

# RECALIBRATION DUE DATE:

January 24, 2019

# Certificate of Calibration

Calibration Certification Information

Cal. Date: January 24, 2018

Rootsmeter S/N: 438320

Ta: 293 Pa: 756.9 °K

Operator: Jim Tisch

Calibration Model #: TE-5025A

Calibrator S/N: 3166

mm Hg

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4430	3.2	2.00
2	3	4	1	1.0270	6.4	4.00
3	5	6	1	0.9220	7.9	5.00
4	7	8	1	0.8780	8.7	5.50
5	9	10	1	0.7270	12.6	8.00

		Data Tabulat	ion		
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	√∆H(Ta/Pa)
1.0087	0.6990	1.4233	0.9958	0.6901	0.8799
1.0044	0.9780	2.0129	0.9915	0.9655	1.2443
1.0024	1.0872	2.2505	0.9896	1.0733	1.3912
1.0013	1.1404	2.3603	0.9885	1.1259	1.4591
0.9961	1.3701	2.8467	0.9834	1.3526	1.7598
CARCON - VI-	m=	2.12231		m=	1.32895
QSTD	b=	-0.06016	QA	b=	-0.03719
	r=	0.99999	~ .	r=	0.99999

	Calculation	ns	
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/∆Time		Va/ΔTime
	For subsequent flow ra	te calculatio	ns:
Qstd=	$1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$	Qa=	1/m(( √ΔH(Ta/Pa))-t

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	Key
ΔH: calibrator	manometer reading (in H2O)
ΔP: rootsmete	er manometer reading (mm Hg)
Ta: actual abs	olute temperature (°K)
Pa: actual bar	ometric 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



Location :		CMA1b		Calibration Date : 0				: 03-May-18
Equipment no.	-	HVS001				Calibrati	on Due Date	: 03-Jul-18
CALIBRATION OF CONTIN	NUOUS FL	OW RECO	RDER					
				Ambient C	ondition			
Temperature, T <sub>a</sub>		300		Kelvin	Pressure, Pa		10	014 mmHg
			Orifice 1	Transfer Sta	ndard Informa	ation		
Equipment No.		Ori002		Slope, m <sub>c</sub> 2.12231 Intercept, bc			-0.06016	
Last Calibration Date		19-Jan-18 $(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$					$\Gamma_a$ ) $^{1/2}$	
Next Calibration Date		19-Jan-19	9			m <sub>c</sub>	x Q <sub>std</sub> + b <sub>c</sub>	
				Calibration	n of TSP			
Calibration	Mar	nometer Re	ading	Q	std	Conti	nuous Flow	IC
Calibration Point		nometer Re	-		std min.)		nuous Flow corder, W	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3
			-	(m <sup>3</sup> /		Red		
	Н(	inches of w	vater)	(m³ / <b>X-</b> a	min.)	Red	corder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3
Point	<b>H (</b> (up)	inches of v	vater) (difference)	(m³ / <b>X-</b> ε	min.)	Red	corder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3 <b>Y-axis</b>
Point 1	H (up)	(down)	(difference)	(m³ / X-a 0.8 1.0	min.) axis 420	Red	corder, W (CFM)	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3 <b>Y-axis</b> 23.9281
Point  1 2	H (up) 1.5 2.4	(down) 1.5 2.4	(difference) 3.0 4.8	(m³ / X-ε 0.8 1.0	min.) axis 420 576	Red	(CFM) 24 32	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3 <b>Y-axis</b> 23.9281  31.9042
Point  1 2 3	H ( (up) 1.5 2.4 3.8	(down) 1.5 2.4 3.8	(difference) 3.0 4.8 7.6	(m³ / X-æ 0.8 1.0 1.3	axis 420 576	Red	(CFM) 24 32 40	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3 <b>Y-axis</b> 23.9281 31.9042 39.8802
Point  1 2 3 4	H ((up)) 1.5 2.4 3.8 4.9 6.1	(down) 1.5 2.4 3.8 4.9	(difference) 3.0 4.8 7.6 9.8	(m³ / X-æ 0.8 1.0 1.3	axis 420 576 234	Red	(CFM)  24  32  40  46	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3 Y-axis 23.9281 31.9042 39.8802 45.8622

Correlation Coefficient\*

Date

Calibration Accepted

** Delete as a	appropriate.					
Remarks :	As per client's pr	ovided information, the equipr	ment reference no. of the calibrated High Volume Sample	ler has bee	en	
	re-assigned from	ı EL452 to HVS001 with respe	ect to the update in quality management system.			
Calibrated b	; y	Jackey MA	Checked by	:	Pauline Wong	
D-1-	:	03-May-18	Date	:	03-May-18	

0.9995

Yes/No\*\*

<sup>\*</sup> if Correlation Coefficient < 0.990, check and recalibration again.



Location : GMATE	Calibration Date : 28-Jun-18							
Equipment no.		HVS001			(	Calibration Due Date	-	28-Aug-18
CALIBRATION OF CONT	INUOUS FL	OW RECO	RDER					
			Ind.	Ambient C	ondition	ENEWS !		
Temperature, T <sub>a</sub>		302.	2	Kelvin	Pressure, Pa		1010	mmHg
			Orifice	Transfer Sta	ndard Information	n		District of the same of the sa
Equipment No.		Ori002	H 9	Slope, m <sub>c</sub>	2.12231	Intercept, b	С	-0.06016
Last Calibration Date		19-Jan-1	8	(HxP <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup>			/2	
Next Calibration Date		19-Jan-1	9	$m_c \times Q_{std} + b_c$				
		-		Calibration	n of TSP			
Calibration	Ma	nometer Re	eading	Q	std	Continuous Flow		IC
Point	н	inches of v	vater)	(m³ / min.) Reco		Recorder, W	(W(F	P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-a	X-axis (CFM)			Y-axis
1	1.5	1.5	3.0	0.8	375	24		23.7938
2	2.2	2.2	4.4	1.0	1.0082 31			30.7337
3	3.5	3.5	7.0	1.2	643	42		41.6392
4	4.7	4.7	9.4	1.4	606	47	$\perp$	46.5962
5	5.8	5.8	11.6	1.6	194	54		53.5361
By Linear Regression of Y	on X							
	Slope, m	=	37.4	025	Interce	pt, b =	-7.0435	
Correlation (	Coefficient*	=	0.99	972				
Calibration	Accepted	=	Yes/	Ne**				
if Correlation Coefficient <	0.990, che	ck and reca	libration agai	n.				
** Delete as appropriate.								
10 01 01:	s provided i	nformation,	the equipmer	nt reference n	o. of the calibrated	d High Volume Sample	r has bee	on.
2 10	rom EL452	to HVS001	with respect t	o the update	in quality manager	nent system.		
Calibrated by	1000	talie Lau			W-237-163	hecked by	-	Pauline Wong
Date :	28	3-Jun-18			D	ate		28-Jun-18



