TISCH Environmental

RECALIBRATION DUE DATE:
October 21, 2020

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	October 21, 2019	**Rootsmeter S/N:** 438320	**Ta:** 295	°K
Operator:	Jim Tisch		**Pa:** 744.2	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **2456**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4200	3.2	2.00
2	3	4	1	1.0180	6.3	4.00
3	5	6	1	0.9030	7.9	5.00
4	7	8	1	0.8620	8.8	5.50
5	9	10	1	0.7120	12.6	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
0.9849	0.6936	1.4066	0.9957	0.7012	0.8904
0.9808	0.9635	1.9892	0.9915	0.9740	1.2592
0.9787	1.0838	2.2240	0.9894	1.0957	1.4078
0.9775	1.1340	2.3325	0.9882	1.1464	1.4765
0.9724	1.3658	2.8131	0.9831	1.3807	1.7808
QSTD	**m=**	**2.08799**	**QA**	**m=**	**1.30746**
	b=	**-0.03545**		**b=**	**-0.02244**
	r=	**0.99989**		**r=**	**0.99989**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	**Qa=**	Va/ΔTime

For subsequent flow rate calculations:

Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$

Qa= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg

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

RECALIBRATION

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

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.com
TOLL FREE: (877)263-7610
FAX: (513)467-9009

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge — Date of Calibration: 28-Apr-20
Location : AMS2 — Next Calibration Date: 27-Jul-20
Brand: Tisch — Technician: Ting Chan
Model: TE-5170 S/N: HVS-01

CONDITIONS

Sea Level Pressure (hPa):	1017.5	Corrected Pressure (mm Hg):	763
Temperature (℃):	24.3	Temperature (K):	297

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

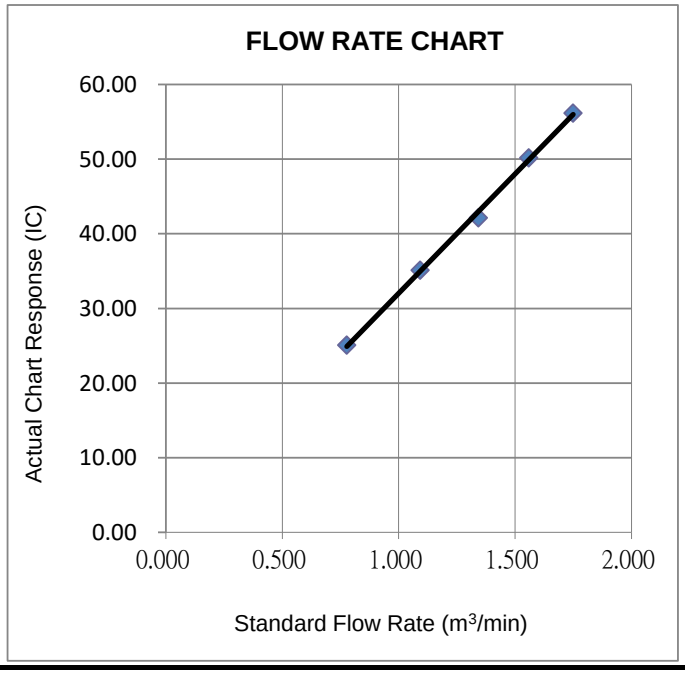
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	4.50	-8.50	13.000	1.749	56.00	56.18	Slope =	31.9482
13	3.10	-7.20	10.300	1.559	50.00	50.16	Intercept =	0.0870
10	1.80	-5.80	7.600	1.342	42.00	42.14	Corr. coeff.=	0.9993
7	0.50	-4.50	5.000	1.091	35.00	35.11		
5	-0.20	-2.70	2.500	0.777	25.00	25.08		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



Report Date: 2/5/2020

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge
Date of Calibration: 27-Jul-20
Location : AMS2
Next Calibration Date: 26-Oct-20
Brand: Tisch
Technician: Sam Fong
Model: TE-5170 S/N: HVS-01

