

MTR Corporation Limited

**Shatin to Central Link**  
**Mong Kok East to Hung Hom Section**

**Monthly Operational Airborne Rail Noise**  
**Monitoring Report No. 6 (Final)**

[period from 15 October to 14 November 2022]

(November 2022)



Verified by:

Claudine Lee

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Position:

Independent Environmental Checker

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Date:

4 November 2022

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MTR Corporation Limited

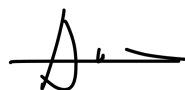
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**Mong Kok East to Hung Hom Section**

**Final Operational Airborne Rail Noise**  
**Monitoring Report**

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(November 2022)

Certified by:



Alex Siu

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Position:

Environmental Team Leader

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Date:

4 November 2022

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MTR Corporation Limited

Consultancy Agreement No. C11033B

**Shatin to Central Link – Mong Kok East to  
Hung Hom Section [SCL (MKK – HUH)]**

**Final Operational Airborne Rail Noise  
Monitoring Report**

October 2022

	Name	Signature
Prepared & Checked:	Ben Wong	
Reviewed & Approved:	 Freeman Cheung	

Version: A Date: 27 October 2022

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## **1 INTRODUCTION**

### **1.1 Background**

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 Following the cessation of the operations of various freight facilities at Hung Hom in April 2011, MTR Corporation Limited started a detailed study to investigate the feasibility and environmental acceptability of utilizing the former freight yard to accommodate the train stabling requirements for SCL (TAW-HUH). To allow Stabling Sidings at Hung Hom Freight Yard (HHS) feasible for the use of stabling, in addition to providing siding tracks underneath the existing podium structure covering the freight yard, and launching/retrieval and emergency tracks and shunt neck extending outside the podium, appropriate changes were made to the design of SCL (TAW-HUH) and SCL Mong Kok East to Hung Hom Section [SCL (MKK-HUH)] at HUH, Kai Tak Station (KAT) and Diamond Hill Station (DIH) and its associated alignment and facilities.
- 1.1.3 Environmental Impact Assessment (EIA) Reports for SCL – Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012), SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) and SCL - Mong Kok East to Hung Hom Section [SCL(MKK – HUH)] (Register No. AEIAR-165/2012) (hereinafter referred to as “the EIA Reports”) were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). The alignment and associated facilities under SCL (TAW-HUH) at HUH, KAT and DIH, and SCL (MKK-HUH) at HUH were superseded by those proposed and assessed in SCL (HHS) EIA Report.
- 1.1.4 Following the approval of the EIA Reports, the Environmental Permit (EP) (EP No: EP-437/2012), covering the construction and operation of SCL (MKK-HUH), was granted on 22 March 2012. Variations of Environmental Permit (VEP) was subsequently applied for EP-437/2012 and the latest Environmental Permit (EP No: EP-437/2012/A) was issued by Director of Environmental Protection (DEP) on 28 November 2017.
- 1.1.5 In accordance with Section 4.19 of the approved Environmental Monitoring and Audit (EM&A) Manuals for SCL (MKK-HUH), monitoring of  $L_{eq,30min}$  airborne rail noise levels will be carried out at the proposed monitoring locations during night-time period, i.e. 2300-0700 hours on a monthly basis after the entire SCL Hung Hom to Admiralty Section (HUH – ADM) is in operation. The noise monitoring will be conducted for the initial start-up of up to 6 months and can be terminated before the end of this 6-month period with full compliance of the noise limit and agreement from IEC.
- 1.1.6 An Operational Rail Noise Monitoring Plan (hereinafter referred to as “the Plan”), which was provided in Appendix A of the Monthly Operational Airborne Rail Noise Monitoring Report No. 1 (June 2022), specifying the monitoring locations, monitoring methodology and noise criteria, was agreed by EPD on 11 May 2022.
- 1.1.7 The East Rail Line Cross-Harbour Extension opened on 15 May 2022, extending its railway services from HUH to ADM as the terminal station via the new EXC (i.e. SCL (HUH – ADM)). As such the operational airborne rail noise monitoring commenced accordingly.
- 1.1.8 AECOM Asia Co. Ltd (AECOM) was commissioned by MTRC to conduct the operational rail noise monitoring for the operation of SCL(MKK-HUH) according to the agreed Plan.

