

# Central Station Main Works

## Construction Noise and Vibration Monitoring Program Report

February 2021 - July 2021

### Document and Revision History

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## 1. Introduction

### 1.1 Background

Sydney Metro City & Southwest – Chatswood to Sydenham Project is a new 30km metro line extending metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the capacity to run a metro train every two minutes each way through the centre of Sydney. The Central Station Main Works Project (CSMW) forms part of the Sydney Metro City & Southwest – Chatswood to Sydenham Project. The works are undertaken by Laing O'Rourke.

The CSMW include the installation of new platforms that will be constructed using sophisticated excavation techniques to create a cavern with an island platform, beneath Central Station's existing heavy-rail platforms 13, 14 and 15. The works include new infrastructure and the adjustments to existing infrastructure at Central Station to construct, operate and maintain the Metro Station Works. The key features of the Central Station works include:

- a new north-south concourse for Central Station which will link the new metro station with the existing northern entrance and north concourse, a new east concourse, and the existing southern baggage tunnel; and
- adjustments to the existing Grand Concourse, Olympic Tunnel, Northern Concourse and northern entrance to Central Station.

The Central Walk works include the provision of infrastructure to provide improved connectivity and other operational enhancements throughout Central Station. The key features of the Central Walk works include:

- a new eastern entrance for Central Station on Chalmers St;
- a new east concourse for Central Station beneath existing platforms 16 to 23, which will link the new eastern entrance, the new north south concourse, existing platforms 16 to 23 and the existing Eastern Suburbs Railway (ESR) concourse; and
- provisions to enable the future construction (by others) of an extension of the Central Walk through a new west concourse and a new western entrance for Central Station.

### 1.2 Planning Requirements

In accordance with Minister's Condition of Approval (CoA) - C9, the Construction Monitoring Program was developed in consultation with the City of Sydney Council and the Environmental Protection Authority during the Construction Environmental Management Plan (CEMP) consultation and approval phase. Each construction monitoring program has been incorporated into the relevant CEMP sub-plan. The results of the Construction Monitoring Program will be submitted to the Secretary and relevant regulatory agencies for information. This Construction Noise and Vibration Monitoring Report covers the monitoring period from February 2020 to July 2020. The applicable CoA are shown in Table 1-1 and the applicable Environmental Protection Licence (EPL) Conditions are shown in Table 1-2 below.

Table 1-1: SSI 7400 Conditions relating to the Construction Monitoring Program

Condition	Requirement	Reference
C9	<p>The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each Construction Monitoring Program to compare actual performance of construction of the CSSI against predicted performance.</p> <p>Required Construction Monitoring Programs Relevant government agencies to be consulted for each Construction Monitoring Program</p> <p>Noise and Vibration - EPA and Relevant Council(s)</p> <p>Blasting - EPA and Relevant Council(s)</p> <p>Water Quality - EPA and Relevant Council(s)</p> <p>Groundwater - DPI Water/NRAR</p>	<p>Noise and Vibration – refer to the Construction Noise and Vibration Management Plan</p> <p>Blasting – Not applicable</p> <p>Water Quality – refer to the Construction Soil and Water Management Plan</p> <p>Groundwater - refer to the Construction Groundwater Management Plan</p>
C16	<p>The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program</p>	<p>The Construction Groundwater and Water Quality Monitoring Report will be submitted separately.</p> <p>The results of the Construction Noise and Vibration Monitoring Program are discussed in Section 3.</p> <p>In accordance with CoA C16, this report will be submitted to the following agencies for information:</p> <p>Department of Planning Industry and Environment</p> <p>NSW Environment Protection Authority</p> <p>City of Sydney Council</p> <p>The Independent Environmental Representative will review the reports prior to submission.</p>

Table 1-2: EPL 21148 Monitoring and reporting requirements

Condition	Requirement	Reference
M7.1	<p>Any noise monitoring must be undertaken in accordance with Australian Standard AS 2659.1 – 1998:</p> <p>Guide to the use of sound measuring equipment – portable sound level meters, or any revisions of that standard which may be made by Standards Australia, and the compliance monitoring guidance provided in the NSW Industrial Noise Policy.</p>	<p>Refer to the Construction Noise and Vibration Management Plan.</p> <p>Refer to S 2 for methodology and Appendix A of this report for Noise monitoring result summary.</p>
M7.2	<p>Any vibration monitoring must be undertaken in accordance with the technical guidance provided in the Environmental Noise Management Assessing Vibration: A Technical Guideline (DECC, 2006). All vibration monitoring results may be assessed and reported against the acceptable values of human exposure to vibration set out in Tables 2.2 and 2.4 of the guideline.</p>	<p>Refer to the Construction Noise and Vibration Management Plan.</p> <p>Refer to S 2 for methodology and Appendix B of this report for Vibration monitoring result summary.</p>

### 1.3 Submission Requirements

In accordance with condition C16, this report will be submitted to the following agencies for information:

- Department of Planning Industry and Environment
- NSW Environment Protection Authority
- City of Sydney Council

The Independent Environmental Representative and Acoustic Advisor will be provided with the report for information prior to submission.

### 1.4 Criteria

#### Standard Construction Hours

7:00am to 6:00pm Monday to Friday

8:00am to 1:00pm Saturday

#### Exceptional Construction Hours:

Due to the Government Gazette Notice No.75 – The standard construction hours at the Sydney Metro site at 20–28 Chalmers Street have changed to 7am-6pm Mon-Sun including public holidays. Works past 13:00 on Saturday or anytime on Sunday would comprise lower impact works including material load out and canopy tube drilling. No high noise impact work is permitted during the extended hours.

### 1.5 Noise

The LAeq15min is the conventional unit of measure for construction noise impact. It is the continuous average energy over a 15-minute period, measured in decibels (dB). The LAeq15min can be either airborne or ground borne.

In accordance with the EPA's Interim Construction Noise Guidelines (ICNG) and the Project's Construction Noise and Vibration Impact Statement (CNVIS), the Highly Noise Affected Management Level (HNML) of 75 dBA will apply to residential (dwelling) receptors.

#### Internal Noise Criteria

Area	Receptor type	Condition of Approval (CoA)	Time Period	Criteria
Identified Precincts in the CNVIS	All	E37/38	0700-2000	Leq, 15 minute 60 dBA internal, If more than 50% of time (6.5 hours total) Leq, 15 minute 55 dBA internal, more than 25% of time (3.25 hours total)

*CoA 37 - The Proponent must identify all receivers likely to experience internal noise levels greater than Leq(15 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 Central.*

*CoA 38 - 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:*

- Leq(15 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) *Leq(15 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 Leq(15 minute) 60 dB(A) for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below Leq(15 minute) 55 dB(A). Noise equal to or above Leq(15 minutes) 60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.

## 1.6 Vibration Criteria

Peak particle velocity (PPV) mm/s is the conventional unit of measure for construction vibration impacts for structural and cosmetic damage and can be applied to determine human comfort.

## 1.7 Vibration impacts for structural and cosmetic damage

The Sydney Metro Construction Noise and Vibration Strategy (CNVS) provides a conservative vibration damage screening level per receiver type given below:

- Reinforced or framed structures: 25.0 mm/s
  - Unreinforced or light framed structures: 7.5 mm/s
- This screening criteria relates Building Damage Vibration Management Levels (BS 7385) provided below.

Line	Type of Building	PPV (mm/s) in the Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz & Above
L1	Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	
L2	Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

Source: BS 7385, CNVS

The building damage management level (BS 7385) has been presented in graph form to help with interpretation. The higher the frequency (x axis), the less stringent the criteria for velocity becomes (y-axis) up to 50mm/s. In the example below, all data points fall below both the Line 1 (L1) (less stringent) and the Line 2 (L2) (more stringent) criteria. An exceedance would be observed if data point were to be observed above the L1 or L2 lines on the graph below.

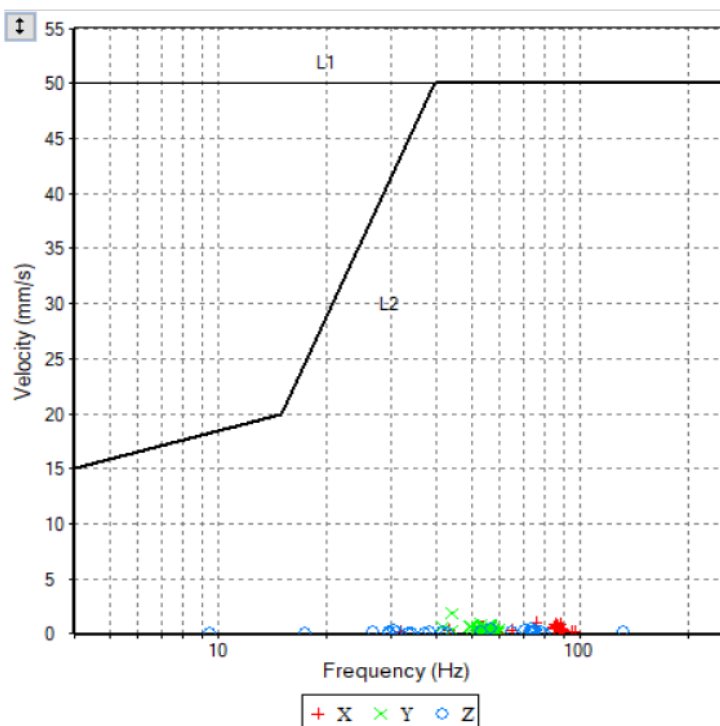


Figure 1: Example of criteria graphed. Note: All structures in the zone of potential construction impact of the Bounce Hotel demolition works are framed or reinforced, hence L1 criteria applies (50mm/s for all frequencies).

