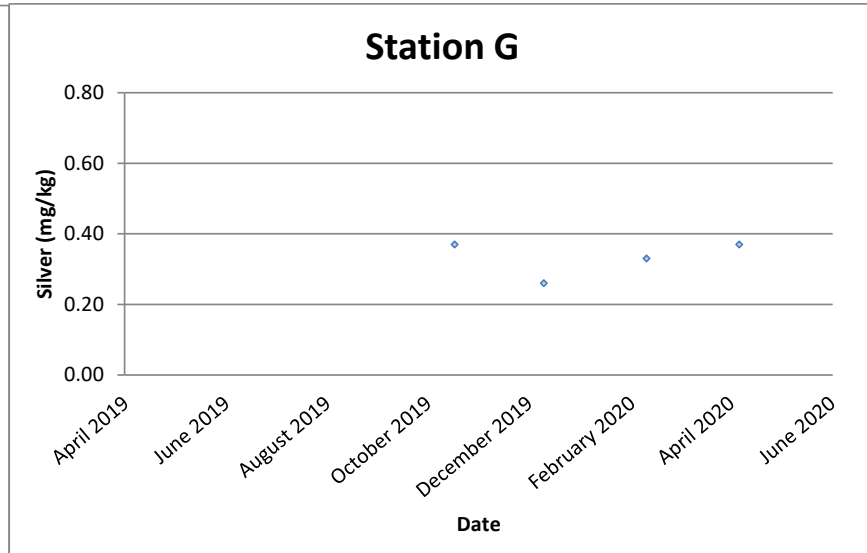
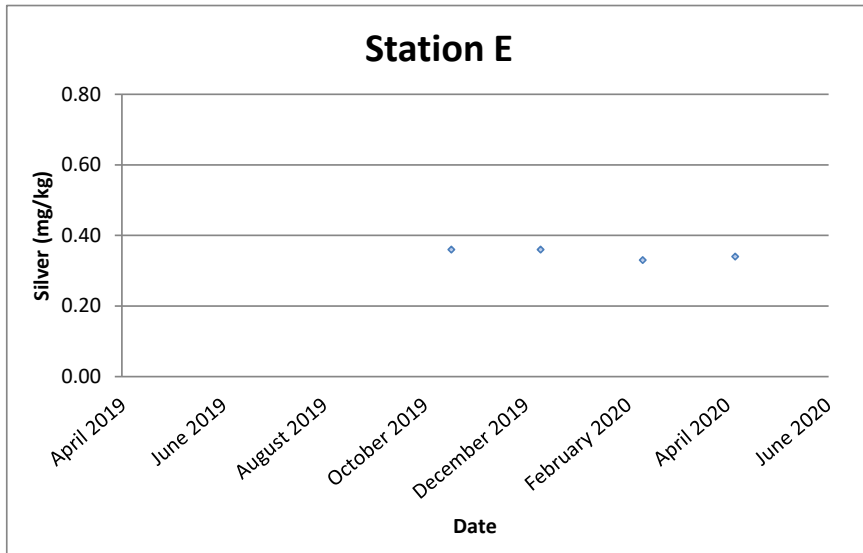
Arsenic (mg/kg)



Silver (mg/kg)



Silver (mg/kg)



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Report No.: 0041/17/ED/0544A

## Appendix I Benthic Survey Report

## Benthic Faunal Monitoring

### Conducted in April 2020

### Summary Report

#### Abundance

A total of 388 macrobenthic organisms recorded from the eight monitoring stations, which is lower than that reported in baseline survey. The decrease is predominantly caused by the lower abundance of annelids recorded in this survey. The lowest abundance with 37 individuals (ind.) recorded in Station C and the highest (60 ind.) recorded in Station H. The results showed that the abundance in impact stations (Stations C and D) has no obvious difference with that in the reference stations (Figure 1). The sediments of impact sites and reference sites are all mainly composed of silt/clay with shell fragments. There is no significant difference between the impact sites and the reference sites. This observation is indicative of a point-source disturbance, which will be verified with continued monitoring.

