Traffic Noise Monitoring Report of the Consultancy Service of Roadworks at West Kowloon Operational Noise Monitoring

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By

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Contents

1 Introduction

On 6th March 2019, NGIS China Ltd (NGIS) was appointed by the MTR Corporation Ltd. (MTR) to undertake Consultancy Service of Roadworks at West Kowloon Operational Noise Monitoring.

Anticipated additional traffic resulted from the recently opened West Kowloon Station of the High Speed Rail, and the development of the West Kowloon Cultural District, is designed to be accommodated by roads D1A, D1, Lin Cheung Road - Austin Road West Underpass and upgrading of Austin Road West.

"Road Works at West Kowloon" was a Schedule 2 Designated Project under the Environmental Impact Assessment Ordinance (Cap. 449), Environmental Impact Assessment (EIA) and Environmental Monitoring and Audit (EM&A) works is thus required.

Further, under Environmental Permit (EP) Condition 3.1 of the latest version of EP No. EP-366/2009/A (EP) issued on 18 June 2012, "During operation phase, road traffic noise levels shall be monitored at representative noise sensitive receivers as described in the approved EIA Report (AEIAR-141/2009) during the first year after the road opening." And in accordance with Section 2.22 of the EM&A Manual, an Operational Noise Monitoring Plan had been submitted to and accepted by the Environmental Protection Department (EPD) on 26th March 2018.

Now, with the first commencement date of the roads on 23rd September 2018, the operational traffic noise monitoring will need to be undertaken in accordance with the Operational Noise Monitoring Plan (ONMP). The key purpose of which is to verify the traffic noise predictions from the Review Report (RR) by comparing the noise impact predictions with the actual impacts.

This document is the Traffic Noise Monitoring Report (TNMR) the purpose of which is to outline and set out the following with respect to the noise monitoring exercise at the Noise Sensitive Receivers (NSRs) as stipulated in the ONMP:

- Measurement requirement;
- Noise monitoring approach and methodology;
- Work plan;
- Noise monitoring assessment;
- Data analysis and result discussion; and,
- Conclusion

2 Measurement Requirements and Methodology

2.1 Objectives

The aim of this consultancy (herein, the Services) is to verify the traffic noise predications from the previously submitted Review Report (RR) by comparing the traffic noise predictions with the actual impacts. The concerned roads include Road D1A, Lin Cheung Road, Austin Road West, Austin Road West Underpass and Jordan Road where increased road traffic are anticipated.

Thus, noise monitoring is required to be conducted based upon the approved ONMP that has already set out the following:

- Monitoring locations;
- Monitoring schedules;
- Noise monitoring methodology such as noise measurement procedures, traffic counts and speed checks; and,
- Methodology of comparison with the predicted levels.

2.2 General Requirements

With reference to the ONMP, the task lists required for the Services will include:

1) To conduct traffic surveys, noise measurement and monitoring as per the ONMP;
2) To provide all the necessary operational noise monitoring equipment and/or other approved equipment to undertake traffic survey of item (1) above;
3) To analyse the noise impact predictions in RR with the actual noise monitoring data;
4) To provide valid justifications on the results should discrepancies between predicted and actual values are found after the traffic survey; and,
5) To prepare the Traffic Noise Monitoring Reports (TNMRs) for submission to EPD.

3 Approach and Methodology

3.1 The Team

In view of the field traffic survey and noise measurement requirements of this Services, NGIS has partnered and associated with ATSL who will undertake the actual field works under the supervision and management of NGIS.

3.2 Noise Modelling Platform

As per the recommendation of the ONMP, software modelling tool and an in-house noise model should be utilized for purpose of adjusting measured noise levels from current situation to Year 2030. For this Services, the ODEN online environmental platform is used.

ODEN is a fully web-based assessment platform for hybrid noise and air quality assessment. For noise assessment, ODEN utilizes LimA from Germany. Besides the adoption of UK's CRTN calculation methodology for traffic noise, ODEN's noise modelling capabilities also include industrial (ISO9613) and railway (CRN) as illustrated.

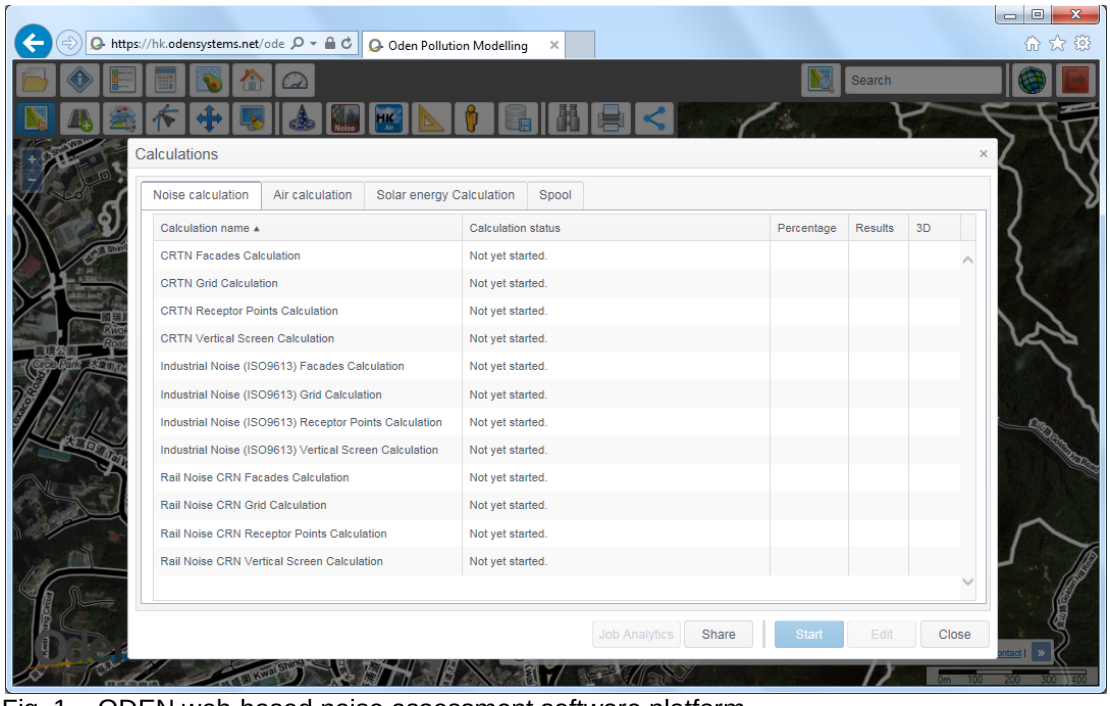


Fig. 1 – ODEN web-based noise assessment software platform

3.3 Instrumentation

Throughout the survey, Type 1 acoustical instrumentation ((i.e. International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications and

acoustic calibrators) will be used. All the acoustical equipment will be equipped with valid certificates of calibration, not exceeding one year from the last certified check by accredited laboratory. (see Appendix A1.4)

Prior to and after each site measurement, the equipment will be checked with a portable sound calibrator. Variation not exceeding 0.5 dB will be accepted. Further, the noise surveyor will record the before and after survey calibration check results.

The noise measurement equipment to be used for both the 1st and 2nd noise monitoring are as shown below.

Instrument / Accessory	Brand & Model
Precision integrating sound level meter 	Svantek Svan 959
Precision integrating sound level meter 	NTi-XL2-TA
Sound level calibrator 	Svantek SV 30A
Precision integrating sound level meter 	Bruel & Kjaer 2270

Precision integrating sound level meter 	Bruel & Kjaer 2250
Sound level calibrator 	Bruel & Kjaer 4231

3.4 Weather Conditions

In general, noise measurements will not be performed during rain and moisture saturated atmosphere. Rather, days with stable and calm conditions and with wind speed not exceeding 5 m/s will be chosen. Further, the road surface should be dry during the duration of the measurement period.

3.5 Noise Monitoring

During the monitoring, the surveyor will take reference from the measurement methodology contained within Calculation of Road Traffic Noise[1] for ascertaining the façade noise level at the receptor and the measurement methodology contained within the Technical Memoranda issued under the Noise Control Ordinance[2]. The measurement methodology will also follow the approved ONMP. Hence, the surveyor, having considered the recommended requirement as per the ONMP, will also make professional evaluation and best judgment on-site so as to select the most appropriate façade measurement position at the receptor to avoid adverse influence of background.

[1] Calculation of Road Traffic Noise, 1988. Department of Transport, Welsh Office, Her Majesty's Stationary Office, United Kingdom.
[2] Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites. Hong Kong SAR Government.

3.6 Traffic Survey

Traffic survey will be conducted using video recording from which vehicle count will be performed. Video will be captured on the same day when noise survey is performed. Also, where possible, the video recording device will be set up at roof top or open area where they are better open or wider view for both near and far side roads facing the façade of the respective noise monitoring location.

3.7 Result Tabulation

Recorded field measurement results will be processed, analysed and then tabulated into table using the field record sheet of Appendix A1.1. Besides, photographic records will also be captured of the equipment and set up at each NSR location.

4 Work Plan

The works will be undertaken in two stages i.e.:

- Stage 1 – Preparation of Method Statement for Operation Noise Monitoring and Traffic Noise Model; and,
- Stage 2 – Operation Noise Monitoring implementation.

The task list and schedule of each stage are outlined as follows:

4.1 Stage 1 – Noise Monitoring Preparation

During this stage, mobilization and pre-monitoring preparation will be performed. This includes the following tasks:

a). Method Statement

The method statement is prepared based on the followings.

- Proposed monitoring date;
- Submission programme;
- Measurement requirements;
- Noise monitoring locations;
- Noise monitoring equipment;
- Noise measurement and monitoring methodology, and.
- Traffic survey methodology and data assessment etc.

b). Traffic Noise Model

On the other hand, a Traffic Noise Model will be created using the ODEN platform as described in Section 3.2 above. In setting up the model, relevant acoustic data are provided by MTR in certain appropriate form and in digital format.

In general, acoustic model data include:

- Road alignments (3.5m from the edge of nearside carriageway as stated in CRTN);
- Estimated or projected traffic flow for the Year 2030;
- Location and configuration of various mitigation measures used such as barrier, low noise road surface (LNRS) etc.;
- Location of NSRs;
- Building or road networks within the concerned assessment area;
- Etc.

Once collected, prepared and imported, the study or assessment site will then be created for a buffered area of 300m as illustrated.

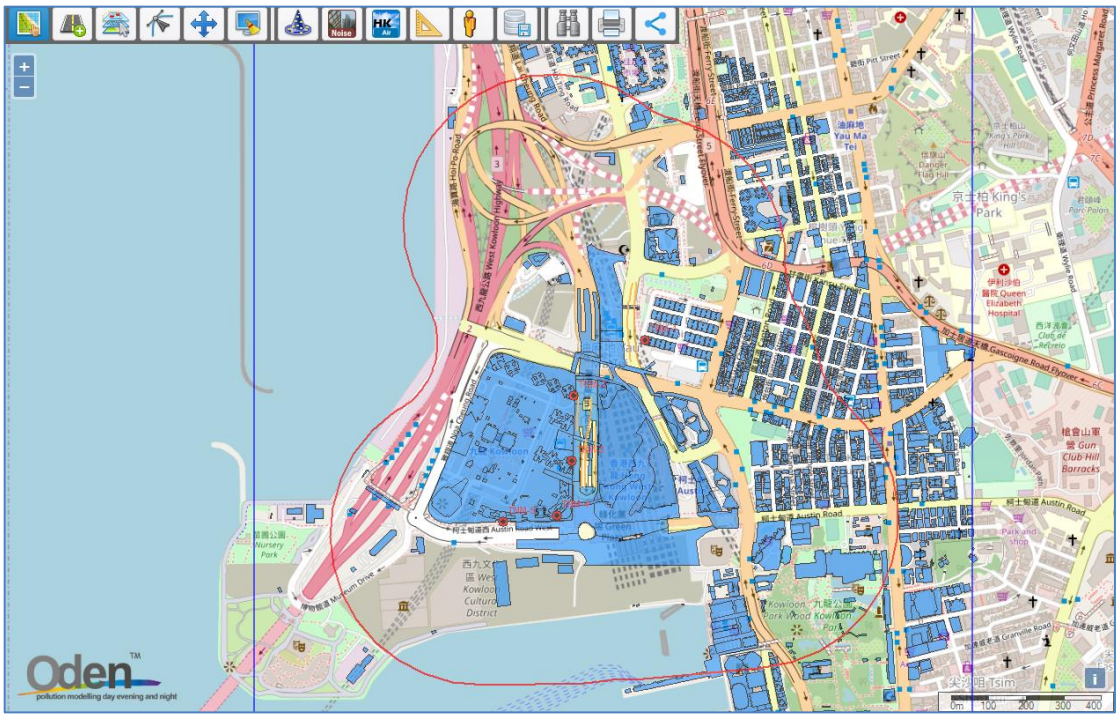


Fig. 2 – The assessment area

c). Model Calibration with RR's Traffic Data

Upon setup of ODEN traffic noise model, calibration will then be performed using traffic data from RR. The predicted result will then be compared with the approved RR results. With reference to ONMP's assessment methodology as detailed in Section 4.1.1.5(i) that should there be no large discrepancies between the RR predictions and in-house model result, the in-house model would then be calibrated. Whilst discrepancy may vary with different cases, 0.5 dB(A) should generally be allowable. See Table 2.

4.2 Stage 2 – Noise Monitoring Implementation

During this stage, the actual monitoring works will be scheduled and then performed based upon the approved method statement as mentioned in Section 4.1 above.

a). Noise Sensitive Receivers (NSR) Locations

Monitoring works will be performed at representative noise sensitive receivers (NSRs) as per the approved ONMP namely:

- TNM-1 at Man King Building;
- TNM-2 at Tower 6, Sorrento;

- TNM-3 at Tower III, the Waterfront;
- TNM-4 at Sun Tower, the Arch; and,
- TNM-5 at Tower 2, the Harborside.

The locations and distribution of the five NSRs are as illustrated:

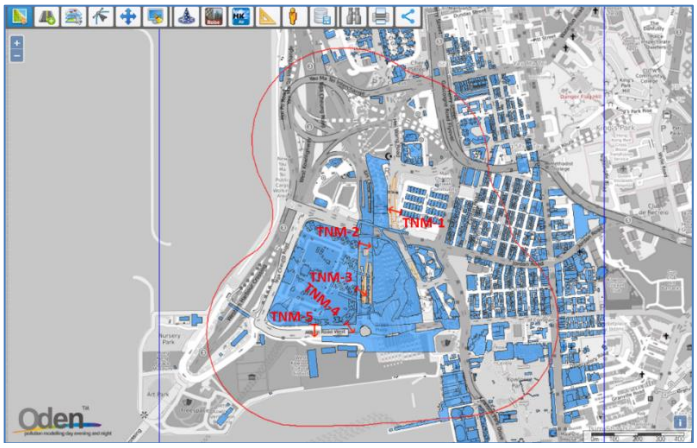


Fig. 3 – The NSRs (i.e. TNM-1 to TNM-5) distribution

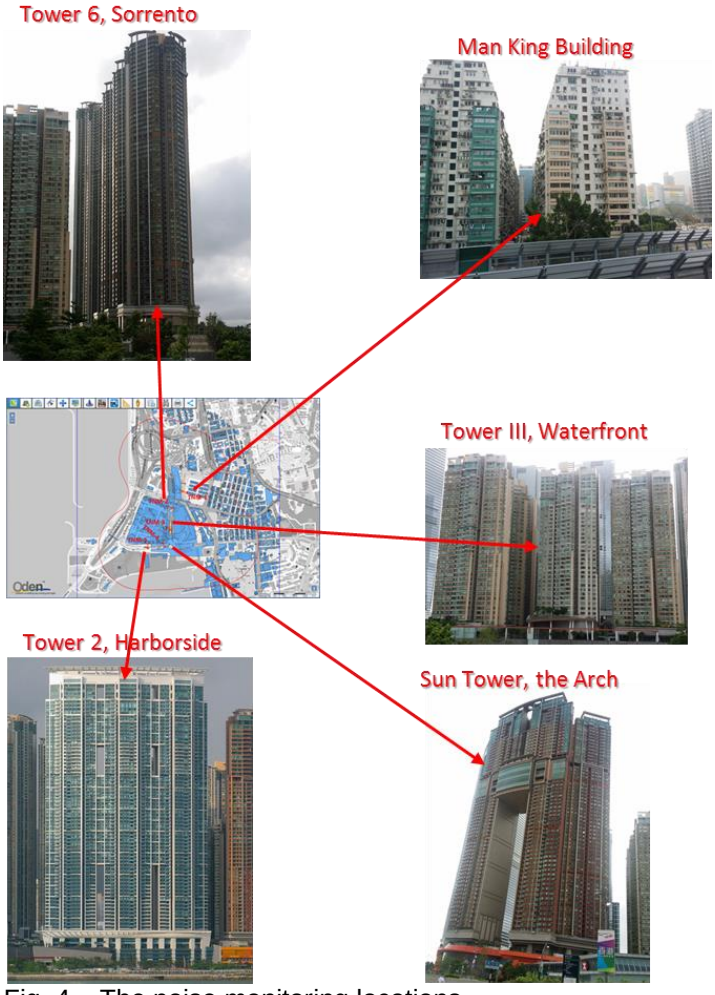


Fig. 4 – The noise monitoring locations

b). Noise Monitoring Measurement and Traffic Survey

Noise measurement and survey tasks will be undertaken as following at each NSR location and as per the corresponding requirement of the ONMP.

Noise Measurement (to be conducted at 6-month Interval)

- Traffic noise levels will be measured in terms of $L_{10\ (30min)}$ dB(A) over three (3x) half-hour periods;
  (Noting that noise data will be continuously recorded and other sources (e.g. construction noise and honking noise) and extraneous noise shall not be taken into calculation of the traffic noise level)
- Measurement will be taken during both morning peak hours (i.e. 07:30-09:30) and evening peak hours (i.e. 17:30-19:30) and on normal weekdays;
  (Noting that morning and evening peak hours will be checked with the latest Annual Traffic Census);
- Two sets of A-weighted $L_{10(1\ hour)}$ readings will be taken during morning and afternoon peak and L_{max}, L_{min}, L_{eq}, L_{10} and L_{90} will also be taken for record;
- As far as possible and practical, a high and a medium floor will be selected for noise measurement; and,
- Measurement will be taken at 1m building façade and at 1.2m above ground.

Concurrent Traffic Survey (to be conducted during noise measurement)

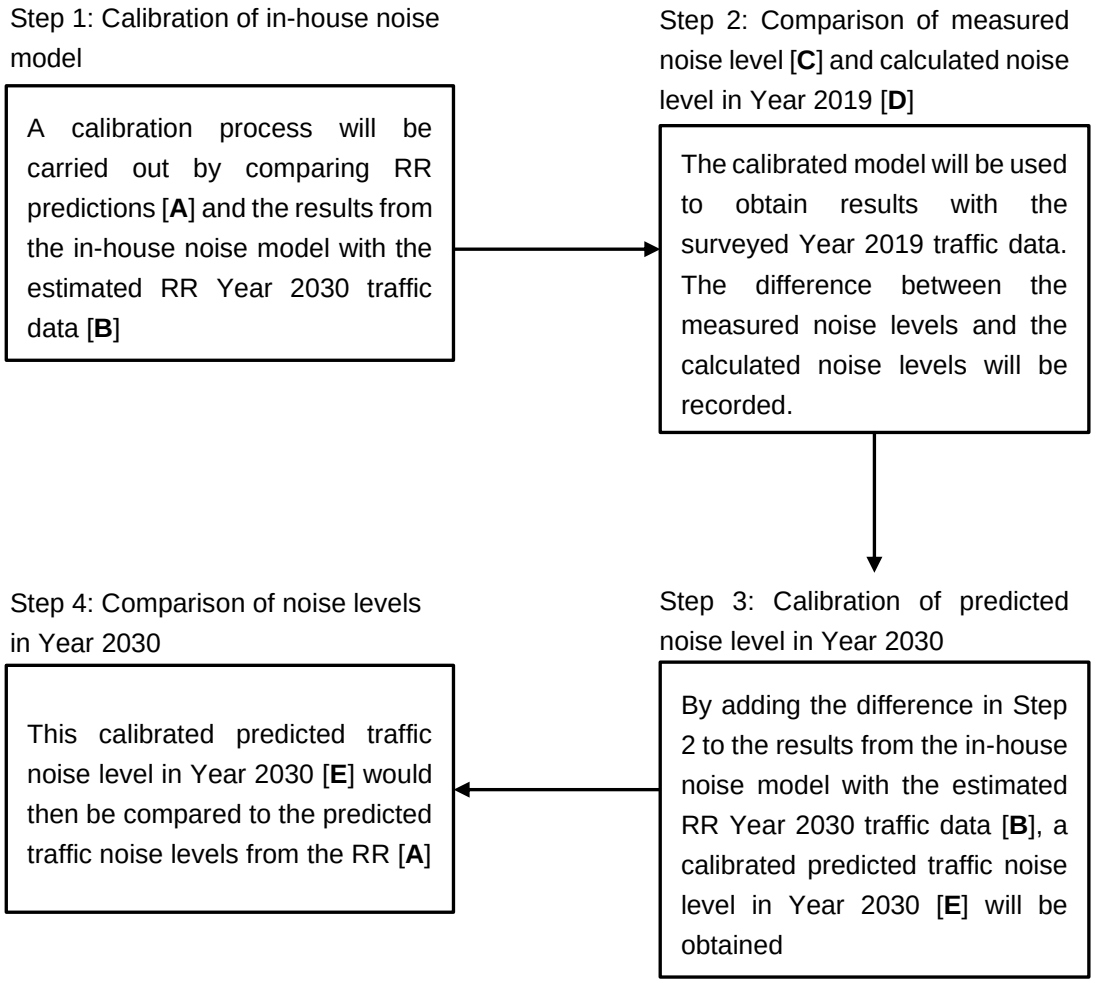
- Perform traffic count, percentage of heavy vehicles (i.e. all vehicles with an unladen weight exceeding 1525kg) and average speed for both far-side and near-side of the road carriageways and the nearby existing road network; and,
- Traffic survey will cover the sections of Road D1A, Lin Cheung Road (LCR), Austin Road West (ARW), Austin Road West Underpass (ARWU) and Jordan Road (JR).

c). Measurement Report

The measurement report will elaborate the deviation of the adjusted measured noise levels from the predictions in the RR and provide explanation if the discrepancies are observed.

d). Assessment

In comparing the measured and predicted noise levels at each NSR, it will make reference and base upon the methodology described in the ONMP. The method extracted from the Appendix 3.1 of the ONMP is illustrated as follows:



Note:

[A] : Predicted Year 2030 traffic noise levels from the RR

[B] : Calculated traffic noise levels in Year 2030 (Using the in-house model and RR Year 2030 traffic data)

[C] : Measured noise level

[D] : Calculated noise level in Year 2019 (Using the in-house model and surveyed traffic data)

[E] : Calibrated predicted traffic noise level in Year 2030

4.3 Programme

Following the opening of the West Kowloon Station of the High Speed Rail, noise monitoring are required to be undertaken, during operation phase, within the first year and in two 6-month intervals as per the EM&A Manual.

The programme schedule is as follows:

Table 1 – Programme schedule

Deliverable / Action	**Operational Noise Monitoring Period**
1st Noise monitoring	12th to 19th March 2019 i.e. before 23rd March 2019
2nd Noise monitoring	10th to 19th September 2019 i.e. before 23rd September 2019

5 Noise Monitoring Assessment

With reference and base upon the assessment process of Section 4.2d, the following procedures will be performed for the calibration process:

i. An in-house noise model will firstly be established based on the mitigation measures and 2030 traffic flow as listed in RR, which is also contained in Appendix A1.2 (a);
ii. The calculated noise levels will then be compared with the calculated values as listed in the RR for the five receptor locations of TNM-1 to TNM-5; and,
iii. Once calibrated, this will serve as the model of assessment of the 1st and 2nd noise monitoring results.

5.1 Calibration of In-house Noise Model

Following the above process, an in-house noise model will be established using the relevant site visits, drawings and traffic data of the RR.

a) Establishment of an ODEN 2030 Calibration Model

The established 2030 Calibration Model using the ODEN platform for a buffer area of 300m of the project and assessment site extent is as illustrated. Model setup can be referred in Appendix A1.2

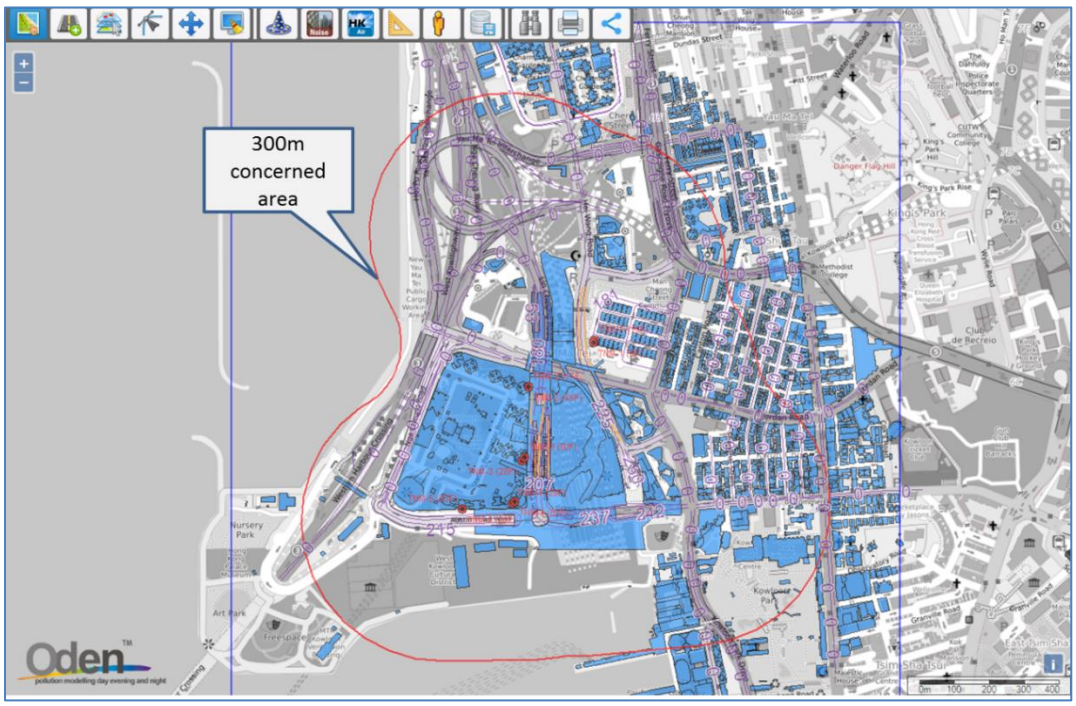


Fig. 5 – Assessment area

b) Location of Monitoring Stations

For purpose of comparison with the predicted noise level, noise measurements will be conducted at the five monitoring locations denoted by TNM-1 to TNM-5 as illustrated below.