CONDITIONS

Sea Level Pressure (hPa):	1006.4	Corrected Pressure (mm Hg):	755
Temperature (℃):	30.5	Temperature (K):	304

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

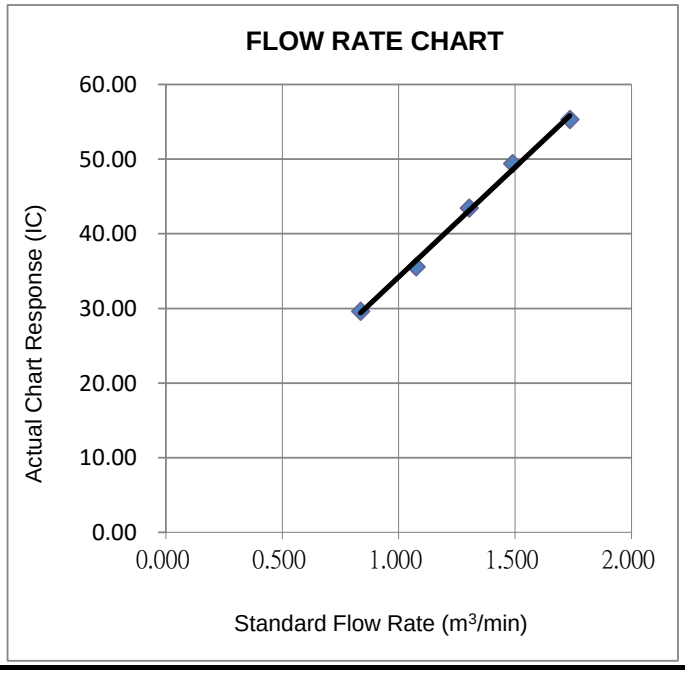
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	6.80	-6.40	13.200	1.735	56.00	55.30	Slope =	29.3988
13	4.50	-5.20	9.700	1.490	50.00	49.38	Intercept =	4.7982
10	3.40	-4.00	7.400	1.304	44.00	43.45	Corr. coeff.=	0.9980
7	1.20	-3.80	5.000	1.075	36.00	35.55		
5	0.80	-2.20	3.000	0.836	30.00	29.63		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



Report Date: **28/7/2020**

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge — Date of Calibration: 28-Apr-20
Location : AMS3C — Next Calibration Date: 27-Jul-20
Brand: Tisch — Technician: Ting Chan
Model: TE-5170 S/N: HVS-02

CONDITIONS

Sea Level Pressure (hPa):	1017.5	Corrected Pressure (mm Hg):	763
Temperature (℃):	24.3	Temperature (K):	297

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

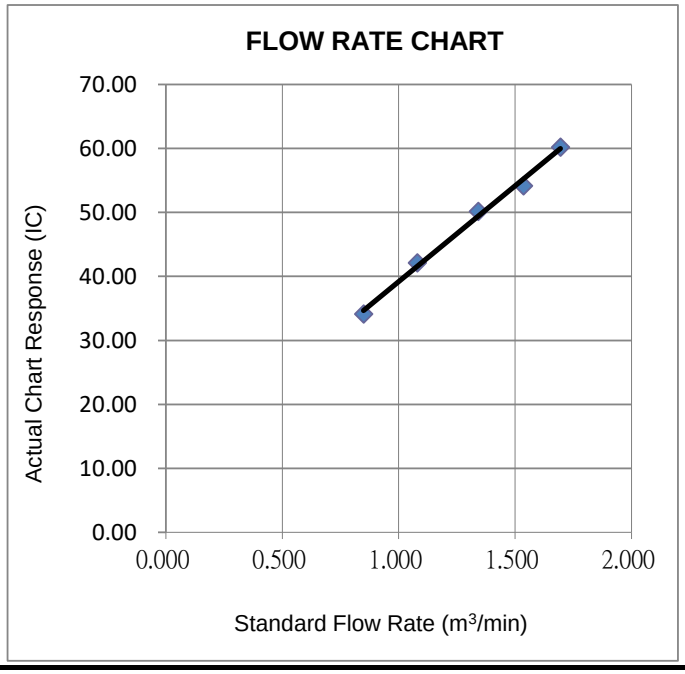
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	6.80	-5.40	12.200	1.695	60.00	60.20	Slope =	29.9170
13	5.60	-4.40	10.000	1.536	54.00	54.18	Intercept =	9.2460
10	4.80	-2.80	7.600	1.342	50.00	50.16	Corr. coeff.=	0.9972
7	3.30	-1.60	4.900	1.081	42.00	42.14		
5	2.40	-0.60	3.000	0.849	34.00	34.11		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