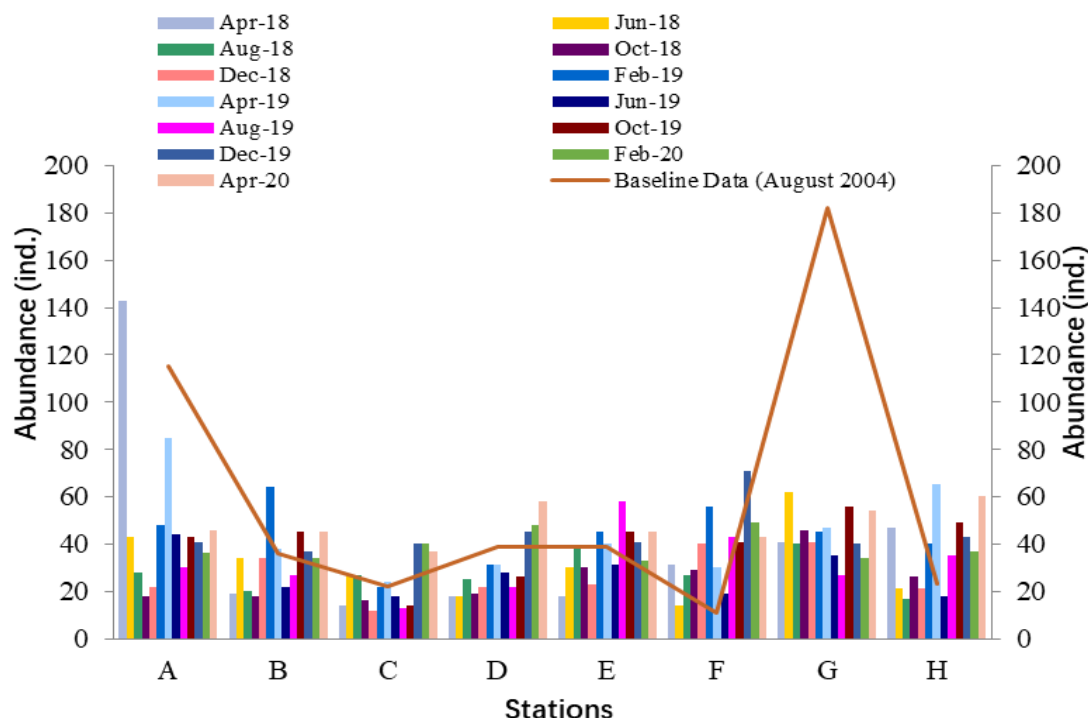


Figure 1. Total abundance (ind.) of benthic organisms collected in the eight monitoring stations, August 2004, April to December in 2018, February to December in 2019 and February & April in 2020



## Biomass

The total wet biomass from eight monitoring stations is comprised of 84.311g. The highest total biomass was observed in Station D (15.189g), while Station H (4.567g) exhibited the lowest biomass. The relatively higher biomass observed in Station D contributed to the relatively higher biomass of the mollusca species, *Paphia undulate*. The biomass at the impact stations were generally lower compared to those of the reference stations in the baseline data (August 2004). The data of all surveys are shown in Figure 2.

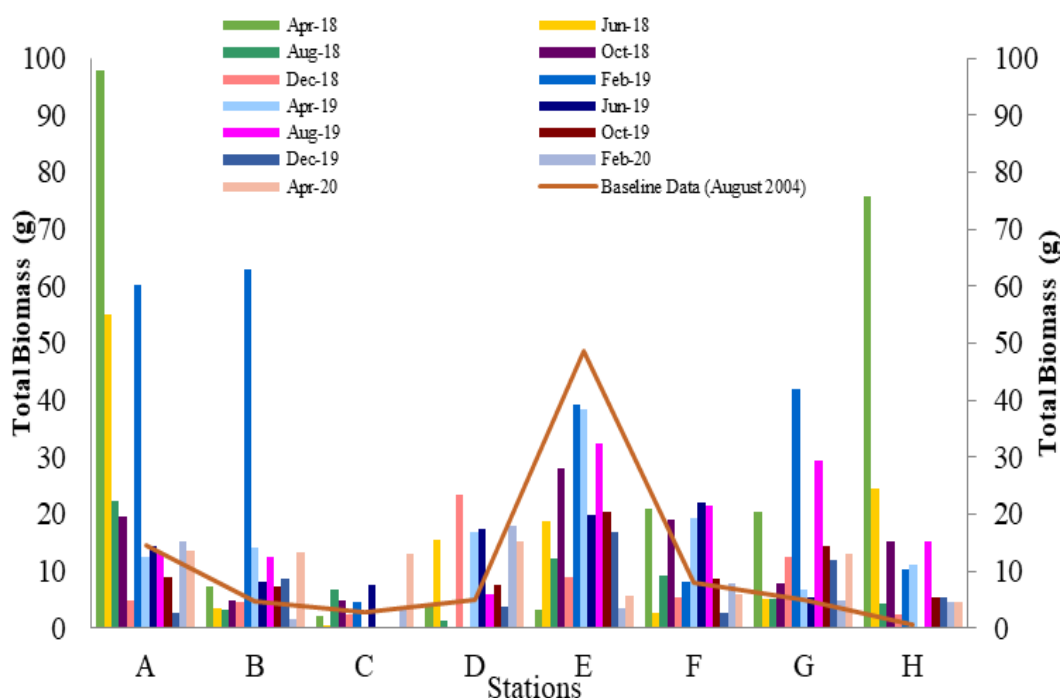


Figure 2. Total biomass (g) of benthic organisms collected in the eight monitoring stations, August 2004, April to December in 2018, February to December in 2019 and February & April in 2020

## Taxonomic Composition

Specimens were identified to family, genus and species level or to the lowest practicable taxon as possible. Fauchald (1977), Huang Z.G. (1994), Rouse & Pleijel (2001), and Xu et al. (2008) were used as the reference for taxonomic or species identification and nomenclature. A total of eight phyla comprising of 38 families and 54 genera were identified. The benthic fauna composition is dominated by Annelida (56.44%), Arthropoda (28.87%) and Mollusca (11.60%)(Figure 3). Compared to the baseline study (August 2004), the most dominant groups were the *Capitellidae* polychaetes and *Veneridae* Bivalvia, typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000). Based on the recorded abundance, the percentage of mollusca decreased during monitoring period.