## **1.2 Purpose of the Report**

- 1.2.1 The operation of SCL(MKK-HUH) commenced on 15 May 2022. This is the final operational noise monitoring report presenting the monitoring results obtained between 15 October and 14 November (i.e. 6<sup>th</sup> monitoring period), and summarizing the monitoring results obtained since the operation of SCL(MKK-HUH).

## 2 OPERATIONAL RAIL NOISE MONITORING

### 2.1 Monitoring Equipment

- 2.1.1 In accordance with the Plan, sound level meters in compliance with the prevailing International Electrotechnical Commission Publications 60651 (Type 1) and 60804 (Type 1) specifications were used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of sound level meter was checked using an acoustic calibrator generating 94dB at 1000 Hz. Measurement was considered to be valid with the calibration level from before and after the noise measurement within 1.0 dB. **Table 2.1** summarizes the noise monitoring equipment model used in the final monitoring.

**Table 2.1 Noise Monitoring Equipment**

Equipment	Model
Integrating Sound Level Meter	<ul style="list-style-type: none"> <li>NTi XL2 (Serial No. A2A-17440-EO)</li> <li>NTi XL2 (Serial No. A2A-17788-EO)</li> </ul>
Calibrator	<ul style="list-style-type: none"> <li>B&amp;K 4231 (Serial No. 3006428)</li> </ul>

### 2.2 Monitoring Parameter

- 2.2.1 A  $L_{Aeq\ 30min}$  was obtained during night-time normal train operation on a monthly basis.

### 2.3 Monitoring Location and Date

- 2.3.1 The operational airborne noise monitoring for operation of SCL (MKK – HUH) was conducted at Shun Man House, Oi Man Estate (OM1a) and Wylie Court, Block C (HH1) on 21 October 2022.
- 2.3.2 The corresponding monitoring locations during the reporting period were shown in **Figure C11033B/C/SCL/ACM/M52/151**.
- 2.3.3 A summary of the monitoring locations and monitoring date during the reporting period is shown in **Table 2.2**.

**Table 2.2 Monitoring Locations and Schedule of Noise Monitoring**

Monitoring ID	NSR ID	Description	Type	Measurement Floor <sup>(1)</sup>	ASR <sup>(2)</sup>	Monitoring Date
ON1	OM1a	Shun Man House, Oi Man Estate	Residential	Roof Level	C	21 October 2022
ON2	HH1	Wylie Court, Block C	Residential	Roof Level	C	

Remarks:

(1) According to Table 6.24 of the approved EIA Report, the worst affected floor of OM1a and HH1 is 2/F. Nevertheless, according to the observation from site visits, the lower floors of the NSRs would be blocked by the vegetation/slope/road structures in the vicinity of the NSRs. It was therefore proposed to conduct measurements on the roof level of both NSRs.

(2) Based on latest Annual Traffic Census 2021, the ASRs assigned at OM1a and HH1 for the noise monitoring remain valid (i.e. ASR "C").

### 2.4 Monitoring Procedures

- 2.4.1 During the noise monitoring, the following procedures were followed:
- All measurements were made in facade type. The microphone of the sound level meter was positioned 1m exterior of the sensitive receivers and lowered sufficiently so that the external wall of the building acts as a reflecting surface.
  - Parameters such as frequency weighting, the time weighting and the duration of

measurement were set as follows:

- Frequency weighting : A
  - Time weighting : Fast
  - Duration of measurement :  $L_{Aeq\ 30\ min}$  (with data being logged at every one second)
- Prior to and after each noise measurement, the sound level meter was calibrated using the Calibrator for 94 dB at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB (A), the measurement is considered invalid and repeat of noise measurement should be required after repair or re-calibration of the equipment.
  - Details were recorded when intrusive noise was observed. Noise sources and duration were also recorded during the measurement process.
  - All the monitoring data within the sound level meter system were downloaded through the computer software. All these data were then checked and reviewed properly.
  - The weather condition during the monitoring period was recorded by the monitoring staff.
  - Noise monitoring was conducted in the absence of fog, rain, and wind with a steady speed lower than 5 m/s, or wind with gusts lower than 10 m/s.

