High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

Project No.   KER 1 - Future Residential Development at Kerry Godown

Date: 3-Aug-20   Next Due Date: 3-Oct-20   Operator: SK

Equipment No.:   A-01-04   Model No.:   TE 5170   Serial No.   10595

Ambient Condition			
Temperature, Ta (K)	299.5	Pressure, Pa (mmHg)	760

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$

Calibration of TSP Sampler					
Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	12.9	3.58	60.98	6.0	2.44
2	10.2	3.19	54.28	4.8	2.19
3	7.8	2.79	47.52	3.6	1.89
4	4.2	2.04	34.99	2.3	1.51
5	2.5	1.58	27.10	1.6	1.26

By Linear Regression of Y on X

Slope , mw =   0.0346   Intercept, bw =   0.3015

Correlation coefficient* =   0.9976

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   3.22

Remarks:

Conducted by: SK Wong   Signature: Date: 3 August 2020

Checked by: Henry Leung   Signature: Date: 3 August 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

Project No. KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)

Date:	3-Aug-20	Next Due Date:	3-Oct-20	Operator:	SK
Equipment No.:	A-01-44	Model No.:	TE-5170	Serial No.	1316

Ambient Condition			
Temperature, Ta (K)	304	Pressure, Pa (mmHg)	760

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.02740
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) **X - axis**	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ **Y-axis**
1	13.0	3.57	60.76	8.5	2.89
2	10.2	3.16	53.88	6.3	2.49
3	7.8	2.77	47.17	4.7	2.15
4	5.4	2.30	39.33	3.1	1.74
5	2.9	1.69	28.94	1.9	1.36

By Linear Regression of Y on X

 Slope , mw =   0.0480   Intercept, bw =   -0.0845

 Correlation coefficient* =   0.9960

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

 Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   4.00

Remarks:

Conducted by:	SK Wong	Signature:		Date:	3 August 2020
Checked by:	Henry Leung	Signature:		Date:	3 August 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No. MA20003/41/0001

Project No.   KTD 2c - G/IC Zone next to Kwun Tong Bypass (Next to the Kowloon Bay Sewage Interception Station)

Date: 3-Aug-20   Next Due Date: 3-Oct-20   Operator: SK

Equipment No.:   A-01-41   Model No.:   TE 5170   Serial No.   5280

Ambient Condition			
Temperature, Ta (K)	299.5	Pressure, Pa (mmHg)	760

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	13.0	3.60	61.21	6.1	2.46
2	10.5	3.23	55.06	4.9	2.21
3	7.7	2.77	47.22	3.8	1.94
4	4.4	2.09	35.81	2.4	1.55
5	2.4	1.55	26.57	1.7	1.30

By Linear Regression of Y on X

Slope , mw =   0.0336   Intercept, bw =   0.3745

Correlation coefficient* =   0.9979

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   3.33

Remarks:

Conducted by: SK Wong   Signature: Date: 3 August 2020

Checked by: Henry Leung   Signature: Date: 3 August 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No.   MA20003/18/0004

Project No.	CKL 1 - Flat 121 Cha Kwo Ling Village				
Date:	7-Sep-20	Next Due Date:	7-Nov-20	Operator:	SK
Equipment No.:	A-01-18	Model No.:	TE 5170	Serial No.	0723

Ambient Condition			
Temperature, Ta (K)	302.4	Pressure, Pa (mmHg)	755.4

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} -bc\} / mc$			

Calibration of TSP Sampler					
Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) **X - axis**	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ **Y-axis**
1	14.6	3.78	64.34	9.9	3.11
2	11.6	3.37	57.40	7.6	2.73
3	8.5	2.89	49.20	6.0	2.42
4	5.4	2.30	39.31	3.6	1.88
5	3.4	1.82	31.29	2.0	1.40

By Linear Regression of Y on X

Slope , mw =   0.0509   Intercept, bw =   -0.1489

Correlation coefficient* =   0.9974

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; $W = (mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.24

Remarks:

Conducted by:	SK Wong	Signature:	Date:	7 September 2020
Checked by:	Henry Leung	Signature:	Date:	7 September 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

File No. MA20003/55/0004

Project No.   CKL 2 - Flat 103 Cha Kwo Ling Village

Date: 7-Sep-20   Next Due Date: 7-Nov-20   Operator: SK

Equipment No.:   A-01-55   Model No.:   TE 5170   Serial No.   1956

Ambient Condition			
Temperature, Ta (K)	302.4	Pressure, Pa (mmHg)	755.4

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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Calibration of TSP Sampler					
Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) **X - axis**	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ **Y-axis**
1	15.0	3.83	65.21	9.3	3.02
2	11.6	3.37	57.40	7.0	2.62
3	8.6	2.90	49.49	5.6	2.34
4	5.4	2.30	39.31	3.5	1.85
5	3.2	1.77	30.37	2.3	1.50

By Linear Regression of Y on X

  Slope , mw =   0.0433   Intercept, bw =   0.1717

  Correlation coefficient* =   0.9988

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

  Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   4.22

Remarks:

Conducted by: SK Wong   Signature: _____   Date: 7 September 2020

Checked by: Henry Leung   Signature: _____   Date: 7 September 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No. MA20003/04/0002

Project No.	KER 1 - Future Residential Development at Kerry Godown

Date:	3-Oct-20	Next Due Date:	3-Dec-20	Operator:	SK
Equipment No.:	A-01-04	Model No.:	TE 5170	Serial No.	10595