TESTING	Calibi	ation L	ala ioi r	iigii voit	illie Salli	ipiei (13	r Sampler)	)				
Location :		CMA2a				Calibration	on Date	: (	03-May-18			
Equipment no.		HVS002				Calibration	on Due Date	:	03-Jul-18			
CALIBRATION OF CONTIN	NUOUS FL	OW RECO	<u>RDER</u>									
				Ambient Co	ondition							
Temperature, T <sub>a</sub>		300		Kelvin	Pressure, P <sub>a</sub>	ı	10	014	mmHg			
			Orifice <sup>-</sup>	Transfer Star	dard Inform	ation						
Equipment No.		Ori002		Slope, m <sub>c</sub>					-0.06016			
Last Calibration Date	19-Jan-18				( H	x P <sub>a</sub> / 10	13.3 x 298 / T	$\Gamma_{\rm a}$ ) 1/2	a) 1/2			
Next Calibration Date		19-Jan-1	$m_c \times Q_{std} + b_c$									
				Calibration	of TSP							
Calibration	Mai	nometer R	eading	Q	std	Contin	uous Flow		IC			
Point	Н (	inches of	water)	$(m^3 /$	min.)	Rec	Recorder, W		3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)			
	(up)	(down)	(difference)	X-a	xis	(CFM)		,	Y-axis			
1	1.6	1.6	3.2	0.86	687	25		2	4.9251			
2	2.5	2.5	5.0	1.07	788	32		3	1.9042			
3	4.0	4.0	8.0	1.35	571		43	4	2.8712			
4	5.1	5.1	10.2	1.52	287		50	4	9.8503			
5	6.5	6.5	13.0	1.72	221		56	5	5.8323			
By Linear Regression of Y o	on X Slope, m	=	37.0	)288	Int	tercept, b =	-7.4	<b>4710</b>				
Correlation C	Coefficient*	=	0.9	991								
Calibration	Accepted	=	Yes	′ <del>No</del> **								
* if Correlation Coefficient <	: 0.990, che	eck and rec	alibration aga	in.								
** Delete as appropriate.												
Remarks : As per client's	s provided i	nformation,	the equipme	nt reference n	o. of the calil	brated High V	olume Sampler h	as been				
re-assigned fr	rom EL449	to HVS002	with respect	to the update	in quality mar	nagement sys	item.					
Calibrated by	J	ackey MA				Checked	by	: _ Pu	aline Wong			
Date	0	3-May-18				Date		: 0	03-May-18			



Location	1	CMA2a	Calibration Date	: 28-Jun-18					
Equipment no.	1	HVS002				Calibration Due Date	:	28-Aug-18	
CALIBRATION OF CON	ITINUOUS FL	OW RECO	RDER						
			THE	Ambient C	ondition			7	
Temperature, T <sub>a</sub>		302.	2	Kelvin	Pressure, Pa		1010	mmHg	
			Orifice	Transfer Sta	ndard Informatio	n	- 10		
Equipment No.		Ori002	8	Slope, m <sub>c</sub>	2.12231	Intercept, b	c	-0.06016	
Last Calibration Date	9	19-Jan-1	В		(Hxi	P <sub>a</sub> / 1013.3 x 298	/T <sub>a</sub> ) 1/	2	
Next Calibration Date	0	19-Jan-1	9			$m_c \times Q_{std} + b_c$			
			11-6	Calibration	n of TSP			The state of	
Calibration	Ma	nometer Re	eading	Q	std	Continuous Flow	T	IC	
Point	н	H (inches of water)		ter) (m³/min.)		Recorder, W	(W(Pa	/1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-4	X-axis (CFM)		Y-axis		
1	1.3	1.3	2.6	0.7	816	25		24.7852	
2	2.3	2.3	4.6	1.0	302	32		31.7251	
3	3.5	3.5	7.0	1.2	643	43		42.6306	
4	4.8	4.8	9.6	1.4	757	50		49.5704	
5	6.1	6.1	12.2	1.6	600	56		55.5189	
By Linear Regression of	Y on X								
	Slope, m	=	36.0	376	Interce	ept, b =	3.9257		
Correlation	n Coefficient*	=	0.9	971	10				
Calibrat	ion Accepted	=	Yes/	No**					
	100								
* if Correlation Coefficien	t < 0.990, che	ck and reca	libration agai	n.					
** Delete as appropriate.									
Remarks : As per clier	nt's provided in	nformation,	the equipmer	nt reference n	no. of the calibrate	ed High Volume Sampler	has beer	Î.	
re-assigned	from EL449	to HVS002	with respect t	o the update	in quality manage	ment system.			
Calibrated by	: Na	atalie Lau				Checked by	:	Pualine Wong	
Date	2	8-Jun-18			ı	Date	:	28-Jun-18	



Location	:	CMA3a	Calibration Date	:	04-May-18
Equipment no.	:	HVS012	Calibration Due Date	:	04-Jul-18