## 1.8 Human Comfort Criteria

The NSW Vibration Guideline provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS 6472:1992.

Place	Time	Preferred PPV (mm/s)	Max PPV (mm/s)
<b>Continuous Vibration</b>			
<b>Residences</b>	Day	0.28	0.56
	Night	0.2	0.4
<b>Offices</b>	Day or night	0.56	1.1
<b>Workshops</b>	Day or night	1.1	2.2
<b>Impulsive Vibration</b>			
<b>Residences</b>	Day	8.6	17.0
	Night	2.8	5.6
<b>Offices</b>	Day or night	18.0	36.0

<b>Workshops</b>	Day or night	18.0	36.0
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Values given for the most critical frequency range >8Hz assuming sinusoidal motion. Source - Table C1.1 – The NSW Vibration Guideline

Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- Continuous vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time).
- Impulsive vibration is a rapid build up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds.
- Intermittent vibration can be defined as interrupted periods of continuous (e.g. a drill) or repeated periods of impulsive vibration (e.g. a pile driver), or continuous vibration that varies significantly in magnitude. It may originate from impulse sources (e.g. pile drivers and forging presses) or repetitive sources (e.g. pavement breakers), or sources which operate intermittently, but which would produce continuous vibration if operated continuously (for example, intermittent machinery, railway trains and traffic passing by). Assessing Vibration: a technical guideline, DEC NSW, February 2006. (Applicable for Vibration Dose Value (VDV)).

Vibration from the works can be subjectively considered as continuous or intermittent.

Conservatively and based on site observations and on what the receivers may experience, the vibration has been classified as continuous. As identified in Table 3 above, continuous vibration is measured in PPV. PPV is the preferred parameter for measuring vibration impacts as it can be obtained in real time, whereas VDV is more of a retrospective measure based on time exposure over a prolonged period of operation (i.e. 8hrs or 16hrs).

## 1.9 Perception relating to human comfort

An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other associations with the perceived source of the vibration. An indication of the human tactile perception of vibration of random motion is given in the table below.

Approximate Vibration Level	Degree of Perception
0.10 mm/s	Not Felt
0.20 mm/s	Threshold of Perception
0.35 mm/s	Barely Noticeable
1.0 mm/s	Noticeable
2.2 mm/s	Easily Noticeable
6.0 mm/s	Strongly Noticeable

Source: German Standard DIN 4150: Part 2-1975 - Note: These approximate vibration levels (in floors of buildings) are for vibration having a frequency content in the range of 8 Hz to 80 Hz.

The table above suggests that most people will be just able to feel continuous floor vibration at levels of about 0.20 mm/s, and that the motion becomes “noticeable” at a level of approximately 1.0 mm/s. The threshold for visible movement of susceptible building contents (e.g. plants,



hanging pictures, blinds, etc) is approximately 0.5 mm/s and the audible rattling of loose objects (e.g. crockery) generally occurs at levels of about 0.9 mm/s.

These levels are considerably lower than the BS 7385 criterion of 15mm/s and well below the cited 12.5 mm/s level corresponding to a near-zero probability of damage (refer Sydney Metro CNVS section 5.4.3).

In any premises, day-to-day activities (e.g. footfalls, doors closing, etc) will cause levels of vibration in floors and walls that exceed 1 mm/s (sometimes by quite considerable margins), and therefore visible movement and rattling are often observed. In most instances, however, such movement is considered normal and vibration levels of even much greater magnitude do not result in damage to the objects or building contents.

Because people are able to “feel” very low levels of vibration (even though they may not be disturbed by the motion), it is common to associate building damage with perceptible vibration, particularly when the source of vibration is outside the building and out of the occupants’ control. This largely subjective response is particularly accentuated when perceptible vibration is accompanied by high noise levels, or if there are other adverse effects associated with the source of vibration (e.g. inconvenience, dust, etc).

The NSW Vibration Guideline provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS 6472:1992.

## 2. Methodology

The Construction Noise and Vibration Monitoring Program is designed to compare actual performance of construction of the CSSI against predicted performance and to assess the effectiveness of the mitigation measures applied during construction of the CSMW Project. The program has been executed in accordance with Section 10 of the Construction Noise and Vibration Management Plan (CNVMP) and recording requirements as specified in Section 10.2. The Construction Monitoring Program commenced 3 August 2018 and will continue for the duration of the project.

### 2.1 Sensitive Receivers

The CSMW Construction Noise and Vibration Impact Statement (CNVIS) assessed 50 sensitive receivers potentially affected by construction noise. The receiver locations are seen in the figure below.

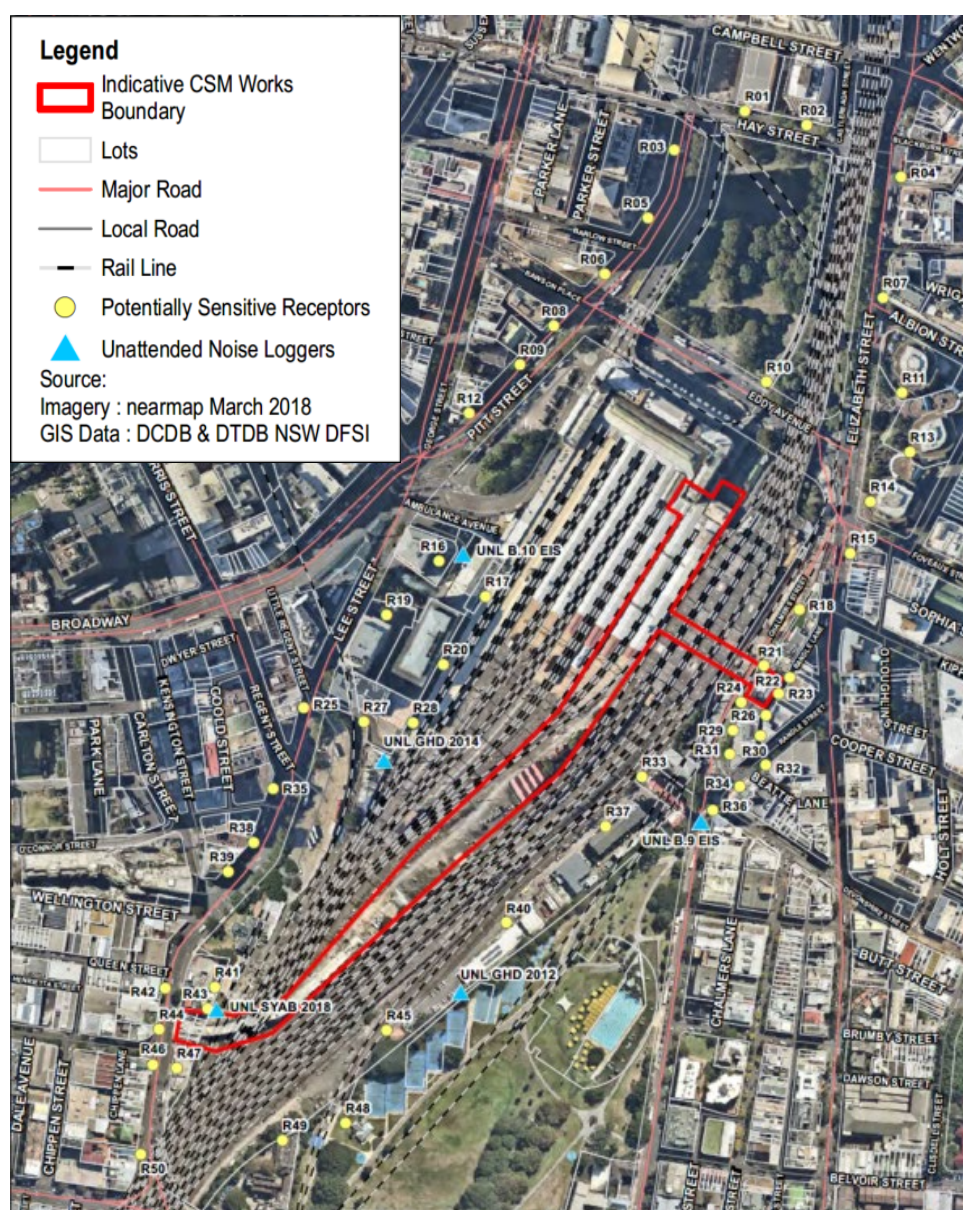


Figure 2-1: Location of Sensitive Receivers

CSM CNVIS

In accordance with CoA E33, ongoing consultation with sensitive receivers is undertaken as the project progresses based on the scenarios identified in the Construction Noise and Vibration Impact Statement (CNVIS). The scenarios are reviewed and refined with the input of construction detail to determine the potential impact and appropriate mitigation. All consultation with potentially affected receivers is undertaken prior to the start of the relevant portion of works. Additional mitigation measures are then tailored based on the consultation feedback.