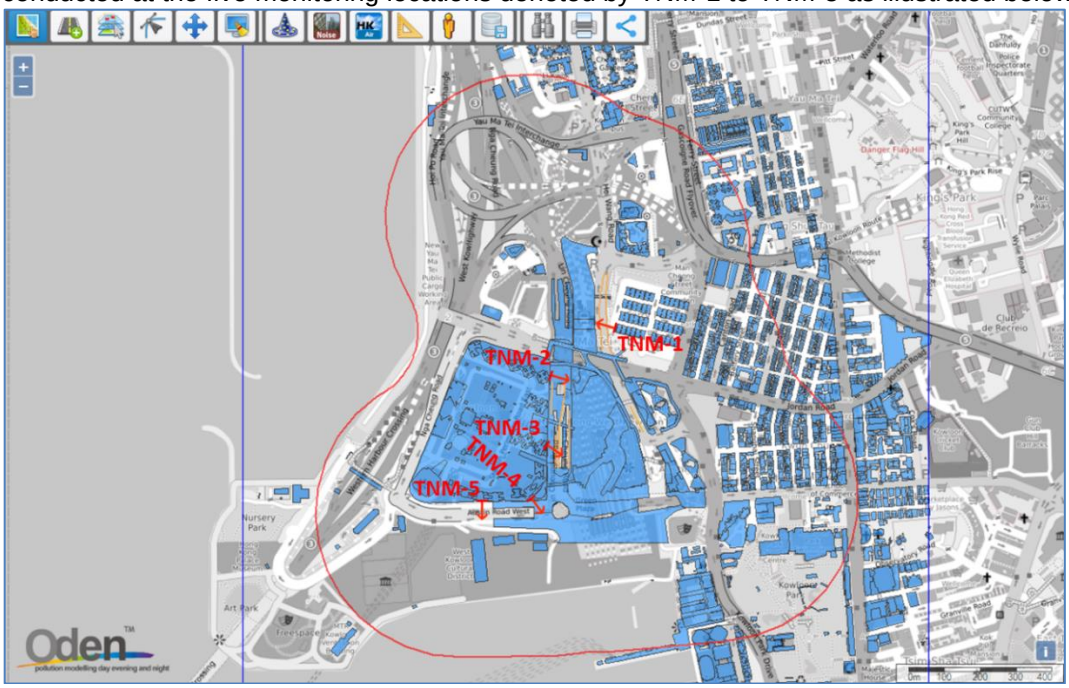


Fig. 6 – Noise monitoring location (i.e. TNM-1 to TNM-5)

c). Comparison of Calculated Result of ODEN Vs RR

Using 2030 traffic flow as per Appendix 2.3 of the Review Report. The noise levels in 2030 for the specific floors of TNM-1 to TNM-5 are predicted using the in-house noise model to compare the noise levels in Appendix 3.7 of the Review Report as listed below. Referring to Table 2, the value difference between the RR predicted noise model and the calibrated in-house model is within 0.5 dB(A), which is generally considered not large discrepancies.

Table 2 – Calibration of in-house model with RR

Monitoring Station	Building	RR's NSR ID	Floor	Height (mPD)	RR Predicted Noise Level, dB(A) [A]	ODEN Predicted Noise Level, dBA [B]	Difference = [B]-[A]
TNM-1	Man King Building	MC2	1	7.8	65.3	65.5	0.2
			5	19.0	68.6	68.4	-0.2
			10	33.0	68.4	68.6	0.1
			15	47.0	69.4	69.3	-0.1
			19	58.2	69.7	69.5	-0.2
TNM-2	Tower 6, Sorrento	SOR3	1	44.9	69.7	69.3	-0.4
			5	56.1	69.6	69.8	0.2
			10	70.1	69.8	69.7	-0.1
			15	84.1	69.9	69.6	-0.3
			20	98.1	69.9	69.4	-0.5
			25	112.1	69.8	69.3	-0.5
			30	126.1	69.6	69.1	-0.5
			35	140.1	69.4	69.0	-0.4
			40	154.1	69.2	68.8	-0.4
			45	168.1	69.0	68.6	-0.4
			50	182.1	68.8	68.4	-0.4
			51	184.9	68.8	68.4	-0.5
TNM-3	Tower III, The Waterfront	TW3a	1	34.7	69.8	69.6	-0.2
			5	45.9	70.2	70.3	0.1
			10	59.9	70.3	70.3	0.0
			15	73.9	70.4	70.4	-0.1
			20	87.9	70.3	70.3	0.0
			25	101.9	70.1	70.0	-0.1
			30	115.9	69.8	69.6	-0.2
			35	129.9	69.6	69.2	-0.4
			37	135.5	69.5	69.1	-0.4
TNM-4	Sun Tower, The Arch	ARCH3a	1	39.7	62.8	62.4	-0.4
			5	50.9	65.2	65.6	0.4
			10	64.9	65.4	65.9	0.4
			15	78.9	65.2	65.6	0.3
			20	92.9	64.9	65.1	0.1
			25	106.9	64.6	64.6	0.0
			30	120.9	64.2	64.0	-0.2
			35	134.9	63.8	63.6	-0.3
			40	148.9	63.5	63.1	-0.4
			45	162.9	63.2	62.7	-0.5
			50	176.9	62.9	62.7	-0.2
			55	190.9	62.6	62.6	0.0
TNM-5	Tower 2, The Harbourside	HARB2	1	39.7	70.4	70.0	-0.4
			5	50.9	69.7	69.4	-0.3
			10	64.9	69.1	68.9	-0.3
			15	78.9	68.5	68.3	-0.3
			20	92.9	68.0	67.7	-0.3
			25	106.9	67.5	67.1	-0.4
			30	120.9	67.1	66.7	-0.4
			35	134.9	66.7	66.5	-0.2
			40	148.9	66.3	66.3	0.0
			45	162.9	66.1	66.1	0.0
			50	176.9	65.9	65.9	0.0
			55	190.9	65.7	65.6	-0.1
			60	204.9	65.5	65.4	-0.1
			63	213.3	65.4	65.3	-0.1

5.2 1st Noise Monitoring Locations and Result (L_{10})

Prior to scheduling the 1st noise monitoring, a site visit was performed on 11st March 2019 at the five monitoring stations. With consideration of accessibility, practicality of equipment setup as well as maximum and open façade viewing, the following five locations were chosen. See site photos of Section 5.3, where all measurements were carried out at building façade.

Table 3 – Floor level and height of noise monitoring locations

NSR	Building Premises	Floor	Floor Level	Height (mPD)
TNM-1	Man King House	10/F	10	33.0
		Roof top	19	58.2
TNM-2	Tower 6, Sorrento	17/F	8	64.5
		45/F	33	134.5
TNM-3	Tower III, the Waterfront	28/F	22	93.5
		Roof top	Roof top	142.2
TNM-4*	Sun Tower, the Arch	29/F	23	101.3
		62/F	42	154.5
TNM-5	Tower 2, the Harbourside	26/F	18	87.3
		53/F	43	157.3

* Noting that owing to site accessibility, the high floor of TNM-4 is different from the 2nd noise monitoring which is at 57/F of Star Tower, the Arch.

5.3 Site Photos at Each Monitoring Location (1st Noise Monitoring)

a) TNM-1: Man King Building

Photo 1 : Man King Building

Photo 2 : Man King Building (R/F position)

Photo 3 : Man King Building (10/F position)

Photo 4 : Man King Building (10/F position)

b) TNM-2: Sorrento

Photo 1 : Sorrento

Photo 2 : Sorrento (R/F) – Video taking

Photo 3 : Sorrento (45/F position)

Photo 4 : Sorrento (17/F position)

c) TNM-3: The Waterfront

Photo 1 : The Waterfront

Photo 2 : The Waterfront (R/F) – Video taking

Photo 3 : The Waterfront (R/F position)

Photo 4 : The Waterfront (28/F position)

d) TNM-4: The Arch

Photo 1 : The Arch

Photo 2 : The Arch (62/F) – Video taking

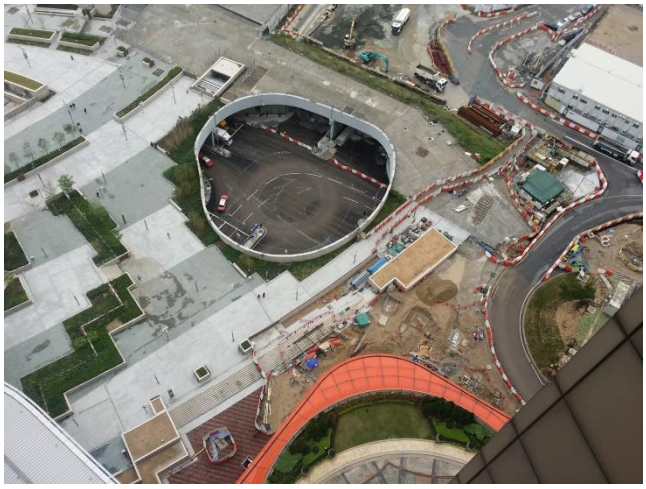


Photo 3 : The Arch (29/F position)

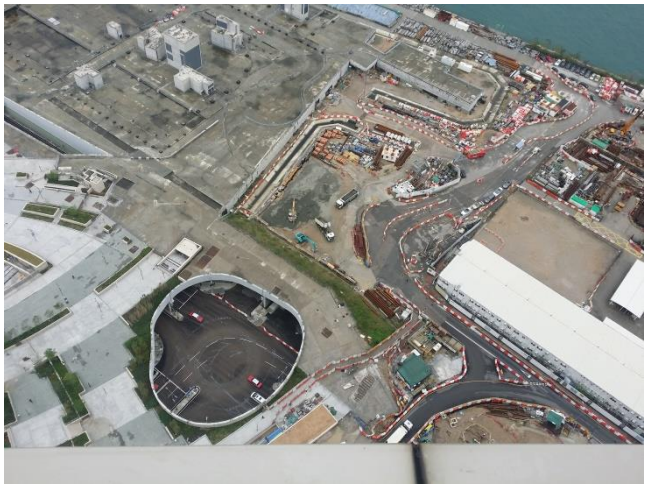


Photo 4 : The Arch (62/F position)

e) TNM-5: The Harbourside

Photo 1 : The Harbourside

Photo 2 : The Harbourside (26/F) – Video taking

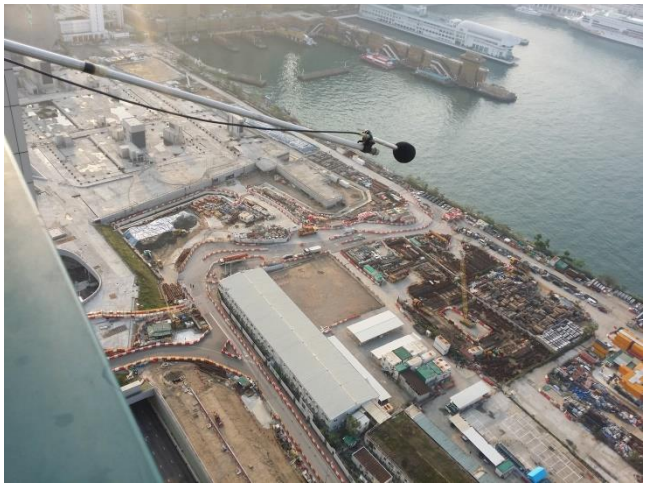


Photo 3 : The Harbourside (53/F position)

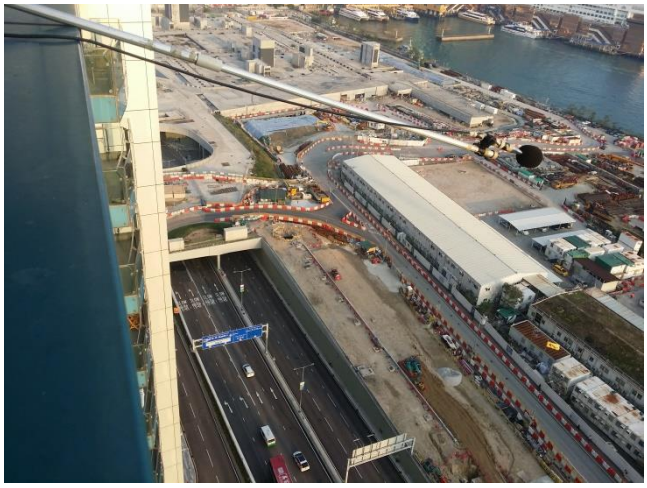


Photo 4 : The Harbourside (26/F position)

5.4 Noise Measurement (1st Noise Monitoring)

The result of each 30-min noise measurement (L_{10}) as well as the derived 1-hour sample, i.e. $L_{10(1\text{-hour})}$ or [C], is tabulated in Table 4 below.

With reference to Section 4.2(d) above and for purpose of working out worst-case scenario, [C] will be represented by the highest level of set of 30-minutes L_{10} dB(A) recorded during peak hour of noise monitoring. Therefore, it will take the highest value among the two L_{10} values listed in the "1-hour Sample", which in turn were extracted from 3,600 readings (of L_{10} 30-min sample 1+2 and sample 2+3) and sorted in descending order. As for the L_{10} 30-min sample, they were captured by continuous logging at '1 second per readings' (i.e. 1,800 readings over each 30 minutes).

Further, as there are middle and high floor measurements taken during the same am and pm peak period, hence, the determination of traffic count time period (i.e. sample 1+2 or 2+3) will be based on the majority of the highest noise levels among all the measurements.

Following this method, sample 1+2 with nine number of highest noise levels is determined to be am peak period. The selected am peak period as well as [C] are as highlighted in yellow cell, shown in Table 4, which represent the worst-case scenario for each monitoring location. Likewise, green highlight are for the chosen pm peak period.

Table 4 – Noise measurement result of 1st noise monitoring

Stage	Traffic Noise Measurement															Traffic Survey
	Monitoring Station			Date	Time Session		Sample	Measured Noise Level, dB(A)								Dominant Source (Road)
								30-min Sample						1-hour Sample		
	NSR	Building Premises	Floor Level					L_{eq}	L_{10}	L_{50}	L_{90}	L_{max}	L_{min}	L_{10}		
Stage 1 (By 23-03-2019)	TNM-1	Man King Building	R/F	19/03/19	AM	07:58 - 08:28	1	63.3	64.9	62.9	61.1	70.6	59.6	64.9	-	Road D1A(N) and Lin Cheung Road (LCR)
						08:28 - 08:58	2	63.2	64.8	62.8	61.3	70.3	59.9		64.9	
						08:58 - 09:28	3	63.4	64.9	62.9	61.4	76.8	60.0	-		
					PM	17:30 - 18:00	1	63.4	65.0	62.6	61.0	74.4	59.1	64.9	-	
						18:00 - 18:30	2	63.1	64.8	62.6	60.9	74.5	59.5		64.8	
						18:30 - 19:00	3	63.3	64.8	62.4	60.5	79.7	58.3	-		
			10/F (Office floor)		AM	07:58 - 08:28	1	63.5	65.4	62.8	61.0	69.8	59.0	65.2	-	
						08:28 - 08:58	2	63.2	65.0	62.7	61.2	72.9	59.5		64.8	
						08:58 - 09:28	3	63.1	64.5	62.6	61.1	74.6	59.4	-		
					PM	17:30 - 18:00	1	63.4	65.0	62.6	61.0	74.4	59.1	64.9	-	
						18:00 - 18:30	2	63.1	64.8	62.6	60.9	74.5	59.5		64.8	
						18:30 - 19:00	3	63.3	64.8	62.4	60.5	79.7	58.3	-		
	TNM-2	Tower 6, Sorrento	45/F (Refuge floor)	13/03/19	AM	07:56 - 08:26	1	65.9	67.2	65.5	64.4	75.7	63.2	67.1	-	Lin Cheung Road (LCR) and Jordan Road (JR)
						08:26 - 08:56	2	65.8	66.9	65.6	64.4	74.0	63.0		66.9	
						08:56 - 09:26	3	65.6	66.8	65.3	64.1	72.3	62.7	-		
					PM	17:54 - 18:24	1	65.6	67.0	64.7	62.8	81.4	60.9	66.9	-	
						18:24 - 18:54	2	64.9	66.7	64.2	62.5	75.0	60.0		66.5	
						18:54 - 19:24	3	64.5	66.3	63.9	62.0	75.6	59.5	-		
			17/F (Refuge floor)		AM	07:56 - 08:26	1	66.2	67.9	65.5	63.7	76.3	61.7	67.9	-	
						08:26 - 08:56	2	66.2	67.9	65.8	63.9	73.4	61.7		67.7	
						08:56 - 09:26	3	65.9	67.7	65.4	63.6	74.7	61.2	-		
					PM	17:54 - 18:24	1	64.3	65.5	63.8	62.6	76.4	61.3	65.2	-	
						18:24 - 18:54	2	63.6	64.9	63.1	61.9	76.3	60.8		64.7	
						18:54 - 19:24	3	63.2	64.5	62.8	61.5	74.8	59.9	-		
	TNM-3	Tower III, the Waterfront	R/F	13/03/19	AM	07:46 - 08:16	1	61.3	62.6	60.6	59.5	71.0	58.2	63.5	-	Lin Cheung Road (LCR)
						08:16 - 08:46	2	62.7	64.2	61.6	60.5	77.7	59.3		63.6	
						08:46 - 09:16	3	62.2	63.2	61.5	60.4	77.9	59.0	-		
					PM	17:31 - 18:01	1	61.8	63.1	60.9	60.0	74.2	59.0	62.6	-	
						18:01 - 18:31	2	61.5	62.1	60.8	59.8	81.8	58.8		62.1	
						18:31 - 19:01	3	60.9	62.0	60.4	59.4	72.7	58.4	-		
			28/F	13/03/19	AM	07:35 - 08:05	1	59.5	60.8	59.1	58.0	67.3	56.7	61.0	-	
						08:05 - 08:35	2	60.0	61.1	59.7	58.7	72.1	57.1		62.3	
						08:35 - 09:05	3	61.5	63.2	60.9	59.7	73.1	58.0	-		
					PM	17:35 - 18:05	1	61.1	62.3	60.4	59.4	72.3	58.4	62.3	-	
						18:05 - 18:35	2	61.3	62.4	60.6	59.7	76.6	58.4		62.2	
						18:35 - 19:05	3	60.9	62.0	60.2	59.3	71.7	58.4	-		
	TNM-4	Sun Tower, the Arch	62/F (Refuge floor)	12/03/19	AM	07:45 - 08:15	1	61.8	63.1	60.6	59.3	75.7	57.1	63.5	-	Austin Road West Underpass (ARWU)
						08:15 - 08:45	2	62.1	63.6	61.7	60.3	73.2	58.7		63.4	
						08:45 - 09:15	3	62.1	63.3	61.3	60.2	75.0	59.1	-		
					PM	17:51 - 18:21	1	62.0	63.5	60.7	59.4	74.9	57.9	63.3	-	
						18:21 - 18:51	2	61.0	63.0	59.7	58.3	76.1	57.2		62.7	
						18:51 - 19:21	3	61.2	62.3	59.5	58.1	78.8	56.6	-		
			29/F (Refuge floor)		AM	07:45 - 08:15	1	61.2	62.9	60.8	59.2	66.1	57.6	63.9	-	
						08:15 - 08:45	2	62.7	64.5	62.3	60.5	71.4	58.5		64.2	
						08:45 - 09:15	3	62.2	63.6	61.5	60.2	74.1	58.5	-		
					PM	17:51 - 18:21	1	61.6	63.2	60.0	58.5	79.8	56.9	63.0	-	
						18:21 - 18:51	2	60.6	62.9	59.4	57.5	71.8	56.2		62.7	
						18:51 - 19:21	3	61.6	62.6	59.3	57.6	79.7	56.4	-		
	TNM-5	Tower 2, the Harbourside*	53/F (Refuge floor)	12/03/19	AM	07:58 - 08:28	1	65.2	67.0	64.9	63.0	68.0	61.8	66.9	-	Austin Road West (ARW)
						08:28 - 08:58	2	65.1	66.8	64.8	63.3	68.0	62.1		67.0	
						08:58 - 09:28	3	65.5	67.2	65.4	63.0	68.0	62.8	-		
					PM	17:57 - 18:27	1	64.0	65.6	62.8	61.2	76.3	59.9	65.0	-	
						18:27 - 18:57	2	62.6	64.1	61.7	60.2	72.8	58.4		63.9	
						18:57 - 19:27	3	62.1	63.4	60.5	58.9	78.5	57.8	-		
			26/F (Refuge floor)		AM	07:58 - 08:28	1	65.7	67.4	65.5	63.6	68.0	62.3	67.3	-	
						08:28 - 08:58	2	65.7	67.1	65.6	63.6	68.0	62.9		67.3	
						08:58 - 09:28	3	65.9	67.4	66.0	63.6	68.0	63.1	-		
					PM	17:57 - 18:27	1	64.6	66.4	63.7	61.8	76.0	59.5	65.8	-	
						18:27 - 18:57	2	63.1	65.1	62.5	60.1	72.2	57.9		64.9	
						18:57 - 19:27	3	62.8	64.5	61.4	59.1	77.0	57.4	-		

***** To correct for the prevailing background noise from the construction at WKCD site which in front of TNM-5, each 1-sec noise sample exceeding 68 dB(A) in the am session has been replaced by the value of Leq (1.5hr) of the corresponding pm session at the same measurement location after 6pm with prevailing road traffic but minimal construction noise contribution. This capped 68 dB(A) is indeed a clearly audible level and considering that construction noise source perceived were mildly audible, it offers a conservative approach for the noise correction.

5.5 Traffic Count (1st Noise Monitoring)

The corresponding 15-min traffic count for both far end dominant roads as per ONMP requirement are as listed below by each monitoring station.

