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Report No.: 0041/17/ED/0501B

## Monthly EM&A Report October 2019

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/0501B

Prepared by: Andy K. H. Choi

Reviewed by: Cyrus C. Y. Lai

Certified by:

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

Colin K. L. Yung  
Environmental Team Leader  
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Our Ref. 1458/19-0028



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

28 November 2019

**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 (OCTOBER 2019)**

Reference is made to the submission of Monthly Environmental Monitoring and Audit (EM&A) Report for October 2019 (Report No.:0041/17/ED/0501B) from the Environmental Team (ET), Fugro Technical Services Ltd., received on 27 November 2019 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).

Notwithstanding, please be reminded that the ET shall strictly follow Condition 4.3 of the EP to submit monthly EM&A report within two weeks after the completion of each reporting period and the report shall be certified by the Independent Environmental Checker (IEC) before depositing with the Environmental Protection Department.

Should you have any queries, please feel free to contact the undersigned, or our Mr. Rodney IP 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/ri/ck/sc

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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## **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 Twenty-seventh Monthly EM&A Report for the Project which summarizes findings of the EM&A works during the reporting period from 1 October 2019 to 31 October 2019 (the “reporting period”).

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

Air quality monitoring (i.e. H<sub>2</sub>S concentration monitoring, odour patrol monitoring and olfactometry analysis), was temporarily suspended and no monitoring was carried out in the reporting period. No exceedances of Action/Limit levels at Air Sensitive Receivers (ASRs) were recorded and no non-compliance of odour monitoring at ASRs were recorded in the reporting period.

Water quality monitoring, sediment quality monitoring and benthic survey were carried out on 17 October 2019. 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.

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### 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).

Due to inadequacy of representative data collected between August 2017 and May 2018, current H<sub>2</sub>S measurement and olfactometry analysis were considered as unsuitable methods to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). In order to assess whether SHWSTW is the major H<sub>2</sub>S source to ASRs, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASRs are not the appropriate locations for the correlation study as the change of both odour level and H<sub>2</sub>S concentrations at ASRs were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.

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 suspended until alternative methods of correlation study is approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

## 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. EIAR-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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### 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 Odour Patrol Monitoring

2.2.1 Odour patrol monitoring was carried out in accordance with the European Standard method: BS EN13725, to ensure the odour sensitivities of all patrol members are within 20-80 ppb/V. Environmental conditions were record 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

The perceived intensity is classified into 5 categories as shown in **Table 2.2** below.



**Table 2.2 Categories of Odour Intensity**

Odour Level	Odour Intensity	Classification Criteria
0	Not detected	No odour perceives or an odour so weak that it cannot be readily characterised or described
1	Slight	Identifiable odour, barely noticeable
2	Noticeable	Identifiable odour, noticeable
3	Strong	Identifiable odour, strong
4	Extreme	Severe odour

**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, odour patrol monitoring and odour sampling were carried out at ASR, Cheung Tung Road near the Bus Depot at the west of the Siu Ho Wan Treatment Plant. The location of ASR is shown in **Figure 1**.

**2.5 Monitoring Frequency and Duration**

The durations and frequencies of H<sub>2</sub>S concentration measurement, odour patrolling and odour sampling are summarized in **Table 2.3** below.



**Table 2.3 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		
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.

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

## 2.6 Event and Action Plan

2.6.1 Action and limit levels for air quality monitoring are presented in **Table 2.4**.

**Table 2.4 Action and Limit Levels for Air Quality Monitoring**

Parameter	Action	Limit
Odour	One complaint received for specific odour event	Two or more independent complaints receive for specific odour event

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 Air quality monitoring (i.e. H<sub>2</sub>S concentration monitoring, odour patrol monitoring and olfactometry analysis), was temporary suspended and no monitoring was carried out in the reporting period.
- 2.8.2 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>). Due to non-ideal



wind direction or domination of non-target smell during the measurements conducted between August 2017 and May 2018, inadequacy of representative data was result between August 2017 and May 2018. Current H<sub>2</sub>S measurement and olfactometry analysis 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>). In order to assess whether SHWSTW is the major H<sub>2</sub>S source to ASRs, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASRs are not the appropriate locations for the correlation study as the change of both odour level and H<sub>2</sub>S concentrations at ASRs were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.

- 2.8.3 No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period.
- 2.8.4 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 suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.
- 2.8.5 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 2**.

**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 3**.

**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.

**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 on 17 October 2019. 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 E**.

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	5.32	29.41	9.38	31.66	9.9	0.13	191.6

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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	5.31	29.38	9.42	31.65	10.3	0.15	230.6
		M 8.5	5.24	29.23	8.80	31.77	16.5	0.26	195.5
		M 8.5	5.16	29.14	8.57	31.76	14.0	0.25	198.0
		B 16	5.12	29.10	8.57	31.82	14.6	0.43	236.8
		B 16	5.09	29.05	8.26	31.89	17.2	0.44	236.1
B	14	S 1	5.24	28.94	9.95	31.76	12.7	0.15	151.8
		S 1	5.32	28.96	9.98	31.78	12.0	0.15	144.1
		M 7	5.24	28.88	8.85	32.30	15.4	0.30	224.2
		M 7	5.13	28.87	8.65	32.49	17.6	0.29	202.8
		B 13	5.08	28.85	8.45	32.56	15.9	0.28	235.5
		B 13	5.07	28.87	8.45	32.58	14.0	0.26	230.7
C	12	S 1	5.66	29.33	9.70	32.05	13.5	0.10	174.2
		S 1	5.67	29.32	9.66	32.08	14.0	0.11	191.0
		M 6	5.57	29.27	8.36	31.40	14.4	0.16	208.6
		M 6	5.25	29.02	8.35	32.24	15.3	0.17	208.0
		B 11	5.01	28.91	8.34	32.63	18.5	0.27	238.2
		B 11	5.00	28.92	8.34	32.55	16.3	0.26	241.6
D	13	S 1	5.72	29.13	9.34	31.73	12.3	0.21	160.7
		S 1	5.71	29.13	9.35	31.92	11.1	0.21	157.6
		M 6.5	5.46	28.89	8.33	32.18	16.1	0.23	178.3
		M 6.5	5.19	28.84	8.32	32.34	18.0	0.21	173.5
		B 12	5.08	28.80	8.32	32.52	14.8	0.31	231.6
		B 12	5.03	28.78	8.32	32.74	18.0	0.32	228.9
E	16	S 1	6.05	28.91	9.26	28.18	12.2	0.17	166.8
		S 1	5.93	29.02	9.41	28.08	10.9	0.16	171.1
		M 8	5.21	28.69	8.33	32.79	14.6	0.21	221.1
		M 8	5.08	28.65	8.32	32.93	16.9	0.15	215.2
		B 15	4.98	28.65	8.32	32.98	16.7	0.18	226.7
		B 15	4.96	28.65	8.32	33.06	15.9	0.16	225.9
F	23	S 1	5.32	28.91	8.43	30.06	10.9	0.22	158.3
		S 1	5.37	28.90	8.48	30.07	11.4	0.20	155.8
		M 11.5	5.10	28.83	8.32	32.86	11.9	0.24	188.0
		M 11.5	5.08	28.82	8.32	32.91	11.5	0.29	190.0
		B 22	5.05	28.81	8.32	32.91	18.1	0.18	186.3
		B 22	5.05	28.81	8.32	32.78	16.9	0.18	189.8
G	22	S 1	5.27	28.84	8.34	32.50	14.5	0.19	185.3
		S 1	5.25	28.84	8.34	32.51	13.3	0.21	192.4
		M 11	5.83	28.41	8.33	32.58	12.9	0.27	221.1
		M 11	5.63	28.38	8.33	32.60	11.9	0.24	230.0
		B 21	5.40	28.30	8.36	32.58	12.8	0.37	250.9
		B 21	5.30	28.22	8.35	32.49	12.4	0.37	244.3
H	19	S 1	5.29	27.21	8.41	32.62	11.4	0.19	174.2
		S 1	5.26	27.17	8.39	32.59	11.1	0.19	184.6
		M 9.5	5.28	28.48	8.38	32.60	11.5	0.19	180.1
		M 9.5	5.23	28.63	8.37	32.65	12.0	0.20	187.9
		B 18	5.19	28.67	8.36	32.62	10.3	0.33	225.4
		B 18	5.18	28.73	8.36	32.61	11.6	0.32	225.8



**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	5.79	28.43	8.58	31.69	8.8	0.26	211.0
		S 1	5.77	28.49	8.42	31.85	8.0	0.19	204.8
		M 7.5	5.55	28.52	8.38	32.00	9.9	0.27	192.7
		M 7.5	5.40	28.52	8.37	32.28	9.5	0.28	190.4
		B 14	5.34	28.55	8.36	32.21	15.8	0.31	197.3
		B 14	5.26	28.55	8.36	31.96	13.3	0.29	202.6
B	14	S 1	5.79	28.14	8.40	29.72	10.1	0.22	232.2
		S 1	5.71	28.23	8.39	29.78	11.5	0.24	243.9
		M 7	5.59	28.32	8.38	31.87	12.6	0.30	209.9
		M 7	5.41	28.36	8.37	32.35	13.9	0.29	213.7
		B 13	5.30	28.43	8.37	32.43	17.5	0.19	195.4
		B 13	5.21	28.45	8.36	32.46	18.2	0.24	219.9
C	12	S 1	5.50	28.54	9.05	31.58	8.6	0.18	210.7
		S 1	5.50	28.53	9.08	31.54	8.3	0.11	237.2
		M 6	5.31	28.55	8.36	31.67	11.4	0.27	219.7
		M 6	5.24	28.60	8.34	32.17	11.8	0.21	212.8
		B 11	5.16	28.60	8.33	32.19	9.3	0.22	192.4
		B 11	5.14	28.63	8.33	32.31	10.8	0.20	208.7
D	14	S 1	5.58	28.20	8.49	31.76	9.6	0.21	199.8
		S 1	5.39	28.31	8.37	31.64	9.3	0.14	197.8
		M 7	5.32	28.39	8.36	31.79	11.7	0.47	220.4
		M 7	5.28	28.42	8.35	32.30	9.9	0.43	220.6
		B 13	5.21	28.43	8.34	32.28	9.2	0.32	202.8
		B 13	5.18	28.50	8.34	32.25	9.9	0.32	209.5
E	14	S 1	5.43	28.52	8.49	32.23	12.3	0.20	204.5
		S 1	5.28	28.57	8.33	32.38	10.9	0.17	198.6
		M 7	5.22	28.59	8.34	32.36	9.8	0.23	194.0
		M 7	5.18	28.62	8.30	32.38	10.9	0.24	189.5
		B 13	5.16	28.62	8.30	32.40	10.1	0.20	204.7
		B 13	5.17	28.63	8.55	32.32	10.2	0.24	221.7
F	18	S 1	5.29	28.45	8.41	31.32	10.7	0.24	221.6
		S 1	5.09	28.46	8.58	31.22	10.8	0.23	223.8
		M 9	5.10	28.46	8.56	31.18	16.4	0.21	209.3
		M 9	4.99	28.46	8.56	31.27	16.7	0.22	222.1
		B 17	4.99	28.24	8.53	31.12	12.1	0.31	223.0
		B 17	4.99	28.28	8.51	31.25	12.5	0.31	222.7
G	13	S 1	5.46	28.61	8.56	31.57	7.7	0.14	162.2
		S 1	5.47	28.61	8.45	31.61	6.9	0.15	175.1
		M 6.5	5.45	28.62	8.40	31.58	8.3	0.16	156.2
		M 6.5	5.34	28.59	8.38	31.81	8.3	0.18	159.3
		B 12	5.30	28.59	8.37	31.88	9.3	0.21	219.0
		B 12	5.18	28.65	8.36	32.28	10.9	0.20	210.4
H	19	S 1	5.48	28.58	8.47	31.58	8.7	0.19	205.5
		S 1	5.47	28.57	8.45	31.41	7.2	0.17	203.2
		M 9.5	5.49	28.58	8.42	31.61	9.9	0.22	169.0
		M 9.5	5.36	28.57	8.40	31.85	10.4	0.20	174.8
		B 18	5.31	28.57	8.38	31.86	13.6	0.33	174.2
		B 18	5.28	28.60	8.37	32.03	13.6	0.39	170.4



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 E**.

**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	8.8	0.058	0.090	0.237	0.385	2	0.03	<1.0
		S 1	8.0	0.046	0.089	0.239	0.373	1	0.03	<1.0
		M 8.5	12.6	0.053	0.087	0.227	0.367	2	0.04	<1.0
		M 8.5	13.0	0.061	0.088	0.230	0.378	ND	0.03	<1.0
		B 16	14.1	0.053	0.088	0.232	0.374	8	0.03	<1.0
		B 16	13.7	0.049	0.086	0.234	0.368	12	0.03	<1.0
B	14	S 1	14.1	0.047	0.086	0.232	0.365	7	0.03	<1.0
		S 1	14.4	0.054	0.085	0.217	0.356	10	0.03	<1.0
		M 7	14.5	0.042	0.089	0.233	0.364	21	0.03	<1.0
		M 7	14.3	0.048	0.084	0.217	0.35	34	0.03	<1.0
		B 13	14.6	0.048	0.085	0.222	0.354	14	0.03	<1.0
		B 13	14.8	0.054	0.084	0.206	0.344	23	0.03	<1.0
C	12	S 1	11.7	0.059	0.090	0.236	0.386	9	0.03	1.2
		S 1	12.3	0.076	0.088	0.230	0.394	11	0.03	<1.0
		M 6	13.1	0.052	0.093	0.252	0.398	37	0.03	<1.0
		M 6	12.9	0.051	0.092	0.252	0.395	32	0.03	<1.0
		B 11	18.2	0.055	0.095	0.248	0.397	18	0.03	<1.0
		B 11	18.6	0.054	0.092	0.246	0.392	23	0.03	<1.0
D	13	S 1	10.9	0.062	0.085	0.225	0.372	9	0.03	<1.0
		S 1	11.3	0.078	0.087	0.239	0.405	6	0.03	<1.0
		M 6.5	11.6	0.046	0.092	0.250	0.387	2	0.03	<1.0
		M 6.5	11.5	0.041	0.092	0.248	0.381	4	0.03	<1.0
		B 12	13.4	0.151	0.092	0.240	0.484	43	0.03	<1.0
		B 12	13.8	0.150	0.091	0.234	0.475	41	0.03	<1.0
E	16	S 1	12.2	0.104	0.088	0.228	0.419	7	0.03	1.6
		S 1	13.2	0.086	0.086	0.234	0.406	11	0.03	<1.0
		M 8	11.9	0.082	0.077	0.190	0.349	25	0.03	<1.0
		M 8	12.5	0.076	0.080	0.202	0.358	21	0.03	1.3
		B 15	14.5	0.059	0.078	0.191	0.329	26	0.03	<1.0
		B 15	14.1	0.067	0.076	0.184	0.327	23	0.03	<1.0
F	23	S 1	10.9	0.060	0.083	0.199	0.342	8	0.03	<1.0
		S 1	10.1	0.059	0.086	0.195	0.339	6	0.03	<1.0
		M 11.5	11.3	0.082	0.074	0.185	0.341	26	0.03	<1.0
		M 11.5	11.1	0.070	0.079	0.182	0.330	20	0.03	<1.0
		B 22	11.2	0.073	0.078	0.197	0.348	44	0.03	<1.0
		B 22	11.6	0.076	0.078	0.185	0.339	37	0.03	<1.0
G	22	S 1	10.7	0.062	0.083	0.203	0.348	26	0.03	<1.0
		S 1	10.0	0.072	0.082	0.205	0.360	33	0.02	<1.0
		M 11	9.9	0.060	0.078	0.198	0.337	37	0.02	<1.0
		M 11	10.6	0.072	0.088	0.202	0.362	31	0.03	<1.0
		B 21	14.4	0.065	0.082	0.199	0.345	40	0.03	<1.0
		B 21	13.6	0.064	0.085	0.200	0.348	41	0.03	<1.0
H	19	S 1	7.3	0.078	0.083	0.208	0.370	11	0.03	<1.0
		S 1	7.5	0.064	0.084	0.212	0.359	13	0.02	<1.0
		M 9.5	8.2	0.075	0.084	0.209	0.368	14	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	7.8	0.070	0.084	0.209	0.363	11	0.03	<1.0
		B 18	9.2	0.086	0.085	0.200	0.370	41	0.03	<1.0
		B 18	9.9	0.078	0.084	0.198	0.360	32	0.03	1.7

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	11.4	0.041	0.096	0.243	0.380	7	0.03	1.0
		S 1	11.6	0.051	0.096	0.246	0.394	9	0.03	1.0
		M 7.5	13.1	0.032	0.100	0.239	0.372	8	0.03	1.1
		M 7.5	13.2	0.042	0.098	0.247	0.388	4	0.03	1.0
		B 14	14.7	0.048	0.096	0.244	0.388	7	0.03	1.1
		B 14	14.3	0.042	0.091	0.228	0.362	6	0.03	1.1
B	14	S 1	9.6	0.046	0.094	0.248	0.388	16	0.03	1.1
		S 1	9.8	0.060	0.097	0.244	0.402	12	0.03	<1.0
		M 7	12.8	0.045	0.094	0.248	0.388	27	0.03	1.1
		M 7	12	0.065	0.094	0.249	0.407	29	0.03	<1.0
		B 13	14.3	0.064	0.084	0.237	0.385	20	0.03	1.1
		B 13	14.9	0.064	0.084	0.225	0.373	25	0.03	<1.0
C	12	S 1	11.4	0.042	0.102	0.237	0.381	28	0.03	<1.0
		S 1	11.0	0.039	0.098	0.234	0.371	24	0.03	<1.0
		M 6	12.3	0.040	0.097	0.250	0.387	30	0.03	<1.0
		M 6	12.1	0.038	0.096	0.251	0.385	32	0.03	<1.0
		B 11	14.3	0.041	0.094	0.242	0.378	28	0.03	1.1
		B 11	13.5	0.042	0.093	0.241	0.376	24	0.03	<1.0
D	14	S 1	12.5	0.042	0.093	0.242	0.378	33	0.03	<1.0
		S 1	12.0	0.043	0.096	0.244	0.383	31	0.03	<1.0
		M 7	12.6	0.040	0.089	0.251	0.380	42	0.03	<1.0
		M 7	12.8	0.041	0.098	0.249	0.389	49	0.03	<1.0
		B 13	12.4	0.040	0.098	0.250	0.389	47	0.03	<1.0
		B 13	12.3	0.041	0.093	0.248	0.382	39	0.03	<1.0
E	14	S 1	15.5	0.054	0.089	0.205	0.347	19	0.03	<1.0
		S 1	15.8	0.054	0.083	0.209	0.346	23	0.03	<1.0
		M 7	16.4	0.054	0.084	0.223	0.360	60	0.03	<1.0
		M 7	16.2	0.054	0.074	0.212	0.339	54	0.03	<1.0
		B 13	18.3	0.055	0.089	0.222	0.366	64	0.03	<1.0
		B 13	18.1	0.055	0.090	0.219	0.364	59	0.03	<1.0
F	18	S 1	13.5	0.051	0.088	0.226	0.366	31	0.03	<1.0
		S 1	14.0	0.054	0.093	0.218	0.365	33	0.03	<1.0
		M 9	16.9	0.048	0.073	0.220	0.342	18	0.03	1.3
		M 9	17.1	0.056	0.087	0.220	0.364	12	0.03	<1.0
		B 17	17.7	0.050	0.081	0.240	0.371	120	0.04	<1.0
		B 17	17.6	0.062	0.089	0.269	0.420	92	0.03	1.3
G	13	S 1	13.3	0.057	0.089	0.240	0.387	18	0.03	1.2
		S 1	13.5	0.061	0.089	0.238	0.388	12	0.03	1.3
		M 6.5	14.1	0.046	0.093	0.237	0.375	30	0.03	<1.0
		M 6.5	13.6	0.052	0.089	0.241	0.382	38	0.03	<1.0
		B 12	15.1	0.058	0.081	0.228	0.367	23	0.03	<1.0
		B 12	14.6	0.057	0.094	0.232	0.383	24	0.03	<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	9.0	0.083	0.092	0.263	0.438	34	0.03	1.9
		S	1	9.3	0.084	0.090	0.249	0.422	30	0.03	<1.0
		M	9.5	11.7	0.047	0.081	0.264	0.392	36	0.04	<1.0
		M	9.5	11.1	0.055	0.079	0.262	0.395	39	0.03	<1.0
		B	18	13.4	0.067	0.091	0.247	0.405	17	0.03	<1.0
		B	18	12.7	0.071	0.090	0.267	0.428	11	0.03	1.5

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 F**.

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)		
17 October 2019	29.7	26.2	23.9	70	0.0

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 2**.

**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 3**.

### 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 I**.

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 I**.

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 17 October 2019. 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 G**.

**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	8.5	3	936	479	<0.10	40.3	31.5	44.8	0.15	23.4	101	17.4	0.24
B	8.6	3	846	417	<0.10	35.1	32.8	37.0	0.10	20.4	92.1	14.4	0.36
C	8.3	10	1140	585	<0.10	49.4	41.8	52.9	0.12	28.9	130	16.6	0.40
D	8.5	5	947	477	0.11	40.7	35.4	43.6	0.11	24.6	109	11.3	0.30
E	8.4	12	1300	562	<0.10	46.6	42.0	49.5	0.12	28.0	126	12.2	0.36
F	8.3	26	1440	589	<0.10	45.8	40.5	48.0	0.15	27.8	121	12.4	0.32
G	8.4	6	1030	502	0.11	46.4	103	67.7	0.11	25.8	216	15.6	0.37
H	8.4	2	941	463	0.13	44.6	43.7	45.7	0.11	26.2	108	14.1	0.39

**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	0.95	3	27	37	33	Dark grey, slightly sandy SILT/CLAY with shell fragments
B	0.65	6	25	41	28	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
C	0.90	0	3	58	39	Dark grey, slightly sandy SILT/CLAY with shell fragments
D	0.86	0	15	53	32	Dark grey, slightly sandy SILT/CLAY with shell fragments
E	1.11	0	6	56	38	Dark grey, slightly sandy SILT/CLAY with shell fragments
F	1.18	0	4	55	41	Dark grey, slightly sandy SILT/CLAY with shell fragments
G	0.87	10	17	44	29	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments
H	0.85	3	10	54	33	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 G**.

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)		
17 October 2019	29.7	26.2	23.9	70	0.0

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 17 October 2019

Monitoring Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	43	9.04	21	2.93	0.96
B	45	7.25	22	2.84	0.92
C	14	0.07	9	2.11	0.96
D	26	7.62	13	2.26	0.88
E	45	20.33	24	2.97	0.94
F	41	8.66	19	2.76	0.94
G	56	14.28	24	2.79	0.88
H	49	5.41	22	2.97	0.96
TOTAL	319	72.67			

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

i) Abundance

A total of 319 macrobenthic organisms were recorded from the eight monitoring stations during the October 2019 monitoring period. Compared to both dry (March 2004) and wet (August 2004) seasons baseline data, the current total abundance remained to be relatively lower. This trend has been observed since the commencement of the monitoring activities in April 2018. As previously reported, generally, decreasing abundances were observed during wet season monitoring periods while increasing abundances during dry monitoring periods. These variations might be attributed to the natural response of macrobenthic communities to seasonal changes. However, similar to previous monitoring periods, these observed seasonal variation are not statistically significant (F-value = 1.32, F-crit = 1.90, P-value = 0.22).

Similar to the previous monitoring periods, statistically significant (F-value = 3.10, F-crit = 2.11, P-value = 0.006) in total abundances across monitoring stations was observed. The lowest abundances were recorded in the impact stations, Station C and Station D, with 14 ind. and 26 ind., respectively. The highest abundance (56 ind.) was recorded in Station G. Abundance distribution showed that the impact stations have relatively lower abundances compared to the reference stations, a similar trend observed in the baseline data. Sediments in these stations remained to be well-sorted composed silt/clay substrate. During the present monitoring period, stations with moderately sorted sediments have generally higher abundances compared to stations with well-sorted sediments. The abundance-sediment size correlation was more apparent compared to the previous two monitoring periods.

ii) Biomass

The total wet biomass recorded in the eight monitoring stations was 72.67g, which is lower compared to the previous monitoring period (129.87g). The current biomass is higher compared to the wet season but lower compared to the dry season baseline data. The highest total biomass was recorded in Station E (20.33 g) while the lowest was in the impact station Station C (0.072g), same observation with the previous monitoring period. The higher biomass observed in Station E was contributed by the relatively larger molluscan species, *Paphia undulata*.

**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 seven phyla comprising of 33 families and 49 taxa were identified. The benthic fauna composition is dominated by annelids (66.14%), arthropods (19.75%), and molluscs (8.15%). Same as the baseline study, the most dominant group for the October 2019 monitoring period was the polychaetes *Capitellidae*. The most dominant species (abundance  $\geq 10$ ) was the polychaete, *Capitella* sp., with the abundance of 11 ind. in Station G. Capitellids are typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

Highest number of genera was recorded in Station E (24) and Station G (24) and the lowest in was in the impact station Station C (9). Similar to abundance and biomass, relatively lower number of taxa was observed at impact stations compared to the reference stations.

**iv) Diversity**

Diversity index ( $H'$ ) and Evenness index ( $J$ ) ranged from 2.11 – 2.26 and 0.88 – 0.96 in impact stations, and 2.76 – 2.97 and 0.88 – 0.96 among the reference stations, which suggest that benthic faunal diversity is relatively higher at reference stations than those at impact stations. However, overall diversity in the eight monitoring stations was within the range of typical values recorded in the previous monitoring periods. Compared with the baseline survey result, the diversity index and evenness index increased.

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





## **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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### 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 J**.



## **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 J**.

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

- 8.1.1 Air quality monitoring (i.e. H<sub>2</sub>S concentration monitoring, odour patrol monitoring and olfactometry analysis), was temporary suspended and no monitoring was carried out in the reporting period. 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 17 October 2019. 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	0
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



## 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. Due to inadequacy of representative data collected between August 2017 and May 2018, current H<sub>2</sub>S measurement and olfactometry analysis were considered as unsuitable method to establish the relationship of H<sub>2</sub>S concentration (ppb) with the odour unit (OU/m<sup>3</sup>). In order to assess whether SHWSTW is the major H<sub>2</sub>S source to ASRs, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR are not appropriate locations for the correlation study as the change of both odour level and H<sub>2</sub>S concentrations at ASRs were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.
- iii. 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 suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

## 11. CONCLUSION

- 11.1.1 Air quality monitoring i.e. H<sub>2</sub>S concentration monitoring, odour patrol monitoring and olfactometry analysis, was temporary suspended and no monitoring was carried out in the reporting period. No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during 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>). Due to non-ideal wind direction or domination of non-target smell during the measurements conducted between August 2017 and May 2018, inadequacy of representative data was result between August 2017 and May 2018. Current H<sub>2</sub>S measurement and olfactometry analysis 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>). In order to assess whether SHWSTW is the major H<sub>2</sub>S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H<sub>2</sub>S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval. 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 suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.
- 11.1.3 Water quality monitoring, sediment quality monitoring and benthic survey were conducted on 17 October 2019 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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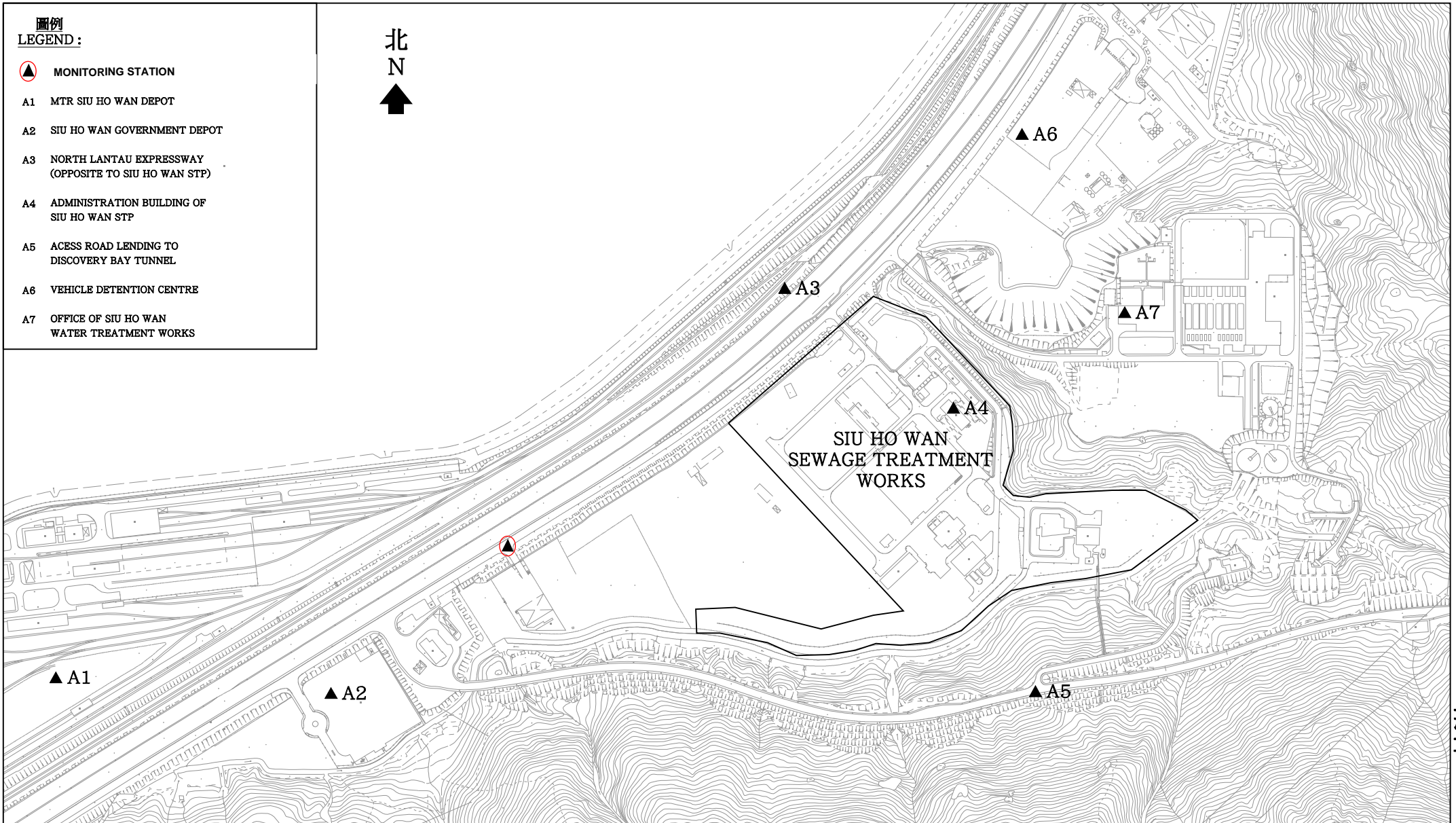
Figure 1


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



<p>圖則名稱 drawing title</p> <p><b>UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT OPTIONAL ENVIRONMENTAL MONITORING AND AUDIT PLAN ODOUR PATROL MONITORING STATIONS</b></p>	繪畫 drawn	C.W. CHAN	日期 date 16-08-2006	圖則編號 drawing no.	比例 scale	
	核對 checked	C.K. LAM	日期 date 16-08-2006	<b>DCM/2006/063</b>	N.T.S.	
	批核 approved	S.K. WONG	日期 date 16-08-2006	保留版權 COPYRIGHT RESERVED		
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### Figure 2

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





816000E

818000E

820000E

822000E

## 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

822000N

820000N

大小灣刀  
BROTHERS

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

圖例  
LEGEND :

IMPACT STATION



CONTROL STATION



SUBMARINE OUTFALL

圖則編號 drawing no.

DCM/2004/002

比例 scale

N.T.S.

保留版權

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香港特別行政區政府渠務署  
DRAINAGE SERVICES DEPARTMENT  
GOVERNMENT OF THE  
HONG KONG  
SPECIAL ADMINISTRATIVE REGION

# FUGRO TECHNICAL SERVICES LIMITED

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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/0501B

## Figure 3

### 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



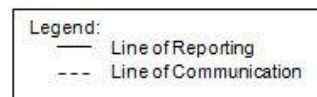
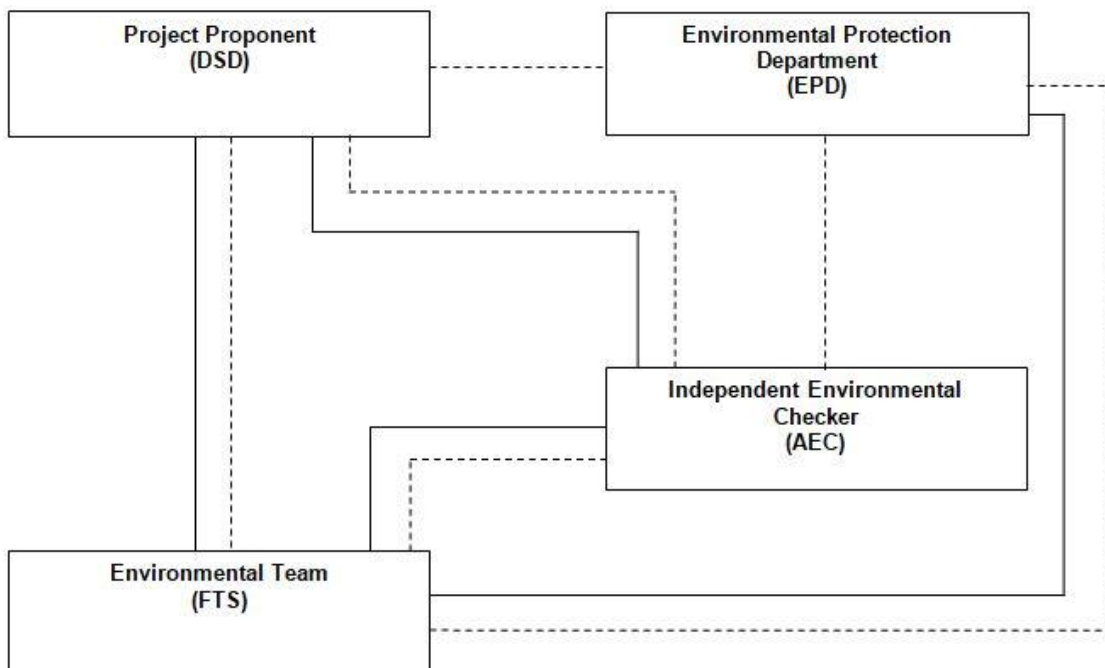
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## Appendix B

### Monitoring Schedule for Present and Next Reporting Period



# FUGRO TECHNICAL SERVICES LIMITED

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Report No.: 0041/17/ED/0501B

## Monitoring Schedule for the Present Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
		1 October	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17 Water Quality Monitoring and Sediment Quality Monitoring and Benthic Survey Mid-Flood (08:40) Mid-Ebb (14:25)	18	19
20	21	22	23	24	25	26
27	28	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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Report No.: 0041/17/ED/0501B

## Monitoring Schedule for the Next Reporting Period

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

### Remarks

1. 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/0501B

## Appendix C

### Event and Action Plan for Air Quality Monitoring

# FUGRO TECHNICAL SERVICES LIMITED

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Website : www.fugro.com



Report No.: 0041/17/ED/0501B

EVENT	ACTION		
	ET	IEC	*Operator
<b>Action Level</b>			
One complaint received for specific odour event	<ol style="list-style-type: none"> <li>1. Check Operator's working methods;</li> <li>2. Discuss with Operator on required remedial actions</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss with ET and Operator on the possible remedial actions;</li> <li>2. Advise the Operator on the effectiveness of the proposed remedial measures;</li> <li>3 Supervise implementation of remedial measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify/ confirm source with ET;</li> <li>2. Discuss with ET for remedial actions required;</li> <li>3. Ensure remedial actions properly implemented</li> <li>4. Rectify any unacceptable practice;</li> <li>5. Amend operation methods if appropriate</li> </ol>
<b>Limit Level</b>			
More than one complaint	<ol style="list-style-type: none"> <li>1. Investigated the causes of complaint;</li> <li>2. Check Operator's working methods;</li> <li>3. Carry out analysis of Operator's working procedures to determine possible mitigation to be implemented;</li> <li>4. Arrange meeting with ET and EPD to discuss the remedial actions to be taken;</li> <li>5. Discuss with EPD and the Operator on the required remedial actions;</li> <li>6. Submit proposals for remedial actions within 3 working days of notification;</li> <li>7. Assess effectiveness of Operator's remedial actions and keep EPD informed of the results;</li> <li>8. Amend proposal if appropriate;</li> <li>9. Resubmit proposal if problem still not under control</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ET and the Operator on the potential remedial actions;</li> <li>2. Review the proposed remedial actions whenever necessary to assure their effectiveness and advise the Operator accordingly;</li> <li>3. Supervise implementation of remedial measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Indentify/ confirm source with ET;</li> <li>2. Confirm receipt of notification of failure in writing;</li> <li>3. Inform ET, IEC and EPD;</li> <li>4. Discuss with EPD and ET on the required remedial actions;</li> <li>5. Ensure remedial actions properly implemented;</li> <li>6. Take immediate action to avoid further exceedance;</li> <li>7. Implement the agreed proposals</li> </ol>

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

## **FUGRO TECHNICAL SERVICES LIMITED**

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Report No.: 0041/17/ED/0501B

### Appendix D

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

Report No. : 142626WA192143



Page 1 of 3

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

Client : Fugro Technical Services Limited (MCL)

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 : WA192143/1

Date of calibration : 25/09/2019

Next calibration date : 24/12/2019

Test method used : In-house comparison method

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

Report No. : 142626WA192143

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	9.18	0.00
6.86	6.85	-0.01

**B. Salinity calibration**

Salinity, ppt			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
10	10.04	+0.04	± 0.5
20	20.07	+0.07	± 1.0
30	29.76	-0.24	± 1.5
40	39.81	-0.19	± 2.0

**C. Dissolved Oxygen calibration**

Trial No.	Dissolved oxygen content, mg/L	
	By calibrated D.O. meter	By D.O. meter
1	7.32	7.32
2	7.33	7.34
3	7.33	7.33
Average	7.33	7.33

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 : HO Kin Man, John  
 Assistant General Manager – Laboratories

Date : 4/10/2019

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

Report No. : 142626WA192143

Page 3 of 3

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

Thermometer reading, °C	Meter reading, °C
25.17	25.21

**E. Turbidity calibration**

Turbidity, N.T.U.			
Theoretical	Measured	Deviation	Maximum acceptable Deviation
4	4.07	+0.07	± 0.4
8	8.09	+0.09	± 0.6
40	39.69	-0.31	± 3.0
80	79.55	-0.45	± 4.0

Certified by :   
Approved Signatory : HO Kin Man, John  
Assistant General Manager – Laboratories

Date

: 4/10/2019

\*\* 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.

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Report No.: 0041/17/ED/0501B

## Appendix E

### 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	: HK1944686
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	Amendment	: 1
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	: 17-Oct-2019
Order number	: 0041/17	Quote number	: HKE/1654/2017_R1	Issue Date	: 20-Nov-2019
C-O-C number	: ---			No. of samples received	: 96
Site	: ---			No. of samples analysed	: 96

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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
		
Ng Sin Kou, May	Laboratory Manager	Microbiology_ENV



### **General Comments**

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. 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 17-Oct-2019 to 28-Oct-2019.

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: HK1944686**

Sample(s) were received in chilled condition.

Water sample(s) analysed and reported on as received basis.

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

Sample(s) arrived in the laboratory at 18:45. Microbiological sample(s), in 125mL plastic bottle labelled sterile, with addition of sodium thiosulfate solution.

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

This is an amendment of the Certificate of Analysis.

The sample receipt date has been amended.