# **CALIBRATION OF CONTINUOUS FLOW RECORDER**

Ambient Condition							
Temperature, T <sub>a</sub>	297	Kelvin	Pressure, P <sub>a</sub>	1016	mmHg		
	Office Transfer Oracle Hall of constant						

Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.12231	Intercept, bc	-0.06016			
Last Calibration Date	19-Jan-18		(HxP <sub>a</sub> / 1013.3 x 298 / T <sub>a</sub> ) <sup>1/2</sup>					
Next Calibration Date	19-Jan-19	$m_c \times Q_{std} + b_c$						

				Calibration of TSP		
Calibration	Mai	nometer Re	eading	Q <sub>std</sub>	Continuous Flow	ıc
Point	Н (	inches of v	water)	(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis
1	1.3	1.3	2.6	0.7904	32	32.0965
2	2.2	2.2	4.4	1.0197	38	38.1146
3	3.5	3.5	7.0	1.2787	46	46.1387
4	4.6	4.6	9.2	1.4618	50	50.1508
5	5.7	5.7	11.4	1.6240	56	56.1689
By Linear Regression of Y	on X					
	Slope, m	=	28.4	850 In	tercept, b =	9.3566
Correlation C	oefficient*	=	0.99	982		
Calibration	Accepted	=	Yes/l	<del>\0</del> **		

<sup>\*</sup> if Correlation Coefficient < 0.990, check and recalibration again.

As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been Remarks :

re-assigned from EL333 to HVS012 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong

Date Date Checked by : O4-May-18

Date 04-May-18

<sup>\*\*</sup> Delete as appropriate.



Location	2	CMA3a	Calibration Date :	27-Jun-18
Equipment no.	2	HVS012	Calibration Due Date :	27-Aug-18

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

		Ambient C	ondition			
remperature, T <sub>a</sub>	302.2	Kelvin	Pressure, Pa		1010 mm	ıHg
	Orifice	Transfer Star	ndard Information		4-1-6	
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.12231	Intercept, be	-0.06016	
Last Calibration Date	19-Jan-18		(HxPa)	1013.3 x 298	/T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date	19-Jan-19		п	$b_c \times Q_{std} + b_c$		
	THE CONTRACTOR OF THE PARTY OF	Calibration	of TSP			
Calibration	Manometer Reading	C	t std Co	entinuous Flow	IC	
Point	H (inches of water)	(m³	/ min.)	Recorder, W	(W(P,/1013.3x298/T,)1/2	/35.31

Point	(W(P <sub>a</sub> /1013.3x29	98/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	Y-ax	tis
1	29.74	123
2	36.68	321
3	43.62	220
4	48.57	'90
5	53.53	161
Regression of Y on 2		
Slo	6.5410	
Correlation Coeffi		75
Calibration Acc		

<sup>\*</sup> If Correlation Coefficient < 0.990, check and recalibration again.

" Delete as	appropriate.				
Remarks :	As per client's p	provided information, the equipment ref	ference no. of the calibrated High Volume	Sampler	has been
Calibrated b		m EL333 to HVS012 with respect to the Natalie Lau	e update in quality management system.  Checked by	:	Pauline Wong
Dato	. —	27-Jun-18	Date		27-Jun-18

24.0724



# **Calibration Data for High Volume Sampler (TSP Sampler)**

Location	:	CMA4a	Calibration Date	:	04-May-18
Equipment no.	:	HVS004	Calibration Due Date	: ]	04-Jul-18

#### **CALIBRATION OF CONTINUOUS FLOW RECORDER**

CALIBRATION OF CONT	INCOCC I LOW K	LCONDLN					
			Ambient C	Condition			
Temperature, T <sub>a</sub>	297 Kelvin <b>Pressure</b> , <b>P</b> <sub>a</sub> 1016 mmH						
		Orifice	Transfer Sta	ndard Inforn	mation		
Equipment No.	Ori0	02	Slope, m <sub>c</sub>	2.122	31	Intercept, bc	-0.06016
Last Calibration Date	19-Jai	n-18		( H	x P <sub>a</sub> / 1	013.3 x 298 / T	a) 1/2
Next Calibration Date	19-Jai	า-19	$m_c \times Q_{std} + b_c$				
			Calibratio	n of TSP			
Calibration	Manometer	Reading	Q	std	Cont	inuous Flow	IC
Point	H (inches	of water)	(m <sup>3</sup> /	min.)	Re	ecorder, W	$(W(P_a/1013.3x298/T_a)^{1/2}/35.31)$
	(up) (dowr	) (difference)	X-a	xis		(CFM)	Y-axis

0.8469

24

2	2.3	2.3	4.6	1.0420	34	34.1025
3	3.7	3.7	7.4	1.3140	44	44.1327
4	4.9	4.9	9.8	1.5078	50	50.1508
5	6.2	6.2	12.4	1.6926	56	56.1689
By Linear Regression of Y	on X					
	Slope, m	=	37.	2631 In	tercept, b = -5.5	9956
Correlation C	oefficient*	=	0.9	9954		
Calibration	Accepted	=	Yes	./ <del>No</del> **		

<sup>\*</sup> if Correlation Coefficient < 0.990, check and recalibration again.

1.5

3.0

Remarks : 

As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL390 to HVS004 with respect to the update in quality management system.

 Calibrated by
 Jackey MA
 Checked by
 : Pauline Wong

 Date
 04-May-18
 Date
 : 04-May-18

<sup>\*\*</sup> Delete as appropriate.