Report Date: **2/5/2020**

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge — Date of Calibration: 27-Jul-20
Location : AMS3C — Next Calibration Date: 26-Oct-20
Brand: Tisch — Technician: Sam Fong
Model: TE-5170 S/N: HVS-02

CONDITIONS

Sea Level Pressure (hPa):	1006.4	Corrected Pressure (mm Hg):	755
Temperature (℃):	30.5	Temperature (K):	304

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

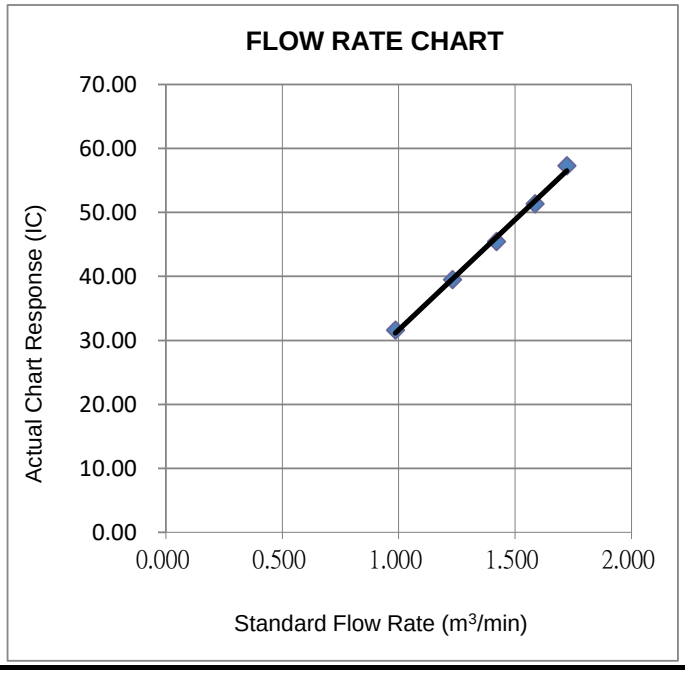
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	7.20	-5.80	13.000	1.722	58.00	57.28	Slope =	34.4066
13	6.20	-4.80	11.000	1.586	52.00	51.35	Intercept =	-2.7672
10	5.60	-3.20	8.800	1.420	46.00	45.43	Corr. coeff.=	0.9982
7	4.40	-2.20	6.600	1.232	40.00	39.50		
5	3.00	-1.20	4.200	0.986	32.00	31.60		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



Report Date: **28/7/2020**

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge — Date of Calibration: 28-Apr-20
Location : AMS7B — Next Calibration Date: 27-Jul-20
Brand: Tisch — Technician: Ting Chan
Model: TE-5170 S/N: HVS-03

CONDITIONS

Sea Level Pressure (hPa):	1017.5	Corrected Pressure (mm Hg):	763
Temperature (℃):	24.3	Temperature (K):	297