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
				17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-001	HK1944686-002	HK1944686-003	HK1944686-004	HK1944686-005
<b>EA/ED: Physical and Aggregate Properties</b>								
EA025: Suspended Solids (SS)	----	0.5	mg/L	8.8	8.0	12.6	13.0	14.1
<b>ED/EK: Inorganic Nonmetallic Parameters</b>								
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.058	0.046	0.053	0.061	0.053
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.090	0.089	0.087	0.088	0.088
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.237	0.239	0.227	0.230	0.232
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.385	0.373	0.367	0.378	0.374
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.04	0.03	0.03
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	2	NOT DETECTED	8





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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-006	HK1944686-007	HK1944686-008	HK1944686-009	HK1944686-010	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	13.7	14.1	14.4	14.5	14.3	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.049	0.047	0.054	0.042	0.048	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.086	0.086	0.085	0.089	0.084	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.234	0.232	0.217	0.233	0.217	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.368	0.365	0.356	0.364	0.350	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	12	7	10	21	34	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-011	HK1944686-012	HK1944686-013	HK1944686-014	HK1944686-015	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	14.6	14.8	11.7	12.3	13.1	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.048	0.054	0.059	0.076	0.052	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.085	0.084	0.090	0.088	0.093	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.222	0.206	0.236	0.230	0.252	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.354	0.344	0.386	0.394	0.398	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	1.2	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	14	23	9	11	37	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-016	HK1944686-017	HK1944686-018	HK1944686-019	HK1944686-020	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	12.9	18.2	18.6	10.9	11.3	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.051	0.055	0.054	0.062	0.078	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.092	0.095	0.092	0.085	0.087	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.252	0.248	0.246	0.225	0.239	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.395	0.397	0.392	0.372	0.405	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	32	18	23	9	6	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-021	HK1944686-022	HK1944686-023	HK1944686-024	HK1944686-025	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	11.6	11.5	13.4	13.8	12.2	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.046	0.041	0.151	0.150	0.104	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.092	0.092	0.092	0.091	0.088	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.250	0.248	0.240	0.234	0.228	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.387	0.381	0.484	0.475	0.419	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	1.6	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	2	4	43	41	7	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-026	HK1944686-027	HK1944686-028	HK1944686-029	HK1944686-030	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	13.2	11.9	12.5	14.5	14.1	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.086	0.082	0.076	0.059	0.067	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.086	0.077	0.080	0.078	0.076	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.234	0.190	0.202	0.191	0.184	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.406	0.349	0.358	0.329	0.327	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	1.3	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	11	25	21	26	23	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-031	HK1944686-032	HK1944686-033	HK1944686-034	HK1944686-035	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	10.9	10.1	11.3	11.1	11.2	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.060	0.059	0.082	0.070	0.073	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.083	0.086	0.074	0.079	0.078	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.199	0.195	0.185	0.182	0.197	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.342	0.339	0.341	0.330	0.348	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	6	26	20	44	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-036	HK1944686-037	HK1944686-038	HK1944686-039	HK1944686-040	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	11.6	10.7	10.0	9.9	10.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.076	0.062	0.072	0.060	0.072	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.078	0.083	0.082	0.078	0.088	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.185	0.203	0.205	0.198	0.202	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.339	0.348	0.360	0.337	0.362	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.02	0.02	0.03	
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	37	26	33	37	31	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-041	HK1944686-042	HK1944686-043	HK1944686-044	HK1944686-045	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	14.4	13.6	7.3	7.5	8.2	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.065	0.064	0.078	0.064	0.075	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.082	0.085	0.083	0.084	0.084	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.199	0.200	0.208	0.212	0.209	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.345	0.348	0.370	0.359	0.368	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	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	40	41	11	13	14	





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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-046	HK1944686-047	HK1944686-048	HK1944686-049	HK1944686-050	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	7.8	9.2	9.9	11.4	11.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.070	0.086	0.078	0.041	0.051	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.084	0.085	0.084	0.096	0.096	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.209	0.200	0.198	0.243	0.246	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.363	0.370	0.360	0.380	0.394	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	1.7	1.0	1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	11	41	32	7	9	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-051	HK1944686-052	HK1944686-053	HK1944686-054	HK1944686-055	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	13.1	13.2	14.7	14.3	9.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.032	0.042	0.048	0.042	0.046	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.100	0.098	0.096	0.091	0.094	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.239	0.247	0.244	0.228	0.248	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.372	0.388	0.388	0.362	0.388	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.01	0.01	0.01	0.01	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.1	1.0	1.1	1.1	1.1	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	8	4	7	6	16	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-056	HK1944686-057	HK1944686-058	HK1944686-059	HK1944686-060	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	9.8	12.8	12.0	14.3	14.9	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.060	0.045	0.065	0.064	0.064	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.097	0.094	0.094	0.084	0.084	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.244	0.248	0.249	0.237	0.225	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.402	0.388	0.407	0.385	0.373	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.01	0.02	0.02	0.02	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	<1.0	1.1	<1.0	1.1	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	12	27	29	20	25	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-061	HK1944686-062	HK1944686-063	HK1944686-064	HK1944686-065	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	11.4	11.0	12.3	12.1	14.3	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.042	0.039	0.040	0.038	0.041	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.102	0.098	0.097	0.096	0.094	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.237	0.234	0.250	0.251	0.242	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.381	0.371	0.387	0.385	0.378	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	1.1	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	28	24	30	32	28	



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				17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	
Compound	CAS Number	LOR	Unit	HK1944686-066	HK1944686-067	HK1944686-068	HK1944686-069	HK1944686-070	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	13.5	12.5	12.0	12.6	12.8	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.042	0.042	0.043	0.040	0.041	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.093	0.093	0.096	0.089	0.098	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.241	0.242	0.244	0.251	0.249	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.376	0.378	0.383	0.380	0.389	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
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	24	33	31	42	49	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-071	HK1944686-072	HK1944686-073	HK1944686-074	HK1944686-075	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	12.4	12.3	15.5	15.8	16.4	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.040	0.041	0.054	0.054	0.054	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.098	0.093	0.089	0.083	0.084	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.250	0.248	0.205	0.209	0.223	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.389	0.382	0.347	0.346	0.360	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.02	0.01	
<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	47	39	19	23	60	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-076	HK1944686-077	HK1944686-078	HK1944686-079	HK1944686-080	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	16.2	18.3	18.1	13.5	14.0	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.054	0.055	0.055	0.051	0.054	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.074	0.089	0.090	0.088	0.093	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.212	0.222	0.219	0.226	0.218	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.339	0.366	0.364	0.366	0.365	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.02	0.02	0.02	0.01	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	54	64	59	31	33	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-081	HK1944686-082	HK1944686-083	HK1944686-084	HK1944686-085	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	16.9	17.1	17.7	17.6	13.3	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.048	0.056	0.050	0.062	0.057	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.073	0.087	0.081	0.089	0.089	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.220	0.220	0.240	0.269	0.240	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.342	0.364	0.371	0.420	0.387	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.04	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	0.01	0.02	0.02	0.01	0.01	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.3	<1.0	<1.0	1.3	1.2	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	18	12	120	92	18	





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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-086	HK1944686-087	HK1944686-088	HK1944686-089	HK1944686-090	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	13.5	14.1	13.6	15.1	14.6	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.061	0.046	0.052	0.058	0.057	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.089	0.093	0.089	0.081	0.094	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.238	0.237	0.241	0.228	0.232	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.388	0.375	0.382	0.367	0.383	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.03	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.02	0.02	0.01	0.02	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.3	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	12	30	38	23	24	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944686-091	HK1944686-092	HK1944686-093	HK1944686-094	HK1944686-095	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	----	0.5	mg/L	9.0	9.3	11.7	11.1	13.4	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.083	0.084	0.047	0.055	0.067	
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.092	0.090	0.081	0.079	0.091	
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.263	0.249	0.264	0.262	0.247	
EK063A: Inorganic Nitrogen as N	----	0.010	mg/L	0.438	0.422	0.392	0.395	0.405	
EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.04	0.03	0.03	
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.02	0.02	0.01	0.01	
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	----	1.0	mg/L	1.9	<1.0	<1.0	<1.0	<1.0	
<b>EM: Microbiological Testing</b>									
EM002: E. coli	----	1	CFU/100mL	34	30	36	39	17	



Sub-Matrix: WATER				Client sample ID	H/B/F/Dup	---	---	---	---
				Client sampling date / time	17-Oct-2019	---	---	---	---
Compound	CAS Number	LOR	Unit	HK1944686-096	---	---	---	---	---
<b>EA/ED: Physical and Aggregate Properties</b>									
EA025: Suspended Solids (SS)	---	0.5	mg/L	12.7	---	---	---	---	---
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.071	---	---	---	---	---
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.090	---	---	---	---	---
EK058A: Nitrate as N	14797-55-8	0.005	mg/L	0.267	---	---	---	---	---
EK063A: Inorganic Nitrogen as N	---	0.010	mg/L	0.428	---	---	---	---	---
EK067P: Total Phosphorus as P	---	0.01	mg/L	0.03	---	---	---	---	---
EK067P: Total Phosphorus - Filtered	---	0.01	mg/L	<0.01	---	---	---	---	---
<b>EP: Aggregate Organics</b>									
EP030: Biochemical Oxygen Demand	---	1.0	mg/L	1.5	---	---	---	---	---
<b>EM: Microbiological Testing</b>									
EM002: E. coli	---	1	CFU/100mL	11	---	---	---	---	---



**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: 2651004)</b>								
HK1944686-001	A/S/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	8.8	8.6	2.60
HK1944686-011	B/B/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	14.6	14.8	1.53
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651005)</b>								
HK1944686-021	D/M/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	11.6	11.3	2.40
HK1944686-031	F/S/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	10.9	10.6	2.09
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651006)</b>								
HK1944686-041	G/B/E	EA025: Suspended Solids (SS)	----	0.5	mg/L	14.4	14.1	2.27
HK1944686-051	A/M/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	13.1	13.4	2.08
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651007)</b>								
HK1944686-061	C/S/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	11.4	11.9	4.28
HK1944686-071	D/B/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	12.4	12.0	3.49
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651008)</b>								
HK1944686-081	F/M/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	16.9	16.5	2.24
HK1944686-091	H/S/F	EA025: Suspended Solids (SS)	----	0.5	mg/L	9.0	9.5	4.59
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650634)</b>								
HK1944686-020	D/S/E/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.078	0.081	3.47
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650635)</b>								
HK1944686-040	G/M/E/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.072	0.069	5.09
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650636)</b>								
HK1944686-060	B/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.064	0.071	10.2
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650637)</b>								
HK1944686-080	F/S/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.054	0.051	6.65
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650638)</b>								
HK1944686-096	H/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.005	mg/L	0.071	0.076	5.87
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650647)</b>								
HK1944686-020	D/S/E/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.087	0.086	1.50
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650649)</b>								
HK1944686-040	G/M/E/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.088	0.087	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650651)</b>								
HK1944686-060	B/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.084	0.084	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: 2650653)</b>								
HK1944686-080	F/S/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.093	0.089	4.62
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650655)</b>								
HK1944686-096	H/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.005	mg/L	0.090	0.093	3.62
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650662)</b>								
HK1944686-020	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: 2650663)</b>								
HK1944686-020	D/S/E/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650664)</b>								
HK1944686-040	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: 2650665)</b>								
HK1944686-040	G/M/E/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650666)</b>								
HK1944686-060	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: 2650667)</b>								
HK1944686-060	B/B/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650668)</b>								
HK1944686-080	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: 2650669)</b>								
HK1944686-080	F/S/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650670)</b>								
HK1944686-096	H/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	<0.01	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650671)</b>								
HK1944686-096	H/B/F/Dup	EK067P: Total Phosphorus as P	----	0.01	mg/L	0.03	0.03	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: 2651004)</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	113	----	85.0	115	----	----
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651005)</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: 2651005) - Continued</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	104	----	85.0	115	----	----
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651006)</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	92.0	----	85.0	115	----	----
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651007)</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	107	----	85.0	115	----	----
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2651008)</b>											
EA025: Suspended Solids (SS)	----	0.5	mg/L	<0.5	20 mg/L	97.0	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650634)</b>											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	104	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650635)</b>											
EK055A: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.05 mg/L	105	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650636)</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: 2650637)</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: 2650638)</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: 2650647)</b>											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	105	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650649)</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: 2650651)</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: 2650653)</b>											
EK057A: Nitrite as N	14797-65-0	0.005	mg/L	<0.005	0.05 mg/L	102	----	85.0	115	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650655)</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: 2650662)</b>											
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.2	----	85.0	115	----	----



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>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650663)</b>													
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	97.8	----	94.2	101	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650664)</b>													
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	97.3	----	85.0	115	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650665)</b>													
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	99.3	----	94.2	101	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650666)</b>													
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	99.0	----	85.0	115	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650667)</b>													
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	99.0	----	94.2	101	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650668)</b>													
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	99.0	----	85.0	115	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650669)</b>													
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	98.7	----	94.2	101	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650670)</b>													
EK067P: Total Phosphorus - Filtered	----	0.01	mg/L	<0.01	0.5 mg/L	98.2	----	85.0	115	----	----		
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650671)</b>													
EK067P: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.5 mg/L	100	----	94.2	101	----	----		
<b>EP: Aggregate Organics (QC Lot: 2651747)</b>													
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	104	----	81.0	115	----	----		
<b>EP: Aggregate Organics (QC Lot: 2651748)</b>													
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	102	----	81.0	115	----	----		
<b>EP: Aggregate Organics (QC Lot: 2651749)</b>													
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	108	----	81.0	115	----	----		
<b>EP: Aggregate Organics (QC Lot: 2651750)</b>													
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	105	----	81.0	115	----	----		
<b>EP: Aggregate Organics (QC Lot: 2651751)</b>													
EP030: Biochemical Oxygen Demand	----	----	mg/L	----	198 mg/L	109	----	81.0	115	----	----		



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

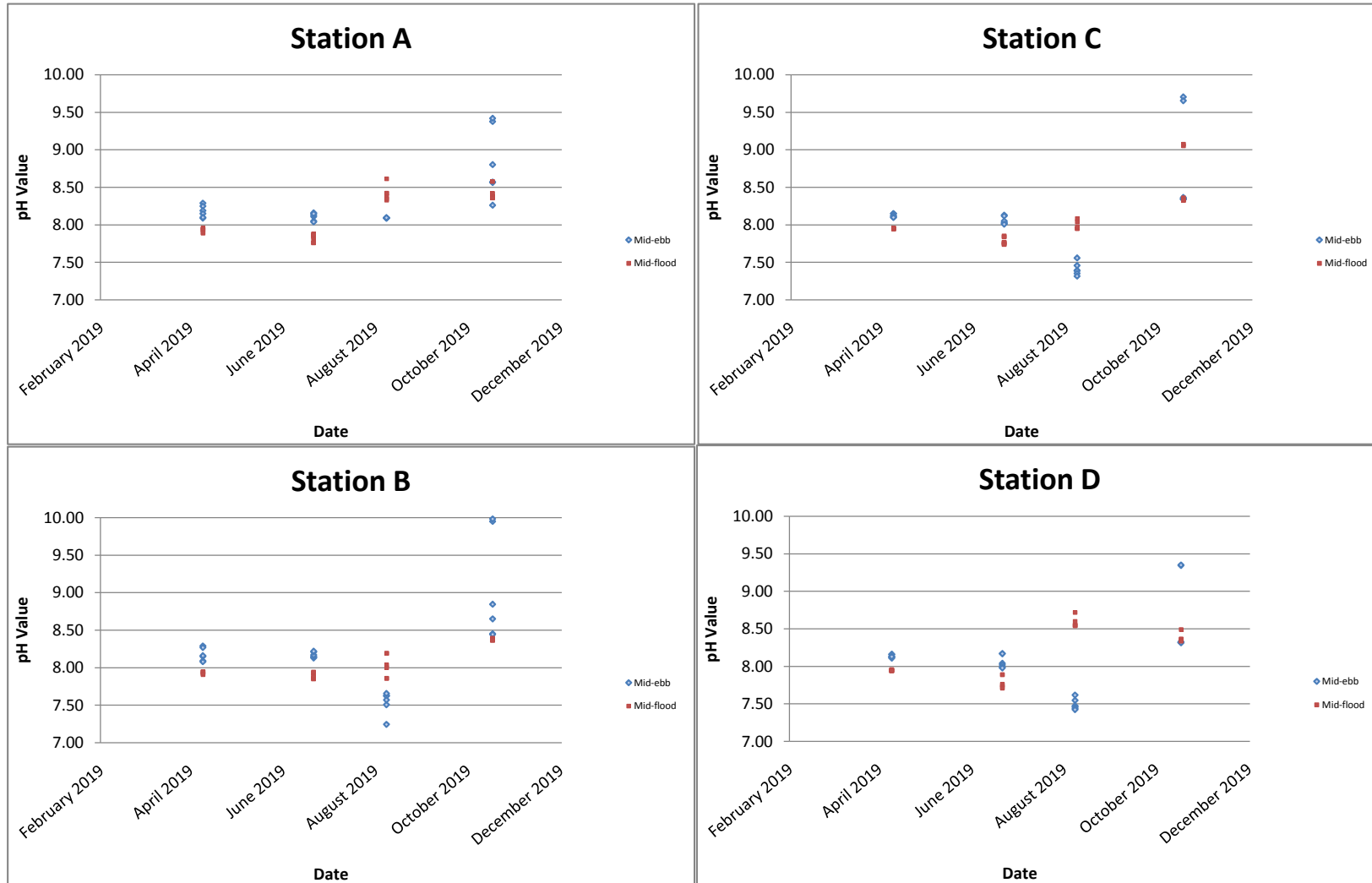
Matrix: WATER					Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)		
					MS	MSD	Low	High	Value	Control Limit	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650634)</b>											
HK1944686-020	D/S/E/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	106	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650635)</b>											
HK1944686-040	G/M/E/Dup	EK055A: Ammonia as N	7664-41-7	0.25 mg/L	91.6	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650636)</b>											
HK1944686-060	B/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	100	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650637)</b>											
HK1944686-080	F/S/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	93.5	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650638)</b>											
HK1944686-096	H/B/F/Dup	EK055A: Ammonia as N	7664-41-7	0.5 mg/L	94.1	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650647)</b>											
HK1944686-020	D/S/E/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	109	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650649)</b>											
HK1944686-040	G/M/E/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	100	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650651)</b>											
HK1944686-060	B/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	114	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650653)</b>											
HK1944686-080	F/S/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: 2650655)</b>											
HK1944686-096	H/B/F/Dup	EK057A: Nitrite as N	14797-65-0	0.25 mg/L	89.9	----	75.0	125	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650662)</b>											
HK1944686-020	D/S/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	90.0	----	75.0	125	----	25	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650663)</b>											



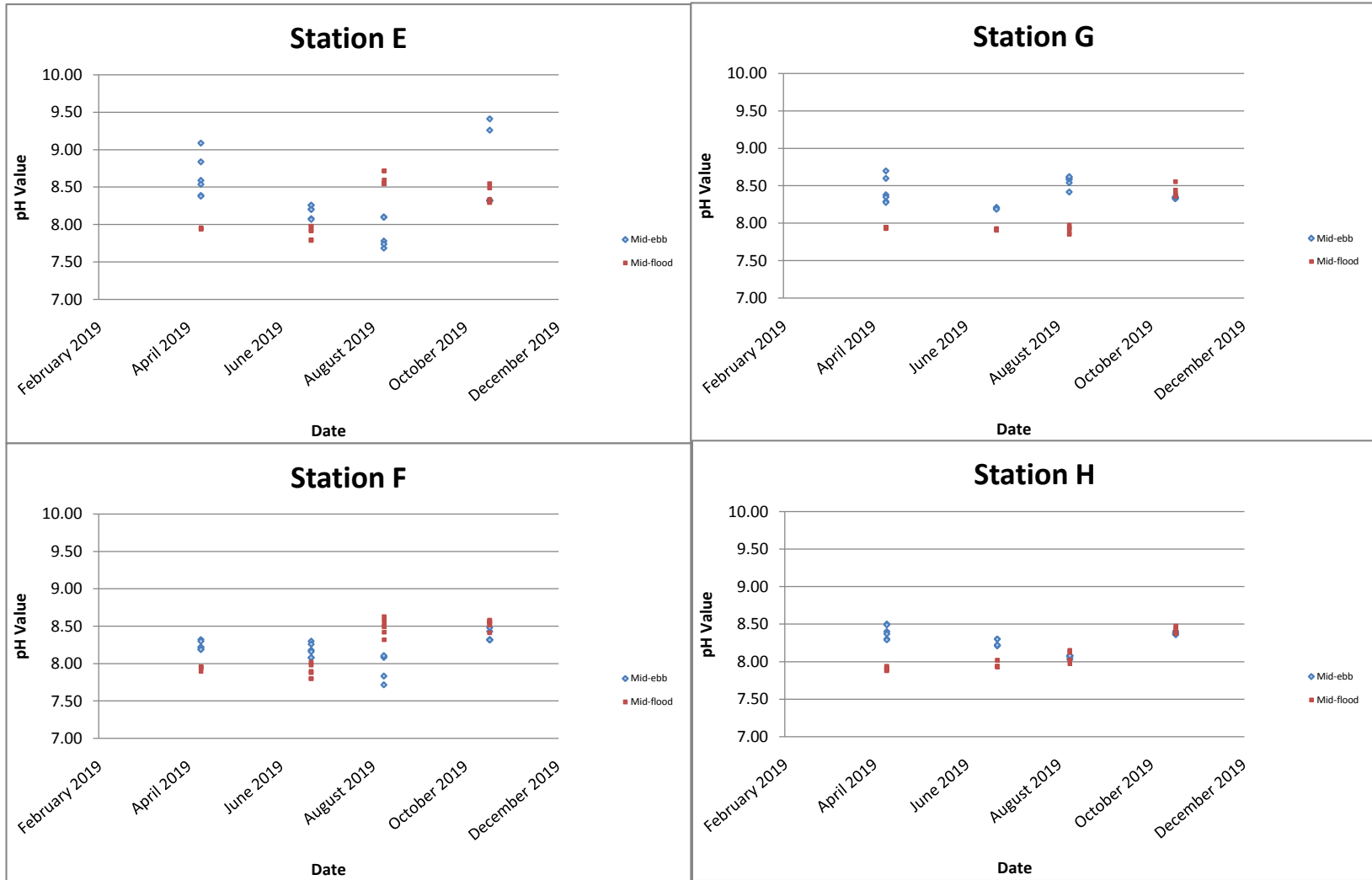


Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPD (%)	
					MS	MSD	Low	High	Value	Control Limit
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650663) - Continued</b>										
HK1944686-020	D/S/E/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	91.6	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650664)</b>										
HK1944686-040	G/M/E/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	91.5	----	75.0	125	----	25
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650665)</b>										
HK1944686-040	G/M/E/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	91.1	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650666)</b>										
HK1944686-060	B/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	90.7	----	75.0	125	----	25
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650667)</b>										
HK1944686-060	B/B/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	91.7	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650668)</b>										
HK1944686-080	F/S/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	91.8	----	75.0	125	----	25
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650669)</b>										
HK1944686-080	F/S/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	92.5	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650670)</b>										
HK1944686-096	H/B/F/Dup	EK067P: Total Phosphorus - Filtered	----	0.5 mg/L	90.5	----	75.0	125	----	25
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2650671)</b>										
HK1944686-096	H/B/F/Dup	EK067P: Total Phosphorus as P	----	0.5 mg/L	92.0	----	75.0	125	----	----

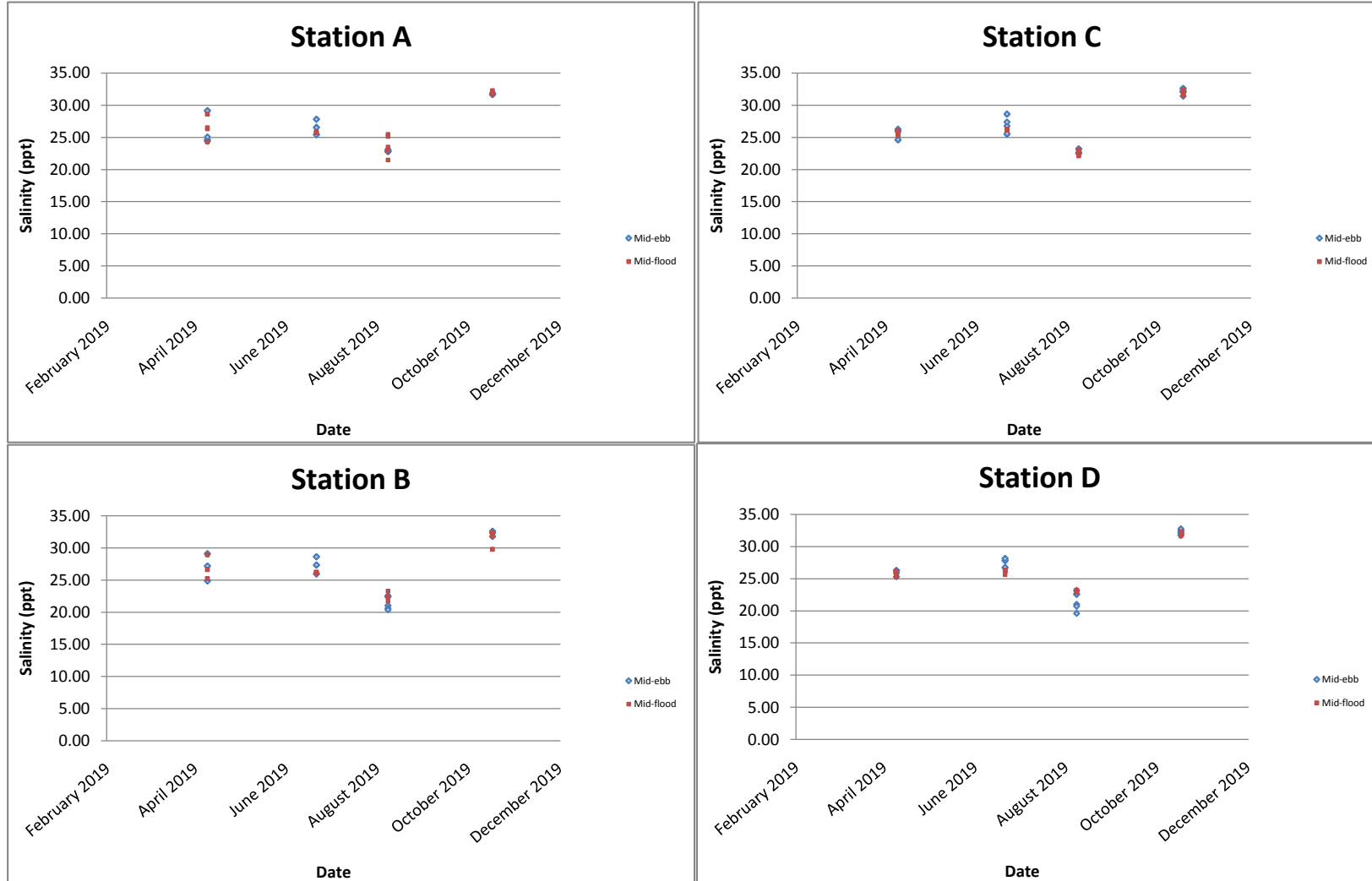
pH value



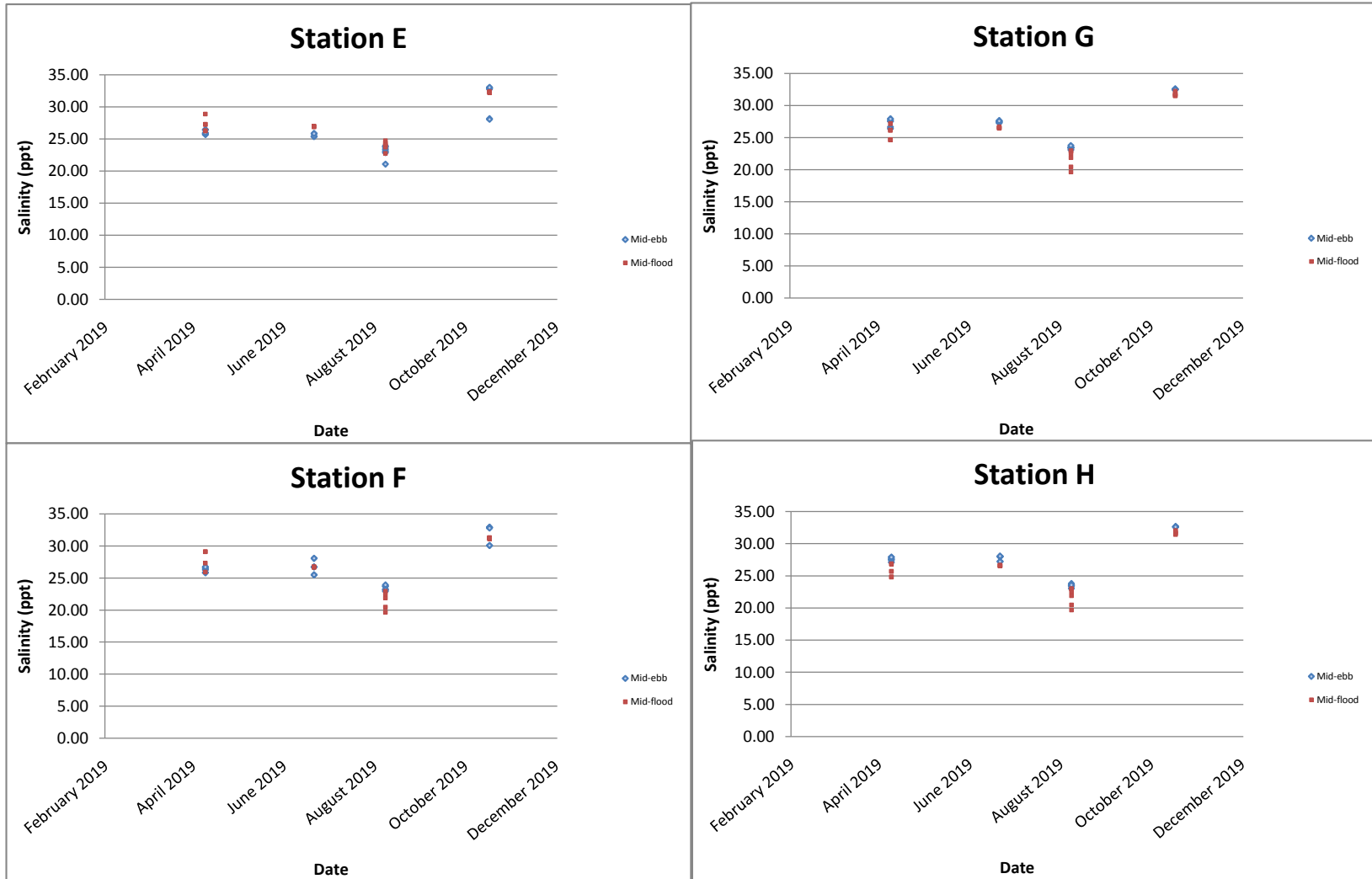
pH value



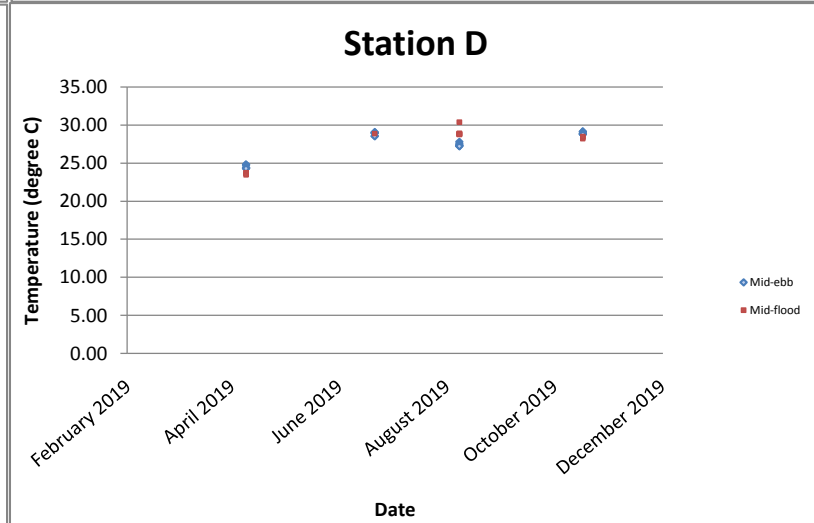
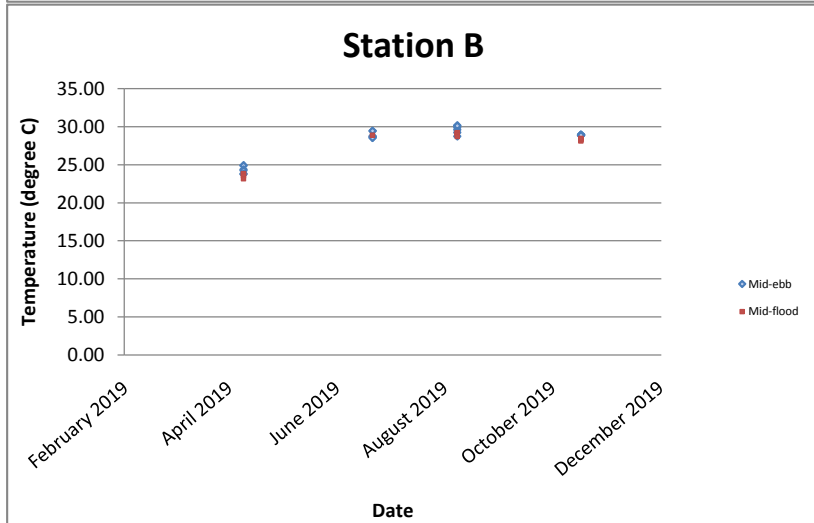
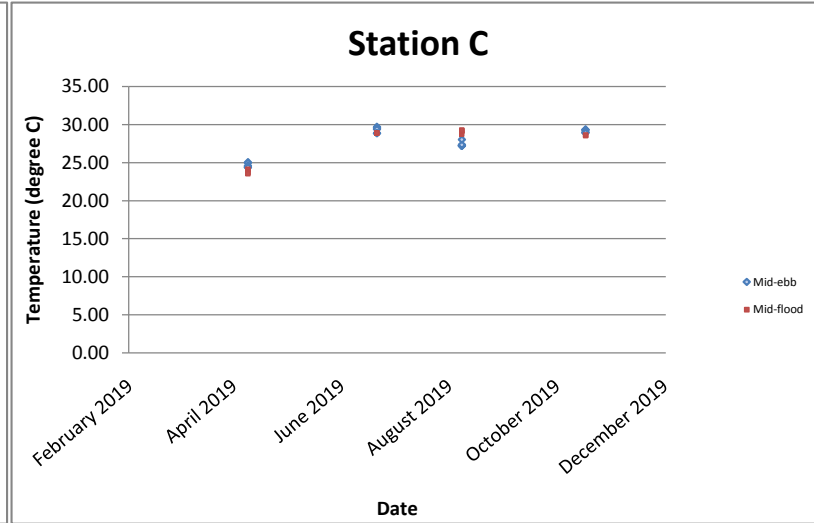
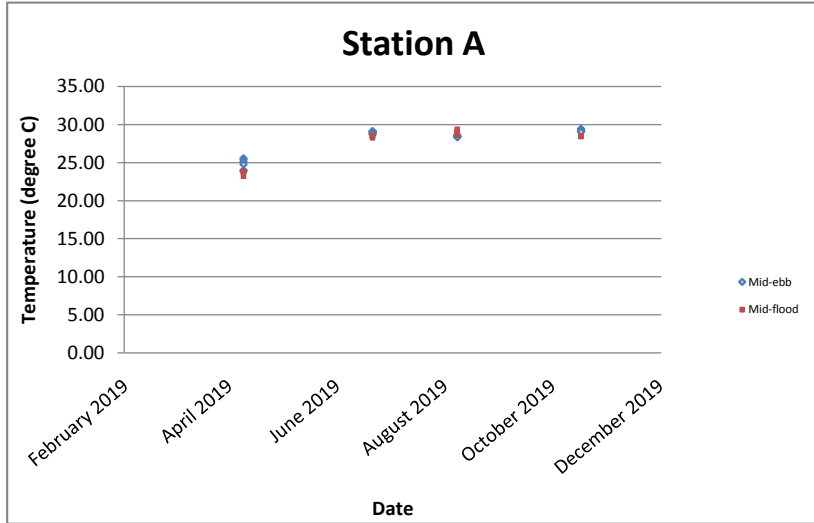
Salinity (ppt)



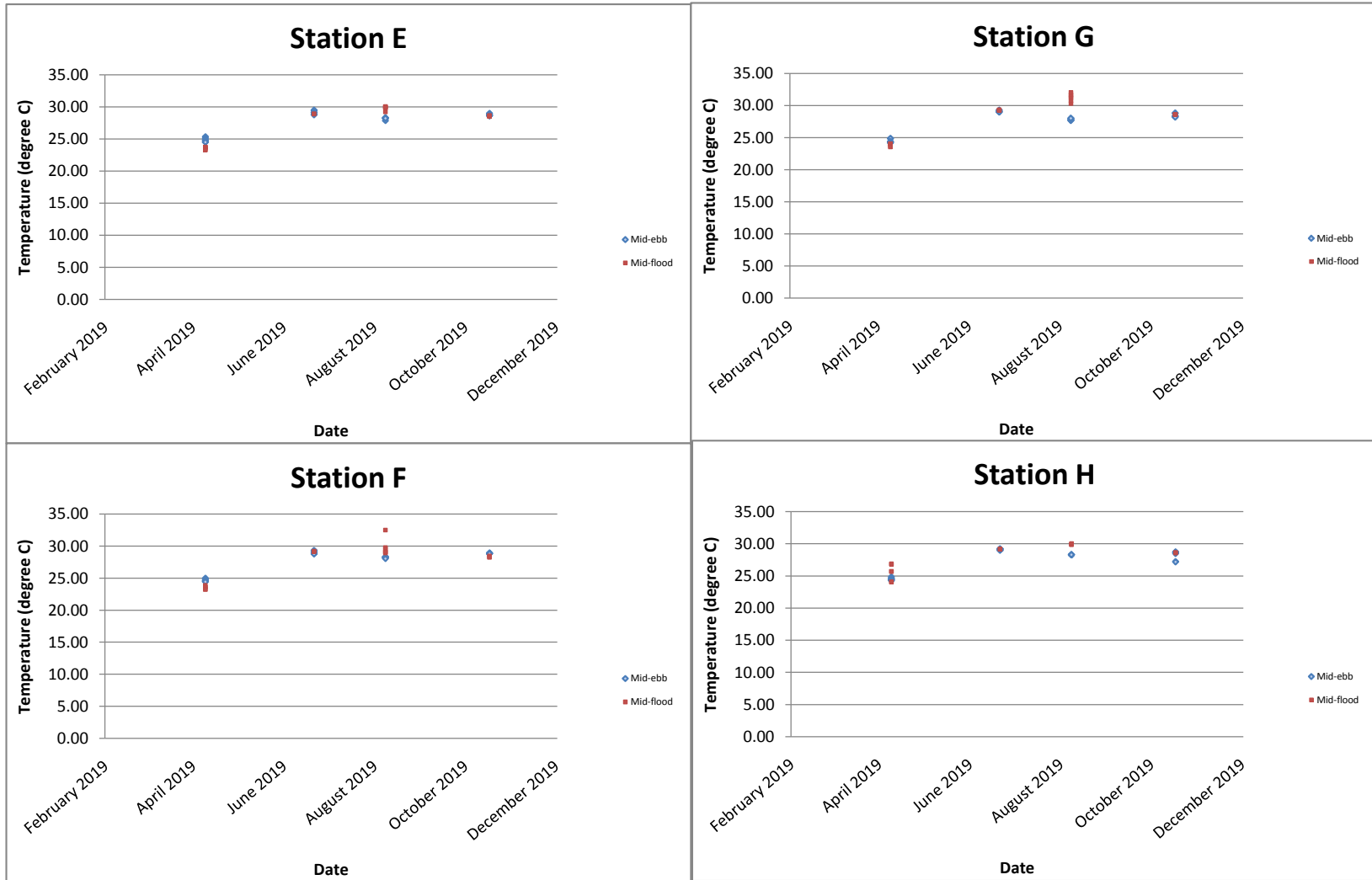
Salinity (ppt)



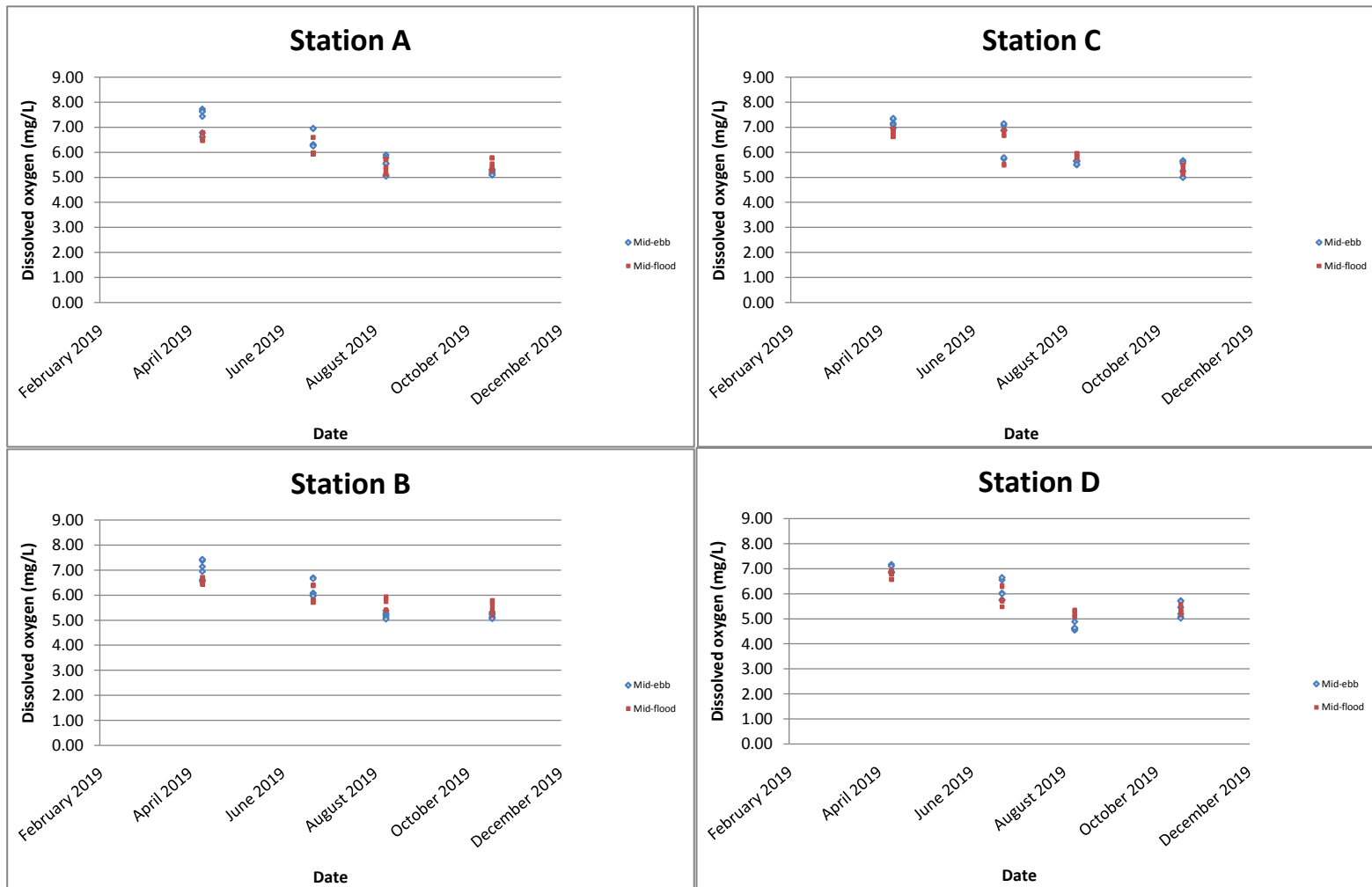
Temperature (degree C)



Temperature (degree C)