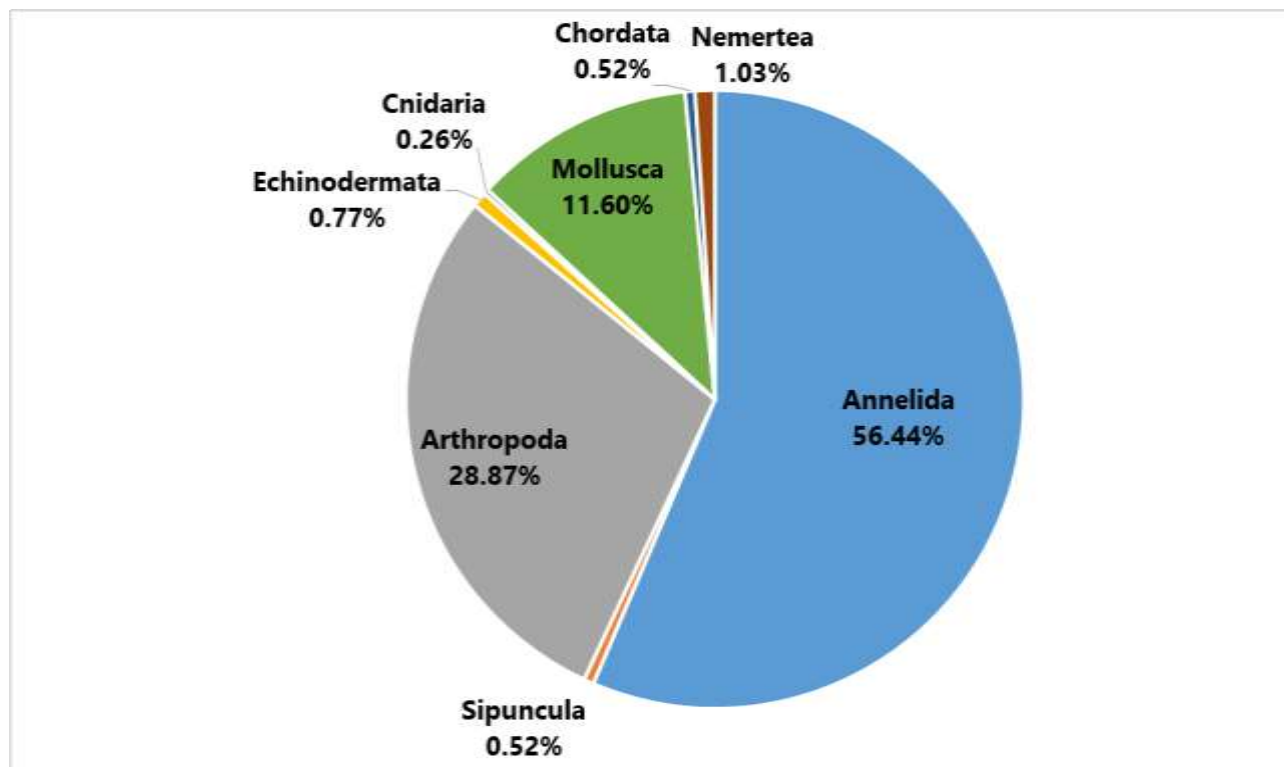


Figure 3. Percent composition of benthic organisms collected in the eight monitoring stations, in April 2020

The dominant species (abundance > 10) were the Arthropoda, *Gammarus sp.1* and the Annelida *Paraprionospio*. Arthropoda, *Gammarus sp.1* with the abundance of 14 ind from Stations E and the abundance of 18 ind from Stations H in this survey. While Annelida *Paraprionospio* with the abundance of 15 ind from Station A. Compared to the baseline study (August 2004), the most dominant groups were the capitellid and cirratulid polychaetes, typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

Highest number of genera was recorded in Station G (29) and relatively lower in Station C & Station F (18). Similar to abundance and biomass, little differences in number of taxa was observed at impact stations compared to the reference stations.

Macrobenithic data of numerical abundance and biomass is given in Table 1 and data summary for different sampling time was presented in Tables 2 to 5. Representative photos of specimens were given in the last page of this benthic survey report.

## Diversity

Benthic diversity index ( $H'$ ) and evenness index ( $J$ ) ranged 2.705 – 2.706 and 0.889 – 0.936 in impact stations, and 2.471 – 3.085 and 0.839 – 0.916 among the reference stations as shown in data summary, which suggest that benthic faunal diversity is relatively richer at some of reference stations than those at impact stations. However, overall diversity in the eight monitoring stations was within the range of typical values in the impact stations and the reference stations, respectively. Compared with the baseline survey result, the diversity index and evenness index increased obviously.

