

## SYDNEY METRO – VICTORIA CROSS STATION ISD

NORTH SYDNEY NSW 2060

NOISE AND VIBRATION MONITORING REPORT JANUARY-JUNE 2021

RWDI # 2101617

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## DOCUMENT CONTROL

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# 1 INTRODUCTION

The New South Wales (NSW) Government through Transport for NSW (TfNSW) is implementing Sydney's Rail Future, a plan to transform and modernise Sydney's rail network so that it can grow with the city's population and meet the needs of commuters and customers in the future.

Sydney Metro is a new standalone rail network identified in Sydney's Rail Future. The Sydney Metro network consists of Sydney Metro Northwest (previously known as the North West Rail Link), Sydney Metro City & Southwest and Sydney Metro West.

The Victoria Cross Integrated Station Development (ISD), made up of the metro station and over station development, will include the following features.

- Two station entrances including a northern entrance opening to Miller and McLaren streets, and a southern entrance with pedestrian access to Miller and Denison streets.
- A commercial building above the station's southern entrance.
- Station concourse and platforms beneath Miller Street.
- A commercial and retail hub.
- Enhancement of pedestrian infrastructure around the station, as well as new bike parking at the northern entrance, and new kiss and ride bays on McLaren Street opposite the northern entrance.
- Improvements to the public domain.

RWDI was engaged by Lendlease to provide a six-monthly noise and vibration monitoring report for the Sydney Metro Victoria Cross Integrated Station Development (ISD) site for the period between 1<sup>st</sup> January and 30<sup>th</sup> June 2021.

Construction noise & vibration objectives for the Victoria Cross ISD project are to minimise unreasonable noise and vibration impacts on residents and businesses, and to avoid structural damage to buildings or heritage items as a result of construction vibration.

## 2 MONITORING LOCATIONS, METHODOLOGY AND EQUIPMENT

### 2.1 Site description

The Victoria Cross Station will have two station entrance boxes - Victoria Cross North (VCN) and Victoria Cross South (VCS) connected by a cavern platform directly beneath Miller Street.

A Site Location Plan is shown in Figure 1 .

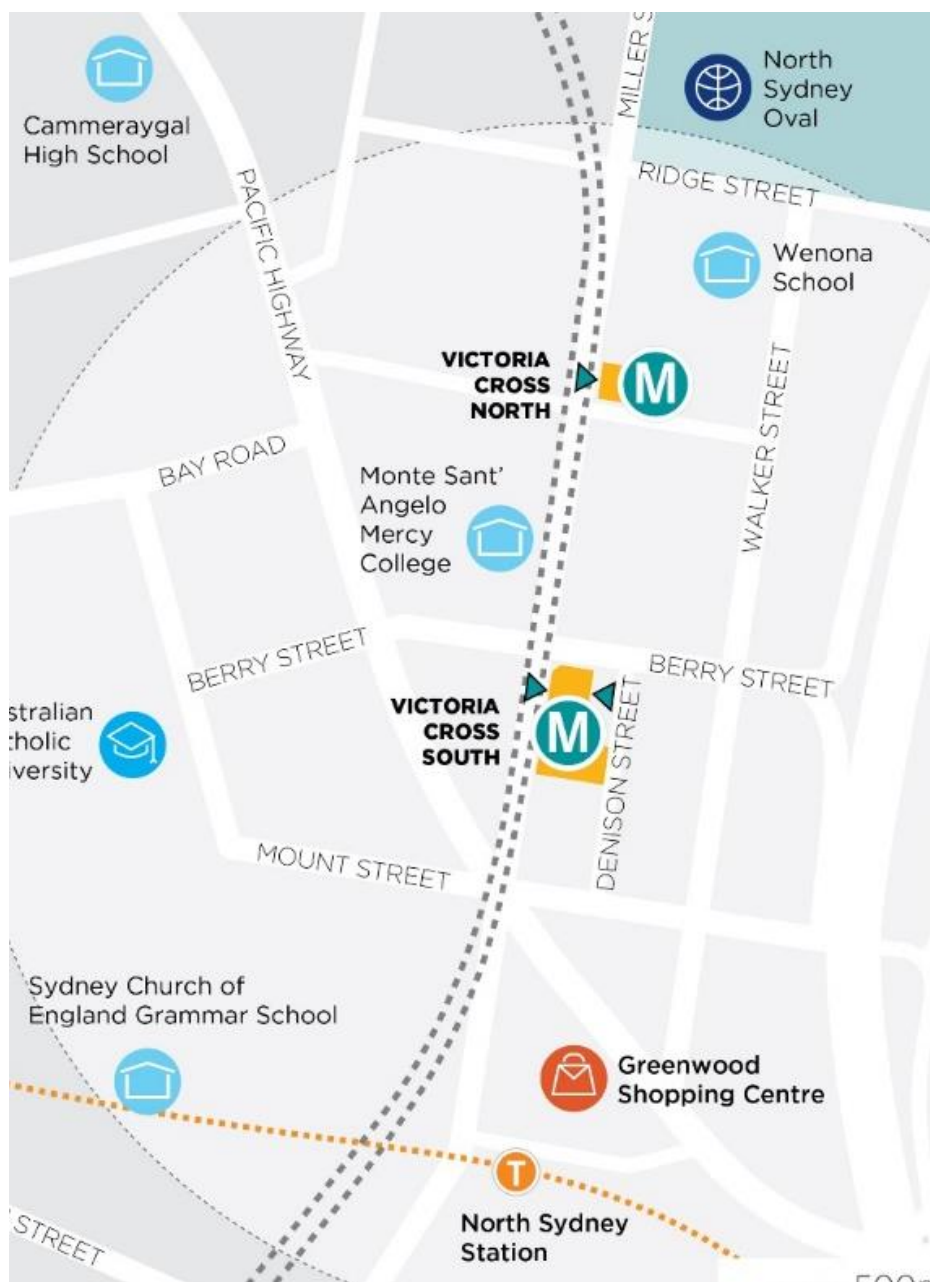
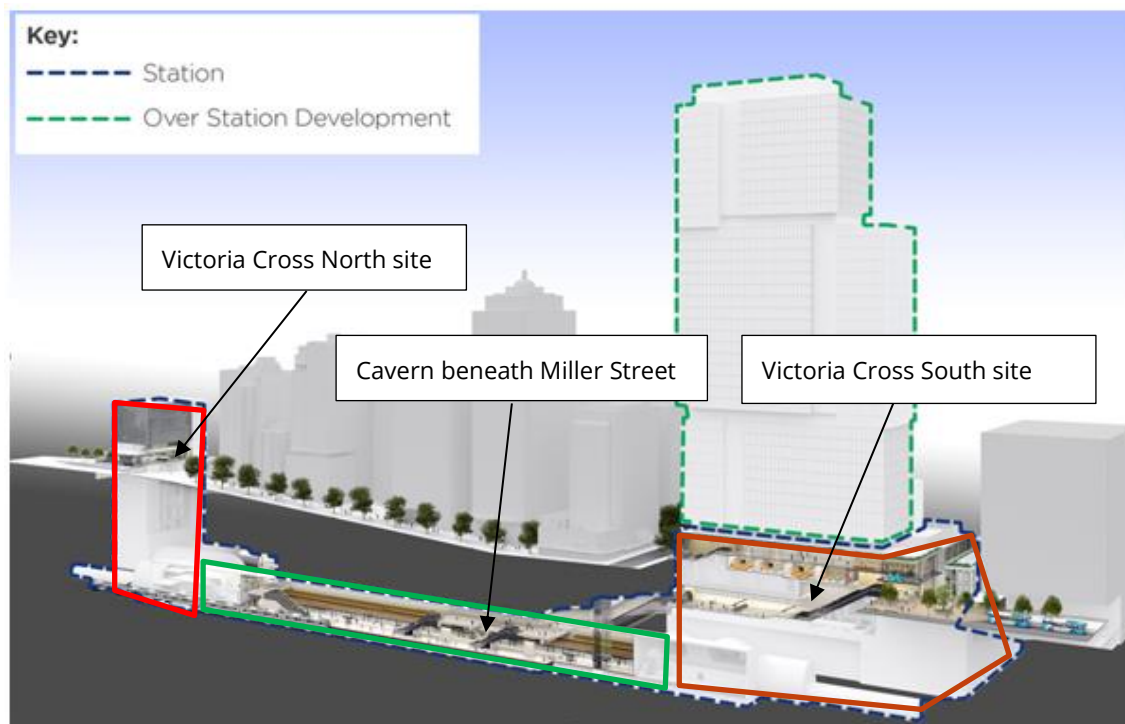


Figure 1 Site Location Plan

Figure 2 shows the Schematic 3D View of the ISD Showing OSD & Station Components.



**Figure 2 Schematic 3D View of the ISD Showing OSD & Station Components**

## 2.2 Monitoring Methodology

Long-term real time noise and vibration monitoring has been conducted at two locations in the vicinity of Victoria Cross South and Victoria Cross North sites, at the locations shown on Figure 3 and Figure 4.

Realtime noise and vibration monitors were installed at 243 Miller Street, North Sydney and at 65 Berry Street, North Sydney. These locations are both representative of the most potentially impacted receivers for Victoria Cross North (VCN) and Victoria Cross South (VCS).

The monitors at 65 Berry Street were installed on 23<sup>rd</sup> April 2020 and are located on an outdoor ground floor balcony at 65 Berry Street, on the western façade of the commercial building.

The monitor at 243 Miller Street were installed on 2<sup>nd</sup> February 2021, at the 243 Miller Street southern boundary with the VCN site. On 27 May 2021, the monitors were moved to a slightly different location, at the eastern boundary of 243 Miller Street, adjacent to VCN site.

### 2.2.1 Unattended Noise Monitoring

Unattended noise monitoring was conducted using two environmental noise loggers with audio recording capability. The noise loggers record A-weighted sound pressure levels with “fast” time weighting, and a digital recording of real-time audio saved in mp3 file format for the duration of the monitoring.

The logger determines  $L_{Amax}$ ,  $L_{A10}$ ,  $L_{A90}$ , and  $L_{Aeq}$  levels of ambient noise.  $L_{A10}$ , and  $L_{A90}$  are the levels exceeded for 10%, and 90% of the sample time. The  $L_{Amax}$  is indicative of maximum noise levels due to individual noise

events. This is typically used for the assessment of sleep disturbance. The  $L_{A90}$  level is typically taken as the background noise level during the sample period.

Unattended noise monitors are also capable of storing high-quality, high-resolution audio files. These files are uploaded on the Sound Science website every fifteen minutes, and can be accessed remotely anytime.

Calibration certificates of unattended noise monitors used on this project are shown in Appendix A.

Photos of the unattended noise monitors used on this project are shown in Appendix B.

## **2.2.2 Unattended Vibration Monitoring**

The purpose of the monitoring assessment is to ensure significant vibration peaks do not cause structural damage to neighbouring properties.

Two Environmental Texcel Monitors (ETMs) were installed at the locations shown on Figure 3 and Figure 4.

The vibration monitors collect the Peak Particle Velocity (PPV) values of three vibration axes x, y and z, and the Peak Vector Sum (PVS). The monitor is programmed to record one-minute intervals and an alarm system when vibration screening criteria for building damage are exceeded.

Calibration certificates of attended and unattended vibration monitors used on this project are shown in Appendix A. Photos of the unattended vibration monitors used on this project are shown in Appendix B.

## **2.2.3 Attended Noise Monitoring**

Attended noise measurements were undertaken at locations surrounding the VCN and VCS sites on a number of occasions during the monitoring period.

The noise monitoring equipment used for attended measurements consisted of an NTI Audio XL2 sound level meter (SLM). This SLM is a type approved system, offering Class 1 performance according to IEC 61672-1:2013 *Electroacoustics – Sound level meters – Part 1: Specifications and has current calibration with National Association of Testing Authorities, Australia requirements (NATA)*. It is calibrated in accordance with IEC 61672-3:2013 *Electroacoustics – Sound level meters – Part 3: Periodic tests*.

The A-weighting filter of the meter was selected to allow for the human ear's response to the frequency range involved. The field calibration of the meter was checked before and after the measurements with a Brüel & Kjær Type 4231 sound level calibrator (SLC) and no significant drift was noted. This SLC is a Class 1 calibrator according to AS IEC 60942-2004 *Electroacoustics – Sound calibrators* and has been calibrated to the same Standard.

The NTI XL2 and Brüel & Kjær Type 4231 hold current laboratory calibrations in accordance with NATA and our in-house Quality Assurance Procedures.

Calibration certificates of sound level meters used on this project are shown in Appendix A.

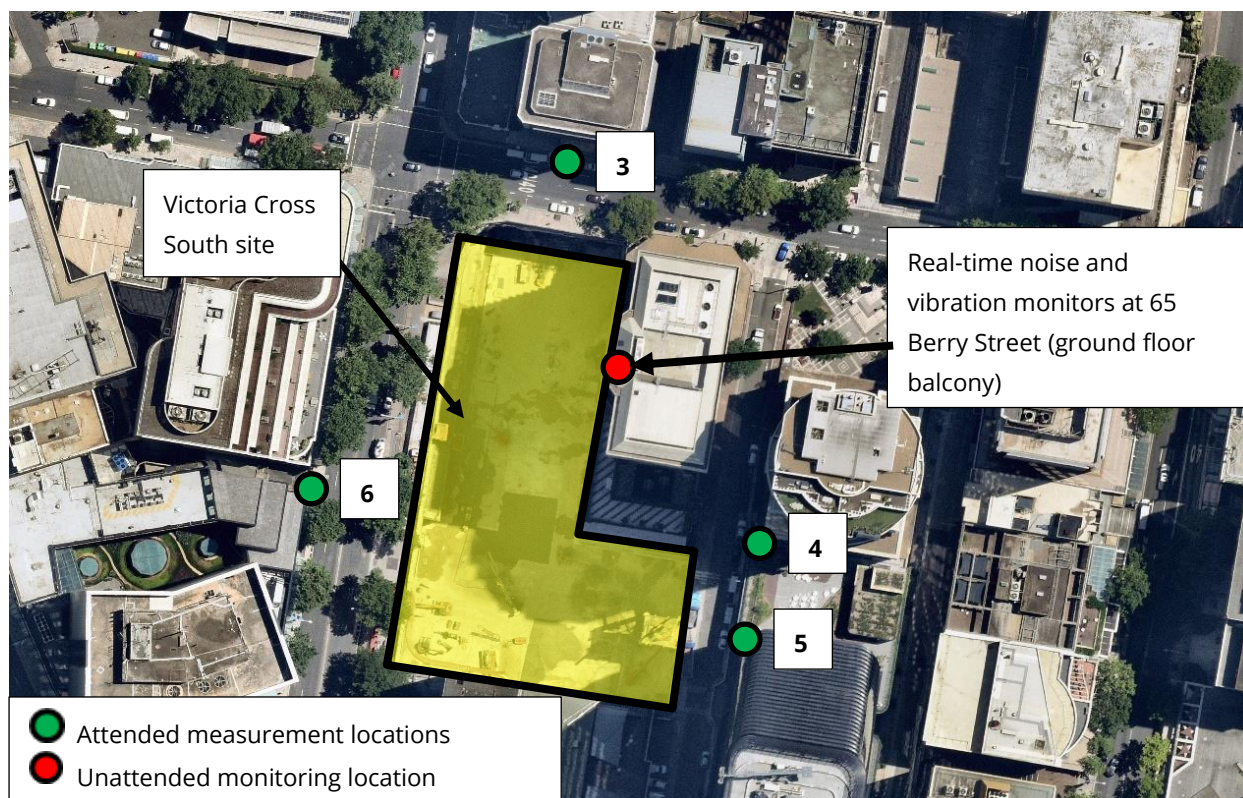
Photos of the attended sound level meters used on this project are shown in Appendix B.