Ambient Condition

Temperature, Ta (K)	301.3	Pressure, Pa (mmHg)	758.4

Orifice Transfer Standard Information

Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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Calibration of TSP Sampler

Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) **X - axis**	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ **Y-axis**
1	13.5	3.65	62.12	6.6	2.55
2	10.7	3.25	55.36	5.3	2.29
3	8.2	2.84	48.52	4.0	1.99
4	4.4	2.08	35.66	2.5	1.57
5	2.6	1.60	27.52	1.8	1.33

By Linear Regression of Y on X

 Slope , mw =   0.0353   Intercept, bw =   0.3298

  Correlation coefficient* =   0.9974

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

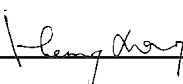From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

 Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   3.45

Remarks:

Conducted by:	SK Wong	Signature:	Date: 3 October 2020
Checked by:	Henry Leung	Signature:	Date: 3 October 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No. MA20003/44/0003

Project No.   KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)

Date:	3-Oct-20	Next Due Date:	3-Dec-20	Operator:	SK
Equipment No.:	A-01-44	Model No.:	TE-5170	Serial No.	1316

Ambient Condition			
Temperature, Ta (K)	301.3	Pressure, Pa (mmHg)	758.4

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.02740
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$

$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$

$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$

Calibration of TSP Sampler					
Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	12.8	3.55	60.50	8.6	2.91
2	10.3	3.19	54.32	6.5	2.53
3	7.9	2.79	47.63	4.9	2.20
4	5.8	2.39	40.88	3.3	1.80
5	3.0	1.72	29.53	1.8	1.33

By Linear Regression of Y on X

Slope , mw = 0.0511   Intercept, bw = -0.2236

Correlation coefficient* = 0.9972

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   3.95

Remarks:

Conducted by:	SK Wong	Signature:		Date:	3 October 2020
Checked by:	Henry Leung	Signature:		Date:	3 October 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No. MA20003/41/0002

Project No. KTD 2c - G/IC Zone next to Kwun Tong Bypass (Next to the Kowloon Bay Sewage Interception Station)

Date:	3-Oct-20	Next Due Date:	3-Dec-20	Operator:	SK
Equipment No.:	A-01-41	Model No.:	TE 5170	Serial No.	5280

Ambient Condition			
Temperature, Ta (K)	301.3	Pressure, Pa (mmHg)	758.4

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	13.6	3.66	62.35	6.6	2.55
2	11.0	3.29	56.12	5.3	2.29
3	8.0	2.81	47.93	4.1	2.01
4	4.6	2.13	36.46	2.6	1.60
5	2.5	1.57	27.00	1.8	1.33

By Linear Regression of Y on X

Slope , mw = 0.0344   Intercept, bw = 0.3744

Correlation coefficient* = 0.9984

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; $W = (mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.49

Remarks:

Conducted by:	SK Wong	Signature:	Date:	3 October 2020
Checked by:	Henry Leung	Signature:	Date:	3 October 2020

TISCH Environmental

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 17, 2020	**Rootsmeter S/N:** 438320	**Ta:** 295 °K
Operator: Jim Tisch		**Pa:** 744.2 mm Hg
Calibration Model #: TE-5025A	**Calibrator S/N: 3746**	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4340	3.2	2.00
2	3	4	1	1.0180	6.4	4.00
3	5	6	1	0.9080	7.9	5.00
4	7	8	1	0.8700	8.7	5.50
5	9	10	1	0.7150	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	0.6868	1.4066	0.9957	0.6944	0.8904
0.9807	0.9633	1.9892	0.9914	0.9739	1.2592
0.9787	1.0779	2.2240	0.9894	1.0896	1.4078
0.9776	1.1237	2.3325	0.9883	1.1360	1.4765
0.9724	1.3601	2.8131	0.9831	1.3749	1.7808
QSTD m=	2.09221		**QA** m=	1.31010	
b=	-0.02779		b=	-0.01759	
r=	0.99994		r=	0.99994	

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

Cerificate of Calibration - Wind Monitoring Station

Description:	Yau Lai Estate, Bik Lai House
Manufacturer:	Davis Instruments
Model No.:	Davis7440
Serial No.:	MC01010A44
Equipment No.:	SA-03-04
Date of Calibration	21-Aug-2020
Next Due Date	21-Feb-2021

1. Performance check of Wind Speed

Wind Speed, m/s		Difference D (m/s)
Wind Speed Reading (V1)	Anemometer Value (V2)	D = V1 – V2
0.0	0.0	0.0
1.5	1.5	0.0
2.2	2.3	-0.1
3.5	3.4	0.1
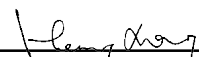
2. Performance check of Wind Direction

Wind Direction (^{o})		Difference D (^{o})
Wind Direction Reading (W1)	Marine Compass Value (W2)	D = W1 - W2
0	0	0.0
90	90	0.0
180	180	0.0
270	270	0.0

Test Specification:

1. Performance Wind Speed Test - The wind meter was on-site calibrated against the anemometer

2. Performance Wind Direction Test - The wind meter was on-site calibrated against the marine compass at four direction

Calibrated by: _____   Approved by: _____

Wong Shing Kwai   Henry Leung