## References:

Borja, A., Franco, J. and Perez, V. (2000). A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. *Marine Pollution Bulletin*, 40, 1100-1114.

Fauchald K. (1977) *The Polychaete Worms Definitions And Keys To Orders, Families And Genera*. Natural History Museum of Los Angeles County. Science Series 28: 1 – 190.

Huang Z.G. (1994). *Marine Species and Their Distributions in China's Seas*. China Ocean Press, Beijing.


Pearson, T. and Rosenberg, R. (1978). Macrobenthic succession in relation to organic enrichment and pollution of the marine environment. *Oceanography and Marine Biology Annual Review*, 16, 229-311.

Rouse G. W. & Pleijel F. (2001) *Polychaetes*. Oxford University Press. United Kingdom.

Xu F. S. & Zhang S. P. (2008) *An Illustrated Bivalvia Mollusca Fauna of China Seas*. Science Press (China), Beijing.

## Approved by Supervisor

Name of Consultant : China Hong Kong Ecology Consultants Ltd.

Signature of Supervisor : 

Name and Position of Supervisor: Dr. Mark Shea, Senior Ecology Consultant

Date: April 27, 2020

## Data Summaries

**Table 1. Macrobenithic data of numeral abundance and biomass from eight sampling stations, Siu Ho Wan. (April 2020)**

Phylum	Class	Order	Family	Genus	SHW-Benthic Stations							
					A		B		C		D	
					Abd*	Mass (g)	Abd*	Mass (g)	Abd*	Mass (g)	Abd*	Mass (g)
Annelida	Polychaeta	Aciculata	Aphroditidae	<i>c.f. Laetmonice</i>	1	4.800	0	0	0	0	0	0
Annelida	Polychaeta	Aciculata	Glyceridae	<i>Glycera</i>	4	0.042	1	T	1	0.001	2	0.003
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella(C.capitata)</i>	1	0.001	2	0.002	0	0	2	0.002
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella</i>	3	0.003	0	0	5	0.003	5	0.003
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Mediomastus</i>	2	0.002	2	0.002	3	0.001	0	0
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Notomastus</i>	1	0.001	0	0	2	0.004	2	0.002
Annelida	Polychaeta	Errantia	Phyllodoceidae	<i>Phyllodoce</i>	0	0	0	0	0	0	1	0.002
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice(E. indica)</i>	0	0	9	0.033	2	0.007	5	0.013
Annelida	Polychaeta	Phyllodocimorpha	Goniadidae	<i>Glycinde</i>	1	0.002	2	0.002	0	0	0	0
Annelida	Polychaeta	-	Cossuridae	<i>Cossurella(C. aciculata)</i>	0	0	0	0	1	0.003	0	0
Annelida	Polychaeta	Nereidida	Nereidae	<i>Neanthes</i>	0	0	1	0.002	0	0	1	0.002
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis1</i>	3	0.004	0	0	0	0	1	0.001
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis2</i>	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocida	Polynoidae	<i>Gattyana</i>	0	0	0	0	0	0	1	0.002



Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i> ( <i>A. dibranchis</i> )	0	0	0	0	1	0.003	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i> ( <i>A. lyrochaeta</i> )	0	0	0	0	0	0	1	0.078
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys</i>	0	0	2	0.001	1	0.001	0	0
Annelida	Polychaeta	Sabellida	Oweniidae	<i>Owenia</i>	0	0	1	0.002	0	0	0	0
Annelida	Polychaeta	Scolecida	Opheliidae	<i>Ophelia</i>	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus</i>	4	0.017	0	0	0	0	1	0.001
Annelida	Polychaeta	Spionida	Spionidae	<i>Paraprionospio</i>	15	0.025	3	0.006	0	0	2	0.002
Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio</i>	0	0	0	0	2	0.001	0	0
Annelida	Polychaeta	Sternaspida	Sternaspidae	<i>Sternaspis</i> ( <i>S. scutata</i> )	1	0.004	2	0.005	4	0.016	3	0.008
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Amaeana</i>	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Loimia</i> ( <i>L.loimia</i> )	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella sp.1</i>	0	0	0	0	1	0.004	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella sp.2</i>	0	0	1	0.005	0	0	0	0
Annelida	Polychaeta	Terebellida	Trichobranchidae	<i>Terebellides</i> ( <i>T. stroemii</i> )	0	0	0	0	0	0	1	0.009
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	<i>Lumbriculus sp.1</i>	1	0.002	0	0	1	0.004	1	0.002
Sipuncula	Sipunculiformes	Sipunculidea	Sipunculidae	<i>Sipunculus</i>	0	0	1	0.002	0	0	0	0
Arthropoda	Crustacea	Decapoda	Macrophthalmidae	<i>Cleistostoma</i>	0	0	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Alpheidae	<i>Alpheus</i>	0	0	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Penaeidae	Shrimp juvenile	0	0	3	1.200	0	0	0	0
Arthropoda	Crustacea	Decapoda	Pilumnidae	<i>Typhlocarcinus</i>	2	2.652	2	0.048	0	0	0	0