Note that the attended and unattended monitoring locations include those in the Construction Noise & Vibration Management Plan (CNVMP), and additional monitoring locations that have been selected to represent sensitive receivers.



**Figure 3 Site Map and monitoring locations at Victoria Cross North**



**Figure 4 Site Map and monitoring locations at Victoria Cross South**

## 2.3 Noise and Vibration Monitoring Equipment

The monitors used for the various monitoring completed during the reporting period are outlined below. Attended monitors were field calibrated before each field measurement.

Equipment Details	Monitoring Type	Location(s)	Serial No.	NATA Calibration Date	SoundScience Ref.
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### Unattended noise and vibration monitors

<b>Rion NL-52 Type 1 Sound Level Meter</b>	Real-time noise	65 Berry Street, North Sydney Ground floor balcony	00575757	24/09/2019	241
<b>Texcel ETM Ground Vibration Monitor</b>	Real-time vibration	65 Berry Street, North Sydney Ground floor balcony	ETM7084	9/04/2020	241
<b>Rion NL-52 Type 1 Sound Level Meter</b>	Real-time noise	65 Berry Street, North Sydney Ground floor balcony	01276564	21/02/2020	232
<b>Texcel ETM Ground Vibration Monitor</b>	Real-time vibration	65 Berry Street, North Sydney Ground floor balcony	ETM7177	9/04/2020	232
<b>SVANTEK SVAN 977A Type 1 Sound Level Meter</b>	Real-time noise	243 Miller Street, North Sydney Ground floor balcony	59635	7/08/2020	213
<b>Texcel ETM Ground Vibration Monitor</b>	Real-time vibration	243 Miller Street, North Sydney Ground floor balcony	ETM7349	29/01/2020	213

### Attended noise and vibration monitors

<b>NTI Audio XL2 Audio and Acoustic Analyzer</b>	Sound Level Meter	Various locations around VCS and VCN. See Figure 2 3 and Figure 2 4	A2A-08006-E0	9/01/2020	N/A
<b>Texcel ETM Ground Vibration Monitor</b>	Vibration monitor	105 Miller St basement	ETM7388	6/05/2020	N/A

### Sound level calibrators for attended and unattended noise monitors / meters

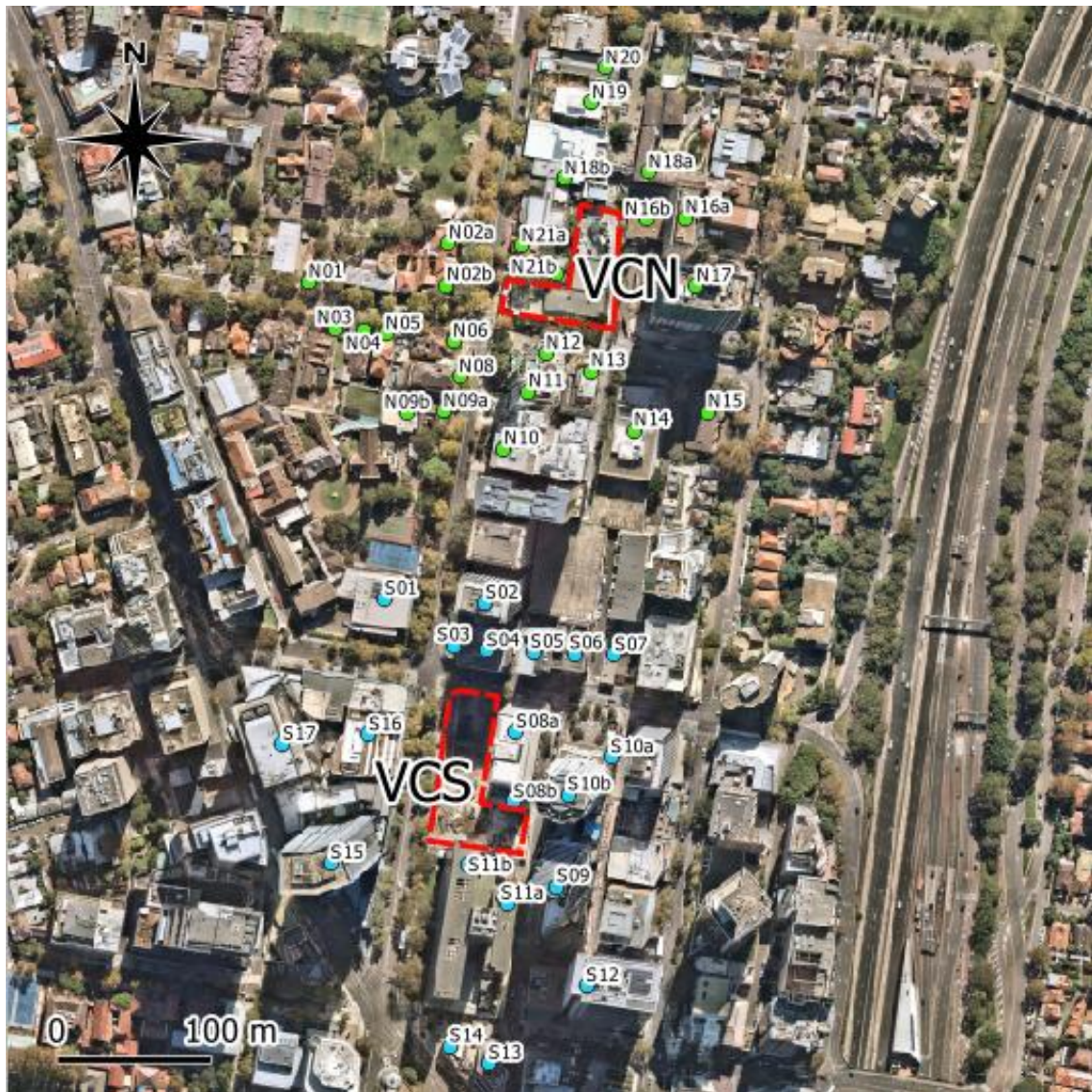
<b>Brüel &amp; Kjær Type 4230 sound level calibrator</b>	Field calibrator	N/A	584164	25/05/2020	N/A
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Equipment Details	Monitoring Type	Location(s)	Serial No.	NATA Calibration Date	SoundScience Ref.
Brüel & Kjær Type 4231 sound level calibrator	Field calibrator	N/A	3017799	25/03/2021	N/A



### 3 SENSITIVE RECEIVERS

**Figure 5** shows the sensitive receivers surrounding the VCN and VCS sites considered by this assessment. A detailed table of receivers including ID, addresses and type receiver is included in Appendix C.



**Figure 5** Sensitive Receivers – Aerial Map

## 4 DESCRIPTION OF CONSTRUCTION WORKS

The Project involves the staged construction of the VCN and VCS station sites, and the 42 storey OSD development which will be completed under a separate Stage Significant Development (SSD) approval.

### 4.1 Works Schedule

The staging plans identify seven discreet construction stages for each of the southern site northern site, with works on both sites occurring together. Each of the identified stages has been summarised in Tables 1 and 2.

**Table 1 Construction Stages – Victoria Cross North (VCN)**

Stage	Description	Construction equipment used during period	Undertaken During Reporting Period
<b>Stage 1</b>	Site establishment <ul style="list-style-type: none"> <li>- Work zones established</li> <li>- Hoardings installed</li> <li>- Out of hours services &amp; mobilisation works</li> </ul>	Hoist, excavators, delivery trucks, concrete trucks, concrete pump, forklift, tower crane	Yes
<b>Stage 2</b>	Detailed excavation & footings <ul style="list-style-type: none"> <li>- Loadout of excavation spoil</li> <li>- Detailed excavation in shaft</li> </ul>	Hoist, excavators, delivery trucks, concrete trucks, concrete pump, forklift, tower crane	Yes
<b>Stage 3</b>	Superstructure B11 – L00 <ul style="list-style-type: none"> <li>- Formwork systems</li> <li>- Concrete structure works</li> </ul>	Hoist, excavators, delivery trucks, concrete trucks, concrete pump, forklift, tower crane	Yes
<b>Stage 4</b>	Above ground structure I00 – I04 roof <ul style="list-style-type: none"> <li>- Above ground concrete structure</li> <li>- Perimeter scaffold/class b hoardings installed</li> </ul>	N/A	No
<b>Stage 5</b>	Façade & internal finishes <ul style="list-style-type: none"> <li>- External façade works using perimeter scaffold</li> </ul>	N/A	No
<b>Stage 6</b>	Public realm works <ul style="list-style-type: none"> <li>- Scaffold and hoarding removed</li> <li>- Tower crane removed</li> </ul>	N/A	No
<b>Stage 7</b>	Regrading adjacent property <ul style="list-style-type: none"> <li>- Demobilisation of site amenities</li> <li>- Removal of concrete hardstand &amp; roadway</li> </ul>	N/A	No

**Table 2 Construction Stages – Victoria Cross South (VCS)**

Stage	Description	Construction equipment used during period	Undertaken During Reporting Period
<b>Stage 1</b>	Site establishment <ul style="list-style-type: none"> <li>- Tower crane installed</li> <li>- Work zone established</li> <li>- Detailed excavation and loadout</li> <li>- Concrete footings</li> <li>- Out of hours services &amp; mobilisation works</li> </ul>	Hoist, excavators, delivery trucks, concrete trucks, concrete pump, piling rig, tower crane	Yes
<b>Stage 2</b>	Stormwater / superstructure <ul style="list-style-type: none"> <li>- Station concrete frame / superstructure commences</li> </ul>	Hoist, excavators, delivery trucks, concrete trucks, concrete pump, tower crane	Yes
<b>Stage 3</b>	Concrete frame below ground level <ul style="list-style-type: none"> <li>- Station concrete frame continues below ground</li> </ul>	Hoist, excavators, delivery trucks, concrete trucks, concrete pump, tower crane	Yes
<b>Stage 4</b>	Concrete frame below ground level <ul style="list-style-type: none"> <li>- Station fitout below ground</li> <li>- Station concrete frame above ground</li> <li>- Out of hours fitout (cavern) and structures (south site) works</li> </ul>	Hoist, excavators, delivery trucks, concrete trucks, concrete pump, tower crane	Yes
<b>Stage 5</b>	<ul style="list-style-type: none"> <li>- Station fitout continues</li> <li>- Station concrete frame above ground continues</li> <li>- Station façade installation commences</li> <li>- OSD concrete frame commences</li> <li>- Denison street stormwater works</li> </ul>	N/A	No
<b>Stage 6</b>	<ul style="list-style-type: none"> <li>- Station concrete frame infills</li> <li>- Station fitout continues</li> <li>- Station façade installation continues</li> <li>- Miller street stormwater works commence</li> <li>- OSD concrete frame continues</li> <li>- OSD façade &amp; finishes commence</li> </ul>	N/A	No
<b>Stage 7</b>	Station handed to Metro for commissioning <ul style="list-style-type: none"> <li>- OSD concrete frame completed</li> <li>- OSD façade &amp; finishes completed</li> </ul>	N/A	No

## 5 CONSTRUCTION NOISE AND VIBRATION REQUIREMENTS

### 5.1 Construction Noise and Vibration Criteria

#### 5.1.1 Construction Noise Criteria (CNVMP)

In accordance with acoustic requirements identified in the Construction Noise and Vibration Management Plan (CNVMP), airborne Noise Management Levels (NMLs) applicable to Standard Hours and OOH Periods 1 and 2 are presented in Table 3.

**Table 3 Airborne Noise Management Levels (dBA)**

Location	Standard Hours (Day)		OOHW Period 1 (Day)		OOHW Period 1 (Evening)		OOHW Period 2 (Night)		Morning Shoulder (5.00am–7.00am)	
	RBL	NML	RBL	NML	RBL	NML	RBL	NML	RBL	NML
VCS Residential	65	75	65	70	63	68	52	57	59	64
VCN Residential	65	75	65	70	57	62	51	56	58	63
School (Classrooms)	n/a	55	n/a	55	n/a	55	n/a	55	n/a	55
Commercial (Offices)	n/a	70	n/a	70	n/a	70	n/a	70	n/a	70
Hotels (Sleeping Areas)	n/a	60	n/a	60	n/a	60	n/a	60	n/a	60
Childcare Centre (Sleeping areas)	n/a	60	n/a	60	n/a	60	n/a	60	n/a	60
Recording Studio	n/a	55	n/a	55	n/a	55	n/a	55	n/a	55

Notes: RBL – Rating Background Noise Level; NML – Noise Management Level; Non-residential criteria only apply when receiver building is in use. Noise levels apply at the property boundary that is most exposed to construction noise (or receiver building façade that is most exposed to construction noise, noting that noise levels may be higher at upper floors of the noise affected receiver buildings). If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise affected point within 30 m of the residence.



### 5.1.2 SSI 7400 MOD 8 Conditions of E37 and E38

In addition to the construction NMLs detailed in section 5.1.1, SSI 7400 MOD 8 Conditions of E37 and E38 are as follows:

#### Respite for Receivers

**E37** The Proponent must identify all receivers likely to experience internal noise levels greater than  $L_{eq(15 \text{ minute})}$  60 dB(A) inclusive of a 5 dB penalty, if rock breaking or any other annoying activity likely to result in regenerated (ground-borne) noise or a perceptible level of vibration is planned (including works associated with utility adjustments), between 7am – 8pm at:

- (a) Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street, and Central; and
- (b) Marrickville, Newtown, St Peters, Sydenham and Tempe for works specified in SSI 7400\_MOD 4 referenced in Condition A1 (c).

**E38** The Proponent must consult with all receivers identified in accordance with Condition E37 with the objective of determining appropriate hours of respite so that construction noise (including ground-borne noise), does not exceed internal noise levels of:

- (a)  $L_{eq(15 \text{ minute})}$  60 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 50 percent of the time; and
- (b)  $L_{eq(15 \text{ minute})}$  55 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 25 percent of the time, unless an agreement is reached with those receivers. This condition does not apply to noise associated with the cutting surface of a TBM as it passes under receivers.

*Note This condition requires that noise levels be less than  $L_{eq(15 \text{ minute})}$  60 dB(A) for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below  $L_{Aeq(15 \text{ minute})}$  55 dB(A). Noise equal to or above  $L_{eq(15 \text{ minutes})}$  60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.*

### 5.1.3 Vibration Criteria

In accordance with condition of approval E28 and requirements detailed in section 9.1.4 of the CNVMP, the following vibration screening criteria have been applied:

- 25mm/s for 65 Berry Street, North Sydney (reinforced or framed structures).
- 7.5mm/s for 243 Miller Street, North Sydney (unreinforced or light framed structures).

