

Annex E1

Calibration Certificates for Air Quality



ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES

SUB-CONTRACTING REPORT

| | | | |
|---------|---|----------------|---------------|
| CONTACT | : MR K.W. FAN | WORK ORDER | : HK2240047 |
| CLIENT | : ENVIROTECH SERVICES CO. | | |
| ADDRESS | : RM 712, 7/F, MY LOFT 9 HOI WING ROAD, TUEN MUN, N.T., HK | SUB-BATCH | : 1 |
| | | DATE RECEIVED | : 11-OCT-2022 |
| | | DATE OF ISSUE | : 20-OCT-2022 |
| PROJECT | : ---- | NO. OF SAMPLES | : 1 |
| | | CLIENT ORDER | : ---- |

General Comments

- Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition. The result(s) related only to the item(s) tested.
- Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.
- Result(s) of sample(s) is/are reported on as received basis, unless otherwise specified.
- Calibration was subcontracted to and analysed by Action-United Environmental Services & Consulting.

Signatories

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

Signatories

Position

Richard Fung

Managing Director

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

All pages of this report have been checked and approved for release.

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

11/F Chung Shun Knitting Centre 1 - 3 Wing Yip Street Kwai Chung N.T. Hong Kong
Kwai Tsing Hong Kong

WORK ORDER : HK2240047
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ---



| ALS Lab ID | Client's Sample ID | Sample Type | Sample Date | External Lab Report No. |
|---------------|--------------------|-------------|-------------|-------------------------|
| HK2240047-001 | S/N: 336338 | Equipments | 11-Oct-2022 | S/N: 336338 |

Equipment Verification Report (TSP)

Equipment Calibrated:

Type: Laser Dust monitor
Manufacturer: Sibata LD – 3B
Serial No. 336338
Equipment Ref: NA
Job Order HK2240047

Standard Equipment:

Standard Equipment: Higher Volume Sampler (TSP)
Location & Location ID: AUES office (calibration room)
Equipment Ref: HVS 018
Last Calibration Date: 13 September 2022

Equipment Verification Results:

Verification Date: 14 October 2022

| Hour | Time | Mean Temp °C | Mean Pressure (hPa) | Concentration in $\mu\text{g}/\text{m}^3$ (Standard Equipment) | Total Count (Calibrated Equipment) | Count/Minute (Total Count/min) |
|------------|---------------|--------------|---------------------|--|------------------------------------|--------------------------------|
| 2hr15mins | 09:33 ~ 11:48 | 26.9 | 1012.1 | 44.6 | 2621 | 19.5 |
| 2hr01 mins | 11:51 ~ 13:52 | 26.9 | 1012.1 | 45.7 | 2722 | 22.6 |
| 2hr01 mins | 13:55 ~ 15:56 | 26.9 | 1012.1 | 56.6 | 2922 | 24.1 |

Linear Regression of Y or X

Slope (K-factor): 2.2211 ($\mu\text{g}/\text{m}^3$)/CPM

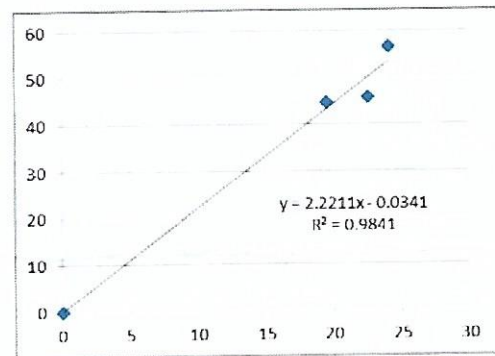
Correlation Coefficient (R) 0.9920

Date of Issue 17 October 2022

Remarks:

1. **Strong Correlation ($R > 0.8$)**
2. Factor 2.2211 ($\mu\text{g}/\text{m}^3$)/CPM should be applied for TSP monitoring

*If $R < 0.5$, repair or re-verification is required for the equipment



Operator: Fai So Signature:  Date: 17 October 2022

QC Reviewer: Ben Tam Signature:  Date: 17 October 2022

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : Gold King Industrial Building, Kwai Chung
 Location ID : Calibration Room

Date of Calibration: 13-Sep-22
 Next Calibration Date: 13-Dec-22

CONDITIONS

| | | | |
|--------------------------|--------|----------------------------|---------|
| Sea Level Pressure (hPa) | 1007.3 | Corrected Pressure (mm Hg) | 755.475 |
| Temperature (°C) | 31.7 | Temperature (K) | 305 |