Arthropoda	Crustacea	Decapoda	Porcellanidae	<i>Petrolisthes</i>	0	0	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Portunidae	<i>Charybdis( C. variegata)</i>	0	0	1	10.800	0	0	0	0
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.1</i>	1	T	7	0.001	4	0.001	9	0.002
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.2</i>	0	0	0	0	2	T	5	0.001
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.3</i>	0	0	0	0	0	0	0	0
Arthropoda	Maxillopoda	Sessilia	Balanidae	<i>Balanus</i>	0	0	0	0	0	0	0	0
Echinodermata	Ophiuroidea	Ophiurida	Amphiuridae	<i>Amphioplus</i>	1	0.008	1	0.023	0	0	0	0
Cnidaria	Anthozoa	Pennatulacea	-	<i>Sea pen</i>	0	0	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Dreissenidae	<i>Mytilopsis</i>	0	0	1	0.012	0	0	2	1.235
Mollusca	Bivalvia	Veneroida	Solenidae	<i>Solen</i>	1	1.100	1	1.005	0	0	0	0
Mollusca	Bivalvia	Veneroida	Tellinidae	<i>c.f. Augulus</i>	0	0	0	0	0	0	1	0.098
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Paphia (P. undulata)</i>	1	1.020	0	0	4	11.800	10	13.700
Mollusca	Bivalvia	Veneroida	Veneridae	<i>c.f. Phylloida foliacea</i>	0	0	0	0	1	0.215	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Ruditapes (R. philippinarum)</i>	2	2.600	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	Bivalve juvenile	0	0	0	0	1	0.735	0	0
Mollusca	Gastropoda	Archaeogastropoda	Lottiidae	<i>Nipponacmea</i>	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Neogastropoda	Nassariidae	<i>Nassarius</i>	0	0	0	0	1	0.198	0	0
Mollusca	Scaphopoda	-	Dentaliidae	-	0	0	1	0.036	0	0	0	0
Chordata	Actinopterygii	Perciformes	Gobiidae	UNID Goby	1	1.366	1	0.015	0	0	0	0
Nemertina	Anopla	Heteronemertea	-	<i>Cerebratulus sp.1</i>	0	0	0	0	0	0	2	0.023

**Note: Abd\* means Abundance, T means biomass <0.001 g round to 0.001g**



Phylum	Class	Order	Family	Genus	SHW-Benthic Stations							
					E		F		G		H	
					Abd*	Mass (g)	Abd*	Mass (g)	Abd*	Mass (g)	Abd*	Mass (g)
Annelida	Polychaeta	Aciculata	Aphroditidae	<i>c.f. Laetmonice</i>	0	0	0	0	1	0.003	0	0
Annelida	Polychaeta	Aciculata	Glyceridae	<i>Glycera</i>	2	0.004	1	0.002	2	0.004	4	0.006
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella(C.capitata)</i>	1	0.001	5	0.003	1	T	1	0.002
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella</i>	3	0.001	0	0	0	0	2	0.001
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Mediomastus</i>	1	T	3	0.002	2	0.001	5	0.004
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Notomastus</i>	2	0.001	1	0.002	7	0.008	0	0
Annelida	Polychaeta	Errantia	Phyllodocidae	<i>Phyllodoce</i>	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice(E. indica)</i>	5	0.006	0	0	0	0	1	0.002
Annelida	Polychaeta	Phyllodocimorpha	Goniadidae	<i>Glycinde</i>	1	0.001	4	0.004	0	0	0	0
Annelida	Polychaeta	-	Cossuridae	<i>Cossurella(C. aciculata)</i>	0	0	0	0	1	0.002	0	0
Annelida	Polychaeta	Nereidida	Nereidae	<i>Neanthes</i>	0	0	1	0.002	1	0.001	1	0.003
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis1</i>	0	0	0	0	1	0.001	1	0.002
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis2</i>	0	0	0	0	1	T	0	0
Annelida	Polychaeta	Phyllodocida	Polynoidae	<i>Gattyana</i>	0	0	0	0	1	0.001	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i> ( <i>A. dibranchis</i> )	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i> ( <i>A. lyrochaeta</i> )	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys</i>	1	0.001	3	0.002	0	0	3	0.004