## 5.2 Construction Noise Hours

For the purposes of this assessment, the provisions of the Metro CNVS have been applied to the noise assessment of the proposed 24/7 activities inside the cavern.

The Metro CNVS defines construction hours as follows:

Standard Hours:

- Monday to Friday 7.00am – 6.00pm; and
- Saturday 8.00am – 1.00pm.

OOH Period 1:

- Monday to Friday 6.00pm – 10.00pm;
- Saturday 1.00pm – 10.00pm; and
- Sunday/Public Holiday 8.00am – 6.00pm.

OOH Period 2:

- Monday to Friday 10.00pm – 7.00am;
- Saturday 10.00pm – 8.00am; and
- Sunday/Public Holiday 6.00pm – 7.00am.

### **COVID 19 Working Hours**

The NSW Government has allowed infrastructure and building construction sites to work extended hours across weekends and public holidays throughout the COVID 19 pandemic via the Environmental Planning and Assessment Amendment (COVID-19 Development – Infrastructure Construction Work Days No. 2) Order 2020. The extended work hours enable the construction industry to practice appropriate social distancing with fewer workers on site on any given day by allowing work to be spread across more days in the week.

VCISD standard construction hours were therefore extended to include the following hours:

- Saturday COVID 7.00am – 8.00am; and 1:00pm – 6:00pm
- Sunday COVID 7.00am – 6.00pm.

## 6 NOISE AND VIBRATION MONITORING RESULTS

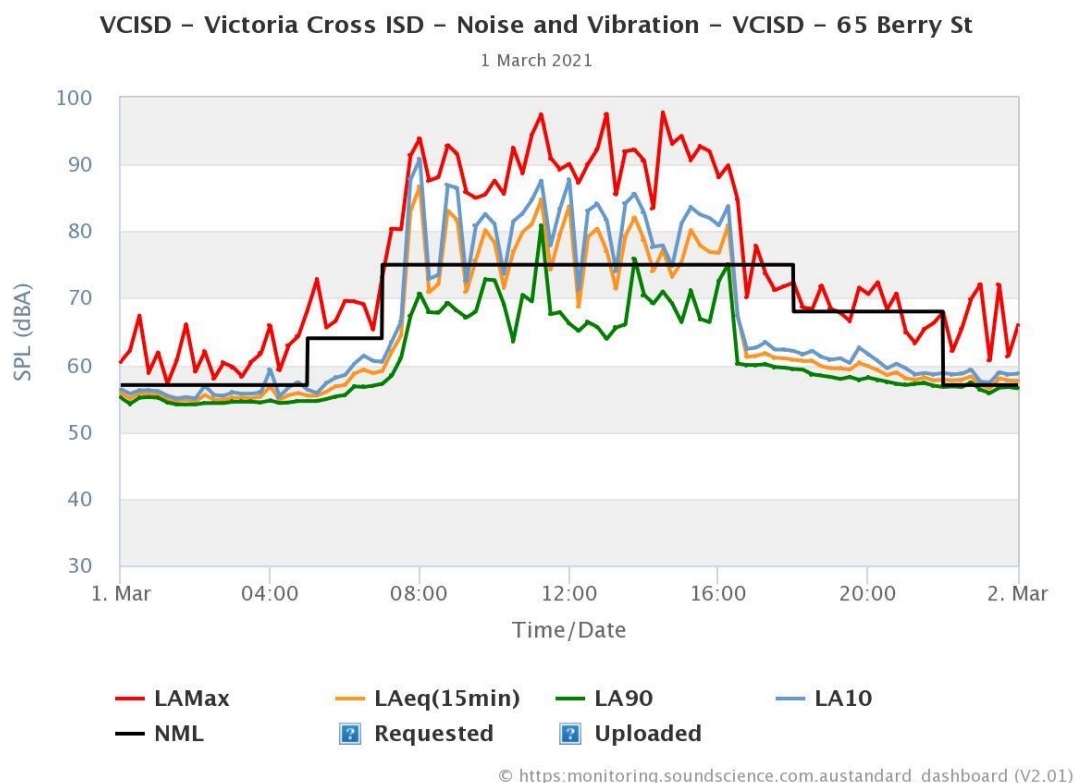
### 6.1 Noise monitoring

#### 6.1.1 Real-time Noise Monitoring

Example graphs and data from real time noise monitoring are presented below to illustrate monitoring results. The remainder of the monitoring data is available if requested.

##### 6.1.1.1 Comparison with levels from the CNVMP

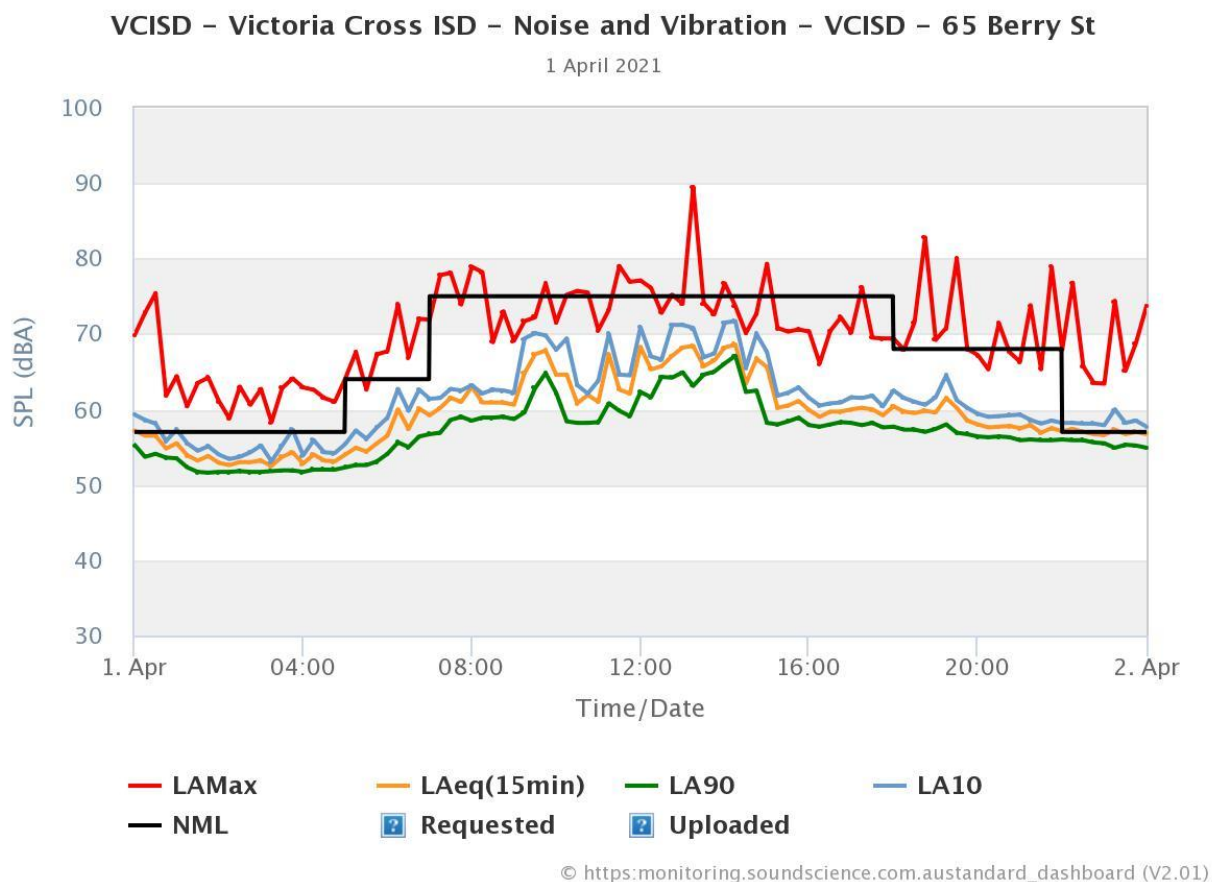
As predicted in the CNVMP, measured levels were generally above the NMLs at both locations. For example, on 1<sup>st</sup> March 2021 at 65 Berry Street, North Sydney, a number of 15-min periods were measured above the NMLs for residential receivers at the VCS site during standard construction hours. This is shown in Figure 6 (**Note:** in the monitoring graph, LAeq levels are in yellow, NMLs are in black).



**Figure 6 Real-time noise monitoring chart at 65 Berry Street, North Sydney on 1<sup>st</sup> March 2021**

The CNVMP predicted construction noise levels between 76 dBA LAeq (15min) and 88 dBA LAeq (15min) during VCS Phases 1, 2, 3 and 4. Noise levels measured on Monday 1<sup>st</sup> March 2021 are representative of days when construction noise levels from the VCS site are high. These levels measured that day were ranging between 68 dBA LAeq (15min) and 87 dBA LAeq (15min), in line with the levels predicted and detailed in the CNVMP at that location.

Some days, such as Thursday 1<sup>st</sup> April 2021 (see Figure 7) measured levels remained below the NMLs for residential receivers.



**Figure 7 Real-time noise monitoring chart at 65 Berry Street, North Sydney on 1<sup>st</sup> April 2021**

#### 6.1.1.2 Assessment of CSSI Condition E38

CSSI Condition E38 is summarised as follows:

Internal noise levels must be less than 60 dBA  $L_{Aeq}(15 \text{ minute})$  for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below 55 dBA  $L_{Aeq}(15 \text{ minutes})$ . Noise equal to or above 60 dBA  $L_{Aeq}(15 \text{ minutes})$  is allowed for the remaining 6.5 hours between 7am and 8pm.

The above levels are inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration.

Given both monitors are located outdoors, a correction taking into account the distance to the façade and the façade construction was considered for both locations.

- An assumed façade façade transmission loss of airborne noise of 30 dB was considered for 65 Berry Street, and;
- An assumed façade façade transmission loss of airborne noise of 15 dB was considered for 243 Miller Street.



To assess compliance with E38 a) and b), the levels are measured then corrected to account for façade attenuation correction. The number of 15-minute periods exceeding 55 dBA  $L_{Aeq}(15 \text{ minute})$  and 60 dBA  $L_{Aeq}(15 \text{ minute})$  between 7am and 8pm is then counted in real-time.

Prior to any non-compliances occurring, an alert is sent 1 hour (or 4x 15-min periods) before the alarm for E38a or E38b is triggered. These alerts and alarms are sent to the Lendlease team by emails and text messages.

Appendix D details examples of real-time noise and vibration monitoring daily charts at 65 Berry St, North Sydney (VCS) and 243 Miller Street (VCN).

Appendix E shows the results of the E38 daily compliance assessment for both sites.

**During the monitoring period, there has been no exceedance of the E37/E38 noise criteria for both VCN and VCS sites.**

### 6.1.2 Attended Noise Monitoring – Standard Construction Hours

Attended noise monitoring was conducted during daytime at the VCS site on 11 February 2021 to measure construction noise levels from rock hammering activities.

The measurements were conducted at representative receivers along Denison Street to the east of the VCS site. Results of the attended monitoring are detailed in Table 4 below. Noise levels were measured above the NMLs at the façades of surrounding developments, and per the Noise and Vibration Management Plan relevant mitigation measures such as respite periods were in place and observed. The noise levels were in line with predicted noise levels detailed in Table 8-6 of the CNVMP.



**Table 4 Attended Monitoring – 11 February 2021**

Location	Type	Time	Noise Management Levels, dBA, L <sub>Aeq</sub> 15min			Measured Levels, dBA		Comments
			OOHW Period 1 (Day)	OOHW Period 1 (Evening)	OOHW Period 2 (Night)	L <sub>Aeq</sub> dBA	L <sub>90</sub> dBA	
Eastern façade 65 Berry St	Commercial	2.45pm	70	70	70	70	58	Construction noise from Sydney Metro site clearly audible, hammering the primary source of noise. Traffic on surrounding roadways contributes to the noise levels, but to a lesser extent.
North-western corner of 79-81 Berry St	Commercial/Residential	3.00pm	70	62	57	72	61	Construction noise from Sydney Metro site clearly audible, hammering the primary source of noise. Traffic on surrounding roadways contributes to the noise levels, but to a lesser extent.
South-western corner of 79-81 Berry St	Commercial/Residential	3.15pm	70	62	57	76	62	Construction noise from Sydney Metro site clearly audible, hammering the primary source of noise. Traffic on surrounding roadways contributes to the noise levels, but to a lesser extent.
Western façade of 1 Denison St	Commercial	3.30pm	70	70	70	78	61	Construction noise from Sydney Metro site clearly audible, hammering the primary source of noise. Traffic on surrounding roadways contributes to the noise levels, but to a lesser extent.

### **6.1.3 Attended Noise Monitoring – OOH Works**

Substantial out-of-hours construction activities started on 31 May 2021 inside the cavern and in the VCS shaft, and continued throughout June 2021. The out-of-hours works consisted of:

- fitout and services works in the cavern;
- structure, waterproofing and services works within the VCS shaft; and
- hoarding and deliveries on Berry and Miller streets adjacent to the VCS shaft.

Attended noise monitoring was conducted at both VCN and VCS sites on four occasions at night time, during the OOHW Period 2 in order to measure construction noise levels during the period when the criteria are the most stringent.

The first attendance was conducted on 31<sup>st</sup> May 2021 between 9pm and 12am. The objective of the first set of measurements conducted that night was to measure noise levels generated by construction activities proposed to be conducted Out-of-Hours by Lendlease inside the cavern and in the VCS yard (outside the cavern). These levels were used to calibrate RWDI environmental noise model, in order to predict future noise levels during Out-of-Hours periods.

The following measurements conducted on 9 June 2021, 17 June 2021 and 23 June 2021 were conducted at the most representative receivers surrounding both sites. Results of the attended monitoring at surrounding sensitive receivers are detailed in Table 5, Table 6 and Table 7.



**Table 5 Attended Monitoring – Wednesday 9 June 2021**

Location (see Figure 3Error! Reference source not found. & Figure 4)	Type	Time	Noise Management Levels, dBA, L <sub>Aeq</sub> 15min			Measured Levels, dBA		Comments
			OOHW Period 1 (Day)	OOHW Period 1 (Evening)	OOHW Period 2 (Night)	L <sub>Aeq</sub> dBA	L <sub>90</sub> dBA	
<b>1</b> 243 Miller Street, North Sydney	Residential	10.00pm	70	62	56	54	49	Construction noise from Sydney Metro site inaudible. Distant construction audible on Warringah Freeway. Traffic noise and wind in foliage constitute the dominant noise source.
<b>2</b> 239 Miller Street, North Sydney	Residential	10.05pm	70	62	56	56	50	Construction noise from Sydney Metro site inaudible. Distant construction audible on Warringah Freeway. Traffic noise and wind in foliage constitute the dominant noise source.
<b>3</b> Rag & Famish Hotel 199 Miller St, North Sydney	Commercial	10.15pm	70	70	70	71	64	Traffic noise from the Miller St and Berry St intersection is the dominant source. People in street and noise from the Rag and Famish Hotel also contribute to ambient noise. Construction noise from the Sydney Metro is inaudible most of the time, however noise from the rebaring works are audible at times.
<b>4</b> 79-81 Berry Street, North Sydney	Residential	10.23pm	70	68	57	62	58	Construction noise from the Sydney Metro site is audible. Car passbys in Denison contribute to the measured levels. The Elevated Working Platform (EWP) located outside the cavern can be heard operating at 58dBA. Rebaring works generate maximum noise levels up to 66 dBA L <sub>max</sub> .
<b>5</b> 1 Denison Street, North Sydney	Commercial	10.30pm	70	70	70	62	59	Construction noise from the Sydney Metro is generally audible. Operation of the hoist was clearly audible, at 62 dBA in operation. Noise from rebaring works was also audible, with maximum noise levels between 60 and 65 dBA L <sub>max</sub> .
<b>6</b> 110 Miller St, North Sydney	Commercial	10.38pm	70	70	70	67	60	Mechanical noise from a nearby building on Miller Street was the main noise source, generating a background noise environment of 60dBA L <sub>90</sub> . Cars passbys on Miller Street at 70-80 dBA L <sub>eq</sub> , garbage truck at 70 dBA nearby. EWP operating on site audible at 58dBA L <sub>eq</sub> . Crane in operation but inaudible in a 60 dBA background noise environment. Rebaring works (hammering on metal) at audible at 62 dBA L <sub>eq</sub> .