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

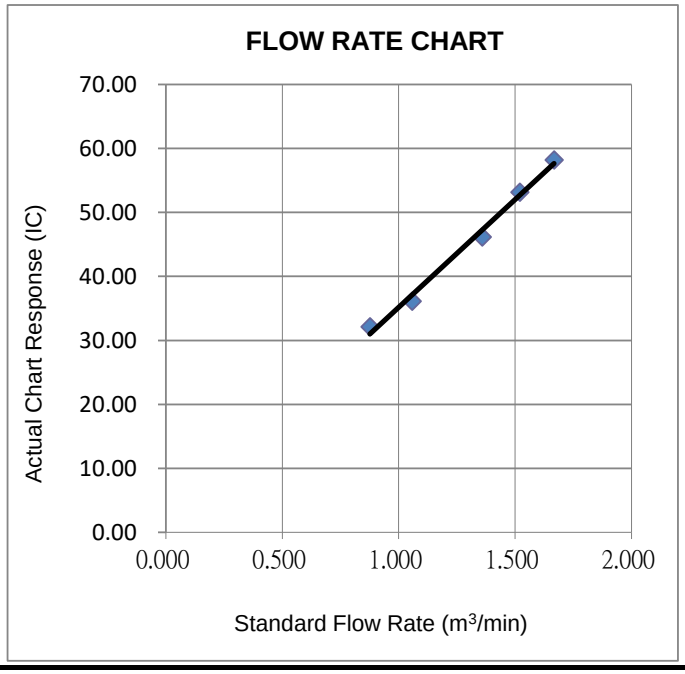
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	7.00	-4.80	11.800	1.668	58.00	58.19	Slope =	33.7189
13	6.00	-3.80	9.800	1.521	53.00	53.17	Intercept =	1.4285
10	5.00	-2.80	7.800	1.359	46.00	46.15	Corr. coeff.=	0.9959
7	3.40	-1.30	4.700	1.059	36.00	36.12		
5	2.60	-0.60	3.200	0.877	32.00	32.10		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



Report Date: **2/5/2020**

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge
Location : AMS7B
Brand: Tisch
Model: TE-5170 S/N: HVS-03

Date of Calibration: 27-Jul-20
Next Calibration Date: 26-Oct-20
Technician: Sam Fong

CONDITIONS

Sea Level Pressure (hPa):	1006.4	Corrected Pressure (mm Hg):	755
Temperature (℃):	30.5	Temperature (K):	304

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08799
Model:	TE-5025A	Qstd Intercept:	-0.03545
Calibration Date:	21-Oct-19	Expiry Date:	21-Oct-20
S/N:	2456		

CALIBRATION

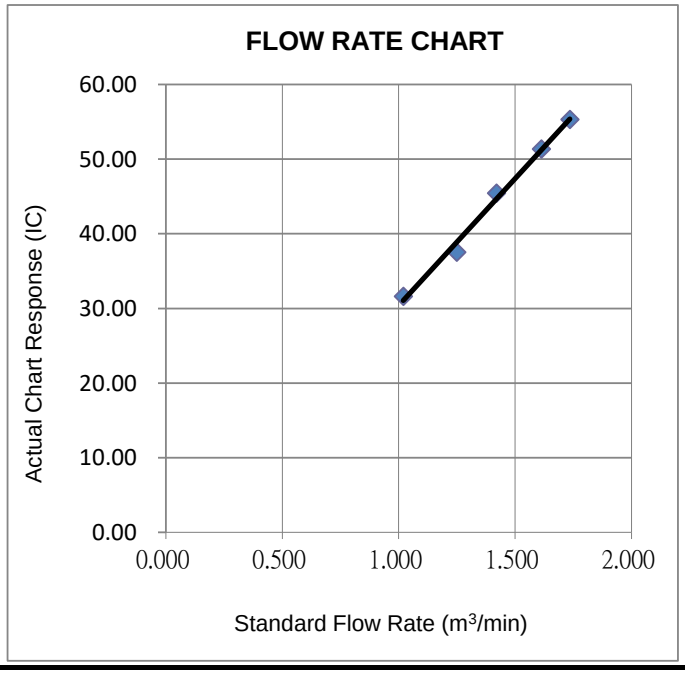
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	7.00	-6.20	13.200	1.735	56.00	55.30	Slope =	34.0396
13	6.20	-5.20	11.400	1.614	52.00	51.35	Intercept =	-3.6848
10	5.40	-3.40	8.800	1.420	46.00	45.43	Corr. coeff.=	0.9964
7	4.20	-2.60	6.800	1.250	38.00	37.53		
5	2.70	-1.80	4.500	1.020	32.00	31.60		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