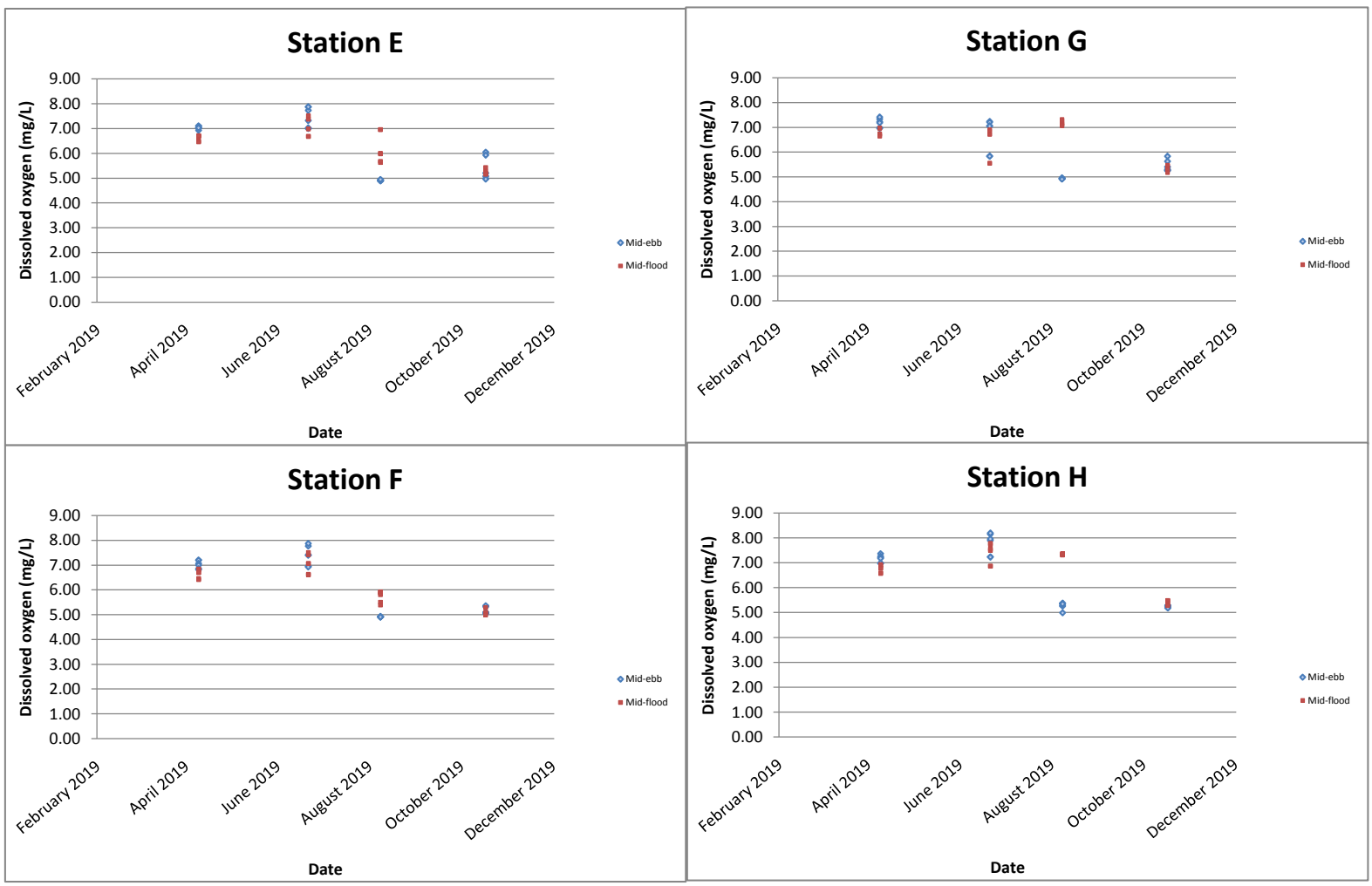


Dissolved oxygen (mg/L)

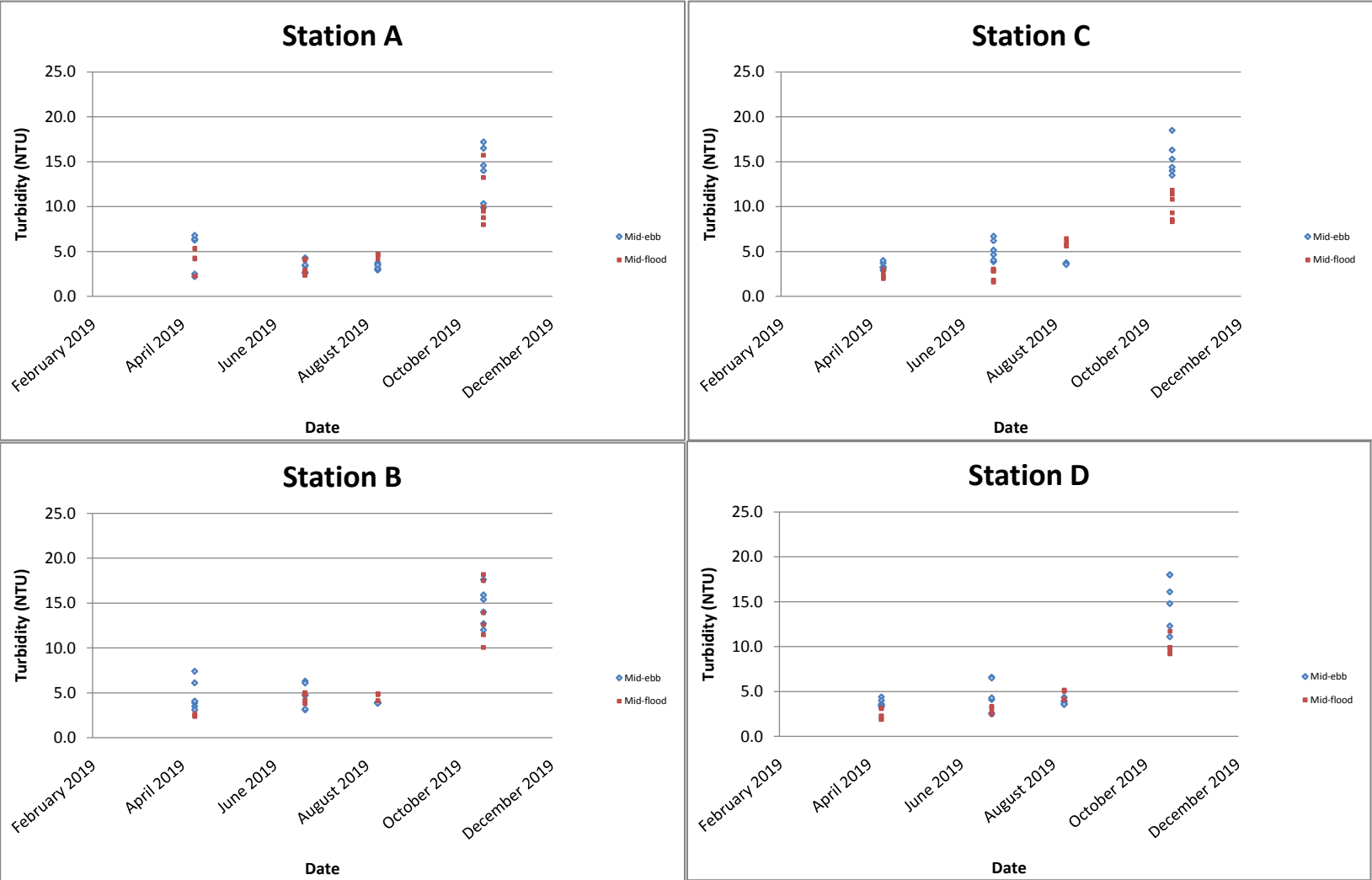




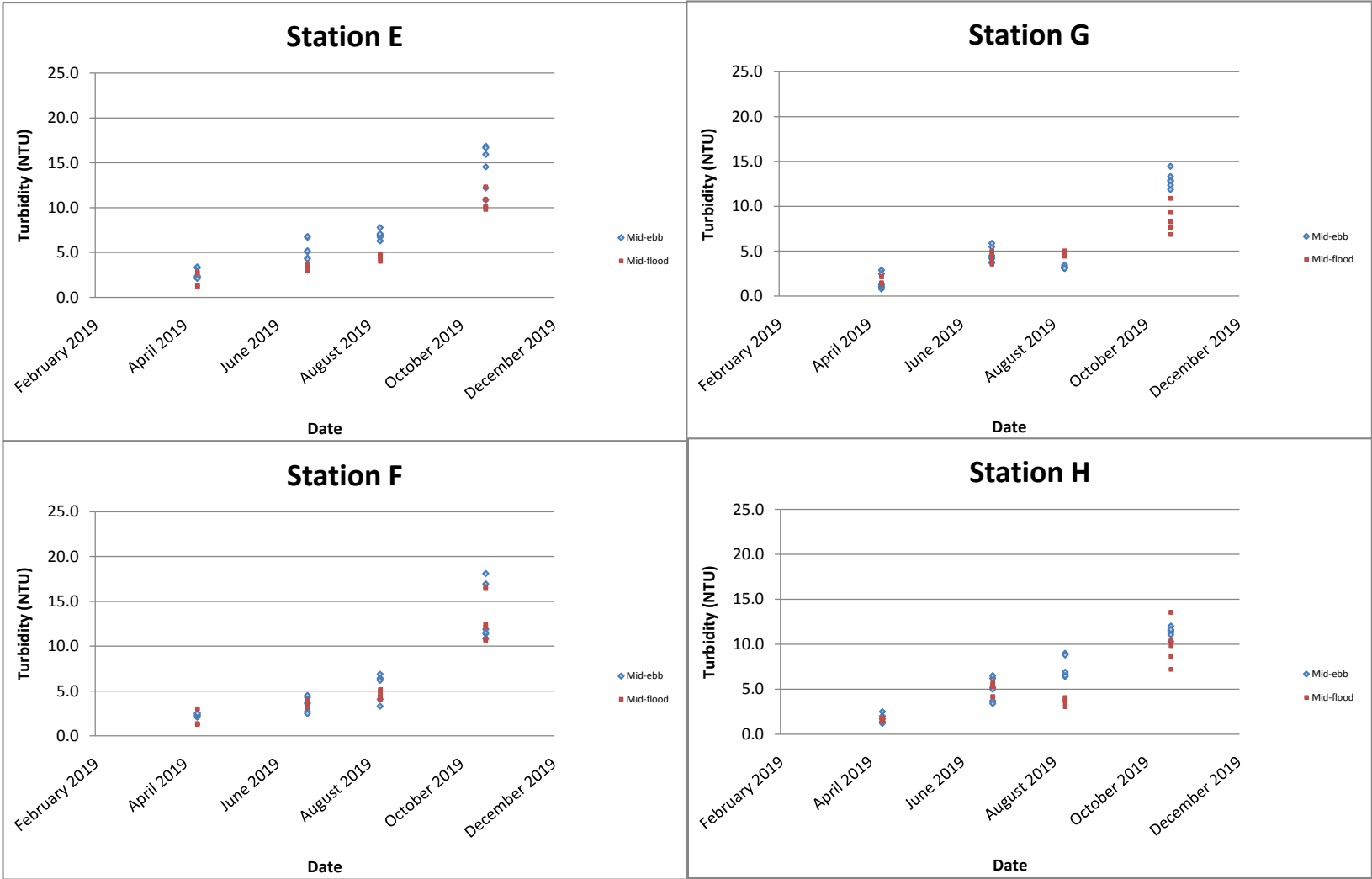
Dissolved oxygen (mg/L)



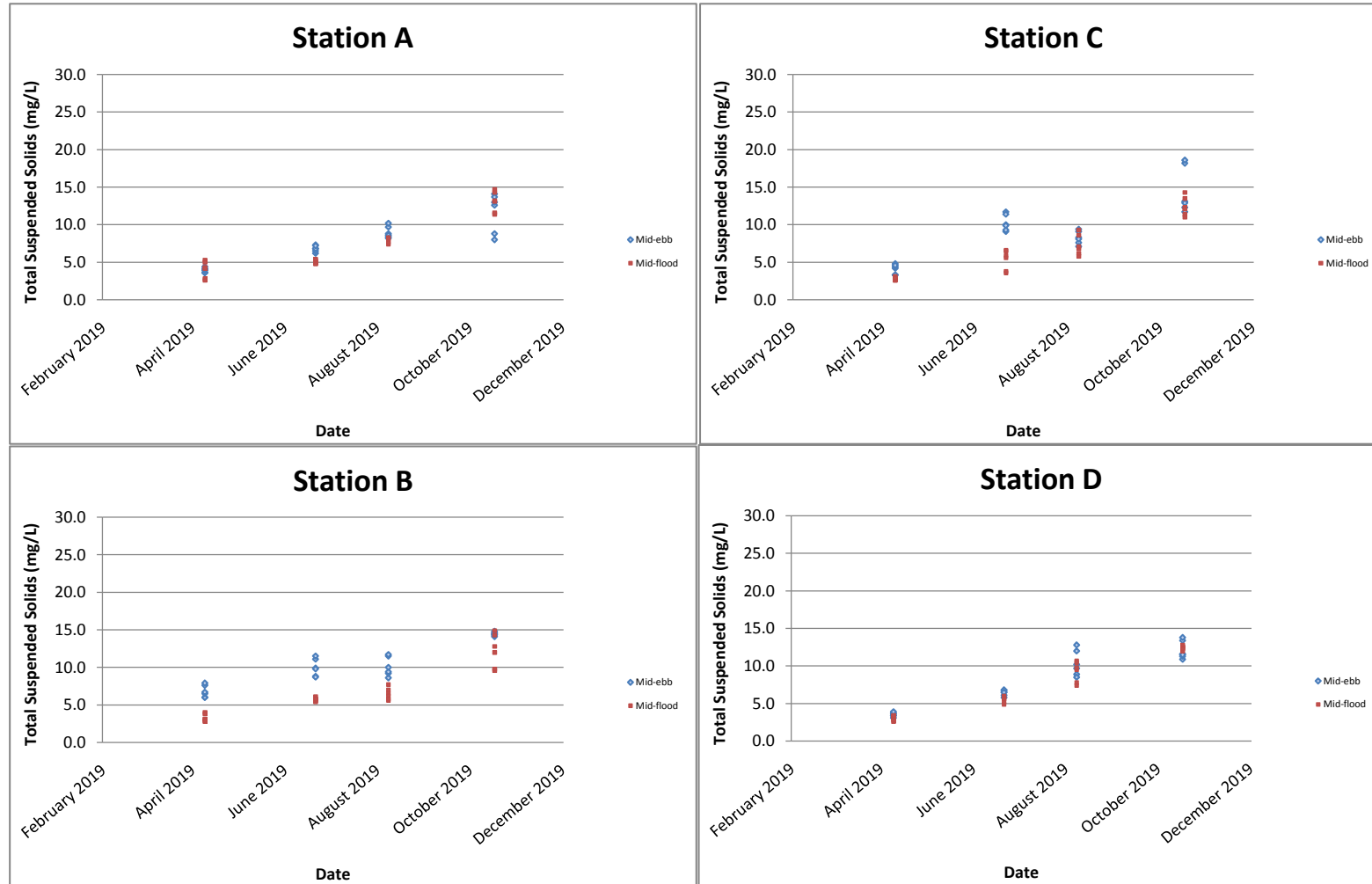
Turbidity (NTU)



Turbidity (NTU)

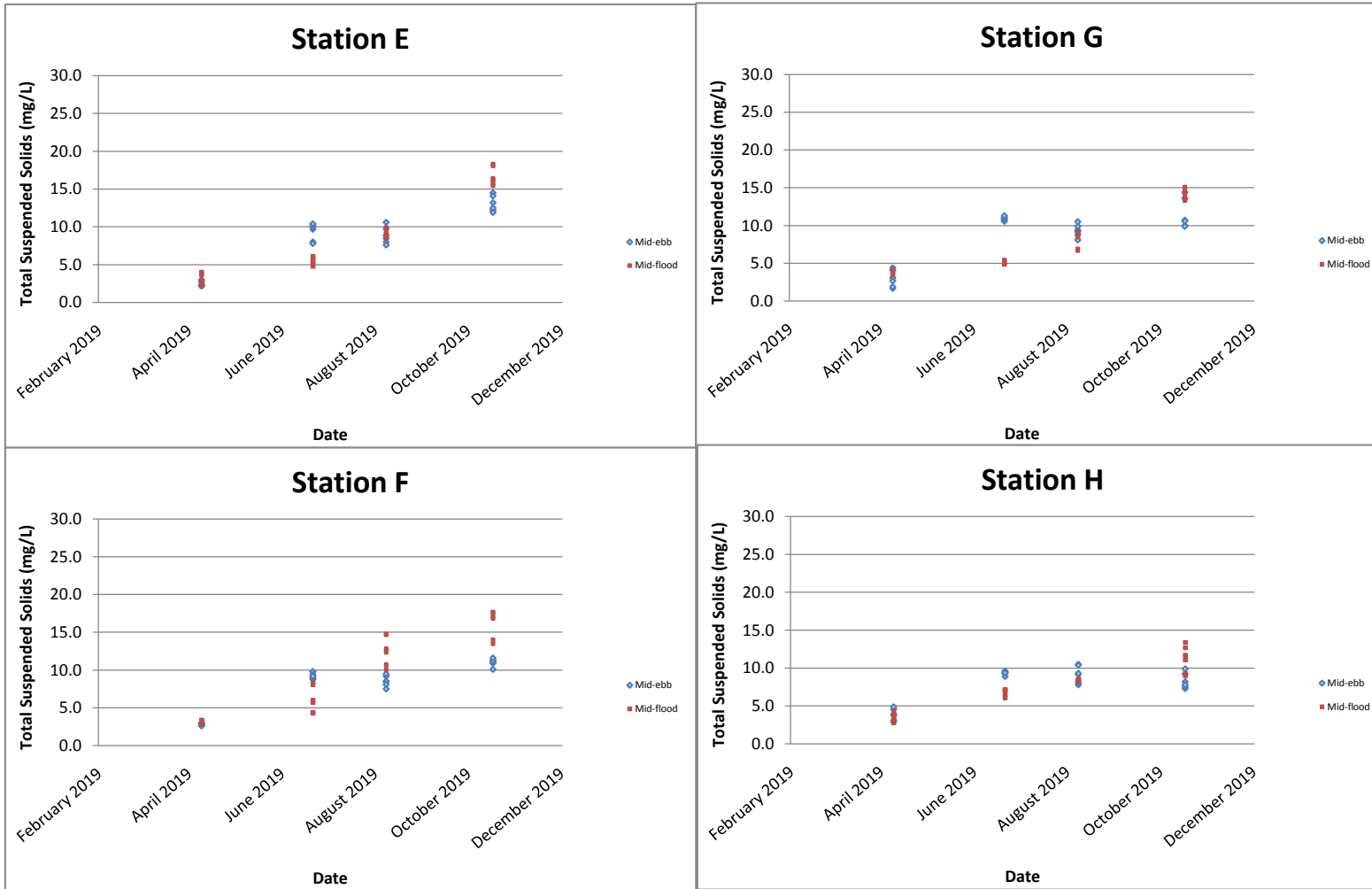


Total Suspended Solids (mg/L)



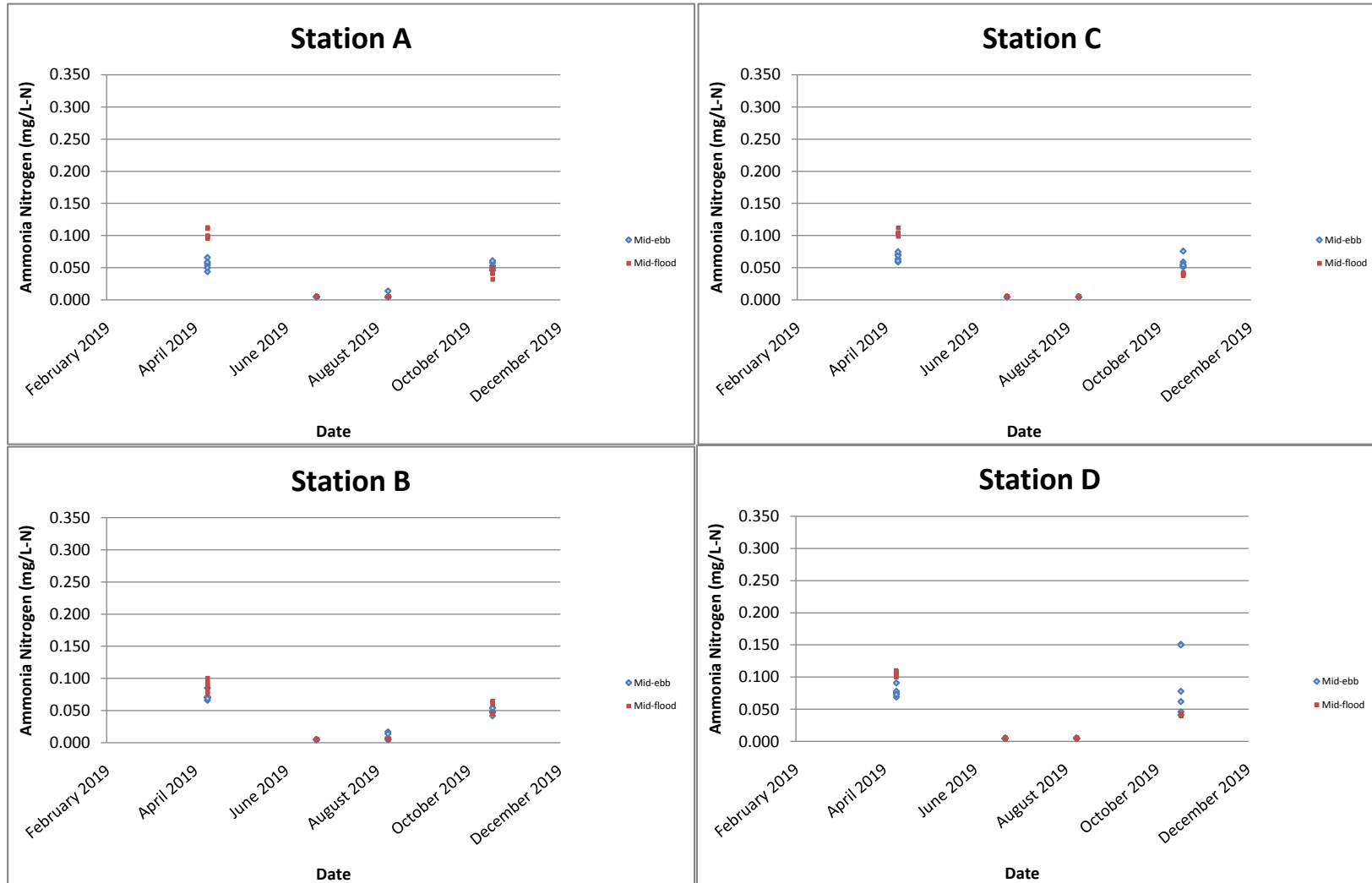
Remark: All below the Limit of Report sample results (<0.5 mg/L) for Total Suspended Solids is regarded as 0.5 mg/L in graphical presentation.

Total Suspended Solids (mg/L)



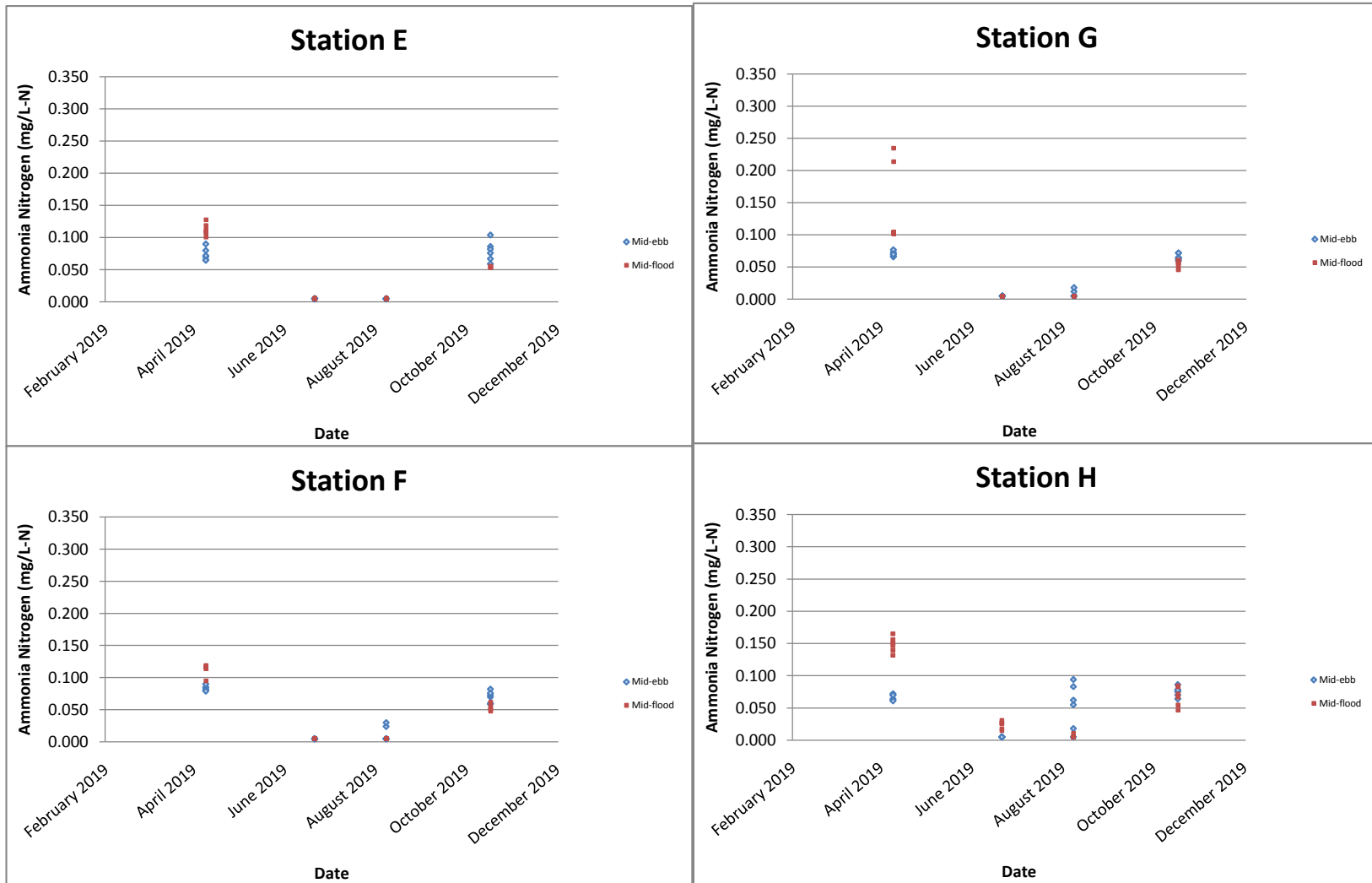
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### Ammonia Nitrogen (mg/L-N)



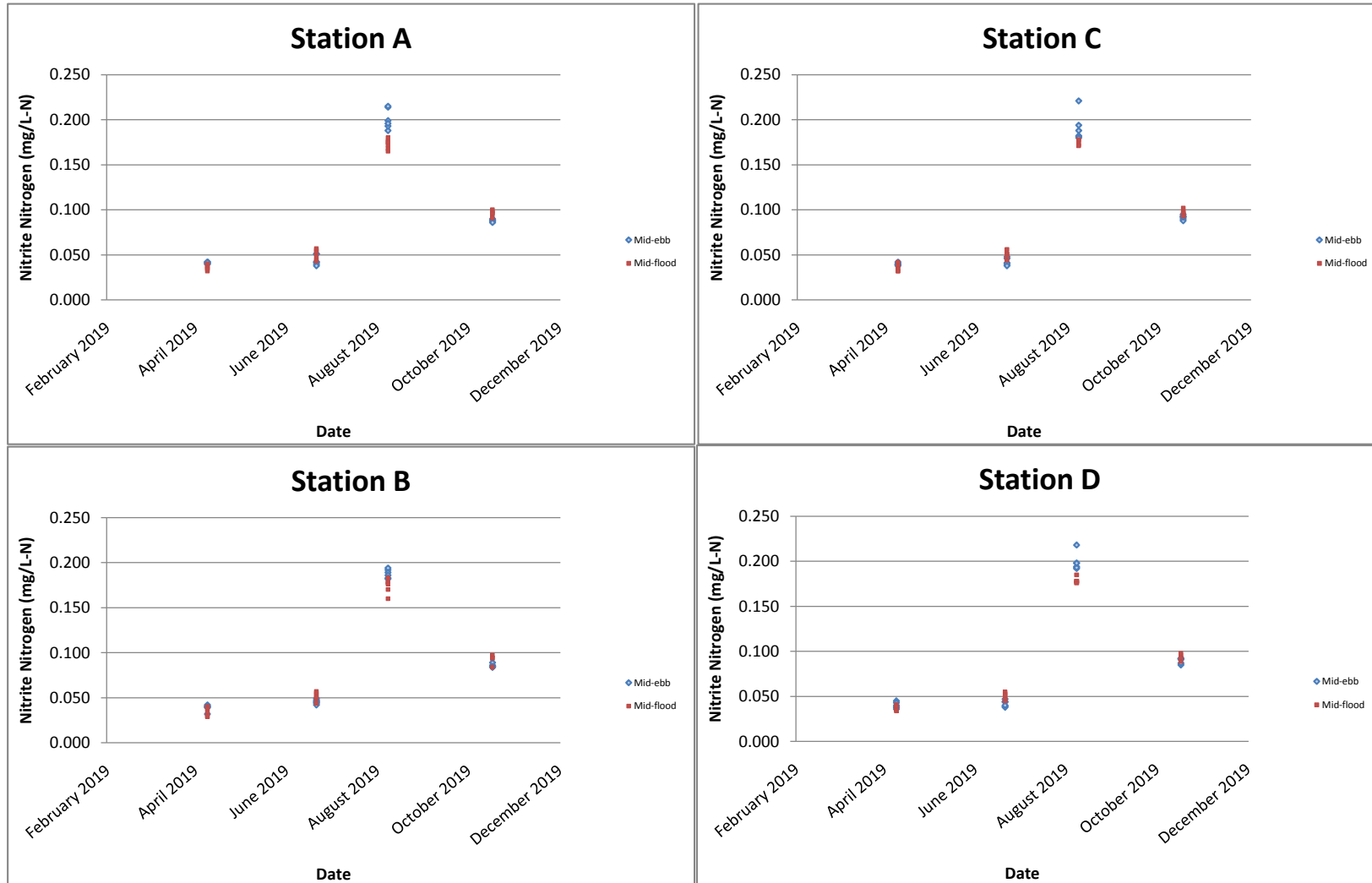
Remark: All below the Limit of Report sample results (<0.005 mg/L) for Ammonia Nitrogen is regarded as 0.005 mg/L in graphical presentation.

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.

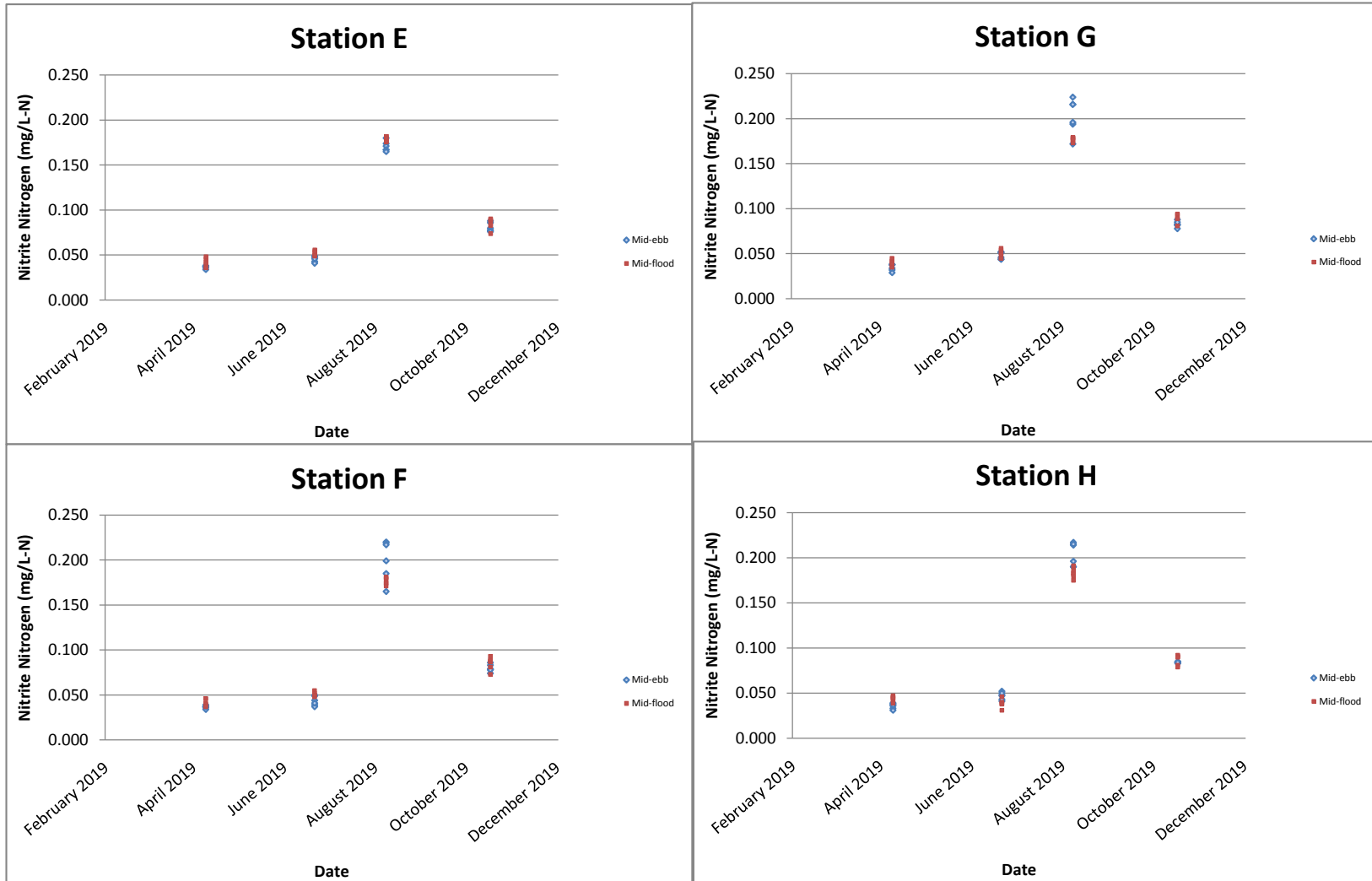
Nitrite Nitrogen (mg/L-N)



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.

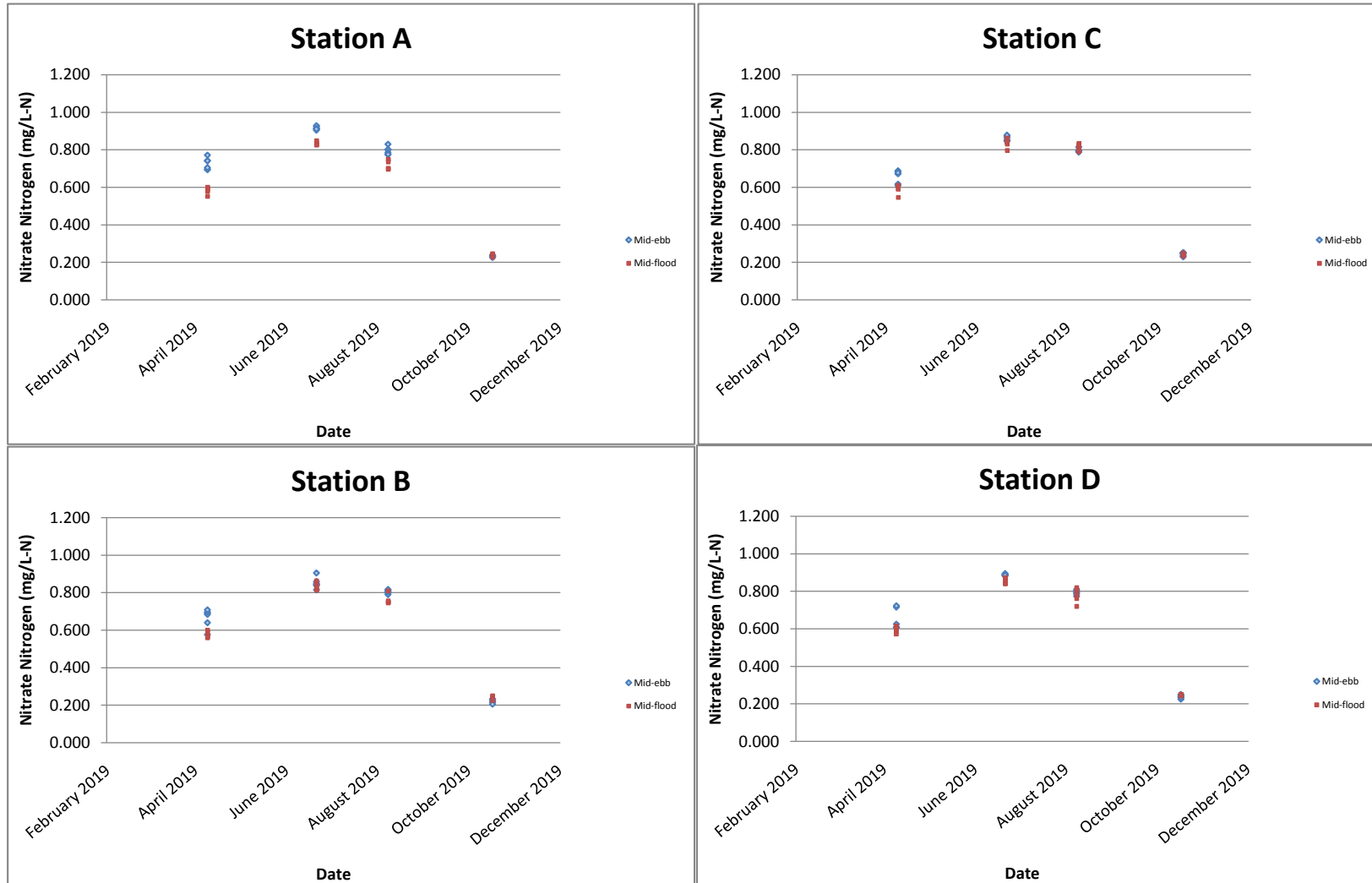


Nitrite Nitrogen (mg/L-N)



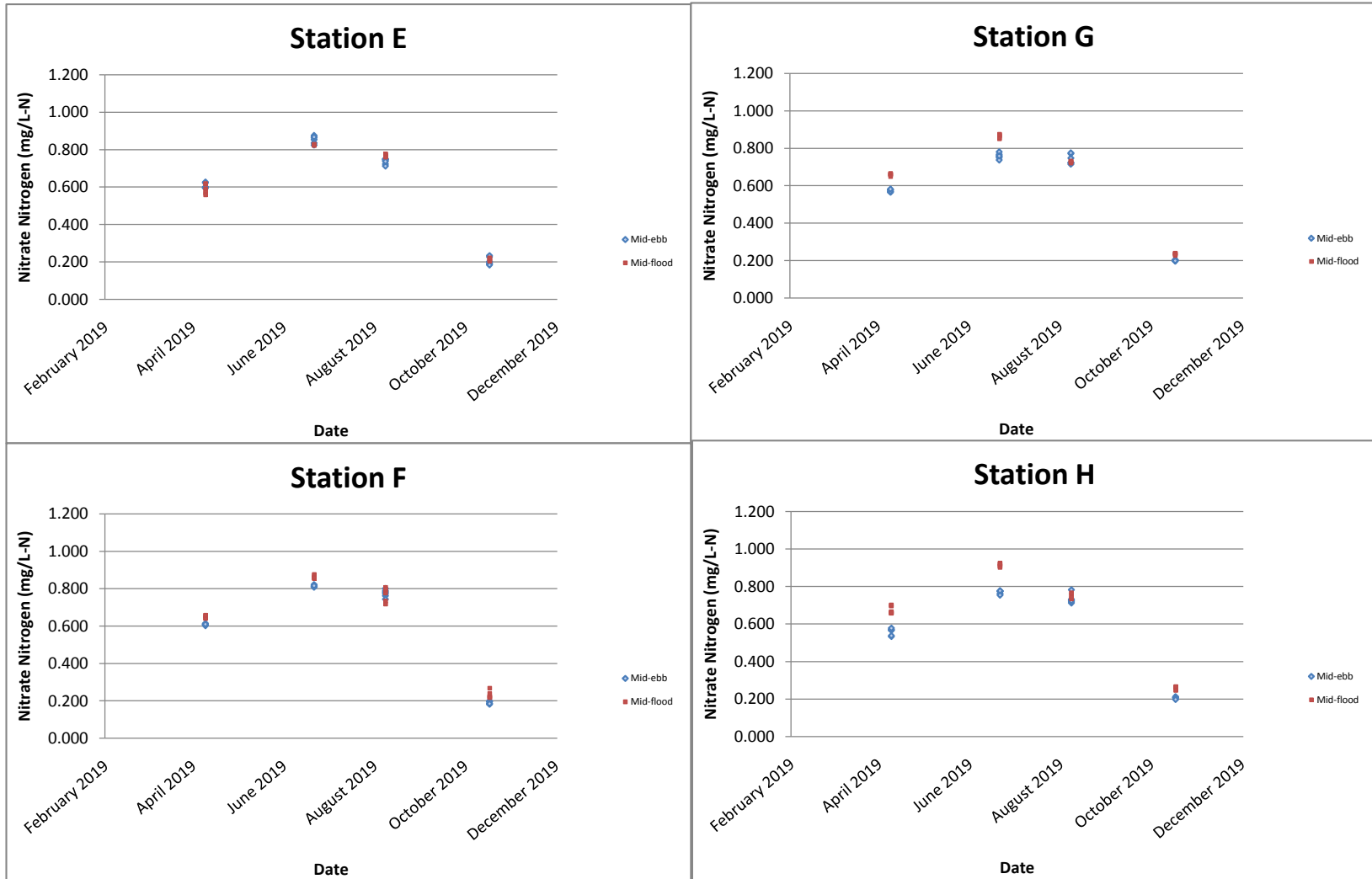
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Nitrate Nitrogen (mg/L-N)