**Table 6 Attended Monitoring – Thursday 17 June 2021**

Location	Type	Time	Noise Management Levels, dBA, L <sub>Aeq</sub> 15min			Measured Levels, dBA		Comments
			OOHW Period 1 (Day)	OOHW Period 1 (Evening)	OOHW Period 2 (Night)	L <sub>Aeq</sub> dBA	L <sub>90</sub> dBA	
<b>1</b> 243 Miller Street, North Sydney	Residential	10.10pm	70	62	56	54	47	Construction noise from Sydney Metro site inaudible. Traffic noise and wind in foliage constitute the dominant noise source. Mechanical plant noise barely audible at 47 dBA, potentially from the north shaft.
<b>2</b> 239 Miller Street, North Sydney	Residential	10.16pm	70	62	56	56	50	Construction noise from Sydney Metro site inaudible. Traffic noise and wind in foliage constitute the dominant noise source. Mechanical noise barely audible, possibly from north shaft, not measurable in 50 dBA L <sub>90</sub> background noise environment.
<b>3</b> Rag & Famish Hotel 199 Miller St, North Sydney	Commercial	10.26pm	70	70	70	76	70	Dominant noise source is from the crane in the middle of the street lifting equipment to and from the site (south shaft). Traffic noise from the Miller St and Berry St intersection is also contributes to the ambient noise. Construction noise from the shaft is inaudible, while the crane is operating.
<b>4</b> 79-81 Berry Street, North Sydney	Residential	10.37pm	70	68	57	59	54	Construction noise from the Sydney Metro site is audible. Car passbys in Denison contribute to the measured levels. The Elevated Working Platform (EWP) located outside the cavern can be heard operating at 55-57dBA. Rebaring works generate maximum noise levels up to 60 dBA L <sub>max</sub> . Metal equipment being dropped / dragged on the floor generates maximum noise levels up to 64 dBA L <sub>max</sub> . Crane in Berry Street is audible at 59 dBA. Hoist is audible at 58 dBA.
<b>5</b> 1 Denison Street, North Sydney	Commercial	10.50pm	70	70	70	60	55	Construction noise from the Sydney Metro is generally audible. Operation of the EWP was clearly audible, at 60-62 dBA in operation. Traffic noise also contributed to ambient noise.
<b>6</b> 110 Miller St, North Sydney	Commercial	11.01pm	70	70	70	65	56	Cars passbys on Miller Street at 70-80 dBA L <sub>eq</sub> . Crane in operation, lifting an excavator and generating noise levels up to 60 dBA, with an L <sub>max</sub> of 65dBA. Noise environment dominated by road traffic.



**Table 7 Noise Measurements – Tuesday 23 June 2021**

Location	Type	Time	Noise Management Levels, dBA, L <sub>Aeq</sub> 15min			Measured Levels, dBA		Comments
			OOHW Period 1 (Day)	OOHW Period 1 (Evening)	OOHW Period 2 (Night)	L <sub>Aeq</sub> dBA	L <sub>90</sub> dBA	
<b>1</b> 243 Miller Street, North Sydney	Residential	10.10pm	70	62	56	56	47	Construction noise from Sydney Metro site inaudible. Traffic noise constitutes the dominant noise source. Distant mechanical plant noise audible in 47 dBA background noise environment.
<b>2</b> 239 Miller Street, North Sydney	Residential	10.15pm	70	62	56	51	48	Construction noise from Sydney Metro site inaudible. Traffic noise constitutes the dominant noise source. Mechanical noise barely audible, possibly from north shaft, not measurable in 48 dBA L <sub>90</sub> background noise environment.
<b>3</b> Rag & Famish Hotel 199 Miller St, North Sydney	Commercial	10.20pm	70	70	70	66	59	Construction noise from Victoria Cross site is inaudible. Jackhammer in use for road works on Pacific Highway the dominant noise source. Traffic noise and noise from hotel also contribute to ambient noise.
<b>4</b> 79-81 Berry Street, North Sydney	Residential	10.25pm	70	68	57	57	55	Construction noise from the Sydney Metro site is slightly audible, at times. The Elevated Working Platform (EWP) located outside the cavern can be heard operating at 55dBA. Rebaring works generate maximum noise levels up to 65 dBA L <sub>max</sub> . Jackhammer on Pacific Highway audible at 50-55 dBA L <sub>Aeq</sub> . Traffic noise on Berry Street also contributes to ambient noise levels.
<b>5</b> 1 Denison Street, North Sydney	Commercial	10.36pm	70	70	70	56	53	Construction noise from the Sydney Metro is audible. Operation of the Hoist was the loudest activity, at 57-59 dBA L <sub>Aeq</sub> when in operation. Traffic noise also contributed to ambient noise. Jackhammer on Pacific Highway audible at 54 dBA L <sub>Aeq</sub> .
<b>6</b> 110 Miller St, North Sydney	Commercial	10.48pm	70	70	70	65	57	Cars passbys on Miller Street at 70-80 dBA L <sub>Aeq</sub> . Hoist operating and generating noise levels from 55 to 64 dBA L <sub>Aeq</sub> , with an L <sub>Amax</sub> of 68 dBA when door opens. No other construction plant audible during the measurement period. Noise environment dominated by road traffic, and garbage truck.

Noise measurements performed at the most sensitive receivers surrounding both sites in February and June 2021 demonstrated that construction noise levels were generally in line with predicted noise levels detailed in the Wilkinson Murray (WM) Construction Noise & Vibration Management Plan (CNVMP) dated 22 July 2020 (ref 16095-VC).

Sleep disturbance impacts were also monitored during the night time OOH works at residential receivers. The sleep disturbance criteria detailed in the Wilkinson Murray (WM) Construction Noise & Vibration Management Plan (CNVMP) dated 22 July 2020 (ref 16095-VC) have not been exceeded during these measurements.

## 6.2 Vibration monitoring

### 6.2.1 Real-time Vibration Monitoring

Vibration monitoring was conducted using two Texcel ETMs set to record maximum peak particle velocity (PPV) in each of the three orthogonal axes (x, y and z), every minute of the monitoring period.

At 65 Berry Street, no exceedances of the 25mm/s screening criteria were recorded during the monitoring period at the VCS site.

At 243 Miller Street, one exceedance of the 7.5mm/s screening criterion occurred on 27/05/2021. An alarm was sent to Lendlease indicating there had been a PPV level of 18.9mm/s. RWDI can confirm a technician was on site at the time of the exceedance in order to service the monitor and accidentally bumped the geophone.

It is noted that PPV levels at 243 Miller Street are regularly exceeding 1mm/s. After investigation, it is believed that the construction activities are not responsible for these vibration levels. Chickens owned by the property owner are believed to be responsible for these levels, when in close proximity to the geophone and cable.

Appendix D details examples of real-time noise and vibration monitoring daily charts at 65 Berry St, North Sydney (VCS) and 243 Miller Street (VCN).

The graph in Appendix F shows the maximum daily vibration levels at both monitoring locations for the monitoring period.

**No exceedance of the vibration level requirements for each location has been recorded during the monitoring period at both unattended locations.**

### 6.2.2 Attended Vibration Monitoring

Attended vibration monitoring was conducted using a Texcel ETM Ground Vibration Monitor during daytime at the VCS site on 11 February 2021 in order to measure construction vibration levels from rock hammering adjacent to the MLC building located at 105 Miller Street.

Vibration monitoring was conducted at the northern boundary of the MLC Building basement level.

The highest measured level was under 0.6mm/s, which is in compliance with the vibration requirements detailed in the CNVMP for this location (25mm/s).

**No exceedance of the vibration level requirements has been recorded during the site visit at 105 Miller Street, North Sydney.**

## 7 CONCLUSION

Noise and vibration levels measured between 1 January 2021 and 30 June 2021 were found to be generally in accordance with predicted noise levels detailed in the Wilkinson Murray (WM) Construction Noise & Vibration Management Plan (CNVMP) dated 22 July 2020 (ref 16095-VC).

Based on the monitoring results and site observations, RWDI can confirm that noise and vibration impacts associated with construction works at Victoria Cross ISD were compliant with project approvals and requirements between 1 January and 30 June 2021.

All data obtained using attended and unattended monitors will be stored and made available to Sydney Metro, for forwarding to Department of Planning, Industry and Environment (DPIE) at the end of the monitoring.

## APPENDIX A – NOISE & VIBRATION EQUIPMENT CALIBRATION

Equipment Details	Monitoring Type	Location(s)	Serial No.	NATA Calibration Date	SoundScience Ref.
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### Unattended noise and vibration monitors

<b>Rion NL-52 Type 1 Sound Level Meter</b>	Real-time noise	65 Berry Street, North Sydney Ground floor balcony	00575757	24/09/2019	241
<b>Texcel ETM Ground Vibration Monitor</b>	Real-time vibration	65 Berry Street, North Sydney Ground floor balcony	ETM7084	9/04/2020	241
<b>Rion NL-52 Type 1 Sound Level Meter</b>	Real-time noise	65 Berry Street, North Sydney Ground floor balcony	01276564	21/02/2020	232
<b>Texcel ETM Ground Vibration Monitor</b>	Real-time vibration	65 Berry Street, North Sydney Ground floor balcony	ETM7177	9/04/2020	232
<b>SVANTEK SVAN 977A Type 1 Sound Level Meter</b>	Real-time noise	243 Miller Street, North Sydney Ground floor balcony	59635	7/08/2020	213
<b>Texcel ETM Ground Vibration Monitor</b>	Real-time vibration	243 Miller Street, North Sydney Ground floor balcony	ETM7349	29/01/2020	213

### Attended noise and vibration monitors

<b>NTI Audio XL2 Audio and Acoustic Analyzer</b>	Sound Level Meter	Various locations around VCS and VCN. See Figure 2 3 and Figure 2 4	A2A-08006-E0	9/01/2020	N/A
<b>Texcel ETM Ground Vibration Monitor</b>	Vibration monitor	105 Miller St basement	ETM7388	6/05/2020	N/A

### Sound level calibrators for attended and unattended noise monitors / meters

<b>Brüel &amp; Kjær Type 4230 sound level calibrator</b>	Field calibrator	N/A	584164	25/05/2020	N/A
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**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

Equipment Details	Monitoring Type	Location(s)	Serial No.	NATA Calibration Date	SoundScience Ref.
Brüel & Kjær Type 4231 sound level calibrator	Field calibrator	N/A	3017799	25/03/2021	N/A



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**Sound Level Meter**  
**IEC 61672-3:2013**  
**Calibration Certificate**  
Calibration Number C19586

<b>Client Details</b>	Wilkinson Murray Pty Ltd Level 4, 272 Pacific Highway Crows Nest NSW 2065
<b>Equipment Tested/ Model Number :</b>	Rion NL-52EX
<b>Instrument Serial Number :</b>	00575757
<b>Microphone Serial Number :</b>	11353
<b>Pre-amplifier Serial Number :</b>	75996
<b>Pre-Test Atmospheric Conditions</b>	<b>Post-Test Atmospheric Conditions</b>
<b>Ambient Temperature :</b> 23.7°C	<b>Ambient Temperature :</b> 24.1°C
<b>Relative Humidity :</b> 32.5%	<b>Relative Humidity :</b> 31.4%
<b>Barometric Pressure :</b> 101.36kPa	<b>Barometric Pressure :</b> 101.21kPa
<b>Calibration Technician :</b> Jeff Yu	<b>Secondary Check:</b> James Jepsen
<b>Calibration Date :</b> 24 Sep 2019	<b>Report Issue Date :</b> 25 Sep 2019
<b>Approved Signatory :</b>	Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	±0.18dB	Temperature	±0.2°C
12.5kHz	±0.19dB	Relative Humidity	±2.4%
16kHz	±0.29dB	Barometric Pressure	±0.015kPa
Electrical Tests			
31.5 Hz to 20 kHz	±0.11dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.  
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.





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Northgate, Queensland 4013  
+61 7 3237 8111  
ABN: 17 010 698 316

## ETM CALIBRATION CERTIFICATE

#708420200409

DATE: 9/04/2020  
SERIAL NUMBER: 7084

### SERVICE NOTES:

As part of this Calibration service, the monitor, sensors and accessories were tested, and found to be functioning correctly.

### CERTIFIED QUANTITIES:

Monitor electronics passed all calibration tests to within  $\pm 2.0\%$ .

Sensor	Sensitivity	Frequency	Tolerance
Geophone	29 mV/mm/s	63 Hz	$\pm 1.2$ mV/mm/s

### GENERAL:

- (1) Instrument calibration measurements were performed with a Calibrated Multimeter.
- (2) Sensor calibration measurements were performed with a National Instruments 333 kS/s Multifunction I/O card Model PCI6052E.
- (3) Geophone sensitivity was determined by comparing the output from the geophones under test with that of a reference accelerometer.
- (4) Microphone sensitivity was determined by comparing the output from the microphone under test with that of a reference microphone.

### CALIBRATION INSTRUMENTS USED:

	Type	Serial	Calibrated
(1) Multimeter	FLUKE 45	4764100	July 2019
(2) NI Multifunction I/O	PCI6052E	10A17EE	December 2019
(3) Vibration Reference Horizontal	PCB 333B50	44878	July 2019
(4) Vibration Reference Vertical	PCB 333B50	44877	July 2019

All instrument calibrations NATA Certified or traceable to the Australian Government National Measurement Institute.