## 2.2 Key Noise Monitoring Locations

Based on planned construction work, the area's most regularly impacted by construction noise and vibration during the reporting period are shown in Table 2-1 below:

Table 2-1: Estimated RBLs for Residential Receivers and NMLs for Non-Residential Receiver

Sensitive Receiver Category	Estimated RBLs (dBA)		
	Daytime	Evening	Night Time
Residential			
30 Chalmers St (R24)	56	53	45
38 Chalmers St (R29)	56	53	45
YHA (R17)	54	52	49
54 Regent St (R43)	50	50	44
Non- Residential	Daytime	Evening	Night Time
Dental Hospital _ A (north) - 2 Chalmers St (R18)	55	55	55

## 2.3 Monitoring

In accordance with CoA C11 unattended real-time noise and vibration monitoring will be the focus of monitoring however attended noise and vibration monitoring is undertaken where specific circumstances warrant. Real-time noise loggers were installed at:

- the rear of 54 Regent Street on 12 December 2018 (the closest to traffic movements on Sydney Yard Access Bridge and activities in Sydney Yard)
- on the hoarding at the Bounce Hotel site at 20-28 Chalmers Street on 11 January 2019 (being the closest to the proximity of the Eastern Entrance works and Central Walk works)
- at the YHA (Platform 1) on 24 October 2019, decommissioned 29/06/2021.

Real-time vibration loggers were installed at:

- Central Station at the State Significant Heritage listed Train Crew Assignment Centre (previously titled the Central Electric building) on 10 January 2019, decommissioned 29/06/2021; and
- Façade of 30 Chalmers St on 14 October 2019, relocated to the centre of the site 19 January 2021, decommissioned 29 June 2021.

The noise and vibration impact due to construction has progressively tapered off as the site activities transition from demolition, excavation to building and installation. Through extensive assessment and in consultation with the Acoustic Advisor, it was determined that some of the

continuous monitoring was no longer warranted as described above. Attended monitoring will continue as required.

As per CoA C11 real time monitoring data was made available to the LOR construction team, Sydney Metro, the Environmental Representative (ER), the Acoustic Advisor (AA), the Department of Planning, Industry and Environment (DPIE) and the Environment Protection Authority (EPA) via the project website <https://centralstationmetro.com/documents/>.

Impacts from vibration are considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (structural / cosmetic damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits is achieved, it will follow that compliance will be achieved with the building damage objectives. In accordance with CoA E28 and the requirements of the CNVIS, the vibration limits have been set in accordance with the British Standard BS 7385-2:1993. Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals (as is the case for select project works), noise or vibration monitoring is conducted at a nominated representative location (typically the nearest receptor where more than one receptor has been identified). Monitoring is also conducted in the event of a complaint being received or during OOHW where the Additional Mitigation Measures Matrix (AMMM) has identified monitoring as a requirement. In addition to monitoring required by the CoA and CNVMP, monitoring is conducted throughout Central Railway Station to assess the impact of construction activities on commuters and station staff with the results reported through a separate stakeholder management process. In the event of an exceedance of a predicted noise level, an investigation is undertaken followed by corrective actions as specified in the CNVIS and CNVMP if the exceedance was determined to be related to the project.

The results of the monitoring are communicated to relevant personnel when the noise or vibration goal is being approached so that work methodology or equipment being used can be altered, and / or additional management measures may be implemented where reasonable and feasible.

Table 2-2: Monitoring Equipment

Unit	Serial	Calibration Type	Frequency	Last calibration
<b>Sound and Vibration Analyser</b>				
Svantek 977 (noise logger)	36834	Factory	Biennial	12/12/2019
Svantek SV33 (calibration unit)	43175	Factory	Biennial	28/05/2021
Chalmers St	59643	Factory	Biennial	30/03/2020
54 Regent St	59644	Factory	Biennial	27/04/2020
YHA	59636	Factory	Biennial	4/10/2019
<b>Ground vibration Logger</b>				
Svantek 958A (vibration logger)	59157	Factory	Biennial	28/05/2021
Svantek SV84 (transducer)	E3496	Factory	Biennial	28/05/2021
Texcel (CEB)	7273	Factory	Biennial	10/12/2020
Texcel (30 Chalmers St)	7516	Factory	Biennial	27/09/2019





Figure 2-2: Unattended vibration Logger set up at the Dental Hospital southern stairwell



Figure 2-3: Attended noise logger setup on Chalmers St



Figure 2-4: Real time noise logger setup at the YHA (Platform 1), Installed 24 October 2019



Figure 2-5: Real time vibration logger 30 Chalmers St





Figure 2-6: Real time noise logger setup at 54 Regent St (in the process of being serviced), installed 12/12/2018

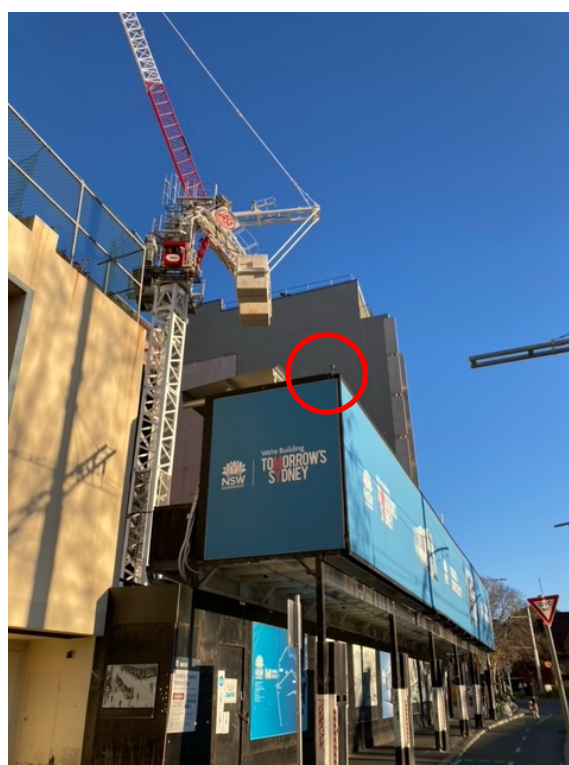


Figure 2-7: Real time noise logger Chalmers St, installed 11/01/2019



Figure 2-8: Real time vibration logger Central Electric Building, installed 11/01/19