CALIBRATION ORIFICE

| | | | |
|--------------------|-----------|-------------------|-----------|
| Make-> | TISCH | Qstd Slope -> | 1.99838 |
| Model-> | 5025A | Qstd Intercept -> | -0.00903 |
| Calibration Date-> | 27-Dec-21 | Expiry Date-> | 27-Dec-22 |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION | | |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|-------------------|-------------|----------------|
| | | | | | | | Slope = | Intercept = | Corr. coeff. = |
| 18 | 6 | 6 | 12.0 | 1.714 | 54 | 53.24 | 30.1792 | 1.5486 | 0.9961 |
| 13 | 4.9 | 4.9 | 9.8 | 1.549 | 48 | 47.33 | | | |
| 10 | 3.7 | 3.7 | 7.4 | 1.347 | 44 | 43.38 | | | |
| 8 | 2.5 | 2.5 | 5.0 | 1.108 | 36 | 35.50 | | | |
| 5 | 1.6 | 1.6 | 3.2 | 0.887 | 28 | 27.61 | | | |

Calculations :

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

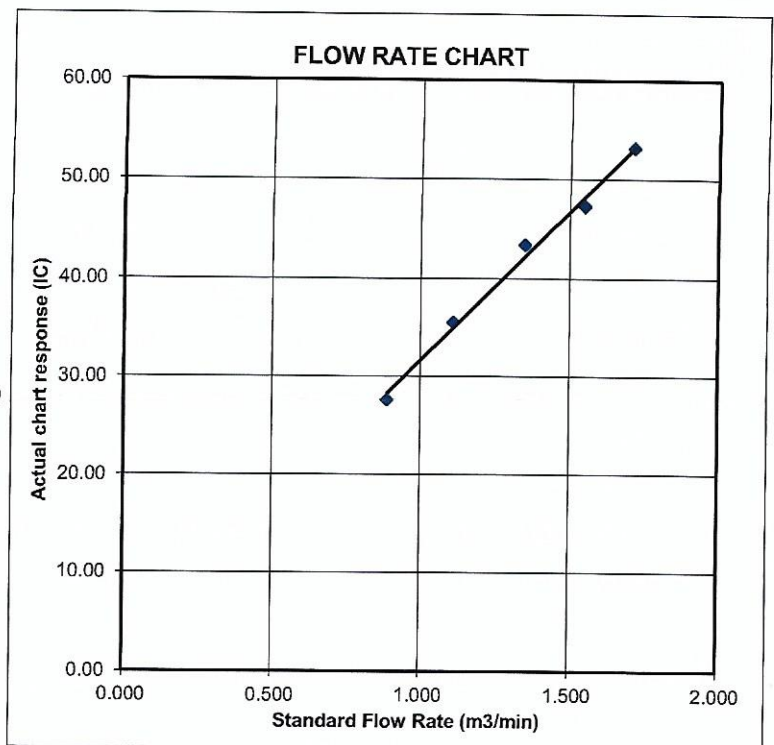
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

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

For subsequent calculation of sampler flow:

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

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



Certificate of Calibration

| Calibration Certification Information | | | |
|---------------------------------------|-----------------------------|-----------|-------|
| Cal. Date: December 27, 2021 | Rootsmeter S/N: 438320 | Ta: 295 | °K |
| Operator: Jim Tisch | | Pa: 740.4 | mm Hg |
| Calibration Model #: TE-5025A | Calibrator S/N: 1612 | | |

| Run | Vol. Init (m3) | Vol. Final (m3) | ΔVol. (m3) | ΔTime (min) | ΔP (mm Hg) | ΔH (in H2O) |
|-----|----------------|-----------------|------------|-------------|------------|-------------|
| 1 | 1 | 2 | 1 | 1.3890 | 3.2 | 2.00 |
| 2 | 3 | 4 | 1 | 0.9760 | 6.4 | 4.00 |
| 3 | 5 | 6 | 1 | 0.8740 | 7.9 | 5.00 |
| 4 | 7 | 8 | 1 | 0.8320 | 8.8 | 5.50 |
| 5 | 9 | 10 | 1 | 0.6870 | 12.7 | 8.00 |

| Data Tabulation | | | | | |
|-----------------|---------------|--|-----------|-------------|---|
| Vstd (m3) | Qstd (x-axis) | $\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis) | Va | Qa (x-axis) | $\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis) |
| 0.9799 | 0.7055 | 1.4029 | 0.9957 | 0.7168 | 0.8927 |
| 0.9756 | 0.9996 | 1.9841 | 0.9914 | 1.0157 | 1.2624 |
| 0.9736 | 1.1140 | 2.2183 | 0.9893 | 1.1320 | 1.4114 |
| 0.9724 | 1.1688 | 2.3265 | 0.9881 | 1.1876 | 1.4803 |
| 0.9673 | 1.4079 | 2.8059 | 0.9828 | 1.4306 | 1.7853 |
| QSTD | m= | 1.99838 | QA | m= | 1.25135 |
| | b= | -0.00903 | | b= | -0.00574 |
| | r= | 0.99999 | | r= | 0.99999 |

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

| 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 |