Report Date: **28/7/2020**

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

CALIBRATION REPORT OF WIND METER

Project: Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge
Location: AMS3C

Date of Calibration: 5-Feb-2020
Next Calibration Date: 4-Jul-2020
Technician: Sam Fong

Brand: Global Water
Model: GL500-7-2 **S/N: 1847003409**

Anemometer

Brand: Benetech
Model: GM816 **Equipment ID: 08**

Procedures:

1. **Wind Still Test:** **The wind speed sensor was held by hand until stabilized.**
2. **Wind Speed Test:** **The wind meter was calibrated in-situ and compared with the Anemometer.**
3. **Wind Direction Test:** **The wind meter was calibrated in-situ and compared with a marine compass from four directions.**

Wind Still Test:

Wind Speed (m/s)
0.00

Wind Speed Test:

Global Water (m/s)	Anemometer (m/s)
2.3	2.6
3.0	2.8
3.4	3.0

Wind Direction Test:

	Marine Compass (o)
252	250
72	70
0	357
340	341

Report Date: 14/2/2020

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Room 723 & 725, 7/F, Block B,
Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
Hong Kong.

CALIBRATION REPORT OF WIND METER

Project: Contract No. HY/2019/01 - Hong Kong-Zhuhai-Macao Bridge		**Date of Calibration:**	**2-Jul-2020**
Location:	**AMS3C**	**Next Calibration Date:**	**1-Jan-2021**
		Technician:	**Ting Chan**
Brand:	**Global Water**		
Model:	**GL500-7-2**	**S/N:**	**1847003409**

Anemometer

Brand:	**Benetech**		
Model:	**GM816**	**Equipment ID:**	**08**

Procedures:

1. **Wind Still Test:** **The wind speed sensor was held by hand until stabilized.**
2. **Wind Speed Test:** **The wind meter was calibrated in-situ and compared with the Anemometer.**
3. **Wind Direction Test:** **The wind meter was calibrated in-situ and compared with a marine compass from four directions.**

Wind Still Test:

Wind Speed (m/s)
0.00

Wind Speed Test:

Global Water (m/s)	Anemometer (m/s)
0.9	0.5
2.4	2.6
3.4	3.8

Wind Direction Test:

Global Water (o)	Marine Compass (o)
0	358
247	244
173	172
80	79

Report Date: **3/7/2020**

Wan Ka Ho
Project Consultant

FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Report No. : 183057CA200894(3)

CALIBRATION CERTIFICATE OF ANEMOMETER

Client Supplied Information

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Anemometer

Manufacturer : Benetech

Model No. : GM816

Serial No. : N/A

Equipment ID. : WS-08

Next Calibration Date : 14-Jun-2021

Laboratory Information

Details of Reference Equipment –

Description : Reference Anemometer

Equipment ID. : R-101-4

Date of Calibration : 15-Jun-2020 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of FTS

Method Used : R-C-279

Calibration Results :

Reference Reading (m/s)	UUT Reading (m/s)	Error (m/s)
2.02	2.0	0.0
4.15	4.1	-0.1
6.27	6.0	-0.3
8.43	8.0	-0.4
10.75	10.1	-0.7

Remark :

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The reported readings in this calibration are an average from 10 trials.