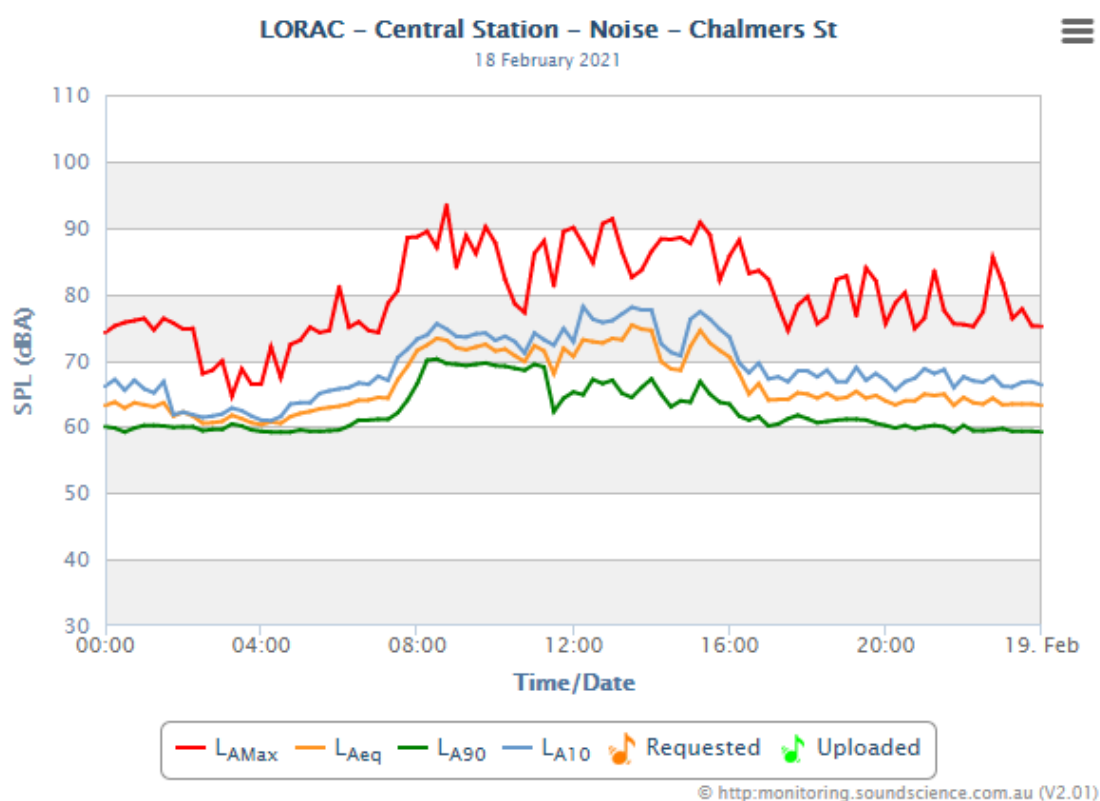


Figure 2-9: Example of real time noise monitoring data



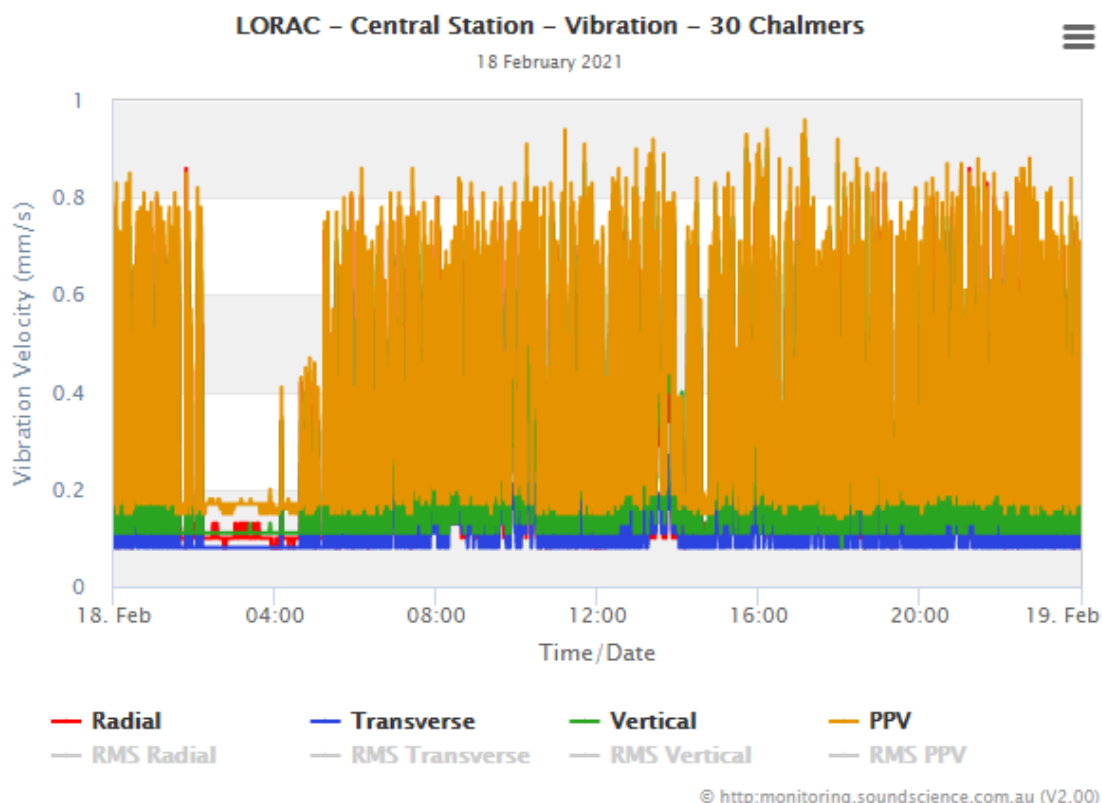


Figure 2-10: Example of real time vibration data. Graph showing general background vibration levels.

Note: general background level slightly elevated due to repositioning geophone to ground level where it is more readily influenced by heavy and light rail movements.

## 2.4 Noise Monitoring Frequency

Activities were assessed in the CNVIS under the following scenarios. During detailed planning of the activities to be conducted around rail possessions some of the activities were conducted concurrently. The potential noise impacts were reassessed on a monthly basis. Because the works are subject to an EPL, the Out of Hours Work Protocol as per CoA E47 is not applicable. To demonstrate due diligence and establish appropriate additional mitigation measures, the CSM works are assessed and documented on a monthly basis.

Table 2-3: Monitoring requirements for construction scenarios.

ID	Description	Frequency (as per AMMM)
SCN 01	Platforms & Sydney Yard: Stage 6 – Installing Services/Wiring	During OOH works
SCN 02	Platforms & Sydney Yard: Stage 7 – Installing Services / Hoarding / Offices	Daytime standard construction hours
		During OOH works
SCN 03	Platforms & Sydney Yard: Stage 7, 9 & 11 - Combine Services Route / Demolition of Sydney Yard Buildings / Salvage Canopy/ Remove Track / Remove Waste	During OOH work

ID	Description	Frequency (as per AMMM)
SCN 04	Platforms & Sydney Yard: Stage 8 & 10 - OHW on Platform 11/12 / Replace Track Country End 12/13 / Installing CSR	During OOH works
SCN 05	Stage 12 - Piling Works / Removing Track	During OOH works
SCN 06	Platforms & Sydney Yard: Stage 13	Daytime standard construction hours/ During OOH work
SCN 07	Platforms & Sydney Yard: Stage 14, 16, 18 & 20	Daytime standard construction hours/ During OOH work
SCN 08	Platforms & Sydney Yard: Stage 15,17 & 19	Daytime standard construction hours/ During OOH work
SCN 09	Metro Box: Piling for the box perimeter and the plunge columns	Daytime standard construction hours/ During OOH work
SCN 10	Metro Box: FRP Capping Beam	Daytime standard construction hours/ During OOH work
SCN 11	Metro Box: Excavation to underside of Intercity Slab	Daytime standard construction hours/ During OOH work
SCN 12	Metro Box: FRP Platform and Intercity slab	Daytime standard construction hours
SCN 13	Metro Box: Excavation to underside of Metro Concourse	During OOH works
SCN 14	Metro Box: Ongoing Logistical support of Box Construction	During OOH works
SCN 15	Central Walk: Site investigation Works (Tracks 16-23)	Daytime standard construction hours/ During OOH work
SCN 16A	Central Walk: Construction of Olympic Stairs (Temp) - Platform 20/21 and 22/23	During OOH works
SCN 16B		
SCN 16C		
SCN 16D		
SCN 17	Central Walk: Construction of the new Standby Guards Rooms / demolition of existing standby guards rooms	Daytime standard construction hours
		During OOH works
SCN 18	Central Walk: Construction of Platform Canopy Support System to Platforms 16 to 23 and Excavation of Launch Chambers	During OOH works
SCN 19	Central Walk: Platform works including works below the top slab	During OOH works
SCN 20	Central Walk: Platform Remodelling works including platform canopy modifications	During OOH works
SCN 21	ESR: Construction of Shaft to ESR Ghost Platform	Daytime standard construction hours
SCN 22	ESR: Surface Works and Underground works	During OOH works
SCN 23	East Entrance: Demolition of the Bounce Hotel	Daytime standard construction hours
SCN 24	East Entrance: Piling for East Entrance	Daytime standard construction hours
SCN 25	East Entrance: Excavation of East Entrance	Daytime standard construction hours
SCN 26	East Entrance: Excavation of Adit to ESR Concourse including Canopy Tube installation	Daytime standard construction hours
SCN 27	East Entrance: FRP works to East Entrance	Daytime standard construction hours

ID	Description	Frequency (as per AMMM)
SCN 28	East Entrance: East Entrance Works and Underground Works	Daytime standard construction hours
SCN 29	Grand Concourse: Piling in Grand Concourse	During OOH works
SCN 30	Grand Concourse: FRP Pile caps	Daytime standard construction hours
		During OOH works
SCN 31	Grand Concourse: Removal of Existing Canopies	During OOH work
SCN 32	Grand Concourse: Installation of precast / in situ columns and arches	Daytime standard construction hours
		During OOH works
SCN 33	Grand Concourse: Installation of Roof Structure	Daytime standard construction hours/ During OOH work
SCN 34	Northern Concourse & North Entry: Demolition Southern Half	Daytime standard construction hours
SCN 35	Northern Concourse & North Entry: FRP of Structure (Floor, retaining wall, Columns)	Daytime standard construction hours
SCN 36	Northern Concourse & North Entry: Demolition Northern Half	Daytime standard construction hours
SCN 37	Northern Concourse & North Entry: FRP of Structure (Floor, retaining wall, Columns)	Daytime standard construction hours
SCN 38	Northern Concourse & North Entry: Installation of remaining precast columns and Arches	Daytime standard construction hours
SCN 39	Sydney Yard Access Bridge: Heavy Vehicle Traffic on the SYAB	Daytime standard construction hours
		During OOH works

The activities in Table 2-3 below were assessed against the scenarios in the CNVIS as show in Table 2-2 above through the OOH assessment process.

## 2.5 Out of Hours Works Summary

Generally, OOHW at Central Station are scheduled either when trains stop running or electrical isolation has been provided. OOHW are required to provide safe access for personnel and plant to the rail corridor to complete the required works. Additional Mitigation and Management Measures (AMMM) are adopted as required. OOHW are governed by the CoA and reflected in the EPL as required by Part 3.1 Section 45 (i). An EPL (EPL 21148) was issued for the Project on 28 November 2018. The LOR Environmental Manager provides internal approval for any Out of Hours Work (OOHW) conducted under the project EPL.

Table 2-4: Monitoring requirements for construction scenarios. Note Both CNVIS Scenario (SCN) predictions and OOHW Model predictions are presented in the far right column, as well as the receiver I.D (CH = Chalmers Street, RS = 54 Regent Street, YHA = Youth Hostel at 10 Lee Street (Platform 1)).