Location		CMA4a	Calibration Date		27-Jun-18
Equipment no.		HVS004	Calibration Due Date	1	27-Aug-18
	100	100000000000000000000000000000000000000			

## CALIBRATION OF CONTINUOUS FLOW RECORDER

Temperature, T <sub>a</sub>	302.2	Kelvin	Pressure, Pa	1010	mmHg
	0	rifice Transfer Sta	andard Information		
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.12231	Intercept, bc	-0.06016
Last Calibration Date	19-Jan-18		(HxPa)	(1013.3 x 298 / T <sub>a</sub> )	1/2
Next Calibration Date	19-Jan-19		n	c X Q <sub>std</sub> + b <sub>c</sub>	

				Calibration of TS	P		
Calibration Point		nometer R inches of (down)	1000	Q <sub>std</sub> (m³ / min.) X-axis	Continuo Record (CF	ler, W	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31 <b>Y-axis</b>
1	1.3	1.3	2.6	0.7816	20	)	19.8282
2	2.2	2.2	4.4	1.0082	30	)	29.7423
3	3.6	3.6	7.2	1.2818	40	)	39.6563
4	4.8	4.8	9.6	1.4757	46	3	45.6048
5	6.0	6.0	12.0	1.6466	56	3	55.5189
	Slope, m ion Coefficient* ration Accepted	= =	39.528 0.9962 Yes/No	2	Intercept, b =	-1	0.8967

<ul> <li>if Correlation Coefficient &lt; 0.990, che</li> </ul>	ck and recalibration again
--	----------------------------

** Delete as approp	oriate.
---------------------	---------

As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been Remarks: re-assigned from EL390 to HVS004 with respect to the update in quality management system. Checked by Pauline Wong Natalie Lau Calibrated by Date 27-Jun-18 27-Jun-18 Date



Location	:	CMA5b	Calibration Date	:	04-May-18
Equipment no.	: '	HVS010	Calibration Due Date	: '	04-Jul-18

## CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
Temperature, T <sub>a</sub>	297	Kelvin <b>Pressure</b> , P <sub>a</sub>	1016	mmHg	

	Orifice Transfer Standard Information						
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.12231	Intercept, bc	-0.06016		
Last Calibration Date	19-Jan-18		( H x P <sub>a</sub> /	1013.3 x 298 / T <sub>a</sub> )	1/2		
Next Calibration Date	19-Jan-19		= m	$a_c \times Q_{std} + b_c$			

	Calibration of TSP						
Calibration	Ма	nometer Re	eading	Q <sub>std</sub>	Continuous Flow	IC	
Point	н	(inches of v	water)	(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis	
1	1.5	1.5	3.0	0.8469	30	30.0905	
2	2.3	2.3	4.6	1.0420	38	38.1146	
3	3.9	3.9	7.8	1.3483	46	46.1387	
4	5.0	5.0	10.0	1.5229	52	52.1568	
5	6.4	6.4	12.8	1.7192	56	56.1689	

Slope, m = 29.7383 Intercept, b = 5.9977

Correlation Coefficient\* = 0.9953

Calibration Accepted = Yes/<del>No</del>\*\*

**	Delete	as	appro	priate.

Remarks: As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been

re-assigned from EL222 to HVS010 with respect to the update in quality management system.

 Calibrated by Date
 :
 Jackey MA
 Checked by Date
 :
 Pauline Wong

 Date
 04-May-18
 04-May-18
 :
 04-May-18

 $<sup>\</sup>ensuremath{^*}$  if Correlation Coefficient < 0.990, check and recalibration again.



Location	;	CMA5b	Calibration Date		27-Jun-18
Equipment no.		HVS010	Calibration Due Date	t	27-Aug-18

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition					
302.2	Kelvin	Pressure, P.	1010	mmHg	
,	302.2	302.2 Kelvin	302.2 Kelvin Pressure, Pa	302.2 Kelvin Pressure, P. 1010	

	01	rifice Transfer Standa	ard Information		
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.12231	Intercept, bc	-0.06016
Last Calibration Date	19-Jan-18	3,000	(HxPa	/1013.3 x 298/T <sub>a</sub> )	1/2
Next Calibration Date	19-Jan-19		= /	$m_c \times Q_{std} + b_c$	

Point Point	1550	(inches of (down)	KD-000857/	Q <sub>std</sub> (m <sup>3</sup> / min.) X-axis	Continuous Flow Recorder, W (CFM)	IC (W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>12</sup> /35.31 Y-axis
1	1.5	1.5	3.0	0.8375	28	27.7594
2	2.3	2.3	4.6	1.0302	36	35.6907
3	3.5	3.5	7.0	1.2643	43	42,6306
4	4.3	4.3	8.6	1.3983	47	46.5962
5	5.5	5.5	11.0	1.5777	52	51.5532

Slope, m

Correlation Coefficient\*

0.9968

Yes/Ne\*\* Calibration Accepted

** Delei	le as	appropriate.
----------	-------	--------------

Remarks:

As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been

re-assigned from EL222 to HVS010 with respect to the update in quality management system.

Calibrated by Date

Natalie Lau 27-Jun-18

Checked by Date

Pauline Wong 27-Jun-18

<sup>\*</sup> if Correlation Coefficient < 0.990, check and recalibration again.



Location	:	CMA6a	Calibration Date	:	04-May-18
Equipment no.	:	HVS013	Calibration Due Date	:	04-Jul-18

## **CALIBRATION OF CONTINUOUS FLOW RECORDER**

Ambient Condition							
Temperature, T <sub>a</sub>	297	Kelvin <b>Pressure</b> , <b>P</b> <sub>a</sub>	1016	mmHg			

Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.12231	Intercept, bc	-0.06016			
Last Calibration Date	19-Jan-18	(HxP <sub>a</sub> /1013.3 x 298/T <sub>a</sub> ) <sup>1/2</sup>						
Next Calibration Date	19-Jan-19		= <b>m</b>	$_{\rm c}$ x Q $_{\rm std}$ + $_{\rm c}$				

Calibration of TSP								
Calibration	Manometer Reading		Q <sub>std</sub>	Continuous Flow	IC			
Point	H (inches of water)		(m³ / min.) Recorder, W		(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)			
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis		
1	1.5	1.5	3.0	0.8469	30	30.0905		
2	2.4	2.4	4.8	1.0638	36	36.1086		
3	3.8	3.8	7.6	1.3312	44	44.1327		
4	4.8	4.8	9.6	1.4927	50	50.1508		
5	5.8	5.8	11.6	1.6380	56	56.1689		
By Linear Regression of Y or	v Linear Regression of Y on X							

z,a					
	Slope, m	=	32.6286	Intercept, b =	1.7447

Calibration Accepted = 0.9968

Yes/No\*\*

Remarks: As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been

re-assigned from EL551 to HVS013 with respect to the update in quality management system.