Tests Performed by:   
(Calibration Station)


Date: 09/04/2020



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**Sound Level Meter**  
IEC 61672-3:2013  
**Calibration Certificate**  
Calibration Number C20121

<b>Client Details</b> Wilkinson Murray (Sydney) Pty Ltd Level 4, 272 Pacific Highway Crows Nest NSW 2065	
<b>Equipment Tested/ Model Number :</b> Rion NL-52EX <b>Instrument Serial Number :</b> 01276564 <b>Microphone Serial Number :</b> 12625 <b>Pre-amplifier Serial Number :</b> 76783	
<b>Pre-Test Atmospheric Conditions</b> Ambient Temperature : 22.8°C Relative Humidity : 53% Barometric Pressure : 100.5kPa	<b>Post-Test Atmospheric Conditions</b> Ambient Temperature : 22.8°C Relative Humidity : 53.2% Barometric Pressure : 100.5kPa
<b>Calibration Technician :</b> Lucky Jaiswal <b>Calibration Date :</b> 21 Feb 2020	<b>Secondary Check:</b> Alannah Squires <b>Report Issue Date :</b> 24 Feb 2020
<b>Approved Signatory :</b> 	Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
125Hz	±0.13dB	Temperature	±0.2°C
1kHz	±0.13dB	Relative Humidity	±2.4%
8kHz	±0.14dB	Barometric Pressure	±0.015kPa
Electrical Tests	±0.10dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172  
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Environmental monitoring made easy

ETM CALIBRATION CERTIFICATE

#717720210729

DATE: 29/07/2021  
SERIAL NUMBER: 7177

SERVICE NOTES:

As part of this Calibration service, the monitor, sensors and accessories were tested, and found to be functioning correctly.

CERTIFIED QUANTITIES:

Monitor electronics passed all calibration tests to within  $\pm 2.0\%$ .

Sensor	Sensitivity	Frequency	Tolerance
Geophone	27 mV/mm/s	63 Hz	$\pm 1.2$ mV/mm/s

GENERAL:

- (1) Instrument calibration measurements were performed with a Calibrated Multimeter.
- (2) Sensor calibration measurements were performed with a National Instruments 333 kS/s Multifunction I/O card Model PCI6052E.
- (3) Geophone sensitivity was determined by comparing the output from the geophones under test with that of a reference accelerometer.
- (4) Microphone sensitivity was determined by comparing the output from the microphone under test with that of a reference microphone.

CALIBRATION INSTRUMENTS USED:

	Type	Serial	Calibrated
(1) Multimeter	Tonghui TH1941	71104376	July 2020
(2) NI Multifunction I/O	PCI6052E	10A17EE	December 2019
(3) Vibration Reference Horizontal	PCB 333B50	30588	June 2020
(4) Vibration Reference Vertical	PCB 333B50	40756	June 2020

All instrument calibrations NATA Certified or traceable to the Australian Government National Measurement Institute.

Tests Performed by:   
(Calibration Station)

Date: 29/07/2021

ABN 17 010 698 316

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## Octave Band Filter IEC 61260-3:2016 Calibration Certificate

Calibration Number C20449A

<b>Client Details</b>		Wilkinson Murray Pty Ltd Level 4, 272 Pacific Highway Crows Nest NSW 2065
<b>Filter Model Number :</b>	SVANTEK SVAN 977A	
<b>Filter Serial Number :</b>	N/A	
<b>Instrument Serial Number :</b>	59635	
<b>Microphone Serial Number :</b>	64852	
<b>Pre-amplifier Serial Number :</b>	67616	
<b>Atmospheric Conditions</b>		
<b>Ambient Temperature :</b>	23.5°C	
<b>Relative Humidity :</b>	38.9%	
<b>Barometric Pressure :</b>	100.86kPa	
<b>Calibration Technician :</b>	Jeff Yu	<b>Secondary Check:</b> Max Moore
<b>Calibration Date :</b>	07 Aug 2020	<b>Report Issue Date :</b> 12 Aug 2020
<b>Approved Signatory :</b>		Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
Midband Relative Attenuation (Clause 10)	Pass	Operating Range Lower Limit (Clause 12)	Pass
Linearity, Range and Overload (Clause 11)	Pass	Relative Attenuation (Clause 13)	Pass

The filter submitted for testing successfully completed the periodic tests of IEC 61260-3, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the filter to the full specifications of IEC 61260-1:2014 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of filter fully conformed to the class 1 specifications in IEC 61260-1:2014 and (b) because the periodic tests of IEC 61260-3 cover only a limited subset of the specifications in IEC 61260-1:2014.

Electrical Tests	Least Uncertainties of Measurement -
5dB < ΔA(f) < -5dB ±0.1dB	Environmental Conditions
40dB < ΔA(f) < 5dB ±0.2dB	Temperature ±0.2°C
ΔA(f) < 40dB ±0.3dB	Relative Humidity ±2.4%
	Barometric Pressure ±0.015kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.  
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

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## ETM CALIBRATION CERTIFICATE

#734920200129

DATE: 29/01/2020  
SERIAL NUMBER: 7349

### SERVICE NOTES:

As part of this Calibration service, the monitor, sensors and accessories were tested, and found to be functioning correctly.

### CERTIFIED QUANTITIES:

Monitor electronics passed all calibration tests to within  $\pm 2.0\%$ .

Sensor	Sensitivity	Frequency	Tolerance
Geophone	28 mV/mm/s	63 Hz	$\pm 1.2$ mV/mm/s


### GENERAL:

- (1) Instrument calibration measurements were performed with a Calibrated Multimeter.
- (2) Sensor calibration measurements were performed with a National Instruments 333 kS/s Multifunction I/O card Model PCI6052E.
- (3) Geophone sensitivity was determined by comparing the output from the geophones under test with that of a reference accelerometer.
- (4) Microphone sensitivity was determined by comparing the output from the microphone under test with that of a reference microphone.

### CALIBRATION INSTRUMENTS USED:

	Type	Serial	Calibrated
(1) Multimeter	FLUKE 45	4764100	July 2019
(2) NI Multifunction I/O	PCI6052E	10A17EE	December 2019
(3) Vibration Reference Horizontal	PCB 333B50	44878	July 2019
(4) Vibration Reference Vertical	PCB 333B50	44877	July 2019

All instrument calibrations NATA Certified or traceable to the Australian Government National Measurement Institute.

Tests Performed by:   
(Calibration Station)

Date: 29/01/2020





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www.acousticresearch.com.au

**Sound Level Meter**  
IEC 61672-3:2013  
**Calibration Certificate**  
Calibration Number C20005\_Reissued\_1

**Client Details** Wilkinson Murray Pty Ltd  
Level 4, 272 Pacific Highway  
Crows Nest NSW 2065

**Equipment Tested/ Model Number :** Nii XL2  
**Instrument Serial Number :** A2A-08006-E0  
**Microphone Serial Number :** 7796  
**Pre-amplifier Serial Number :** 3287

**Pre-Test Atmospheric Conditions**  
**Ambient Temperature :** 24°C  
**Relative Humidity :** 50.4%  
**Barometric Pressure :** 100.72kPa

**Post-Test Atmospheric Conditions**  
**Ambient Temperature :** 23.8°C  
**Relative Humidity :** 45.3%  
**Barometric Pressure :** 100.68kPa

**Calibration Technician :** Lucky Jaiswal  
**Calibration Date :** 9 Jan 2020

**Secondary Check:** Max Moore  
**Report Issue Date :** 28 Jan 2020

**Approved Signatory :**

Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement - Environmental Conditions			
Acoustic Tests		Temperature	±0.2°C
31.5 Hz to 8kHz	±0.18dB	Relative Humidity	±2.4%
12.5kHz	±0.19dB	Barometric Pressure	±0.015kPa
16kHz	±0.31dB		
Electrical Tests			
31.5 Hz to 20 kHz	±0.11dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This report was reviewed because the calibration date indicated was 2019 not 2020.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172, Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.



1/180 Northgate Rd  
Northgate, Queensland 4013  
+61 7 3237 8111  
ABN: 17 010 698 316

## ETM CALIBRATION CERTIFICATE

#738820200506

DATE: 6/05/2020  
SERIAL NUMBER: 7388

### SERVICE NOTES:

As part of this Calibration service, the monitor, sensors and accessories were tested, and found to be functioning correctly.

### CERTIFIED QUANTITIES:

Monitor electronics passed all calibration tests to within  $\pm 2.0\%$ .

Sensor	Sensitivity	Frequency	Tolerance
Geophone	28 mV/mm/s	63 Hz	$\pm 1.2$ mV/mm/s

### GENERAL:

- (1) Instrument calibration measurements were performed with a Calibrated Multimeter.
- (2) Sensor calibration measurements were performed with a National Instruments 333 kS/s Multifunction I/O card Model PCI6052E.
- (3) Geophone sensitivity was determined by comparing the output from the geophones under test with that of a reference accelerometer.
- (4) Microphone sensitivity was determined by comparing the output from the microphone under test with that of a reference microphone.

### CALIBRATION INSTRUMENTS USED:

	Type	Serial	Calibrated
(1) Multimeter	FLUKE 45	4764100	July 2019
(2) NI Multifunction I/O	PCI6052E	10A17EE	December 2019
(3) Vibration Reference Horizontal	PCB 333B50	44878	July 2019
(4) Vibration Reference Vertical	PCB 333B50	44877	July 2019

All instrument calibrations NATA Certified or traceable to the Australian Government National Measurement Institute.

Tests Performed by:

(Calibration Station)

Date:

06/05/2020



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### Sound Calibrator

IEC 60942-2017

## Calibration Certificate

Calibration Number C20304

**Client Details** Wilkinson Murray Pty Ltd  
Level 4, 272 Pacific Highway  
Crows Nest NSW 2065

**Equipment Tested/ Model Number :** B&K 4230  
**Instrument Serial Number :** 584164

#### Atmospheric Conditions

**Ambient Temperature :** 24.4°C  
**Relative Humidity :** 44.2%  
**Barometric Pressure :** 100.66kPa

**Calibration Technician :** Jeff Yu  
**Calibration Date :** 25 May 2020

**Secondary Check:** Max Moore  
**Report Issue Date :** 29 May 2020

**Approved Signatory :**

Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	Pass
Frequency Generated	Pass
Total Distortion	Pass

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	93.88	1000.60

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942 2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed

Least Uncertainties of Measurement -			
Specific Tests		Environmental Conditions	
Generated SPL	±0.14dB	Temperature	±0.2°C
Frequency	±0.09%	Relative Humidity	±2.4%
Distortion	±0.09%	Barometric Pressure	±0.015kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

\* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.  
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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**Sound Calibrator**

IEC 60942-2017

## Calibration Certificate

Calibration Number C21176

**Client Details** RWDI  
Level 4, 272 Pacific Highway  
Crows Nest NSW 2065

**Equipment Tested/ Model Number :** Bruel & Kjaer Type 4231  
**Instrument Serial Number :** 3017799

### Atmospheric Conditions

**Ambient Temperature :** 22.6°C  
**Relative Humidity :** 55.2%  
**Barometric Pressure :** 99.2kPa

**Calibration Technician :** Lucky Jaiswal  
**Calibration Date :** 25 Mar 2021

**Secondary Check:** Max Moore  
**Report Issue Date :** 30 Mar 2021

**Approved Signatory :**

Ken Williams

### Characteristic Tested

Characteristic Tested	Result
Generated Sound Pressure Level	Pass
Frequency Generated	Pass
Total Distortion	Pass

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.07	999.90
114	1000	114.08	999.90

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

### Specific Tests

**Generated SPL**  $\pm 0.14\text{dB}$   
**Frequency**  $\pm 0.09\%$   
**Distortion**  $\pm 0.09\%$

### Least Uncertainties of Measurement -

**Environmental Conditions**  
**Temperature**  $\pm 0.2^\circ\text{C}$   
**Relative Humidity**  $\pm 2.4\%$   
**Barometric Pressure**  $\pm 0.015\text{kPa}$

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

\* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation.



This calibration certificate is to be read in conjunction with the calibration test report.

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## APPENDIX B – PHOTOS OF NOISE & VIBRATION EQUIPMENT



**Figure 8** Real-time Noise and Vibration Monitors at 65 Berry St Ground floor balcony





**Figure 9 Real-time Noise and Vibration Monitors at 243 Miller Berry St southern boundary (before relocation on 27 May 2021)**





**Figure 10 Real-time Noise and Vibration Monitors at 243 Miller Berry St eastern boundary  
(after relocation on 27 May 2021)**

## APPENDIX C - TABLE OF SENSITIVE RECEIVERS

ID	Address	Description	Land Use
N01	34A McLaren St	-	Commercial
N02a	200 Miller St	North Sydney Council Chambers	Commercial
N02b	200 Miller St	North Sydney Council Chambers	Commercial
N03	27 McLaren St	Stormanston House	Residential
N04	29 McLaren St	Coolock House	Residential
N05	31 McLaren St	Bermondsey Lodge	Commercial
N06	196 Miller St	Pizza Pasta Benne	Comm/Res
N08	194 Miller St	Office Building	Commercial
N09a	128 Miller St	Monte Sant' Angelo	School
N09b	128 Miller St	Monte Sant' Angelo	School
N10	225 Miller St	The Mullberry on Miller	Comm/Res
N11	231 Miller St	-	Comm/Res
N12	237 Miller St	-	Residential
N13	39 McLaren St	-	Residential
N14	41 McLaren St	-	Commercial
N15	45 McLaren St	-	Residential
N16	54 McLaren St	Rydges North Sydney (Hotel)	Commercial
N16	54 McLaren St	Rydges North Sydney (Hotel)	Commercial
N17	168 Walker St	-	Commercial
N18a	170 Walker St	Wenona School	School
N18b	176 Walker St	Wenona School	School
N19	267 Miller St	-	Residential
N20	269 Miller St	The Independent	Commercial
N21a	243 Miller St	-	Comm/Res

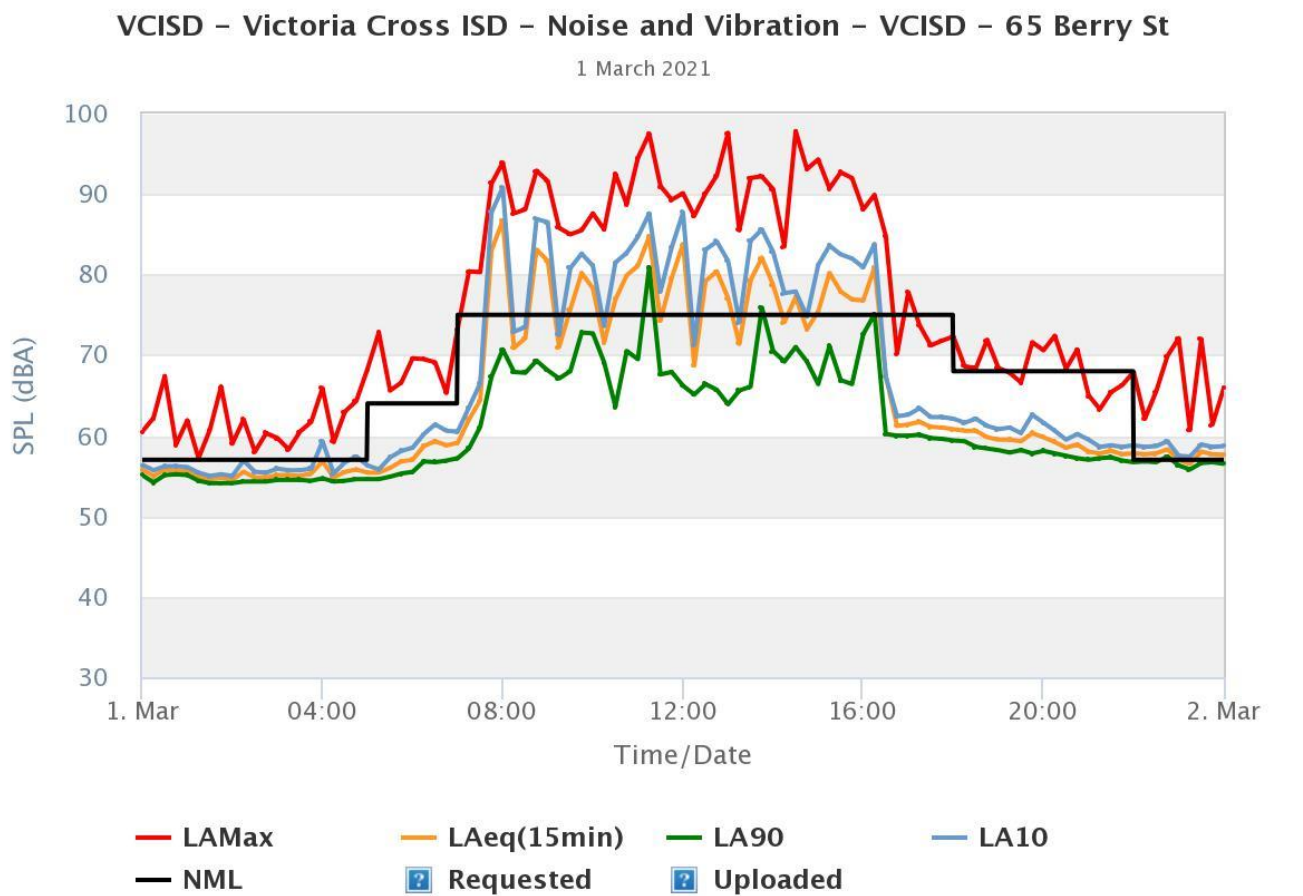
**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