#	Activity	Monitoring requirement	SCN and prediction (dB)
31	February 2021   Weekday 31 – Weekend 35 – 01/02/21 to 28/02/21 Platforms and Sydney Yard Works as per CNVIS Rev 5, Annex B and C		
	<b>Suburban Tracks (Central Walk, Eastern Entrance, ESR, back of house &amp; tunnel works)</b>		
	<b>Central Walk</b> OOH throughout February 2021 <ul style="list-style-type: none"> <li>Subsurface excavation, ground support and temp prop</li> <li>Installation of temporary track slab support frame</li> <li>FRP – CB2 and soffit to P23 B4 beam</li> </ul>	Real time monitoring	SCN20: 72 Pred: 70 (CH)

<p><b>Central Walk – Suburban Platforms</b>  <b>WE31 Possession, 29/1/21 – 1/2/21</b></p> <ul style="list-style-type: none"> <li>• Tile removal on northern and southern sides of P20/21</li> <li>• Platform slab replacement southern end of P18/19</li> <li>• Drainage works along P20/21 including installation of a deep pit on the south of platforms</li> <li>• Canopy modifications including services diversions</li> </ul> <p><b>WE33 Possession, 12/2/21 – 14/2/21</b></p> <ul style="list-style-type: none"> <li>• Existing canopy modification on P16/17 including canopy services diversions</li> <li>• Hazmat removal on Platforms 16/17</li> <li>• Installation of temporary track slab support frame</li> <li>• Subsurface excavation works</li> </ul> <p><b>WE35 Possession, 27/2/21 – 28/2/21</b></p> <ul style="list-style-type: none"> <li>• Tile removal on northern and southern sides of platforms 22/23</li> <li>• Existing canopy services diversions</li> <li>• Service installation works</li> <li>• Hazmat removal on southern half of platforms</li> <li>• Northern fire hydrant installation</li> </ul>	<p>Real time monitoring, attended monitoring</p>	<p>SCN20: 72 Pred: 75 (CH)</p> <p>SCN20: 72 Pred: 65 (CH)</p> <p>SCN20: 72 Pred: 75 (CH)</p>
<p align="center"><b><u>Grand Concourse and Northern Concourse</u></b></p>		
<p><b>Grand Concourse</b>  <b>WK32 Night Shift, 6/2/21 – 12/2/21</b></p> <ul style="list-style-type: none"> <li>• Installation of roof canopy cladding</li> <li>• Balustrade installation and stair tiling</li> <li>• Completing of roof sheeting and soffit works</li> </ul>	<p>Real time monitoring</p>	<p>SCN33: 53 Pred: 50 (CH)</p>
<p><b>Northern Concourse</b>  <b>WE31 Possession, 29/1/21 – 1/2/21</b></p> <ul style="list-style-type: none"> <li>• Removal of remaining canopy units from P8</li> <li>• South of TCAC upper concourse slab demolition western portion continuing from XMAS shutdown</li> </ul> <p><b>WE32 Possession, 6/2/21 – 7/2/21</b></p> <ul style="list-style-type: none"> <li>• South of TCAC upper concourse slab demolition eastern portion continuing from XMAS shutdown</li> <li>• NB: interface with overhead wire modernisation</li> </ul> <p><b>WE35 Possession, 27/2/21 – 28/2/21</b></p> <ul style="list-style-type: none"> <li>• Removal of remaining canopy units from P8</li> <li>• South of TCAC upper concourse slab demolition western portion continuing from XMAS shutdown</li> </ul>	<p>Real time monitoring, attended monitoring</p>	<p>SCN34: 74 Pred: 65 (YHA)</p>
<p align="center"><b><u>Metro Box and Sydney Yard</u></b></p>		
<p><b>Metro Box</b>  <b>OOH throughout February 2021</b></p> <ul style="list-style-type: none"> <li>• Ventilation extraction unit</li> <li>• Excavation below RL3.655 TSE cut of level</li> <li>• Excavation below RL3.655 and tunnel deconstruction</li> <li>• Raking struts and load transfers</li> <li>• DST horizontal piling and underpinning – rectification</li> <li>• DST pour 3 construction – pending rectification works</li> <li>• B1 bench FRP works (GL 9-18)</li> <li>• B1 structural steel</li> <li>• Temporary construction hoist installation</li> <li>• Structural steel and slim deck installation</li> <li>• B1 and B2 Zone 1 FRP</li> <li>• B1 and B2 Zone 5 FRP</li> <li>• Finishes works in MB – NS concourse level</li> </ul>	<p>Works occurring below ground are inaudible.</p> <p>Only air extraction units located behind noise attenuating hoarding on P12 and 16 will be used as in sight.</p>	<p>SCN12: 74 Pred: 60 (CH)</p>

	<b>Sydney Yard</b> <i>OOH throughout February 2021</i> <ul style="list-style-type: none"> <li>Ongoing SYAB usage for OOH deliveries</li> </ul>	Real time monitoring	SCN39b: 71 Pred: 66 (RS)
32	<b>March 2021   Weekday 35 – Weekday 39 – 01/03/21 to 31/03/21</b> Platforms and Sydney Yard Works as per CNVIS Rev 5, Annex B and C		
	<b><u>Suburban Tracks (Central Walk, Eastern Entrance, ESR, back of house &amp; tunnel works)</u></b>		
	<b>Central Walk – Suburban Platforms</b> <b>WE35 Possession, 27/2/21 – 1/3/21</b> <ul style="list-style-type: none"> <li>Tile removal on northern and southern sides of platforms</li> <li>Slab replacement on the southern side</li> <li>Northern fire hydrant route installation</li> <li>Hazmat cleaning on the southern half of P22/23 staged over Saturday and Sunday</li> <li>Canopy hydrant works on P22/23</li> <li>Install concrete footings for condenser access stairs along track 23</li> <li>Remove survey prisms on country side of track 23 on Saturday day shift prior to ST rerail on Sunday</li> </ul> <b>WE38 Possession, 20/3/21 – 21/3/21</b> <ul style="list-style-type: none"> <li>Hazmat removal on northern and southern sides of platforms 16/17</li> <li>Existing canopy steelwork modification on platforms 16/17 for future lift</li> <li>Services installation works on platform 16/17 i.e. canopy hydrant pipes and lighting</li> <li>Tiling trial P18/19</li> <li>Drilling for the southern monitoring well on P16/17</li> <li>Groundwater monitoring wells</li> </ul>	Real time monitoring	SCN20: 72 Pred: 75 (WE35 CH),  SCN20: 72 Pred: 60 (WE38 CH)
	<b>ESR</b> <b>WK38 Extended Weeknights, 22/3/21 – 26/3/21</b> <ul style="list-style-type: none"> <li>Excavating for Central Walk, shotcreting, loading out excavated materials and installing new concrete beams underneath Suburban Platforms 16-23</li> <li>Excavating within hoarded work zones on suburban platforms 16-23 and platform surface excavation and retiling during rail possession weekends</li> <li>Installation of new guards' room within hoarded zone on suburban platforms 16-23</li> </ul> <b>Services</b> <ul style="list-style-type: none"> <li>Contingency date for submain, PA, and CCTV installation</li> <li>Core holing and HV cable feeding on ceiling of tunnel over tracks 24 and 25 using hi rail EWP</li> </ul>	Real time monitoring	SCN22: 72 Pred: 65 (CH)
	<b>Eastern Entrance</b> <i>OOH throughout March 2021</i> <ul style="list-style-type: none"> <li>Likely to be two heavy vehicle movements OOH in March, based on previous instances where there has been one OOH vehicle movement per month. These have all occurred between 3:00 and 5:00 as per traffic approval.</li> </ul>	Real time monitoring	SCN25: 81 Pred: 70 (CH, from time to time)
	<b><u>Grand Concourse and Northern Concourse</u></b>		