2.4.2 Calibration certificates for the equipment employed for monitoring (**Table 2.1** refers) are presented in **Appendix A**.

## 2.5 Data Analysis

2.5.1 Background noise levels,  $L_{Aeq\ 30\ min}$  (background) was evaluated by discarding logged data for the period when the trains passed in front of the monitoring stations.

2.5.2 The noise level contributed by the trains,  $L_{Aeq\ 30min}$  (event), was calculated by subtracting the background noise level  $L_{Aeq\ 30min}$  (background) from the overall noise level  $L_{Aeq\ 30\ mins}$  (overall) in accordance with standard acoustical principles.

2.5.3 The operational rail noise level is considered in compliance with NCO noise criteria if one of following conditions is satisfied:

- Operational rail noise level,  $L_{Aeq\ 30min}$  (event), do not exceed ANL; or
- Overall noise level is comparable to background noise level (i.e.  $L_{Aeq\ 30min}$  (overall) -  $L_{Aeq\ 30min}$  (background) < 3 dB).

## 2.6 Result and Observation

2.6.1 The final night-time operational rail noise monitoring was carried out at OM1a and HH1 on 21 Oct 2022. The monitoring results are provided in **Appendix B** and are summarised in **Table 2.3**.



**Table 2.3 Summary of Operational Rail Noise Monitoring Results in the Final Monitoring Period**

Monitoring Date	Time	Noise Level, dB(A)					Compliance
		L <sub>Aeq</sub> , 30min (overall)	L <sub>Aeq</sub> , 30min (background)	Difference	L <sub>Aeq</sub> , 30min (event)	ANL	
Shun Man House, Oi Man Estate (ON1)							
21 Oct 2022	06:30-07:00	66.5	66.5	0.0	<60 <sup>(1)</sup>	60	Yes
Wylie Court, Block C (ON2)							
21 Oct 2022	06:30-07:00	68.4	68.4	0.0	<60 <sup>(1)</sup>	60	Yes

Remark:

(1) The noise climate was dominated by the road traffic noise from Chatham Road North, Hung Hom Bypass and Princess Margaret Road. Therefore, the rail noise contributed from the operation of SCL (MKK – HUH) is anticipated to be insignificant and well below ANL (i.e. 60 dB(A)).

- 2.6.2 According to site observations, the dominant noise sources included road traffic noise from Chatham Road North, Hung Hom Bypass and Princess Margaret Road, while train noise from SCL (MKK – HUH) was barely audible at both measurement locations.
- 2.6.3 With the satisfaction of either one of conditions set out in **Section 2.5.3**, the monitoring results indicated the compliance of operational rail noise level with NCO noise criteria.

### 3 SUMMARY OF NOISE MONITORING RESULTS

#### 3.1 Noise Monitoring Periods

- 3.1.1 A 6-month night-time operational airborne rail noise monitoring was conducted at Shun Man House, Oi Man Estate and Wylie Court, Block C, from 15 May to 14 November 2022.

#### 3.2 Summary of Noise Monitoring Results

- 3.2.1 All the night-time noise monitoring results recorded at both monitoring stations demonstrated full compliance with NCO noise criterion throughout the monitoring periods (i.e. from 15 May to 14 November 2022), and are summarized in **Table 3.1** and provided in **Appendix B**.