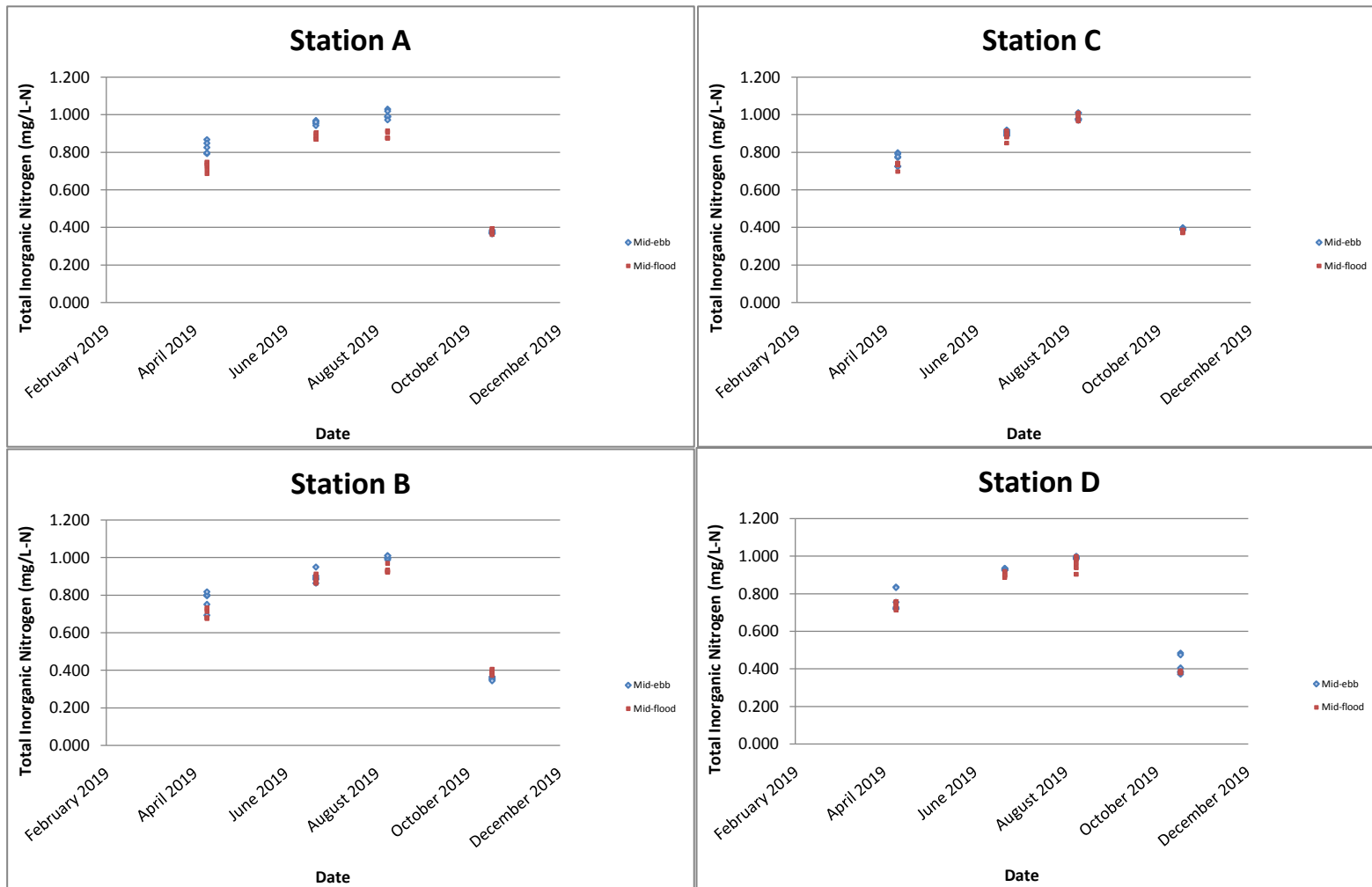
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Nitrate Nitrogen (mg/L-N)



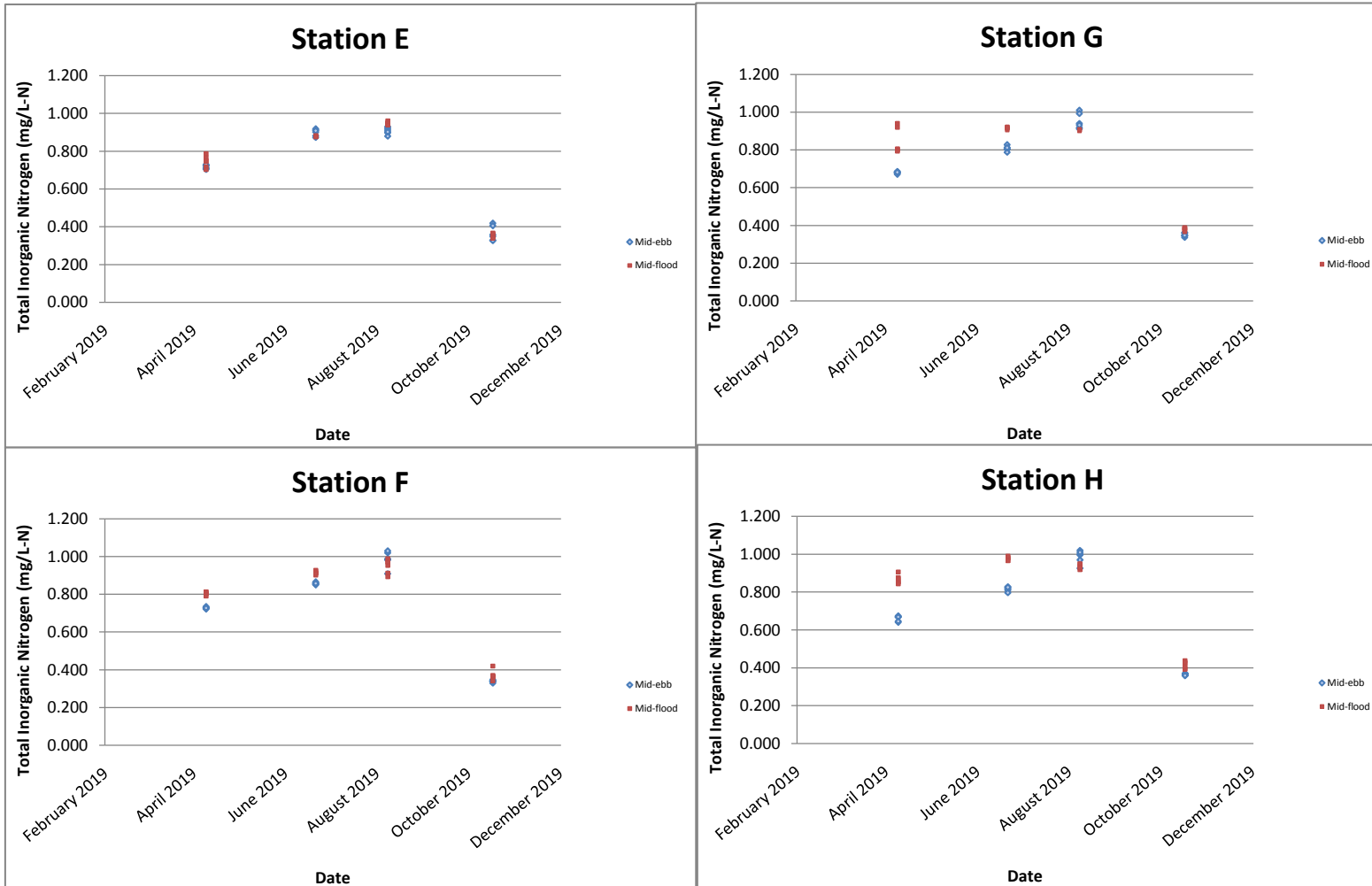
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Total Inorganic Nitrogen (mg/L-N)



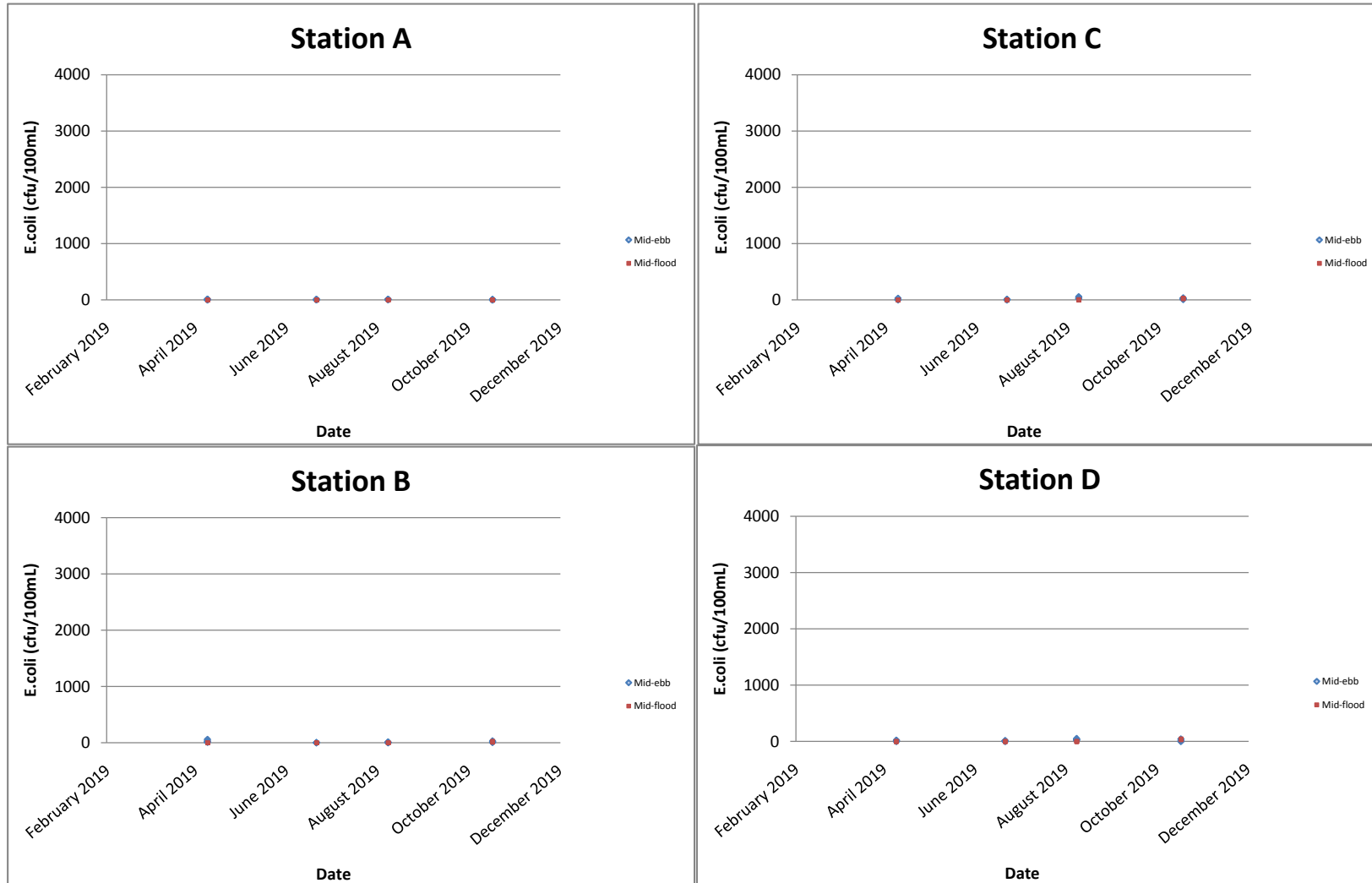
Remark: All below the Limit of Report sample results (<0.010 mg/L) for Total Inorganic Nitrogen is regarded as 0.010 mg/L in graphical presentation.

Total Inorganic Nitrogen (mg/L-N)



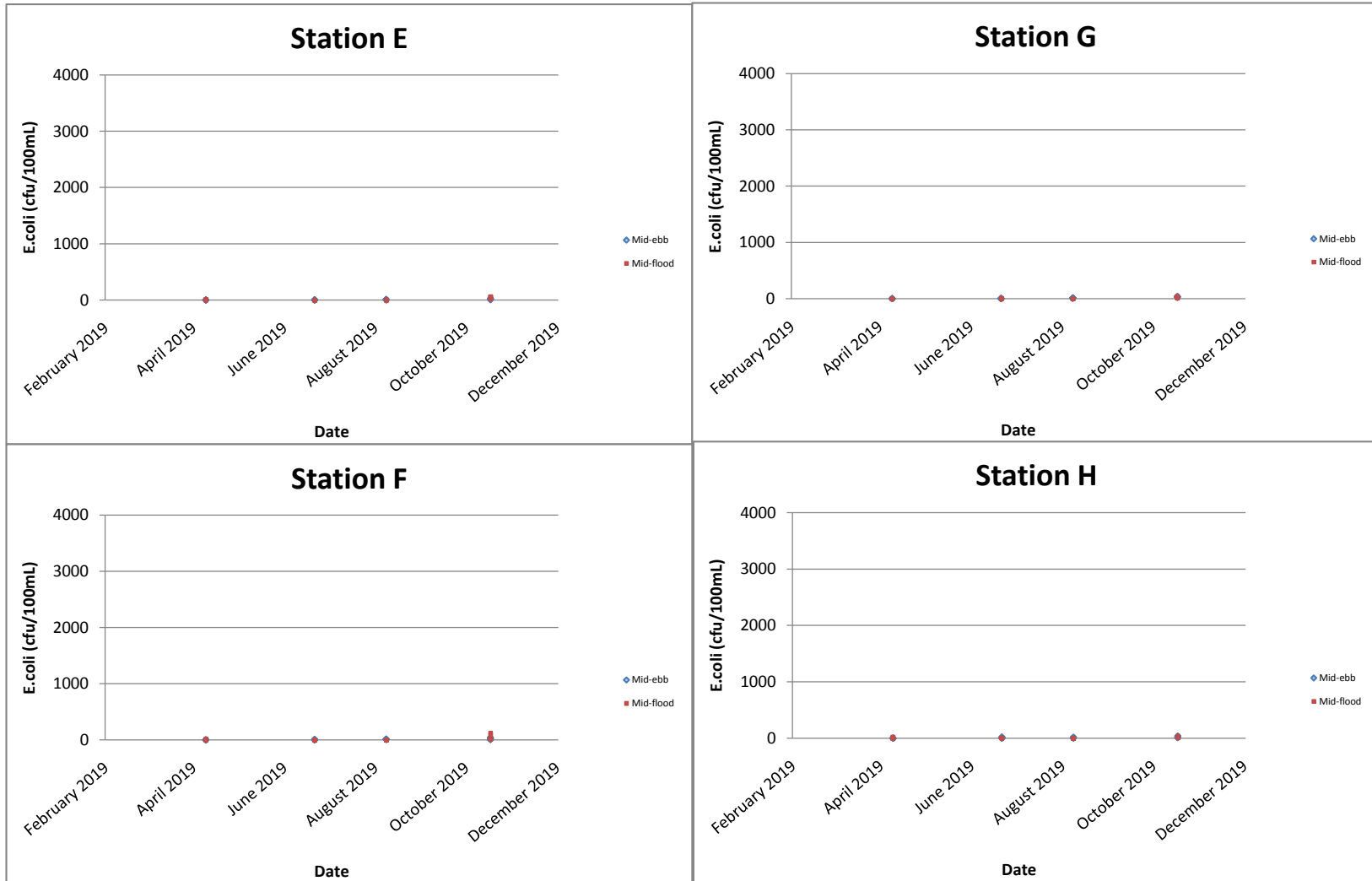
Remark: All below the Limit of Report sample results (<0.010 mg/L) for Total Inorganic Nitrogen is regarded as 0.010 mg/L in graphical presentation.

E.coli (cfu/100mL)



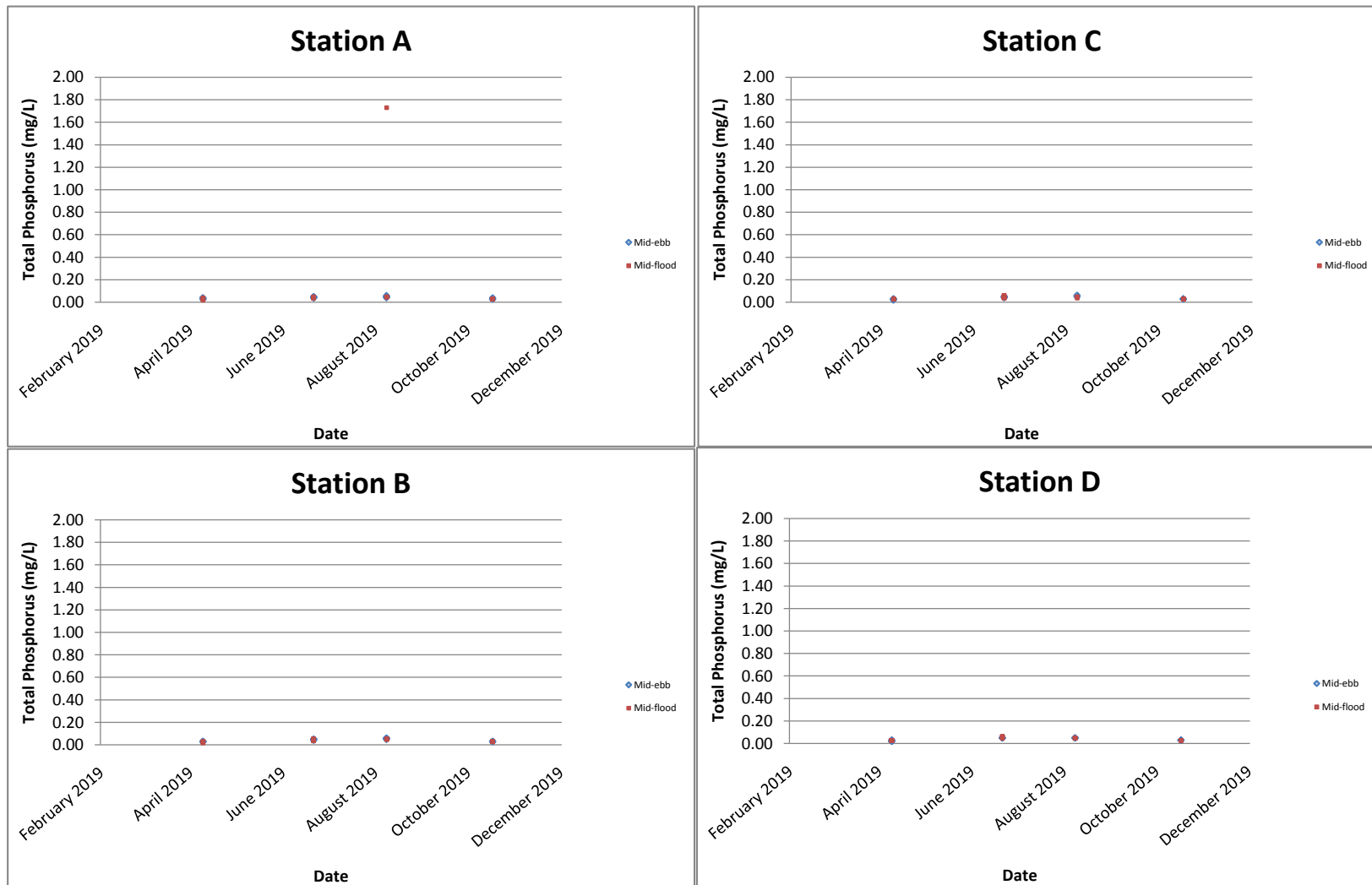
Remark: All below the Limit of Report sample results (<1 CFU/100mL) for E.coli is regarded as 1 CFU/100mL in graphical presentation.

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.

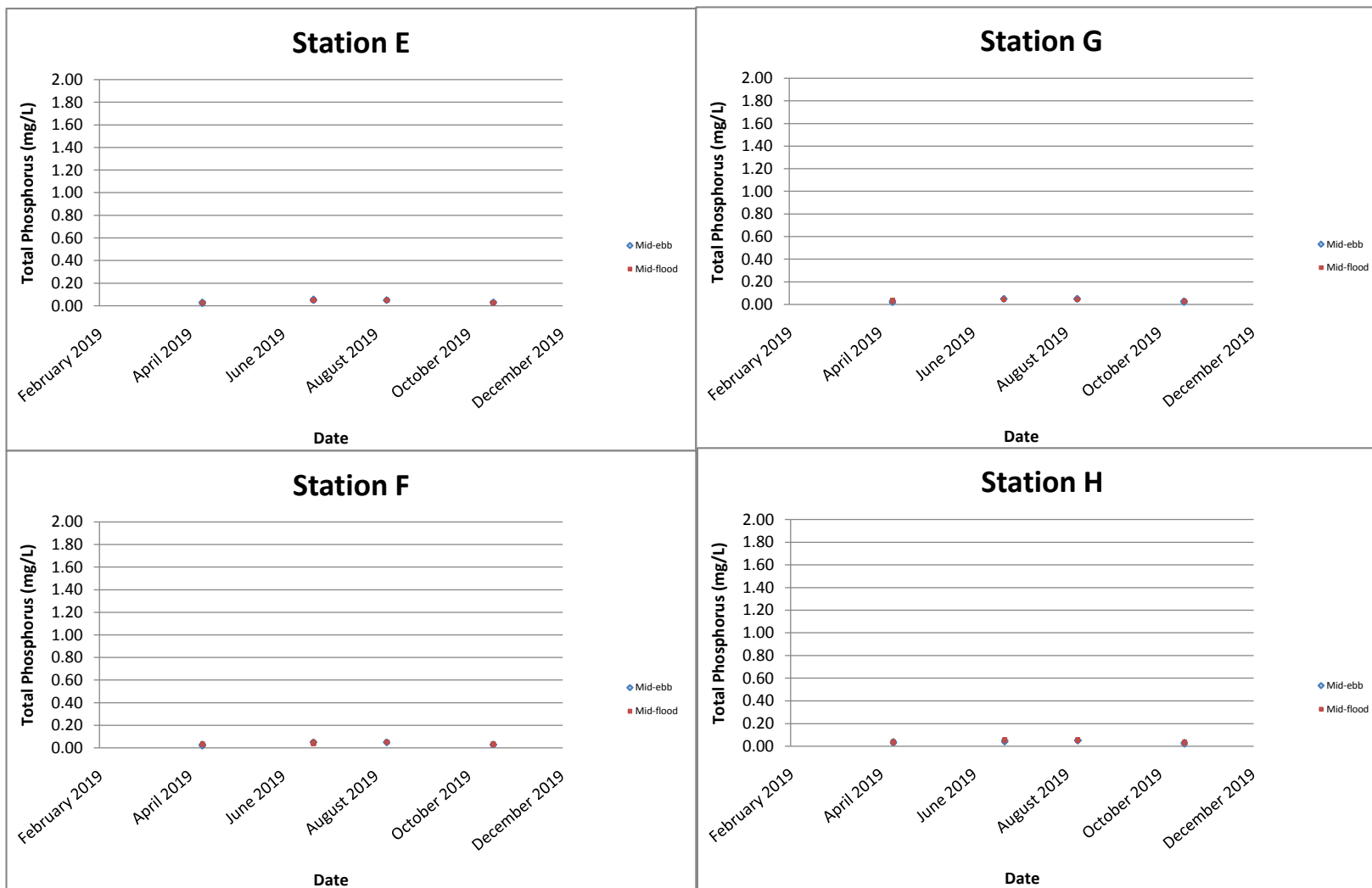
Total Phosphorus (soluble and particulate) (mg/L)



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.

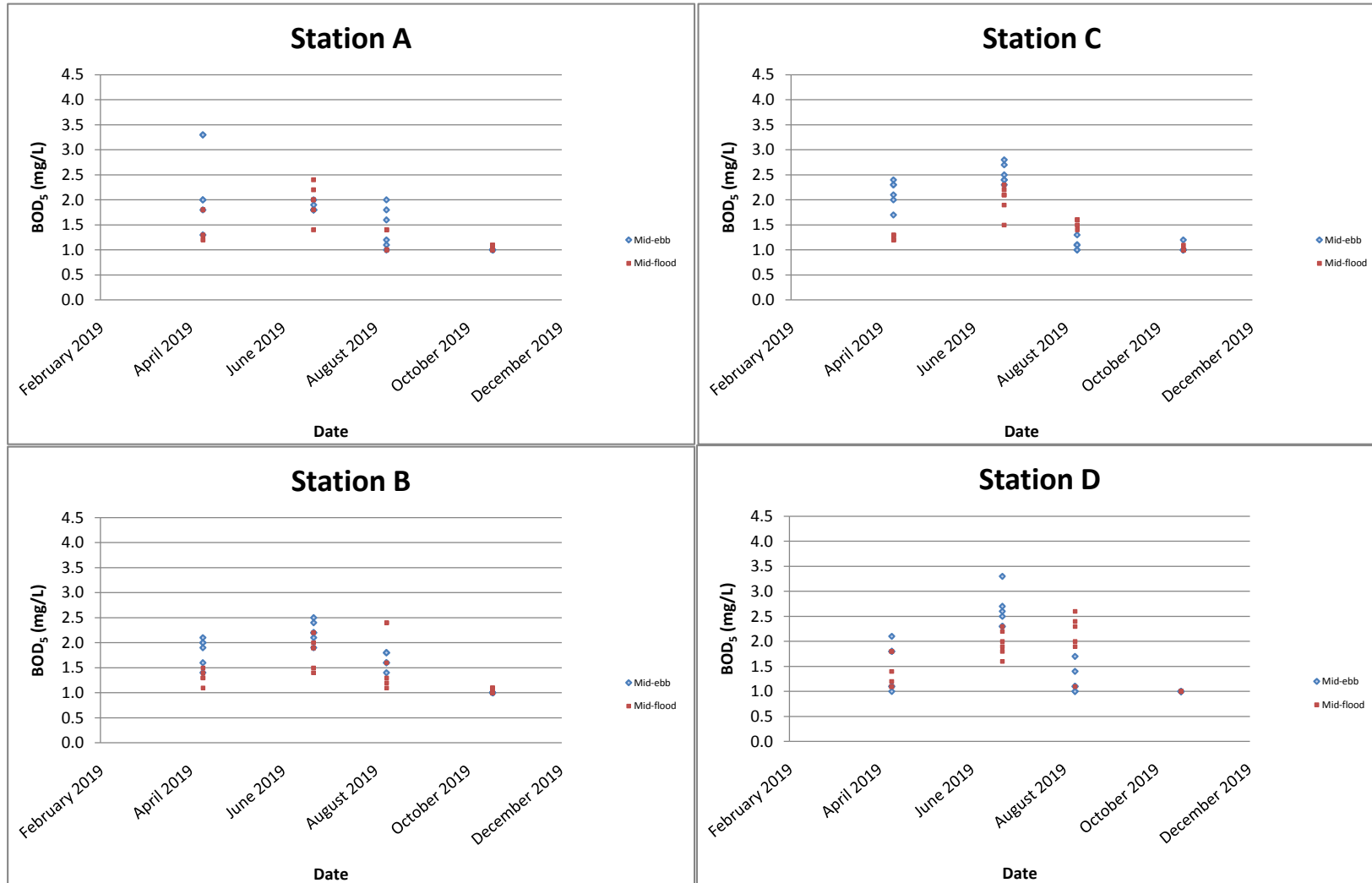


Total Phosphorus (soluble and particulate) (mg/L)



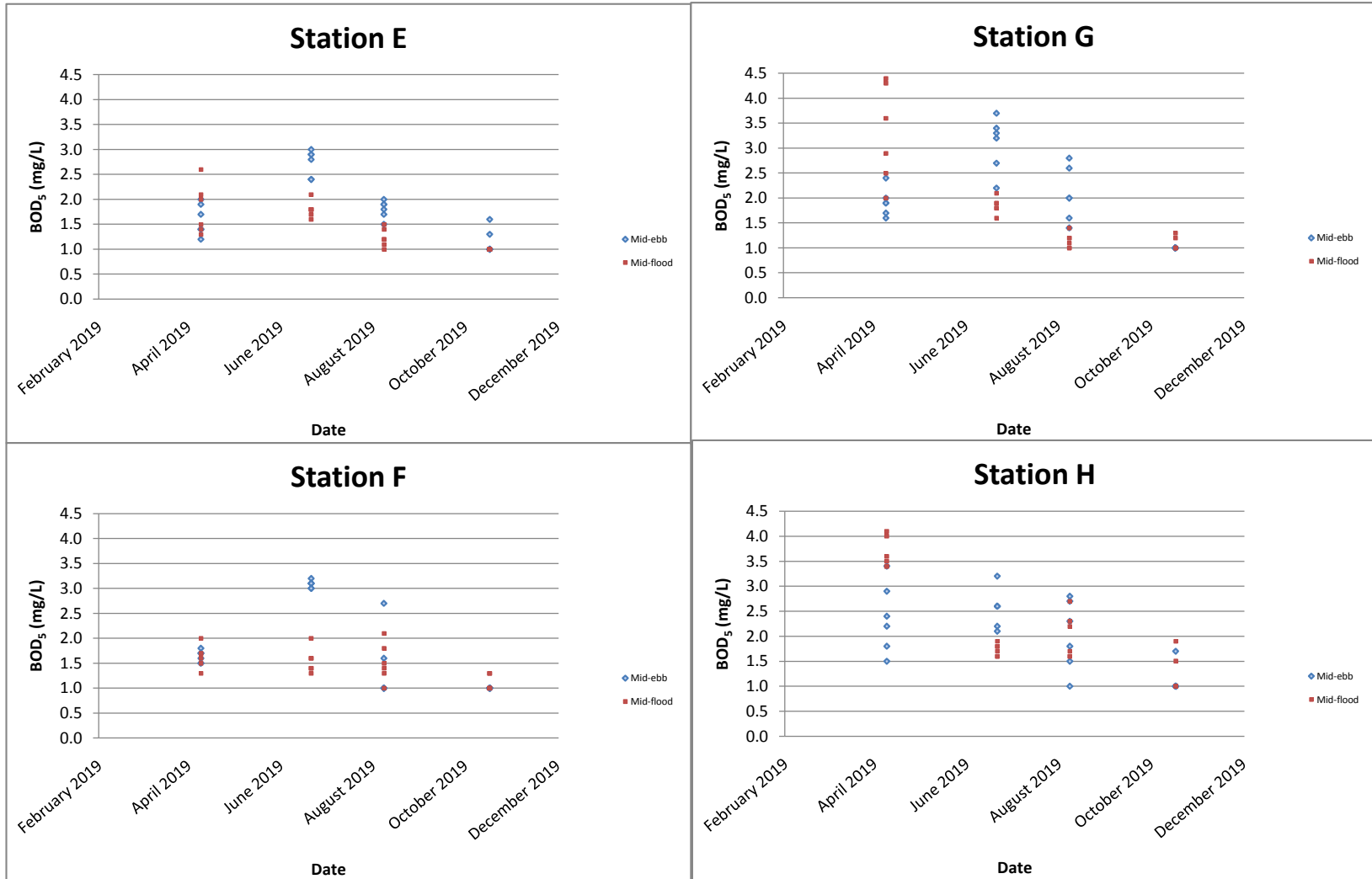
Remark: All below the Limit of Report sample results (<0.01 mg/L) for Total Phosphorus is regarded as 0.01 mg/L in graphical presentation.

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/0501B

## Appendix F

### Tidal Data obtained from Ma Wan Marine Traffic Station

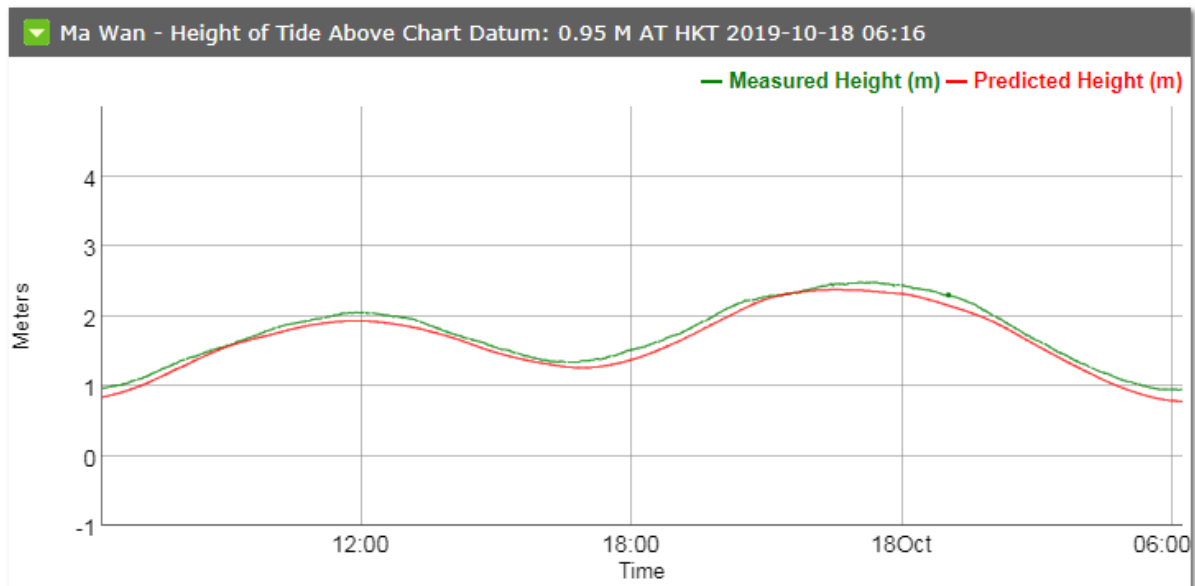
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Report No.: 0041/17/ED/0501B

### Appendix G

#### 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	17/10/2019	Sunny	Moderate	15:23	8.5	3	936	479	<0.10	40.3	31.5	44.8	0.15	23.4	101	17.4	0.24
B	17/10/2019	Sunny	Moderate	15:41	8.6	3	846	417	<0.10	35.1	32.8	37.0	0.10	20.4	92.1	14.4	0.36
C	17/10/2019	Sunny	Moderate	16:03	8.3	10	1140	585	<0.10	49.4	41.8	52.9	0.12	28.9	130	16.6	0.40
D	17/10/2019	Sunny	Moderate	16:11	8.5	5	947	477	0.11	40.7	35.4	43.6	0.11	24.6	109	11.3	0.30
E	17/10/2019	Sunny	Moderate	16:32	8.4	12	1300	562	<0.10	46.6	42.0	49.5	0.12	28.0	126	12.2	0.36
F	17/10/2019	Sunny	Moderate	16:44	8.3	26	1440	589	<0.10	45.8	40.5	48.0	0.15	27.8	121	12.4	0.32
G	17/10/2019	Sunny	Moderate	17:04	8.4	6	1030	502	0.11	46.4	103	67.7	0.11	25.8	216	15.6	0.37
H	17/10/2019	Sunny	Moderate	17:27	8.4	2	941	463	0.13	44.6	43.7	45.7	0.11	26.2	108	14.1	0.39

Monitoring Location	Date	Weather	Sea Condition	Time	Benthic Survey				
					Total Organic Carbon (%)	Particle Size Distribution			
						Gravel (%)	Sand (%)	Silt (%)	Clay (%)
A	17/10/2019	Sunny	Moderate	15:23	0.95	3	27	37	33
B	17/10/2019	Sunny	Moderate	15:41	0.65	6	25	41	28
C	17/10/2019	Sunny	Moderate	16:03	0.90	0	3	58	39
D	17/10/2019	Sunny	Moderate	16:11	0.86	0	15	53	32
E	17/10/2019	Sunny	Moderate	16:32	1.11	0	6	56	38
F	17/10/2019	Sunny	Moderate	16:44	1.18	0	4	55	41
G	17/10/2019	Sunny	Moderate	17:04	0.87	10	17	44	29
H	17/10/2019	Sunny	Moderate	17:27	0.85	3	10	54	33





### 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	: HK1944691
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	: 17-Oct-2019		
Order number	: 0041/17	Quote number	: HKE/1654/2017_R1	Issue Date	: 31-Oct-2019
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.

<i>Signatories</i>	<i>Position</i>	<i>Authorised results for</i>
		
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. Results apply to the sample(s) as submitted. 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 17-Oct-2019 to 30-Oct-2019.

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: HK1944691**

Sample(s) were received in chilled condition.

Water sample(s) analysed and reported on as received basis.

Sediment sample(s) analysed on an as received basis. Result(s) reported on dry weight basis.

Sample information (Project name, Sample ID, Sampling date/ time) 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
				17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944691-001	HK1944691-002	HK1944691-003	HK1944691-004	HK1944691-005
<b>EA/ED: Physical and Aggregate Properties</b>								
EA002SOIL: pH Value	----	0.1	pH Unit	8.5	8.6	8.3	8.5	8.4
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	55.1	50.6	62.0	54.5	57.7
<b>ED/EK: Inorganic Nonmetallic Parameters</b>								
EK055S: Ammonia as N	7664-41-7	0.5	mg/kg	3	3	10	5	12
EK062A: Total Nitrogen as N	----	10	mg/kg	936	846	1140	947	1300
EK067A: Total Phosphorus as P	----	10	mg/kg	479	417	585	477	562
<b>EG: Metals and Major Cations</b>								
EG020: Arsenic	7440-38-2	0.5	mg/kg	17.4	14.4	16.6	11.3	12.2
EG020: Cadmium	7440-43-9	0.10	mg/kg	<0.10	<0.10	<0.10	0.11	<0.10
EG020: Chromium	7440-47-3	0.5	mg/kg	40.3	35.1	49.4	40.7	46.6
EG020: Copper	7440-50-8	0.20	mg/kg	31.5	32.8	41.8	35.4	42.0
EG020: Lead	7439-92-1	0.20	mg/kg	44.8	37.0	52.9	43.6	49.5
EG020: Mercury	7439-97-6	0.05	mg/kg	0.15	0.10	0.12	0.11	0.12
EG020: Nickel	7440-02-0	0.20	mg/kg	23.4	20.4	28.9	24.6	28.0
EG020: Silver	7440-22-4	0.10	mg/kg	0.24	0.36	0.40	0.30	0.36
EG020: Zinc	7440-66-6	0.5	mg/kg	101	92.1	130	109	126



Sub-Matrix: SEDIMENT				Client sample ID	F/Sediment	G/Sediment	H/Sediment	A/Benthic Survey	B/Benthic Survey
				Client sampling date / time	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944691-006	HK1944691-007	HK1944691-008	HK1944691-009	HK1944691-010	
<b>EA/ED: Physical and Aggregate Properties</b>									
EA002SOIL: pH Value	----	0.1	pH Unit	8.3	8.4	8.4	---	---	
EA055: Moisture Content (dried @ 103°C)	----	0.1	%	63.2	56.8	55.5	51.8	49.2	
<b>ED/EK: Inorganic Nonmetallic Parameters</b>									
EK055S: Ammonia as N	7664-41-7	0.5	mg/kg	26	6	2	---	---	
EK062A: Total Nitrogen as N	----	10	mg/kg	1440	1030	941	---	---	
EK067A: Total Phosphorus as P	----	10	mg/kg	589	502	463	---	---	
<b>EG: Metals and Major Cations</b>									
EG020: Arsenic	7440-38-2	0.5	mg/kg	12.4	15.6	14.1	---	---	
EG020: Cadmium	7440-43-9	0.10	mg/kg	<0.10	0.11	0.13	---	---	
EG020: Chromium	7440-47-3	0.5	mg/kg	45.8	46.4	44.6	---	---	
EG020: Copper	7440-50-8	0.20	mg/kg	40.5	103	43.7	---	---	
EG020: Lead	7439-92-1	0.20	mg/kg	48.0	67.7	45.7	---	---	
EG020: Mercury	7439-97-6	0.05	mg/kg	0.15	0.11	0.11	---	---	
EG020: Nickel	7440-02-0	0.20	mg/kg	27.8	25.8	26.2	---	---	
EG020: Silver	7440-22-4	0.10	mg/kg	0.32	0.37	0.39	---	---	
EG020: Zinc	7440-66-6	0.5	mg/kg	121	216	108	---	---	
<b>EP: Aggregate Organics</b>									
EP005: Total Organic Carbon	----	0.05	%	---	---	---	0.95	0.65	



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit		HK1944691-011	HK1944691-012	HK1944691-013	HK1944691-014	HK1944691-015
<b>EA/ED: Physical and Aggregate Properties</b>									
EA055: Moisture Content (dried @ 103°C)	----	0.1	%		60.8	51.1	57.7	62.8	49.2
<b>EP: Aggregate Organics</b>									
EP005: Total Organic Carbon	----	0.05	%		0.90	0.86	1.11	1.18	0.87



Sub-Matrix: SEDIMENT				Client sample ID	H/Benthic Survey	---	---	---	---
				Client sampling date / time	17-Oct-2019	---	---	---	---
Compound	CAS Number	LOR	Unit	HK1944691-016	---	---	---	---	---
<b>EA/ED: Physical and Aggregate Properties</b>									
EA055: Moisture Content (dried @ 103°C)	---	0.1	%	57.5	---	---	---	---	---
<b>EP: Aggregate Organics</b>									
EP005: Total Organic Carbon	---	0.05	%	0.85	---	---	---	---	---



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	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019	17-Oct-2019
Compound	CAS Number	LOR	Unit	HK1944691-017	HK1944691-018	HK1944691-019	HK1944691-020	HK1944691-021	
<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	<1	<1	6	2	
EG020: Copper	7440-50-8	1	µg/L	2	1	1	6	2	
EG020: Lead	7439-92-1	1	µg/L	<1	2	<1	5	1	
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	1	1	1	4	2	
EG020: Silver	7440-22-4	1	µg/L	<1	<1	<1	<1	<1	
EG020: Zinc	7440-66-6	10	µg/L	<10	<10	<10	20	<10	



Sub-Matrix: WATER				Client sample ID	F/Rinsate Blank	G/Rinsate Blank	H/Rinsate Blank	---	---
				Client sampling date / time	17-Oct-2019	17-Oct-2019	17-Oct-2019	----	----
Compound	CAS Number	LOR	Unit	HK1944691-022	HK1944691-023	HK1944691-024	-----	-----	
<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>2</b>	<b>2</b>	---	---	
EG020: Copper	7440-50-8	1	µg/L	<b>3</b>	<b>2</b>	<b>3</b>	---	---	
EG020: Lead	7439-92-1	1	µg/L	<b>3</b>	<1	<b>2</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>2</b>	<b>2</b>	---	---	
EG020: Silver	7440-22-4	1	µg/L	<1	<1	<1	---	---	
EG020: Zinc	7440-66-6	10	µg/L	<10	<10	<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: 2653701)</b>								
HK1944691-001	A/Sediment	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	55.1	54.0	2.06
HK1944691-011	C/Benthic Survey	EA055: Moisture Content (dried @ 103°C)	----	0.1	%	60.8	61.1	0.586
<b>EA/ED: Physical and Aggregate Properties (QC Lot: 2653731)</b>								
HK1944691-004	D/Sediment	EA002SOIL: pH Value	----	0.1	pH Unit	8.5	8.4	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2653725)</b>								
HK1944691-002	B/Sediment	EK055S: Ammonia as N	7664-41-7	1	mg/kg	3	3	0.00
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2667650)</b>								
HK1944691-008	H/Sediment	EK067A: Total Phosphorus as P	----	10	mg/kg	463	467	0.966
<b>EG: Metals and Major Cations (QC Lot: 2653188)</b>								
HK1944691-002	B/Sediment	EG020: Cadmium	7440-43-9	0.01	mg/kg	<0.10	<0.10	0.00
		EG020: Mercury	7439-97-6	0.02	mg/kg	0.10	0.10	0.00
		EG020: Copper	7440-50-8	0.05	mg/kg	32.8	34.0	3.69
		EG020: Lead	7439-92-1	0.05	mg/kg	37.0	36.4	1.67
		EG020: Nickel	7440-02-0	0.05	mg/kg	20.4	20.9	2.09
		EG020: Silver	7440-22-4	0.05	mg/kg	0.36	0.37	3.44
		EG020: Arsenic	7440-38-2	0.5	mg/kg	14.4	13.1	9.68
		EG020: Chromium	7440-47-3	0.5	mg/kg	35.1	35.4	0.822
		EG020: Zinc	7440-66-6	0.5	mg/kg	92.1	94.7	2.80
<b>EP: Aggregate Organics (QC Lot: 2654293)</b>								
HK1944608-001	Anonymous	EP005: Total Organic Carbon	----	0.05	%	0.05	<0.05	0.00
HK1944691-013	E/Benthic Survey	EP005: Total Organic Carbon	----	0.05	%	1.11	1.17	5.02