However, owing to the lack of clear view for vehicle counting for Austin Road West (ARW) from TNM-4, traffic survey for ARW cannot be conducted properly at TNM-4, hence the traffic count data of ARW is shared by TNM-5. Likewise, owing to lack of clear view for vehicle counting for Austin Road West Underpass (ARWU) from TNM-5, traffic survey for ARWU cannot be conducted properly at TNM-5, the traffic count data of ARWU is shared by TNM-4 instead. For further details and illustration of the site constraints at these two monitoring locations, this can be referred to Section 6.1(c).

a) TNM-1

Table 5 – Traffic survey result of 1st noise monitoring for TNM-1 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-1	Man King Building (R/F & 10/F)	Road D1A(N)	19/03/2019	AM	1	07:58 - 08:13	15 min	↓ SB	23	41	↑ NB	4	31	↓ SB	53	59	↑ NB	56	63
						08:13 - 08:28	15 min		22	36		6	28						
					2	08:28 - 08:43	15 min		18	35		6	30						
						08:43 - 08:58	15 min		27	48		3	25						
					3	08:58 - 09:13	15 min		30	58		9	23						
						09:13 - 09:28	15 min		24	40		10	21						
				PM	1	17:30 - 17:45	15 min		29	44		2	21		53	63		58	60
						17:45 - 18:00	15 min		24	51		6	27						
					2	18:00 - 18:15	15 min		33	35		4	30						
						18:15 - 18:30	15 min		28	39		5	26						
					3	18:30 - 18:45	15 min		24	39		3	30						
						18:45 - 19:00	15 min		17	45		2	15						
		Lin Cheung Road (LCR)	19/03/2019	AM	1	07:58 - 08:13	15 min	↓ SB	124	586	↑ NB	62	379	↓ SB	77	81	↑ NB	75	84
						08:13 - 08:28	15 min		116	623		71	370						
					2	08:28 - 08:43	15 min		105	630		57	366						
						08:43 - 08:58	15 min		110	598		65	380						
					3	08:58 - 09:13	15 min		136	631		64	352						
						09:13 - 09:28	15 min		144	654		77	391						
				PM	1	17:30 - 17:45	15 min		46	535		113	525		74	85		78	87
						17:45 - 18:00	15 min		64	520		110	554						
					2	18:00 - 18:15	15 min		56	561		110	535						
						18:15 - 18:30	15 min		66	544		96	613						
					3	18:30 - 18:45	15 min		46	628		96	649						
						18:45 - 19:00	15 min		52	683		89	677						

b) TNM-2

Table 6 – Traffic survey result of 1st noise monitoring for TNM-2 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-2	Sorrento, Tower 6 (45/F & 17/F)	Lin Cheung Road (LCR)	13/03/2019	AM	1	07:56 - 08:11	15 min	↑ NB	85	390	↓ SB	158	662	↑ NB	64	71	↓ SB	62	75
						08:11 - 08:26	15 min		63	373		145	664						
					2	08:26 - 08:41	15 min		66	418		189	585						
						08:41 - 08:56	15 min		75	362		142	655						
					3	08:56 - 09:11	15 min		81	384		153	569						
						09:11 - 09:26	15 min		85	338		150	568						
				PM	1	17:54 - 18:09	15 min		70	559		75	497		66	74		67	72
						18:09 - 18:24	15 min		66	624		51	566						
					2	18:24 - 18:39	15 min		42	606		40	534						
						18:39 - 18:54	15 min		48	624		50	447						
					3	18:54 - 19:09	15 min		37	558		48	444						
						19:09 - 19:24	15 min		35	488		47	364						
		Jordan Road (JR)	13/03/2019	AM	1	07:56 - 08:11	15 min	← WB	53	142	→ EB	86	254	← WB	44	47	→ EB	55	61
						08:11 - 08:26	15 min		38	152		95	233						
					2	08:26 - 08:41	15 min		45	140		97	215						
						08:41 - 08:56	15 min		47	129		91	226						
					3	08:56 - 09:11	15 min		56	117		94	199						
						09:11 - 09:26	15 min		49	115		99	206						
				PM	1	17:54 - 18:09	15 min		42	192		54	225		46	51		53	59
						18:09 - 18:24	15 min		35	229		51	228						
					2	18:24 - 18:39	15 min		37	217		51	263						
						18:39 - 18:54	15 min		34	215		45	233						
					3	18:54 - 19:09	15 min		33	204		34	208						
						19:09 - 19:24	15 min		20	184		36	185						

c) TNM-3

Table 7 – Traffic survey result of 1st noise monitoring for TNM-3 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-3	The Waterfront, Tower III (R/F)	Lin Cheung Road (LCR)	13/03/2019	AM	1	07:46 - 08:01	15 min	↑ NB	7	63	↓ SB	117	461	↑ NB	63	68	↓ SB	57	59
						08:01 - 08:16	15 min		9	79		93	453						
					2	08:16 - 08:31	15 min		8	69		97	506						
						08:31 - 08:46	15 min		15	67		118	528						
					3	08:46 - 09:01	15 min		9	83		102	529						
						09:01 - 09:16	15 min		17	91		138	523						
				PM	1	17:31 - 17:46	15 min		10	62		104	370		58	62		62	64
						17:46 - 18:01	15 min		10	53		104	396						
					2	18:01 - 18:16	15 min		28	60		89	422						
						18:16 - 18:31	15 min		17	81		78	439						
					3	18:31 - 18:46	15 min		14	85		71	440						
						18:46 - 19:01	15 min		9	88		68	408						
	The Waterfront, Tower III (28/F)	Lin Cheung Road (LCR)	13/03/2019	AM	1	07:46 - 08:01	15 min	↑ NB	5	47	↓ SB	122	405	↑ NB	60	63	↓ SB	56	59
						08:01 - 08:16	15 min		4	59		120	428						
					2	08:16 - 08:31	15 min		5	55		129	455						
						08:31 - 08:46	15 min		10	83		147	498						
					3	08:46 - 09:01	15 min		13	89		127	520						
						09:01 - 09:16	15 min		10	85		143	531						
				PM	1	17:31 - 17:46	15 min		12	67		60	415		56	59		60	68
						17:46 - 18:01	15 min		8	68		73	419						
					2	18:01 - 18:16	15 min		14	79		63	470						
						18:16 - 18:31	15 min		8	95		62	496						
					3	18:31 - 18:46	15 min		8	77		53	492						
						18:46 - 19:01	15 min		10	90		61	447						

d) TNM-4

Table 8 – Traffic survey result of 1st noise monitoring for TNM-4 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-4	The Arch, Sun Tower (62/F & 29/F)	Austin Road West Underpass (ARWU)	12/03/2019	AM	1	07:45 - 08:00	15 min	→ EB	27	79	← WB	17	47	→ EB	51	64	← WB	61	71
						08:00 - 08:15	15 min		38	93		18	53						
					2	08:15 - 08:30	15 min		24	91		17	81						
						08:30 - 08:45	15 min		28	118		22	45						
					3	08:45 - 09:00	15 min		25	123		18	76						
						09:00 - 09:15	15 min		36	104		23	62						
				PM	1	17:51 - 18:06	15 min		19	138		14	79		45	53		51	69
						18:06 - 18:21	15 min		21	123		13	103						
					2	18:21 - 18:36	15 min		19	132		19	76						
						18:36 - 18:51	15 min		21	131		13	85						
					3	18:51 - 19:06	15 min		17	136		10	108						
						19:06 - 19:21	15 min		18	128		17	95						

e) TNM-5

Table 9 – Traffic survey result of 1st noise monitoring for TNM-5 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-5	The Harbourside, Tower 2 (53/F & 26/F)	Austin Road West (ARW)	12/03/2019	AM	1	07:58 - 08:13	15 min	→ EB	48	181	← WB	23	75	→ EB	56	65	← WB	60	60
						08:13 - 08:28	15 min		43	177		23	67						
					2	08:28 - 08:43	15 min		42	169		31	76						
						08:43 - 08:58	15 min		50	160		33	73						
					3	08:58 - 09:13	15 min		48	147		27	71						
						09:13 - 09:28	15 min		58	139		35	77						
				PM	1	17:57 - 18:12	15 min		34	169		13	115		56	64		59	61
						18:12 - 18:27	15 min		25	185		19	102						
					2	18:27 - 18:42	15 min		31	200		19	111						
						18:42 - 18:57	15 min		27	188		14	136						
					3	18:57 - 19:12	15 min		25	183		14	116						
						19:12 - 19:27	15 min		19	192		12	92						

Notes:

* Traffic Direction = EB (Eastbound) ; WB (Westbound) ; NB (Northbound) ; SB (Southbound)

f) Hourly Vehicle Count and Average Speed (1st Noise Monitoring)

Based upon the 15-min traffic count, the 1-hour vehicle count, heavy vehicle percentage and average speed are worked out and listed below. Detail calculation can be referred to Appendix A1.3.

Table 10 – Hourly vehicle count and average speed of traffic count for 1st Noise Monitoring

Monitoring Station		Road	Time Session	Time Period	Traffic Count				Speed (km/hr)			
NSR	Building				Near Side		Far Side		Near Side		Far Side	
					HV	LV	HV	LV	HV	LV	HV	LV
TNM-1	Man King Building (R/F & 10/F)	Road D1A(N)	AM (07:58-08:58)	1-hour	90	160	19	114	Average Speed (am)			
				% HV	36.0%		14.3%		53	59	56	63
				Total Vehicle	**250**		**133**					
			PM (17:30-18:30)	1-hour	114	169	17		Average Speed (pm)			
				% HV	40.3%		14.0%		53	63	58	60
				Total Vehicle	**283**		**121**					
		Lin Cheung Road (LCR)	AM (07:58-08:58)	1-hour	455	2437	255	1495	Average Speed (am)			
				% HV	15.7%		14.6%		77	81	75	84
				Total Vehicle.	**2,892**		**1,750**					
			PM (17:30-18:30)	1-hour	232	2160	429	2227	Average Speed (pm)			
				% HV	9.7%		16.2%		74	85	78	87
				Total Vehicle	**2,392**		**2,656**					
TNM-2	Sorrento, Tower 6 (45/F & 17/F)	Lin Cheung Road (LCR)	AM (07:58-08:58)	1-hour	289	1543	634	2566	Average Speed (am)			
				% HV	15.8%		19.8%		64	71	62	75
				Total Vehicle	**1,832**		**3,200**					
			PM (17:30-18:30)	1-hour	226	2413	216	2044	Average Speed (pm)			
				% HV	8.6%		9.6%		66	74	67	72
				Total Vehicle	**2,639**		**2,260**					
		Jordan Road (JR)	AM (07:58-08:58)	1-hour	183	563	369	928	Average Speed (am)			
				% HV	24.5%		28.5%		44	47	55	61
				Total Vehicle	**746**		**1,297**					
			PM (17:30-18:30)	1-hour	148	853	201	949	Average Speed (pm)			
				% HV	14.8%		17.5%		46	51	53	59
				Total Vehicle	**1,001**		**1,150**					
TNM-3	The Waterfront, Tower III (R/F & 28/F)	Lin Cheung Road (LCR)	AM (07:58-08:58)	1-hour	39	278	425	1948	Average Speed (am)			
				% HV	12.3%		17.9%		63	68	57	59
				Total Vehicle	**317**		**2,373**					
			PM (17:30-18:30)	1-hour	65	256	375	1627	Average Speed (pm)			
				% HV	20.2%		18.7%		58	62	62	64
				Total Vehicle	**321**		**2,002**					
TNM-4	The Arch, Sun Tower (62/F & 29/F)	Austin Road West Underpass (ARWU)	AM (07:58-08:58)	1-hour	117	381	74	226	Average Speed (am)			
				% HV	23.5%		24.7%		51	64	61	71
				Total Vehicle	**498**		**300**					
			PM (17:30-18:30)	1-hour	80	524	59	343	Average Speed (pm)			
				% HV	13.2%		14.7%		45	53	51	69
				Total Vehicle	**604**		**402**					
TNM-5	The Harbourside, Tower 2 (53/F & 26/F)	Austin Road West (ARW)	AM (07:58-08:58)	1-hour	183	687	110	291	Average Speed (am)			
				% HV	21.0%		27.4%		56	65	60	60
				Total Vehicle	**870**		**401**					
			PM (17:30-18:30)	1-hour	117	742	65	464	Average Speed (pm)			
				% HV	13.6%		12.3%		56	64	59	61
				Total Vehicle	**859**		**529**					

g) 2019 Traffic Noise Model for 1st Noise Monitoring

Last, for purpose of calibration, a Traffic Noise Model for the 1st noise monitoring was established with the following features:

- Acoustic features and configuration of the 2030 Calibration Model;
- 1-hour traffic count coupled with heavy vehicle percentage and average speed for dominant roads of D1A, LCR, JR, ARWU and ARW of the 1st noise monitoring;
- NSRs of the five (5x) noise monitoring stations; and,
- Traffic flow data for other existing roads within 300m of the assessment area for 1st noise monitoring. (see Table 22)

5.6 Noise Measurements and Noise Model Calibration for Year 2030 (1st Noise Monitoring)

With reference to Section 4.2(d), the following four steps are performed in order to calculate the calibrated noise level at each monitoring station for Year 2030 of the 1st noise monitoring.

a) Step 1

1. Based upon the established in-house noise model (see Section 5.1), calculate a predicted noise level for TNM-1 to TNM-5 for Year 2030 i.e. **[B]**; and,
2. Based upon the predicted noise levels of RR i.e. **[A]**, to perform comparison between them.

b) Step 2

1. Based upon the 1st noise monitoring (see Section 5.5g), calculate a predicted noise level for TNM-1 to TNM-5 for Year 2019 i.e. **[D]**, and,
2. Based upon the measured noise levels for TNM-1 to TNM-5 i.e. **[C]**, to calculate the difference between them, i.e. Diff=[D] - [C].

c) Step 3

1. By adding the difference of Step (2), i.e. [B] + Diff ([D],[C]), to calculate a calibrated predicted noise level for Year 2030 i.e. **[E]**

d) Step 4

1. To compare **[E]** i.e. calibrated predicted traffic noise level with **[A]** i.e. predicted traffic noise levels from RR.

5.7 Calibrated 1st Noise Monitoring Result for Year 2030

The result for performing the four steps as outlined in Section 5.6 above is tabulated as follow:

Table 11 – Result tabulation of 1st noise monitoring calibration

Monitor Station	Building	NSR ID	Floor / Level	Height (mPD)	RR Predicted Overall Noise Level [A]	Step 1 Result In-house Model Predicted 2030 Noise Level* [B]	Step 2 Result Measured Noise Level [C]	In-house Model Predicted 2019 Noise Level [D]	Diff = [D] - [C]	Step 3 Result [E] = [B] + Diff [D][C]	Step 4 Result Diff [E] Vs [A]
TNM-1	Man King Building	MC2	1	7.8	65.3	65.5					
			5	19.0	68.6	68.4					
			10F	33.0	**68.4**	**68.6**	65.2	64.5	-0.7	**67.9**	-0.5
			15	47.0	69.4	69.3					
			RF / 19	58.2	**69.7**	**69.5**	64.9	65.6	0.7	**70.2**	0.5
TNM-2	Tower 6, Sorrento	SOR3	1	44.9	69.7	69.3					
			5	56.1	69.6	69.8					
			17F / 8	64.5	**-**	**70.2**	67.9	67.8	-0.1	**70.1**	-0.1
			10	70.1	69.8	69.7					
			15	84.1	69.9	69.6					
			20	98.1	69.9	69.4					
			25	112.1	69.8	69.3					
			30	126.1	69.6	69.1					
			45F / 33	134.5	**-**	**69.8**	67.1	65.1	-2.0	**67.8**	-2.0
			35	140.1	69.4	69.0					
			40	154.1	69.2	68.8					
			45	168.1	69.0	68.6					
			50	182.1	68.8	68.4					
			51	184.9	68.8	68.4					
TNM-3	Tower III, The Waterfront	TW3a	1	34.7	69.8	69.6					
			5	45.9	70.2	70.3					
			10	59.9	70.3	70.3					
			15	73.9	70.4	70.4					
			20	87.9	70.3	70.3					
			28F / 22	93.5	**-**	**68.1**	61.0	61.7	0.7	**68.8**	0.7
			25	101.9	70.1	70.0					
			30	115.9	69.8	69.6					
			35	129.9	69.6	69.2					
			37	135.5	69.5	69.1					
			RF	142.4	**-**	**67.8**	63.5	61.8	-1.7	**66.1**	-1.7
TNM-4	Sun Tower, The Arch	ARCH3a	1	39.7	62.8	62.4					
			5	50.9	65.2	65.6					
			10	64.9	65.4	65.9					
			15	78.9	65.2	65.6					
			20	92.9	64.9	65.1					
			29F / 23	101.3	**-**	**64.8**	63.9	64.5	0.6	**65.4**	0.6
			25	106.9	64.6	64.6					
			30	120.9	64.2	64.0					
			35	134.9	63.8	63.6					
			40	148.9	63.5	63.1					
			62F / 42	154.5	**-**	**64.9**	63.5	63.3	-0.2	**64.7**	-0.2
			45	162.9	63.2	62.7					
			50	176.9	62.9	62.7					
			55	190.9	62.6	62.6					
TNM-5	Tower 2, The Harbourside	HARB2	1	39.7	70.4	70.0					
			5	50.9	69.7	69.4					
			10	64.9	69.1	68.9					
			15	78.9	68.5	68.3					
			26F / 18	87.3	**-**	**67.9**	67.3	66.9	-0.4	**67.5**	-0.4
			20	92.9	68.0	67.7					
			25	106.9	67.5	67.1					
			30	120.9	67.1	66.7					
			35	134.9	66.7	66.5					
			40	148.9	66.3	66.3					
			53F / 43	157.3	**-**	**66.2**	66.9	63.7	-3.2	**63.0**	-3.2
			45	162.9	66.1	66.1					
			50	176.9	65.9	65.9					
			55	190.9	65.7	65.6					
			60	204.9	65.5	65.4					
			63	213.3	65.4	65.3					

Note: * - For noise monitoring location where predicted values are not available from RR, they are denoted as "-" in [A]. For those cases and for purpose of comparison for Step 4, predicted noise level of the calibrated in-house model (i.e. [B]) will be used instead.

5.8 2nd Noise Monitoring Location and Result (L_{10})

The 2nd noise monitoring was conducted on 10th, 11st, 16th, 17th and 19th of September 2019. With review of the 1st noise monitoring arrangement and consideration of accessibility, the following five locations were determined and hence confirmed. See site photos of Section 5.9, where all measurements were carried out at building façade.

Table 12 – Floor level and height of noise monitoring locations

NSR	Building Premises	Floor	Floor Level	Height (mPD)
TNM-1	Man King House	10/F	10	33.0
		Roof top	19	58.2
TNM-2	Tower 6, Sorrento	17/F	8	64.5
		45/F	33	134.5
TNM-3	Tower III, the Waterfront	28/F	22	93.5
		Roof top	Roof top	142.2
TNM-4*	Sun Tower, the Arch	29/F	23	101.3
	Star Tower, the Arch	57/F	38	143.3
TNM-5	Tower 2, the Harbourside	26/F	18	87.3
		53/F	43	157.3

* Noting that owing to site accessibility, the high floor of TNM-4 is different from the 1st noise monitoring which is at 62/F of Sun Tower, the Arch.

5.9 Site Photos at Each Monitoring (2nd Noise Monitoring)

a) TNM-1: Man King Building

Photo 1 : Man King Building

Photo 2 : Man King Building (R/F position)

Photo 3 : Man King Building (10/F position)

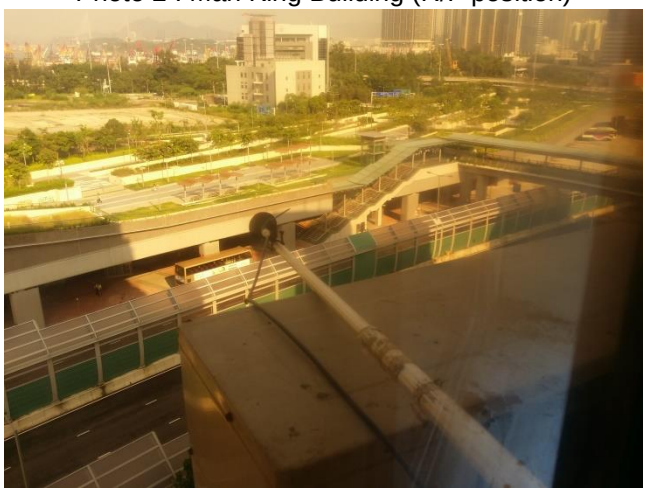


Photo 4 : Man King Building (10/F position)

b) TNM-2: Sorrento

Photo 1 : Sorrento

Photo 2 : Sorrento (Setup at 45/F & 17/F position)

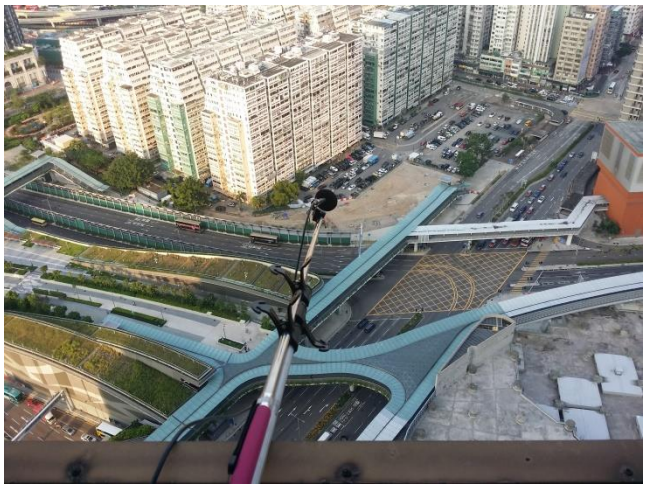


Photo 3 : Sorrento (45/F position)

Photo 4 : Sorrento (17/F position)

c) TNM-3: The Waterfront

Photo 1 : The Waterfront

Photo 2 : The Waterfront (Setup at R/F position)

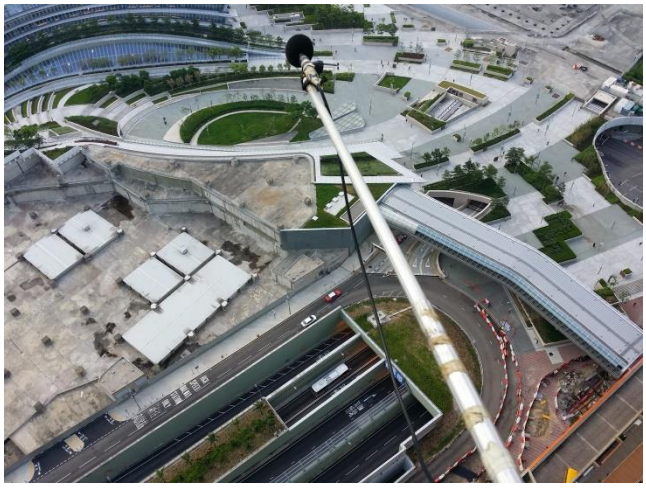


Photo 3 : The Waterfront (R/F position)

Photo 4 : The Waterfront (28/F position)

d) TNM-4: The Arch

Photo 1 : The Arch

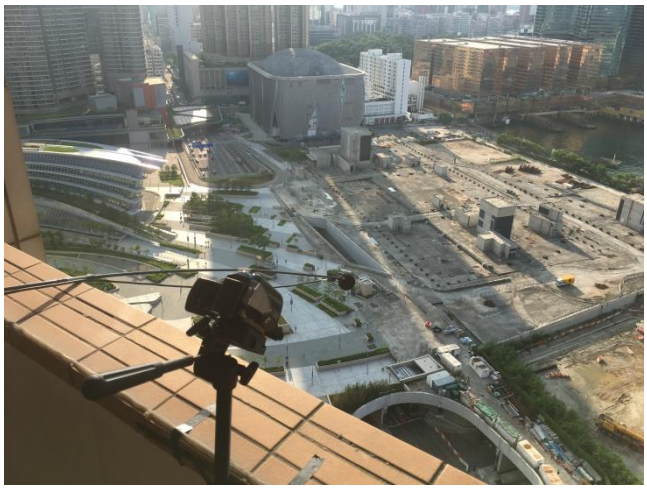


Photo 2 : The Arch (57/F position) – Video taking

Photo 3 : The Arch (29/F position)

Photo 4 : The Arch (57/F position)

e) TNM-5: The Harbourside

Photo 1 : The Harbourside

Photo 2 : The Harbourside (26/F position) – Video taking

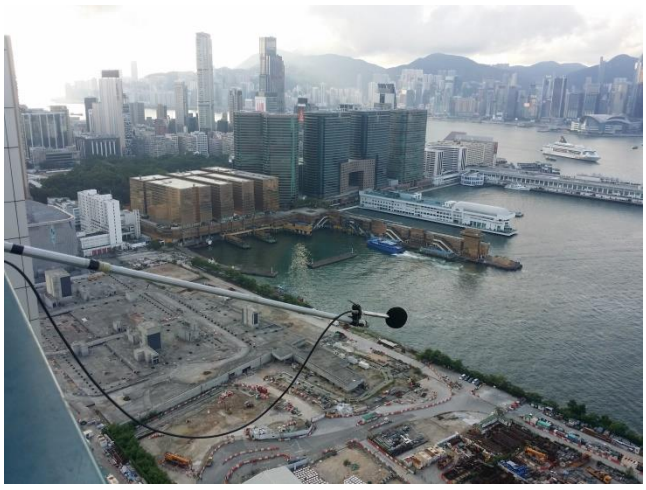


Photo 3 : The Harbourside (53/F position)

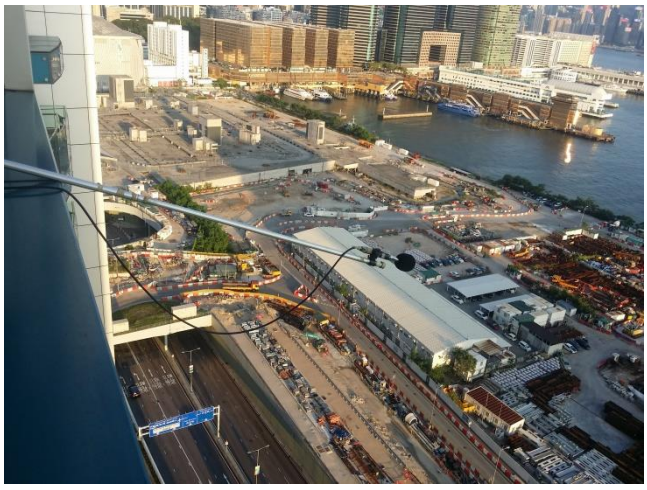


Photo 4 : The Harbourside (26/F position)

5.10 Noise Measurement (2nd Noise Monitoring)

The result of each 30-min noise measurement (L_{10}) as well as the derived 1-hour sample is tabulated in Table 13 below.

With reference to Section 4.2(d) above and for purpose of working out worst-case scenario, [C] will be represented by the highest level of set of 30-minutes L_{10} dB(A) recorded during peak hour of noise monitoring. Therefore, it will take the highest value among the two L_{10} values listed in the "1-hour Sample", which in turn were extracted from 3,600 readings (of L_{10} 30-min sample 1+2 and sample 2+3) and sorted in descending order. As for the L10 30-min sample, they were captured by continuous logging at '1 second per readings' (i.e. 1,800 readings over each 30 minutes).

Further, as there are middle and high floor measurements taken during the same am and pm peak period, hence, the determination of traffic count time period (i.e. sample 1+2 or 2+3) will be based on the majority of the highest noise levels among all the measurements.

Following this method, sample 1+2 with eight number of highest noise levels is determined to be am peak period. The selected am peak period as well as [C] are as highlighted in yellow cell, shown in Table 13, which represent the worst-case scenario for each monitoring location. Likewise, green highlight are for the chosen pm peak period.