ID	Address	Description	Land Use
<b>N21b</b>	243 Miller St	-	Residential
<b>S01</b>	128 Miller St	Monte Sant' Angelo Mercy College	School
<b>S02</b>	201 Miller St	Intel Security Building - Fixed Glass Windows	Commercial
<b>S03</b>	199 Miller St	Rag & Famish (Hotel)	Commercial
<b>S04</b>	50 Berry St	-	Commercial
<b>S05</b>	56 Berry St	-	Commercial
<b>S06</b>	66 Berry St	-	Commercial
<b>S07</b>	72 Berry St	Ausgrid	Industrial
<b>S08a</b>	65 Berry St	-	Commercial
<b>S08b</b>	65 Berry St	Childcare	Childcare
<b>S09</b>	1 Denison St	Includes Channel 9 Studios	Commercial
<b>S10a</b>	77 Berry St	-	Commercial
<b>S10b</b>	79-81 Berry St	-	Residential
<b>S11a</b>	105-153 Miller St	-	Commercial
<b>S11b</b>	105-153 Miller St	-	Commercial
<b>S12</b>	80 Mount St	-	Commercial
<b>S13</b>	2 Elizabeth Plaza	-	Commercial
<b>S14</b>	51 Mount St	-	Commercial
<b>S15</b>	100 Miller St	-	Comm/Res
<b>S16</b>	53 Berry St	-	Commercial
<b>S17</b>	177 Pacific Hwy	-	Commercial
<b>N08</b>	194 Miller St	Office Building	Commercial
<b>N09a</b>	128 Miller St	Monte Sant' Angelo	School
<b>N09b</b>	128 Miller St	Monte Sant' Angelo	School
<b>N10</b>	225 Miller St	The Mullberry on Miller	Comm/Res
<b>N11</b>	231 Miller St	-	Comm/Res
<b>N12</b>	237 Miller St	-	Residential
<b>N13</b>	39 McLaren St	-	Residential

## APPENDIX D – NOISE & VIBRATION DAILY GRAPHS EXAMPLES

### D.1 - 1<sup>st</sup> March 2021 - Real-time noise and vibration Monitoring



© [https://monitoring.soundscience.com.au/standard\\_dashboard](https://monitoring.soundscience.com.au/standard_dashboard) (V2.01)

Figure 11 Real-time noise monitoring daily graph at 65 Berry Street, on 1st March 2021



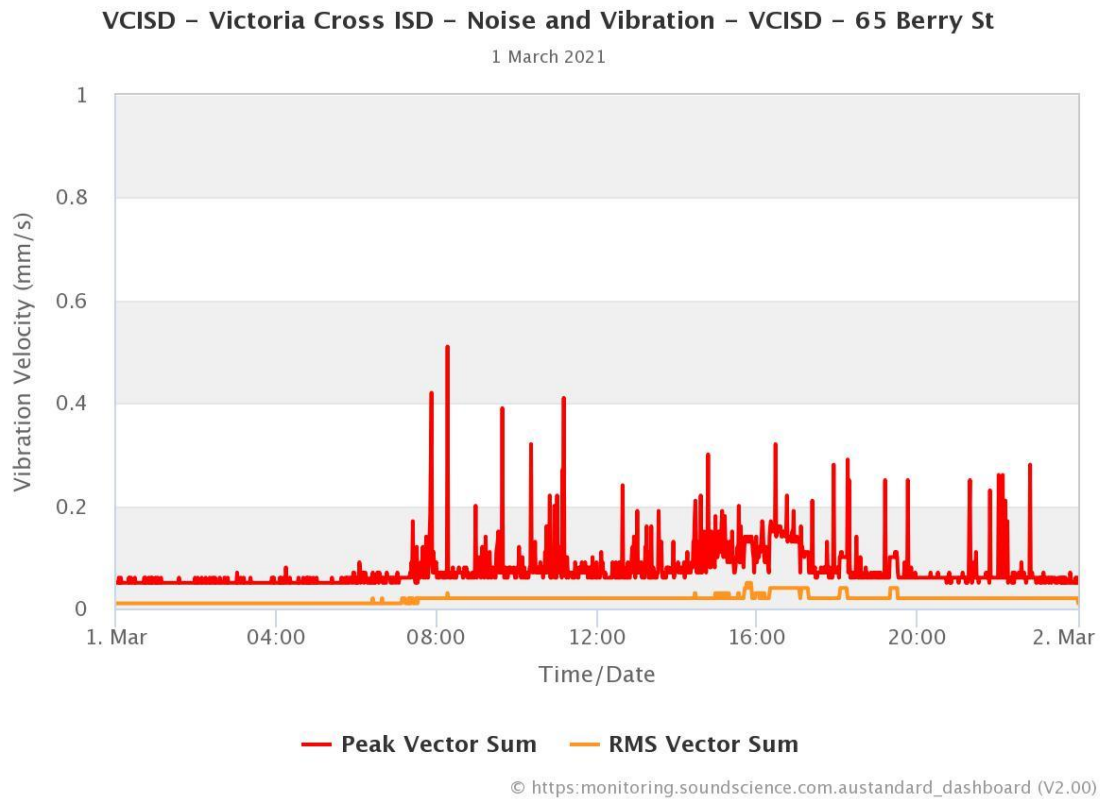


Figure 12 Real-time vibration monitoring daily graph at 65 Berry Street, on 1<sup>st</sup> March 2021

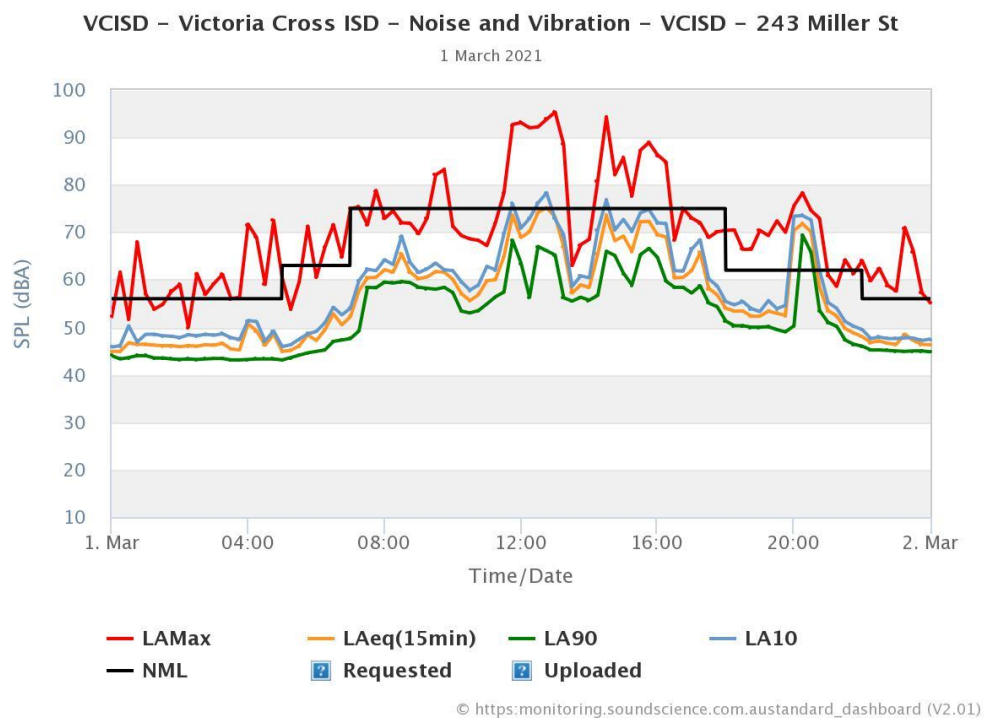


Figure 13 Real-time vibration monitoring daily graph at 243 Miller Street, on 1<sup>st</sup> March 2021



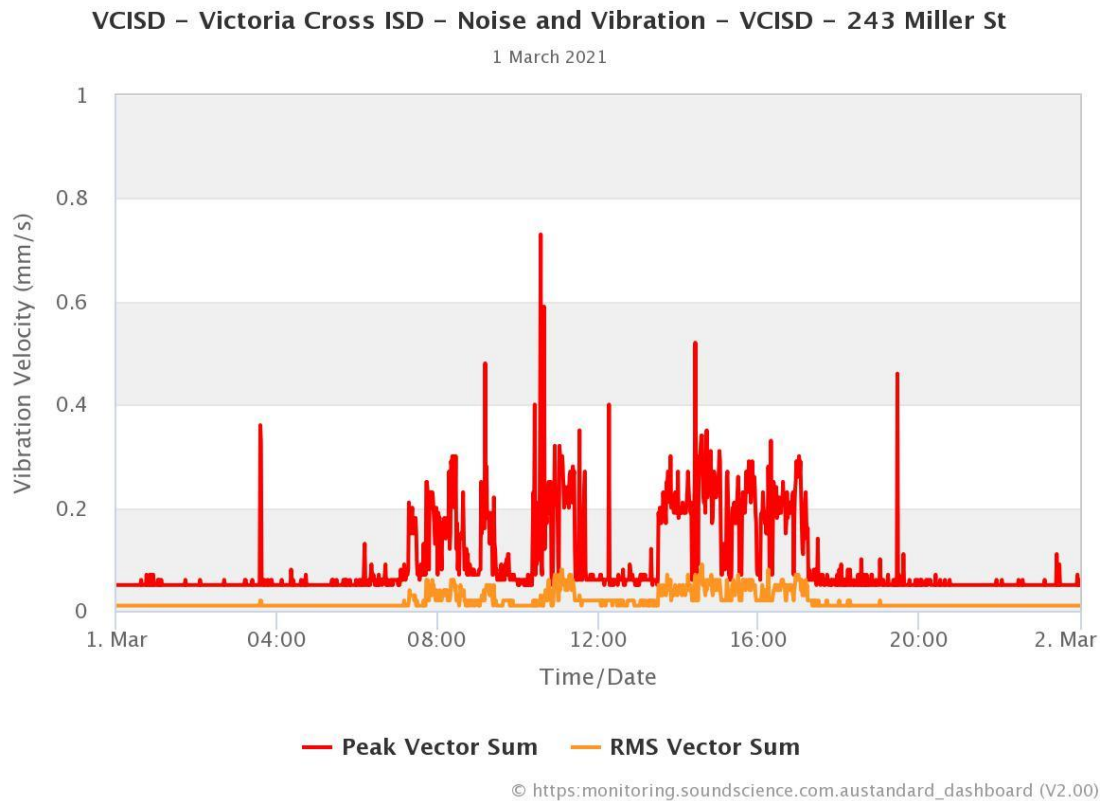


Figure 14 Real-time vibration monitoring daily graph at 243 Miller Street, on 1<sup>st</sup> March 2021

## Compliance Report

Noise Compliance Report				
Report for Condition E38 on 01/03/2021				
Location	Noise Goal	15 minute periods in exceedance		Has condition been met?
		Permitted	Exceeded	
VCISD - 243 Miller St	Upper	26	10	Yes
	Lower	39	20	Yes
VCISD - 65 Berry St	Upper	26	2	Yes
	Lower	39	14	Yes

Figure 15 Daily noise compliance chart for VCN and VCS, on 1<sup>st</sup> March 2021

## D.2 - 1<sup>st</sup> April 2021 - Real-time noise and vibration Monitoring

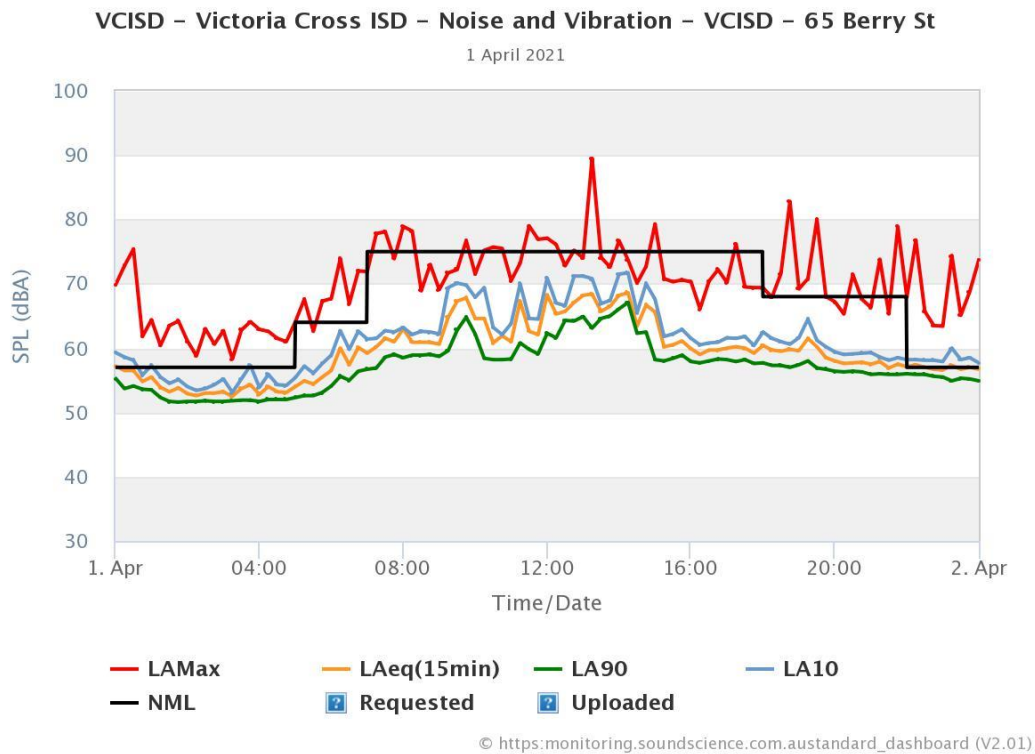


Figure 16 Real-time noise monitoring daily graph at 65 Berry Street, on 1<sup>st</sup> April 2021