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: 2653232)</b>								
HK1944691-018	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: Chromium	7440-47-3	1	µg/L	<1	1	0.00
		EG020: Copper	7440-50-8	1	µg/L	1	1	0.00
		EG020: Lead	7439-92-1	1	µg/L	2	<1	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>EG: Metals and Major Cations - Total (QC Lot: 2653232) - Continued</b>								
HK1944691-018	B/Rinsate Blank	EG020: Nickel	7440-02-0	1	µg/L	1	1	0.00
		EG020: Silver	7440-22-4	1	µg/L	<1	<1	0.00
		EG020: Arsenic	7440-38-2	10	µg/L	<10	<10	0.00
		EG020: Zinc	7440-66-6	10	µg/L	<10	<10	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: 2653725)</b>												
EK055S: Ammonia as N	7664-41-7	1	mg/kg	<1	10 mg/kg	105	----	85.0	115	----	----	
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2667650)</b>												
EK067A: Total Phosphorus as P	----	10	mg/kg	<10	695 mg/kg	90.8	----	83.6	95.2	----	----	
<b>EG: Metals and Major Cations (QC Lot: 2653188)</b>												
EG020: Arsenic	7440-38-2	0.5	mg/kg	<0.5	5 mg/kg	102	----	85.0	110	----	----	
EG020: Cadmium	7440-43-9	0.01	mg/kg	<0.01	5 mg/kg	98.4	----	85.0	115	----	----	
EG020: Chromium	7440-47-3	0.5	mg/kg	<0.5	5 mg/kg	102	----	85.0	115	----	----	
EG020: Copper	7440-50-8	0.05	mg/kg	<0.05	5 mg/kg	103	----	85.0	114	----	----	
EG020: Lead	7439-92-1	0.05	mg/kg	<0.05	5 mg/kg	98.8	----	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	101	----	85.0	115	----	----	
EG020: Silver	7440-22-4	0.05	mg/kg	<0.05	5 mg/kg	100	----	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: 2654293)</b>												
EP005: Total Organic Carbon	----	0.05	%	<0.05	40 %	101	----	90.4	106	----	----	

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: 2653232)</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>EG: Metals and Major Cations - Total (QC Lot: 2653232) - Continued</b>											
EG020: Arsenic	7440-38-2	10	µg/L	<10	100 µg/L	96.5	----	85.0	110	----	----
EG020: Cadmium	7440-43-9	0.2	µg/L	<0.2	100 µg/L	96.3	----	85.0	109	----	----
EG020: Chromium	7440-47-3	1	µg/L	<1	100 µg/L	101	----	86.0	111	----	----
EG020: Copper	7440-50-8	1	µg/L	<1	100 µg/L	102	----	90.0	111	----	----
EG020: Lead	7439-92-1	1	µg/L	<1	100 µg/L	99.0	----	89.0	111	----	----
EG020: Mercury	7439-97-6	0.5	µg/L	<0.5	2 µg/L	94.2	----	85.0	115	----	----
EG020: Nickel	7440-02-0	1	µg/L	<1	100 µg/L	100	----	87.0	110	----	----
EG020: Silver	7440-22-4	1	µg/L	<1	100 µg/L	93.0	----	85.0	114	----	----
EG020: Zinc	7440-66-6	10	µg/L	<10	100 µg/L	97.1	----	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: 2653725)</b>										
HK1944691-002	B/Sediment	EK055S: Ammonia as N	7664-41-7	10 mg/kg	99.9	----	75.0	125	----	----
<b>ED/EK: Inorganic Nonmetallic Parameters (QC Lot: 2667650)</b>										
HK1944691-008	H/Sediment	EK067A: Total Phosphorus as P	----	100 mg/kg	87.0	----	75.0	125	----	----
<b>EG: Metals and Major Cations (QC Lot: 2653188)</b>										
HK1944691-001	A/Sediment	EG020: Arsenic	7440-38-2	5 mg/kg	98.2	----	75.0	125	----	----
		EG020: Cadmium	7440-43-9	5 mg/kg	98.3	----	75.0	125	----	----
		EG020: Chromium	7440-47-3	5 mg/kg	92.4	----	75.0	125	----	----
		EG020: Copper	7440-50-8	5 mg/kg	84.2	----	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	94.3	----	75.0	125	----	----
		EG020: Nickel	7440-02-0	5 mg/kg	92.1	----	75.0	125	----	----
		EG020: Silver	7440-22-4	5 mg/kg	98.6	----	75.0	125	----	----
EG020: Zinc	7440-66-6	5 mg/kg	# Not Determined	----	75.0	125	----	----		
<b>EP: Aggregate Organics (QC Lot: 2654293)</b>										
HK1944608-001	Anonymous	EP005: Total Organic Carbon	----	40 %	102	----	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: 2653232)</b>										
HK1944691-017	A/Rinsate Blank	EG020: Arsenic	7440-38-2	100 µg/L	98.0	----	75.0	125	----	----
		EG020: Cadmium	7440-43-9	100 µg/L	93.7	----	75.0	125	----	----
		EG020: Chromium	7440-47-3	100 µg/L	104	----	75.0	125	----	----
		EG020: Copper	7440-50-8	100 µg/L	87.8	----	75.0	125	----	----
		EG020: Lead	7439-92-1	100 µg/L	83.0	----	75.0	125	----	----
EG020: Mercury	7439-97-6	2 µg/L	81.1	----	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: 2653232) - Continued</b>										
HK1944691-017	A/Rinsate Blank	EG020: Nickel	7440-02-0	100 µg/L	89.5	----	75.0	125	----	----
		EG020: Silver	7440-22-4	100 µg/L	92.3	----	75.0	125	----	----
		EG020: Zinc	7440-66-6	100 µg/L	78.6	----	75.0	125	----	----



### SUB-CONTRACTING REPORT

CONTACT	: MR CYRUS LAI	WORK ORDER	: <b>HK1944691</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	: 17-OCT-2019
		DATE OF ISSUE	: 30-OCT-2019
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) were received in chilled condition.
- Water sample(s) analysed and reported on as received basis.
- Sediment sample(s) analysed on an as received basis. Result(s) reported on dry weight basis.
- Sample information (Project name, Sample ID, Sampling date/ time) 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

General Manager

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

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

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

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Tel. +852 2610 1044 Fax. +852 2610 2021 www.alsglobal.com

WORK ORDER : HK1944691  
 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.
HK1944691-001	A/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-002	B/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-003	C/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-004	D/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-005	E/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-006	F/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-007	G/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-008	H/Sediment	SEDIMENT	17-Oct-2019	
HK1944691-009	A/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-010	B/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-011	C/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-012	D/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-013	E/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-014	F/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-015	G/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-016	H/Benthic Survey	SEDIMENT	17-Oct-2019	J2999-272.54
HK1944691-017	A/Rinsate Blank	WATER	17-Oct-2019	
HK1944691-018	B/Rinsate Blank	WATER	17-Oct-2019	
HK1944691-019	C/Rinsate Blank	WATER	17-Oct-2019	
HK1944691-020	D/Rinsate Blank	WATER	17-Oct-2019	
HK1944691-021	E/Rinsate Blank	WATER	17-Oct-2019	
HK1944691-022	F/Rinsate Blank	WATER	17-Oct-2019	
HK1944691-023	G/Rinsate Blank	WATER	17-Oct-2019	
HK1944691-024	H/Rinsate Blank	WATER	17-Oct-2019	

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



Report No : J2999-272.54

Customer : ALS Technichem (HK) Pty Ltd

Job No. : J2999

Works Order No. : 272

Project : -

Contract No.:

Date : 21/10/2019

Sample ID No.	Sample		Δ Moisture Content (%)	Test 6.1 Liquid Limit (%)	Test 6.1 Plastic 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 (%)
HK1944691-009	A/Benthic Survey	D							1,5,7	3	27	37	33	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK1944691-010	B/Benthic Survey	D							1,5,7	6	25	41	28	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments	- †
HK1944691-011	C/Benthic Survey	D							1,5,7	0	3	58	39	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK1944691-012	D/Benthic Survey	D							1,5,7	0	15	53	32	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK1944691-013	E/Benthic Survey	D							1,5,7	0	6	56	38	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK1944691-014	F/Benthic Survey	D							1,5,7	0	4	55	41	Dark grey, slightly sandy SILT/CLAY with shell fragments	- †
HK1944691-015	G/Benthic Survey	D							1,5,7	10	17	44	29	Dark grey, slightly gravelly, slightly sandy SILT/CLAY with shell fragments	- †
HK1944691-016	H/Benthic Survey	D							1,5,7	3	10	54	33	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 GEOSPEC3 : 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;  
 LB - Large Disturbed Sample;  
 BLK - Block Sample;  
 SPTL - SPT Split-Barrel Sample;  
 P - Piston Sample;  
 M - Mazier Sample;  
 D - Small Disturbed Sample;  
 PT - Portable triple tube Sample;  
 N.P. - Non Plastic;  
 A.R. - As Received;  
 H.P. - Hand Picked;  
 PT - Moisture Content for A.L. Test;  
 A.D. - Air Dried;  
 O.D. - Oven Dried;  
 W.S. - Wet Sieved;

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

Checked by : T K Lam

Approved By : Chung Hei Wing  
 Principal Laboratory Officer

Date : 30/10/2019

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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. : J2999-272.54

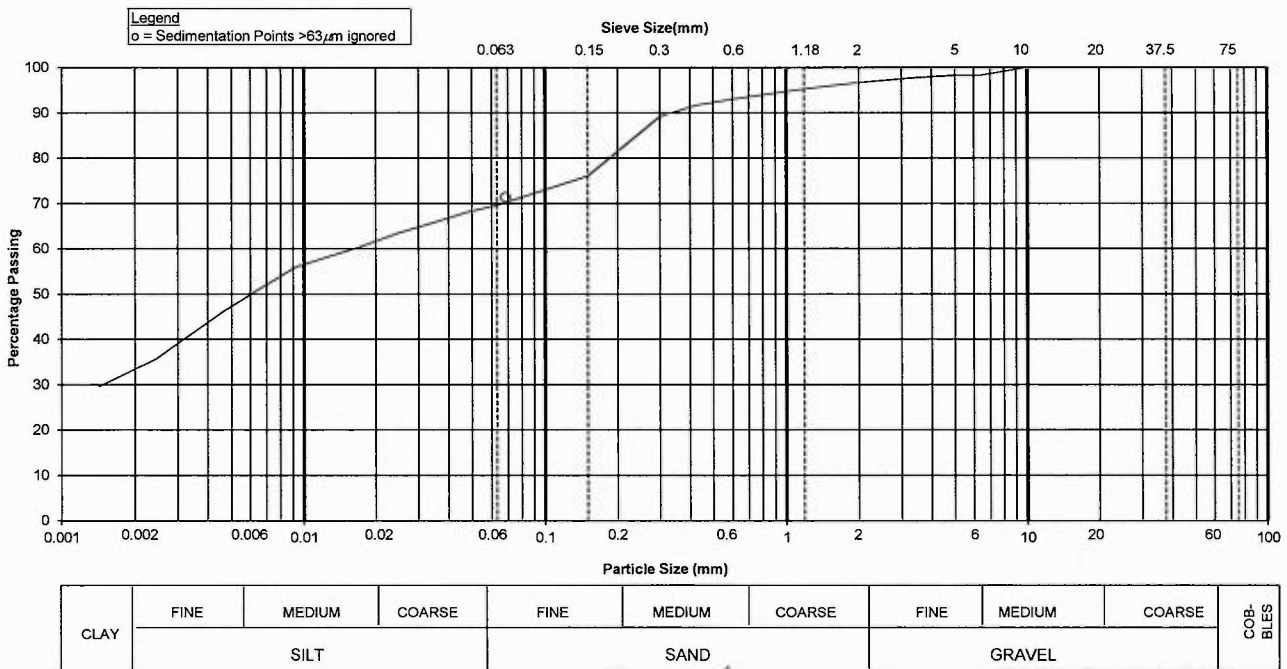
Works Order No. : 272  
 Sample ID No. : HK1944691-009  
 Sample No. : A/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : ‡

Date Received : 21/10/2019  
 Tested Date : 22/10/2019

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	-	-	0.0683	-	71	-
75.0 mm	100	-	-	0.0488	-	68	-
63.0 mm	100	-	-	0.0347	-	66	-
50.0 mm	100	-	-	0.0247	-	63	-
37.5 mm	100	-	-	0.0176	-	61	-
28.0 mm	100	-	-	0.0092	-	56	-
20.0 mm	100	-	-	0.0047	-	47	-
14.0 mm	100	-	-	0.0024	-	36	-
10.0 mm	98	-	-	0.0014	-	30	-
6.30 mm	98	-	-	<b>SUMMARY :</b>			
5.00 mm	98	-	-	Gravel (%)	:	3	
3.35 mm	98	-	-	Sand (%)	:	27	
2.00 mm	97	-	-	Silt (%)	:	37	
1.18 mm	95	-	-	Clay (%)	:	33	
600 µm	93	-	-				
425 µm	92	-	-				
300 µm	89	-	-				
212 µm	83	-	-				
150 µm	76	-	-				
63 µm	70	-	-				
0 µm	0	-	-				



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

Technician : C M Yip Checked By : TK Lam Approved By : Chung Hei Wing  
 Date : 22/10/2019 Date : 30/10/2019 Date : 30/10/2019

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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  
Customer : ALS Technichem (HK) Pty Ltd  
Project : -

Contract No. :

Report No. : J2999-272.54

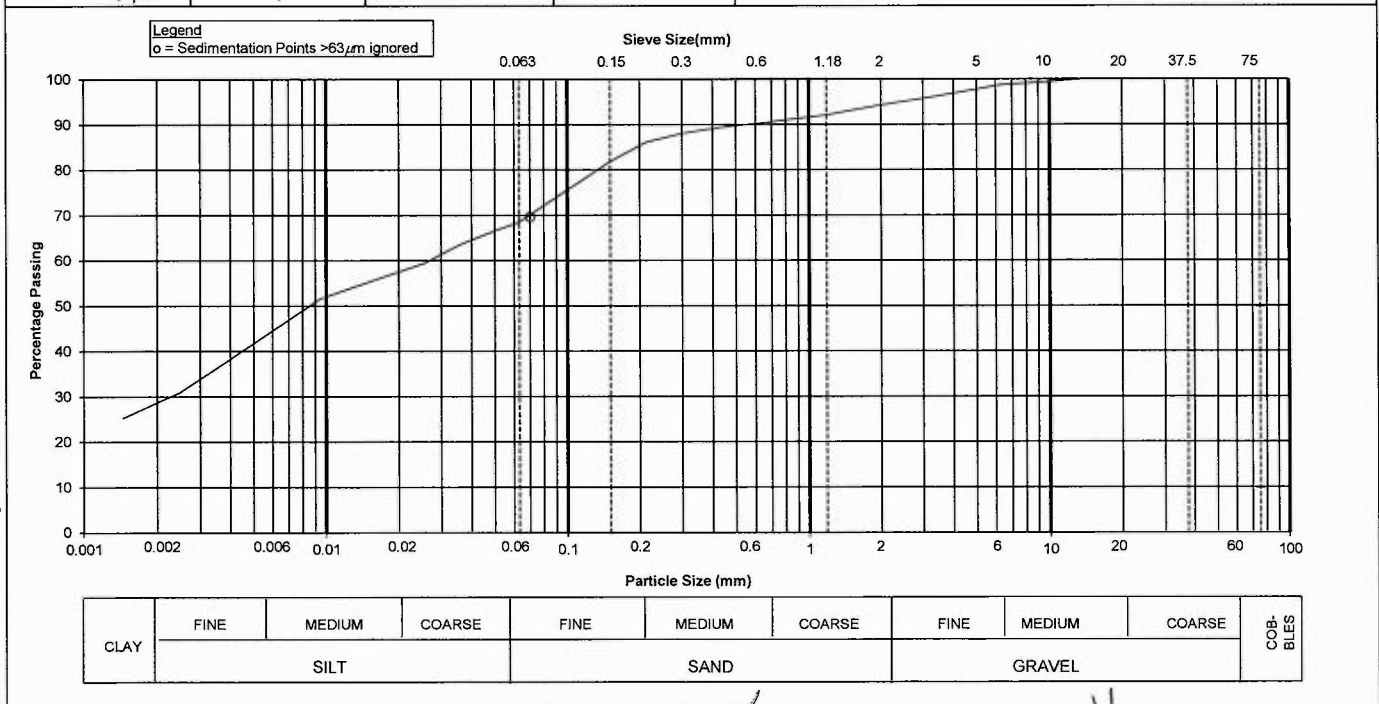
Works Order No. : 272  
Sample ID No. : HK1944691-010  
Sample No. : B/Benthic Survey  
Sample Depth (m) :  
Specimen Depth (m) :  
Sample Type : Small Disturbed  
Sample Origin : ‡

Date Received : 21/10/2019  
Tested Date : 22/10/2019

Description : Dark grey, slightly gravelly, 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	-	-	0.0700	-	70	-
75.0 mm	100	-	-	0.0499	-	67	-
63.0 mm	100	-	-	0.0356	-	63	-
50.0 mm	100	-	-	0.0254	-	59	-
37.5 mm	100	-	-	0.0181	-	57	-
28.0 mm	100	-	-	0.0095	-	52	-
20.0 mm	100	-	-	0.0049	-	41	-
14.0 mm	100	-	-	0.0025	-	31	-
10.0 mm	99	-	-	0.0015	-	25	-
6.30 mm	99	-	-	<b>SUMMARY :</b> Gravel (%) : 6 Sand (%) : 25 Silt (%) : 41 Clay (%) : 28			
5.00 mm	98	-	-				
3.35 mm	96	-	-				
2.00 mm	94	-	-				
1.18 mm	92	-	-				
600 µm	90	-	-				
425 µm	89	-	-				
300 µm	88	-	-				
212 µm	86	-	-				
150 µm	82	-	-				
63 µm	69	-	-				
0 µm	0	-	-				



Technician : C M Yip  
Date : 22/10/2019

Checked By : T K Lam  
Date : 30/10/2019

Approved By : Chung Hei Wing  
Date : 30/10/2019

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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. : J2999-272.54

Works Order No. : 272  
 Sample ID No. : HK1944691-011  
 Sample No. : C/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : ‡

Date Received : 21/10/2019  
 Tested Date : 22/10/2019

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

Sieve Method : Method A

^ Upon request

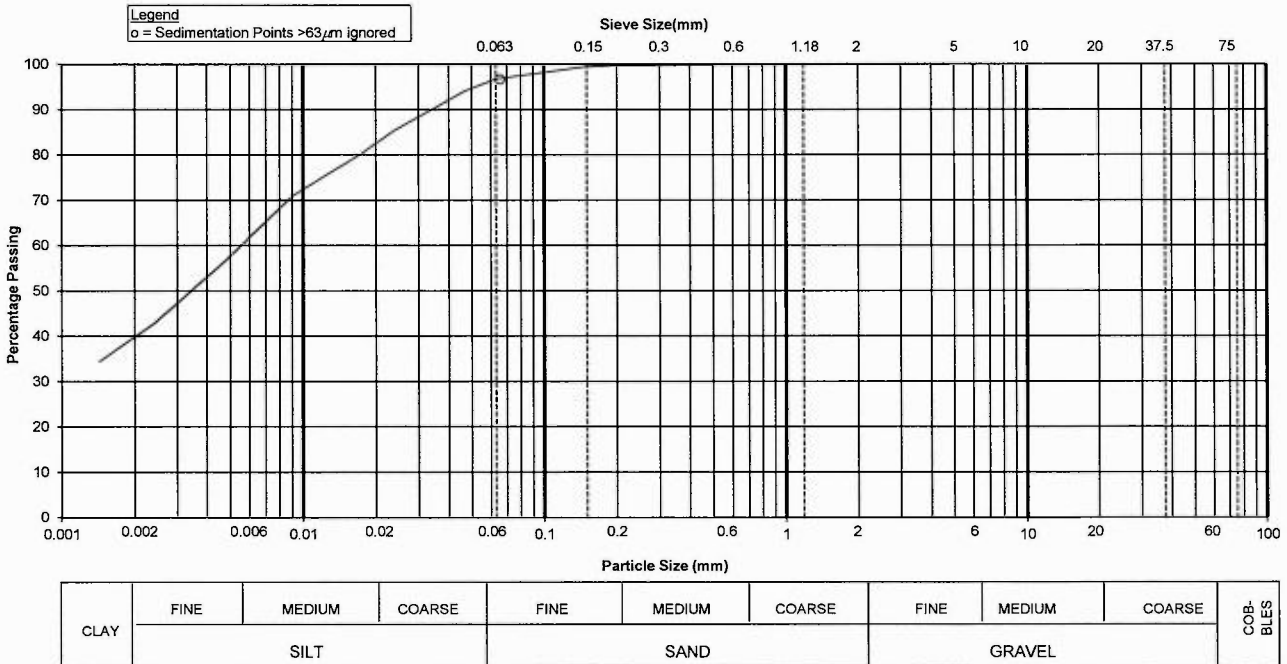
\* Delete as appropriate

‡ 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	-	-	0.0655	-	97	-
14.0 mm	100	-	-	0.0467	-	94	-
10.0 mm	100	-	-	0.0334	-	90	-
6.30 mm	100	-	-	0.0239	-	85	-
5.00 mm	100	-	-	0.0172	-	80	-
3.35 mm	100	-	-	0.0091	-	71	-
2.00 mm	100	-	-	0.0047	-	56	-
1.18 mm	100	-	-	0.0024	-	43	-
600 µm	100	-	-	0.0014	-	34	-
425 µm	100	-	-				
300 µm	100	-	-				
212 µm	100	-	-				
150 µm	99	-	-				
63 µm	97	-	-				
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 (%) : 3  
 Silt (%) : 58  
 Clay (%) : 39



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

Technician : C M Yip  
 Date : 22/10/2019

Checked By : TK Lam  
 Name : TK Lam  
 Date : 30/10/2019

Approved By : Chung Hei Wing  
 Signatory : Chung Hei Wing  
 Date : 30/10/2019

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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. : J2999-272.54

Date Received : 21/10/2019  
 Tested Date : 22/10/2019

Works Order No. : 272  
 Sample ID No. : HK1944691-012  
 Sample No. : D/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : -<sup>‡</sup>

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

Sieve Method : Method A

<sup>^</sup> Upon request

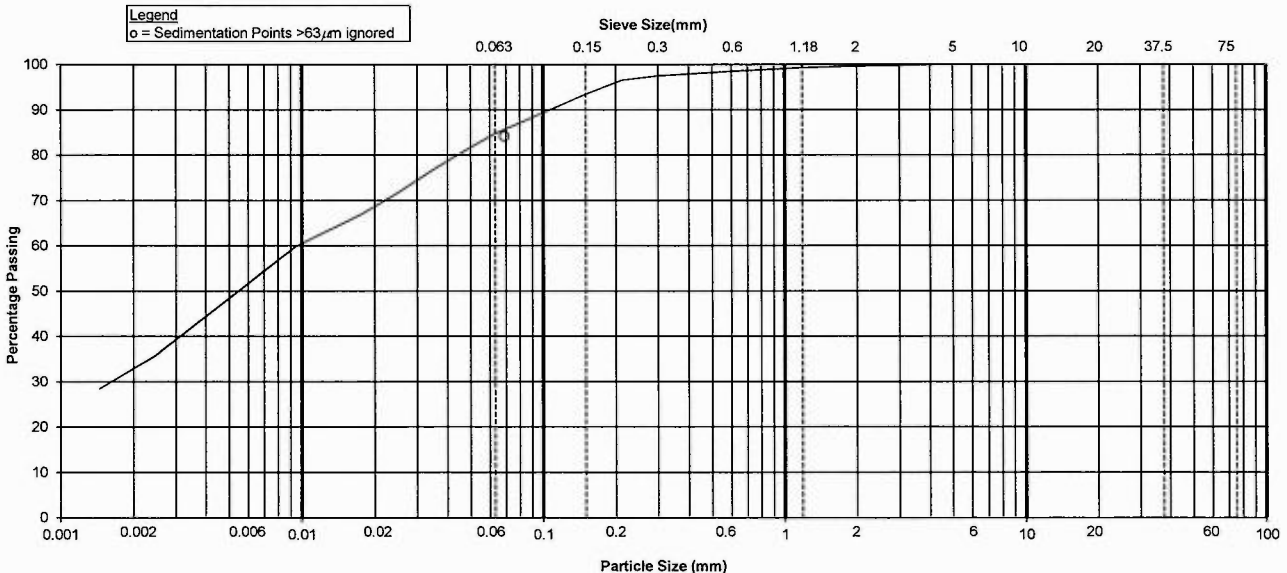
\* Delete as appropriate

<sup>‡</sup> Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	<sup>^</sup> Expanded Uncertainty of the Percent Passing (%)	<sup>^</sup> Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	<sup>^</sup> Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	<sup>^</sup> 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	-	-	0.0687	-	84	-
14.0 mm	100	-	-	0.0489	-	81	-
10.0 mm	100	-	-	0.0350	-	77	-
6.30 mm	100	-	-	0.0250	-	72	-
5.00 mm	100	-	-	0.0179	-	67	-
3.35 mm	100	-	-	0.0094	-	60	-
2.00 mm	100	-	-	0.0048	-	48	-
1.18 mm	99	-	-	0.0025	-	36	-
600 μm	98	-	-	0.0014	-	28	-
425 μm	98	-	-				
300 μm	97	-	-				
212 μm	97	-	-				
150 μm	93	-	-				
63 μm	85	-	-				
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 (%) : 15  
 Silt (%) : 53  
 Clay (%) : 32



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

Technician : C M Yip  
 Date : 22/10/2019

Checked By : TK Lam  
 Date : 30/10/2019

Approved By : Chung Ho Wing  
 Date : 30/10/2019

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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. : J2999-272.54

Works Order No. : 272  
 Sample ID No. : HK1944691-013  
 Sample No. : E/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : ‡

Date Received : 21/10/2019  
 Tested Date : 22/10/2019

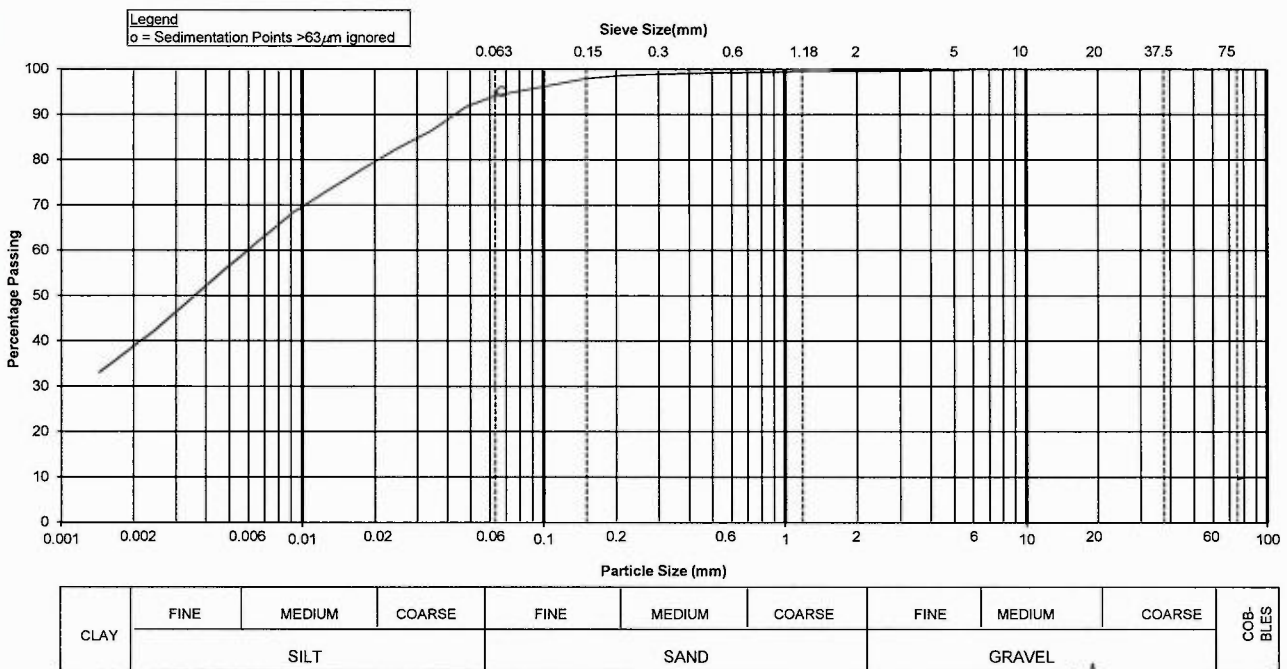
Description : Dark grey, slightly sandy SILT/CLAY with shell fragments

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	-	-	0.0671	-	95	-
14.0 mm	100	-	-	0.0479	-	92	-
10.0 mm	100	-	-	0.0343	-	86	-
6.30 mm	100	-	-	0.0245	-	82	-
5.00 mm	100	-	-	0.0175	-	78	-
3.35 mm	100	-	-	0.0092	-	68	-
2.00 mm	100	-	-	0.0048	-	56	-
1.18 mm	99	-	-	0.0024	-	42	-
600 µm	99	-	-	0.0014	-	33	-
425 µm	99	-	-				
300 µm	99	-	-				
212 µm	99	-	-				
150 µm	98	-	-				
63 µm	94	-	-				
0 µm	0	-	-				

SEDIMENTATION ANALYSIS			
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			
<b>SUMMARY :</b>			
Gravel (%) :	0		
Sand (%) :	6		
Silt (%) :	56		
Clay (%) :	38		



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

Technician : C M Yip      Checked By : TK Lam      Approved By : Chung Hei Wing  
 Date : 22/10/2019      Name : TK Lam      Signatory : Chung Hei Wing  
 Date : 30/10/2019      Date : 30/10/2019

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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  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Contract No. :

Report No. : J2999-272.54

Works Order No. : 272  
 Sample ID No. : HK1944691-014  
 Sample No. : F/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : ‡

Date Received : 21/10/2019  
 Tested Date : 22/10/2019

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

Sieve Method : Method A

^ Upon request

\* Delete as appropriate

‡ Information provided by customer

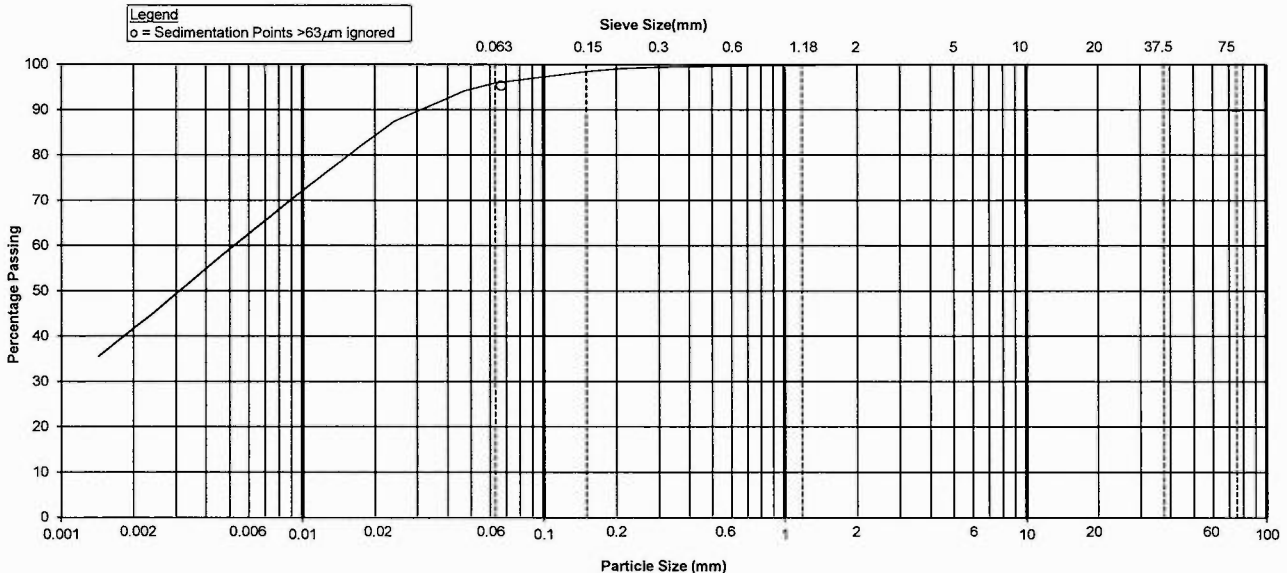
SIEVE ANALYSIS				SEDIMENTATION ANALYSIS			
Sieve Size	Percent Passing (%)	^Expanded Uncertainty of the Percent Passing (%)	^Cumulative Percent Passing with Expanded Uncertainty (%)	Particle Diameter (mm)	^Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	^Expanded Uncertainty of % 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	-	-	0.0666	-	95	-
14.0 mm	100	-	-	0.0472	-	94	-
10.0 mm	100	-	-	0.0337	-	91	-
6.30 mm	100	-	-	0.0240	-	87	-
5.00 mm	100	-	-	0.0173	-	82	-
3.35 mm	100	-	-	0.0092	-	71	-
2.00 mm	100	-	-	0.0047	-	58	-
1.18 mm	100	-	-	0.0024	-	45	-
600 µm	100	-	-	0.0014	-	36	-
425 µm	100	-	-				
300 µm	99	-	-				
212 µm	99	-	-				
150 µm	98	-	-				
63 µm	96	-	-				
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			

<b>SUMMARY :</b>			
Gravel (%)	:	0	
Sand (%)	:	4	
Silt (%)	:	55	
Clay (%)	:	41	



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

Technician : C M Yip  
 Date : 22/10/2019

Checked By : T K Lam  
 Name : T K Lam  
 Date : 30/10/2019

Approved By : Chung Hei Wing  
 Signatory : Chung Hei Wing  
 Date : 30/10/2019

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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  
 Customer : ALS Technichem (HK) Pty Ltd  
 Project : -

Contract No. :

Report No. : J2999-272.54

Works Order No. : 272  
 Sample ID No. : HK1944691-015  
 Sample No. : G/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : ‡

Date Received : 21/10/2019  
 Tested Date : 22/10/2019

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

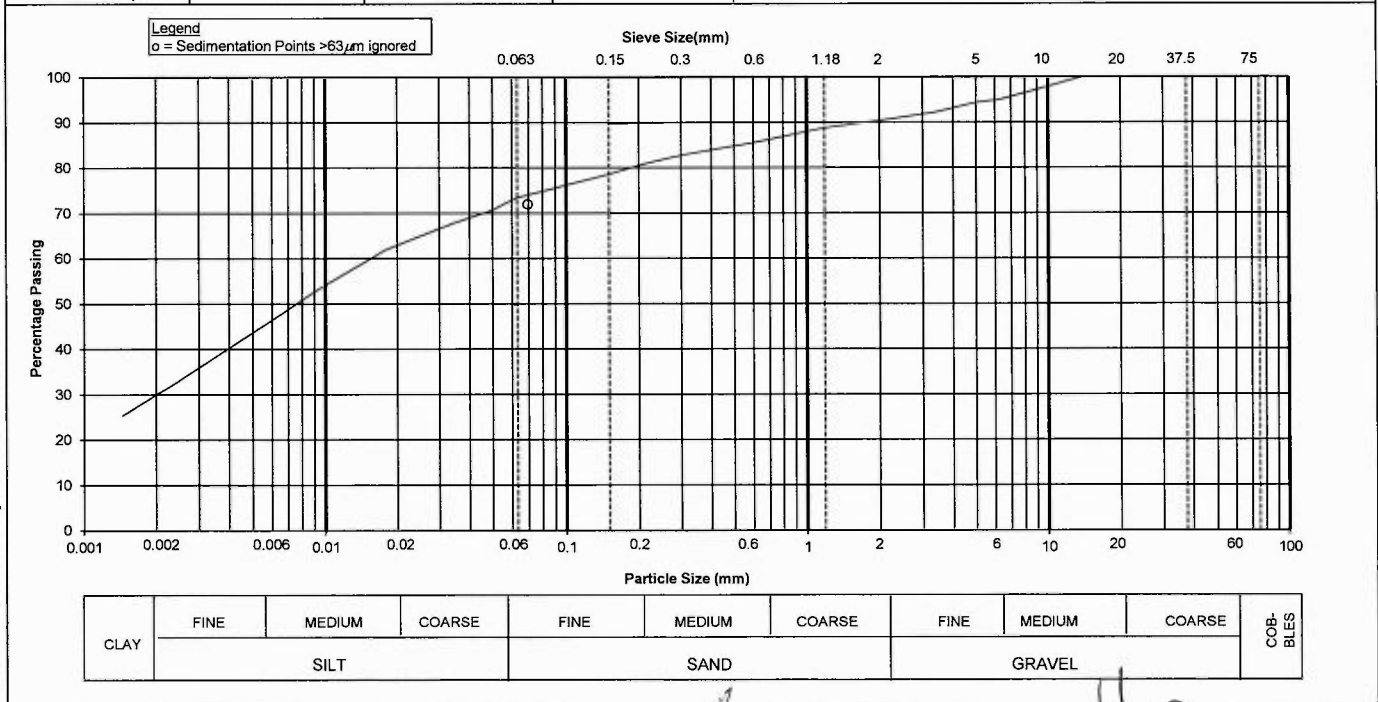
Sieve Method : Method A

^ 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	-	-	0.0693	-	72	-
75.0 mm	100	-	-	0.0492	-	71	-
63.0 mm	100	-	-	0.0350	-	68	-
50.0 mm	100	-	-	0.0250	-	65	-
37.5 mm	100	-	-	0.0178	-	62	-
28.0 mm	100	-	-	0.0094	-	53	-
20.0 mm	100	-	-	0.0048	-	43	-
14.0 mm	100	-	-	0.0025	-	33	-
10.0 mm	98	-	-	0.0014	-	25	-
6.30 mm	95	-	-	<b>SUMMARY :</b> Gravel (%) : 10 Sand (%) : 17 Silt (%) : 44 Clay (%) : 29			
5.00 mm	94	-	-				
3.35 mm	92	-	-				
2.00 mm	90	-	-				
1.18 mm	89	-	-				
600 µm	86	-	-				
425 µm	84	-	-				
300 µm	83	-	-				
212 µm	81	-	-				
150 µm	79	-	-				
63 µm	73	-	-				
0 µm	0	-	-				



Technician : C M Yip  
 Date : 22/10/2019

Checked By : TK Lam  
 Date : 30/10/2019

Approved By : Chung Hei Wing  
 Date : 30/10/2019

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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. : J2999-272.54

Works Order No. : 272  
 Sample ID No. : HK1944691-016  
 Sample No. : H/Benthic Survey  
 Sample Depth (m) :  
 Specimen Depth (m) :  
 Sample Type : Small Disturbed  
 Sample Origin : -<sup>‡</sup>

Date Received : 21/10/2019  
 Tested Date : 22/10/2019

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

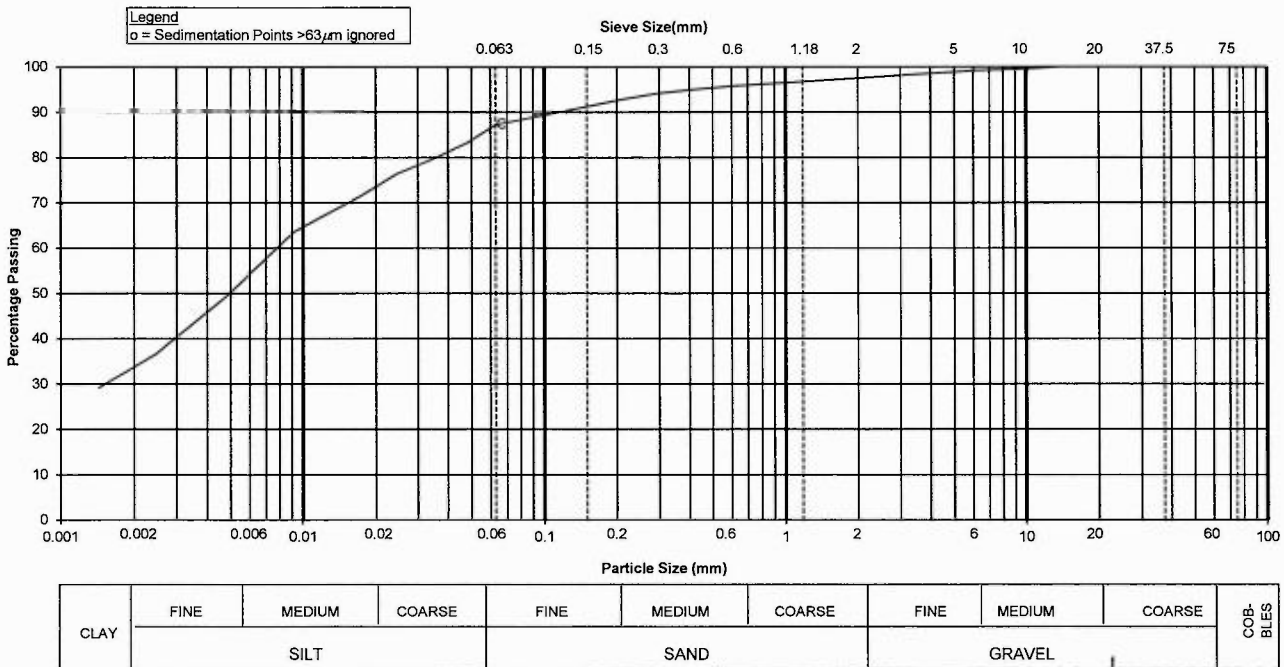
Sieve Method : Method A

<sup>^</sup> Upon request

\* Delete as appropriate

<sup>‡</sup> Information provided by customer

SIEVE ANALYSIS				SEDIMENTATION ANALYSIS				
Sieve Size	Percent Passing (%)	<sup>^</sup> Expanded Uncertainty of the Percent Passing (%)	<sup>^</sup> Cumulative Percent Passing with Expanded Uncertainty (%)	Specific Gravity (# if assumed) :	Particle Diameter (mm)	<sup>^</sup> Expanded Uncertainty of the Particle Diameter (mm)	% Finer than D K (%)	<sup>^</sup> Expanded Uncertainty of % finer than D (%)
100.0 mm	100	-	-	2.65 #	0.0670	-	87	-
75.0 mm	100	-	-	Dispersant Details : Sodium hexametaphosphate, Sodium carbonate	0.0480	-	83	-
63.0 mm	100	-	-	Sampling History : As received	0.0343	-	80	-
50.0 mm	100	-	-	The presence of any visible organic matter in the soil : None	0.0244	-	76	-
37.5 mm	100	-	-		0.0175	-	72	-
28.0 mm	100	-	-		0.0092	-	64	-
20.0 mm	100	-	-		0.0048	-	49	-
14.0 mm	100	-	-		0.0025	-	37	-
10.0 mm	100	-	-		0.0014	-	29	-
6.30 mm	99	-	-	<b>SUMMARY :</b>				
5.00 mm	99	-	-	Gravel (%) :	3			
3.35 mm	98	-	-	Sand (%) :	10			
2.00 mm	97	-	-	Silt (%) :	54			
1.18 mm	97	-	-	Clay (%) :	33			
600 µm	96	-	-					
425 µm	95	-	-					
300 µm	94	-	-					
212 µm	93	-	-					
150 µm	91	-	-					
63 µm	87	-	-					
0 µm	0	-	-					