Table 13 – Noise measurement result of 2nd noise monitoring

Stage	Traffic Noise Measurement															Traffic Survey
	Monitoring Station			Date	Time Session		Sample	Measured Noise Level, dB(A)								Dominant Source (Road)
								30-min Sample						1-hour Sample		
	NSR	Building Premises	Floor Level					L_{eq}	L_{10}	L_{50}	L_{90}	L_{max}	L_{min}	L_{10}		
Stage 2 (By 23-09-2019)	TNM-1	Man King Building	R/F	19/9/2019	AM	07:51 - 08:21	1	63.9	65.3	63.5	62.2	73.0	61.0	65.3	-	Road D1A(N) and Lin Cheung Road (LCR)
						08:21 - 08:51	2	63.9	65.2	63.5	62.4	68.6	61.2		65.1	
						08:51 - 09:21	3	63.3	65.0	62.9	60.8	71.3	57.5	-		
					PM	17:30 - 18:00	1	62.8	64.1	62.4	61.1	69.1	59.6	64.1	-	
						18:00 - 18:30	2	62.8	64.1	62.3	60.9	76.8	59.5		63.8	
						18:30 - 19:00	3	62.0	63.5	61.7	60.3	70.5	58.6	-		
			10/F (Office floor)		AM	07:51 - 08:21	1	64.0	65.6	63.5	62.0	71.3	60.7	66.1	-	
						08:21 - 08:51	2	65.2	66.4	65.0	64.1	68.7	61.7		66.3	
						08:51 - 09:21	3	65.1	66.3	64.8	63.7	76.2	62.7	-		
					PM	17:30 - 18:00	1	62.7	64.3	62.2	60.5	73.0	59.0	64.1	-	
						18:00 - 18:30	2	62.5	63.9	62.0	60.5	74.8	58.6		64.8	
						18:30 - 19:00	3	63.3	65.2	63.1	60.4	73.9	58.8	-		
	TNM-2	Sorrento, Tower 6	45/F (Refuge floor)	11/9/2019	AM	07:59 - 08:29	1	65.0	66.6	64.6	63.3	71.8	62.2	66.4	-	Lin Cheung Road (LCR) and Jordan Road (JR)
						08:29 - 08:59	2	64.9	66.2	64.5	63.4	73.7	62.1		66.3	
						08:59 - 09:29	3	65.1	66.3	64.8	63.7	72.6	62.3	-		
					PM	17:46 - 18:16	1	63.5	64.8	63.3	62.0	69.7	60.4	64.6	-	
						18:16 - 18:46	2	63.4	64.5	63.2	62.1	67.8	60.5		64.5	
						18:46 - 19:16	3	63.3	64.5	62.9	61.7	74.1	60.2	-		
			17/F (Refuge floor)		AM	07:59 - 08:29	1	66.5	68.6	65.8	63.3	75.4	61.0	68.1	-	
						08:29 - 08:59	2	65.6	67.2	64.9	63.4	74.0	61.3		67.4	
						08:59 - 09:29	3	65.7	67.5	65.3	63.5	75.2	61.4	-		
					PM	17:46 - 18:16	1	64.1	65.9	63.7	61.8	70.8	59.6	65.7	-	
						18:16 - 18:46	2	64.0	65.6	63.7	62.1	72.6	60.0		65.6	
						18:46 - 19:16	3	64.0	65.7	63.4	61.8	78.2	59.8	-		
	TNM-3	The Waterfront, Tower III	R/F	17/9/2019	AM	07:35 - 08:05	1	60.0	61.1	59.4	58.4	70.8	57.1	61.5	-	Lin Cheung Road (LCR)
						08:05 - 08:35	2	60.6	61.7	60.2	59.1	77.5	58.1		61.7	
						08:35 - 09:05	3	60.8	61.8	60.6	59.7	67.9	58.8	-		
				16/9/2019	PM	17:45 - 18:15	1	60.6	61.5	60.2	59.3	77.7	58.4	61.2	-	
						18:15 - 18:45	2	59.9	60.9	59.7	58.8	66.0	57.8		61.1	
						18:45 - 19:15	3	60.3	61.4	59.7	58.7	72.7	58.0	-		
			28/F	17/9/2019	AM	07:35 - 08:05	1	59.9	61.4	59.2	58.2	69.3	57.2	61.7	-	
						08:05 - 08:35	2	60.5	61.8	60.1	58.9	72.3	57.7		61.8	
						08:35 - 09:05	3	60.8	61.8	60.5	59.4	66.8	58.1	-		
				16/9/2019	PM	17:45 - 18:15	1	60.3	61.4	60.0	59.1	69.5	58.1	61.2	-	
						18:15 - 18:45	2	59.9	60.9	59.5	58.5	70.8	57.3		61.0	
						18:45 - 19:15	3	60.2	61.1	59.4	58.3	76.0	57.2	-		
	TNM-4	The Arch, Star Tower	57/F (Refuge floor)	10/9/2019	AM	07:50 - 08:20	1	60.9	62.1	60.3	59.3	72.9	58.2	62.0	-	Austin Road West Underpass (ARWU)
						08:20 - 08:50	2	60.9	61.8	60.7	59.9	66.2	59.0		62.1	
						08:50 - 09:20	3	61.5	62.4	61.0	60.2	76.7	59.3	-		
					PM	17:41 - 18:11	1	61.8	63.6	61.2	60.2	71.0	59.3	63.6	-	
						18:11 - 18:41	2	64.3	63.4	60.9	60.0	88.8	58.7		62.5	
						18:41 - 19:11	3	61.4	61.7	60.1	59.3	77.6	58.4	-		
		The Arch, Sun Tower	29/F (Refuge floor)		AM	07:50 - 08:20	1	63.9	66.0	60.7	58.7	77.2	57.2	65.4	-	
						08:20 - 08:50	2	63.8	65.0	61.8	60.5	77.8	59.2		64.9	
						08:50 - 09:20	3	63.2	64.8	62.5	61.3	73.6	60.3	-		
					PM	17:41 - 18:11	1	63.3	65.8	60.8	59.3	77.3	58.1	66.1	-	
						18:11 - 18:41	2	64.7	66.6	60.0	58.3	86.7	56.8		63.9	
						18:41 - 19:11	3	59.6	60.9	58.4	57.3	76.7	56.3	-		
	TNM-5	The Harbourside, Tower 2 *	53/F (Refuge floor)	10/9/2019	AM	07:52 - 08:22	1	64.5	67.5	62.0	62.0	68.0	61.9	67.3	-	Austin Road West (ARW)
						08:22 - 08:52	2	63.2	66.9	62.0	62.0	68.0	62.0		67.0	
						08:52 - 09:22	3	63.4	67.1	62.0	62.0	68.0	62.0	-		
					PM	17:58 - 18:28	1	63.8	65.9	62.5	61.3	80.3	60.0	64.7	-	
						18:28 - 18:58	2	61.0	62.3	60.5	59.3	67.7	57.8		62.1	
						18:58 - 19:28	3	60.3	61.6	59.6	58.6	68.8	57.0	-		
			26/F (Refuge floor)		AM	07:52 - 08:22	1	64.6	67.5	63.2	63.2	68.0	62.5	67.3	-	
						08:22 - 08:52	2	63.9	66.7	63.2	63.2	68.0	63.2		67.2	
						08:52 - 09:22	3	64.2	67.4	63.2	63.2	68.0	63.2	-		
					PM	17:58 - 18:28	1	65.2	67.3	63.4	61.8	76.9	60.4	66.0	-	
						18:28 - 18:58	2	61.9	63.7	61.3	59.4	68.0	57.4		63.4	
						18:58 - 19:28	3	61.4	63.1	60.8	59.1	69.7	57.0	-		

***** To correct for the prevailing background noise from the construction at WKCD site which in front of TNM-5, each 1-sec noise sample exceeding 68 dB(A) in the am session has been replaced by the value of Leq (1.5hr) of the corresponding pm session at the same measurement location after 6pm with prevailing road traffic but minimal construction noise contribution. This capped 68 dB(A) is indeed a clearly audible level and considering that construction noise source perceived were mildly audible, it offers a conservative approach for the noise correction.

5.11 Traffic Count (2nd Noise Monitoring)

The corresponding 15-min traffic count for both far end dominant roads as per ONMP requirement are as listed below by each monitoring station.

However, owing to the lack of clear view for vehicle counting for Austin Road West (ARW) from TNM-4, traffic survey for ARW cannot be conducted properly at TNM-4, hence the traffic count data of ARW is shared by TNM-5. Likewise, owing to lack of clear view for vehicle counting for Austin Road West Underpass (ARWU) from TNM-5, traffic survey for ARWU cannot be conducted properly at TNM-5, the traffic count data of ARWU is shared by TNM-4 instead. For further details and illustration of the site constraints at these two monitoring locations, this can be referred to Section 6.1(c).

a) TNM-1

Table 14 – Traffic survey result of 2nd noise monitoring for TNM-1 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-1	Man King Building (R/F & 10/F)	Road D1A(N)	19/9/2019	AM	1	07:51 - 08:06	15 min	↓	25	56	↑	4	24	↓	53	59	↑	56	63
						08:06 - 08:21	15 min	SB	17	45	NB	6	35	SB			NB		
					2	08:21 - 08:36	15 min		27	46		9	36						
						08:36 - 08:51	15 min		19	39		7	32						
					3	08:51 - 09:06	15 min		26	31		6	14						
						09:06 - 09:21	15 min		22	28		6	18						
				PM	1	17:30 - 17:45	15 min		30	34		4	33		53	63		58	60
						17:45 - 18:00	15 min		25	48		9	32						
					2	18:00 - 18:15	15 min		28	38		6	26						
						18:15 - 18:30	15 min		31	40		6	29						
					3	18:30 - 18:45	15 min		24	46		2	32						
						18:45 - 19:00	15 min		17	38		5	32						
		Lin Cheung Road (LCR)	19/9/2019	AM	1	07:51 - 08:06	15 min	↓	170	595	↑	77	427	↓	77	81	↑	75	84
						08:06 - 08:21	15 min	SB	122	517	NB	82	442	SB			NB		
					2	08:21 - 08:36	15 min		124	622		85	447						
						08:36 - 08:51	15 min		125	599		112	418						
					3	08:51 - 09:06	15 min		127	552		94	382						
						09:06 - 09:21	15 min		124	553		97	368						
				PM	1	17:30 - 17:45	15 min		54	483		95	437		74	85		78	87
						17:45 - 18:00	15 min		44	570		100	528						
					2	18:00 - 18:15	15 min		52	553		97	568						
						18:15 - 18:30	15 min		53	619		97	638						
					3	18:30 - 18:45	15 min		40	630		84	629						
						18:45 - 19:00	15 min		38	623		70	636						

b) TNM-2

Table 15 – Traffic survey result of 2nd noise monitoring for TNM-2 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-2	Sorrento, Tower 6 (45/F & 17/F)	Lin Cheung Road (LCR)	11/9/2019	AM	1	07:59 - 08:14	15 min	↑ NB	163	598	↓ SB	74	419	↑ NB	64	71	↓ SB	62	75
						08:14 - 08:29	15 min		146	556		80	435						
					2	08:29 - 08:44	15 min		123	570		84	445						
						08:44 - 08:59	15 min		125	611		99	433						
					3	08:59 - 09:14	15 min		126	576		103	400						
						09:14 - 09:29	15 min		126	553		96	375						
				PM	1	17:46 - 18:01	15 min		45	568		100	533		66	74		67	72
						18:01 - 18:16	15 min		52	561		97	576						
					2	18:16 - 18:31	15 min		51	620		95	637						
						18:31 - 18:46	15 min		40	629		82	630						
					3	18:46 - 19:01	15 min		38	622		69	634						
						19:01 - 19:16	15 min		38	612		62	618						
		Jordan Road (JR)	11/9/2019	AM	1	07:59 - 08:14	15 min	← WB	35	106	→ EB	78	178	← WB	44	47	→ EB	55	61
						08:14 - 08:29	15 min		30	96		83	160						
					2	08:29 - 08:44	15 min		47	92		63	154						
						08:44 - 08:59	15 min		63	108		54	146						
					3	08:59 - 09:14	15 min		53	99		97	126						
						09:14 - 09:29	15 min		56	127		81	115						
				PM	1	17:46 - 18:01	15 min		40	163		45	177		46	51		53	59
						18:01 - 18:16	15 min		40	139		33	155						
					2	18:16 - 18:31	15 min		46	173		48	198						
						18:31 - 18:46	15 min		49	149		36	190						
					3	18:46 - 19:01	15 min		33	159		40	216						
						19:01 - 19:16	15 min		50	152		40	221						

c) TNM-3

Table 16 – Traffic survey result of 2nd noise monitoring for TNM-3 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-3	The Waterfront, Tower III (R/F & 28/F)	Lin Cheung Road (LCR)	17/9/2019	AM	1	07:35 - 07:50	15 min	↑ NB	3	64	↓ SB	136	420	↑ NB	63	68	↓ SB	57	59
						07:50 - 08:05	15 min		7	68		134	444						
					2	08:05 - 08:20	15 min		7	56		138	478						
						08:20 - 08:35	15 min		7	88		157	523						
					3	08:35 - 08:50	15 min		9	111		111	512						
						08:50 - 09:05	15 min		8	74		125	523						
			16/9/2019	PM	1	17:45 - 18:00	15 min		4	77		55	408		58	62		62	64
						18:00 - 18:15	15 min		10	88		67	412						
					2	18:15 - 18:30	15 min		14	91		50	460						
						18:30 - 18:45	15 min		9	91		49	485						
					3	18:45 - 19:00	15 min		8	68		47	484						
						19:00 - 19:15	15 min		11	76		54	440						

d) TNM-4

Table 17 – Traffic survey result of 2nd noise monitoring for TNM-4 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-4	The Arch (57/F, Star Tower & 29/F, Sun Tower)	Austin Road West Underpass (ARWU)	10/9/2019	AM	1	07:50 - 08:05	15 min	→ EB	33	85	← WB	10	60	→ EB	51	64	← WB	61	71
						08:05 - 08:20	15 min		45	75		19	44						
					2	08:20 - 08:35	15 min		34	87		17	55						
						08:35 - 08:50	15 min		40	93		24	69						
					3	08:50 - 09:05	15 min		37	116		30	64						
						09:05 - 09:20	15 min		37	96		23	65						
				PM	1	17:41 - 17:56	15 min		25	118		16	85		45	53		51	69
						17:56 - 18:11	15 min		26	135		12	71						
					2	18:11 - 18:26	15 min		24	141		13	74						
						18:26 - 18:41	15 min		23	166		20	55						
					3	18:41 - 18:56	15 min		19	143		20	76						
						18:56 - 19:11	15 min		18	116		11	77						

e) TNM-5

Table 18 – Traffic survey result of 2nd noise monitoring for TNM-5 noise monitoring location

Monitoring Station		Road	Date	Time Session	Sample	Time Period		Traffic Count						Speed (km/hr)					
								Near Side			Far Side			Near Side			Far Side		
NSR	Building							*	HV	LV	*	HV	LV	*	HV	LV	*	HV	LV
TNM-5	The Harbourside, Tower 2 (53/F & 26/F)	Austin Road West (ARW)	10/9/2019	AM	1	07:52 - 08:07	15 min	→	24	163	←	16	83	→	56	65	←	60	60
						08:07 - 08:22	15 min	EB	47	160	WB	24	89	EB			WB		
					2	08:22 - 08:37	15 min		33	183		29	105						
						08:37 - 08:52	15 min		52	174		29	85						
					3	08:52 - 09:07	15 min		53	170		20	63						
						09:07 - 09:22	15 min		37	160		33	72						
				PM	1	17:58 - 18:13	15 min		28	177		15	82		56	64		59	61
						18:13 - 18:28	15 min		30	191		12	96						
					2	18:28 - 18:43	15 min		36	203		16	82						
						18:43 - 18:58	15 min		23	172		14	99						
					3	18:58 - 19:13	15 min		20	165		12	104						
						19:13 - 19:28	15 min		20	145		11	87						

Notes:

* Traffic Direction = EB (Eastbound) ; WB (Westbound) ; NB (Northbound) ; SB (Southbound)

f) Hourly Vehicle Count and Average Speed (2nd Noise Monitoring)

Based upon the 15-min traffic count, the 1-hour vehicle count, heavy vehicle percentage and average speed are worked out and listed below. Detail calculation can be referred to Appendix A1.3.

Table 19 – Hourly vehicle count and average speed of traffic count for 2nd noise monitoring

Monitoring Station		Road	Time Session	Time Period	Traffic Count				Speed (km/hr)			
NSR	Building				Near Side		Far Side		Near Side		Far Side	
					HV	LV	HV	LV	HV	LV	HV	LV
TNM-1	Man King Building (R/F & 10/F)	Road D1A(N)	AM (07:51-08:51)	1-hour	88	186	26	127	Average Speed (am)			
				% HV	32.1%		17.0%		53	59	56	63
				Total Vehicle	**274**		**153**					
			PM (17:30-18:30)	1-hour	114	160	25	120	Average Speed (pm)			
				% HV	41.6%		17.2%		53	63	58	60
				Total Vehicle	**274**		**145**					
		Lin Cheung Road (LCR)	AM (07:51-08:51)	1-hour	541	2333	356	1734	Average Speed (am)			
				% HV	18.8%		17.0%		77	81	75	84
				Total Vehicle	**2,874**		**2,090**					
			PM (17:30-18:30)	1-hour	203	2225	389	2171	Average Speed (pm)			
				% HV	8.4%		15.2%		74	85	78	87
				Total Vehicle	**2,428**		**2,560**					
TNM-2	Sorrento, Tower 6 (45/F & 17/F)	Lin Cheung Road (LCR)	AM (07:59-08:59)	1-hour	557	2335	337	1732	Average Speed (am)			
				% HV	19.3%		16.3%		64	71	62	75
				Total Vehicle	**2,892**		**2,069**					
			PM (17:46-18:46)	1-hour	188	2378	374	2376	Average Speed (pm)			
				% HV	7.3%		13.6%		66	74	67	72
				Total Vehicle	**2,566**		**2,750**					
		Jordan Road (JR)	AM (07:59-08:59)	1-hour	175	402	278	638	Average Speed (am)			
				% HV	30.3%		30.3%		44	47	55	61
				Total Vehicle	**577**		**916**					
			PM (17:46-18:46)	1-hour	175	624	162	720	Average Speed (pm)			
				% HV	21.9%		18.4%		46	51	53	59
				Total Vehicle	**799**		**882**					
TNM-3	The Waterfront, Tower III (R/F & 28/F)	Lin Cheung Road (LCR)	AM (07:35-08:35)	1-hour	24	276	565	1865	Average Speed (am)			
				% HV	8.0%		23.3%		63	68	57	59
				Total Vehicle	**300**		**2,430**					
			PM (17:45-18:45)	1-hour	37	347	221	1765	Average Speed (pm)			
				% HV	9.6%		11.1%		58	62	62	64
				Total Vehicle	**384**		**1,986**					
TNM-4	The Arch, Sun Tower (62/F & 29/F)	Austin Road West Underpass (ARWU)	AM (07:50-08:50)	1-hour	152	340	70	228	Average Speed (am)			
				% HV	30.9%		23.5%		51	64	61	71
				Total Vehicle	**492**		**298**					
			PM (17:41-18:41)	1-hour	98	560	61	285	Average Speed (pm)			
				% HV	14.9%		17.6%		45	53	51	69
				Total Vehicle	**658**		**346**					
TNM-5	The Harbourside, Tower 2 (53/F & 26/F)	Austin Road West (ARW)	AM (07:52-08:52)	1-hour	156	680	98	362	Average Speed (am)			
				% HV	18.7%		21.3%		56	65	60	60
				Total Vehicle	**836**		**460**					
			PM (17:58-18:58)	1-hour	117	743	57	359	Average Speed (pm)			
				% HV	13.6%		13.7%		56	64	59	61
				Total Vehicle	**860**		**416**					

g) 2019 Traffic Noise Model for 2nd Noise Monitoring

Last, for purpose of calibration, a Traffic Noise Model for the 2nd noise monitoring was established with the following features:

- Acoustic features and configuration of the 2030 Calibration Model;
- 1-hour traffic count coupled with heavy vehicle percentage and average speed for dominant roads of D1A, LCR, JR, ARWU and ARW of the 2nd noise monitoring;
- NSRs of the five (5x) noise monitoring stations; and,
- Traffic flow data for other existing roads within 300m of the assessment area. (See Table 23)

5.12 Noise Measurements and Noise Model Calibration for Year 2030 (2nd Noise Monitoring)

With reference to Section 4.2(d), the following four steps are performed in order to calculate the calibrated noise level at each monitoring station for Year 2030 of the 2nd noise monitoring.

a) Step 1

1. Based upon the established in-house noise model (see Section 5.1), calculate a predicted noise level for TNM-1 to TNM-5 i.e. **[B]**; and,
2. Based upon the predicted noise levels of RR i.e. **[A]**, to perform comparison between them.

b) Step 2

1. Based upon the 2nd noise monitoring (see Section 5.11g) calculate a predicted noise level for TNM-1 to TNM-5 for Year 2019 i.e. **[D]**, and,
2. Based upon the measured noise levels for TNM-1 to TNM-5 i.e. **[C]**, to calculate the difference between them, i.e. Diff=[D] - [C].

c) Step 3

1. By adding the difference of Step (2), i.e. [B] + Diff ([D],[C]), to calculate a calibrated predicted noise level for Year 2030 i.e. **[E]**

d) Step 4

1. To compare **[E]** i.e. calibrated predicted traffic noise level with **[A]** i.e. predicted traffic noise levels from RR.

5.13 Calibrated 2nd Noise Monitoring Result for Year 2030

The result for performing the four steps as outlined in Section 5.12 above is tabulated as follow:

Table 20 – Result tabulation of 2nd noise monitoring calibration

Monitor Station	Building	NSR ID	Floor / Level	Height (mPD)	RR Predicted Overall Noise Level [A]	Step 1 Result In-house Model Predicted 2030 Noise Level* [B]	Step 2 Result Measured Noise Level [C]	In-house Model Predicted 2019 Noise Level [D]	Diff = [D] - [C]	Step 3 Result [E] = [B] + Diff [D][C]	Step 4 Result Diff [E] Vs [A]
TNM-1	Man King Building	MC2	1	7.8	65.3	65.5					
			5	19.0	68.6	68.4					
			10F	33.0	**68.4**	**68.6**	66.1	64.6	-1.5	**67.1**	-1.3
			15	47.0	69.4	69.3					
			RF / 19	58.2	**69.7**	**69.5**	65.3	65.7	0.4	**69.9**	0.2
TNM-2	Tower 6, Sorrento	SOR3	1	44.9	69.7	69.3					
			5	56.1	69.6	69.8					
			17F / 8	64.5	**-**	**70.2**	68.1	67.9	-0.2	**70.0**	-0.2
			10	70.1	69.8	69.7					
			15	84.1	69.9	69.6					
			20	98.1	69.9	69.4					
			25	112.1	69.8	69.3					
			30	126.1	69.6	69.1					
			45F / 33	134.5	**-**	**69.9**	66.4	65.2	-1.2	**68.7**	-1.2
			35	140.1	69.4	69.0					
			40	154.1	69.2	68.8					
			45	168.1	69.0	68.6					
			50	182.1	68.8	68.4					
			51	184.9	68.8	68.4					
TNM-3	Tower III, The Waterfront	TW3a	1	34.7	69.8	69.6					
			5	45.9	70.2	70.3					
			10	59.9	70.3	70.3					
			15	73.9	70.4	70.4					
			20	87.9	70.3	70.3					
			28F / 22	93.5	**-**	**68.1**	61.7	61.9	0.2	**68.3**	0.2
			25	101.9	70.1	70.0					
			30	115.9	69.8	69.6					
			35	129.9	69.6	69.2					
			37	135.5	69.5	69.1					
			RF	142.4	**-**	**67.8**	61.5	62.2	0.7	**68.5**	0.7
TNM-4	Sun Tower, The Arch	ARCH3a	1	39.7	62.8	62.4					
			5	50.9	65.2	65.6					
			10	64.9	65.4	65.9					
			15	78.9	65.2	65.6					
			20	92.9	64.9	65.1					
			29F / 23	101.3	**-**	**64.8**	65.4	64.5	-0.9	**63.9**	-0.9
			25	106.9	64.6	64.6					
			30	120.9	64.2	64.0					
			35	134.9	63.8	63.6					
			57F# / 38	143.3	**-**	**68.2**	62.0	63.0	1.0	**69.2**	1.0
			40	148.9	63.5	63.1					
			45	162.9	63.2	62.7					
			50	176.9	62.9	62.7					
			55	190.9	62.6	62.6					
TNM-5	Tower 2, The Harbourside	HARB2	1	39.7	70.4	70.0					
			5	50.9	69.7	69.4					
			10	64.9	69.1	68.9					
			15	78.9	68.5	68.3					
			26F / 18	87.3	**-**	**67.9**	67.3	66.7	-0.6	**67.3**	-0.6
			20	92.9	68.0	67.7					
			25	106.9	67.5	67.1					
			30	120.9	67.1	66.7					
			35	134.9	66.7	66.5					
			40	148.9	66.3	66.3					
			53F / 43	157.3	**-**	**66.2**	67.3	63.5	-3.8	**62.4**	-3.8
			45	162.9	66.1	66.1					
			50	176.9	65.9	65.9					
			55	190.9	65.7	65.6					
			60	204.9	65.5	65.4					
			63	213.3	65.4	65.3					

Note:

***** - For noise monitoring location where predicted values are not available from RR, they are denoted as "-" in [A]. For those cases and for purpose of comparison for Step 4, predicted noise level of the calibrated in-house model (i.e. [B]) will be used instead.

- Owing to site accessibility restriction of high floor in Sun Tower for the 2nd noise monitoring, 57/F of Star Tower was used for the measurement instead. As it referred to a different NSR in RR (i.e. ARCH1), it could not be used for direct comparison with the predicted values. However, when comparing the predicted noise level between RR and in-house model in the corresponding NSRs, the results are found to be consistent, and with a difference of approximately ±1.0 dB(A). See Table 20a below:

Table 20a – Result tabulation of ARCH1

Monitor Station	**Building**	**NSR ID**	**Floor / Level**	**Height (mPD)**	**RR Predicted Overall Noise Level [A]**	Step 1 Result **In-house Model Predicted 2030 Noise Level* [B]**	Step 2 Result **Measured Noise Level [C]**	**In-house Model Predicted 2019 Noise Level [D]**	**Diff = [D] - [C]**	Step 3 Result **[E] = [B] + Diff [D][C]**	Step 4 Result **Diff [E] Vs [A]**
TNM-4	Star Tower, The Arch	ARCH1	30	120.9	68.2	68.7					
			35	134.9	67.8	68.4					
			57F / 38	143.3	**-**	**68.2**	62.0	63.0	1.0	**69.2**	1.0
			40	148.9	67.6	68.1					
			45	162.9	67.3	67.8					
			50	176.9	67.0	67.5					
			55	190.9	66.7	67.2					

6 Data Analysis and Results Discussion

In setting up the in-house model, a total of 5 monitoring locations as listed in the ONMP were used in the calibration process.

Based upon the same configuration representing the ground features and implemented mitigation measures (i.e. Figure 8, 9 and 10), an in-house model was set up and then calibrated. Referring to Table 2, the calibration result is within 0.5 dB(A).

Using the calibrated in-house model, predictions were then performed for the 1st and 2nd noise monitoring which in turn will be used to compare with the corresponding measured noise levels. These discrepancies are attributable to several observations and constraints found during noise monitoring, which are as described.

6.1 On-site Observations and Constraints

a) Monitoring Locations

Some monitoring locations differ from the model assessment points due to access constraints. Only TNM-1 (10/F of Man King Building) and TNM-3 (28/F of Tower III the Waterfront) could be aligned with evenly distributed floor levels same as the model.