**Table 3.1 Summary of Operational Rail Noise Monitoring Results**

Monitoring Date	Time	Noise Level, dB(A)					Compliance
		L <sub>Aeq</sub> , 30min (overall)	L <sub>Aeq</sub> , 30min (background)	Difference	L <sub>Aeq</sub> , 30min (event)	ANL	
Shun Man House, Oi Man Estate (ON1)							
24 May 2022	06:30-07:00	68.1	68.0	0.1	<60 <sup>(1)</sup>	60	Yes
22 Jun 2022	06:30-07:00	67.6	67.5	0.1	<60 <sup>(1)</sup>	60	Yes
19 Jul 2022	06:30-07:00	66.9	66.8	0.1	<60 <sup>(1)</sup>	60	Yes
6 Sep 2022	06:30-07:00	67.4	67.3	0.1	<60 <sup>(1)</sup>	60	Yes
6 Oct 2022	06:30-07:00	66.4	66.3	0.0	<60 <sup>(1)</sup>	60	Yes
21 Oct 2022	06:30-07:00	66.5	66.5	0.0	<60 <sup>(1)</sup>	60	Yes
Wylie Court, Block C (ON2)							
24 May 2022	06:30-07:00	67.7	67.6	0.1	<60 <sup>(1)</sup>	60	Yes
22 Jun 2022	06:30-07:00	68.2	68.2	0.0	<60 <sup>(1)</sup>	60	Yes
19 Jul 2022	06:30-07:00	67.6	67.6	0.0	<60 <sup>(1)</sup>	60	Yes
6 Sep 2022	06:30-07:00	68.0	68.0	0.0	<60 <sup>(1)</sup>	60	Yes
6 Oct 2022	06:30-07:00	68.3	68.3	0.0	<60 <sup>(1)</sup>	60	Yes
21 Oct 2022	06:30-07:00	68.4	68.4	0.0	<60 <sup>(1)</sup>	60	Yes

Remark:

- (1) The noise climate was dominated by the road traffic noise from Chatham Road North, Hung Hom Bypass and Princess Margaret Road. Therefore, the rail noise contributed from the operation of SCL (MKK – HUH) is anticipated to be insignificant and well below ANL (i.e. 60 dB(A)).

- 3.2.2 According to site observations, the dominant noise sources included road traffic noise from Chatham Road North, Hung Hom Bypass and Princess Margaret Road, while train noise from SCL (MKK – HUH) was barely audible at both measurement locations throughout the monitoring periods.
- 3.2.3 Given that the train noise levels recorded throughout the monitoring periods demonstrated full compliance of NCO noise criterion and the requirements stated in the approved EM&A Manual has also been fulfilled. With the agreement from IEC, the operational airborne rail noise monitoring at both Shun Man House, Oi Man Estate, and Wylie Court, Block C, have been terminated accordingly.