Technician : C M Yip  
 Date : 22/10/2019

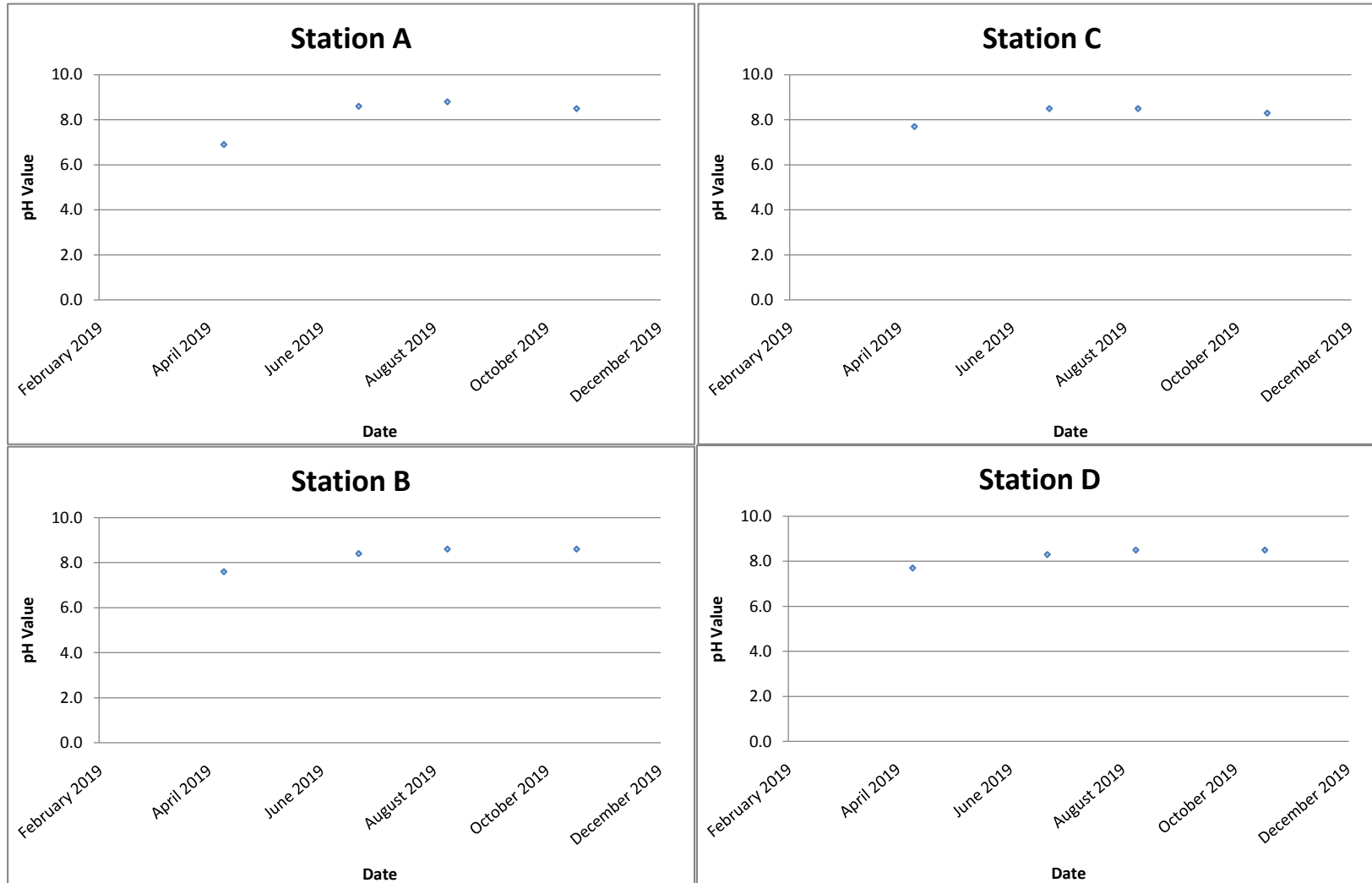
Checked By : T K Lam  
 Date : 30/10/2019

Approved By : Chung Her Wing  
 Date : 30/10/2019

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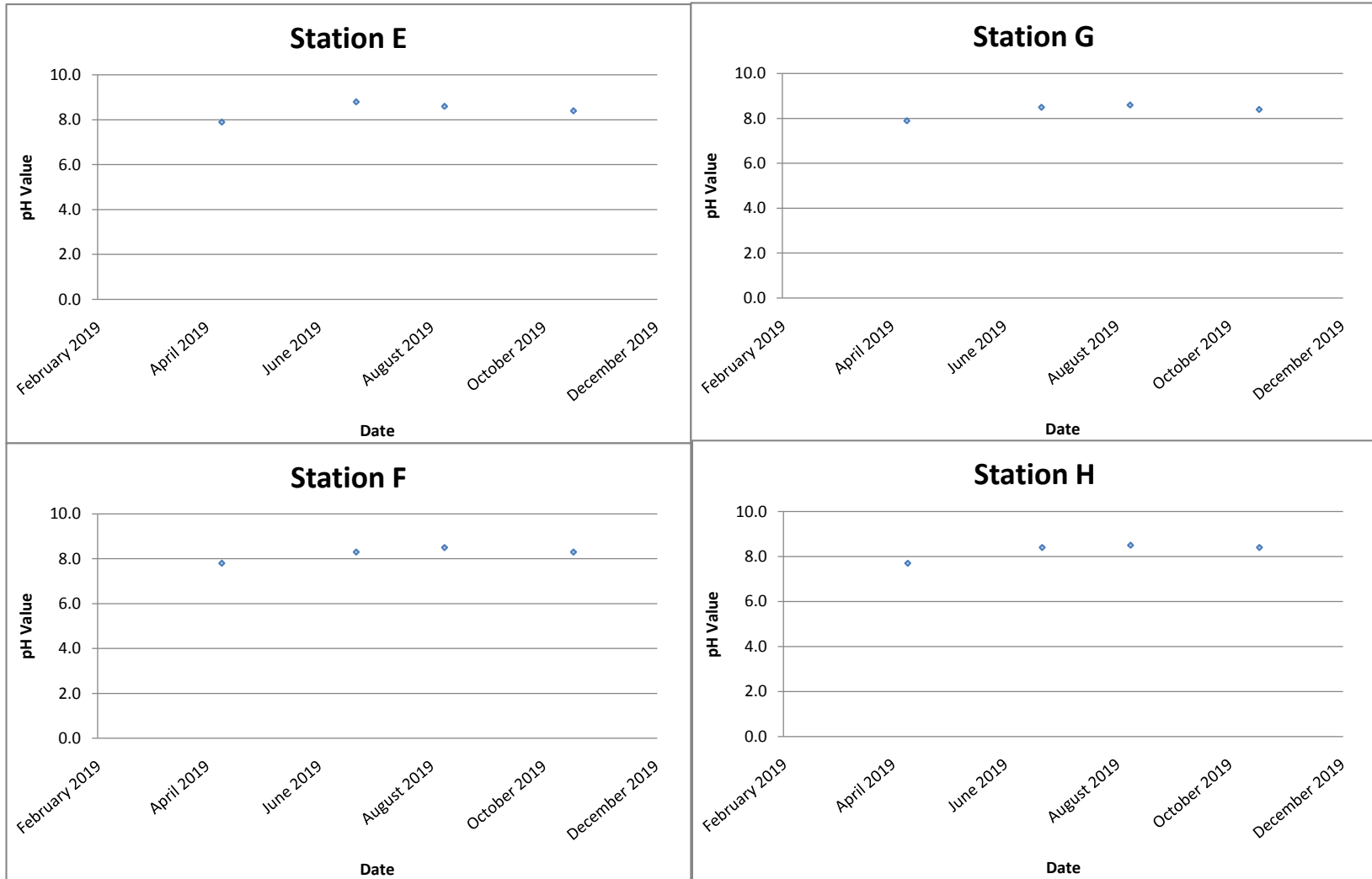
Form : GESR003.5 / Sept.14.18 / Issue 1 / Rev 3

pH value

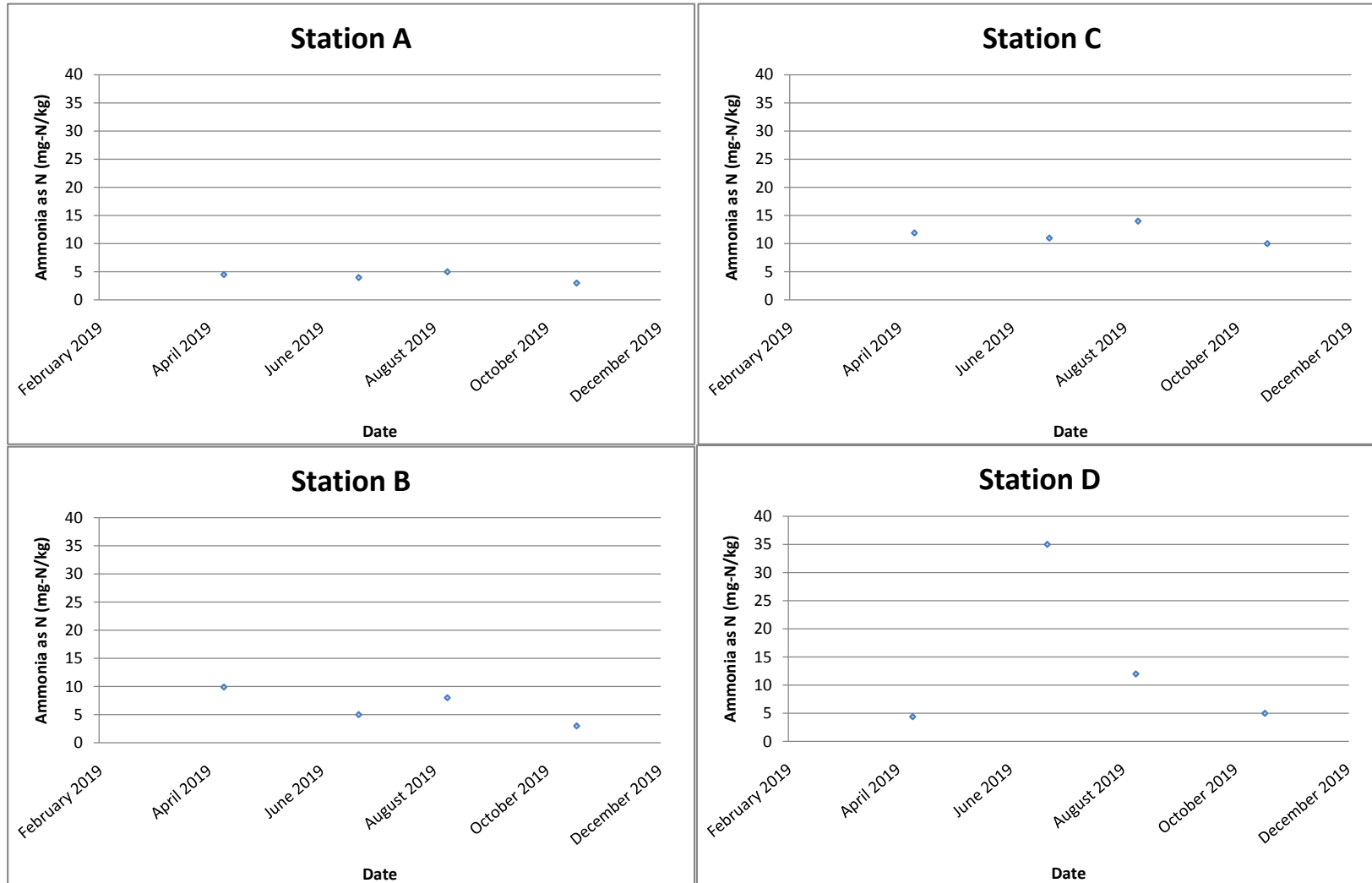




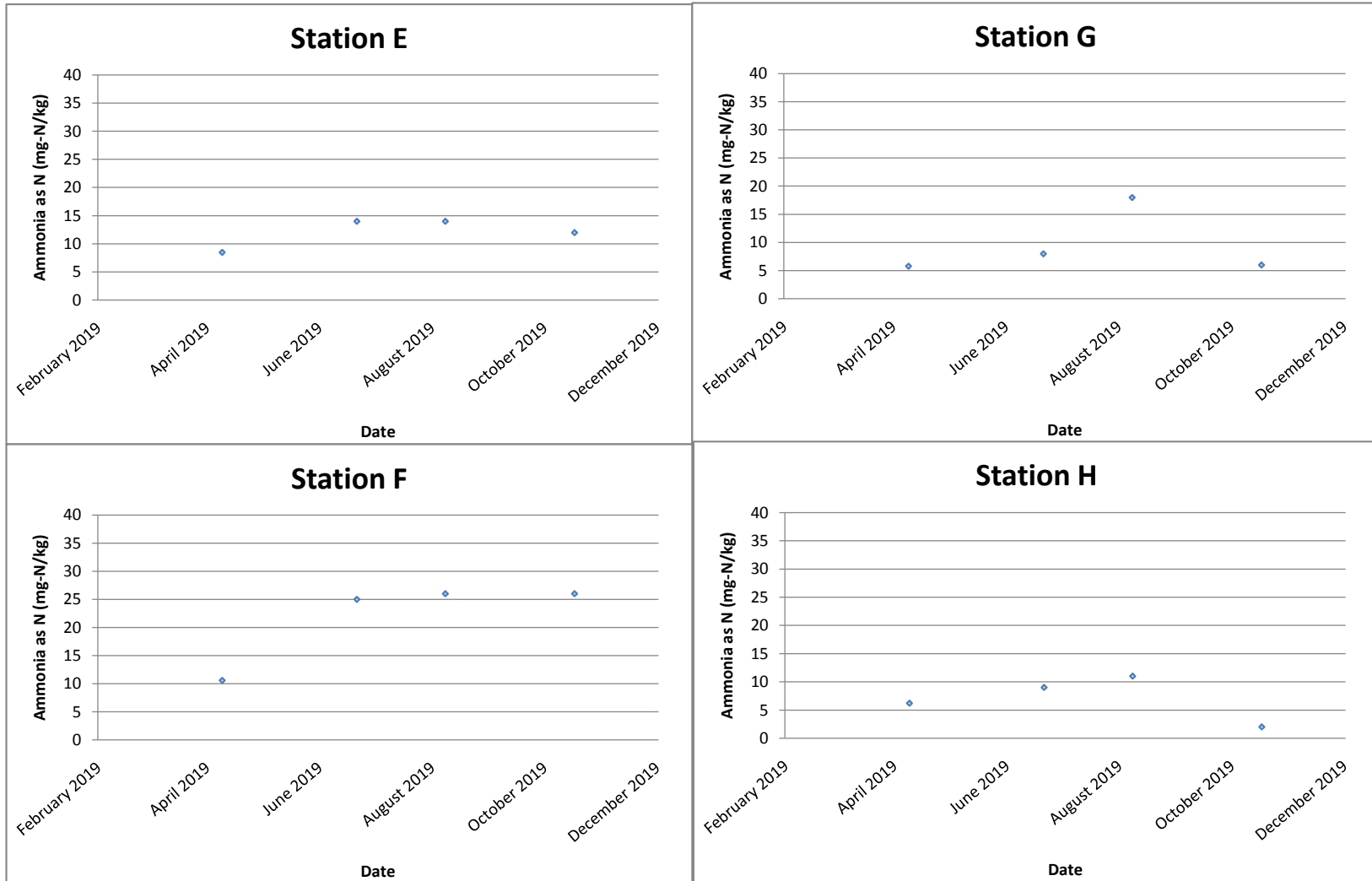
pH value



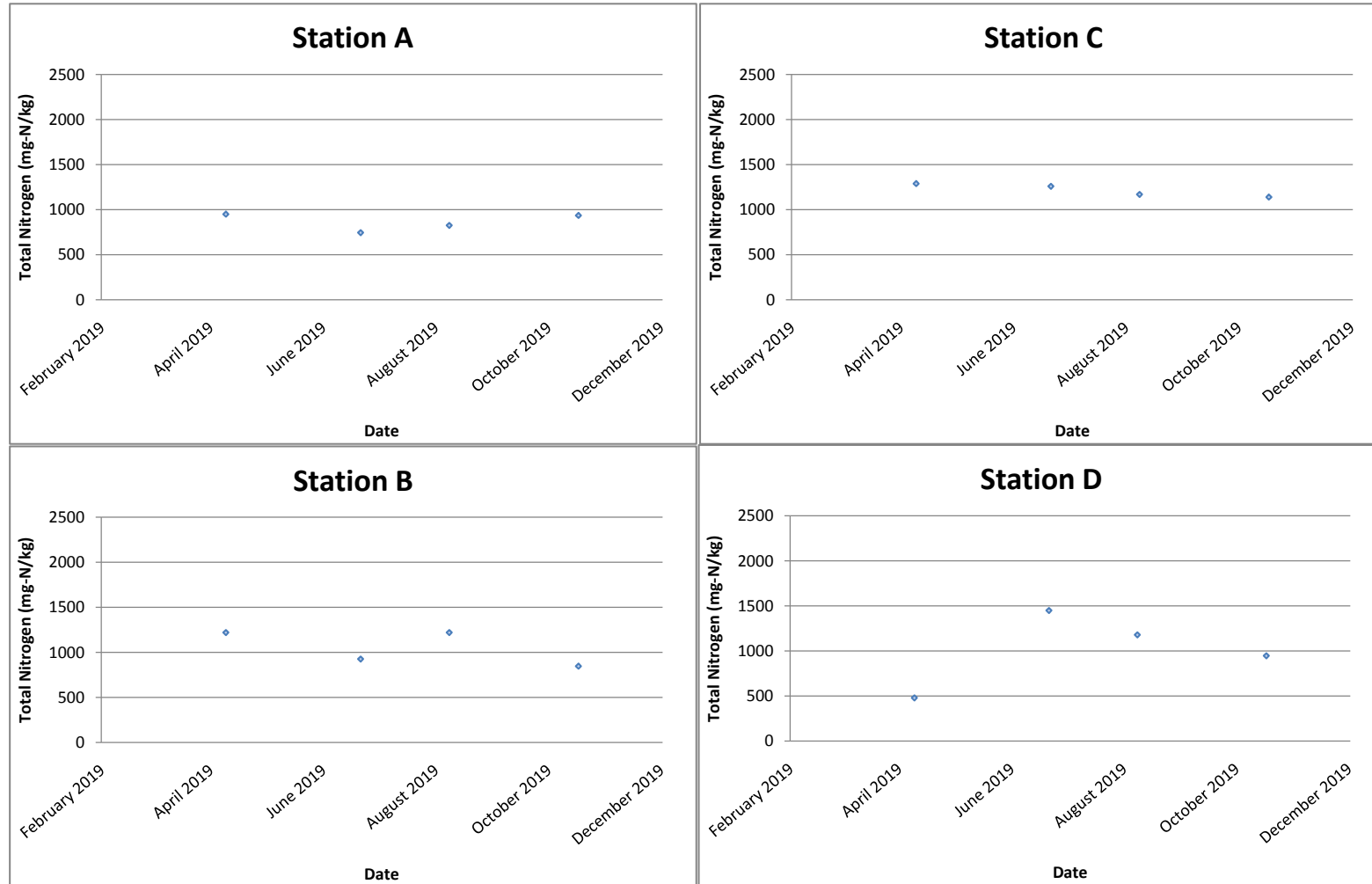
Ammonia Nitrogen (mg-N/kg)



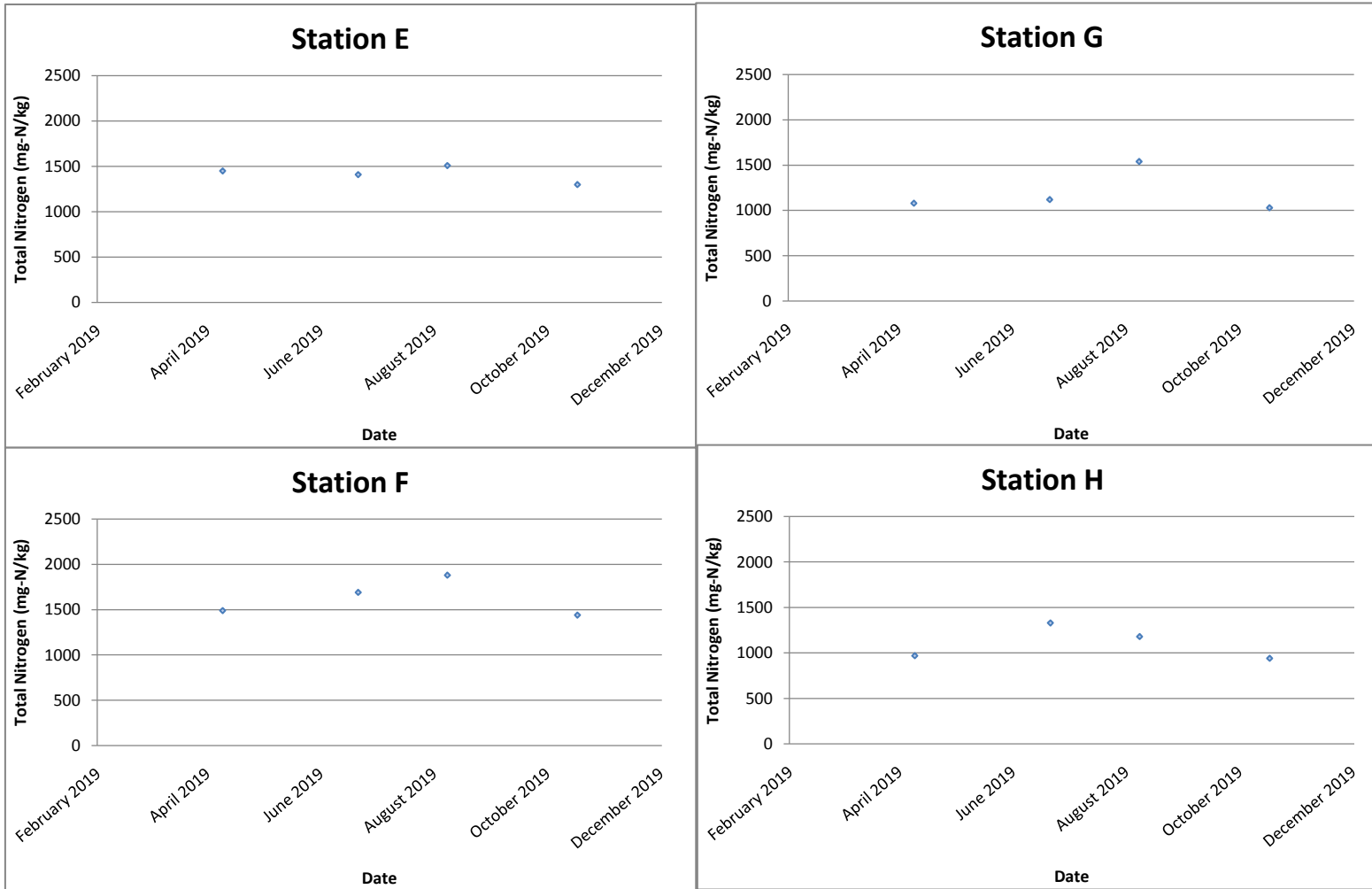
Ammonia Nitrogen (mg-N/kg)



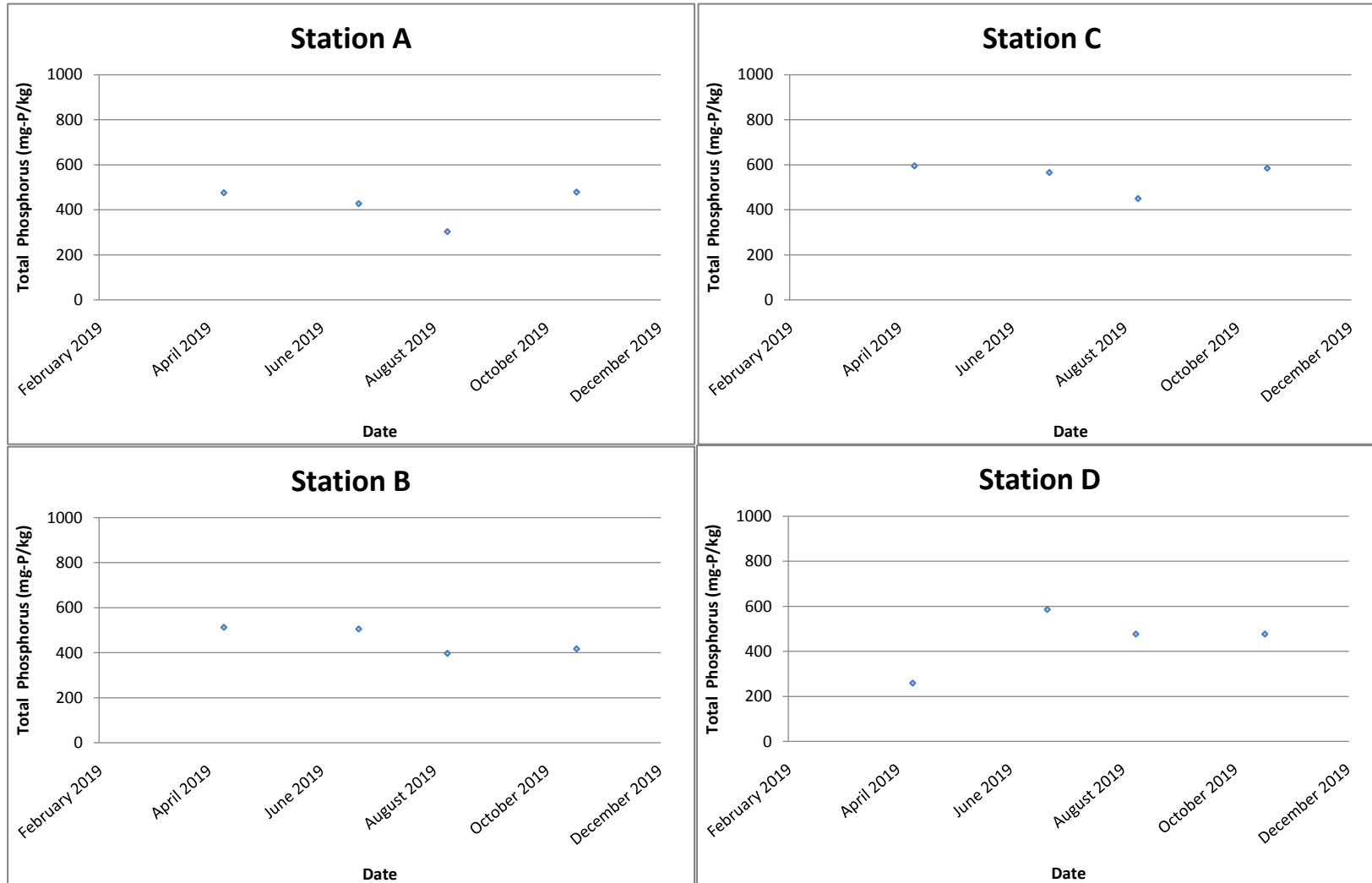
Total Nitrogen (mg-N/kg)



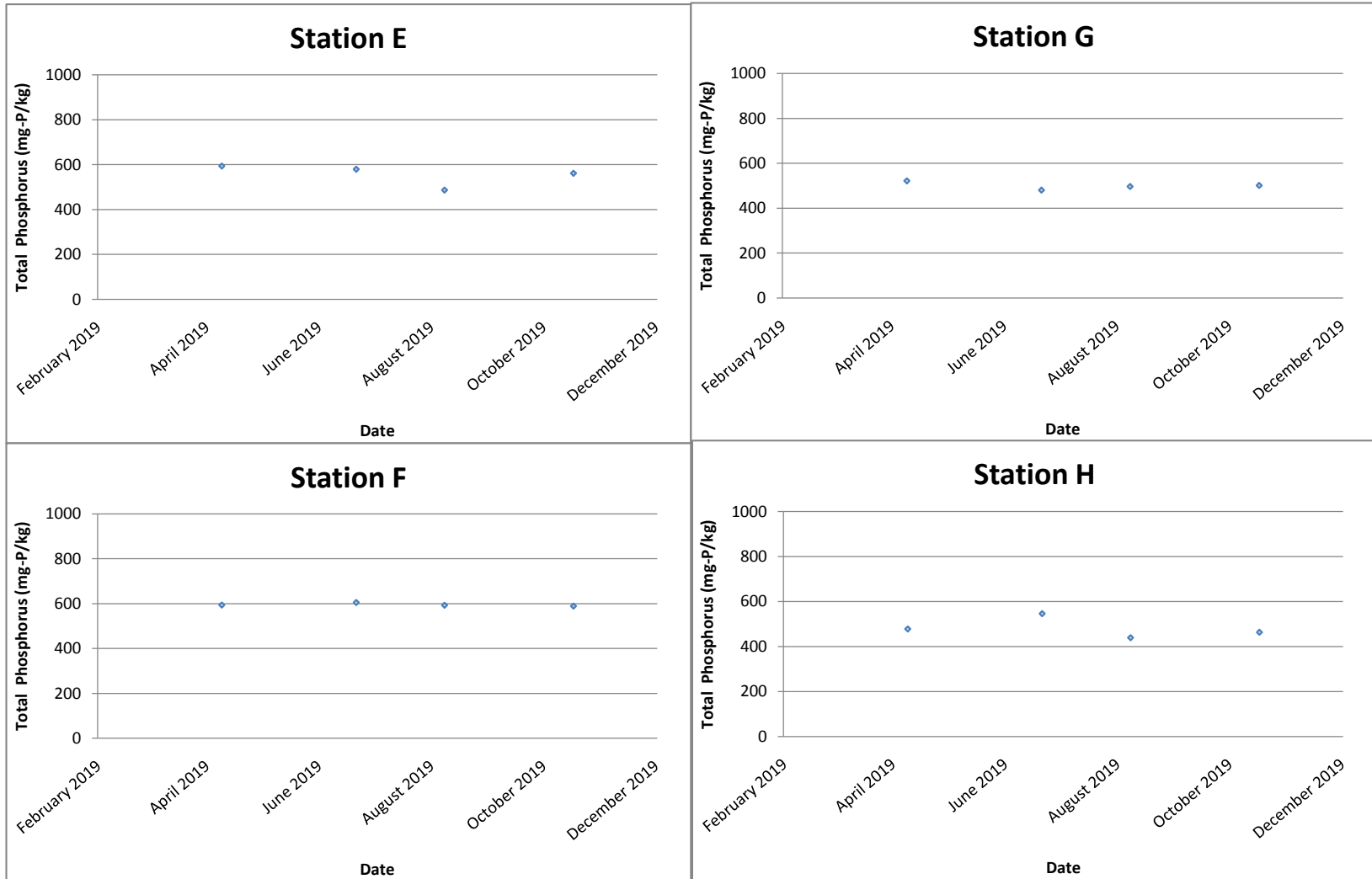
Total Nitrogen (mg-N/kg)



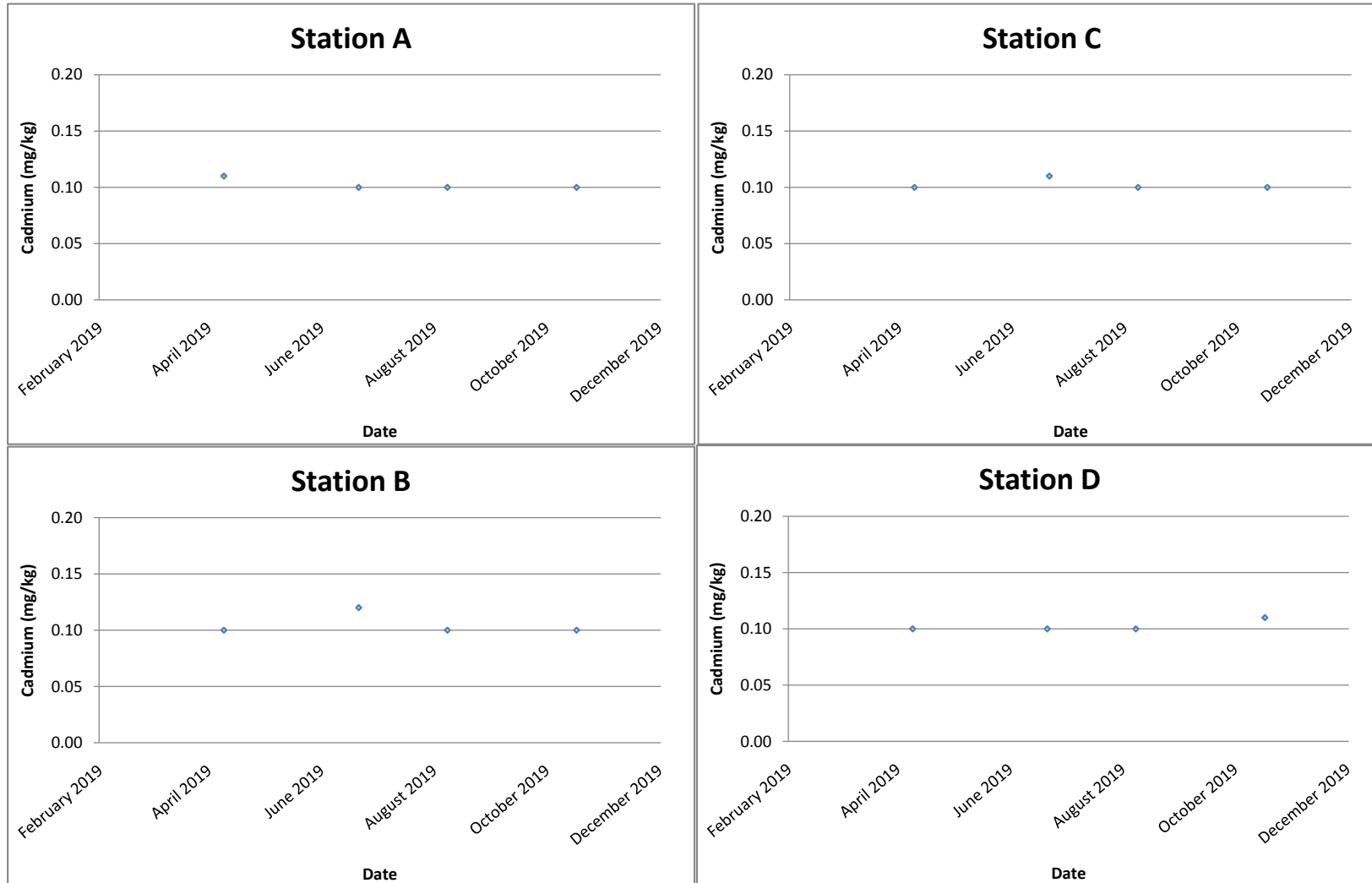
Total Phosphorus (mg-P/kg)



Total Phosphorus (mg-P/kg)



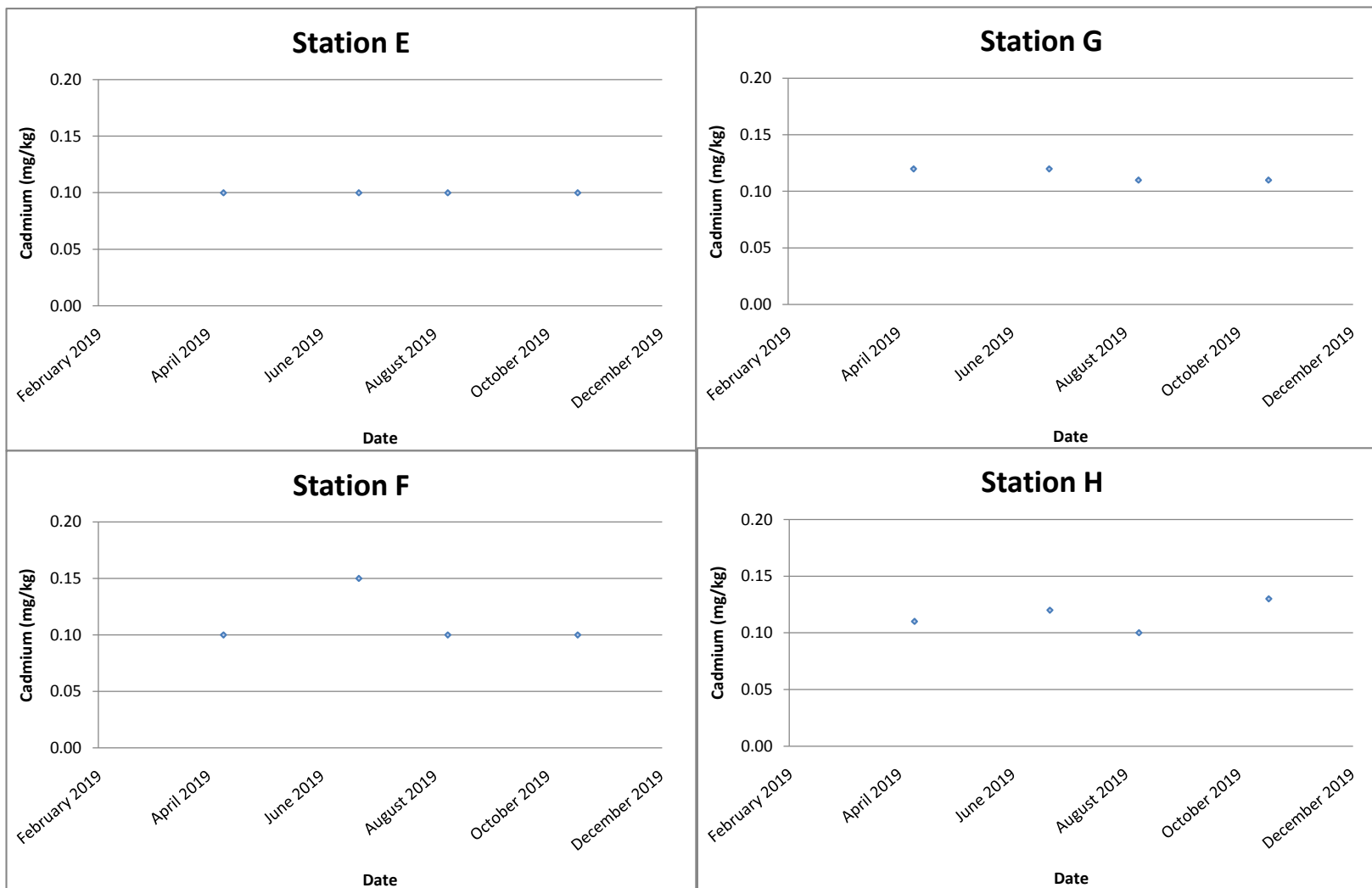
Cadmium (mg/kg)



Remark: All below the Limit of Report sample results (<0.1 mg/kg) for Cadmium is regarded as 0.1 mg/kg in graphical presentation.