In addition, refuge floors are preferred to minimize disturbance to residents during the noise monitoring. As a result, refuge floors were arranged as the middle floor level for noise monitoring. Including TNM-2 (Tower 6 of Sorrento) TNM-4 (i.e. Sun Tower and Star Tower of the Arch) and TNM-5 (i.e. Tower 2 of Harbourside). Also, for TNM-4, the location as the high floor level in 1st and 2nd monitoring was different due to access constraints from estate management office.

b) Background Noises

Background noises, such as construction and fixed plant noises, were also observed and unavoidable during noise monitoring. This may cause discrepancies and result in measured noise levels being higher than predicted noise levels. Higher background noises between the 1st and 2nd noise monitoring can be indicated by comparison of L_{90} values between both noise measurements (i.e. Table 4 and 13). The affected noise monitoring locations include TNM-1, TNM-2, TNM-3 and TNM-5.

c) Traffic Survey

There were visibility constraints in conducting traffic survey to the concerned roads designated at the following monitoring locations.

- TNM-1: According to the on-site observation from Man King Building, there was no or low visibility to Jordan Road (JR), hence Lin Cheung Road (LCR) was measured since it was visible and observed as the dominant source with free flow traffic.

- TNM-4: As shown in Fig. 7 below, despite LCR and Austin Road West (ARW) were specified for traffic survey, these two roads have no visibility from TNM-4 at a height of 154.5mPD (i.e. 62/F) where the video camera was set up and at a rough horizontal distance of 286m between them as indicated. Consequently, traffic survey for ARW cannot be conducted properly at TNM-4, and the traffic count data of ARW is shared by TNM-5.

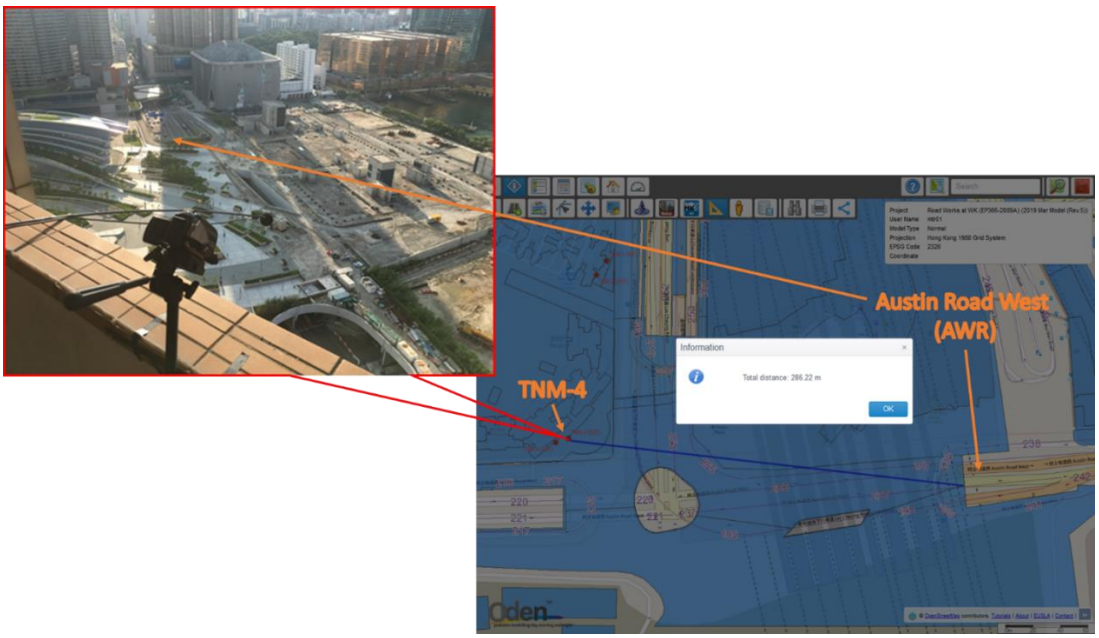


Fig. 7- Site visibility of TNM-4 with ARW

- TNM-5: As shown in Fig. 8 below, despite ARWU was specified, this road has no visibility to TNM-5 at a height of 157.3mPD (i.e. 53/F) where the video camera was set up. Further, ARWU is in almost parallel direction to the building façade; at a rough horizontal distance of 219m between them as indicated and are also underneath road level. Consequently, traffic survey for ARWU cannot be conducted properly at TNM-5, and the traffic count data of ARWU is shared by TNM-4.

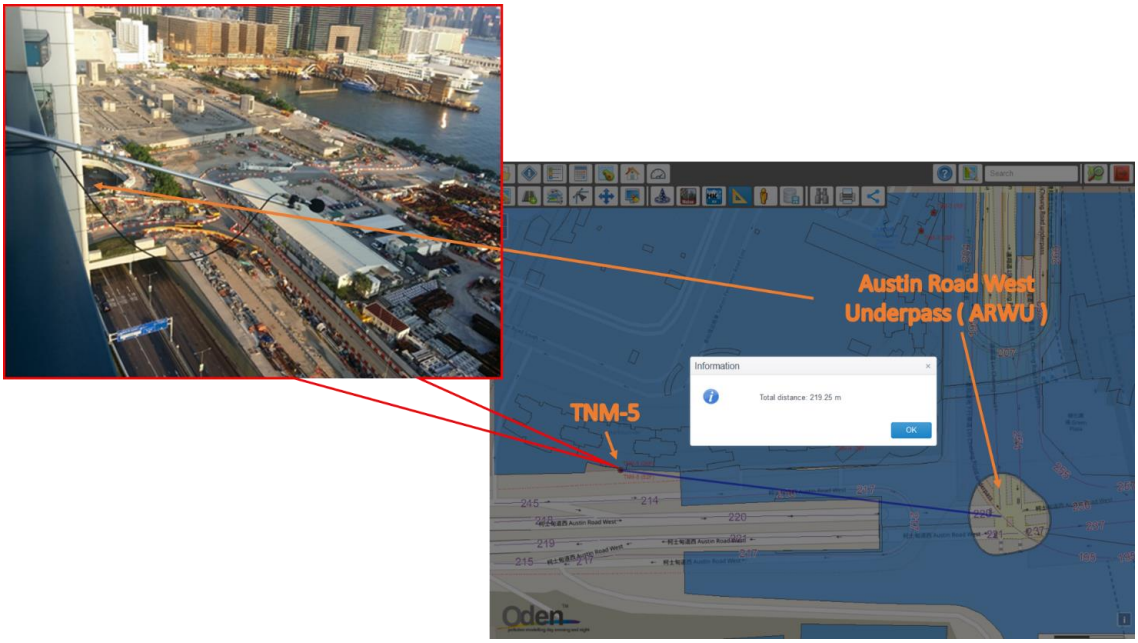


Fig. 8- Site visibility of TNM-5 with ARWU

6.2 Comparison of Adjusted Measured Noise Levels from the Predictions in the RR

Based on the ONMP methodology, once the calibrated predicted traffic noise levels in year 2030 (i.e. [E]) was worked out from the difference in Step 2 (i.e. [D]-[C]), it would then be compared to the predicted traffic noise levels from the RR (i.e. [A]).

However, because of the constraint mentioned in **Section 6.1a**, these values (i.e. [A]) are not available for most of the monitoring locations for direct comparison. Hence, predicted noise levels from the calibrated in-house model (i.e. [B]) are used for both comparison and working out of the adjusted measured noise levels for year 2030 instead.

For TNM-1 (i.e. Man King Building) where predicted noise levels are available for direct comparison, adjusted noise level between noise levels [A] and [E] differ by 0.5 dB(A) to 1.3 dB(A).

For TNM-2, it is due to relatively complex surrounding environment. Referring to Photo 3 of Section 5.3(b) and 5.9(b), an open construction site of a planned development is in front, it has open view angle to Lin Cheung Road, D1A as well as Jordan Roads and two signalized junctions. The high floor is also over looking to Man Wui Street and some section the Ferry Street. This complex environment is envisaged to cause the large discrepancy especially at high floor of TNM-2.

For TNM-5, the discrepancy is due to the relatively higher measured noise level likely caused by the observed background noise from the large construction site of WKCD in front. Whereas,

predicted noise level at high floor will be lower due to longer attenuation distance and relatively open environment at this location. Consequently, this causes a relatively larger discrepancies for the high floor.

6.3 Review of Effectiveness of Implemented Mitigation Measures

The following tables in **Section 6.3a** to **6.3e** summarize the previously discussed discrepancies and adjusted noise levels at each monitoring location to review the effectiveness the implemented mitigation measures.

It is evident that middle floor levels generally exhibit smaller discrepancies between predicted and measured noise levels compared to high floor level.

In addition, for TNM-4 where the designed at-grade road deck serves as an enclosure for the underneath roads (notably LCR underpass and AWR underpass) provide an effective shielding of traffic noise to The Arch. Thus, the overall discrepancies between all the 4 measurement points at this monitoring location is within 1 dB(A) which is the smallest among all the 5 monitoring locations.

In summary, all the adjusted noise levels for year 2030 are found to be within 70 dB(A).

a) TNM-1

Monitoring Location (NSR)	Building Premises	Floor	Floor Level	Height (mPD)	Implemented Mitigation Measures (Concerned Road)	Noise Monitoring	Predicted Vs Measured Noise Level [D]-[C]#	Adjusted Noise Level [E] #
TNM-1	Man King House	10/F	10	33.0	▪ Barrier (D1A)^ ▪ LNRS (D1A)	1st	-0.7	67.9
						2nd	-1.5	67.1
		RT	19	58.2		1st	0.7	70.2
						2nd	0.4	69.9

Notes:

- Refer to Table 11 and 20

^ - Barrier include:
- 5.5m High Cantilever Barrier, with 2.5m Cantilever at 45º (D1A North & South)
- 5.5m High Cantilever Barrier, with 2m Cantilever at 45º (D1A North & South)
- 5.5m High Cantilever Barrier, with 3m Cantilever at 45º (D1A North & South)

b) TNM-2

Monitoring Location (NSR)	Building Premises	Floor	Floor Level	Height (mPD)	Implemented Mitigation Measures (Concerned Road)	Noise Monitoring	Predicted Vs Measured Noise Level [D]-[C]#	Adjusted Noise Level [E] #
TNM-2	Tower 6, Sorrento	17/F	8	64.5	▪ Landscape deck (LCR) ▪ Barrier (LCR)^ ▪ LNRS (LCR)	1st	-0.1	70.1
						2nd	-0.2	70.0
		45/F	33	134.5		1st	-2.0	67.8
						2nd	-1.2	68.7

Notes:

- Refer to Table 11 and 20

^ - Barrier include:
- 5.5m High Cantilever Barrier, with 4m Cantilever at 45º (LCR)
- 5.5m High Semi-enclosure (LCR)

c) TNM-3

Monitoring Location (NSR)	Building Premises	Floor	Floor Level	Height (mPD)	Implemented Mitigation Measures (Concerned Road)	Noise Monitoring	Predicted Vs Measured Noise Level [D]-[C]#	Adjusted Noise Level [E] #
TNM-3	TNM-3	28/F	22	93.5	▪ Barrier (LCR underpass)^ ▪ LNRS (LCR & LCR underpass)	1st	0.7	68.8
						2nd	0.2	68.3
		RT	RT	142.2		1st	-1.7	66.1
						2nd	0.7	68.5

Notes:

- Refer to Table 11 and 20

^ - Barrier include:
- 3m High Vertical Barrier (LCR)
- 3.5m High Vertical Barrier (LCR)
- 5.5m High Cantilever Barrier, with 2.5m Cantilever at 45º (LCR underpass)

d) TNM-4

Monitoring Location (NSR)	Building Premises	Floor	Floor Level	Height (mPD)	Implemented Mitigation Measures (Concerned Road)	Noise Monitoring	Predicted Vs Measured Noise Level [D]-[C]#	Adjusted Noise Level [E] #
TNM-4*	Sun Tower, the Arch	29/F	23	101.3	▪ Landscape deck (ARW) ▪ LNRS (ARW underpass) ▪ Barrier (LCR & LCR underpass)@	1st	0.6	65.4
						2nd	-0.9	63.9
	Sun Tower, the Arch	62/F	42	154.5		1st	-0.2	64.7
	Star Tower, the Arch	57/F@	38	143.3		2nd	1.0	69.2

Notes:

* - The change in location of the high floor level for the 1st and 2nd noise monitoring is due to the fact that no access can be provided by the estate management office to the previous monitoring location.

- Refer to Table 11 and 20

@ - As 57/F of Star Tower has a side viewing angle to LCR and LCR underpass, hence, mitigation measure for this particular location include also the following barriers:

- 3m High Vertical Barrier (LCR)
- 3.5m High Vertical Barrier (LCR)
- 5.5m High Cantilever Barrier, with 2.5m Cantilever at 45º (LCR underpass)

e) TNM-5

Monitoring Location (NSR)	Building Premises	Floor	Floor Level	Height (mPD)	Implemented Mitigation Measures (Concerned Road)	Noise Monitoring	Predicted Vs Measured Noise Level [D]-[C]#	Adjusted Noise Level [E] #
TNM-5	Tower 2, the Harbourside	26/F	18	87.3	▪ NRS (ARW & ARW underpass)	1st	-0.4	67.5
						2nd	-0.6	67.3
		53/F	43	157.3		1st	-3.2	63.0
						2nd	-3.8	62.4

Notes:

- Refer to Table 11 and 20

7 Conclusion

In conclusion, despite varied discrepancies at the designated noise monitoring locations, the mitigation measures for the Road Works at West Kowloon area are considered to be effective and efficient.

Appendix A1.1 – Field Record Sheet

Noise Measurements Form

	Parameter	Measured
Measurement Results (1st 30 mins), dB(A)	L_{eq}	
	L_{10}	
	L_{90}	
Measurement Results (2nd 30 mins), dB(A)	L_{eq}	
	L_{10}	
	L_{90}	
Measurement Results (3rd 30 mins), dB(A)	L_{eq}	
	L_{10}	
	L_{90}	

Traffic Counts Form

Monitoring Location (Road)	Time (15 min each)	Traffic data*				Average travelling time and distance			
		Near side		Far side		Near side		Far side	
		HV	LV	HV	LV	HV	LV	HV	LV
TNM-1 (D1A(N))									
TNM-1 (JR)									
TNM-2 (JR)									
TNM-2 (LCR)									
TNM-3 (LCR)									
TNM-4 (LCR)									
TNM-4 (ARW)									
TNM-4 (ARWU)									

Monitoring Location (Road)	Time (15 min each)	Traffic data*				Average travelling time and distance			
		Near side		Far side		Near side		Far side	
		HV	LV	HV	LV	HV	LV	HV	LV
TNM-5 (ARW)									
TNM-5 (ARWU)									

Note:

LV – Light vehicle (i.e. private car, taxi and motorcycle)

HV – Heavy vehicle (i.e. vehicles other than LV)

* Traffic count for a duration of 15 min.

Appendix A1.2 – Model Setup

a) 2030 Traffic Flow Data

The imported and configured road features and RR's 2030 traffic flow in the ODEN model is as illustrated.

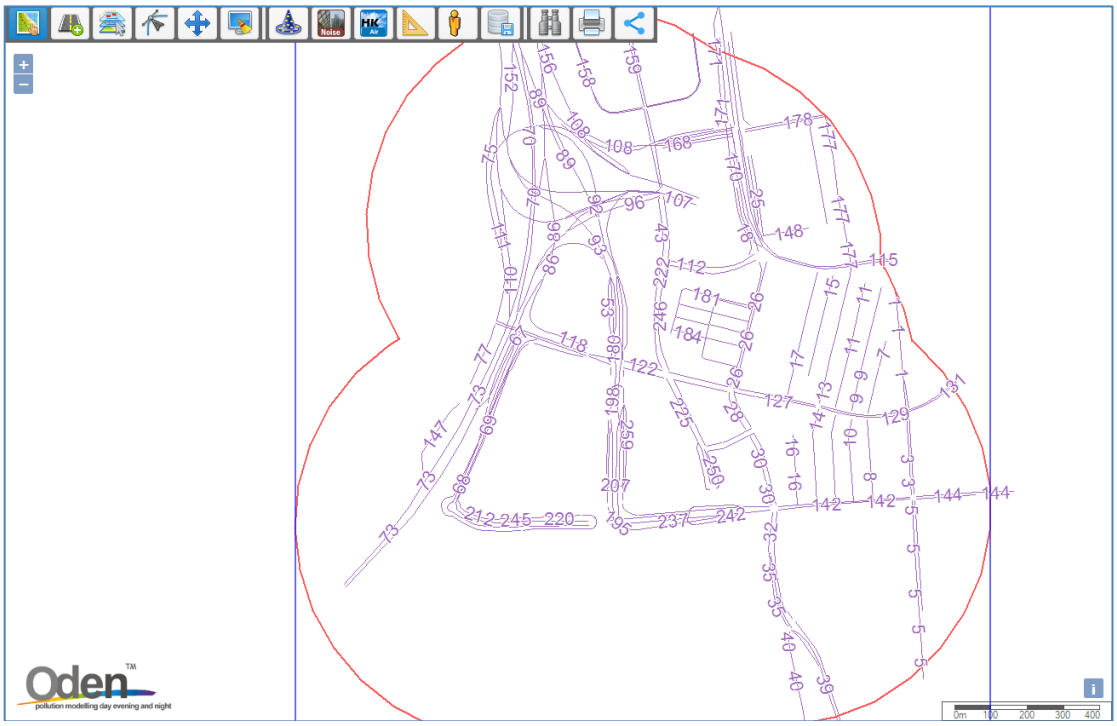


Fig. 9 – Road network within 300m boundary, which has included all roads listed in Table 21 below and in the noise prediction.

RR's 2030 traffic flow for 215 road segments are as listed. Referring to Appendix 2.3 of RR, road traffic flow for road segments 45-50, 55-62, 132-141, 146, 194, 202-203, 205-206, 208-209, 211, 226, 228-236 and 239-240 were not estimated, hence they will not be included in the assessment. Besides, traffic flow for afternoon peak were also not estimated in the RR.

Table 21 – 2030 traffic flow

		Vehicle / Hour (VEH./H)		**Percentage of Heavy Vehicle (% - HGV)**	
ID	**Road Name**	**(DAY)**	**(NIGHT)**	**(DAY)**	**(NIGHT)**
1	NATHAN ROAD	855	0	45	0
2	NATHAN ROAD	1395	0	46	0
3	NATHAN ROAD	755	0	44	0
4	NATHAN ROAD	785	0	45	0
5	NATHAN ROAD	620	0	44	0

6	NATHAN ROAD	1010	0	45	0
7	PARKES STREET	245	0	30	0
8	PARKES STREET	440	0	33	0
9	WOOSUNG STREET	240	0	30	0
10	WOOSUNG STREET	250	0	29	0
11	TEMPLE STREET	185	0	30	0
12	TEMPLE STREET	65	0	18	0
13	SHANGHAI STREET	955	0	59	0
14	SHANGHAI STREET	340	0	61	0
15	RECLAMATION STREET	130	0	37	0
16	KWUN CHUNG STREET	15	0	0	0
17	BATTERY STREET	250	0	29	0
18	FERRY STREET	1055	0	42	0
19	GASCOIGNE ROAD	455	0	28	0
20	FERRY STREET	730	0	24	0
21	WEST KOWLOON CORRIDOR	1495	0	42	0
22	WEST KOWLOON CORRIDOR	1195	0	27	0
23	FERRY STREET	1570	0	41	0
24	WEST KOWLOON CORRIDOR	700	0	41	0
25	FERRY STREET	975	0	43	0
26	FERRY STREET	1600	0	24	0
27	FERRY STREET	1525	0	24	0
28	CANTON ROAD	1945	0	24	0
29	CANTON ROAD	1715	0	23	0
30	CANTON ROAD	2420	0	23	0
31	CANTON ROAD	2695	0	23	0
32	CANTON ROAD	2850	0	23	0
33	CANTON ROAD	3555	0	23	0
34	KOWLOON PARK DRIVE	2015	0	23	0
35	CANTON ROAD	570	0	24	0
36	KOWLOON PARK DRIVE	440	0	29	0
37	KOWLOON PARK DRIVE	1525	0	28	0
38	KOWLOON PARK DRIVE	1410	0	28	0
39	KOWLOON PARK DRIVE	1770	0	28	0
40	CANTON ROAD	1825	0	23	0
41	HOI WANG ROAD	725	0	29	0
42	HOI WANG ROAD	785	0	28	0
43	HOI WANG ROAD	785	0	27	0
44	HOI WANG ROAD	170	0	30	0
51	LIN CHEUNG ROAD	1890	0	19	0
52	LIN CHEUNG ROAD	3350	0	19	0
53	LIN CHEUNG ROAD	310	0	20	0

54	LIN CHEUNG ROAD	1800	0	19	0
63	NGA CHEUNG ROAD	625	0	18	0
64	NGA CHEUNG ROAD	1225	0	19	0
65	NGA CHEUNG ROAD	1320	0	10	0
66	NGA CHEUNG ROAD	865	0	12	0
67	NGA CHEUNG ROAD	50	0	100	0
68	NGA CHEUNG ROAD	1265	0	10	0
69	NGA CHEUNG ROAD	1235	0	10	0
70	WEST KOWLOON HIGHWAY	2455	0	26	0
71	WEST KOWLOON HIGHWAY	2540	0	27	0
72	WEST KOWLOON HIGHWAY	2940	0	26	0
73	WESTERN HARBOUR CROSSING	4655	0	26	0
74	WEST KOWLOON HIGHWAY	5050	0	26	0
75	HOI PO ROAD	465	0	8	0
76	HOI PO ROAD	1050	0	10	0
77	WEST KOWLOON HIGHWAY	400	0	10	0
78	YAU MA TEI INTERCHANGE	2955	0	19	0
79	YAU MA TEI INTERCHANGE	2715	0	20	0
80	YAU MA TEI INTERCHANGE	1055	0	20	0
81	YAU MA TEI INTERCHANGE	1035	0	19	0
82	LIN CHEUNG ROAD	2730	0	19	0
83	YAU MA TEI INTERCHANGE	1920	0	19	0
84	NGA CHEUNG ROAD	1185	0	19	0
85	WEST KOWLOON HIGHWAY	430	0	18	0
86	NGA CHEUNG ROAD	710	0	16	0
87	NGA CHEUNG ROAD	420	0	21	0
88	NGA CHEUNG ROAD	305	0	18	0
89	YAU MA TEI INTERCHANGE	2725	0	20	0
90	LIN CHEUNG ROAD	540	0	17	0
91	LIN CHEUNG ROAD	3310	0	19	0
92	YAU MA TEI INTERCHANGE	25	0	0	0
93	LIN CHEUNG ROAD	1890	0	19	0
94	YAU MA TEI INTERCHANGE	1440	0	20	0
95	YAU MA TEI INTERCHANGE	1545	0	19	0
96	YAU MA TEI INTERCHANGE	305	0	28	0
97	YAU MA TEI INTERCHANGE	910	0	30	0
98	YAU MA TEI INTERCHANGE	2485	0	20	0
99	YAU MA TEI INTERCHANGE	385	0	21	0
100	YAU MA TEI INTERCHANGE	2885	0	19	0
101	YAU MA TEI INTERCHANGE	1140	0	28	0
102	YAU MA TEI INTERCHANGE	940	0	29	0
103	YAU MA TEI INTERCHANGE	520	0	28	0

104	YAU MA TEI INTERCHANGE	1780	0	28	0
105	YAU MA TEI INTERCHANGE	915	0	29	0
106	CENTRAL KOWLOON ROUTE	3200	0	28	0
107	CENTRAL KOWLOON ROUTE	3255	0	28	0
108	LAI CHEUNG ROAD	1445	0	19	0
109	YAU MA TEI INTERCHANGE	645	0	17	0
110	YAU MA TEI INTERCHANGE	2490	0	19	0
111	YAU MA TEI INTERCHANGE	1510	0	20	0
112	YAN CHEUNG ROAD	375	0	27	0
113	YAN CHEUNG ROAD	725	0	28	0
114	GASCOIGNE ROAD	2275	0	42	0
115	GASCOIGNE ROAD	1940	0	42	0
116	JORDAN ROAD	615	0	33	0
117	JORDAN ROAD	1055	0	33	0
118	JORDAN ROAD	815	0	34	0
119	JORDAN ROAD	1120	0	33	0
120	JORDAN ROAD	1475	0	33	0
121	JORDAN ROAD	1975	0	33	0
122	JORDAN ROAD	1890	0	34	0
123	JORDAN ROAD	1735	0	34	0
124	JORDAN ROAD	1105	0	33	0
125	JORDAN ROAD	1205	0	33	0
126	JORDAN ROAD	1300	0	34	0
127	JORDAN ROAD	1165	0	33	0
128	JORDAN ROAD	1315	0	33	0
129	JORDAN ROAD	2050	0	35	0
130	JORDAN ROAD	625	0	32	0
131	JORDAN ROAD	1600	0	34	0
142	AUSTIN ROAD	1165	0	19	0
143	AUSTIN ROAD	905	0	17	0
144	AUSTIN ROAD	840	0	18	0
145	AUSTIN ROAD	660	0	18	0
147	WESTERN HARBOUR CROSSING	410	0	19	0
148	PUBLIC SQUARE STREET	265	0	40	0
149	WUI CHEUNG ROAD	1685	0	23	0
150	WUI CHEUNG ROAD	1325	0	24	0
151	LIN CHEUNG ROAD	45	0	6	0
152	WEST KOWLOON HIGHWAY	3130	0	23	0
153	LIN CHEUNG ROAD	3325	0	30	0
154	WEST KOWLOON HIGHWAY	3790	0	23	0
155	LIN CHEUNG ROAD	1725	0	29	0
156	LAI CHEUNG ROAD	2055	0	23	0