	<b>Northern Concourse</b> <i>OOH throughout March 2021</i> <ul style="list-style-type: none"> <li>• TCAC underpinning works including excavation of foundations</li> <li>• Re-leveling floor slab, concreting, reinforcing beams, underpinning, installing steel columns and posts, fencing and balustrades, props and demolishing floor slab and former lift, and walls within the hoardings on upper and lower northern concourse</li> <li>• Removing temporary awnings from upper concourse</li> <li>• Installing services, glazing, and finishing works on the new roof canopy</li> <li>• Cleaning sandstone and brick buildings and ongoing restoration works</li> <li>• Tiling throughout the upper and lower concourse</li> <li>• Midweek removal of remaining canopy elements</li> </ul>	Real time monitoring	SCN36: 76 (CH & YHA) Pred: 65 (CH & YHA)
	<b>Northern Concourse</b> <b>WE35 Possession, 27/2/21 – 1/3/21</b> <ul style="list-style-type: none"> <li>• Lift 8 demolition – northern walls</li> <li>• Vertical tile drilling</li> <li>• Topping slab pour and CEB foundation</li> </ul> <b>WE38 Possession, 20/3/21 – 21/3/21</b> <ul style="list-style-type: none"> <li>• Precast plank demolition</li> <li>• Cladding install on road 16</li> <li>• Contingency date for weather awning</li> </ul>	Real time monitoring, attended monitoring	SCN34: 74 Pred: 65 (CH)
	<b>Northern Concourse</b> <b>WE38 Possession, 20/3/21 – 21/3/21</b> <ul style="list-style-type: none"> <li>• Eastern canopy, lantern, and glazing installation</li> </ul>	Real time monitoring	SCN37: 76 Pred: 45 (CH)
<b>Metro Box and Sydney Yard</b>			
	<b>Metro Box</b> <i>OOH throughout March 2021</i> <ul style="list-style-type: none"> <li>• Ventilation extraction unit</li> <li>• Raking struts and load transfers</li> <li>• DST horizontal piling and underpinning – rectification</li> <li>• DST pour 3 construction – pending rectification works</li> <li>• B1 bench FRP works (GL 9-18)</li> <li>• B1 structural steel</li> <li>• Temporary construction hoist installation</li> <li>• Structural steel and slim deck installation</li> <li>• B1 and B2 Zone 1 FRP</li> <li>• B1 and B2 Zone 5 FRP</li> <li>• Finishes works in MB – NS concourse level</li> </ul>	Works occurring below ground are inaudible.  Only air extraction units located behind noise attenuating hoarding on P12 and 16 will be used as in sight.	SCN12: 74 Pred: 50 (CH)
	<b>Sydney Yard</b> <i>OOH throughout March 2021</i> <ul style="list-style-type: none"> <li>• Ongoing SYAB usage for OOH deliveries</li> </ul>	Real time monitoring	SCN39b: 71 Pred: 66 (RS)
<b>33</b>	<b>April 2021   Weekday 39 - Weekday 43 – 01/04/21 to 30/04/21</b> Platforms and Sydney Yard Works as per CNVIS Rev 5, Annex B and C		
	<b>Suburban Tracks (Central Walk, Eastern Entrance, back of house &amp; tunnel works)</b>		
	<b>Central Walk – Suburban Platforms</b> <b>WE42 Possession, 17/4/21 – 18/4/21</b> <ul style="list-style-type: none"> <li>• Tile removal on northern and southern sides of P18/19</li> <li>• Existing canopy steelwork modification on P18/19 and P20/21</li> <li>• Service installation works on P18/19 and P20/21</li> <li>• Northern fire hydrant route installation on P18/19</li> <li>• Tiling north of P20/21</li> </ul>	Real time monitoring	SCN20: 72 (CH) & 63 (YHA) Pred: 75 (CH) & 60 (YHA)

<b>ESR:</b> <b>WE40 Possession, 2/4/21 – 5/4/21</b> <ul style="list-style-type: none"> <li>Removal of existing tiles and temporary grout ramp in front of existing Lift 6 to P24/25</li> <li>Removal of temporary scaffold ramp section in front of stair access to P24/25</li> <li>Removal of existing tiles in front of stair access to P24/25</li> <li>Tiling in front of existing Lift 6 and stair access to P24/25</li> <li>Reinstatement of ESR temporary scaffold ramp section</li> </ul>	Real time monitoring	SCN22: 72 (CH) Pred: 65 (CH)
<b>Eastern Entrance</b> <b>OOH throughout April 2021</b> <ul style="list-style-type: none"> <li>Likely to be two heavy vehicle movements in April, based on previous instances where there has been one OOH vehicle movement per month. These have all occurred between 0300 and 0500 as per traffic approval</li> </ul>	Real time monitoring	SCN25: 81 (CH) Pred: 70 (CH from time to time)
<b>Eastern Entrance</b> <b>Thursday 8/4/21 – Saturday 10/4/21 between 0300 and 0500</b> <ul style="list-style-type: none"> <li>Excavator removal from 20-28 Chalmers St via Randle Lane to Randle Street (oversized delivery)</li> </ul> <b>Friday 16/4/21 and Saturday 17/4/21</b> <ul style="list-style-type: none"> <li>Tower crane installation at 20-28 Chalmers St</li> </ul>	Real time monitoring	SCN25: 81 (CH) Pred: 70 (CH from time to time)
<b><u>Grand Concourse and Northern Concourse</u></b>		
<b>Northern Concourse</b> <b>OOH throughout April 2021</b> <ul style="list-style-type: none"> <li>SMO sandstone works lower section</li> <li>Transitional roof and lantern glazing</li> <li>Lift 8/motor room demolition</li> <li>TCAC underpinning</li> <li>Balustrade installation and stair tiling</li> <li>Service trench and riser FRP</li> <li>Fire pump room and demo fit out</li> <li>Service trenching from CENA 140 to new ticket gate</li> </ul>	Real time monitoring	SCN34: 74 (CH & YHA) Pred: 65 (CH) & 60 (YHA)
<b>Northern Concourse</b> <b>WE41 Possession, 10/4/21 – 11/4/21</b> <ul style="list-style-type: none"> <li>Remove P8 temporary canopy structures</li> <li>Platform balustrade installation near termination ends of roads 9-12</li> <li>Cladding works for the roof along platform road 8</li> <li>Precast demolition</li> <li>Lift demolition</li> <li>Weather awning removal (WE35 contingency)</li> </ul> <b>WE42 Possession, 17/4/21 – 18/4/21</b> <ul style="list-style-type: none"> <li>Roof cladding along road 16</li> <li>Precast demo</li> <li>Lift demolition</li> </ul>	Real time monitoring	SCN34: 74 (CH & YHA) Pred: 65 (CH) & 60 (YHA)
<b><u>Metro Box and Sydney Yard</u></b>		



	<b>Metro Box</b> <i>OOH throughout April 2021</i> <ul style="list-style-type: none"> <li>Ventilation extraction unit</li> <li>Raking struts and load transfers</li> <li>DST horizontal piling and underpinning – rectification</li> <li>DST pour 3 construction – pending rectification works</li> <li>B1 bench FRP works (GL 9-18)</li> <li>B1 structural steel</li> <li>Temporary construction hoist installation</li> <li>Structural steel and slim deck installation</li> <li>B1 and B2 Zone 1 FRP</li> <li>B1 and B2 Zone 5 FRP</li> <li>Finishes works in MB – NS concourse level</li> </ul>	Works occurring below ground are inaudible.  Only air extraction units located behind noise attenuating hoarding on P12 and 16 will be used as in sight.	SCN12: 74 Pred: 50 (CH)
	<b>Sydney Yard</b> <i>OOH throughout April 2021</i> <ul style="list-style-type: none"> <li>Ongoing SYAB usage for OOH deliveries</li> </ul>	Real time monitoring	SCN39b: 71 Pred: 66 (RS)
<b>34</b>	<b>May 2021   Weekend 44 – Weekday 48 – 01/05/21 to 31/05/21</b> Platforms and Sydney Yard Works as per CNVIS Rev 5, Annex B and C		
	<b><u>Suburban Tracks (Central Walk, Eastern Entrance, ESR, back of house &amp; tunnel works)</u></b>		
	<b>Central Walk</b> <i>OOH throughout May 2021</i> <ul style="list-style-type: none"> <li>Guardrooms handover and upcoming demolition of old guardrooms. Demolition to start 1/5/21 on P20/21: soft strip, day and night</li> </ul>	Real time monitoring	SCN20: 72 (CH) & 63 (YHA) Pred: 70 (CH) (worst case scenario, anticipated to drop off by 5 to 10dB for each platform)
	<b>Central Walk – Suburban Platforms</b> <b>WE46 Possession, 15/5/21 – 16/5/21</b> <ul style="list-style-type: none"> <li>Replace northern 23m of platform slab on P20/21</li> <li>Painting on southern half of platforms 20/21 (300m2)</li> <li>Balustrade hazmat removal on most northern stairs of P20/21</li> </ul> <b>WE47 Possession, 22/5/21 – 23/5/21</b> <ul style="list-style-type: none"> <li>Replace northern 23m of platform slab on P22/23</li> <li>Existing canopy steelwork modification on P22/23 for future lift</li> <li>Northern fire hydrant route installation on P22/23</li> <li>Painting on southern half of P22/23 (300m2)</li> <li>Balustrade hazmat removal on second northern stairs of P22/23</li> </ul>	Real time monitoring  Attended Monitoring	SCN20: 72 (CH) & 63 (YHA) Pred: 75 (CH) & 60 (YHA)
	<b>ESR</b> <b>Monday 17/5/21 – Friday 21/5/21 between 0000 and 0400</b> <ul style="list-style-type: none"> <li>Oversized plant and machinery will be delivered to site at Railway Institute Drive via Chalmers St</li> </ul>	Real time monitoring	SCN22: 72 (CH) & 62 (YHA) Pred: 60 (CH)
	<b>ESR</b> <b>WK46 Possession, 17/5/21 – 21/5/21</b> <ul style="list-style-type: none"> <li>Investigation, removal of hinged ceiling panels and hazmat cleaning behind panels on P25. These works are required for future install of hydrant and hose reel pipe work on P25</li> </ul>	Real time monitoring	SCN22: 72 Pred: 50 (CH) (not predicted to have any impact on sensitive receivers due to distance)
	<b>Eastern Entrance</b> <i>OOH throughout May 2021</i> <ul style="list-style-type: none"> <li>Likely to be two heavy vehicle movements in May, based on previous instances where there has been one OOH vehicle movement per month. These have all occurred between 0300 and 0500 as per traffic approval</li> </ul>	Real time monitoring	SCN25: 81 (CH) Pred: 70 (CH from time to time)
	<b><u>Grand Concourse and Northern Concourse</u></b>		