Checked by : William Date : 20-6-2020 Certified by : KT Leung Date : 20-6-2020

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Report no. : 940891CA200109(2)

CALIBRATION CERTIFICATE OF DUST METER

Client : Fugro Technical Services Limited

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description	: Laser dust monitor
Manufacturer	: SIBATA
Model No.	: LD-5R
Serial No.	: 761101
Specification Limit	: NA
Next Calibration Date	: 09-Oct-2020

Laboratory Information

Description	: TSP high volume air sampler
Serial No.	: 4350
Date of Calibration	: 10-Oct-2019 Ambient Temperature : 28 °C
Calibration Location	: Ma Wan A1 Site Boundary
Method Used	: By direct comparison the weight of dust particle trapped in a filter paper using high volume sampler (TSP method) for a certain period, with the reading of the UUT. They should be placed at the same location and powered on and off at the same time.

Calibration Results :

Reference concentration (mg/m^3)	Total count for 1 hour	CPM (Count per minute)
0.1047	2110	35.17
0.0623	1948	32.47
0.0587	1908	31.80

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m^3) = K x [UUT reading (CPM)], where K = 0.002270
3. Correlation coefficient (r) : 0.9931

Checked by : _____ Date : 10-2-2020 Certified by : _____ Date : 10-2-2020

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Report no. : 940891CA200109(5)

CALIBRATION CERTIFICATE OF DUST METER

Client : Fugro Technical Services Limited

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description	: Laser dust monitor
Manufacturer	: SIBATA
Model No.	: LD-5R
Serial No.	: 761104
Specification Limit	: NA
Next Calibration Date	: 21-Oct-2020

Laboratory Information

Description	: TSP high volume air sampler
Serial No.	: 4350
Date of Calibration	: 22-Oct-2019 Ambient Temperature : 25 °C
Calibration Location	: Ma Wan A1 Site Boundary
Method Used	: By direct comparison the weight of dust particle trapped in a filter paper using high volume sampler (TSP method) for a certain period, with the reading of the UUT. They should be placed at the same location and powered on and off at the same time.

Calibration Results :

Reference concentration (mg/m^3)	Total count for 1 hour	CPM (Count per minute)
0.1287	3564	59.40
0.0888	2877	47.95
0.1141	3267	54.45

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m^3) = K x [UUT reading (CPM)], where K = 0.002049
3. Correlation coefficient (r) : 0.9971

Checked by : Date : 10-2-2020 Certified by : Date : 10-2-2020

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Report no. : 940891CA200109

CALIBRATION CERTIFICATE OF DUST METER

Client : Fugro Technical Services Limited

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description	: Laser dust monitor
Manufacturer	: SIBATA
Model No.	: LD-5R
Serial No.	: 882147
Specification Limit	: NA
Next Calibration Date	: 09-Oct-2020

Laboratory Information

Description	: TSP high volume air sampler
Serial No.	: 4350
Date of Calibration	: 10-Oct-2019 Ambient Temperature : 28 °C
Calibration Location	: Ma Wan A1 Site Boundary
Method Used	: By direct comparison the weight of dust particle trapped in a filter paper using high volume sampler (TSP method) for a certain period, with the reading of the UUT. They should be placed at the same location and powered on and off at the same time.

Calibration Results :

Reference concentration (mg/m^3)	Total count for 1 hour	CPM (Count per minute)
0.1047	2477	41.28
0.0623	2121	35.35
0.0587	2073	34.55

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m^3) = K x [UUT reading (CPM)], where K = 0.002030
3. Correlation coefficient (r) : 0.9993

Checked by : Date : 10-2-2020 Certified by : Date : 10-2-2020

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

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

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com

MateriaLab

Report no.: 183057CA196181

CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter

Manufacturer : Casella

	Meter	Microphone	Preamplifier
Model No.	CEL-63X	CE-251	CEL-495
Serial No.	1488272	02552	003942

Next Calibration Date : 01-Oct-2020

Specification Limit : EN 61672: 2003 Type 1

Laboratory Information

Details of Reference Equipment -

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 02-Oct-2019 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of FTS

Method Used : By direct comparison

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	2.0	2.6 to -0.6
	2000Hz	1.4	2.8 to -0.4
	1000Hz	0.0	1.1 to -1.1
	500Hz	-3.4	-1.8 to -4.6
	250Hz	-8.8	-7.2 to -10.0
	125Hz	-16.3	-14.6 to -17.6
	63Hz	-26.3	-24.7 to -27.7
	31.5Hz	-39.3	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.0	± 0.6
	104dB-114dB	0.0	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighting is fast
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.
5. The values given in this Calibration Certificate only relate to the unit-under-test and the values measured at the time of the test. Uncertainties will not include allowances for the environmental changes, variation and shock during transportation, or the capability of any other laboratory to repeat the measurement.