#### **4 CONCLUSION**

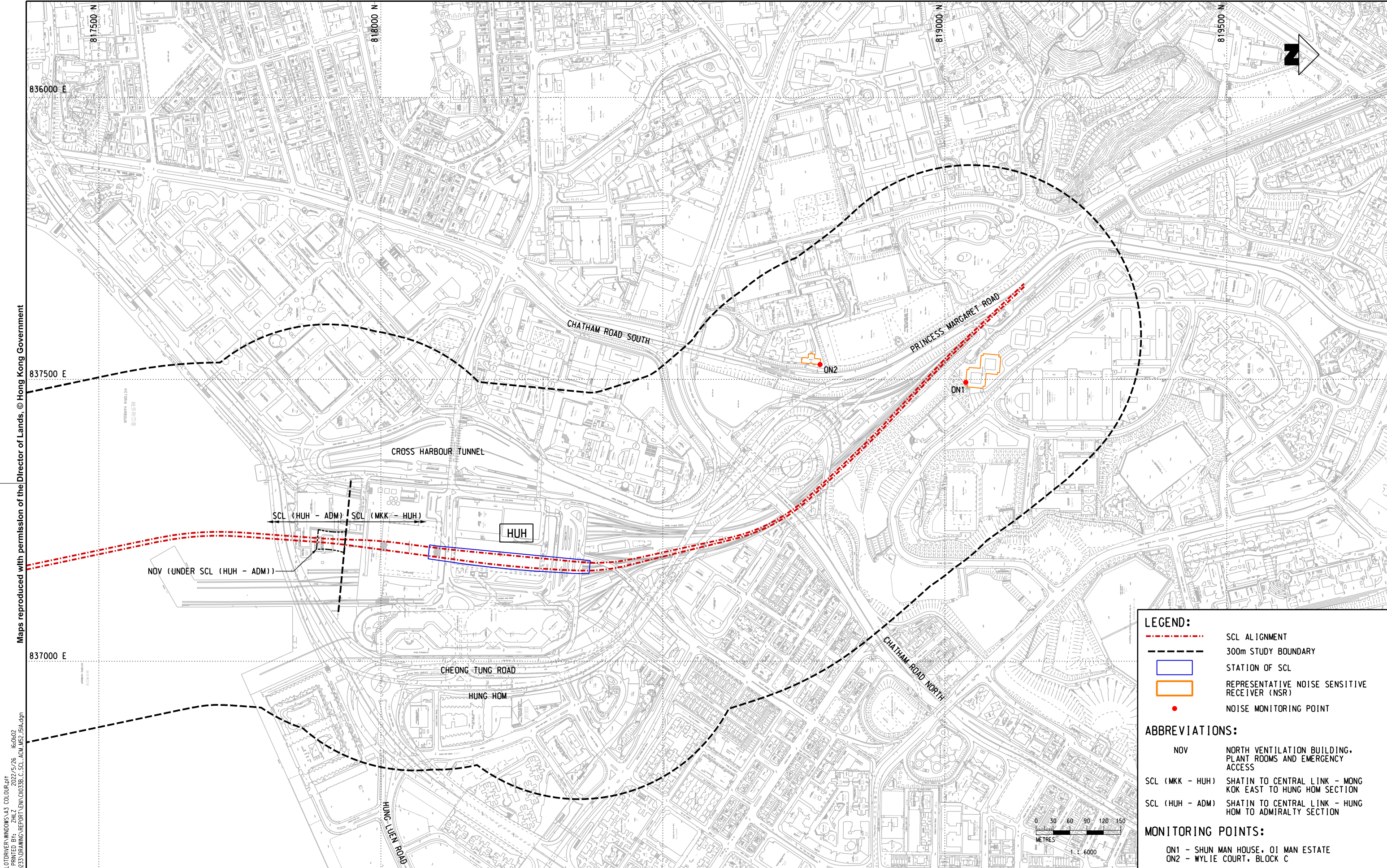
- 4.1.1 The operation of SCL (MKK-HUH) commenced on 15 May 2022. In accordance with the approved Plan, the night-time noise monitoring was carried out on a monthly basis since 15 May 2022. The sixth monthly night-time noise monitoring was conducted on 21 October 2022 at Shun Man House, Oi Man Estate, and Wylie Court, Block C, and the monitoring results indicated the operation rail noise levels complied with NCO noise criterion.
- 4.1.2 Operational rail noise monitoring for operation of SCL (MKK-HUH) has been undertaken for 6 months between 15 May and 14 November 2022. All the night-time rail noise levels recorded at the selected monitoring stations (i.e. Shun Man House, Oi Man Estate, and Wylie Court, Block C) complied with the NCO noise criterion throughout the monitoring periods (i.e. from 15 May to 14 November 2022). While the noise performance of the operation of SCL (MKK-HUH) fulfilled the condition specified in Section 4.19 of the approved EM&A Manual, with the agreement from IEC, the operational airborne rail noise monitoring at both Shun Man House, Oi Man Estate, and Wylie Court, Block C, have been terminated accordingly.