	<b>Northern Concourse</b> <b>WE47 Possession, 22/5/21 – 23/5/21</b> <ul style="list-style-type: none"> <li>Hoarding to be adjusted from stage 4 to stage 5 and will be in place until 19 September 2021</li> <li>4 ticket gates and 1 WAG open for the weekend</li> <li>Temp PIDS in place during weekend</li> <li>Existing hoarding at CENA 140 to be demolished</li> </ul>	Real time monitoring	SCN30: 76 Pred: 55 (YHA)
	<b>Metro Box and Sydney Yard</b>		
	<b>Metro Box</b> <b>OOH throughout May 2021</b> <b>Zone 1-3</b> <ul style="list-style-type: none"> <li>Waterproof membranes</li> <li>FRP – metro track slab and walls</li> <li>FRP – basement 3</li> <li>Plunge column removal</li> <li>Complete structural steel framing B1 and B2</li> </ul> <b>Zone 2-4</b> <ul style="list-style-type: none"> <li>Complete structural steel framing B1 and B2</li> <li>Waterproof membranes</li> <li>Shotcrete B1 and B3 walls</li> <li>FRP metro track slab, B3 and walls</li> <li>B3 hanging steel and hollow core planks</li> <li>Metro precast platforms and topping</li> <li>33kv</li> </ul> <b>Zone 5</b> <ul style="list-style-type: none"> <li>Detailed excavation – ULX, sumps, drainage</li> <li>Waterproofing membranes</li> <li>FRP – walls</li> <li>FRP – metro track and B3</li> <li>Plunge column removal</li> </ul>	Works occurring below ground are inaudible.  Only air extraction units located behind noise attenuating hoarding on P12 and 16 will be used an in sight.	SCN12: 74 Pred: 50 (CH)
	<b>Platforms &amp; Sydney Yard: Stage 6 – Installing Services/Wiring</b> <b>WE44 Possession, 1/5/21 – 2/5/21</b> <b>Services on Platforms 1-4</b> <ul style="list-style-type: none"> <li>Cutover of SYW main switchboard into SYAB padmount</li> <li>Decommissioning of feeder 631/1</li> <li>Re-route feeder 631/2 into SYAB padmount. Works to include new cable joint between existing 631/2 cable located on the Powerhouse Museum siding and new cable from SYAB padmount. Cable to be relabelled 579</li> </ul>	No monitoring undertaken as not required by AMM's. Not predicted to impact on any sensitive receivers.	
	<b>Sydney Yard</b> <b>OOH throughout May 2021</b> <ul style="list-style-type: none"> <li>Ongoing SYAB usage for OOH deliveries</li> </ul>	Real time monitoring	SCN39b: 71 Pred: 66 (RS)
<b>35</b>	<b>June 2021   Weekday 48 – Weekday 52 – 01/06/20 to 30/06/20</b> <b>Platforms and Sydney Yard Works as per CNVIS Rev 5, Annex B and C</b>		
	<b>Suburban Tracks (Central Walk, Eastern Entrance, ESR, back of house &amp; tunnel works)</b>		
	<b>ESR</b> <b>OOH throughout June 2021</b> <ul style="list-style-type: none"> <li>33kv underbore (4 bores x 86m length from Ghost Platform to Metro Box). Surface site will be at Railway Institute Drive</li> </ul>	Real time monitoring	SCN21: 72 Pred: 65 (CH)
	<b>Eastern Entrance</b> <b>OOH throughout June 2021</b> <ul style="list-style-type: none"> <li>During 33kv underbore works at RID, the tower crane at eastern entrance may be utilised to lift materials</li> <li>Likely to be two heavy vehicle movements in May, based on previous instances where there has been one OOH vehicle movement per month. These have all occurred between 0300 and 0500 as per traffic approval</li> </ul>	Real time monitoring	SCN25: 81 (CH) Pred: 70 (CH from time to time)
	<b>Grand Concourse and Northern Concourse</b>		

	<b>Northern Concourse</b> <b>WE49 Possession, 5/6/21 – 6/6/21</b> <ul style="list-style-type: none"> <li>Eastern canopy lantern and glazing installation</li> </ul> <b>WE50 Possession, 11/6/21 – 15/6/21</b> <ul style="list-style-type: none"> <li>Concourse relevelling (P8/9)</li> <li>Tiling to end of platform extensions and in front of escalators</li> <li>Platform handrail/guard rail installation</li> <li>Western canopy soffit, external cladding and ladder install</li> <li>Platforms 8 and 11 CSR trenches tiling</li> </ul>	Real time monitoring, attended monitoring	SCN 34: 74 Pred: 65 (YHA/CH)
	<b><u>Metro Box and Sydney Yard</u></b>		
	<b>Metro Box</b> <i>OOHW occurring throughout June 2021, however noise not predicted to impact any sensitive receivers due to being so deep underground.</i>	No monitoring undertaken as not required by AMM's. Not predicted to impact on any sensitive receivers.	
	<b>Sydney Yard</b> <i>OOH throughout June 2021</i> <ul style="list-style-type: none"> <li>Ongoing SYAB usage for OOH deliveries</li> </ul>	Real time monitoring	SCN39b: 71 Pred: 65 (RS)
36	<b>July 2021   Weekday 52 – Weekday 04 – 01/07/21 to 31/07/21</b> <b>Platforms and Sydney Yard Works as per CNVIS Rev 5, Annex B and C</b>		
	<b><u>Suburban Tracks (Central Walk, Eastern Entrance, ESR, back of house &amp; tunnel works)</u></b>		
	<b>Central Walk</b> <b>WE01 Possession, 3/7/21 – 4/7/21</b> <ul style="list-style-type: none"> <li>Replace half of northern platform slab on P18/19</li> <li>Lighting installation on southern half of P18/19</li> <li>Balustrade hazmat removal on second northern stairs of P18/19</li> <li>Fix slab section on southern end of P18/19</li> <li>Tiling on northern side of P20/21 (278m2)</li> <li>Add hoarding for lift on P20/21</li> <li>Northern fire hydrant route installation on P18/19</li> </ul> <b>WE02 Possession, 10/7/21 – 11/7/21</b> <ul style="list-style-type: none"> <li>Replace half of northern platform slab on P16/17</li> <li>Tiling removal on southern side of P16/17</li> <li>Northern fire hydrant route installation on P16/17</li> <li>Balustrade hazmat removal on second northern stairs of P16/17</li> <li>Painting on P16/17</li> </ul> <b>WE05 Possession, 31/7/21 – 1/8/21</b> <ul style="list-style-type: none"> <li>Tiling on northern side of P16/17 (351m2)</li> <li>Lighting installation on northern half of P18/19</li> <li>Lift hoarding extended for glass flooring prep works on P16/17</li> <li>Add hoarding for lift on P22/23</li> </ul>	Real time monitoring	SCN20: 72 (CH) & 63 (YHA) Pred: 65 (CH) & 60 (YHA)
	<b>ESR</b> <i>OOH throughout July 2021</i> <ul style="list-style-type: none"> <li>33kv underbore (4 bores x 86m length from Ghost Platform to Metro Box). Surface site will be at Railway Institute Drive</li> </ul>	Real time monitoring	SCN21: 72 Pred: 65 (CH)
	<b>Eastern Entrance</b> <i>OOH throughout July 2021</i> <ul style="list-style-type: none"> <li>During 33kv underbore works at RID, the tower crane at eastern entrance may be utilised to lift materials</li> <li>Likely to be two heavy vehicle movements in May, based on previous instances where there has been one OOH vehicle movement per month. These have all occurred between 0300 and 0500 as per traffic approval</li> </ul>	Real time monitoring	SCN25: 81 (CH) Pred: 70 (CH from time to time)

	<u><b>Grand Concourse and Northern Concourse</b></u>		
	<b>Northern Concourse</b> <b>WE01 Possession, 3/7/21 – 4/7/21</b> <ul style="list-style-type: none"><li>• Roof cladding</li><li>• Hoarding changes</li><li>• </li></ul> <b>WE02 Possession, 10/7/21 – 11/7/21</b> <ul style="list-style-type: none"><li>• Roof cladding</li></ul> <b>WE04 Possession, 24/7/21 – 25/7/21</b> <ul style="list-style-type: none"><li>• Platform 8 tiling</li><li>• Tiling and aco drain installation P8</li><li>• Western canopy soffit, external cladding and ladder install</li><li>• Glazing and completion works to heritage canopies</li><li>• Platform balustrade installation</li></ul>	Real time monitoring	SCN35: 76 (CH & YHA)  Pred: 50 (CH) & 55 (YHA)
	<u><b>Metro Box and Sydney Yard</b></u>		
	<b>Metro Box</b> <i>OOHW occurring throughout July 2021, however noise not predicted to impact any sensitive receivers due to being so deep underground.</i>	No monitoring undertaken as not required by AMM's. Not predicted to impact on any sensitive receivers.	
	<b>Sydney Yard</b> <i>OOH throughout July 2021</i> <ul style="list-style-type: none"><li>• Ongoing SYAB usage for OOH deliveries</li></ul>	Real time monitoring	SCN39b: 71 Pred: 65 (RS)
	<u><b>Site Wide CSR Works</b></u>		
	<b>WE50 Possession, 11/6/21 – 15/6/21</b> <i>Civil - Between Platforms 8 to 11</i> <ul style="list-style-type: none"><li>• Platforms 8 and 11 CSR trenches tiling</li></ul>	No monitoring undertaken as not required by AMM's.	