Checked by : William Date : 4-10-2019 Certified by : KT Leung Date : 4-10-2019

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Report no.: 183057CA196458

CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter

Manufacturer : Casella

	Meter	Microphone	Preamplifier
Model No. :	CEL-63X	CE-251	CEL-495
Serial No. :	2451048	02789	004065

Equipment ID : N/A

Next Calibration Date : 21-Nov-2020

Specification Limit : EN 61672: 2003 Type 1

Laboratory Information

Details of Reference Equipment -

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 22-Nov-2019 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of FTS

Method Used : By direct comparison

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weigthing frequency response	4000Hz	1.9	2.6 to -0.6
	2000Hz	1.5	2.8 to -0.4
	1000Hz	0.0	1.1 to -1.1
	500Hz	-3.4	-1.8 to -4.6
	250Hz	-8.8	-7.2 to -10.0
	125Hz	-16.2	-14.6 to -17.6
	63Hz	-26.2	-24.7 to -27.7
	31.5Hz	-38.9	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.0	± 0.6
	104dB-114dB	0.0	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighting is fast
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by : William Date : 27-11-2019 Certified by : K T Leung Date : 28-11-2019

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

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

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com

MateriaLab

Report no.: 183057CA196275

CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

Client Supplied Information

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description	:	Sound Calibrator
Manufacturer	:	Casella (Model CEL-120/1)
Serial No.	:	2383852
Equipment ID	:	N/A
Next Calibration Date	:	15-Oct-2020
Specification Limit	:	EN 60942: 2003 Type 1

Laboratory Information

Details of Reference Equipment -

Description	:	Reference Sound level meter
Equipment ID.	:	R-119-1

Date of Calibration : 16-Oct-2019 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of FTS

Method Used : By direct comparison

Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit(dB)
94dB	0.0 dB	±0.4dB
114dB	0.0 dB	

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The equipment does comply with the specification limit.
4. The values given in this Calibration Certificate only relate to the values at the time of the test and any uncertainties will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during tranportation, overloading, mis-handling or the capability of any other laboratory to repeat the measurement.

Checked by : Gillian Date : 22-10-2019 Certified by : K.T. Leung Date : 22-10-2019

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **

FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Report no.: 183057CA200018(1)

CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

Client Supplied Information

Client : Fugro Technical Services Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description	:	Sound Calibrator
Manufacturer	:	Casella (Model CEL-120/1)
Serial No.	:	2383886
Equipment ID	:	N/A
Next Calibration Date	:	12-Jan-2021
Specification Limit	:	EN 60942: 2003 Type 1

Laboratory Information

Description	:	Reference Sound level meter
Equipment ID.	:	R-119-1
Date of Calibration	:	13-Jan-2020 Ambient Temperature : 22 °C
Calibration Location	:	Calibration Laboratory of FTS
Method Used	:	By direct comparison

Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit(dB)
94dB	-0.2 dB	±0.4dB
114dB	-0.1 dB	

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The equipment does comply with the specification limit.
4. The values given in this Calibration Certificate only relate to the values at the time of the test and any uncertainties will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during tranportation, overloading, mis-handling or the capability of any other laboratory to repeat the measurement.

Checked by : William Date : 20-1-2020 Certified by : K L Leung Date : 21-1-2020

CA-R-297 (22/07/2009)

Leung Kwok Tai (Assistant Manager)

** End of Report **