157	HOI TING ROAD	150	0	28	0
158	HOI TING ROAD	80	0	20	0
159	HOI WANG ROAD	50	0	15	0
160	HOI WANG ROAD	440	0	29	0
161	HOI WANG ROAD	460	0	29	0
162	HOI WANG ROAD	995	0	28	0
163	HOI TING ROAD	100	0	15	0
164	HOI TING ROAD	320	0	26	0
165	LAI CHEUNG ROAD	65	0	10	0
166	LAI CHEUNG ROAD	170	0	19	0
167	LAI CHEUNG ROAD	680	0	30	0
168	LAI CHEUNG ROAD	2040	0	30	0
169	NGO CHEUNG ROAD	1910	0	33	0
170	FERRY STREET	1200	0	27	0
171	FERRY STREET	40	0	0	0
172	WEST KOWLOON CORRIDOR	2540	0	41	0
173	FERRY STREET	140	0	24	0
174	WEST KOWLOON CORRIDOR	2745	0	41	0
175	FERRY STREET	220	0	18	0
176	RECLAMATION STREET	765	0	43	0
177	SHANGHAI STREET	1285	0	58	0
178	WATERLOO ROAD	1530	0	16	0
179	WATERLOO ROAD	1205	0	15	0
180	LIN CHEUNG ROAD	755	0	19	0
181	MAN CHEONG STREET	240	0	30	0
182	MAN WAI STREET	90	0	39	0
183	MAN YUEN STREET	90	0	39	0
184	MAN YING STREET	90	0	39	0
185	MAN SING STREET	175	0	38	0
186	MAN WAI STREET	125	0	31	0
187	MAN YUEN STREET	25	0	0	0
188	MAN YING STREET	90	0	39	0
189	MAN WUI STREET	110	0	36	0
190	MAN CHEONG STREET	165	0	34	0
191	MAN CHEONG STREET	90	0	39	0
192	MAN SING STREET	230	0	32	0
193	MAN SING STREET	135	0	36	0
195	LIN CHEUNG ROAD UNDERPASS	820	0	18	0
196	LIN CHEUNG ROAD UNDERPASS	1610	0	19	0
197	LIN CHEUNG ROAD	1530	0	19	0
198	LIN CHEUNG ROAD	1630	0	19	0
199	LIN CHEUNG ROAD	2660	0	19	0

200	LIN CHEUNG ROAD	95	0	6	0
201	LIN CHEUNG ROAD	2755	0	18	0
204	LIN CHEUNG ROAD	800	0	18	0
207	LIN CHEUNG ROAD	975	0	18	0
210	LIN CHEUNG ROAD UNDERPASS	830	0	19	0
212	AUSTIN ROAD WEST	1065	0	14	0
213	AUSTIN ROAD WEST	795	0	12	0
214	AUSTIN ROAD WEST	290	0	5	0
215	AUSTIN ROAD WEST	825	0	13	0
216	AUSTIN ROAD WEST	245	0	5	0
217	AUSTIN ROAD WEST	330	0	9	0
218	AUSTIN ROAD WEST	285	0	6	0
219	AUSTIN ROAD WEST	420	0	5	0
220	AUSTIN ROAD WEST	1030	0	11	0
221	AUSTIN ROAD WEST	960	0	11	0
222	ROAD D1A (N)	1165	0	18	0
223	ROAD D1A (N)	1185	0	17	0
224	ROAD D1A (N)	1415	0	19	0
225	ROAD D1A (N)	1355	0	18	0
227	ROAD D1A (S)	1215	0	19	0
237	AUSTIN ROAD WEST	185	0	6	0
238	AUSTIN ROAD WEST	410	0	11	0
241	AUSTIN ROAD WEST	580	0	13	0
242	AUSTIN ROAD WEST	1180	0	13	0
243	AUSTIN ROAD WEST	2295	0	13	0
244	AUSTIN ROAD WEST	1750	0	13	0
245	AUSTIN ROAD WEST	1160	0	12	0
246	ROAD D1A (S)	950	0	19	0
247	WUI MAN ROAD	385	0	0	0
248	WUI MAN ROAD	340	0	54	0
249	WUI MAN ROAD	120	0	0	0
250	WUI MAN ROAD	460	0	38	0
251	LIN CHEUNG ROAD	950	0	18	0
252	LIN CHEUNG ROAD UNDERPASS	1060	0	18	0
253	LIN CHEUNG ROAD UNDERPASS	205	0	10	0
254	LIN CHEUNG ROAD UNDERPASS	1370	0	18	0
255	LIN CHEUNG ROAD UNDERPASS	1560	0	19	0
256	AUSTIN ROAD WEST	415	0	11	0
257	AUSTIN ROAD WEST	1990	0	12	0
258	LIN CHEUNG ROAD	1465	0	18	0
259	LIN CHEUNG ROAD	1415	0	18	0
260	LIN CHEUNG ROAD	1385	0	19	0

With regard to comparison of the 1st and 2nd noise monitoring measurement results (i.e. Step 3 of Section 4.2d), the calibrated in-house model was utilized. However, as only 5 major roads of Road D1A, Lin Cheung Road, Austin Road West, Austin Road West Underpass and Jordan Road were measured, traffic flow for rest of the road network are required to be worked out and factored into the in-house model in order to provide a more comparable and comprehensive model configuration for prediction calculation.

The estimation of traffic flow for 2019 was based on the 2030 traffic flow of Appendix 2.3 of RR and TD's 2015-2019 Annual Traffic Census3. The former contains approved traffic flow forecast whereas the latter contain yearly territory-wide traffic survey and statistical trend conducted and published by TD.

The approach to estimate 2019 traffic flow for all the non-measured roads is to discount the traffic flow figures from the 2030 forecast back to 2019 using annual traffic growth rate from Annual Traffic Census. The 2030 traffic flow of Appendix 2.3 of RR are as-is data which are available and are estimated by the traffic consultant. As the figures in the actual traffic survey of 2019 were less than these forecast figures, hence, the method for estimation for all non-measured roads is considered as appropriate.

As for heavy vehicle figures, as they are only available as percentages in the 2030 traffic forecast (i.e. Appendix 2.3 of RR), thus, discounted heavy vehicles % for 2019 cannot be worked out using similar approach of traffic flow estimation. As such, the 2030 figures were adopted for 2019 and as worst-case scenario.

The summary of the AADT described the annual trend in the traffic traveling in Kowloon Peninsula which across in the east-west direction giving a general indication (see Kowloon section of Summary in preface pages iii and iv), hence this growth rate is the best available information for the calculation.

In reviewing the Annual Traffic Census in the past five years (2015-2019), the growth rate of increase 0.5% in Year 2018 was taken as the discount rate since:

i. it is the closest year to the commencement date (23rd September 2018) of the opening of roadworks at West Kowloon; and,
ii. it is the worst-case scenario.

Using this adopted method described above, the 2019 traffic counts was calculated, which is as illustrated below using two non-measured roads. Following this, the respective traffic flow for both the 1st and 2nd noise monitoring is as listed in Table 22 and 23 below.

[3] Section 3.3.2 of the Annual Traffic Census for year 2015 to 2019
https://www.td.gov.hk/filemanager/en/content_5018/annual%20traffic%20census%202019.pdf
https://www.td.gov.hk/filemanager/en/content_4953/annual%20traffic%20census%202018.pdf
https://www.td.gov.hk/filemanager/en/content_4915/annual%20traffic%20census%202017.pdf
https://www.td.gov.hk/filemanager/en/content_4875/annual%20traffic%20census%202016.pdf
https://www.td.gov.hk/filemanager/en/content_4772/annual%20traffic%20census%202015.pdf

b) 2019 Traffic Flow for 1st Noise Monitoring

Table 22 – 2019 traffic flow for 1st noise monitoring

		Vehicle / Hour (VEH./H)		Percentage of Heavy Vehicle (% - HGV)	
ID	Road Name	(DAY)	(NIGHT)	(DAY)	(NIGHT)
1	NATHAN ROAD	809	0	45	0
2	NATHAN ROAD	1320	0	46	0
3	NATHAN ROAD	714	0	44	0
4	NATHAN ROAD	742	0	45	0
5	NATHAN ROAD	586	0	44	0
6	NATHAN ROAD	955	0	45	0
7	PARKES STREET	231	0	30	0
8	PARKES STREET	416	0	33	0
9	WOOSUNG STREET	227	0	30	0
10	WOOSUNG STREET	236	0	29	0
11	TEMPLE STREET	175	0	30	0
12	TEMPLE STREET	61	0	18	0
13	SHANGHAI STREET	903	0	59	0
14	SHANGHAI STREET	321	0	61	0
15	RECLAMATION STREET	123	0	37	0
16	KWUN CHUNG STREET	14	0	0	0
17	BATTERY STREET	236	0	29	0
18	FERRY STREET	998	0	42	0
19	GASCOIGNE ROAD	430	0	28	0
20	FERRY STREET	690	0	24	0
21	WEST KOWLOON CORRIDOR	1414	0	42	0
22	WEST KOWLOON CORRIDOR	1130	0	27	0
23	FERRY STREET	1485	0	41	0
24	WEST KOWLOON CORRIDOR	662	0	41	0
25	FERRY STREET	922	0	43	0
26	FERRY STREET	1514	0	24	0
27	FERRY STREET	1443	0	24	0
28	CANTON ROAD	1840	0	24	0
29	CANTON ROAD	1622	0	23	0
30	CANTON ROAD	2290	0	23	0
31	CANTON ROAD	2550	0	23	0
32	CANTON ROAD	2697	0	23	0
33	CANTON ROAD	3364	0	23	0
34	KOWLOON PARK DRIVE	1906	0	23	0

35	CANTON ROAD	539	0	24	0
36	KOWLOON PARK DRIVE	416	0	29	0
37	KOWLOON PARK DRIVE	1443	0	28	0
38	KOWLOON PARK DRIVE	1334	0	28	0
39	KOWLOON PARK DRIVE	1675	0	28	0
40	CANTON ROAD	1727	0	23	0
41	HOI WANG ROAD	686	0	29	0
42	HOI WANG ROAD	742	0	28	0
43	HOI WANG ROAD	742	0	27	0
44	HOI WANG ROAD	160	0	30	0
51	LIN CHEUNG ROAD	1788	0	19	0
52	LIN CHEUNG ROAD	3170	0	19	0
53	LIN CHEUNG ROAD	289	226	15.8	8.6
54	LIN CHEUNG ROAD	455	232	15.7	9.7
63	NGA CHEUNG ROAD	591	0	18	0
64	NGA CHEUNG ROAD	1159	0	19	0
65	NGA CHEUNG ROAD	1249	0	10	0
66	NGA CHEUNG ROAD	818	0	12	0
67	NGA CHEUNG ROAD	47	0	100	0
68	NGA CHEUNG ROAD	1197	0	10	0
69	NGA CHEUNG ROAD	1168	0	10	0
70	WEST KOWLOON HIGHWAY	2323	0	26	0
71	WEST KOWLOON HIGHWAY	2403	0	27	0
72	WEST KOWLOON HIGHWAY	2782	0	26	0
73	WEST KOWLOON HIGHWAY	4405	0	26	0
74	WEST KOWLOON HIGHWAY	4779	0	26	0
75	HOI PO ROAD	440	0	8	0
76	HOI PO ROAD	993	0	10	0
77	WEST KOWLOON HIGHWAY	378	0	10	0
78	YAU MA TEI INTERCHANGE	2796	0	19	0
79	YAU MA TEI INTERCHANGE	2569	0	20	0
80	YAU MA TEI INTERCHANGE	998	0	20	0
81	YAU MA TEI INTERCHANGE	979	0	19	0
82	LIN CHEUNG ROAD	2583	0	19	0
83	YAU MA TEI INTERCHANGE	1817	0	19	0
84	NGA CHEUNG ROAD	1121	0	19	0
85	WEST KOWLOON HIGHWAY	406	0	18	0
86	NGA CHEUNG ROAD	671	0	16	0
87	NGA CHEUNG ROAD	397	0	21	0
88	NGA CHEUNG ROAD	288	0	18	0

89	YAU MA TEI INTERCHANGE	2578	0	20	0
90	LIN CHEUNG ROAD	511	0	17	0
91	LIN CHEUNG ROAD	3132	0	19	0
92	YAU MA TEI INTERCHANGE	23	0	0	0
93	LIN CHEUNG ROAD	1788	0	19	0
94	YAU MA TEI INTERCHANGE	1362	0	20	0
95	YAU MA TEI INTERCHANGE	1462	0	19	0
96	YAU MA TEI INTERCHANGE	288	0	28	0
97	YAU MA TEI INTERCHANGE	861	0	30	0
98	YAU MA TEI INTERCHANGE	2351	0	20	0
99	YAU MA TEI INTERCHANGE	364	0	21	0
100	YAU MA TEI INTERCHANGE	2730	0	19	0
101	YAU MA TEI INTERCHANGE	1078	0	28	0
102	YAU MA TEI INTERCHANGE	889	0	29	0
103	YAU MA TEI INTERCHANGE	492	0	28	0
104	YAU MA TEI INTERCHANGE	1684	0	28	0
105	YAU MA TEI INTERCHANGE	865	0	29	0
106	CENTRAL KOWLOON ROUTE	3028	0	28	0
107	CENTRAL KOWLOON ROUTE	3080	0	28	0
108	LAI CHEUNG ROAD	1367	0	19	0
109	YAU MA TEI INTERCHANGE	610	0	17	0
110	YAU MA TEI INTERCHANGE	2356	0	19	0
111	YAU MA TEI INTERCHANGE	1428	0	20	0
112	YAN CHEUNG ROAD	354	0	27	0
113	YAN CHEUNG ROAD	686	0	28	0
114	GASCOIGNE ROAD	2152	0	42	0
115	GASCOIGNE ROAD	1835	0	42	0
116	JORDAN ROAD	582	0	33	0
117	JORDAN ROAD	998	0	33	0
118	JORDAN ROAD	771	0	34	0
119	JORDAN ROAD	1059	0	33	0
120	JORDAN ROAD	1395	0	33	0
121	JORDAN ROAD	1869	0	33	0
122	JORDAN ROAD	369	201	28.5	17.5
123	JORDAN ROAD	183	148	24.5	14.8
124	JORDAN ROAD	369	201	28.5	17.5
125	JORDAN ROAD	183	148	24.5	14.8
126	JORDAN ROAD	1230	0	34	0
127	JORDAN ROAD	1102	0	33	0
128	JORDAN ROAD	1244	0	33	0

129	JORDAN ROAD	1940	0	35	0
130	JORDAN ROAD	591	0	32	0
131	JORDAN ROAD	1514	0	34	0
142	AUSTIN ROAD	1102	0	19	0
143	AUSTIN ROAD	856	0	17	0
144	AUSTIN ROAD	794	0	18	0
145	AUSTIN ROAD	624	0	18	0
147	WESTERN HARBOUR CROSSING	388	0	19	0
148	PUBLIC SQUARE STREET	250	0	40	0
149	WUI CHEUNG ROAD	1594	0	23	0
150	WUI CHEUNG ROAD	1253	0	24	0
151	LIN CHEUNG ROAD	42	0	6	0
152	WEST KOWLOON HIGHWAY	2962	0	23	0
153	LIN CHEUNG ROAD	3146	0	30	0
154	WEST KOWLOON HIGHWAY	3586	0	23	0
155	LIN CHEUNG ROAD	1632	0	29	0
156	LAI CHEUNG ROAD	1944	0	23	0
157	HOI TING ROAD	141	0	28	0
158	HOI TING ROAD	75	0	20	0
159	HOI WANG ROAD	47	0	15	0
160	HOI WANG ROAD	416	0	29	0
161	HOI WANG ROAD	435	0	29	0
162	HOI WANG ROAD	941	0	28	0
163	HOI TING ROAD	94	0	15	0
164	HOI TING ROAD	302	0	26	0
165	LAI CHEUNG ROAD	61	0	10	0
166	LAI CHEUNG ROAD	160	0	19	0
167	LAI CHEUNG ROAD	643	0	30	0
168	LAI CHEUNG ROAD	1930	0	30	0
169	NGO CHEUNG ROAD	1807	0	33	0
170	FERRY STREET	1135	0	27	0
171	FERRY STREET	37	0	0	0
172	WEST KOWLOON CORRIDOR	2403	0	41	0
173	FERRY STREET	132	0	24	0
174	WEST KOWLOON CORRIDOR	2597	0	41	0
175	FERRY STREET	208	0	18	0
176	RECLAMATION STREET	723	0	43	0
177	SHANGHAI STREET	1216	0	58	0
178	WATERLOO ROAD	1447	0	16	0
179	WATERLOO ROAD	1140	0	15	0

180	LIN CHEUNG ROAD	255	429	14.6	16.2
181	MAN CHEONG STREET	227	0	30	0
182	MAN WAI STREET	85	0	39	0
183	MAN YUEN STREET	85	0	39	0
184	MAN YING STREET	85	0	39	0
185	MAN SING STREET	165	0	38	0
186	MAN WAI STREET	118	0	31	0
187	MAN YUEN STREET	23	0	0	0
188	MAN YING STREET	85	0	39	0
189	MAN WUI STREET	104	0	36	0
190	MAN CHEONG STREET	156	0	34	0
191	MAN CHEONG STREET	85	0	39	0
192	MAN SING STREET	217	0	32	0
193	MAN SING STREET	127	0	36	0
195	LIN CHEUNG ROAD UNDERPASS	776	0	18	0
196	LIN CHEUNG ROAD UNDERPASS	1523	0	19	0
197	LIN CHEUNG ROAD	1448	0	19	0
198	LIN CHEUNG ROAD	1542	0	19	0
199	LIN CHEUNG ROAD	2517	0	19	0
200	LIN CHEUNG ROAD	89	0	6	0
201	LIN CHEUNG ROAD	2607	0	18	0
204	LIN CHEUNG ROAD	39	65	12.3	20.2
207	LIN CHEUNG ROAD	922	0	18	0
210	LIN CHEUNG ROAD UNDERPASS	785	0	19	0
212	AUSTIN ROAD WEST	183	117	21	13.6
213	AUSTIN ROAD WEST	752	0	12	0
214	AUSTIN ROAD WEST	183	117	21	13.6
215	AUSTIN ROAD WEST	780	0	13	0
216	AUSTIN ROAD WEST	183	117	21	13.6
217	AUSTIN ROAD WEST	312	0	9	0
218	AUSTIN ROAD WEST	269	0	6	0
219	AUSTIN ROAD WEST	110	65	27.4	12.3
220	AUSTIN ROAD WEST	117	80	23.5	13.2
221	AUSTIN ROAD WEST	110	65	27.4	12.3
222	ROAD D1A (N)	19	17	14.3	14
223	ROAD D1A (N)	19	17	14.3	14
224	ROAD D1A (N)	19	17	14.3	14
225	ROAD D1A (N)	1282	0	18	0
227	ROAD D1A (S)	1149	0	19	0
237	AUSTIN ROAD WEST	74	59	24.7	14.7

238	AUSTIN ROAD WEST	388	0	11	0
241	AUSTIN ROAD WEST	548	0	13	0
242	AUSTIN ROAD WEST	156	117	18.7	13.6
243	AUSTIN ROAD WEST	2171	0	13	0
244	AUSTIN ROAD WEST	1656	0	13	0
245	AUSTIN ROAD WEST	183	117	21	13.6
246	ROAD D1A (S)	90	114	36	40.3
247	WUI MAN ROAD	364	0	0	0
248	WUI MAN ROAD	321	0	54	0
249	WUI MAN ROAD	113	0	0	0
250	WUI MAN ROAD	435	0	38	0
251	LIN CHEUNG ROAD	634	216	19.8	9.6
252	LIN CHEUNG ROAD UNDERPASS	1003	0	18	0
253	LIN CHEUNG ROAD UNDERPASS	194	0	10	0
254	LIN CHEUNG ROAD UNDERPASS	1296	0	18	0
255	LIN CHEUNG ROAD UNDERPASS	1476	0	19	0
256	AUSTIN ROAD WEST	117	80	23.5	13.2
257	AUSTIN ROAD WEST	1883	0	12	0
258	LIN CHEUNG ROAD	425	375	17.9	18.7
259	LIN CHEUNG ROAD	425	375	17.9	18.7
260	LIN CHEUNG ROAD	425	375	17.9	18.7

c) 2019 Traffic Flow for 2nd Noise Monitoring

Table 23 – 2019 traffic flow for 2nd noise monitoring

		Vehicle / Hour (VEH./H)		Percentage of Heavy Vehicle (% - HGV)	
ID	Road Name	(DAY)	(NIGHT)	(DAY)	(NIGHT)
1	NATHAN ROAD	809	0	45	0
2	NATHAN ROAD	1320	0	46	0
3	NATHAN ROAD	714	0	44	0
4	NATHAN ROAD	742	0	45	0
5	NATHAN ROAD	586	0	44	0
6	NATHAN ROAD	955	0	45	0
7	PARKES STREET	231	0	30	0
8	PARKES STREET	416	0	33	0
9	WOOSUNG STREET	227	0	30	0
10	WOOSUNG STREET	236	0	29	0
11	TEMPLE STREET	175	0	30	0
12	TEMPLE STREET	61	0	18	0
13	SHANGHAI STREET	903	0	59	0

14	SHANGHAI STREET	321	0	61	0
15	RECLAMATION STREET	123	0	37	0
16	KWUN CHUNG STREET	14	0	0	0
17	BATTERY STREET	236	0	29	0
18	WEST KOWLOON CORRIDOR	998	0	42	0
19	GASCOIGNE ROAD	430	0	28	0
20	FERRY STREET	690	0	24	0
21	WEST KOWLOON CORRIDOR	1414	0	42	0
22	WEST KOWLOON CORRIDOR	1130	0	27	0
23	FERRY STREET	1485	0	41	0
24	WEST KOWLOON CORRIDOR	662	0	41	0
25	FERRY STREET	922	0	43	0
26	FERRY STREET	1514	0	24	0
27	FERRY STREET	1443	0	24	0
28	CANTON ROAD	1840	0	24	0
29	CANTON ROAD	1622	0	23	0
30	CANTON ROAD	2290	0	23	0
31	CANTON ROAD	2550	0	23	0
32	CANTON ROAD	2697	0	23	0
33	CANTON ROAD	3364	0	23	0
34	KOWLOON PARK DRIVE	1906	0	23	0
35	CANTON ROAD	539	0	24	0
36	KOWLOON PARK DRIVE	416	0	29	0
37	KOWLOON PARK DRIVE	1443	0	28	0
38	KOWLOON PARK DRIVE	1334	0	28	0
39	KOWLOON PARK DRIVE	1675	0	28	0
40	CANTON ROAD	1727	0	23	0
41	HOI WANG ROAD	686	0	29	0
42	HOI WANG ROAD	742	0	28	0
43	HOI WANG ROAD	742	0	27	0
44	HOI WANG ROAD	160	0	30	0
51	LIN CHEUNG ROAD	1788	0	19	0
52	LIN CHEUNG ROAD	3170	0	19	0
53	LIN CHEUNG ROAD	557	188	19.3	7.3
54	LIN CHEUNG ROAD	541	203	18.8	8.4
63	NGA CHEUNG ROAD	591	0	18	0
64	NGA CHEUNG ROAD	1159	0	19	0
65	NGA CHEUNG ROAD	1249	0	10	0
66	NGA CHEUNG ROAD	818	0	12	0
67	NGA CHEUNG ROAD	47	0	100	0
68	NGA CHEUNG ROAD	1197	0	10	0
69	NGA CHEUNG ROAD	1168	0	10	0

70	WEST KOWLOON HIGHWAY	2323	0	26	0
71	WEST KOWLOON HIGHWAY	2403	0	27	0
72	WEST KOWLOON HIGHWAY	2782	0	26	0
73	WEST KOWLOON HIGHWAY	4405	0	26	0
74	WEST KOWLOON HIGHWAY	4779	0	26	0
75	HOI PO ROAD	440	0	8	0
76	HOI PO ROAD	993	0	10	0
77	WEST KOWLOON HIGHWAY	378	0	10	0
78	YAU MA TEI INTERCHANGE	2796	0	19	0
79	YAU MA TEI INTERCHANGE	2569	0	20	0
80	YAU MA TEI INTERCHANGE	998	0	20	0
81	YAU MA TEI INTERCHANGE	979	0	19	0
82	LIN CHEUNG ROAD	2583	0	19	0
83	YAU MA TEI INTERCHANGE	1817	0	19	0
84	NGA CHEUNG ROAD	1121	0	19	0
85	WEST KOWLOON HIGHWAY	406	0	18	0
86	NGA CHEUNG ROAD	671	0	16	0
87	NGA CHEUNG ROAD	397	0	21	0
88	NGA CHEUNG ROAD	288	0	18	0
89	YAU MA TEI INTERCHANGE	2578	0	20	0
90	LIN CHEUNG ROAD	511	0	17	0
91	LIN CHEUNG ROAD	3132	0	19	0
92	YAU MA TEI INTERCHANGE	23	0	0	0
93	LIN CHEUNG ROAD	1788	0	19	0
94	YAU MA TEI INTERCHANGE	1362	0	20	0
95	YAU MA TEI INTERCHANGE	1462	0	19	0
96	YAU MA TEI INTERCHANGE	288	0	28	0
97	YAU MA TEI INTERCHANGE	861	0	30	0
98	YAU MA TEI INTERCHANGE	2351	0	20	0
99	YAU MA TEI INTERCHANGE	364	0	21	0
100	YAU MA TEI INTERCHANGE	2730	0	19	0
101	YAU MA TEI INTERCHANGE	1078	0	28	0
102	YAU MA TEI INTERCHANGE	889	0	29	0
103	YAU MA TEI INTERCHANGE	492	0	28	0
104	YAU MA TEI INTERCHANGE	1684	0	28	0
105	YAU MA TEI INTERCHANGE	865	0	29	0
106	CENTRAL KOWLOON ROUTE	3028	0	28	0
107	CENTRAL KOWLOON ROUTE	3080	0	28	0
108	LAI CHEUNG ROAD	1367	0	19	0
109	YAU MA TEI INTERCHANGE	610	0	17	0
110	YAU MA TEI INTERCHANGE	2356	0	19	0
111	YAU MA TEI INTERCHANGE	1428	0	20	0