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**Figure**

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Default: PRINTED BY: ZHILL  
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PLOT DRW:  
MODEL NAME:  
FILE NAME:

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED

DRAWN	ZLZ
DESIGNED	---
CHECKED	LCR
APPROVED	---
DATE	15/JUL/2021
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SHATIN TO CENTRAL LINK



ORIGINATOR

CADD REF. C11033B.C.SCL.ACM.M52.151A.dgn

TITLE		C11033B SCL (MKK-HUH) LOCATIONS OF OPERATION RAIL NOISE MONITORING POINTS	
SCALE	1 : 6000 (A3)	FIGURE NO.	C11033B/C/SCL/ACM/M52/151
REV.	A		



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## **Appendix A**

### **Calibration Records of Monitoring Equipment**

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## CERTIFICATE OF CALIBRATION

Certificate No.: 22CA0512 02-02

Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	, Microphone	Preamp
Manufacturer:	Nti	, Nti Andio	Nti Andio
Type/Model No.:	XL2	, MC230A	MA220
Serial/Equipment No.:	A2A-17440-EO	, A18423	9087
Adaptors used:	-		

### Item submitted by

Customer Name: AECOM  
Address of Customer: -  
Request No.: -  
Date of receipt: 12-May-2022

Date of test: 13-May-2022

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2022	CIGISMEC
Signal generator	DS 360	33873	27-May-2022	CEPREI

### Ambient conditions

Temperature:  $22 \pm 1$  °C  
Relative humidity:  $55 \pm 10$  %  
Air pressure:  $1005 \pm 5$  hPa

### Test specifications

- 1, 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  $\pm 20\%$ .
- 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 response 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.

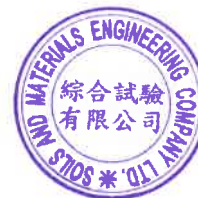
Actual Measurement data are documented on worksheets.

Approved Signatory:

Feng Junqi

Date: 14-May-2022

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. The results apply to the item as received.

**CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

22CA0512 02-02

Page 2 of 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 Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	2.1
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	2.2
	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	
	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Linearity range for SPL	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
	Single Burst Fast	Pass	0.3	
Peak response	Single Burst Slow	Pass	0.3	
	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
	Single burst 5 ms at 2000 Hz	Pass	0.3	
Time weighting I	Repeated at frequency of 100 Hz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
	Single burst 10 ms at 4 kHz	Pass	0.4	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	SPL	Pass	0.3	
Overload indication	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 Uncertainty (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	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:

Date: 13-May-2022

Yung Chi Yip

Checked by:

Date: 14-May-2022

Chan Yuk Yiu

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.





## CERTIFICATE OF CALIBRATION

Certificate No.: 22CA0512 02-01

Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	,	Microphone	Preamp
Manufacturer:	Nti	,	Nti Andio	Nti Andio
Type/Model No.:	XL2	,	MC230A	MA220
Serial/Equipment No.:	A2A-17788-EO	,	A18398	9065
Adaptors used:	-	,		

### Item submitted by

Customer Name: AECOM  
Address of Customer: -  
Request No.: -  
Date of receipt: 12-May-2022

Date of test: 13-May-2022

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2022	CIGISMEC
Signal generator	DS 360	33873	27-May-2022	CEPREI

### Ambient conditions

Temperature:  $22 \pm 1$  °C  
Relative humidity:  $55 \pm 10$  %  
Air pressure:  $1005 \pm 5$  hPa

### Test specifications

- 1, 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  $\pm 20\%$ .
- 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 response 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.

Actual Measurement data are documented on worksheets.

Approved Signatory:

  
Feng Junqi

Date: 14-May-2022

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. The results apply to the item as received.

**CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.: 22CA0512 02-01

Page 2 of 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 Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	2.1
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	2.2
	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	
	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Linearity range for SPL	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	Pass	0.3	
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 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> 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 Uncertainty (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	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:

Date:

Fung Chi Yiu

13-May-2022

- End -

Checked by:

Date:

Chan Yuk Yiu

14-May-2022

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.