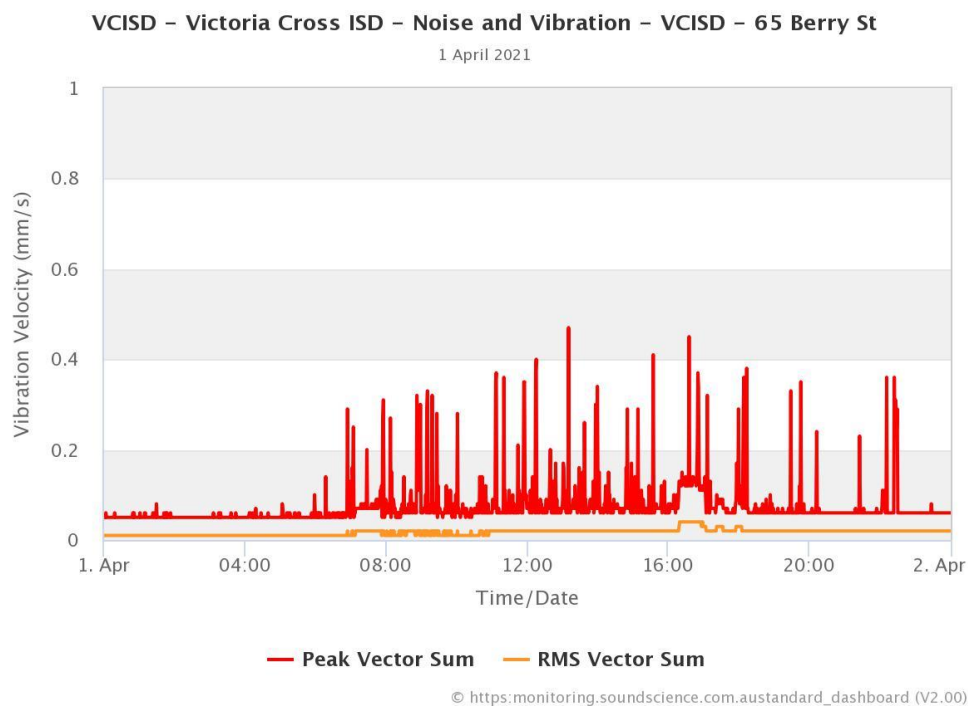
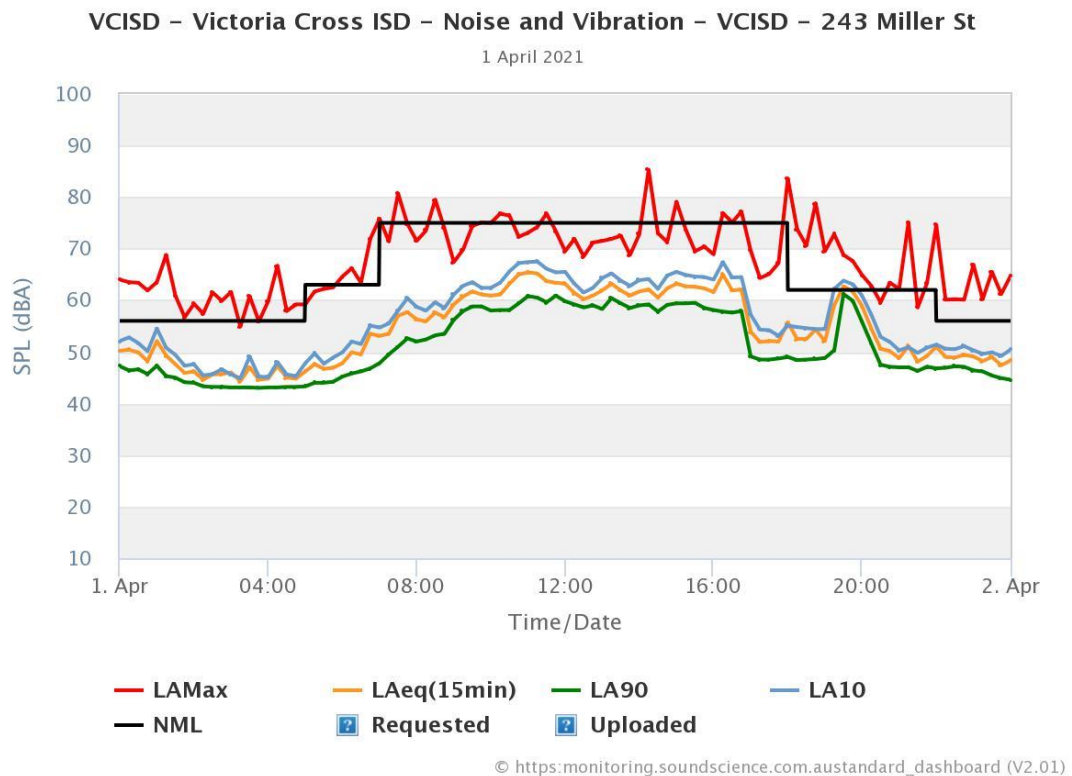
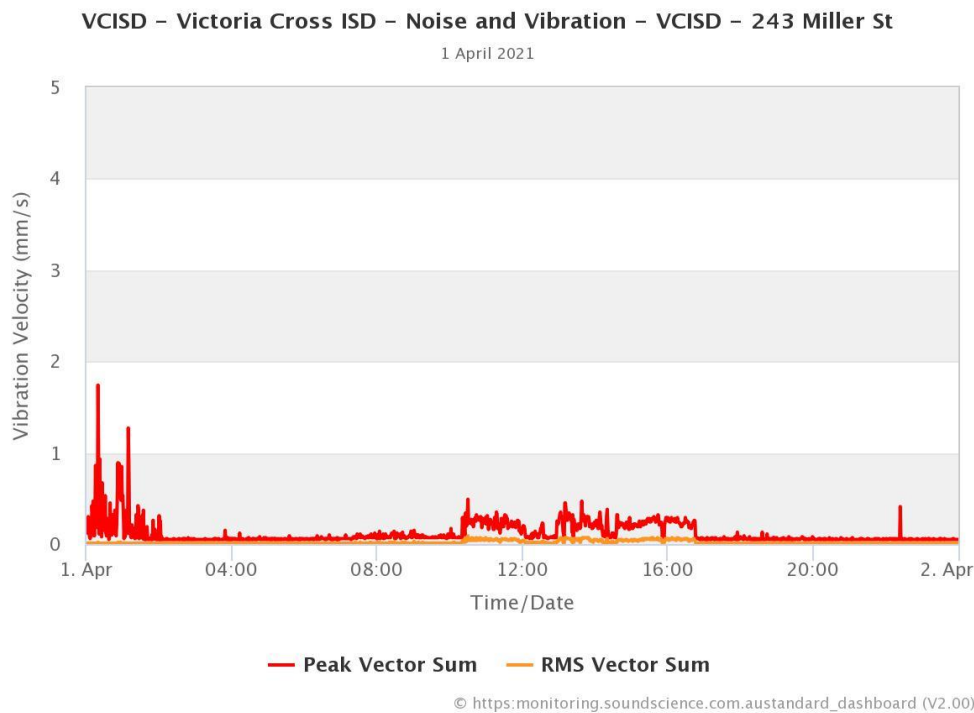


Figure 17 Real-time vibration monitoring daily graph at 65 Berry Street, on 1<sup>st</sup> April 2021



**Figure 18** Real-time vibration monitoring daily graph at 243 Miller Street, on 1<sup>st</sup> April 2021



**Figure 19** Real-time vibration monitoring daily graph at 243 Miller Street, on 1<sup>st</sup> April 2021

## Compliance Report

Noise Compliance Report				
Report for Condition E38 on 01/04/2021				
Location	Noise Goal	15 minute periods in exceedance		Has condition been met?
		Permitted	Exceeded	
VCISD - 243 Miller St	Upper	26	0	Yes
	Lower	39	4	Yes
VCISD - 65 Berry St	Upper	26	0	Yes
	Lower	39	0	Yes

Figure 20 Daily noise compliance chart for 243 Miller Street, on 1<sup>st</sup> April 2021

## D.3 1<sup>st</sup> June 2021 - Real-time noise and vibration Monitoring

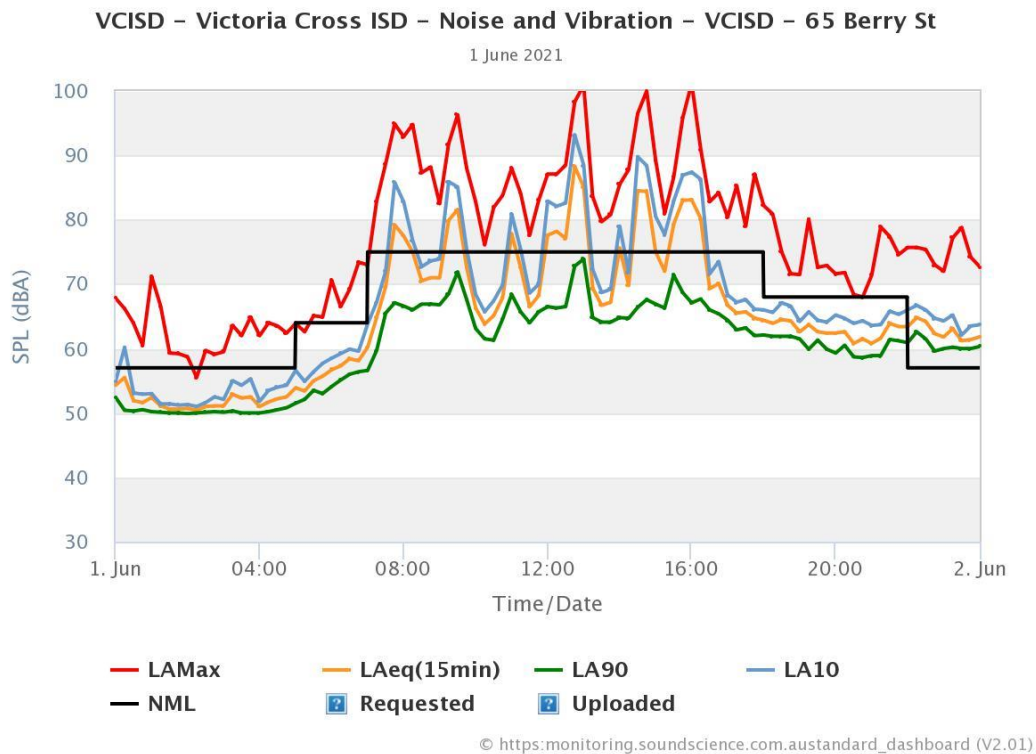


Figure 21 Real-time noise monitoring daily graph at 65 Berry Street, on 1<sup>st</sup> June 2021

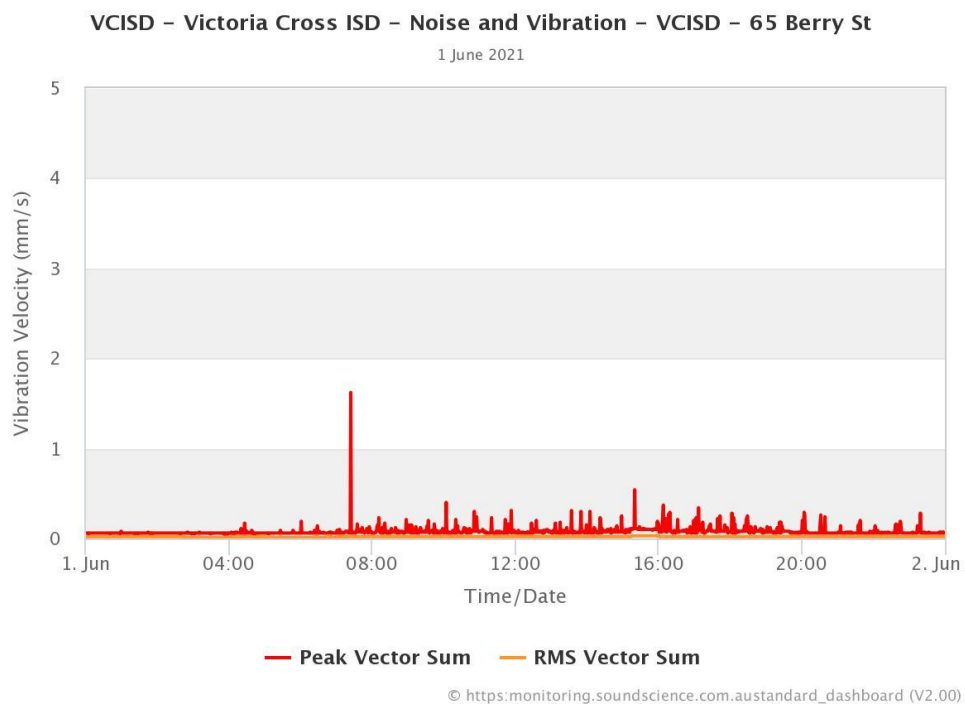
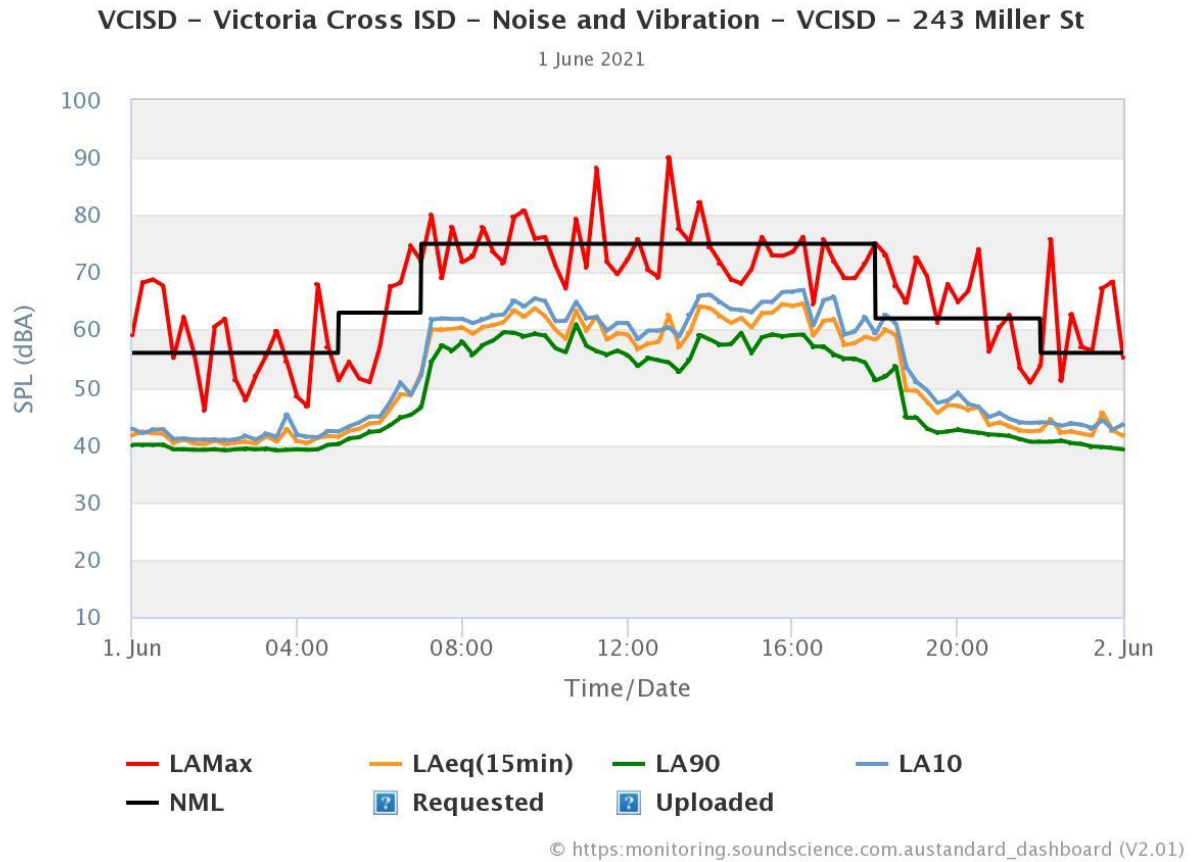
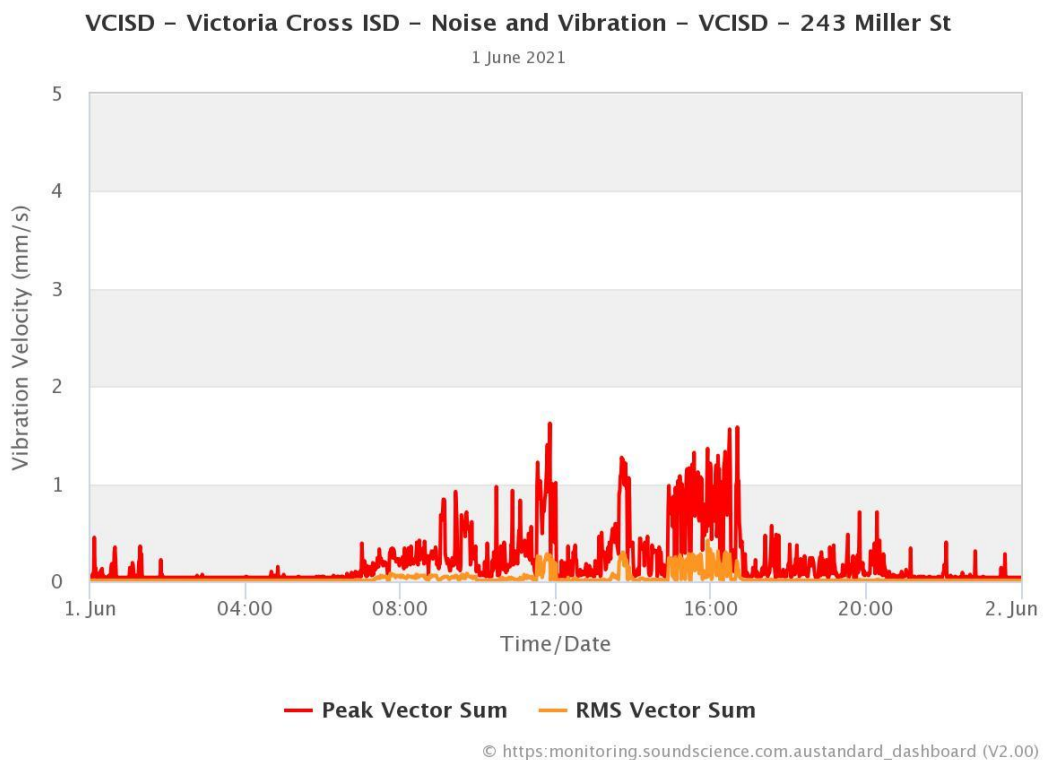