112	YAN CHEUNG ROAD	354	0	27	0
113	YAN CHEUNG ROAD	686	0	28	0
114	GASCOIGNE ROAD	2152	0	42	0
115	GASCOIGNE ROAD	1835	0	42	0
116	JORDAN ROAD	582	0	33	0
117	JORDAN ROAD	998	0	33	0
118	JORDAN ROAD	771	0	34	0
119	JORDAN ROAD	1059	0	33	0
120	JORDAN ROAD	1395	0	33	0
121	JORDAN ROAD	1869	0	33	0
122	JORDAN ROAD	278	162	30.3	18.4
123	JORDAN ROAD	175	175	30.3	21.9
124	JORDAN ROAD	278	162	30.3	18.4
125	JORDAN ROAD	175	175	30.3	21.9
126	JORDAN ROAD	1230	0	34	0
127	JORDAN ROAD	1102	0	33	0
128	JORDAN ROAD	1244	0	33	0
129	JORDAN ROAD	1940	0	35	0
130	JORDAN ROAD	591	0	32	0
131	JORDAN ROAD	1514	0	34	0
142	AUSTIN ROAD	1102	0	19	0
143	AUSTIN ROAD	856	0	17	0
144	AUSTIN ROAD	794	0	18	0
145	AUSTIN ROAD	624	0	18	0
147	WESTERN HARBOUR CROSSING	388	0	19	0
148	PUBLIC SQUARE STREET	250	0	40	0
149	WUI CHEUNG ROAD	1594	0	23	0
150	WUI CHEUNG ROAD	1253	0	24	0
151	LIN CHEUNG ROAD	42	0	6	0
152	WEST KOWLOON HIGHWAY	2962	0	23	0
153	LIN CHEUNG ROAD	3146	0	30	0
154	WEST KOWLOON HIGHWAY	3586	0	23	0
155	LIN CHEUNG ROAD	1632	0	29	0
156	LAI CHEUNG ROAD	1944	0	23	0
157	HOI TING ROAD	141	0	28	0
158	HOI TING ROAD	75	0	20	0
159	HOI WANG ROAD	47	0	15	0
160	HOI WANG ROAD	416	0	29	0
161	HOI WANG ROAD	435	0	29	0
162	HOI WANG ROAD	941	0	28	0
163	HOI TING ROAD	94	0	15	0
164	HOI TING ROAD	302	0	26	0

165	LAI CHEUNG ROAD	61	0	10	0
166	LAI CHEUNG ROAD	160	0	19	0
167	LAI CHEUNG ROAD	643	0	30	0
168	LAI CHEUNG ROAD	1930	0	30	0
169	NGO CHEUNG ROAD	1807	0	33	0
170	FERRY STREET	1135	0	27	0
171	FERRY STREET	37	0	0	0
172	WEST KOWLOON CORRIDOR	2403	0	41	0
173	FERRY STREET	132	0	24	0
174	WEST KOWLOON CORRIDOR	2597	0	41	0
175	FERRY STREET	208	0	18	0
176	RECLAMATION STREET	723	0	43	0
177	SHANGHAI STREET	1216	0	58	0
178	WATERLOO ROAD	1447	0	16	0
179	WATERLOO ROAD	1140	0	15	0
180	LIN CHEUNG ROAD	356	389	17	15.2
181	MAN CHEONG STREET	227	0	30	0
182	MAN WAI STREET	85	0	39	0
183	MAN YUEN STREET	85	0	39	0
184	MAN YING STREET	85	0	39	0
185	MAN SING STREET	165	0	38	0
186	MAN WAI STREET	118	0	31	0
187	MAN YUEN STREET	23	0	0	0
188	MAN YING STREET	85	0	39	0
189	MAN WUI STREET	104	0	36	0
190	MAN CHEONG STREET	156	0	34	0
191	MAN CHEONG STREET	85	0	39	0
192	MAN SING STREET	217	0	32	0
193	MAN SING STREET	127	0	36	0
195	LIN CHEUNG ROAD UNDERPASS	776	0	18	0
196	LIN CHEUNG ROAD UNDERPASS	1523	0	19	0
197	LIN CHEUNG ROAD	1448	0	19	0
198	LIN CHEUNG ROAD	1542	0	19	0
199	LIN CHEUNG ROAD	2517	0	19	0
200	LIN CHEUNG ROAD	89	0	6	0
201	LIN CHEUNG ROAD	2607	0	18	0
204	LIN CHEUNG ROAD	24	37	8.4	9.6
207	LIN CHEUNG ROAD	922	0	18	0
210	LIN CHEUNG ROAD UNDERPASS	785	0	19	0
212	AUSTIN ROAD WEST	156	117	18.7	13.6
213	AUSTIN ROAD WEST	752	0	12	0
214	AUSTIN ROAD WEST	156	117	18.7	13.6

215	AUSTIN ROAD WEST	780	0	13	0
216	AUSTIN ROAD WEST	156	117	18.7	13.6
217	AUSTIN ROAD WEST	312	0	9	0
218	AUSTIN ROAD WEST	269	0	6	0
219	AUSTIN ROAD WEST	98	57	21.3	13.7
220	AUSTIN ROAD WEST	152	98	30.9	14.9
221	AUSTIN ROAD WEST	98	57	21.3	13.7
222	ROAD D1A (N)	26	25	17	17.2
223	ROAD D1A (N)	26	25	17	17.2
224	ROAD D1A (N)	26	25	17	17.2
225	ROAD D1A (N)	1282	0	18	0
227	ROAD D1A (S)	1149	0	19	0
237	AUSTIN ROAD WEST	70	61	23.5	17.6
238	AUSTIN ROAD WEST	388	0	11	0
241	AUSTIN ROAD WEST	548	0	13	0
242	AUSTIN ROAD WEST	156	117	18.7	13.6
243	AUSTIN ROAD WEST	2171	0	13	0
244	AUSTIN ROAD WEST	1656	0	13	0
245	AUSTIN ROAD WEST	156	117	18.7	13.6
246	ROAD D1A (S)	88	114	32.1	41.6
247	WUI MAN ROAD	364	0	0	0
248	WUI MAN ROAD	321	0	54	0
249	WUI MAN ROAD	113	0	0	0
250	WUI MAN ROAD	435	0	38	0
251	LIN CHEUNG ROAD	337	374	16.3	13.6
252	LIN CHEUNG ROAD UNDERPASS	1003	0	18	0
253	LIN CHEUNG ROAD UNDERPASS	194	0	10	0
254	LIN CHEUNG ROAD UNDERPASS	1296	0	18	0
255	LIN CHEUNG ROAD UNDERPASS	1476	0	19	0
256	AUSTIN ROAD WEST	152	98	30.9	14.9
257	AUSTIN ROAD WEST	1883	0	12	0
258	LIN CHEUNG ROAD	565	221	23.3	11.1
259	LIN CHEUNG ROAD	565	221	23.3	11.1
260	LIN CHEUNG ROAD	565	221	23.3	11.1

a) Barrier Features

The imported and configured barrier migration features in the ODEN model is as illustrated.

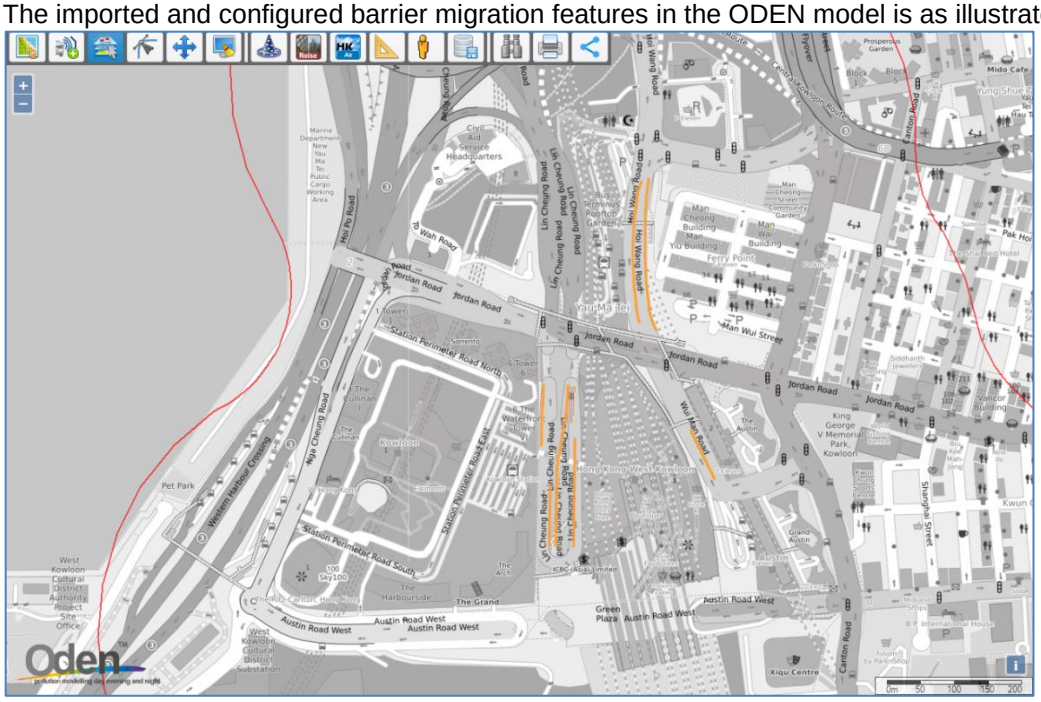


Fig. 10 – Noise barrier

b) Landscape Deck

The imported and configured landscape deck, which also serves as semi-enclosure, in the ODEN model is as illustrated.

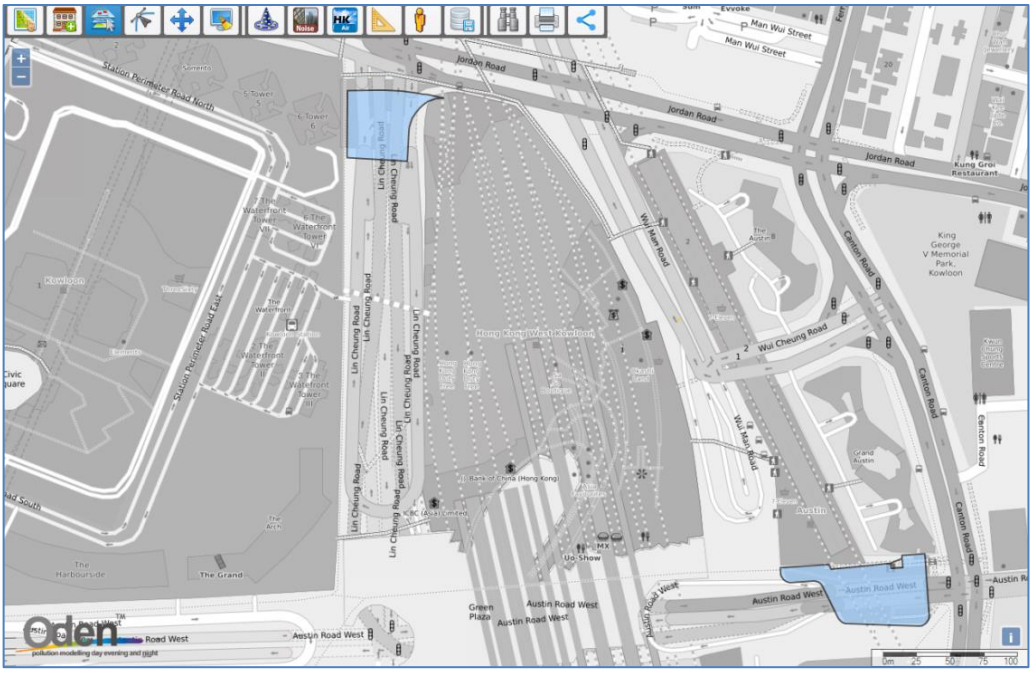


Fig. 11 – Semi-enclosure features

c) Low Noise Road Surface (LNRS)

The imported and configured LNRS features in the ODEN model is as illustrated.

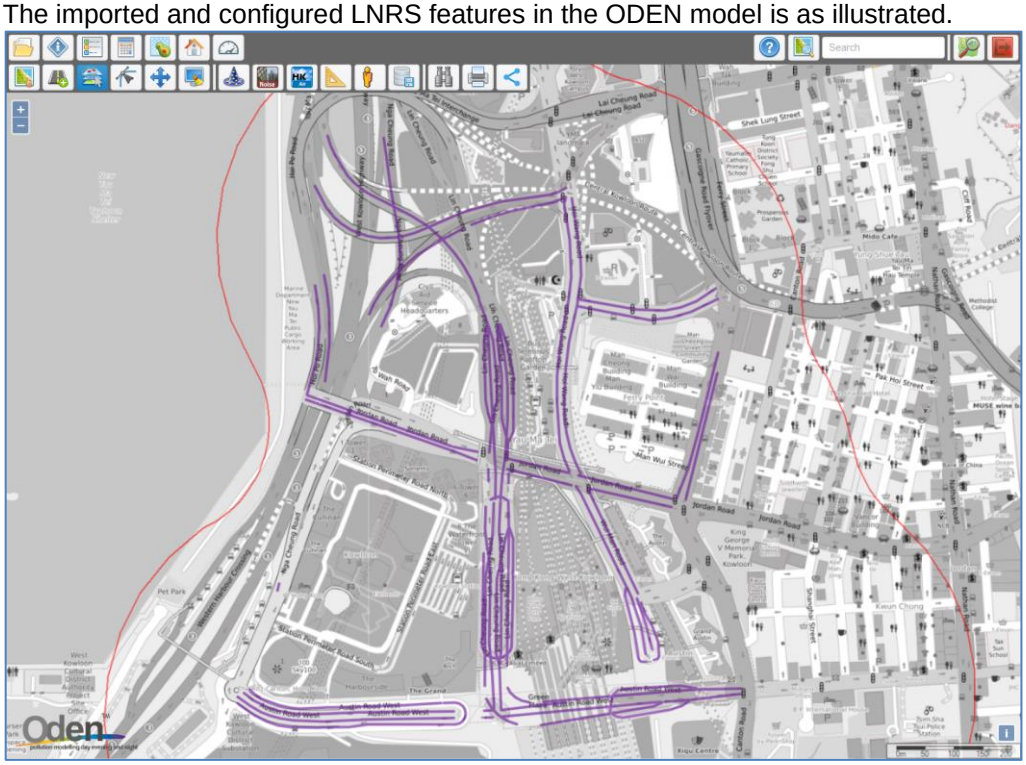


Fig. 12 – New and Existing roads with LNRS

Appendix A1.3 – Hourly Traffic Count and % Heavy Vehicle

With reference to the adopted method of Section 5.4 and Section 5.10 above, as sample 1+2 as highlighted below is determined to be the time period for highest noise level, the corresponding hourly traffic flow as well as % heavy vehicle will also be worked out from that. Thus, the “1-hour” value below is worked out from total traffic count from the four corresponding 15-min counts.

Table 24 – Calculation of hourly traffic count, % heavy vehicle and average speed of 1st traffic survey

TNM-1

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-1	Man King Building (R/F & 10/F)	Road D1A(N)	AM	1	07:58 - 08:13	15 min	23	41	4	31	53	59	56	63
					08:13 - 08:28	15 min	22	36	6	28				
				2	08:28 - 08:43	15 min	18	35	6	30				
					08:43 - 08:58	15 min	27	48	3	25				
				3	08:58 - 09:13	15 min	30	58	9	23				
					09:13 - 09:28	15 min	24	40	10	21				
						1-hour	90	160	19	114				
						% HV	36.0%		14.3%					
						Total Vehicle	250		133					
			PM	1	17:30 - 17:45	15 min	29	44	2	21	53	63	58	60
					17:45 - 18:00	15 min	24	51	6	27				
				2	18:00 - 18:15	15 min	33	35	4	30				
					18:15 - 18:30	15 min	28	39	5	26				
				3	18:30 - 18:45	15 min	24	39	3	30				
					18:45 - 19:00	15 min	17	45	2	15				
						1-hour	114	169	17	104				
						% HV	40.3%		14.0%					
						Total Vehicle	283		121					
		Lin Cheung Road (LCR)	AM	1	07:58 - 08:13	15 min	124	586	62	379	77	81	75	84
					08:13 - 08:28	15 min	116	623	71	370				
				2	08:28 - 08:43	15 min	105	630	57	366				
					08:43 - 08:58	15 min	110	598	65	380				
				3	08:58 - 09:13	15 min	136	631	64	352				
					09:13 - 09:28	15 min	144	654	77	391				
						1-hour	455	2437	255	1495				
						% HV	15.7%		14.6%					
						Total Vehicle	2,892		1,750					
			PM	1	17:30 - 17:45	15 min	46	535	113	525	74	85	78	87
					17:45 - 18:00	15 min	64	520	110	554				
				2	18:00 - 18:15	15 min	56	561	110	535				
					18:15 - 18:30	15 min	66	544	96	613				
				3	18:30 - 18:45	15 min	46	628	96	649				
					18:45 - 19:00	15 min	52	683	89	677				
						1-hour	232	2160	429	2227				
						% HV	9.7%		16.2%					
						Total Vehicle	2,392		2,656					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-2

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-2	Sorrento, Tower 6 (45/F & 17/F)	Lin Cheung Road (LCR)	AM	1	07:56 - 08:11	15 min	85	390	158	662	64	71	62	75
					08:11 - 08:26	15 min	63	373	145	664				
				2	08:26 - 08:41	15 min	66	418	189	585				
					08:41 - 08:56	15 min	75	362	142	655				
				3	08:56 - 09:11	15 min	81	384	153	569				
					09:11 - 09:26	15 min	85	338	150	568				
						1-hour	289	1543	634	2566				
						% HV	15.8%		19.8%					
						Total Vehicle	1,832		3,200					
			PM	1	17:54 - 18:09	15 min	70	559	75	497	66	74	67	72
					18:09 - 18:24	15 min	66	624	51	566				
				2	18:24 - 18:39	15 min	42	606	40	534				
					18:39 - 18:54	15 min	48	624	50	447				
				3	18:54 - 19:09	15 min	37	558	48	444				
					19:09 - 19:24	15 min	35	488	47	364				
						1-hour	226	2413	216	2044				
						% HV	8.6%		9.6%					
						Total Vehicle	2,639		2,260					
		Jordan Road (JR)	AM	1	07:56 - 08:11	15 min	53	142	86	254	44	47	55	61
					08:11 - 08:26	15 min	38	152	95	233				
				2	08:26 - 08:41	15 min	45	140	97	215				
					08:41 - 08:56	15 min	47	129	91	226				
				3	08:56 - 09:11	15 min	56	117	94	199				
					09:11 - 09:26	15 min	49	115	99	206				
						1-hour	183	563	369	928				
						% HV	24.5%		28.5%					
						Total Vehicle	746		1,297					
			PM	1	17:54 - 18:09	15 min	42	192	54	225	46	51	53	59
					18:09 - 18:24	15 min	35	229	51	228				
				2	18:24 - 18:39	15 min	37	217	51	263				
					18:39 - 18:54	15 min	34	215	45	233				
				3	18:54 - 19:09	15 min	33	204	34	208				
					19:09 - 19:24	15 min	20	184	36	185				
						1-hour	148	853	201	949				
						% HV	14.8%		17.5%					
						Total Vehicle	1,001		1,150					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-3

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-3	The Waterfront, Tower III (R/F)	Lin Cheung Road (LCR)	AM	1	07:46 - 08:01	15 min	7	63	117	461	63	68	57	59
					08:01 - 08:16	15 min	9	79	93	453				
				2	08:16 - 08:31	15 min	8	69	97	506				
					08:31 - 08:46	15 min	15	67	118	528				
				3	08:46 - 09:01	15 min	9	83	102	529				
					09:01 - 09:16	15 min	17	91	138	523				
						1-hour	39	278	425	1948				
						% HV	12.3%		17.9%					
						Total Vehicle	317		2,373					
			PM	1	17:31 - 17:46	15 min	10	62	104	370	58	62	62	64
					17:46 - 18:01	15 min	10	53	104	396				
				2	18:01 - 18:16	15 min	28	60	89	422				
					18:16 - 18:31	15 min	17	81	78	439				
				3	18:31 - 18:46	15 min	14	85	71	440				
					18:46 - 19:01	15 min	9	88	68	408				
						1-hour	65	256	375	1627				
						% HV	20.2%		18.7%					
						Total Vehicle	321		2,002					
	The Waterfront, Tower III (28/F)	Lin Cheung Road (LCR)	AM	1	07:46 - 08:01	15 min	5	47	122	405	60	63	56	59
					08:01 - 08:16	15 min	4	59	120	428				
				2	08:16 - 08:31	15 min	5	55	129	455				
					08:31 - 08:46	15 min	10	83	147	498				
				3	08:46 - 09:01	15 min	13	89	127	520				
					09:01 - 09:16	15 min	10	85	143	531				
						1-hour	24	244	518	1786				
						% HV	9.0%		22.5%					
						Total Vehicle	268		2,304					
			PM	1	17:31 - 17:46	15 min	12	67	60	415	56	59	60	68
					17:46 - 18:01	15 min	8	68	73	419				
				2	18:01 - 18:16	15 min	14	79	63	470				
					18:16 - 18:31	15 min	8	95	62	496				
				3	18:31 - 18:46	15 min	8	77	53	492				
					18:46 - 19:01	15 min	10	90	61	447				
						1-hour	42	309	258	1800				
						% HV	12.0%		12.5%					
						Total Vehicle	351		2,058					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-4

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-4	The Arch, Sun Tower (62/F & 29/F)	Austin Road West Underpass (ARWU)	AM	1	07:45 - 08:00	15 min	27	79	17	47	51	64	61	71
					08:00 - 08:15	15 min	38	93	18	53				
				2	08:15 - 08:30	15 min	24	91	17	81				
					08:30 - 08:45	15 min	28	118	22	45				
				3	08:45 - 09:00	15 min	25	123	18	76				
					09:00 - 09:15	15 min	36	104	23	62				
						1-hour	117	381	74	226				
						% HV	23.5%		24.7%					
						Total Vehicle	498		300					
			PM	1	17:51 - 18:06	15 min	19	138	14	79	45	53	51	69
					18:06 - 18:21	15 min	21	123	13	103				
				2	18:21 - 18:36	15 min	19	132	19	76				
					18:36 - 18:51	15 min	21	131	13	85				
				3	18:51 - 19:06	15 min	17	136	10	108				
					19:06 - 19:21	15 min	18	128	17	95				
						1-hour	80	524	59	343				
						% HV	13.2%		14.7%					
						Total Vehicle	604		402					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-5

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-5	The Harbourside, Tower 2 (53/F & 26/F)	Austin Road West (ARW)	AM	1	07:58 - 08:13	15 min	48	181	23	75	56	65	60	60
					08:13 - 08:28	15 min	43	177	23	67				
				2	08:28 - 08:43	15 min	42	169	31	76				
					08:43 - 08:58	15 min	50	160	33	73				
				3	08:58 - 09:13	15 min	48	147	27	71				
					09:13 - 09:28	15 min	58	139	35	77				
						1-hour	183	687	110	291				
						% HV	21.0%		27.4%					
						Total Vehicle	870		401					
			PM	1	17:57 - 18:12	15 min	34	169	13	115	56	64	59	61
					18:12 - 18:27	15 min	25	185	19	102				
				2	18:27 - 18:42	15 min	31	200	19	111				
					18:42 - 18:57	15 min	27	188	14	136				
				3	18:57 - 19:12	15 min	25	183	14	116				
					19:12 - 19:27	15 min	19	192	12	92				
						1-hour	117	742	65	464				
						% HV	13.6%		12.3%					
						Total Vehicle	859		529					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

Table 25 – Calculation of hourly traffic count, % heavy vehicle and average speed of 2nd traffic survey

TNM-1

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-1	Man King Building (R/F & 10/F)	Road D1A(N)	AM	1	07:51 - 08:06	15 min	25	56	4	24	53	59	56	63
					08:06 - 08:21	15 min	17	45	6	35				
				2	08:21 - 08:36	15 min	27	46	9	36				
					08:36 - 08:51	15 min	19	39	7	32				
				3	08:51 - 09:06	15 min	26	31	6	14				
					09:06 - 09:21	15 min	22	28	6	18				
						1-hour	88	186	26	127				
						% HV	32.1%		17.0%					
						Total Vehicle	274		153					
			PM	1	17:30 - 17:45	15 min	30	34	4	33	53	63	58	60
					17:45 - 18:00	15 min	25	48	9	32				
				2	18:00 - 18:15	15 min	28	38	6	26				
					18:15 - 18:30	15 min	31	40	6	29				
				3	18:30 - 18:45	15 min	24	46	2	32				
					18:45 - 19:00	15 min	17	38	5	32				
						1-hour	114	160	25	120				
						% HV	41.6%		17.2%					
						Total Vehicle	274		145					
		Lin Cheung Road (LCR)	AM	1	07:51 - 08:06	15 min	170	595	77	427	77	81	75	84
					08:06 - 08:21	15 min	122	517	82	442				
				2	08:21 - 08:36	15 min	124	622	85	447				
					08:36 - 08:51	15 min	125	599	112	418				
				3	08:51 - 09:06	15 min	127	552	94	382				
					09:06 - 09:21	15 min	124	553	97	368				
						1-hour	541	2333	356	1734				
						% HV	18.8%		17.0%					
						Total Vehicle	2,874		2,090					
			PM	1	17:30 - 17:45	15 min	54	483	95	437	74	85	78	87
					17:45 - 18:00	15 min	44	570	100	528				
				2	18:00 - 18:15	15 min	52	553	97	568				
					18:15 - 18:30	15 min	53	619	97	638				
				3	18:30 - 18:45	15 min	40	630	84	629				
					18:45 - 19:00	15 min	38	623	70	636				
						1-hour	203	2225	389	2171				
						% HV	8.4%		15.2%					
						Total Vehicle	2,428		2,560					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-2

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-2	Sorrento, Tower 6 (45/F & 17/F)	Lin Cheung Road (LCR)	AM	1	07:59 - 08:14	15 min	163	598	74	419	64	71	62	75
					08:14 - 08:29	15 min	146	556	80	435				
				2	08:29 - 08:44	15 min	123	570	84	445				
					08:44 - 08:59	15 min	125	611	99	433				
				3	08:59 - 09:14	15 min	126	576	103	400				
					09:14 - 09:29	15 min	126	553	96	375				
						1-hour	557	2335	337	1732				
						% HV	19.3%		16.3%					
						Total Vehicle	2,892		2,069					
			PM	1	17:46 - 18:01	15 min	45	568	100	533	66	74	67	72
					18:01 - 18:16	15 min	52	561	97	576				
				2	18:16 - 18:31	15 min	51	620	95	637				
					18:31 - 18:46	15 min	40	629	82	630				
				3	18:46 - 19:01	15 min	38	622	69	634				
					19:01 - 19:16	15 min	38	612	62	618				
						1-hour	188	2378	374	2376				
						% HV	7.3%		13.6%					
						Total Vehicle	2,566		2,750					
		Jordan Road (JR)	AM	1	07:59 - 08:14	15 min	35	106	78	178	44	47	55	61
					08:14 - 08:29	15 min	30	96	83	160				
				2	08:29 - 08:44	15 min	47	92	63	154				
					08:44 - 08:59	15 min	63	108	54	146				
				3	08:59 - 09:14	15 min	53	99	97	126				
					09:14 - 09:29	15 min	56	127	81	115				
						1-hour	175	402	278	638				
						% HV	30.3%		30.3%					
						Total Vehicle	577		916					
			PM	1	17:46 - 18:01	15 min	40	163	45	177	46	51	53	59
					18:01 - 18:16	15 min	40	139	33	155				
				2	18:16 - 18:31	15 min	46	173	48	198				
					18:31 - 18:46	15 min	49	149	36	190				
				3	18:46 - 19:01	15 min	33	159	40	216				
					19:01 - 19:16	15 min	50	152	40	221				
						1-hour	175	624	162	720				
						% HV	21.9%		18.4%					
						Total Vehicle	799		882					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-3