 Calibrated by Date
 : Jackey MA
 Checked by Date
 : Pauline Wong

 Date
 04-May-18
 Date
 : 04-May-18

<sup>\*</sup> if Correlation Coefficient < 0.990, check and recalibration again.

<sup>\*\*</sup> Delete as appropriate.



Location	\$8	CMA6a	Calibration Date	:	27-Jun-18
Equipment no.		HVS013	Calibration Due Date	4	27-Aug-18

## CALIBRATION OF CONTINUOUS FLOW RECORDER

	302.2	Kelvin Pre	essure, P <sub>a</sub>	1010	mmHg
	Ort	fice Transfer Standa	ard Information		
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.12231	Intercept, bc	-0.06016
Last Calibration Date	19-Jan-18		(HxPa	/1013.3 x 298 / T <sub>a</sub> )	1/2
Next Calibration Date	19-Jan-19		= n	$n_c \times Q_{std} + b_c$	

**Ambient Condition** 

Calibration		nometer R		Q <sub>std</sub> (m <sup>3</sup> / min.)		rder, W	IC (W(P <sub>2</sub> /1013.3x298/T <sub>2</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-axis	(0)/(0)	FM)	Y-axis
1	1.6	1.6	3.2	0.8640		30	29.7423
2	2.6	2.6	5.2	1.0936	S	38	37.6735
3	3.4	3.4	6.8	1.2465		44	43.6220
4	4.9	4.9	9.8	1.4907		50	49.5704
5	5.8	5.8	11.6	1.6194		57	56.5103
y Linear Regression of Y	on X						
	Slope, m		34.0385	i	Intercept, b =	0	0.4390
Correlation	Coefficient*	-	0.9952		-		
Calibration	on Accepted	-	Yes/No*	•			

<ul> <li>if Correlation</li> </ul>	Coefficient	< 0.990.	check and	recalibration	again.

Remarks: As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL551 to HVS013 with respect to the update in quality management system.

Calibrated by	- 4	Natalie Lau	Checked by		Pauline Wong
Date	: =	27-Jun-18	Date	8_	27-Jun-18

<sup>\*\*</sup> Delete as appropriate.



港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0322 01

Page

of

2

Item tested

Description

Sound Level Meter (Type 1)

Microphone

Manufacturer: Type/Model No.: Larson Davis

PCB

Serial/Equipment No.:

LxT1 0003737 377B02 171529

Adaptors used:

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.

Date of receipt:

22-Mar-2018

Date of test:

28-Mar-2018

Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator

B&K 4226 DS 360

2288444 61227

08-Sep-2018 01-Apr-2018

CIGISMEC CEPREL

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 % 1005 ± 5 hPa

Test specifications

The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152

2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of +20%

3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

## Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

06-Apr-2018

Company Chop:

The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

© Soils & Materials Engineering Co. Ltd.

Form No CARP157-1/Issue 1/Rev C/01/02/2007



香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mall: smec@cigismec.com Website; www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0322 01

Page

2

2

#### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A C	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	N/A	N/A	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz Weighting A at 8000 Hz	Pass Pass	0.3 0.5	

#### 3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

End

by:

Date:

Fung Chi Yip

Checked by:

Lam Tze Wai

28-Mar-2018

Date:

06-Apr-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd.

Form No CARP 152-2/Issue 1/Rev C/01/02/2007



香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:

17CA1110 02

Item tested

Description: Manufacturer: Acoustical Calibrator (Class 1)

Type/Model No.: Serial/Equipment No.: Rion Co., Ltd. NC-73

Adaptors used:

10707358

Item submitted by

Curstomer.

Lam Geotechnics Ltd.

Address of Customer Request No.

Date of receipt:

10-Nov-2017

Date of test:

14-Nov-2017

# Reference equipment used in the calibration

Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer Universal counter	Model:	Serial No.	Expiry Date:	Traceable to:
	B&K 4180	2341427	11-Apr-2018	SCL
	B&K 2673	2239857	05-May-2018	CEPREI
	B&K 2610	2346941	03-May-2018	CEPREI
	DS 360	61227	01-Apr-2018	CEPREI
	34401A	US36087050	25-Apr-2018	CEPREI
	8903B	GB41300350	21-Apr-2018	CEPREI
	53132A	MY40003662	22-Apr-2018	CEPREI

#### Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1010 ± 5 hPa

## Test specifications

- 1. The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique. 2.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes

#### Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

-Min/Feng Jun Qi

Huang Jia

Approved Signatory:

Date:

15-Nov-2017

Company Chop:

Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

© Soils & Materials Engineering Co., Ltd.

Form No CARP156-1/Issue 1/Rev D/01/03/2007



香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA1110 02

Page:

2

1, Measured Sound Pressure Level

> The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties

Hz dB	30	16
1000 94.00	93.93	0.10

#### 2. Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be

At 1000 Hz

STF = 0.008 dB

Estimated expanded uncertainty

0.005 dB

#### 3, **Actual Output Frequency**

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz

Actual Frequency = 991.5 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

#### Total Noise and Distortion 4.

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz

TND = 0.3 %

Estimated expanded uncertainty

0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

End

Calibrated by:

Checked by:

Date:

14-Nov-2017

Date:

Fung Chi Yip 5-Nov-2017

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

Form No CARP156-2/Issue 1/Rev C/01/05/2000



香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail; smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0309 02

Page:

of

2

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.: Larson Davis CAL 200

Serial/Equipment No.: Adaptors used: 13098

Item submitted by

Curstomer:

Lam Environmental Service Ltd.