Annelida	Polychaeta	Sabellida	Oweniidae	<i>Owenia</i>	0	0	0	0	0	0	0	0
Annelida	Polychaeta	Scolecida	Opheliidae	<i>Ophelia</i>	0	0	0	0	0	0	2	0.036
Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus</i>	2	0.002	0	0	1	T	1	0.001
Annelida	Polychaeta	Spionida	Spionidae	<i>Paraprionospio</i>	1	T	3	0.002	8	0.003	2	T
Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio</i>	1	0.002	0	0	0	0	1	0.002
Annelida	Polychaeta	Sternaspida	Sternaspidae	<i>Sternaspis(S. scutata)</i>	0	0	0	0	1	0.002	1	0.003
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Amaeana</i>	0	0	0	0	1	0.002	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Loimia(L.loimia)</i>	0	0	1	0.011	1	0.002	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella sp.1</i>	0	0	1	0.002	1	0.001	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella sp.2</i>	0	0	0	0	1	0.003	1	0.007
Annelida	Polychaeta	Terebellida	Trichobranchidae	<i>Terebellides (T. stroemii)</i>	0	0	0	0	1	0.001	0	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	<i>Lumbriculus sp.1</i>	1	0.002	0	0	0	0	0	0
Sipuncula	Sipunculiformes	Sipunculidea	Sipunculidae	<i>Sipunculus</i>	0	0	0	0	0	0	1	0.003
Arthropoda	Crustacea	Decapoda	Macrophthalmidae	<i>Cleistostoma</i>	0	0	0	0	2	4.535	0	0
Arthropoda	Crustacea	Decapoda	Alpheidae	<i>Alpheus</i>	1	1.011	0	0	0	0	2	3.468
Arthropoda	Crustacea	Decapoda	Penaeidae	Shrimp juvenile	0	0	1	0.018	2	2.096	0	0
Arthropoda	Crustacea	Decapoda	Pilumnidae	<i>Typhlocarcinus</i>	1	0.835	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Porcellanidae	<i>Petrolisthes</i>	0	0	1	1.362	0	0	0	0
Arthropoda	Crustacea	Decapoda	Portunidae	<i>Charybdis( C. variegata)</i>	0	0	0	0	0	0	0	0
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.1</i>	14	0.002	9	0.002	0	0	18	0.003
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.2</i>	4	0.001	3	0.001	4	0.001	5	0.001





Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.3</i>	0	0	1	T	2	0.001	3	0.001
Arthropoda	Maxillopoda	Sessilia	Balanidae	<i>Balanus</i>	0	0	0	0	3	1.100	0	0
Echinodermata	Ophiuroidea	Ophiurida	Amphiuridae	<i>Amphiopus</i>	0	0	0	0	0	0	1	0.008
Cnidaria	Anthozoa	Pennatulacea	-	<i>Sea pen</i>	0	0	0	0	1	0.005	0	0
Mollusca	Bivalvia	Veneroida	Dreissenidae	<i>Mytilopsis</i>	1	1.100	0	0	0	0	2	0.085
Mollusca	Bivalvia	Veneroida	Solenidae	<i>Solen</i>	0	0	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Tellinidae	<i>c.f. Augulus</i>	0	0	0	0	2	0.713	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Paphia (P. undulata)</i>	2	2.600	3	2.500	1	0.158	2	0.925
Mollusca	Bivalvia	Veneroida	Veneridae	<i>c.f. Phylloda foliacea</i>	0	0	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Ruditapes (R. philippinarum)</i>	0	0	1	2.100	2	1.900	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	Bivalve juvenile	0	0	0	0	0	0	0	0
Mollusca	Gastropoda	Archaeogastropoda	Lottiidae	<i>Nipponacmea</i>	0	0	0	0	1	0.273	0	0
Mollusca	Gastropoda	Neogastropoda	Nassariidae	<i>Nassarius</i>	0	0	0	0	1	2.300	0	0
Mollusca	Scaphopoda	-	Dentaliidae	-	0	0	0	0	0	0	0	0
Chordata	Actinopterygii	Perciformes	Gobiidae	UNID Goby	0	0	0	0	0	0	0	0
Nemertina	Anopla	Heteronemertea	-	<i>Cerebratulus sp.1</i>	1	0.001	1	0.004	0	0	0	0

**Note: Abd\* means Abundance, T means biomass <0.001 g round to 0.001g**



**Table 2. Summary of Benthic Survey Data, April 2020**

Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	46	13.649	19	2.471	0.839
B	45	13.202	21	2.733	0.898
C*	37	12.997	18	2.705	0.936
D*	58	15.189	21	2.706	0.889
E	45	5.571	19	2.487	0.845
F	43	6.019	18	2.602	0.900
G	54	13.117	29	3.085	0.916
H	60	4.567	22	2.618	0.847
<b>TOTAL</b>	<b>388</b>	<b>84.311</b>			

\*Impact Sites

**Table 3. Summary of Benthic Survey Baseline Data, August 2004**

Stations	Abundance	Total Biomass	Number of Taxa	Diversity (H')	Evenness (J)
A	115	14.56	24	0.93	0.29
B	36	4.76	14	0.89	0.34
C*	22	2.66	13	0.80	0.31
D*	39	5.07	11	0.62	0.26
E	39	48.69	16	0.89	0.32
F	11	8.07	9	0.68	0.31
G	182	4.91	31	1.10	0.32
H	23	0.49	11	0.81	0.34

\*Impact Sites



**Table 4.** Taxonomic Composition (%) of Benthic Survey, Baseline (August 2004), April to December in 2018, February to December in 2019 and February & April in 2020