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-3	The Waterfront, Tower III (R/F & 28/F)	Lin Cheung Road (LCR)	AM	1	07:35 - 07:50	15 min	3	64	136	420	63	68	57	59
					07:50 - 08:05	15 min	7	68	134	444				
				2	08:05 - 08:20	15 min	7	56	138	478				
					08:20 - 08:35	15 min	7	88	157	523				
				3	08:35 - 08:50	15 min	9	111	111	512				
					08:50 - 09:05	15 min	8	74	125	523				
						1-hour	24	276	565	1865				
						% HV	8.0%		23.3%					
						Total Vehicle	300		2,430					
			PM	1	17:45 - 18:00	15 min	4	77	55	408	58	62	62	64
					18:00 - 18:15	15 min	10	88	67	412				
				2	18:15 - 18:30	15 min	14	91	50	460				
					18:30 - 18:45	15 min	9	91	49	485				
				3	18:45 - 19:00	15 min	8	68	47	484				
					19:00 - 19:15	15 min	11	76	54	440				
						1-hour	37	347	221	1765				
						% HV	9.6%		11.1%					
						Total Vehicle	384		1,986					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-4

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-4	The Arch, Sun Tower (62/F & 29/F)	Austin Road West Underpass (ARWU)	AM	1	07:50 - 08:05	15 min	33	85	10	60	51	64	61	71
					08:05 - 08:20	15 min	45	75	19	44				
				2	08:20 - 08:35	15 min	34	87	17	55				
					08:35 - 08:50	15 min	40	93	24	69				
				3	08:50 - 09:05	15 min	37	116	30	64				
					09:05 - 09:20	15 min	37	96	23	65				
						1-hour	152	340	70	228				
						% HV	30.9%		23.5%					
						Total Vehicle	492		298					
			PM	1	17:41 - 17:56	15 min	25	118	16	85	45	53	51	69
					17:56 - 18:11	15 min	26	135	12	71				
				2	18:11 - 18:26	15 min	24	141	13	74				
					18:26 - 18:41	15 min	23	166	20	55				
				3	18:41 - 18:56	15 min	19	143	20	76				
					18:56 - 19:11	15 min	18	116	11	77				
						1-hour	98	560	61	285				
						% HV	14.9%		17.6%					
						Total Vehicle	658		346					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

TNM-5

Monitoring Station		Road	Session	Sample	Time Period		Traffic Count				Speed (km/hr)*			
							Near Side		Far Side		Near Side		Far Side	
NSR	Building						HV	LV	HV	LV	HV	LV	HV	LV
TNM-5	The Harbourside, Tower 2 (53/F & 26/F)	Austin Road West (ARW)	AM	1	07:52 - 08:07	15 min	24	163	16	83	56	65	60	60
					08:07 - 08:22	15 min	47	160	24	89				
				2	08:22 - 08:37	15 min	33	183	29	105				
					08:37 - 08:52	15 min	52	174	29	85				
				3	08:52 - 09:07	15 min	53	170	20	63				
					09:07 - 09:22	15 min	37	160	33	72				
					1-hour		156	680	98	362				
					% HV		18.7%		21.3%					
					Total Vehicle		836		460					
			PM	1	17:58 - 18:13	15 min	28	177	15	82				
					18:13 - 18:28	15 min	30	191	12	96				
				2	18:28 - 18:43	15 min	36	203	16	82				
					18:43 - 18:58	15 min	23	172	14	99				
				3	18:58 - 19:13	15 min	20	165	12	104				
					19:13 - 19:28	15 min	20	145	11	87				
					1-hour		117	743	57	359				
					% HV		13.6%		13.7%					
					Total Vehicle		860		416					

***** - Speed (km/hr) is worked out from traffic counting based upon all time periods in AM/PM session.

Appendix A1.4a – Noise Measurement Equipment Calibration Certificates for 1st Noise Monitoring

Calibration Certificates (Stage 1)

Item	Instrument / Accessory	Brand & Model	Serial No.	Calibration Date
1	Precision integrating sound level meter	Svantek Svan 959	11238	01/02/2019
2	Precision integrating sound level meter	NTi-XL2-TA	A2A-08670-E0	18/05/2018
3	Sound level calibrator	Svantek SV 30A	7441	01/02/2019
4	Precision integrating sound level meter	Bruel & Kjaer 2270	2679277	16/10/2018
5	Precision integrating sound level meter	Bruel & Kjaer 2250	2722935	25/02/2019
6	Sound level calibrator	Bruel & Kjaer 4231	2478237	31/01/2019

聲學測試服務有限公司
Acoustic Testing Services Limited
Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, New Territories, Hong Kong
Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

Certificate of Calibration

Certificate No. ATS18-014-CC002

Customer: **Aeolian View Consultants**
Room 1907 Tung Che Commercial Centre,
246 Des Voeux Road West,
Hong Kong

Unit-under-test (UUT):

Description:	Sound Analyzer	,	Microphone	,	Pre-amplifier
Manufacturer:	Svantek		BSWA		Svantek
Type No.:	Svan-959	,	231	,	SV 12L
Serial No.:	11238	,	540602	,	73661

Conditions during calibration:

Temperature:	25°C
Relative Humidity:	53%
Test Specifications:	Calibration Check
Date of calibration:	01 February 2019
Test Results:	All calibration points are within manufacturer's specification.

Certified by: _____
Mr. Y. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 01 February 2019

Certificate No.: ATS18-014-CC002 *Page 1 of 3*

聲學測試服務有限公司
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1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	15th May 2018
Certificate No.:	SSD201803033

The test equipment used for calibration is traceable to National Standards via South China National Center of Metrology, Guangdong Institute of Metrology.

3. The sensitivity of the microphone has been adjusted by the calibration function of the Sound Analyzer (calibrated as 94.0dB at 1000Hz) before the calibration. And the adjusted sensitivity was recorded.

Adjusted Microphone Sensitivity (mV/Pa)	41.44

4. The Sound Analyzer has been calibrated in accordance with the requirements as specified in IEC 61672 Class 1, and vendor specific procedures.

5. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allowance for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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6. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB	IEC 61672-1 Class 1 Tolerance Limits, dB	Conclusion
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz			
-10-140	SPL	A	F	94.00	1000	93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		C	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		L	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			94.0	± 1.1	PASS
		A	F	114.00	1000	113.9	± 1.1	PASS
			S			113.9	± 1.1	PASS
			I			113.9	± 1.1	PASS

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Acoustic Testing Services Limited
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Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

Certificate of Calibration

Certificate No. ATS18-014-CC001

Customer:	**Aeolian View Consultants** Room 1907 Tung Che Commercial Centre, 246 Des Voeux Road West, Hong Kong
Item Tested	
Description:	Sound Analyzer , Microphone , Preamplifier
Manufacturer:	NTi Audio
Type No.:	XL2-TA , MC230 , MA220
Serial No.:	A2A-08670-E0 , 9422 , 5045
Test Conditions	
Temperature:	28°C
Relative Humidity:	51%
Test Specifications:	Calibration Check
Date of calibration:	18 May 2018
Test Results:	All calibration points are within manufacturer's specification.

The test equipment used for calibration is traceable to National Standards via:
- South China National Center of Metrology, Guangdong Institute of Metrology

Certified by: _____

Y.T. Leung
MIOA, MHKIOA, MHKIQEP

Issue Date: 18 May 2018

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1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	15 May 2018
Certificate No.:	SSD201803033

3. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allow for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

4. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz	
-10-140	SPL	A	F	93.92	1000	94.0
			S			94.0
			I			94.0
		C	F			94.0
			S			94.0
			I			94.0
		L	F			94.0
			S			94.0
			I			94.0
		A	F	113.93	1000	114.0
			S			114.0
			I			114.0

5. The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC 60651 and IEC 60804 type 1, and vendor specific procedures.

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Certificate of Calibration

Certificate No. ATS18-014-CC003

Customer:	**Aeolian View Consultants** Room 1907 Tung Che Commercial Centre, 246 Des Voeux Road West, Hong Kong
Unit-under-test (UUT):	
Description:	Acoustic Calibrator
Manufacturer:	Svantek
Type No.:	SV-30A
Serial No.:	7441
Conditions during calibration:	
Temperature:	25°C
Relative Humidity:	53%
Test Specifications:	Calibration Check
Date of calibration:	01 February 2019
Test Results:	All calibration points are within manufacturer's specification.

Certified by: _____

Mr. Y. K. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 01 February 2019

聲學測試服務有限公司
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1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

	Type	Serial No.	Last Calibration Date	Calibration Report Number	Traceable to
Sound Analyzer	2270	2821591	02-Nov-2018	AV180148	SCL, HKSAR
Reference Microphone*	B&K 4189	2799478	02-Nov-2018	AV180148	SCL, HKSAR

The test equipment used for calibration is traceable to Standards and Calibration Laboratory, the Government of the HKSAR.

3. Calibration Results

Nominal value dB	Measured value dB	Expanded Measurement Uncertainty of Reference Microphone B&K 4189 at 1000 Hz dB
94.00	93.90	0.20
114.00	113.90	0.20

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Certificate of Calibration

Certificate No. ATS18-CC2013

Customer:	**Acoustics Testing Services Limited** Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong				
Unit-under-test (UUT):					
Description:	Sound Analyzer	,	Microphone	,	Pre-amplifier
Manufacturer:	Brüel & Kjær				
Type No.:	2270	,	4189	,	ZC 0032
Serial No.:	2679277	,	2676603	,	11385
Conditions during calibration:					
Temperature:	26°C				
Relative Humidity:	69%				
Test Specifications:	Calibration Check				
Date of calibration:	16th October 2018				
Test Results:	All calibration points are within manufacturer's specification.				

Certified by: _____

Mr. Y.T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 16th October 2018

1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	15th May 2018
Certificate No.:	SSD201803033

The test equipment used for calibration is traceable to National Standards via South China National Center of Metrology, Guangdong Institute of Metrology.

3. The sensitivity of the microphone has been adjusted by the calibration function of the Sound Analyzer (calibrated as 94.0dB at 1000Hz) before the calibration. And the adjusted sensitivity was recorded.

Initial Microphone Sensitivity (mV/Pa)	52.80
Adjusted Microphone Sensitivity (mV/Pa)	54.08

4. The Sound Analyzer has been calibrated in accordance with the requirements as specified in IEC 61672 Class 1, and vendor specific procedures.

5. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allowance for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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6. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB	IEC 61672-1 Class 1 Tolerance Limits, dB	Conclusion
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz			
-10-140	SPL	A	F	93.92	1000	93.8	± 1.1	PASS
			S			93.8	± 1.1	PASS
			I			93.8	± 1.1	PASS
		C	F			93.8	± 1.1	PASS
			S			93.8	± 1.1	PASS
			I			93.8	± 1.1	PASS
		L	F			93.8	± 1.1	PASS
			S			93.8	± 1.1	PASS
			I			93.8	± 1.1	PASS
		A	F	113.93	1000	113.9	± 1.1	PASS
			S			113.9	± 1.1	PASS
			I			113.9	± 1.1	PASS

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Certificate of Calibration

Certificate No. ATS19-CC1021

Customer:	**Acoustics Testing Services Limited** Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong			
Unit-under-test (UUT):				
Description:	Sound Analyzer	, Microphone	, Pre-amplifier	
Manufacturer:	Brüel & Kjær			
Type No.:	2250	, 4189	, ZC 0032	
Serial No.:	2722935	, 2339313	, 11291	
Conditions during calibration:				
Temperature:	23°C			
Relative Humidity:	59%			
Test Specifications:	Calibration Check			
Date of calibration:	25th February 2019			
Test Results:	All calibration points are within manufacturer's specification.			

Certified by: _____

Mr. Y. T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 25th February 2019

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Acoustic Testing Services Limited
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1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	15th May 2018
Certificate No.:	SSD201803033

The test equipment used for calibration is traceable to National Standards via South China National Center of Metrology, Guangdong Institute of Metrology.

3. The sensitivity of the microphone has been adjusted by the calibration function of the Sound Analyzer (calibrated as 94.0dB at 1000Hz) before the calibration. And the adjusted sensitivity was recorded.

Adjusted Microphone Sensitivity (mV/Pa)	45.16

4. The Sound Analyzer has been calibrated in accordance with the requirements as specified in IEC 61672 Class 1, and vendor specific procedures.

5. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allowance for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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6. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB	IEC 61672-1 Class 1 Tolerance Limits, dB	Conclusion
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz			
-10-140	SPL	A	F	94.00	1000	93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		C	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		L	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		A	F	114.00	1000	113.9	± 1.1	PASS
			S			113.9	± 1.1	PASS
			I			113.9	± 1.1	PASS

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Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

Certificate of Calibration

Certificate No. ATS19-CC1002

Customer:	**Acoustics Testing Services Limited** Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Unit-under-test (UUT):	
Description:	Acoustic Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Conditions during calibration:	
Temperature:	26°C
Relative Humidity:	54%
Test Specifications:	Calibration Check
Date of calibration:	31st January 2019
Test Results:	All calibration points are within manufacturer's specification.

Certified by: _____

Mr. Y. T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 01st February 2019

Certificate No.: ATS19-CC1002 *Page 1 of 2*

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Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

	Type	Serial No.	Last Calibration Date	Calibration Report Number	Traceable to
Sound Analyzer	2270	2821591	02-Nov-2018	AV180148	SCL, HKSAR
Reference Microphone*	B&K 4189	2799478	02-Nov-2018	AV180148	SCL, HKSAR

The test equipment used for calibration is traceable to Standards and Calibration Laboratory, the Government of the HKSAR.

3. Calibration Results

Nominal value dB	Measured value dB	Expanded Measurement Uncertainty of Reference Microphone B&K 4189 at 1000 Hz dB
94.00	93.9	0.20
114.00	113.9	0.20

Appendix A1.4b – Noise Measurement Equipment Calibration Certificates for 2nd Noise Monitoring

Calibration Certificates (Stage 2)

Item	Instrument / Accessory	Brand & Model	Serial No.	Calibration Date
1	Precision integrating sound level meter	Svantek Svan 959	11238	01/02/2019
2	Precision integrating sound level meter	NTi-XL2-TA	A2A-08670-E0	31/05/2019
3	Sound level calibrator	Svantek SV 30A	7441	01/02/2019
4	Precision integrating sound level meter	Bruel & Kjaer 2270	2679277	16/10/2018
5	Precision integrating sound level meter	Bruel & Kjaer 2250	2722935	25/02/2019
6	Sound level calibrator	Bruel & Kjaer 4231	2478237	31/01/2019

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Acoustic Testing Services Limited

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Certificate of Calibration

Certificate No. ATS18-014-CC002

Customer: **Aeolian View Consultants**
Room 1907 Tung Che Commercial Centre,
246 Des Voeux Road West,
Hong Kong

Unit-under-test (UUT):

Description:	Sound Analyzer	,	Microphone	,	Pre-amplifier
Manufacturer:	Svantek		BSWA		Svantek
Type No.:	Svan-959	,	231	,	SV 12L
Serial No.:	11238	,	540602	,	73661

Conditions during calibration:

Temperature:	25°C
Relative Humidity:	53%
Test Specifications:	Calibration Check
Date of calibration:	01 February 2019
Test Results:	All calibration points are within manufacturer's specification.

Certified by: _____
Mr. Y. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 01 February 2019

Certificate No.: ATS18-014-CC002 *Page 1 of 3*

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Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	15th May 2018
Certificate No.:	SSD201803033

The test equipment used for calibration is traceable to National Standards via South China National Center of Metrology, Guangdong Institute of Metrology.

3. The sensitivity of the microphone has been adjusted by the calibration function of the Sound Analyzer (calibrated as 94.0dB at 1000Hz) before the calibration. And the adjusted sensitivity was recorded.

Adjusted Microphone Sensitivity (mV/Pa)	41.44

4. The Sound Analyzer has been calibrated in accordance with the requirements as specified in IEC 61672 Class 1, and vendor specific procedures.

5. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allowance for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

6. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB	IEC 61672-1 Class 1 Tolerance Limits, dB	Conclusion
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz			
-10-140	SPL	A	F	94.00	1000	93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		C	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		L	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			94.0	± 1.1	PASS
		A	F	114.00	1000	113.9	± 1.1	PASS
			S			113.9	± 1.1	PASS
			I			113.9	± 1.1	PASS

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Certificate of Calibration

Certificate No. ATS19-025-CC001

Customer:	**Aeolian View Consultants** Room 1907 Tung Che Commercial Centre, 246 Des Voeux Road West, Hong Kong		
Unit-under-test (UUT):			
Description:	Sound Analyzer	Microphone	Pre-amplifier
Manufacturer:	NTi Audio		
Type No.:	XL2-TA	MC230	MA220
Serial No.:	A2A-08670-E0	9422	5045
Conditions during calibration:			
Temperature:	24°C		
Relative Humidity:	66%		
Test Specifications:	Calibration Check		
Date of calibration:	31st May 2019		
Test Results:	All calibration points are within manufacturer's specification.		

Certified by: _____

Mr. Y.T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 31st May 2019

Certificate No.: ATS19-025-CC001 *Page 1 of 3*

聲學測試服務有限公司
Acoustic Testing Services Limited
Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, New Territories, Hong Kong
Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	06th May 2019
Certificate No.:	SSD201903494

The test equipment used for calibration is traceable to National Standards via South China National Center of Metrology, Guangdong Institute of Metrology.

3. The Sound Analyzer has been calibrated in accordance with the requirements as specified in IEC 61672 Class 1, and vendor specific procedures.

4. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allowance for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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5. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB	IEC 61672-1 Class 1 Tolerance Limits, dB	Conclusion
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz			
-10-140	SPL	A	F	94.00	1000	94.0	± 1.1	PASS
			S			94.0	± 1.1	PASS
			I			94.0	± 1.1	PASS
		C	F			94.0	± 1.1	PASS
			S			94.0	± 1.1	PASS
			I			94.0	± 1.1	PASS
		L	F			94.0	± 1.1	PASS
			S			94.0	± 1.1	PASS
			I			94.0	± 1.1	PASS
		A	F	114.00	1000	114.0	± 1.1	PASS
			S			114.0	± 1.1	PASS
			I			114.0	± 1.1	PASS

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Certificate of Calibration

Certificate No. ATS18-014-CC003

Customer:	**Aeolian View Consultants** Room 1907 Tung Che Commercial Centre, 246 Des Voeux Road West, Hong Kong
Unit-under-test (UUT):	
Description:	Acoustic Calibrator
Manufacturer:	Svantek
Type No.:	SV-30A
Serial No.:	7441
Conditions during calibration:	
Temperature:	25°C
Relative Humidity:	53%
Test Specifications:	Calibration Check
Date of calibration:	01 February 2019
Test Results:	All calibration points are within manufacturer's specification.

Certified by: _____

Mr. Y. T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 01 February 2019

聲學測試服務有限公司
Acoustic Testing Services Limited
Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, New Territories, Hong Kong
Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

	Type	Serial No.	Last Calibration Date	Calibration Report Number	Traceable to
Sound Analyzer	2270	2821591	02-Nov-2018	AV180148	SCL, HKSAR
Reference Microphone*	B&K 4189	2799478	02-Nov-2018	AV180148	SCL, HKSAR

The test equipment used for calibration is traceable to Standards and Calibration Laboratory, the Government of the HKSAR.

3. Calibration Results

Nominal value dB	Measured value dB	Expanded Measurement Uncertainty of Reference Microphone B&K 4189 at 1000 Hz dB
94.00	93.90	0.20
114.00	113.90	0.20

聲學測試服務有限公司
Acoustic Testing Services Limited
Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, New Territories, Hong Kong
Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

Certificate of Calibration

Certificate No. ATS18-CC2013

Customer:	**Acoustics Testing Services Limited** Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong				
Unit-under-test (UUT):					
Description:	Sound Analyzer	,	Microphone	,	Pre-amplifier
Manufacturer:	Brüel & Kjær				
Type No.:	2270	,	4189	,	ZC 0032
Serial No.:	2679277	,	2676603	,	11385
Conditions during calibration:					
Temperature:	26°C				
Relative Humidity:	69%				
Test Specifications:	Calibration Check				
Date of calibration:	16th October 2018				
Test Results:	All calibration points are within manufacturer's specification.				

Certified by: _____

Mr. Y. T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 16th October 2018

1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	15th May 2018
Certificate No.:	SSD201803033

The test equipment used for calibration is traceable to National Standards via South China National Center of Metrology, Guangdong Institute of Metrology.

3. The sensitivity of the microphone has been adjusted by the calibration function of the Sound Analyzer (calibrated as 94.0dB at 1000Hz) before the calibration. And the adjusted sensitivity was recorded.

Initial Microphone Sensitivity (mV/Pa)	52.80
Adjusted Microphone Sensitivity (mV/Pa)	54.08

4. The Sound Analyzer has been calibrated in accordance with the requirements as specified in IEC 61672 Class 1, and vendor specific procedures.

5. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allowance for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

聲學測試服務有限公司
Acoustic Testing Services Limited
Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, New Territories, Hong Kong
Tel: (852) 2690 9126 Fax: (852) 2690 9125 E-mail: info@ATSL.com.hk http://www.ATSL.com.hk

6. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB	IEC 61672-1 Class 1 Tolerance Limits, dB	Conclusion
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz			
-10-140	SPL	A	F	93.92	1000	93.8	± 1.1	PASS
			S			93.8	± 1.1	PASS
			I			93.8	± 1.1	PASS
		C	F			93.8	± 1.1	PASS
			S			93.8	± 1.1	PASS
			I			93.8	± 1.1	PASS
		L	F			93.8	± 1.1	PASS
			S			93.8	± 1.1	PASS
			I			93.8	± 1.1	PASS
		A	F	113.93	1000	113.9	± 1.1	PASS
			S			113.9	± 1.1	PASS
			I			113.9	± 1.1	PASS

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Certificate of Calibration

Certificate No. ATS19-CC1021

Customer:	**Acoustics Testing Services Limited** Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong			
Unit-under-test (UUT):				
Description:	Sound Analyzer	, Microphone	, Pre-amplifier	
Manufacturer:	Brüel & Kjær			
Type No.:	2250	, 4189	, ZC 0032	
Serial No.:	2722935	, 2339313	, 11291	
Conditions during calibration:				
Temperature:	23°C			
Relative Humidity:	59%			
Test Specifications:	Calibration Check			
Date of calibration:	25th February 2019			
Test Results:	All calibration points are within manufacturer's specification.			

Certified by: _____

Mr. Y. T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 25th February 2019

聲學測試服務有限公司
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1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

Description:	Acoustical Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Last Calibration Date:	15th May 2018
Certificate No.:	SSD201803033

The test equipment used for calibration is traceable to National Standards via South China National Center of Metrology, Guangdong Institute of Metrology.

3. The sensitivity of the microphone has been adjusted by the calibration function of the Sound Analyzer (calibrated as 94.0dB at 1000Hz) before the calibration. And the adjusted sensitivity was recorded.

Adjusted Microphone Sensitivity (mV/Pa)	45.16

4. The Sound Analyzer has been calibrated in accordance with the requirements as specified in IEC 61672 Class 1, and vendor specific procedures.

5. The values given in this certification only related to the values measured at the time of the calibration and any uncertainties quoted will not allowance for the equipment long-term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the calibration. Acoustic Testing Services Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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6. Calibration Results

Setting of unit-under-test (UUT)				Applied value		UUT Reading, dB	IEC 61672-1 Class 1 Tolerance Limits, dB	Conclusion
Range, dB	Parameter	Frequency Weighting	Response	Level, dB	Frequency, Hz			
-10-140	SPL	A	F	94.00	1000	93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		C	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		L	F			93.9	± 1.1	PASS
			S			93.9	± 1.1	PASS
			I			93.9	± 1.1	PASS
		A	F	114.00	1000	113.9	± 1.1	PASS
			S			113.9	± 1.1	PASS
			I			113.9	± 1.1	PASS

Certificate No.: ATS19-CC1021

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Certificate of Calibration

Certificate No. ATS19-CC1002

Customer:	**Acoustics Testing Services Limited** Unit E, 2/F., Century Industrial Centre, 33-35 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong
Unit-under-test (UUT):	
Description:	Acoustic Calibrator
Manufacturer:	Brüel & Kjær
Type No.:	4231
Serial No.:	2478237
Conditions during calibration:	
Temperature:	26°C
Relative Humidity:	54%
Test Specifications:	Calibration Check
Date of calibration:	31st January 2019
Test Results:	All calibration points are within manufacturer's specification.

Certified by: _____

Mr. Y. T. LEUNG
MIOA, MHKIOA, MHKIQEP

Issue Date: 01st February 2019

Certificate No.: ATS19-CC1002 *Page 1 of 2*

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1. The instrument under test was allowed to stabilize in the laboratory for over 24 hours.

2. Calibration equipment:

	Type	Serial No.	Last Calibration Date	Calibration Report Number	Traceable to
Sound Analyzer	2270	2821591	02-Nov-2018	AV180148	SCL, HKSAR
Reference Microphone*	B&K 4189	2799478	02-Nov-2018	AV180148	SCL, HKSAR

The test equipment used for calibration is traceable to Standards and Calibration Laboratory, the Government of the HKSAR.

3. Calibration Results

Nominal value dB	Measured value dB	Expanded Measurement Uncertainty of Reference Microphone B&K 4189 at 1000 Hz dB
94.00	93.9	0.20
114.00	113.9	0.20