## CERTIFICATE OF CALIBRATION

Certificate No.: 22CA0504 01

Page: 1 of 2

### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: B & K  
Type/Model No.: 4231  
Serial/Equipment No.: 3006428  
Adaptors used: -

### Item submitted by

Customer: AECOM  
Address of Customer: -  
Request No.: -  
Date of receipt: 04-May-2022

Date of test: 04-May-2022

### Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	04-May-2022	SCL
Preamplifier	B&K 2673	2239857	31-May-2022	CEPREI
Measuring amplifier	B&K 2610	2346941	01-Jun-2022	CEPREI
Signal generator	DS 360	33873	27-May-2022	CEPREI
Digital multi-meter	34401A	US36087050	27-May-2022	CEPREI
Audio analyzer	8903B	GB41300350	28-May-2022	CEPREI
Universal counter	53132A	MY40003662	02-Jun-2022	CEPREI

### Ambient conditions

Temperature:  $22 \pm 1$  °C  
Relative humidity:  $55 \pm 10$  %  
Air pressure:  $1005 \pm 5$  hPa

### Test specifications

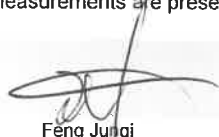
- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results 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.

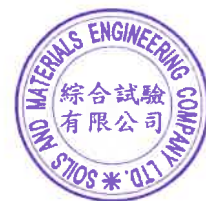
Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

  
Feng Junqi

Date: 05-May-2022

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.

**CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.: 22CA0504 01

Page: 2 of 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.

(Output level in dB re 20 µPa)			
Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.16	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 = 0.014 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 = 999.96 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 = 0.4 %**

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:

Date:

Fung Chi Yip  
04-May-2022

- End -

Checked by:

Date:

Chan Yuk Yiu  
05-May-2022

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are carry no implication regarding the long-term stability of the instrument. The results apply to the item as received.

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## **Appendix B**

### **Operational Train Noise Monitoring Results**

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**Appendix B1 Operational Train Noise Monitoring Results - Shun Man House, Oi Man Estate (ON1)**

Date	Time	L <sub>Aeq 30min (overall)</sub> , dB(A)	L <sub>Aeq 30min (Background)</sub> , dB(A)	Difference, dB(A)	L <sub>Aeq 30min (event)</sub> , dB(A)	ANL, dB(A)	Compliance (Yes/No)
24/05/2022	06:30 - 07:00	68.1	68.0	0.1	< 60	60	Yes
22/06/2022	06:30 - 07:00	67.6	67.5	0.1	< 60	60	Yes
19/07/2022	06:30 - 07:00	66.9	66.8	0.1	< 60	60	Yes
06/09/2022	06:30 - 07:00	67.4	67.3	0.1	< 60	60	Yes
06/10/2022	06:30 - 07:00	66.4	66.3	0.1	< 60	60	Yes
21/10/2022	06:30 - 07:00	66.5	66.5	0.0	< 60	60	Yes

**Appendix B2 Operational Train Noise Monitoring Results - Wylie Court, Block C (ON2)**

Date	Time	L <sub>Aeq</sub> 30min (overall), dB(A)	L <sub>Aeq</sub> 30min (Background), dB(A)	Difference, dB(A)	L <sub>Aeq</sub> 30min (event), dB(A)	ANL, dB(A)	Compliance (Yes/No)
24/05/2022	06:30 - 07:00	67.7	67.6	0.1	< 60	60	Yes
22/06/2022	06:30 - 07:00	68.2	68.2	0.0	< 60	60	Yes
27/07/2022	06:30 - 07:00	67.6	67.6	0.0	< 60	60	Yes
06/09/2022	06:30 - 07:00	68.0	68.0	0.0	< 60	60	Yes
06/10/2022	06:30 - 07:00	68.3	68.3	0.0	< 61	60	Yes
21/10/2022	06:30 - 07:00	68.4	68.4	0.0	< 61	60	Yes