Taxonomic Composition	Aug-04	Apr-18	Jun-18	Aug-18	Oct-18	Dec-18	Feb-19	Apr-19
Annelida	73.29	31.12	53.01	65.02	65.35	69.44	54.99	70.28
Sipuncula	0.21	0.30	0.80	0.45	0	0.93	0	0
Arthropoda	18.80	13.60	15.66	12.11	13.86	10.19	20.23	10.83
Echinodermata	3.63	15.11	4.82	5.38	2.97	2.78	3.42	4.72
Cnidaria	0.43	0.60	0.40	0	0	0.93	0.85	0
Mollusca	3.42	50.45	21.29	15.69	16.83	12.96	19.94	13.33
Chordata	0.21	2.11	0.80	0.45	0	0.93	0.28	0.56
Nemertea	0	0.30	3.21	0.90	0.99	1.85	0.28	0.28

Taxonomic Composition	Jun-19	Aug-19	Oct-19	Dec-19	Feb-20	Apr-20
Annelida	57.67	64.31	66.14	59.78	60.77	56.44
Sipuncula	0	1.57	1.25	0	1.29	0.52
Arthropoda	7.91	9.80	19.75	14.53	13.83	28.87
Echinodermata	4.65	5.10	3.13	1.68	1.61	0.77
Cnidaria	0.93	0.39	0	0.84	0.32	0.26
Mollusca	27.44	17.25	8.15	22.35	19.94	11.60
Chordata	0.93	1.18	0.94	0	0.32	0.52
Nemertea	0.47	0.39	0.63	0.84	1.93	1.03


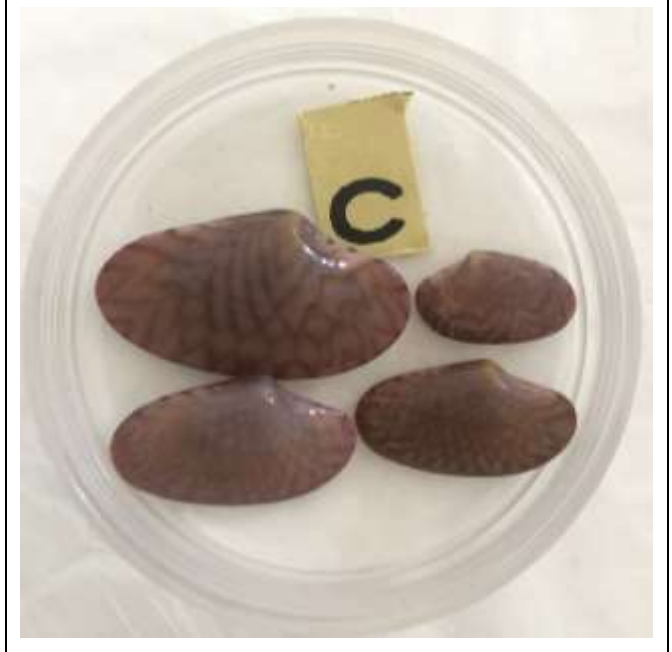




**Table 5.** Taxonomic Composition (abundance) of Benthic Survey, Baseline (August 2004) and April to December in 2018, February to December in 2019 and February & April in 2020

Taxonomic Composition	Aug-04	Apr-18	Jun-18	Aug-18	Oct-18	Dec-18	Feb-19	Apr-19
Annelida	343	103	132	145	132	150	193	253
Sipuncula	1	1	2	1	0	2	0	0
Arthropoda	88	45	39	27	28	22	71	39
Echinodermata	17	5	12	12	6	6	12	17
Cnidaria	2	2	1	0	0	2	3	0
Mollusca	16	167	53	35	34	28	70	48
Chordata	1	7	2	1	0	2	1	2
Nemertea	-	1	8	2	2	4	1	1
Grand total	468	331	249	223	202	216	351	360

Taxonomic Composition	Jun-19	Aug-19	Oct-19	Dec-19	Feb-20	Apr-20
Annelida	124	164	211	214	189	219
Sipuncula	0	4	4	0	4	2
Arthropoda	17	25	63	52	43	112
Echinodermata	10	13	10	6	5	3
Cnidaria	2	1	0	3	1	1
Mollusca	59	44	26	80	62	45
Chordata	2	3	3	0	1	2
Nemertea	1	1	2	3	6	4
Grand total	215	255	319	358	311	388

## Representative Taxa Identified

	
<p>A) The species of Polychaeta, <i>c.f. Laetmonice sp.</i></p>	<p>B) The species of Bivalvia, <i>Paphia undulata</i></p>
	
<p>C) The species of Crustacea, <i>Charybdis variegata</i></p>	<p>D) Benthic of sample</p>

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Report No.: 0041/17/ED/0544A