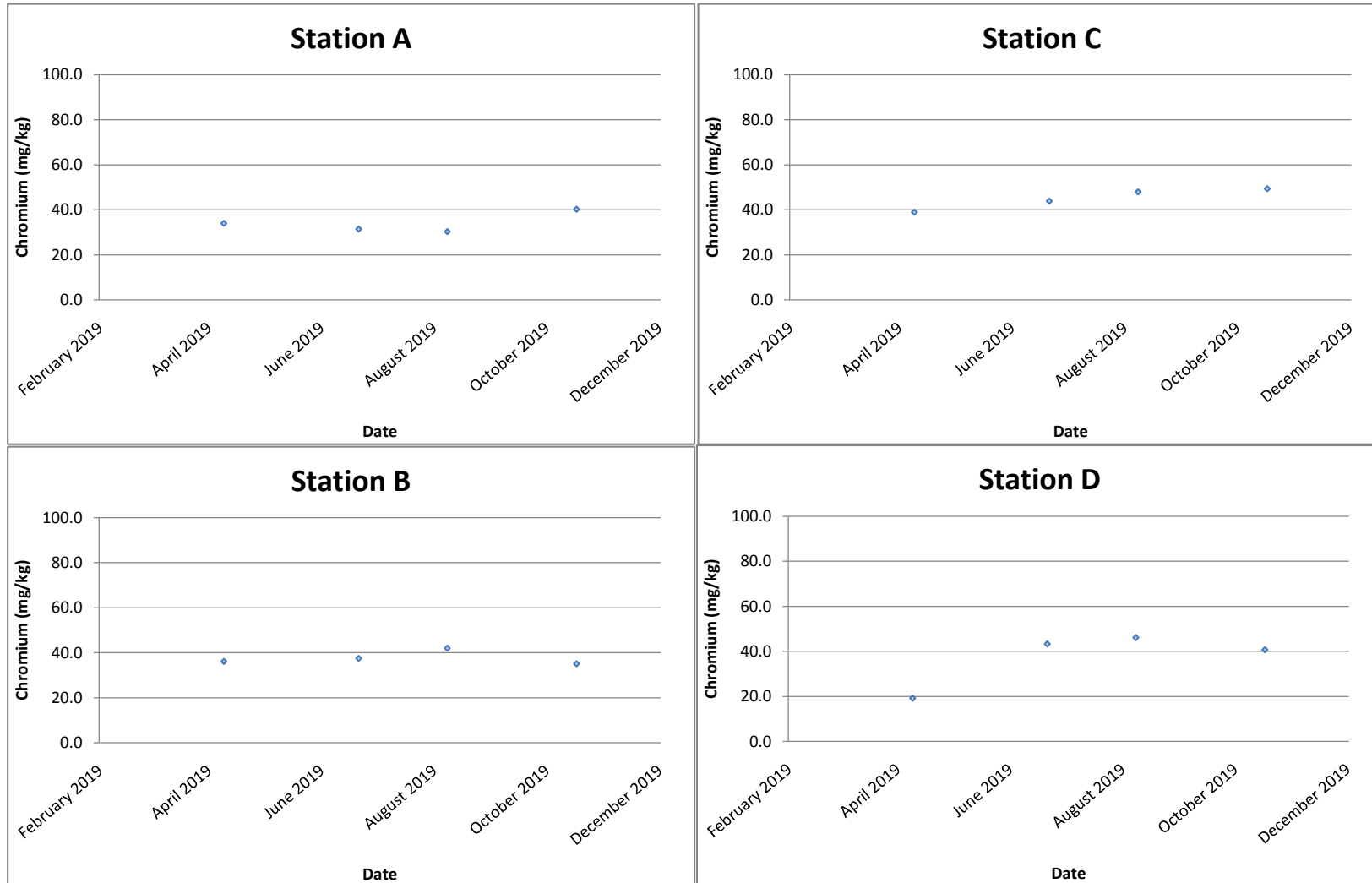


Cadmium (mg/kg)

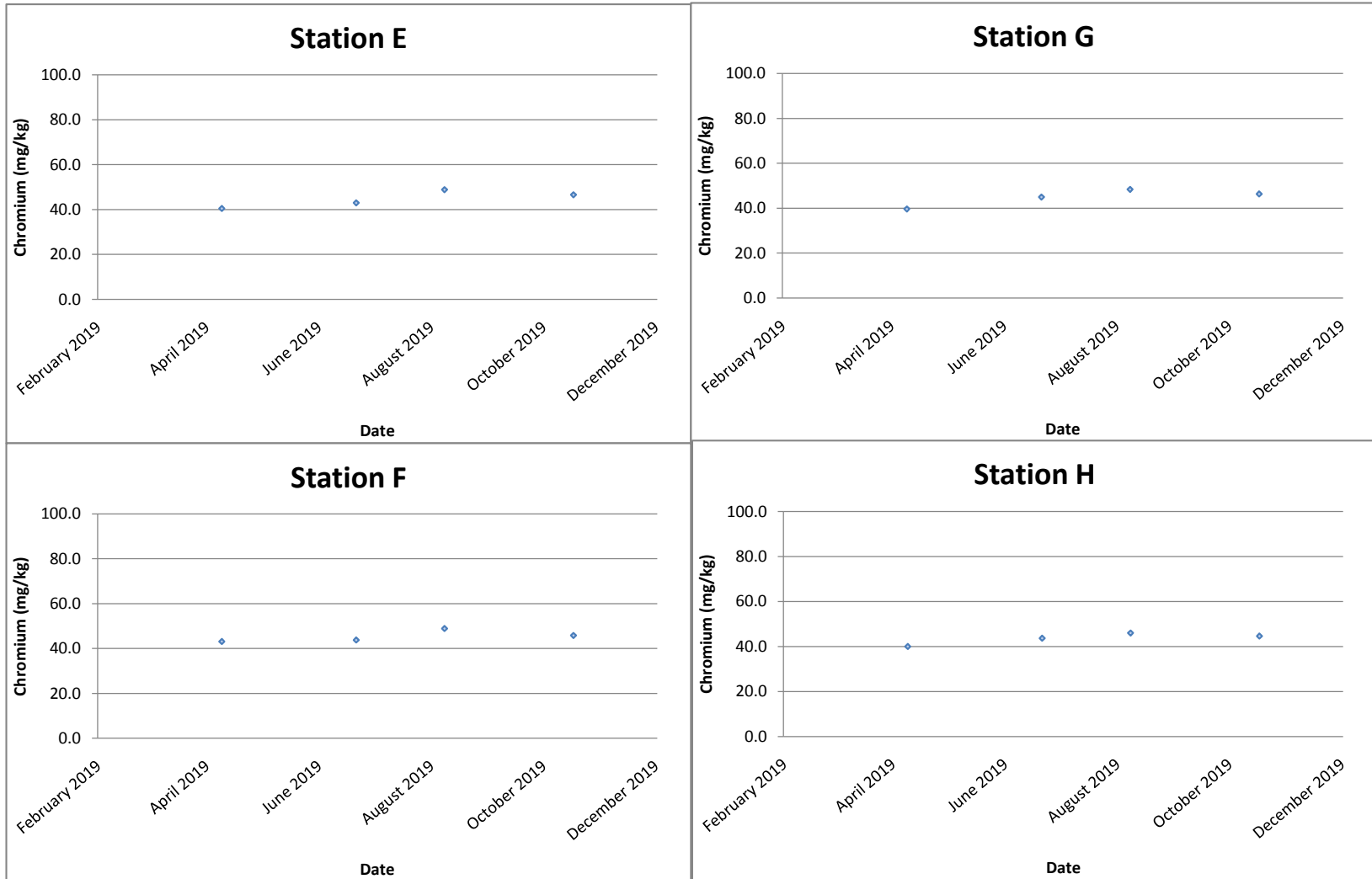


Remark: All below the Limit of Report sample results (<0.1 mg/kg) for Cadmium is regarded as 0.1 mg/kg in graphical presentation.

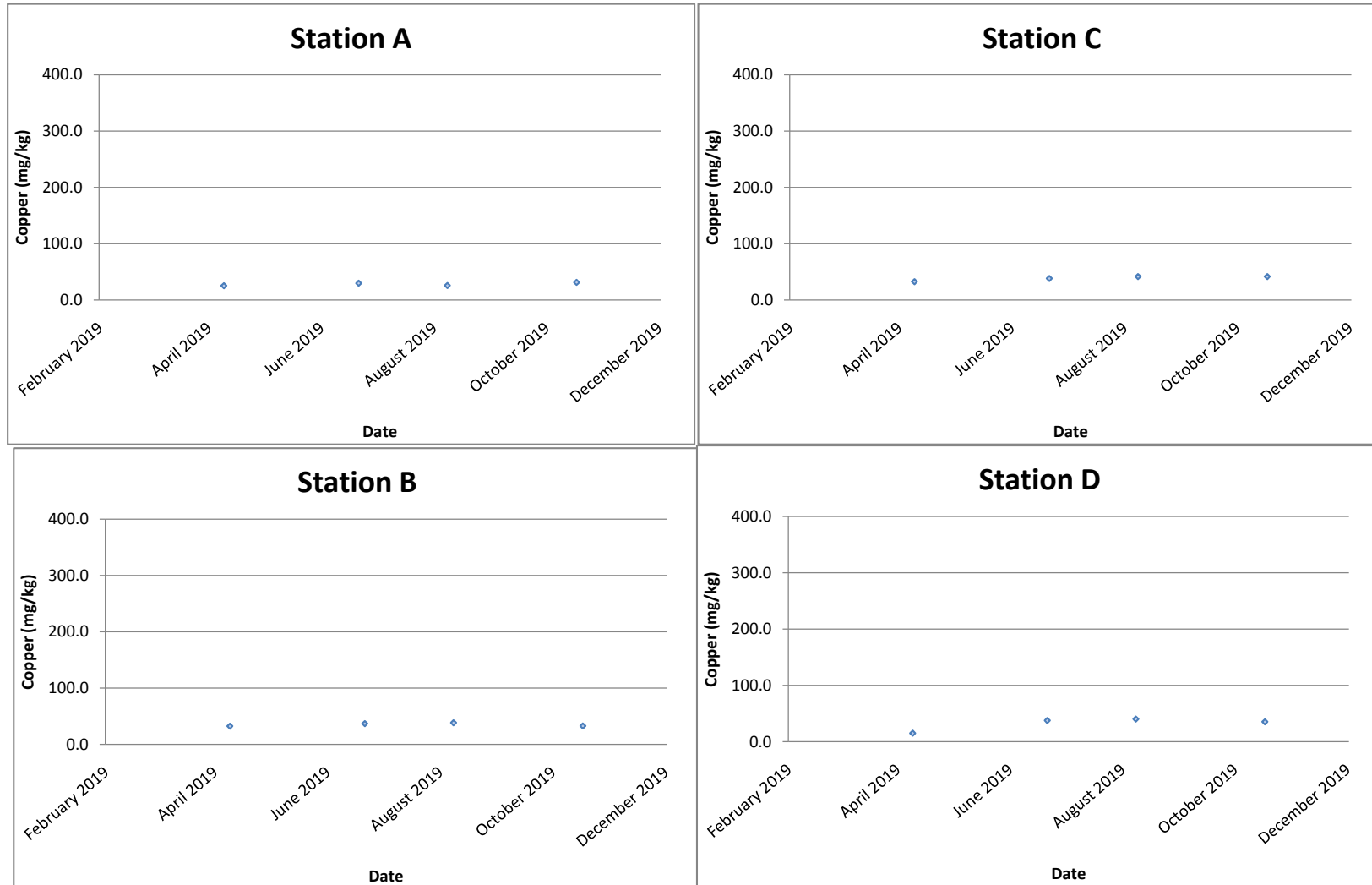
Chromium (mg/kg)



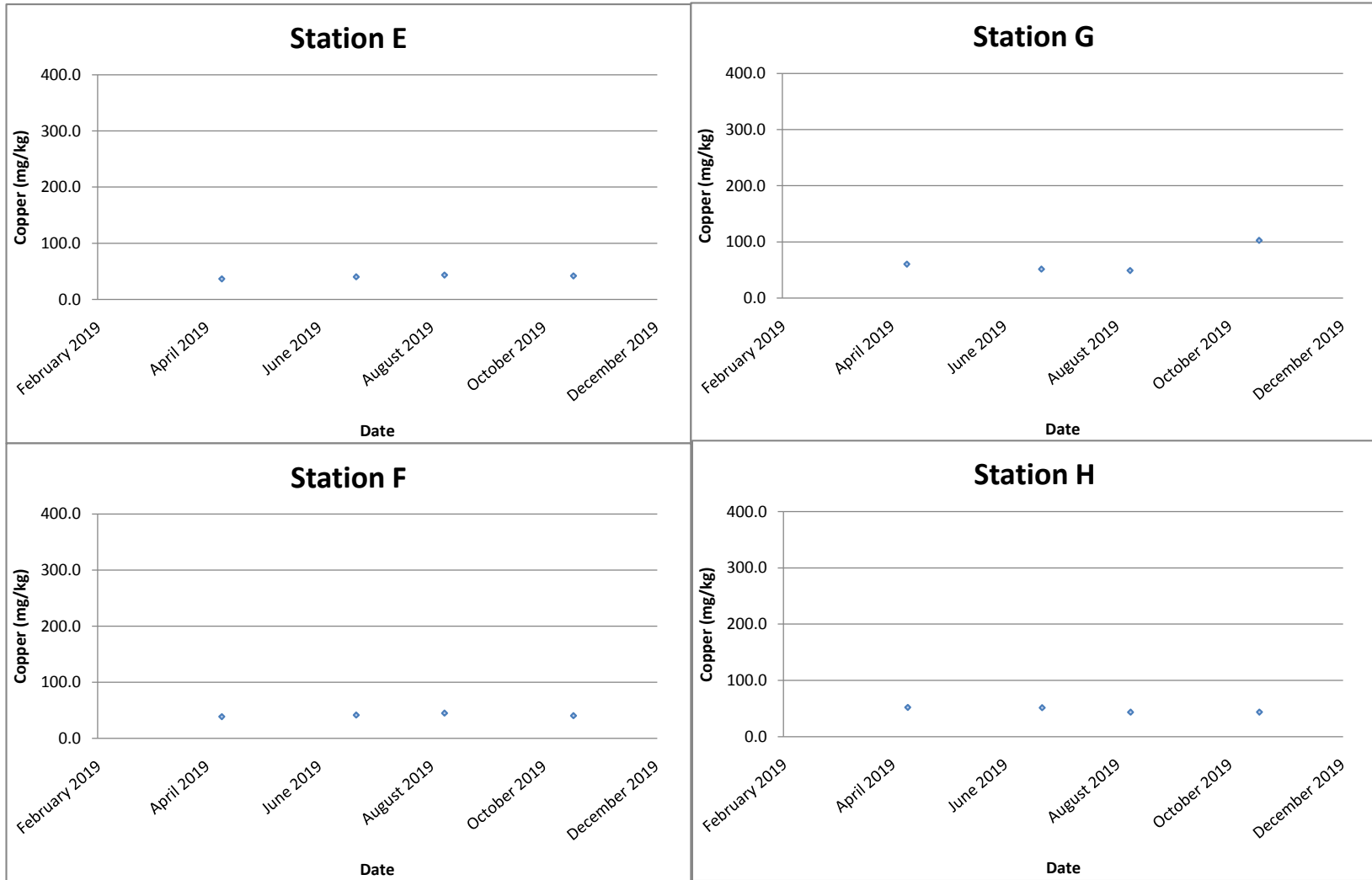
Chromium (mg/kg)



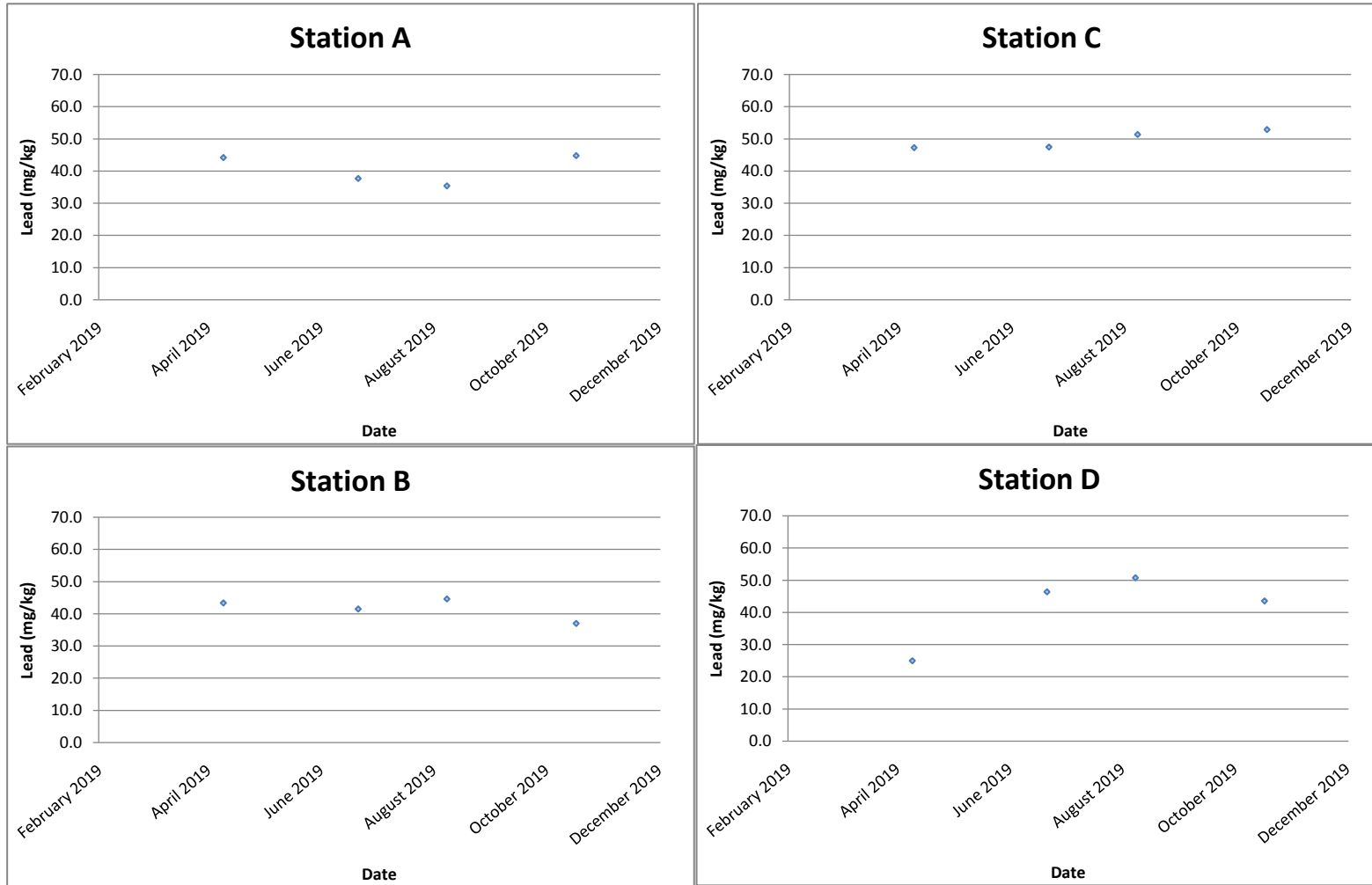
Copper (mg/kg)



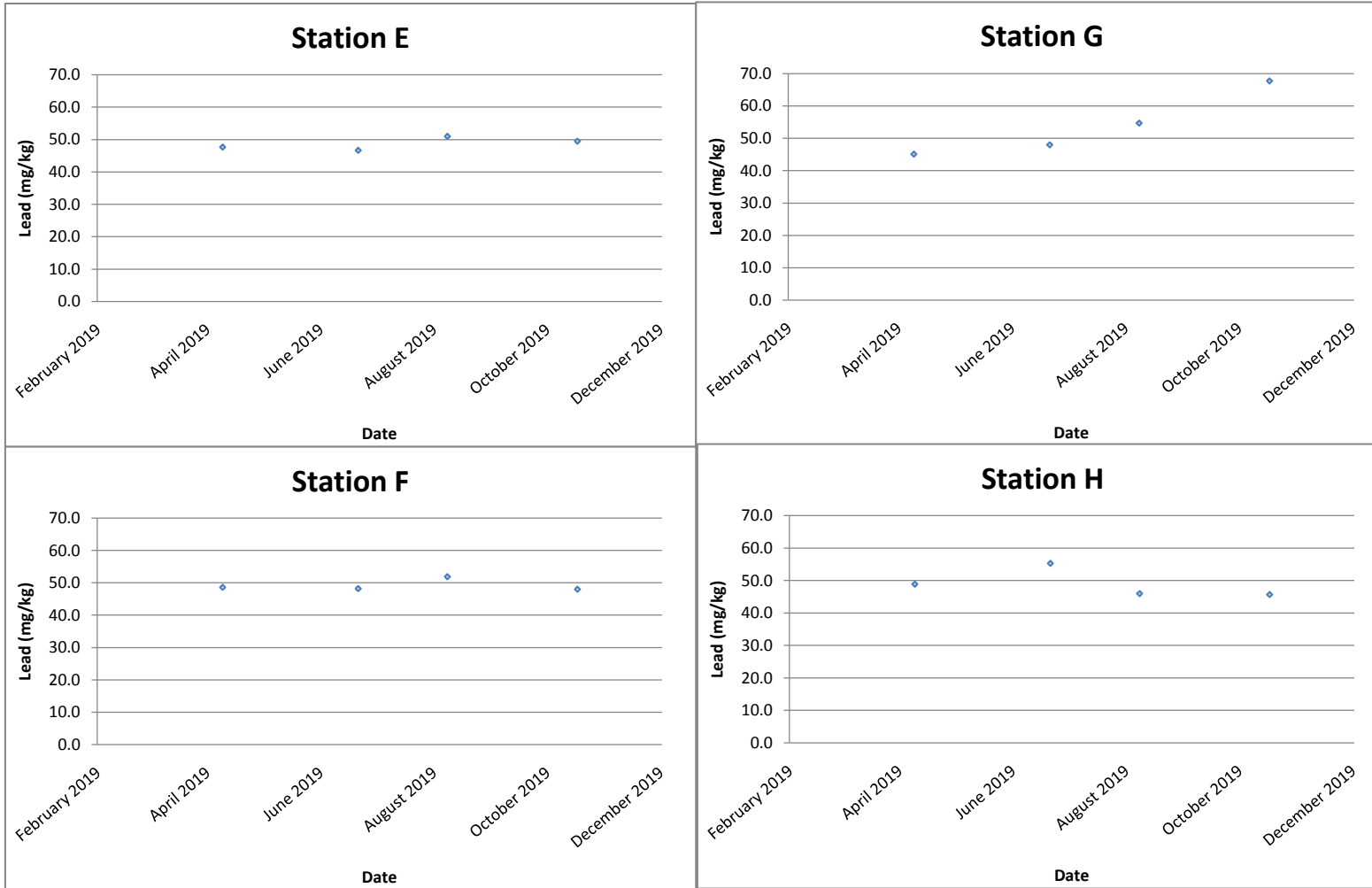
Copper (mg/kg)



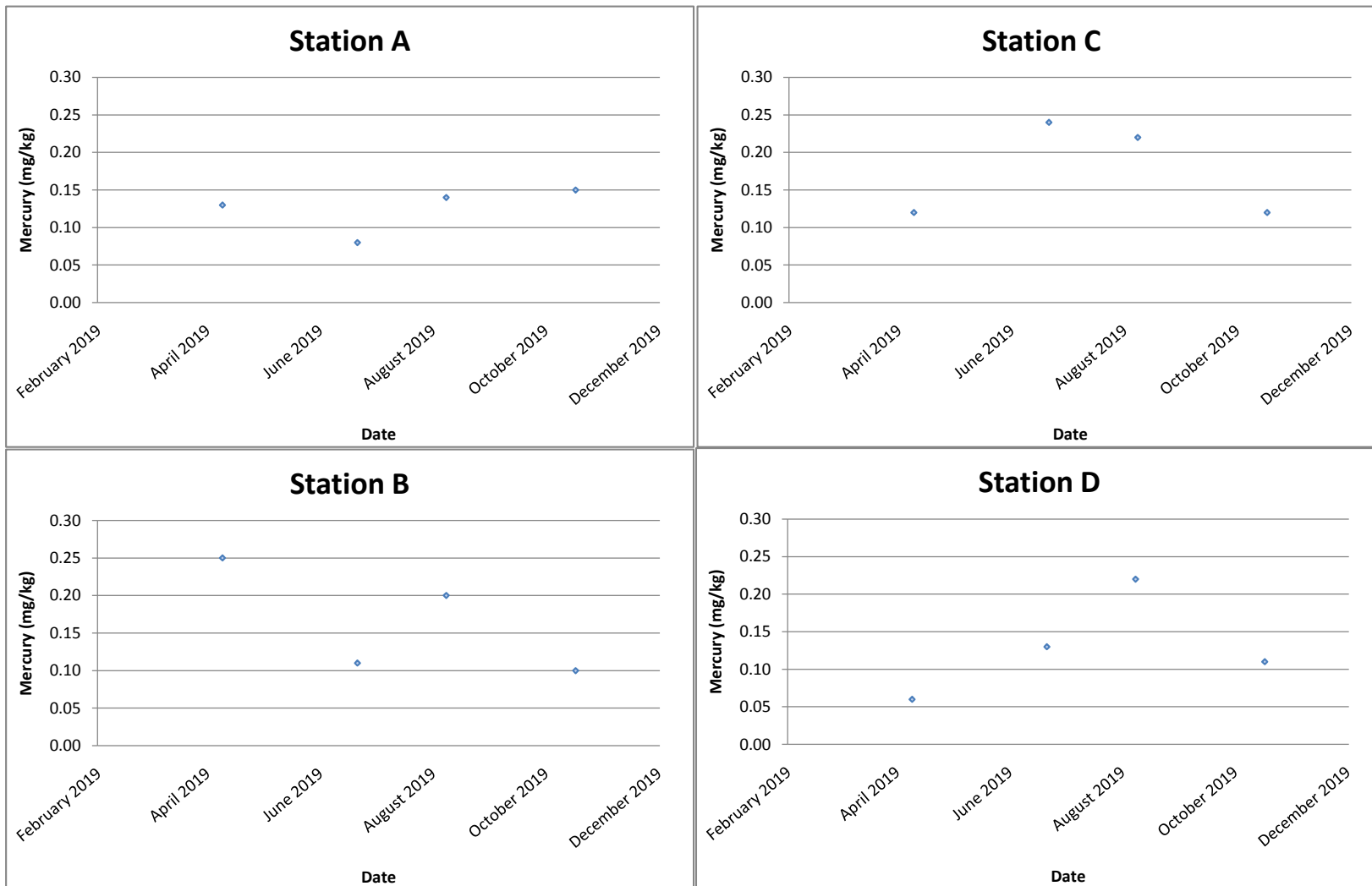
Lead (mg/kg)



Lead (mg/kg)

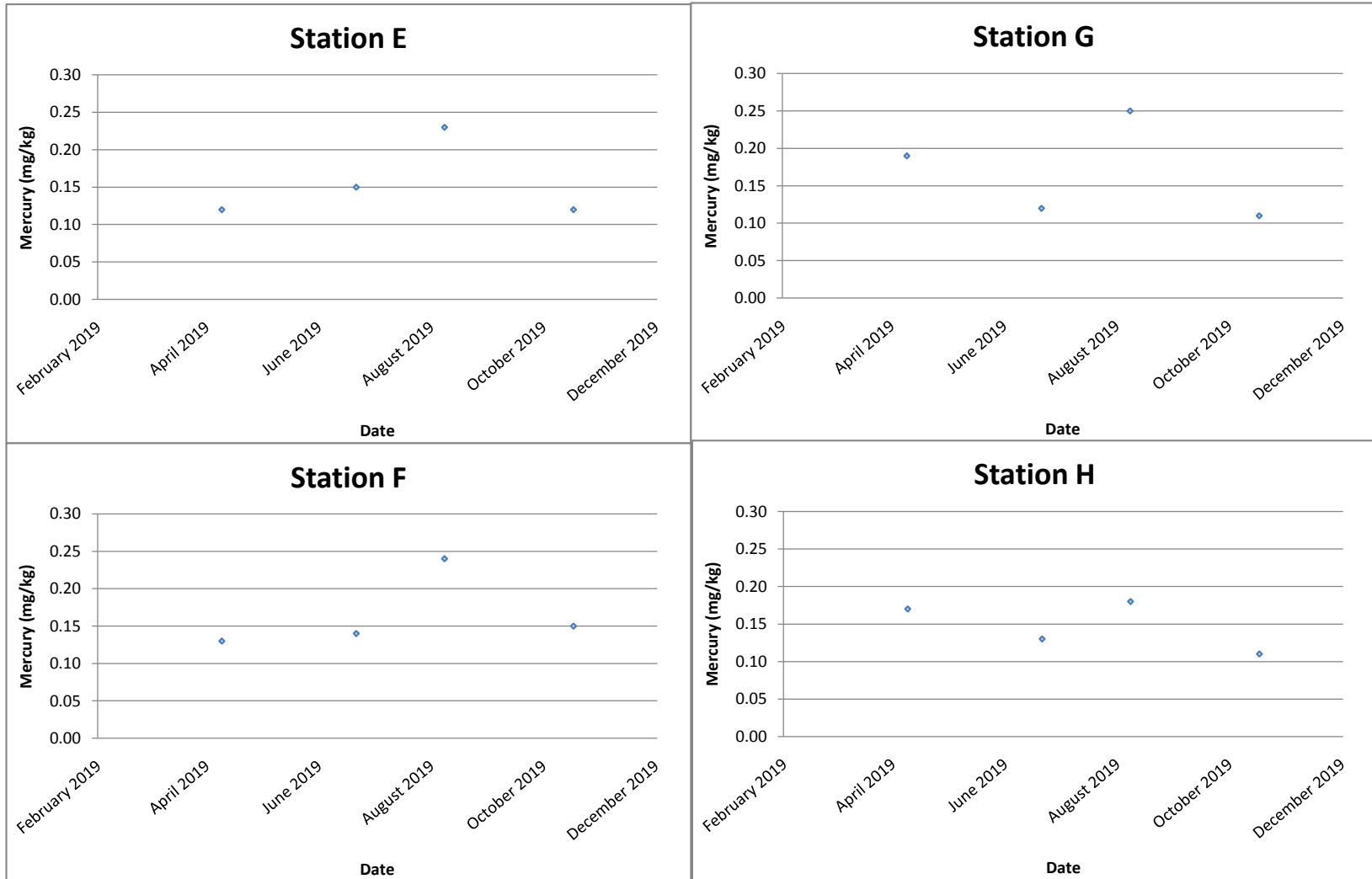


Mercury (mg/kg)

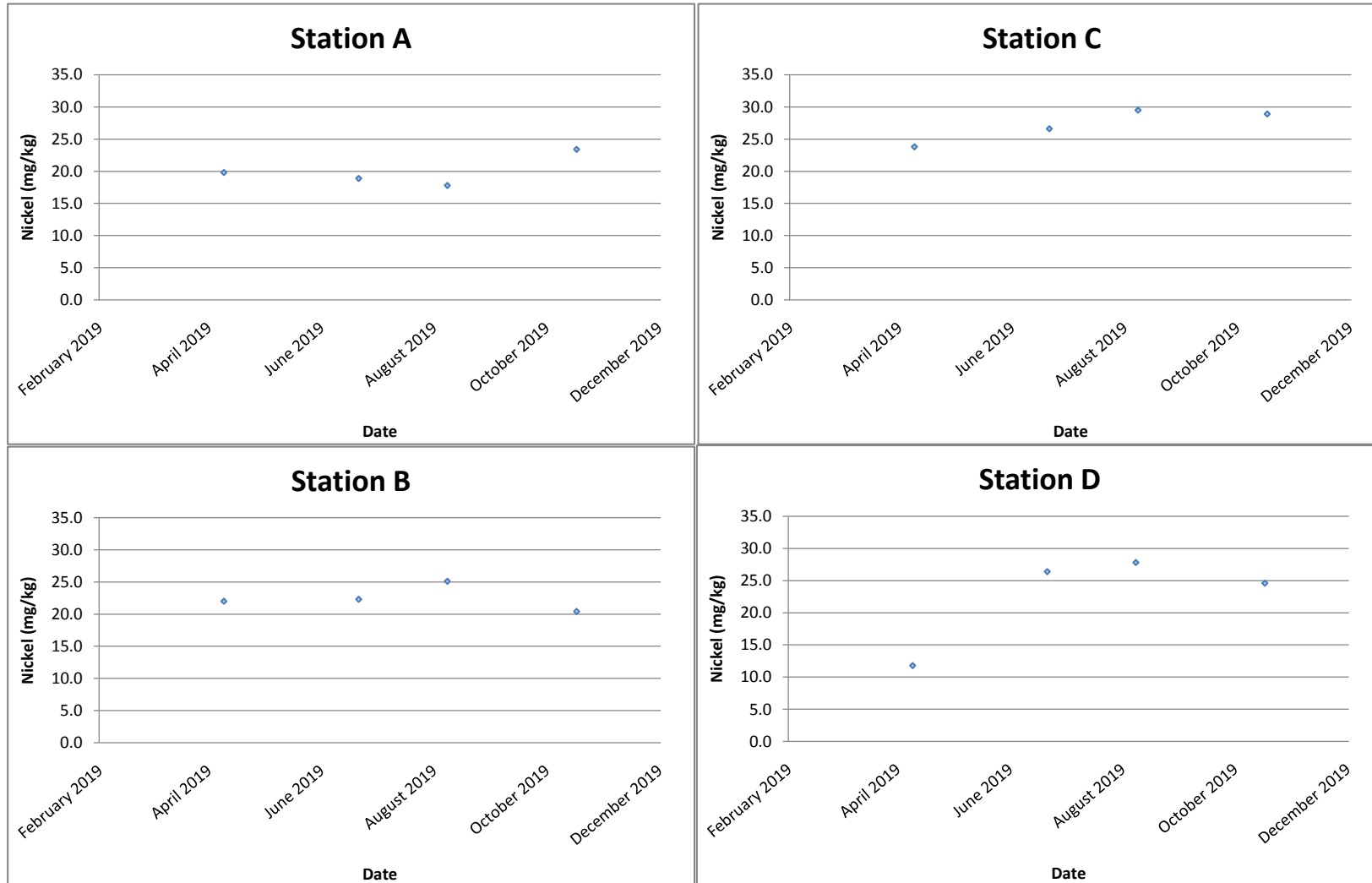




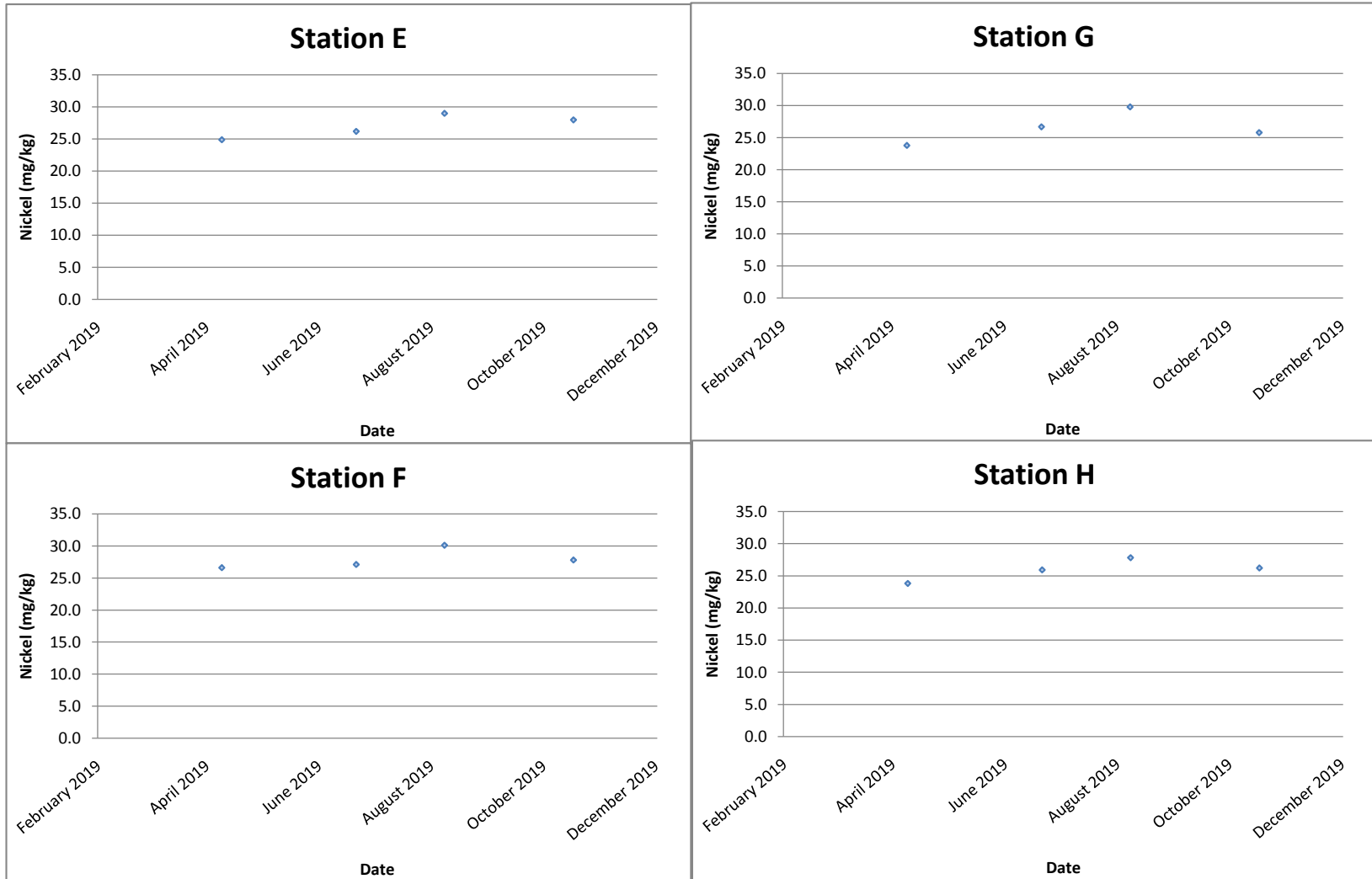
Mercury (mg/kg)



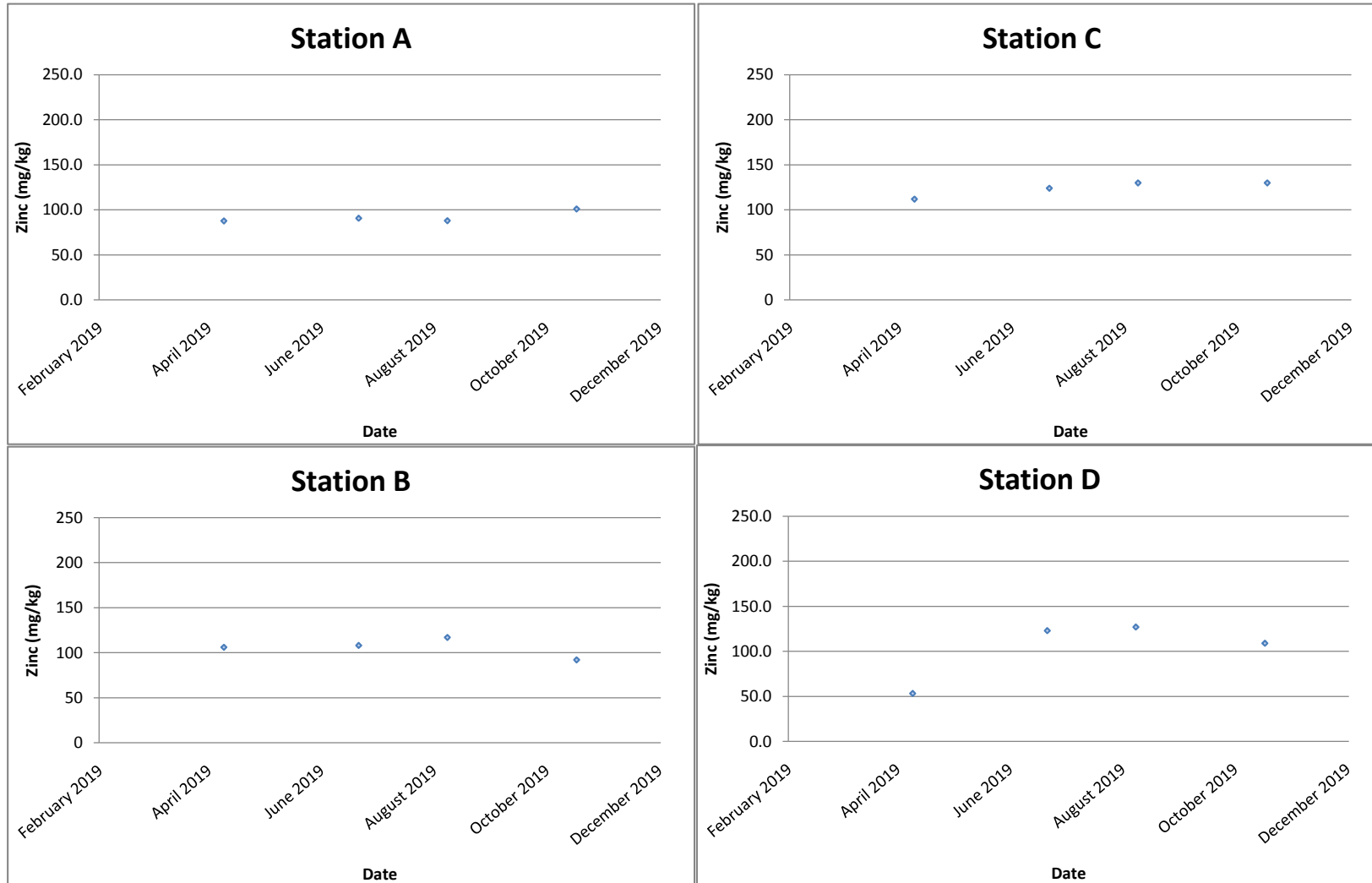
Nickel (mg/kg)



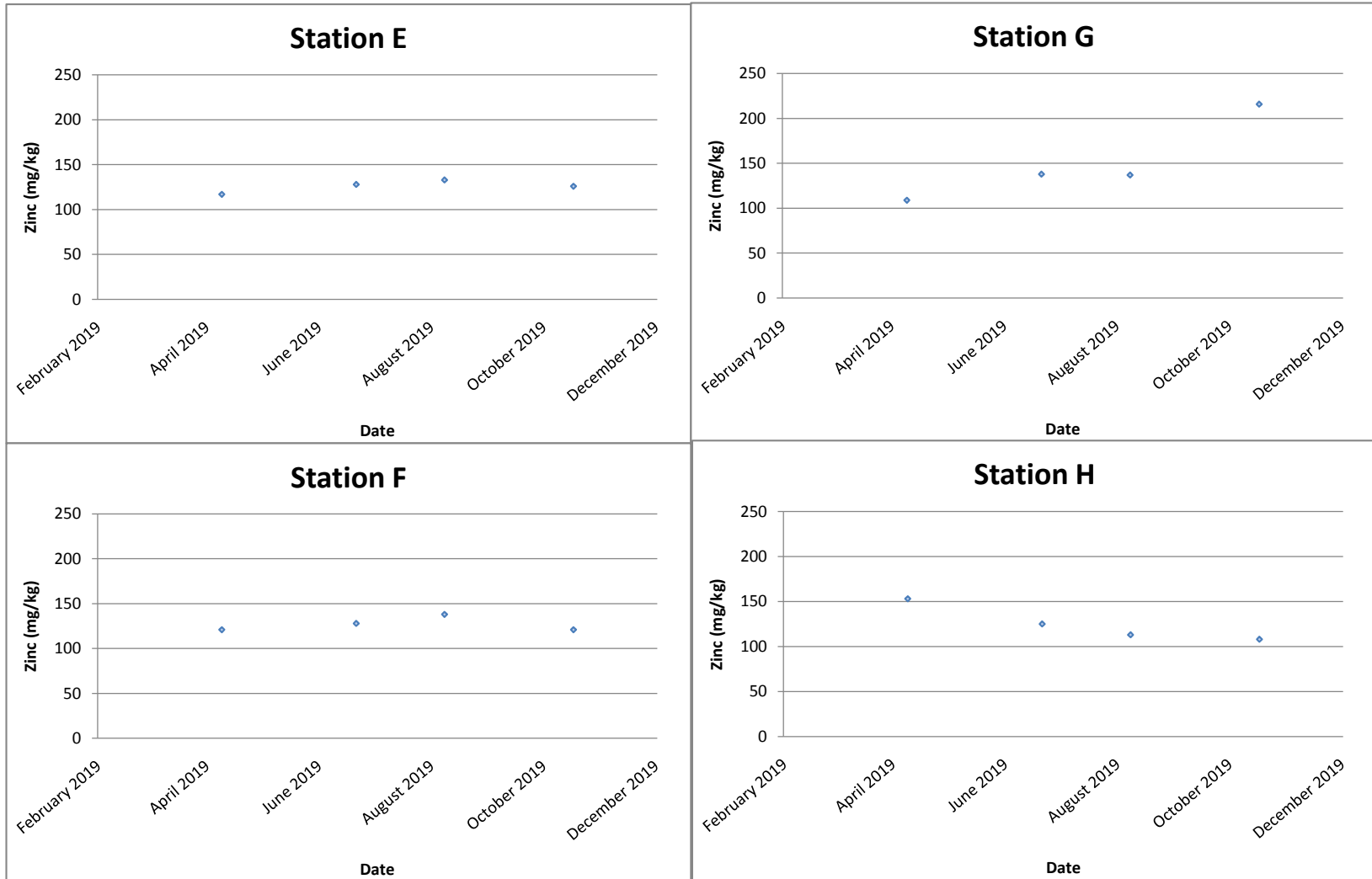
Nickel (mg/kg)