Address of Customer:

- 6

Request No.: Date of receipt:

09-Mar-2018

Date of test:

12-Mar-2018

#### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2239857	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Digital multi-meter	34401A	US36087050	25-Apr-2018	CEPREI
Audio analyzer	8903B	GB41300350	21-Apr-2018	CEPREI
Universal counter	53132A	MY40003662	22-Apr-2018	CEPREI

#### Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity:

50 ± 10 %

Air pressure:

1000 ± 5 hPa

#### Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B
  and the lab calibration procedure SMTP004-CA-156.
- 2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference
  pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure
  changes.

#### Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.

Feng Jun Qi

Approved Signatory:

Date: 12

12-Mar-2018

Company Chop:

SENGINESS SENGI

Comments: The results reported in this conficate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long term stability of the instrument.

© Soils & Materials Engineering Co., Ltd.

Form No CARP156 1/Issue 1/Rev D/01/03/2007



港 黄 竹 坑 道 3 7 號 利 達 中 心 1 2 樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No :

18CA0309 02

Page:

#### Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	(Output level in dB re 20 µPa) Estimated Expanded Uncertainty dB
1000	94.0	93.81	0.10

#### 2. Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz

STF = 0.011 dB

Estimated expanded uncertainty

0.005 dB

#### 3. **Actual Output Frequency**

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz

Actual Frequency = 1000.0 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

#### 4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz

TND = 0.6 %

Estimated expanded uncertainty

0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

End

Fund Chi Yio

Checked by:

Lam Tze Wai

Date:

12-Mar-2018

Date:

12-Mar-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level

© Soils & Materials Engineering Co., Ltd.

Form No CARP156-2/Issue 1/Rev C/01/05/2005



Information supplied by customer:

CONTACT:

MR. SAM LAM

WORK ORDER: HK1810527

CLIENT:

LAM GEOTECHNICS LIMITED

DATE RECEIVED 31/05/2018 DATE OF ISSUE: 04/06/2018

ADDRESS:

11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD,

WANCHAI, HONG KONG

PROJECT:

#### METHOD OF PERFORMANCE CHECK/ CALIBRATION:

Ref: APHA22nd ed 2130B

#### COMMENTS

It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.

Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity	
Equipment Type:	Turbidimeter	
Brand Name:	Xin Rui	
Model No.:	WGZ-3B	
Serial No.:	1403009	
Equipment No.:		
Date of Calibration:	1/6/2018	

Remarks

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

Approved Signatory:

Ms. Wong Po Yan, Pauline Assistant Laboratory Manager Issue Date:

04/06/2018



WORK ORDER: HK1810527 DATE OF ISSUE: 04/06/2018

CLIENT: LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidimeter	
Brand Name:	Xin Rui	
Model No.:	WGZ-3B	
Serial No.:	1403009	
Equipment No.:		
Date of Calibration:	1/6/2018	
Date of next Calibation:	1/9/2018	

#### Parameters:

Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance
0	0.00	
4	3.82	-4.5%
10	9.99	-0.1%
40	37.7	-5.7%
100	100	0.0%
400	414	3.5%
1000	926	-7.4%
	Tolerance Limit (±)	10%

Remark: "Displayed Reading" presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.

This report may not be reproduced except with prior written approval from Pilot Testing Limited.



Information supplied by customer:

CONTACT:

MR. SAM LAM

WORK ORDER: HK1810386

CLIENT:

LAM GEOTECHNICS LIMITED

DATE OF ISSUE: 20/04/2018

DATE RECEIVED: 19/04/2018

ADDRESS:

11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD,

WANCHAI, HONG KONG

PROJECT:

# METHOD OF PERFORMANCE CHECK/ CALIBRATION:

Ref: APHA22nd ed 2130B

## COMMENTS

It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.

Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity	
Equipment Type:	Turbidity Meter	
Brand Name:	PCE Instruments	
Model No.:	PCE-TUM 20	
Serial No.:	Q942542	
Equipment No.:	-	
Date of Calibration:	20/04/2018	

Remarks:

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

Approved Signatory:

Ms. Wong Po Yan, Pauline Assistant Laboratory Manager Issue Date:

20/04/2018

This report may not be reproduced except with prior written approval from Pilot Testing Limited.



WORK ORDER: HK1810386 DATE OF ISSUE: 20/04/2018

CLIENT:

LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidity Meter	
Brand Name:	PCE Instruments	
Model No.:	PCE-TUM 20	
Serial No.:	Q942542	
Equipment No.:		
Date of Calibration:	20/04/2018	
Date of next Calibation:	20/07/2018	

# Parameters:

Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance	
0	0.00		
4	4.38	9.5%	
20	21.91	9.6%	
40	40.45	1.1%	
100	98	-2.0%	
400	393	-1.8%	
800	738	-7.8%	
	Tolerance Limit (±)	10%	

Remark: "Displayed Reading" presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.

This report may not be reproduced except with prior written approval from Pilot Testing Limited.



Information supplied by customer:

CONTACT: MR. SAM LAM WORK ORDER: HK1810676

CLIENT: LAM GEOTECHNICS LIMITED

DATE RECEIVED: 10/07/2018 DATE OF ISSUE: 12/07/2018

ADDRESS: 11/F, CENTRE POINT, 181-185, GLOUCESTER ROAD,

WANCHAI, HONG KONG

PROJECT: -

# METHOD OF PERFORMANCE CHECK/ CALIBRATION:

Ref: APHA22nd ed 2130B

#### COMMENTS

It is certified that the item under performance check/calibration has been calibrated/checked by corresponding calibrated equipment in the laboratory.

Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.