## Appendix J

### Photos of Grab Samplers

# FUGRO TECHNICAL SERVICES LIMITED

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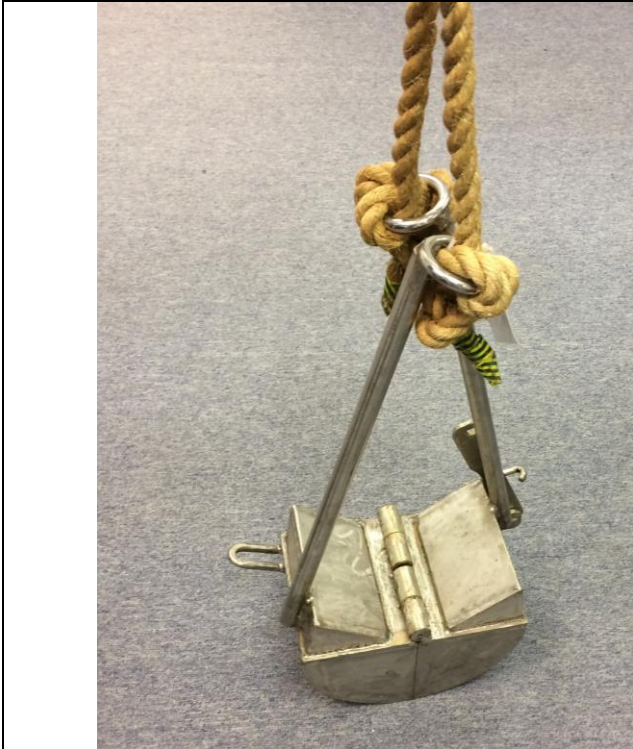


Photo 1. A ponar grab sampler

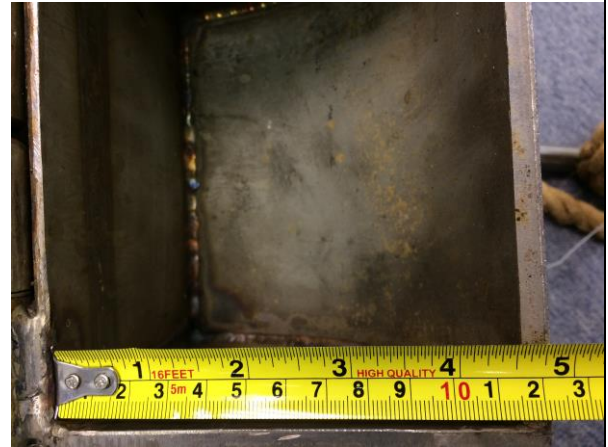


Photo 2. Grab dimension 1



Photo 3. Grab dimension 2



Photo 4. Grab dimension 3

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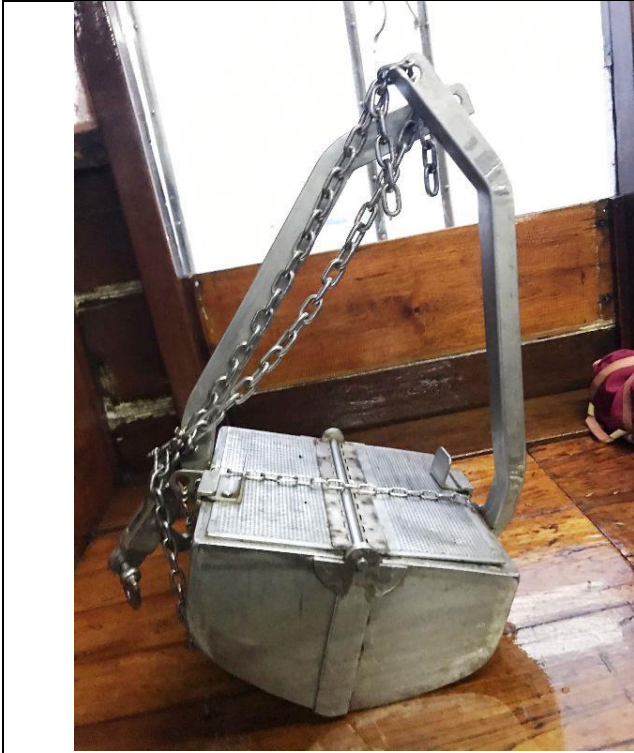


Photo 1. A modified Van Veen grab sampler



Photo 2. Grab dimension 1



Photo3. Grab dimension 2



Photo4. Grab dimension 3



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## Appendix K Environmental Complaints Log

## FUGRO TECHNICAL SERVICES LIMITED

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Report No.: 0041/17/ED/0544A

### Environmental Complaints Log

Complaint Log No.	Date of Complaint	Received From and Received By	Nature of Complaint	Investigation
1	28 November 2019	EPD	According to EPD, a member of public complained that SHWSTW cause a malodour and was smelled as far as the Discovery Bay tunnel portal.	As advised by DSD, the operation of Siu Ho Wan Sewage Treatment Works was properly functioned and there was no special activity on 28 <sup>th</sup> November 2019. Due to the possibility of having unpleasant gases or odours emitted from these non-DSD premises cannot be precluded, the complaint is considered as non-project related.

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Report No.: 0041/17/ED/0544A

## Appendix L

### Environmental Mitigation Implementation Schedule (EMIS)

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Report No.: 0041/17/ED/0544A

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

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Report No.: 0041/17/ED/0544A

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

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

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