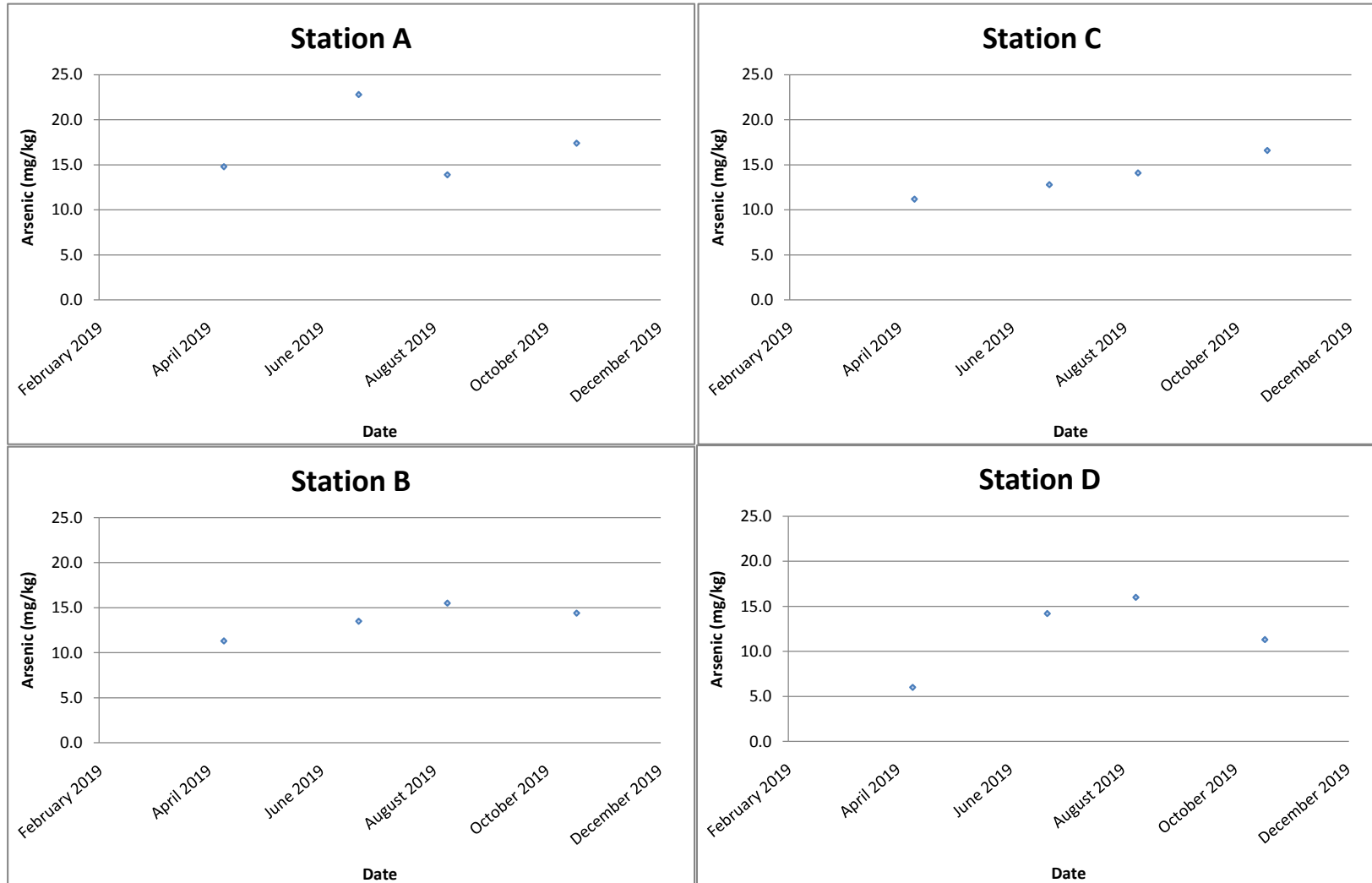
Zinc (mg/kg)



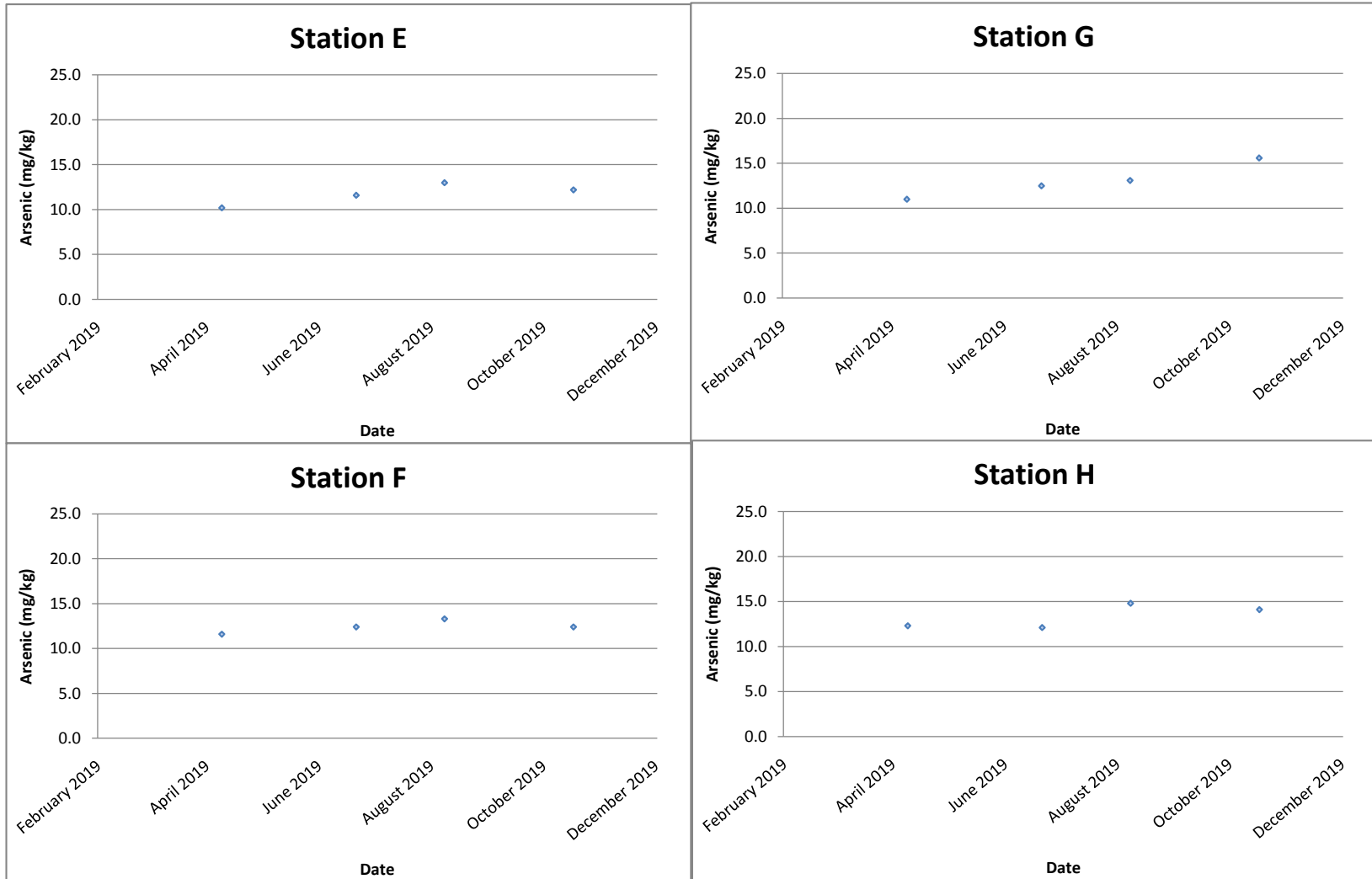
Zinc (mg/kg)



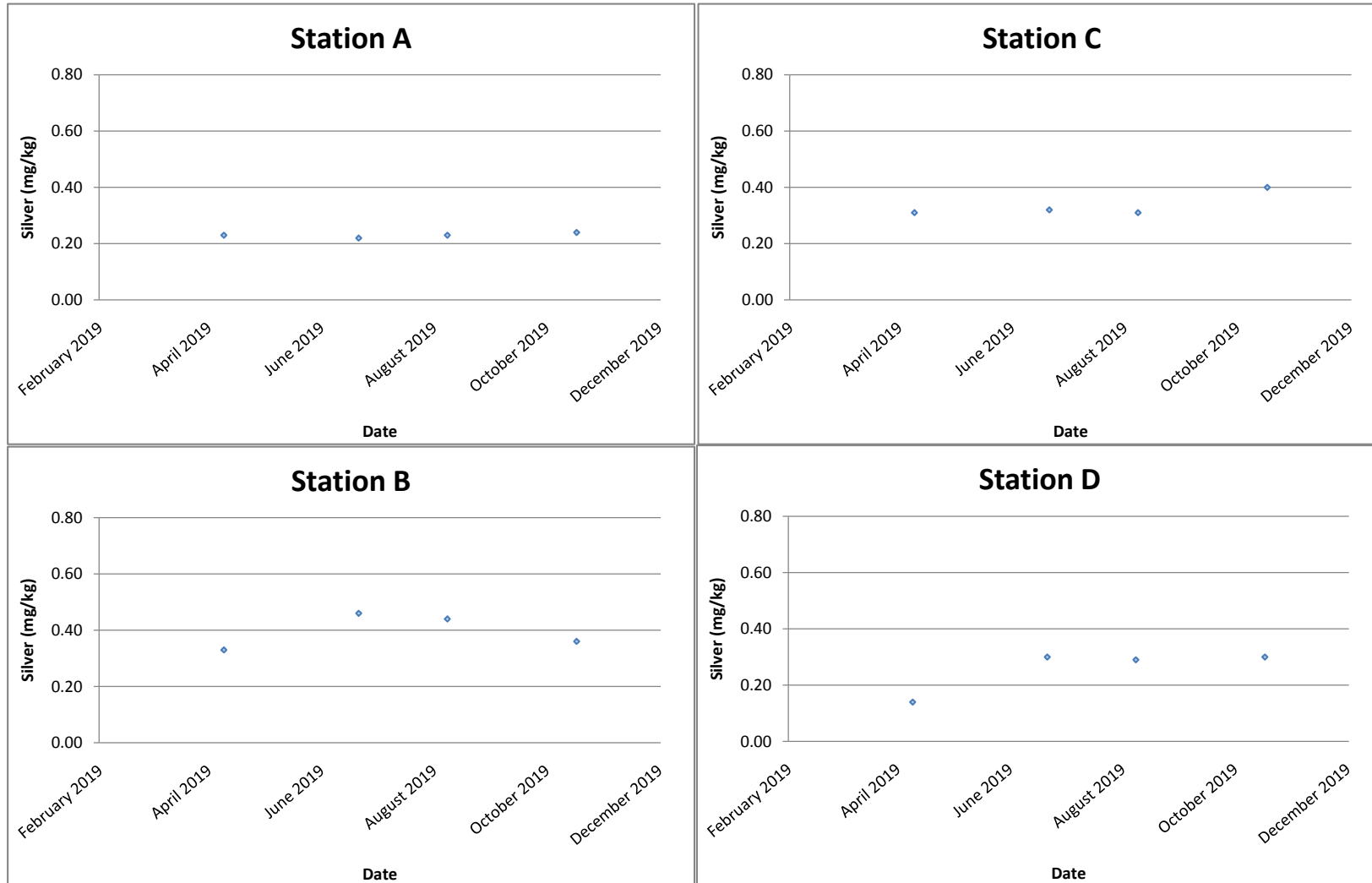
Arsenic (mg/kg)



Arsenic (mg/kg)

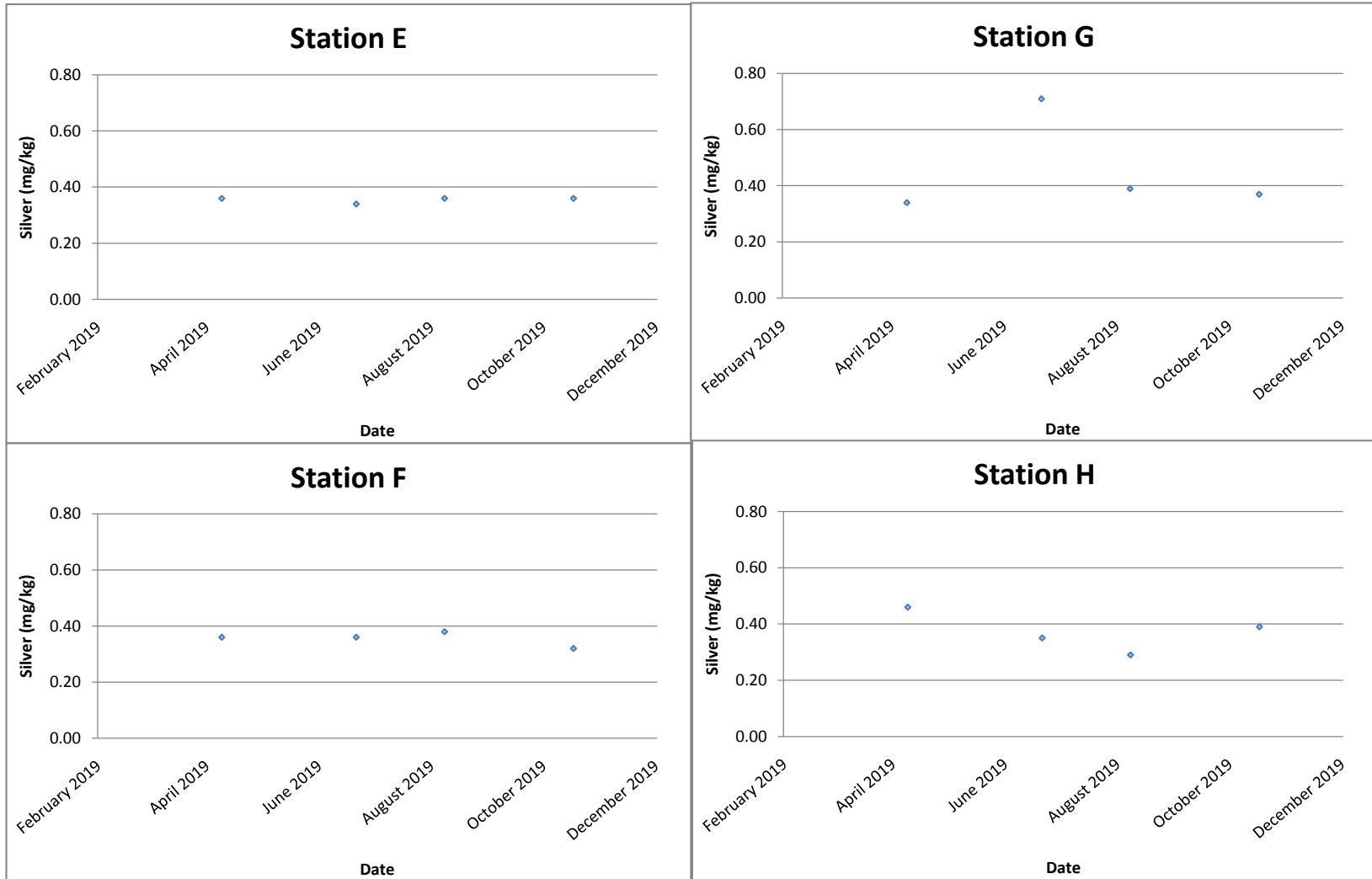


Silver (mg/kg)





Silver (mg/kg)



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Report No.: 0041/17/ED/0501B

## Appendix H Benthic Survey Report



## Benthic Faunal Monitoring

### Conducted in October 2019

#### Summary Report

##### Abundance

A total of 319 macrobenthic organisms were recorded from the eight monitoring stations during the October 2019 monitoring period. Compared to both dry (March 2004) and wet (August 2004) seasons baseline data, the current total abundance remained to be relatively lower. This trend has been observed since the commencement of the monitoring activities in April 2018. The abundance distribution across monitoring periods is shown in Figure 1. As previously reported, generally, decreasing abundances were observed during wet season monitoring periods while increasing abundances during dry monitoring periods. These variations might be attributed to the natural response of macrobenthic communities to seasonal changes. However, similar to previous monitoring periods, these observed seasonal variation are not statistically significant (F-value = 1.32, F-crit = 1.90, P-value = 0.22).

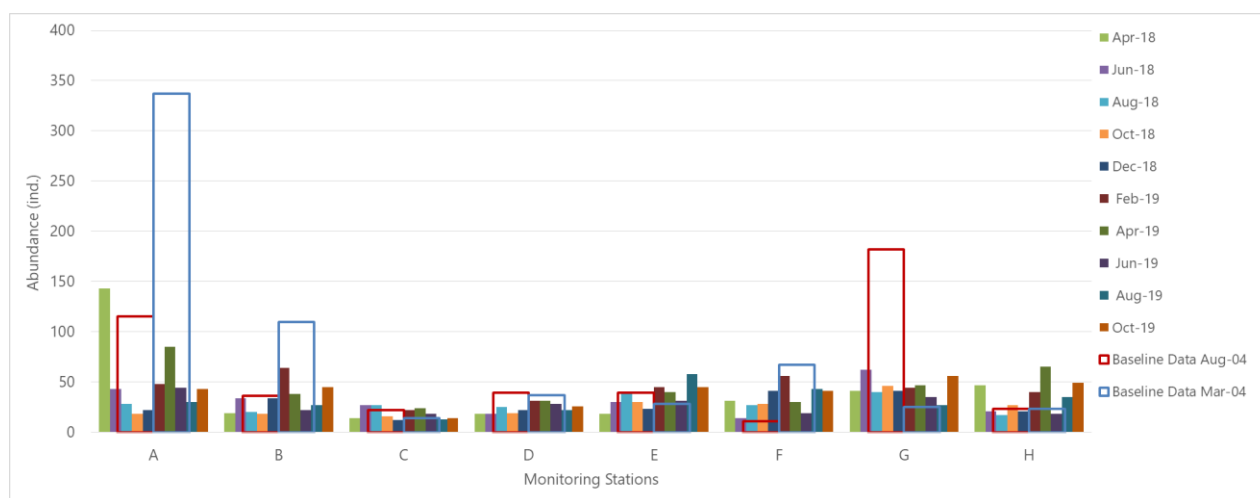


Figure 1. Total abundance (ind.) of benthic

Similar to the previous monitoring periods, statistically significant (F-value = 3.10, F-crit = 2.11, P-value = 0.006) in total abundances across monitoring stations was observed. The lowest abundances were recorded in the impact stations, Station C and Station D, with 14 ind. and 26 ind., respectively. The highest abundance (56 ind.) was recorded in Station G. Abundance distribution showed that the impact stations have relatively lower abundances compared to the reference stations, a similar trend observed in the baseline data. Sediments in these stations remained to be well-sorted composed silt/clay substrate. During the present monitoring period, stations with

moderately sorted sediments have generally higher abundances compared to stations with well-sorted sediments. The abundance-sediment size correlation was more apparent compared to the previous two monitoring periods.

## Biomass

The total wet biomass recorded in the eight monitoring stations was 72.67 g, which is lower compared to the previous monitoring period (129.87 g). The current biomass is higher compared to the wet season but lower compared to the dry season baseline data. The highest total biomass was recorded in Station E (20.33 g) while the lowest was in the impact station Station C (0.072g), same observation with the previous monitoring period. The higher biomass observed in Station E was contributed by the relatively larger molluscan species, *Paphia undulata*. The total biomass distribution across monitoring periods and stations is shown in Figure 2.

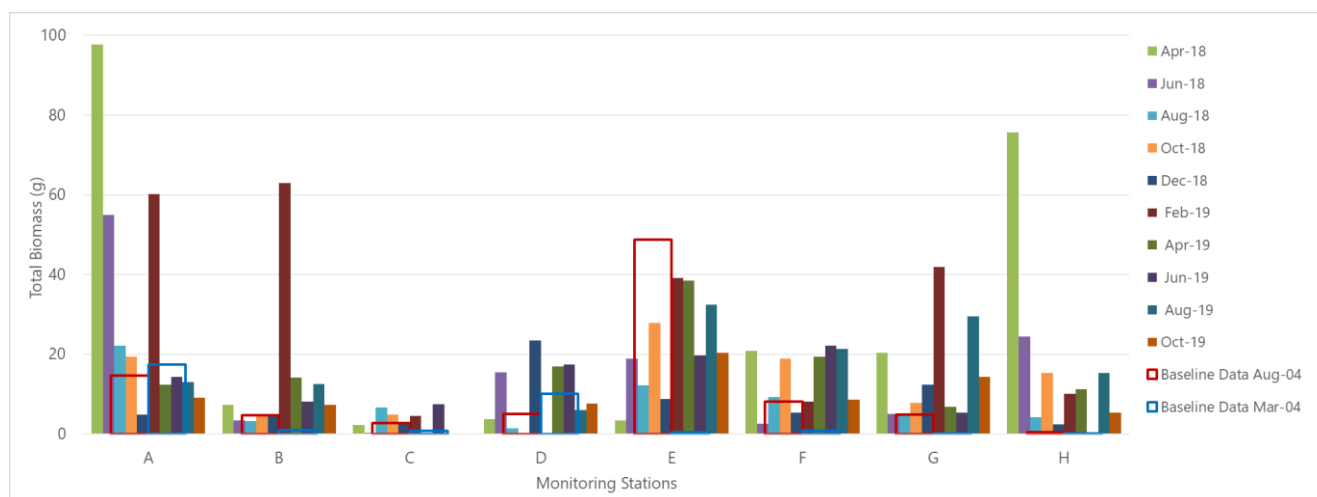


Figure 2. Total biomass (g) of benthic organisms

## 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 seven phyla comprising of 33 families and 49 taxa were identified. The benthic fauna composition is dominated by annelids (66.14%), arthropods (19.75%), and molluscs (8.15%)(Figure 3). Same as the baseline study, the most dominant group for the October 2019 monitoring period was the polychaetes Capitellidae. The most dominant species (abundance  $\geq 10$ ) was the polychaete, *Capitella* sp., with the abundance of 11 ind. in Station G. Capitellids are typical of unbalanced and organically enriched habitats (Pearson and Rosenberg 1978; Borja et al. 2000).

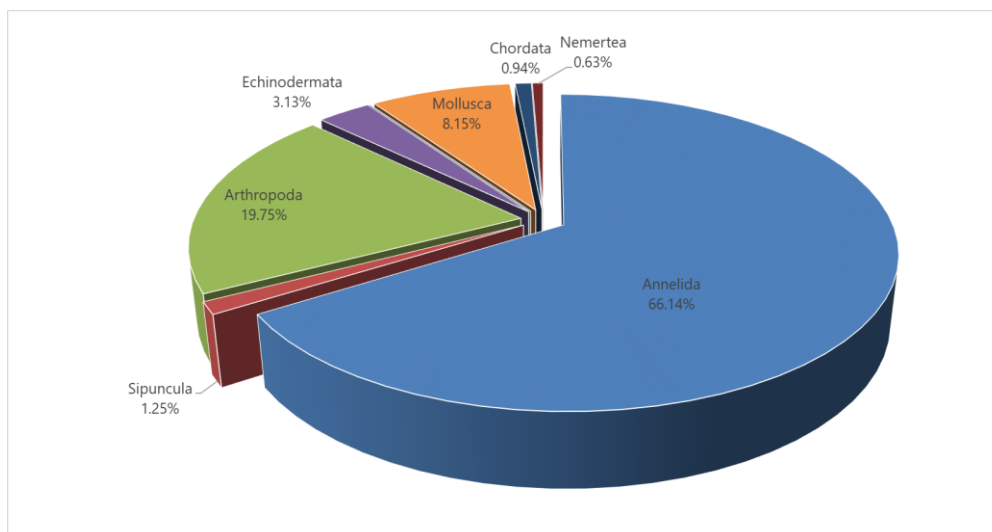


Figure 3. Percent composition of benthic organisms

Highest number of genera was recorded in Station E (24) and Station G (24) and the lowest in was in the impact station Station C (9). Similar to abundance and biomass, relatively lower number of taxa was observed at impact stations compared to the reference stations.

Abundance and biomass of macrobenthic organisms are shown in Tables 1 and 2 and data summary for different monitoring periods are presented in Tables 3 to 7 of Appendix A. Representative photos of specimen are shown in Appendix B.

### Diversity

Diversity index ( $H'$ ) and Evenness index ( $J$ ) ranged from 2.11 – 2.26 and 0.88 – 0.96 in impact stations, and 2.76 – 2.97 and 0.88 – 0.96 among the reference stations as shown in Appendix A, which suggest that benthic faunal diversity is relatively higher at reference stations than those at impact stations. However, overall diversity in the eight monitoring stations was within the range of typical values recorded in the previous monitoring periods. Compared with the baseline survey result, the diversity index and evenness index increased.

### 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.



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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, 2290311.

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: October 30, 2019

## Data Summaries

**Table 1. Abundance of macrobenthic communities in the eight monitoring stations, October 2019**

Phylum	Class	Order	Family	Genus	SHW-Benthic Stations							
					A	B	C	D	E	F	G	H
Annelida	Polychaeta	Aciculata	Glyceridae	<i>Glycera</i>	3	0	0	1	1	0	2	1
Annelida	Polychaeta	Aciculata	Aphroditidae	<i>c.f. Laetmonice</i>	0	0	1	0	0	0	0	0
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella(C.capitata)</i>	3	2	2	1	2	5	1	5
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella</i>	3	2	2	1	5	0	11	2
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Mediomastus</i>	2	1	1	0	6	0	2	3
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Notomastus</i>	1	0	2	0	0	0	1	2
Annelida	Polychaeta	Errantia	Phyllodocidae	<i>Polydora</i>	0	0	0	1	0	0	0	0
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice</i>	0	0	0	3	1	0	0	1
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Marphysa</i>	0	0	0	0	0	0	5	0
Annelida	Polychaeta	-	Cossuridae	<i>Cossurella(C. aciculata)</i>	0	0	0	0	0	1	1	0
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Neanthes</i>	1	0	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis1</i>	2	1	0	0	1	2	1	4
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis2</i>	0	0	0	0	0	1	0	0
Annelida	Polychaeta	Phyllodocida	Polynoidae	<i>Gattyana</i>	1	0	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocimorpha	Goniadidae	<i>Glycinde</i>	0	0	0	0	1	0	0	1
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus (A. dibranchis)</i>	2	7	3	0	0	0	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i>	0	0	0	0	0	1	1	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys1</i>	0	0	0	0	1	2	1	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys2</i>	3	4	0	8	1	3	0	4
Annelida	Polychaeta	Scolecida	Opheliidae	<i>Ophelia</i>	2	1	0	0	1	0	1	2
Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus</i>	2	0	0	1	3	0	8	1
Annelida	Polychaeta	Spionida	Spionidae	<i>Paraprionospio</i>	1	1	0	0	1	6	3	3
Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio</i>	0	5	0	0	1	2	1	1
Annelida	Polychaeta	Sternaspida	Sternaspidae	<i>Sternaspis(S. scutata)</i>	0	2	0	2	0	0	0	2



Phylum	Class	Order	Family	Genus	SHW-Benthic Stations							
					A	B	C	D	E	F	G	H
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Amatea</i>	1	0	0	0	0	0	0	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Loimia(L.loimia)</i>	2	0	0	0	0	0	1	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella</i>	0	0	0	0	0	0	1	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	<i>Lumbriculus sp.1</i>	0	0	0	1	1	1	0	3
Sipuncula	Sipunculiformes	Sipunculidea	Sipunculidae	<i>Sipunculus</i>	0	1	0	0	0	0	1	2
Arthropoda	Crustacea	Cumacea	Diastylidae	<i>c.f. Diastylis</i>	1	1	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Alpheidae	<i>Alpheus</i>	0	1	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Penaeidae	Shrimp juvenile	2	2	0	2	3	4	5	3
Arthropoda	Crustacea	Decapoda	Pilumnidae	<i>Typhlocarcinus</i>	5	2	0	1	2	2	2	1
Arthropoda	Crustacea	Decapoda	Porcellanidae	<i>c.f. Porcellanella picta</i>	0	0	0	0	0	0	2	0
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.1</i>	0	0	0	0	3	2	1	2
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.2</i>	0	5	1	0	2	0	2	3
Arthropoda	Malacostraca	Stomatopoda	Squillidae	Mantis shrimp	0	0	0	0	0	1	0	0
Echinodermata	Ophiuroidea	Ophiurida	Amphiuridae	<i>Amphioplus</i>	3	1	1	0	2	2	1	0
Mollusca	Bivalvia	Veneroida	Dreissenidae	<i>Mytilopsis</i>	0	0	0	3	0	1	0	0
Mollusca	Bivalvia	Veneroida	Kellidae	<i>Pseudopythina</i>	0	0	0	0	0	3	0	0
Mollusca	Bivalvia	Veneroida	Solenidae	<i>Solen</i>	0	1	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroida	Tellinidae	<i>c.f. Angulus</i>	0	1	0	0	1	0	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Paphia (P. undulata)</i>	0	2	0	0	3	1	0	2
Mollusca	Bivalvia	Veneroida	Veneridae	<i>c.f. Phylloda foliacea</i>	0	0	1	0	0	1	0	0
Mollusca	Bivalvia	Veneroida	Veneridae	<i>Ruditapes</i>	2	0	0	0	0	0	0	1
Mollusca	Scaphopoda	-	Dentaliidae	-	1	1	0	1	0	0	0	0
Chordata	Actinopterygii	Perciformes	Gobiidae	UNID Goby	0	0	0	0	1	0	0	0
Chordata	Actinopterygii	Perciformes	Gobiidae	<i>Trypauchen( T. vagina)</i>	0	0	0	0	1	0	1	0
Nemertea	Enopla	-	-	UNID 1	0	1	0	0	1	0	0	0



**Table 2. Biomass of macrobenthic communities in the eight monitoring stations, October 2019**

Phylum	Class	Order	Family	Genus	SHW-Benthic Stations							
					A	B	C	D	E	F	G	H
Annelida	Polychaeta	Aciculata	Glyceridae	<i>Glycera</i>	0.006	0	0	0.001	0.002	0	0.042	0.015
Annelida	Polychaeta	Aciculata	Aphroditidae	<i>c.f. Laetmonice</i>	0	0	0.027	0	0	0	0	0
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella(C.capitata)</i>	0.002	0.001	0.003	0.001	0.001	0.003	0.001	0.003
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Capitella</i>	0.003	0.001	0.002	0.001	0.003	0	0.022	0.001
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Mediomastus</i>	0.002	0.002	0.001	0	0.003	0	0.003	0.002
Annelida	Polychaeta	Capitellida	Capitellidae	<i>Notomastus</i>	0.001	0	0.002	0	0	0	0.002	0.002
Annelida	Polychaeta	Errantia	Phyllodocidae	<i>Polyoclontes</i>	0	0	0	0.007	0	0	0	0
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Eunice</i>	0	0	0	0.005	0.003	0	0	0.002
Annelida	Polychaeta	Eunicida	Eunicidae	<i>Marphysa</i>	0	0	0	0	0	0	0.031	0
Annelida	Polychaeta	-	Cossuridae	<i>Cossurella(C. aciculata)</i>	0	0	0	0	0	0.001	0.001	0
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Neanthes</i>	0.002	0	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis1</i>	0.002	0.001	0	0	0.002	0.002	0.001	0.005
Annelida	Polychaeta	Phyllodocida	Nereidae	<i>Nereis2</i>	0	0	0	0	0	0.001	0	0
Annelida	Polychaeta	Phyllodocida	Polynoidae	<i>Gattyana</i>	0.003	0	0	0	0	0	0	0
Annelida	Polychaeta	Phyllodocimorpha	Goniadidae	<i>Glycinde</i>	0	0	0	0	0.002	0	0	0.001
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus (A. dibranchis)</i>	0.004	0.013	0.005	0	0	0	0	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Aglaophamus</i>	0	0	0	0	0	0.002	0.005	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys1</i>	0	0	0	0	0.004	0.003	0.002	0
Annelida	Polychaeta	Nereidida	Nephtyidae	<i>Nephtys2</i>	0.004	0.004	0	0.011	0.002	0.005	0	0.005
Annelida	Polychaeta	Scolecida	Opheliidae	<i>Ophelia</i>	0.008	0.003	0	0	0.002	0	0.002	0.026
Annelida	Polychaeta	Spionida	Poecilochaetidae	<i>Poecilochaetus</i>	0.003	0	0	0.002	0.012	0	0.048	0.004
Annelida	Polychaeta	Spionida	Spionidae	<i>Paraprionospio</i>	0.001	0.001	0	0	0.001	0.004	0.001	0.003
Annelida	Polychaeta	Spionida	Spionidae	<i>Prionospio</i>	0	0.003	0	0	0.001	0.001	0.001	0.001
Annelida	Polychaeta	Sternaspida	Sternaspidae	<i>Sternaspis(S. scutata)</i>	0	0.007	0	0.008	0	0	0	0.006
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Amaeana</i>	0.001	0	0	0	0	0	0	0

Annelida	Polychaeta	Terebellida	Terebellidae	<i>Loimia(L.loimia)</i>	0.015	0	0	0	0	0	1.628	0
Annelida	Polychaeta	Terebellida	Terebellidae	<i>Terebella</i>	0	0	0	0	0	0	0.017	0
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	<i>Lumbriculus sp.1</i>	0	0	0	0.002	0.002	0.002	0	0.009
Sipuncula	Sipunculiformes	Sipunculidea	Sipunculidae	<i>Sipunculus</i>	0	0.002	0	0	0	0	0.001	0.003
Arthropoda	Crustacea	Cumacea	Diastylidae	<i>c.f. Diastylis</i>	0.016	0.011	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Alpheidae	<i>Alpheus</i>	0	2.855	0	0	0	0	0	0
Arthropoda	Crustacea	Decapoda	Penaeidae	Shrimp juvenile	0.007	0.021	0	0.018	0.133	0.069	0.041	0.023
Arthropoda	Crustacea	Decapoda	Pilumnidae	<i>Typhlocarcinus</i>	1.285	3.216	0	1.035	0.978	0.963	2.765	0.013
Arthropoda	Crustacea	Decapoda	Porcellanidae	<i>c.f. Porcellanella picta</i>	0	0	0	0	0	0	0.055	0
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.1</i>	0	0	0	0	0.001	0.001	0.001	0.001
Arthropoda	Malacostraca	Amphipoda	Gammaridae	<i>Gammarus sp.2</i>	0	0.002	0.001	0	0.001	0	0.001	0.001
Arthropoda	Malacostraca	Stomatopoda	Squillidae	Mantis shrimp	0	0	0	0	0	1.498	0	0
Echinodermata	Ophiuroidea	Ophiurida	Amphiuridae	<i>Amphioplus</i>	1.557	0.764	0.008	0	2.025	3.154	0.011	0
Mollusca	Bivalvia	Veneroidea	Dreissenidae	<i>Mytilopsis</i>	0	0	0	6.500	0	0.031	0	0
Mollusca	Bivalvia	Veneroidea	Kellidae	<i>Pseudopythina</i>	0	0	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroidea	Solenidae	<i>Solen</i>	0	0.018	0	0	0	0	0	0
Mollusca	Bivalvia	Veneroidea	Tellibidae	<i>c.f. Angulus</i>	0	0.010	0	0	3.200	0	0	0
Mollusca	Bivalvia	Veneroidea	Veneridae	<i>Paphia (P. undulata)</i>	0	0.300	0	0	13.900	2.900	0	4.200
Mollusca	Bivalvia	Veneroidea	Veneridae	<i>c.f. Phylloda foliacea</i>	0	0	0.024	0	0	0.020	0	0
Mollusca	Bivalvia	Veneroidea	Veneridae	<i>Ruditapes</i>	5.200	0	0	0	0	0	0	1.087
Mollusca	Scaphopoda	-	Dentaliidae	-	0.923	0.008	0	0.025	0	0	0	0
Chordata	Actinopterygii	Perciformes	Gobiidae	UNID Goby	0	0	0	0	0.015	0	0	0
Chordata	Actinopterygii	Perciformes	Gobiidae	<i>Trypauchen( T. vagina)</i>	0	0	0	0	0.037	0	9.600	0
Nemertea	Enopla	-	-	UNID 1	0	0.003	0	0	0.004	0	0	0



**Table 3. Summary of Benthic Survey Data, October 2019**

Station	Abundance (ind.)	Total Biomass (g)	Number of Taxa	Diversity (H')	Evenness (J)
A	43	9.04	21	2.93	0.96
B	45	7.25	22	2.84	0.92
C*	14	0.07	9	2.11	0.96
D*	26	7.62	13	2.26	0.88
E	45	20.33	24	2.97	0.94
F	41	8.66	19	2.76	0.94
G	56	14.28	24	2.79	0.88
H	49	5.41	22	2.97	0.96
<b>TOTAL</b>	<b>319</b>	<b>72.67</b>	<b>49</b>		

\*Impact Sites

**Table 4. 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 5. Summary of Benthic Survey Baseline Data, March 2004**

Stations	Abundance	Total Biomass	Number of Taxa	Diversity (H')	Evenness (J)
A	337	17.39	38	0.78	0.21
B	110	0.9	21	0.82	0.27
C*	14	0.7	10	0.69	0.30
D*	37	10.07	20	1.01	0.34
E	28	0.44	11	0.76	0.32
F	67	0.78	16	0.85	0.31
G	25	0.09	9	0.64	0.29
H	23	0.15	11	0.44	0.18

\*Impact Sites







**Table 6. Taxonomic Composition (%) of Benthic Survey**

Taxon	Apr-18	Jun-18	Aug-18	Oct-18	Dec-18	Feb-19	Apr-19	Jun-19	Aug-19	Oct-19
Annelida	31.12	53.01	65.02	65.35	69.44	54.99	70.28	57.67	64.31	66.14
Sipuncula	0.30	0.80	0.45	0	0.93	0	0	0	1.57	1.25
Arthropoda	13.60	15.66	12.11	13.86	10.19	20.23	10.83	7.91	9.80	19.75
Echinodermata	15.11	4.82	5.38	2.97	2.78	3.42	4.72	4.65	5.10	3.13
Cnidaria	0.60	0.40	0	0	0.93	0.85	0	0.93	0.39	0
Mollusca	50.45	21.29	15.69	16.83	12.96	19.94	13.33	27.44	17.25	8.15
Chordata	2.11	0.80	0.45	0	0.93	0.28	0.56	0.93	1.18	0.94
Nemertea	0.30	3.22	0.90	0.99	1.85	0.28	0.28	0.47	0.39	0.63

**Table 7. Taxonomic Composition (abundance) of Benthic Survey**

Taxon	Apr-18	Jun-18	Aug-18	Oct-18	Dec-18	Feb-19	Apr-19	Jun-19	Aug-19	Oct-19
Annelida	103	132	145	132	150	193	253	124	164	211
Sipuncula	1	2	1	0	2	0	0	0	4	4
Arthropoda	45	39	27	28	22	71	39	17	25	63
Echinodermata	5	12	12	6	6	12	17	10	13	10
Cnidaria	2	1	0	0	2	3	0	2	1	0
Mollusca	167	53	35	34	28	70	48	59	44	26
Chordata	7	2	1	0	2	1	2	2	3	3
Nemertea	1	8	2	2	4	1	1	1	1	2

## Photos of Representative Taxa Identified

	
A) Mollusca species, <i>Ruditapes philippinarum</i>	B) Arthropoda : mantis shrimp
	
C) Benthic species	D) Fish species, <i>Trypauchen vagina</i>

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## Appendix I

### Photos of Grab Samplers



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Photo 1. A ponar grab sampler



Photo 2. Grab dimension 1



Photo3. Grab dimension 2



Photo4. Grab dimension 3

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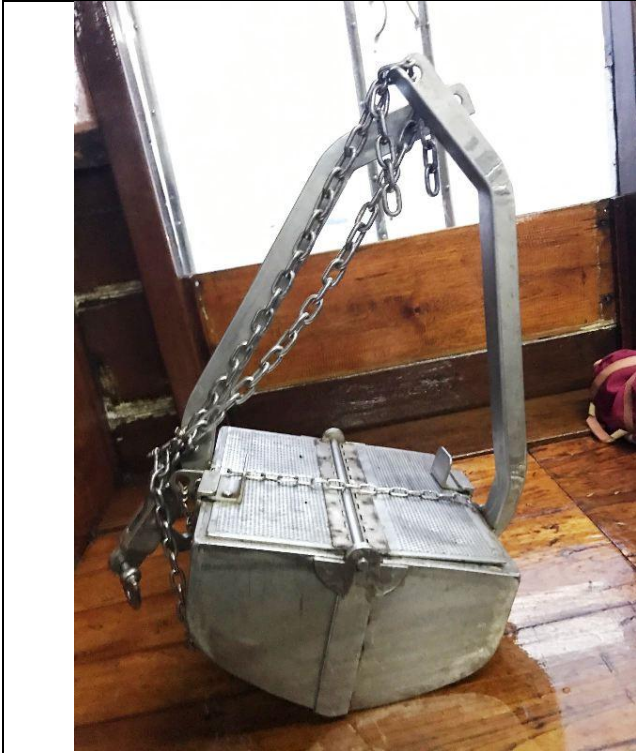


Photo 1. A modified Van Veen grab sampler



Photo 2. Grab dimension 1



Photo3. Grab dimension 2



Photo4. Grab dimension 3



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## Appendix J

### Environmental Mitigation Implementation Schedule (EMIS)

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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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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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