Scope of Test:	Turbidity	
Equipment Type:	Turbidity Meter	
Brand Name:	PCE Instruments	
Model No.:	PCE-TUM 20	
Serial No.:	Q942542	
Equipment No.:		
Date of Calibration:	11/07/2018	

Remarks

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

Approved Signatory:

Ms. Wong Po Yan, Pauline Assistant Laboratory Manager Issue Date:

12/07/2018



WORK ORDER: HK1810676 DATE OF ISSUE: 12/07/2018

CLIENT: LAM GEOTECHNICS LIMITED

Equipment Type:	Turbidity Meter	
Brand Name:	PCE Instruments	
Model No.:	PCE-TUM 20	
Serial No.:	Q942542	
Equipment No.:		
Date of Calibration:	11/07/2018	
Date of next Calibation:	11/10/2018	

# Parameters:

Turbidity

Method Ref: APHA 22nd ed. 2130B

Expected Reading (NTU)	Display Reading (NTU)	Tolerance
0	0.00	
4	4.20	5.0%
20	19.92	-0.4%
40	36.00	-10.0%
100	98	-2.0%
400	383	-4.3%
800	726	-9.3%
F-7-7	Tolerance Limit (±)	10%

Remark: "Displayed Reading" presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.



#### **EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT**

Report No. : HK1810333

Project Name : EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT

Date of Issue : 9/4/2018

Customer : LAM ENVIRONMENTAL SERVICES LIMITED

Address : 11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

 Calibration Job No.
 : HK1810333

 Test Item No.
 : HK1810333-01

Test Item Details Test Item Description

Test Item Description : Sonde
Manufacturer : YSI
Model No. : Professional Plus

Serial No. : 14M100277

Performance Method : Checked according to in-house method CAL005

(References: Temperature (Section 6 of Intermational Accreditation New Zealand Technical Gi No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value

(APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B)

, Dissolved oxygen (APHA 19e 4500-O,C))

Test Item Receipt Date : 6/4/2018 Test Item Calibration Date : 6/4/2018

Notes: 1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.

2. Results relate to item(s) as received.

3. ± indicates the tolerance limit

4. N/A = Not applicable

 APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF. USA

6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.

 Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory

Ms. Wong Po Yan, Pauline (Assistant Laboratory Manager) Issue Date:

9/4/2018



WORK ORDER: HK1810333 DATE OF ISSUE: 9/4/2018

CLIENT: LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde	
Manufacturer	YSI	
Model No.	Professional Plus	
Serial No.	14M100277	
Date of Calibration	06-Apr-18	
Date of next Calibation	06-Jul-18	

#### Parameters:

Temperature (Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No.3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (°C)
4.6	4.6	0.0
15.0	14.8	-0.1
25.1	25.1	0.0
T	olerance Limit	±2.0

pH Value (Method Ref: APHA21e, 4500H:B)

Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	4.06	4.08	0.02
7.0	7.02	7.09	0.07
10.0	9.97	10.00	0.03
	Tolerance Limit		±0,20

Conductivity (Method Ref: APHA 19e, 2510)

KCI concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	. <del></del> )
0.1000	12.2	12.1	-0.98
0.2000	24.8	24.6	-0.65
0.5000	54.5	54.1	-0.73
	Tolerance Limit		±2.0

Dissolved Oxygen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
8.18	8.22	0.04
6.66	6.52	-0.14
4.75	4.81	0.06
	Tolerance Limit	±0.20

Remarks:

- (1) Maxium tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
- (2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
- (3) Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

- End of Report -



# EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT

Report No.

HK1810679

**Project Name** 

EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT

Date of Issue

11/7/2018

Customer

: LAM ENVIRONMENTAL SERVICES LIMITED

Address

: 11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

Calibration Job No. Test Item No. : HK1810679 : HK1810679-01

Test Item Details Test Item Description

: Sonde : YSI

Manufacturer Model No. Serial No.

Professional Plus 14M100277

Performance Method

Checked according to in-house method CAL005

(References: Temperature (Section 6 of Intermational Accreditation New Zealand Technical Gi No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value

(APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B)

Test Item Receipt Date Test Item Calibration Date Dissolved oxygen (APHA 19e 4500-O,C)) 10/7/2018 11/7/2018

Notes: 1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.

2. Results relate to item(s) as received.

3. ± indicates the tolerance limit

4. N/A = Not applicable

 APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF, USA

6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.

 Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory

Ms. Wong Po Yan, Pauline

(Assistant Laboratory Manager)

Issue Date:

11/7/2018



WORK ORDER: **DATE OF ISSUE: 11/7/2018** 

HK1810679

CLIENT:

LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde	
Manufacturer	YSI	
Model No.	Professional Plus	
Serial No.	14M100277	
Date of Calibration	11-Jul-18	
Date of next Calibation	11-Oct-18	

Temperature (Method Ref: Section 6 of Intermational Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (*C)
6.4	6.4	0.0
13.5	13.4	-0.1
26.9	26.7	-0.2
	olerance Limit	±2.0

TO VICE TO THE STATE OF A DUADA A STANLEY

Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	4.08	4.06	-0.02
7.0	7.02	7.13	0.11
10.0	10.00	9.97	-0.03
10.0	Tolerance Limit		±0.20

Conductivity (Method Ref: APHA 19e, 2510)

KCI concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	-
0.1000	12.8	12.6	-1.87
0.2000	23.7	23.6	-0.34
0.5000	57.3	56.8	-0.87
0.000	Tolerance Limit		±2.0

Dissolved Ovegen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
7.37	7.49	0.12
6.41	6.49	0.08
5.55	5.68	0.13
0.00	Tolerance Limit	±0.20

- (1) Maxium tolerance and calibration frequency stated in the report, unless otherewise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
- (2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
- (3) Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.



#### EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT

Report No. : HK1810373

Project Name EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT

Date of Issue 19/04/2018

Customer : LAM ENVIRONMENTAL SERVICES LIMITED

Address : 11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

Calibration Job No. HK1810373 Test Item No. HK1810373-01 Test Item Details Sonde

**Test Item Description** Manufacturer

YSI Professional Plus Model No. Serial No. 14E100105

Performance Method Checked according to in-house method CAL005

(References: Temperature (Section 6 of Intermational Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value

(APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B)

Dissolved oxygen (APHA 19e 4500-O,C))

**Test Item Receipt Date** 18/04/2018 Test Item Calibration Date 18/04/2018

Notes: 1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.

2. Results relate to item(s) as received.

3. ± indicates the tolerance limit

4. N/A = Not applicable

5. APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF, USA

6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.

7. Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory

Ms. Wong Po Yan, Pauline (Assistant Laboratory Manager)

Issue Date:

19/04/2018



**WORK ORDER:** HK1810373 **DATE OF ISSUE:** 19/04/2018

CLIENT: LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde
Manufacturer	YSI
Model No.	Professional Plus
Serial No.	14E100105
Date of Calibration	18-Apr-18
Date of next Calibation	18-Jul-18

#### Parameters:

Temperature (Method Ref: Section 6 of Intermational Accreditation New Zealand Technical Guide No.3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (°C)
7.2	7.2	0.0
14.7	14.6	-0.1
26.0	25.9	-0.1
	Tolerance Limit	±2.0

pH Value (Method Ref: APHA21e, 4500H:B)

	-, ,		
Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	4.12	4.15	0.03
7.0	7.06	7.08	0.02
10.0	10.05	9.92	-0.13
	Tolerance Limit		±0.20

Conductivity (Method Ref: APHA 19e, 2510)

KCI concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	-
0.1000	11.8	11.6	-1.69
0.2000	22.7	22.7	0.00
0.5000	58.6	57.9	-1.19
	Tolerance Limit		±2.0

Dissolved Oxygen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
8.44	8.60	0.16
7.37	7.42	0.05
5.45	5.52	0.07
	Tolerance Limit	±0.20

Remarks:

- (1) Maxium tolerance and calibration frequency stated in the report, unless otherewise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
- (2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
- (3) Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.



# EQUIPMENT PERFORMANCE CHECK / CALIBRATION REPORT

Report No. : HK1810678

Project Name : EQUIPMENT PERFORMANCE CHECK/CALIBRATION REPORT

Date of Issue : 12/7/2018

Customer : LAM ENVIRONMENTAL SERVICES LIMITED

Address : 11/F., CENTRE POINT, 181-185 GLOUCESTER ROAD, WAN CHAI, HONG KONG

Calibration Job No. : HK1810678 Test Item No. : HK1810678-01

Test Item Details

Test Item Description : Sonde Manufacturer : YSI

Model No. : Professional Plus Serial No. : 14K100322

Performance Method : Checked according to in-house method CAL005

(References: Temperature (Section 6 of Intermational Accreditation New Zealand Technical Gi No. 3 Second edition March 2008: Working Thermometer Calibration Procedure), pH value

(APHA 21e 4500H:B), Salinity (Refer to Conductivity APHA 19e 2510B)

Dissolved oxygen (APHA 19e 4500-O,C))

Test Item Receipt Date : 10/7/2018 Test Item Calibration Date : 11/7/2018

Notes: 1. This report shall not be reproduced, except in full, without prior approval from Pilot Testing Limited.

Results relate to item(s) as received.

3. ± indicates the tolerance limit

4. N/A = Not applicable

 APHA - American Public Health Association, American Water Works Association and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WEF, USA

6. DO, pH, salinity and temperature performance check was conducted by Pilot Testing Limited.

 Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

Approved Signatory

Ms. Wong Po Yan, Pauline (Assistant Laboratory Manager) Issue Date:

12/7/2018



WORK ORDER: HK1810678 DATE OF ISSUE: 12/7/2018

CLIENT: LAM ENVIRONMENTAL SERVICES LIMITED

Equipment Type	Sonde	
Manufacturer	YSI	
Model No.	Professional Plus	
Serial No.	14K100322	
Date of Calibration	11-Jul-18	
Date of next Calibation	11-Oct-18	

#### Parameters:

Temperature (Method Ref: Section 6 of Intermational Accreditation New Zealand Technical Guide No.3 Second edition March 2008: Working Thermometer Calibration Procedure)

Reference Reading (°C)	Display Reading (°C)	Deviation (°C)
7.1	7.0	-0.1
13.8	13.9	0.1
27.0	26.8	-0.2
	olerance Limit	±2.0

pH Value (Method Ref: APHA21e, 4500H:B)

Expected Reading (pH unit)	Reference Reading (pH unit)	Display Reading (pH unit)	Deviation (pH unit)
4.0	4.08	4.04	-0.04
7.0	7.02	7.16	0.14
10.0	10.00	10.01	0.01
, , , ,	Tolerance Limit		±0.20

Conductivity (Method Ref: APHA 19e, 2510)

KCI concentration (mol/L)	Reference Reading (ms/cm)	Display Reading (ms/cm)	Deviation (%)
0.0000	0.00	0.00	-
0.1000	12.8	12.8	-0.62
0.2000	23.7	23.7	0.17
0.5000	57.3	56.9	-0.70
0.0000	Tolerance Limit	1000000	±2.0

Dissolved Oxygen (DO) (Method Ref: APHA 19e, 4500-O, C)

Reference DO reading (mg/L)	DO reading od DO probe (mg/L)	Deviation (mg/L)
7.22	7.14	-0.08
6.69	6.75	0.06
5.80	5.93	0.13
0.00	Tolerance Limit	±0.20

Remarks:

- (1) Maxium tolerance and calibration frequency stated in the report, unless otherewise stated, the internal acceptance criteria of Pilot Testing Limited will be followed.
- (2) Displayed reading presents the figures shown on item under calibration/checking regardless of equipment precision or significant figures.
- (3) Because of high sensitivity and ease of measurement, the conductivity method (according to APHA 19e 2510) is used to determine salinity.

- End of Report -