Figure 22 Real-time vibration monitoring daily graph at 65 Berry Street, on 1<sup>st</sup> June 2021



**Figure 23** Real-time vibration monitoring daily graph at 243 Miller Street, on 1<sup>st</sup> June 2021



**Figure 24** Real-time vibration monitoring daily graph at 243 Miller Street, on 1<sup>st</sup> April 2021



## Compliance Report

Noise Compliance Report				
Report for Condition E38 on 01/06/2021				
Location	Noise Goal	15 minute periods in exceedance		Has condition been met?
		Permitted	Exceeded	
VCISD - 243 Miller St	Upper	26	0	Yes
	Lower	39	2	Yes
VCISD - 65 Berry St	Upper	26	2	Yes
	Lower	39	9	Yes

Figure 25 Daily noise compliance chart for VCN and VCS, on 1<sup>st</sup> June 2021

## APPENDIX E - REAL-TIME NOISE MONITORING RESULTS SUMMARY

**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

Day	65 Berry Street, North Sydney (VCS)			243 Miller Street, North Sydney (VCN)		
	L <sub>Aeq(15min)</sub> > 60 dBA longer than 6.5 hours?	L <sub>Aeq(15min)</sub> < 55 dBA for at least 3.25 hours?	Compliance with E37/E38?	L <sub>Aeq(15min)</sub> > 60 dBA longer than 6.5 hours?	L <sub>Aeq(15min)</sub> < 55 dBA for at least 3.25 hours?	Compliance with E37/E38?
Friday, 1 January 2021	No	Yes	Yes	N/A	N/A	Yes
Saturday, 2 January 2021	No	Yes	Yes	N/A	N/A	Yes
Sunday, 3 January 2021	No	Yes	Yes	N/A	N/A	Yes
Monday, 4 January 2021	No	Yes	Yes	N/A	N/A	Yes
Tuesday, 5 January 2021	No	Yes	Yes	N/A	N/A	Yes
Wednesday, 6 January 2021	No	Yes	Yes	N/A	N/A	Yes
Thursday, 7 January 2021	No	Yes	Yes	N/A	N/A	Yes
Friday, 8 January 2021	No	Yes	Yes	N/A	N/A	Yes
Saturday, 9 January 2021	No	Yes	Yes	N/A	N/A	Yes
Sunday, 10 January 2021	No	Yes	Yes	N/A	N/A	Yes
Monday, 11 January 2021	No	Yes	Yes	N/A	N/A	Yes
Tuesday, 12 January 2021	No	Yes	Yes	N/A	N/A	Yes
Wednesday, 13 January 2021	No	Yes	Yes	N/A	N/A	Yes
Thursday, 14 January 2021	No	Yes	Yes	N/A	N/A	Yes
Friday, 15 January 2021	No	Yes	Yes	N/A	N/A	Yes
Saturday, 16 January 2021	No	Yes	Yes	N/A	N/A	Yes
Sunday, 17 January 2021	No	Yes	Yes	N/A	N/A	Yes
Monday, 18 January 2021	No	Yes	Yes	N/A	N/A	Yes
Tuesday, 19 January 2021	No	Yes	Yes	N/A	N/A	Yes
Wednesday, 20 January 2021	No	Yes	Yes	N/A	N/A	Yes
Thursday, 21 January 2021	No	Yes	Yes	N/A	N/A	Yes
Friday, 22 January 2021	No	Yes	Yes	N/A	N/A	Yes
Saturday, 23 January 2021	No	Yes	Yes	N/A	N/A	Yes
Sunday, 24 January 2021	No	Yes	Yes	N/A	N/A	Yes
Monday, 25 January 2021	No	Yes	Yes	N/A	N/A	Yes
Tuesday, 26 January 2021	No	Yes	Yes	N/A	N/A	Yes
Wednesday, 27 January 2021	No	Yes	Yes	N/A	N/A	Yes
Thursday, 28 January 2021	No	Yes	Yes	N/A	N/A	Yes
Friday, 29 January 2021	No	Yes	Yes	N/A	N/A	Yes
Saturday, 30 January 2021	No	Yes	Yes	N/A	N/A	Yes
Sunday, 31 January 2021	No	Yes	Yes	N/A	N/A	Yes
Monday, 1 February 2021	No	Yes	Yes	N/A	N/A	Yes
Tuesday, 2 February 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 3 February 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 4 February 2021	No	Yes	Yes	No	Yes	Yes

**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

Day	65 Berry Street, North Sydney (VCS)			243 Miller Street, North Sydney (VCN)		
	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?
Friday, 5 February 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 6 February 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 7 February 2021	No	Yes	Yes	No	Yes	Yes
Monday, 8 February 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 9 February 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 10 February 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 11 February 2021	No	Yes	Yes	No	Yes	Yes
Friday, 12 February 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 13 February 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 14 February 2021	No	Yes	Yes	No	Yes	Yes
Monday, 15 February 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 16 February 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 17 February 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 18 February 2021	No	Yes	Yes	No	Yes	Yes
Friday, 19 February 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 20 February 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 21 February 2021	No	Yes	Yes	No	Yes	Yes
Monday, 22 February 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 23 February 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 24 February 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 25 February 2021	No	Yes	Yes	No	Yes	Yes
Friday, 26 February 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 27 February 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 28 February 2021	No	Yes	Yes	No	Yes	Yes
Monday, 1 March 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 2 March 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 3 March 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 4 March 2021	No	Yes	Yes	No	Yes	Yes
Friday, 5 March 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 6 March 2021	No	Yes	Yes	No	Yes	Yes

**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

Day	65 Berry Street, North Sydney (VCS)			243 Miller Street, North Sydney (VCN)		
	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?
Sunday, 7 March 2021	No	Yes	Yes	No	Yes	Yes
Monday, 8 March 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 9 March 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 10 March 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 11 March 2021	No	Yes	Yes	No	Yes	Yes
Friday, 12 March 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 13 March 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 14 March 2021	No	Yes	Yes	No	Yes	Yes
Monday, 15 March 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 16 March 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 17 March 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 18 March 2021	No	Yes	Yes	No	Yes	Yes
Friday, 19 March 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 20 March 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 21 March 2021	No	Yes	Yes	No	Yes	Yes
Monday, 22 March 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 23 March 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 24 March 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 25 March 2021	No	Yes	Yes	No	Yes	Yes
Friday, 26 March 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 27 March 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 28 March 2021	No	Yes	Yes	No	Yes	Yes
Monday, 29 March 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 30 March 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 31 March 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 1 April 2021	No	Yes	Yes	No	Yes	Yes
Friday, 2 April 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 3 April 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 4 April 2021	No	Yes	Yes	No	Yes	Yes
Monday, 5 April 2021	No	Yes	Yes	No	Yes	Yes

**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

Day	65 Berry Street, North Sydney (VCS)			243 Miller Street, North Sydney (VCN)		
	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?
Tuesday, 6 April 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 7 April 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 8 April 2021	No	Yes	Yes	No	Yes	Yes
Friday, 9 April 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 10 April 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 11 April 2021	No	Yes	Yes	No	Yes	Yes
Monday, 12 April 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 13 April 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 14 April 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 15 April 2021	No	Yes	Yes	No	Yes	Yes
Friday, 16 April 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 17 April 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 18 April 2021	No	Yes	Yes	No	Yes	Yes
Monday, 19 April 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 20 April 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 21 April 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 22 April 2021	No	Yes	Yes	No	Yes	Yes
Friday, 23 April 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 24 April 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 25 April 2021	No	Yes	Yes	No	Yes	Yes
Monday, 26 April 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 27 April 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 28 April 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 29 April 2021	No	Yes	Yes	No	Yes	Yes
Friday, 30 April 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 1 May 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 2 May 2021	No	Yes	Yes	No	Yes	Yes
Monday, 3 May 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 4 May 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 5 May 2021	No	Yes	Yes	No	Yes	Yes



**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

Day	65 Berry Street, North Sydney (VCS)			243 Miller Street, North Sydney (VCN)		
	L <sub>Aeq(15min)</sub> > 60 dBA longer than 6.5 hours?	L <sub>Aeq(15min)</sub> < 55 dBA for at least 3.25 hours?	Compliance with E37/E38?	L <sub>Aeq(15min)</sub> > 60 dBA longer than 6.5 hours?	L <sub>Aeq(15min)</sub> < 55 dBA for at least 3.25 hours?	Compliance with E37/E38?
Thursday, 6 May 2021	No	Yes	Yes	No	Yes	Yes
Friday, 7 May 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 8 May 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 9 May 2021	No	Yes	Yes	No	Yes	Yes
Monday, 10 May 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 11 May 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 12 May 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 13 May 2021	No	Yes	Yes	No	Yes	Yes
Friday, 14 May 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 15 May 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 16 May 2021	No	Yes	Yes	No	Yes	Yes
Monday, 17 May 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 18 May 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 19 May 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 20 May 2021	No	Yes	Yes	No	Yes	Yes
Friday, 21 May 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 22 May 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 23 May 2021	No	Yes	Yes	No	Yes	Yes
Monday, 24 May 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 25 May 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 26 May 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 27 May 2021	No	Yes	Yes	No	Yes	Yes
Friday, 28 May 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 29 May 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 30 May 2021	No	Yes	Yes	No	Yes	Yes
Monday, 31 May 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 1 June 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 2 June 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 3 June 2021	No	Yes	Yes	No	Yes	Yes
Friday, 4 June 2021	No	Yes	Yes	No	Yes	Yes

**NOISE AND VIBRATION MONITORING REPORT JAN-JUN 2021**  
**SYDNEY METRO – VICTORIA CROSS STATION ISD**

RWDI #2101617

Day	65 Berry Street, North Sydney (VCS)			243 Miller Street, North Sydney (VCN)		
	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?	$L_{Aeq(15min)} > 60$ dBA longer than 6.5 hours?	$L_{Aeq(15min)} < 55$ dBA for at least 3.25 hours?	Compliance with E37/E38?
Saturday, 5 June 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 6 June 2021	No	Yes	Yes	No	Yes	Yes
Monday, 7 June 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 8 June 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 9 June 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 10 June 2021	No	Yes	Yes	No	Yes	Yes
Friday, 11 June 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 12 June 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 13 June 2021	No	Yes	Yes	No	Yes	Yes
Monday, 14 June 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 15 June 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 16 June 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 17 June 2021	No	Yes	Yes	No	Yes	Yes
Friday, 18 June 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 19 June 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 20 June 2021	No	Yes	Yes	No	Yes	Yes
Monday, 21 June 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 22 June 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 23 June 2021	No	Yes	Yes	No	Yes	Yes
Thursday, 24 June 2021	No	Yes	Yes	No	Yes	Yes
Friday, 25 June 2021	No	Yes	Yes	No	Yes	Yes
Saturday, 26 June 2021	No	Yes	Yes	No	Yes	Yes
Sunday, 27 June 2021	No	Yes	Yes	No	Yes	Yes
Monday, 28 June 2021	No	Yes	Yes	No	Yes	Yes
Tuesday, 29 June 2021	No	Yes	Yes	No	Yes	Yes
Wednesday, 30 June 2021	No	Yes	Yes	No	Yes	Yes

## APPENDIX F – VIBRATION MONITORING DATA