### 3. Monitoring Results

#### 3.1 Noise

Construction noise levels for some CSM work activities are predicted in the CNVIS to exceed the external noise management level at times, particularly during works outside of standard hours. Attended and unattended real time noise monitoring was undertaken during the reporting period as required for OOH, particularly during possessions where noise modelling predicted exceedance of noise management levels.

As identified by modelling in the CNVIS, the majority of noise impacts have occurred at the closest sensitive receivers predominantly on Chalmers Street and to a lesser extent the YHA on Platform Zero. Standard mitigation measures were implemented as per Section 8 of the CNVMP and Section 8 of the CNVIS. Additional mitigation and management measures were implemented as per the OOH approvals. Additional respite periods during high noise activities were provided to Sydney Trains staff and commuters by not undertaking high noise impact activities during peak hours as well as using one of three noisy work programs:

- 1) Working three hours on and one hour off, and then repeating this cycle, or;
- 2) Working 45 minutes on with 15 minutes off for three hours, followed by one-hour break and then repeating this cycle.
- 3) Working one hour on, half hour off

Specific respite periods were also negotiated with the Dental Hospital and Columbus & Co Central Café for works in standard construction hours (note: Columbus & Co Central Café closed in May 2021).

The real time noise data was reviewed at the time of potential high noise impact works by site supervisors. The playback function allowed for differentiation of construction noise from ambient noise levels. Notable high ambient noise levels were recorded during attended noise monitoring sessions and from playback recordings downloaded from the real time logger at Chalmers Street, Regent Street and the YHA. Common extraneous noise sources include:

- Other construction works on Chalmers and Elizabeth Streets, particularly maintenance works
- Residences or pedestrians near the measurement position
- Wind-blown vegetation and insects
- Road traffic on public roads, particularly applicable at 54 Regent Street
- A street sweeper going past on Chalmers St
- Light rail on Chalmers St
- Noise from trains passing, diesel trains idling in the intercity platforms, announcements, and train signalling horns at the YHA; and
- Noise from fauna; specifically, cockatoos and seagulls – the latter of which are often active throughout the night.

From the 19<sup>th</sup> July to the 30<sup>th</sup> July, all construction was paused across NSW because of the restrictions associated with COVID-19. Noise levels were continued to be analysed during this time to garner an idea of how CSM works impact upon sensitive receivers. The results from this period in July are detailed below in Figure 3-1. The data points demonstrate that overall, noise levels dropped during the day and night time periods when there was little road usage and no construction presence in the background. The LAeq15min noise levels dropped roughly 5-10dB from the previous weeks. This indicates that now that breaking activities have ceased, construction noise levels are not significantly louder than general activities happening in the area, such as train and light rail, announcements, traffic, birds and talking. Spikes in noise were predominately related to train and light rail movements, birds, and emergency response vehicles.

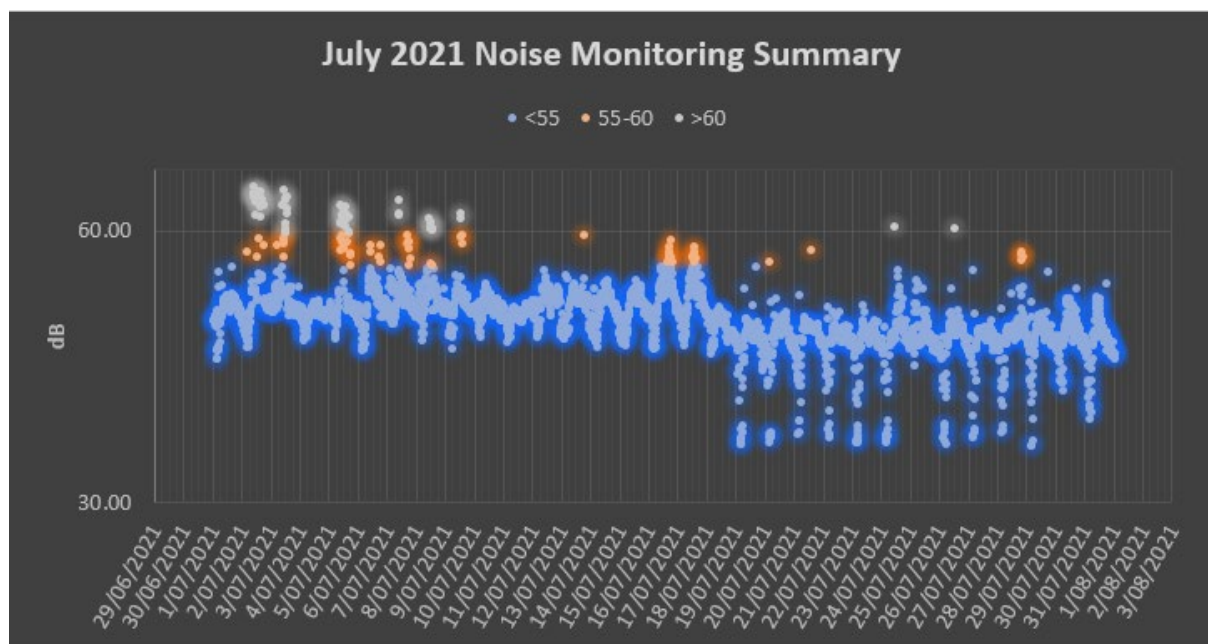


Figure 3-1: July Noise Monitoring Summary

Noise monitoring results are detailed in Appendix A. Monthly noise data tables have been prepared for each sensitive receiver. The objective of the data tables is to validate the predictions for the specific activities as documented in the CNVIS. To obtain a greater understanding of the noise environment the 'adjusted' ( $10 \cdot \log$  of the attribute) and 'non-adjusted' values are analysed. This is explained further below, and a quick reference table is provided in Table 3-1.

Table 3-1:  $10 \cdot \log$  (attribute) quick reference table

Attribute: % Contribution of magnitude	$10 \cdot \log(\text{attribute})$ Reduction in dB	Attribute: Event duration (x mins per 15min measure)	$10 \cdot \log(\text{attribute})$ Reduction in dB
5	-13	1	-12
10	-10	2	-9
15	-8	3	-7
20	-7	4	-6
25	-6	5	-5
30	-5	6	-4
35	-5	7	-3
40	-4	8	-3
45	-3	9	-2
50	-3	10	-2
55	-3	11	-1
60	-2	12	-1
65	-2	13	-1
70	-2	14	0
75 to 85	-1	15	0
90 to 100	0		

Note 1: The Decibel (dB) is a relative unit of measurement corresponding to one tenth of a bel. It is expressed on a logarithmic scale, hence the ratio between decibels also need to be quantified logarithmically.

Note 2: The % Contribution of magnitude is a relatively subjective measure. To keep the methodology repeatable as is required by scientific method, only 5%, 50% and 100% contributions are used in the assessment.

**Example:** A noise file was reviewed that captured saw cutting. The unadjusted  $L_{Aeq15min}$  was 64dB. When in operation the contribution of the saw was 50% to the noise environment due to the distance and use of noise attenuating screens. The other 50% was construction noise confirmed not to be associated with CSM. The saw cutting lasted for 6 minutes over the 15-minute period.

$$64\text{dB} + [10 \cdot \log(0.5)] + [10 \cdot \log(6/15)] = 57\text{dB}.$$

Therefore the 'unadjusted  $L_{Aeq15min}$ ' is 64dB and the 'adjusted  $L_{Aeq15min}$ ' is 57dB.

In this example regardless of the 7dB difference, the mitigation for the impact remains the same.

A precautionary approach is used as follows:

- The 'unadjusted  $L_{Aeq15min}$ ' measure is used to determine potential noise impact in real time to adjust works in real time accordingly. The next  $L_{Aeq15min}$  period can be improved from the last.
- The 'adjusted  $L_{Aeq15min}$ ' measure is used as an indicative noise level. It is a tool used to better understand the noise impact contribution of the project on the surrounding noise environment. The adjusted measure was particularly useful when separating CSM works from rail operational noise, and other construction work in the local area not associated with the project.
- It is difficult to assign a percentage of magnitude, so typically 5% is assigned for no magnitude, 50% if other works or noises are still contributing, or 100% if no other works or impacts can be heard at the time of use of that equipment.
- Not all files are 'adjusted' as the corrections are not always applicable due to the dominant nature of the activity, or the works are considered inaudible.
- The  $L_{Aeq15min}$  of highest noise period is selected for assessment.
- The data table is prepared to ensure results can be verified.

The real time data is reviewed by the night supervisors by smart phone at the time of a noisy activity with the potential to impact the community. This allows for a review of the  $L_{Aeq15min}$  period against predictions. If required, the work methodology is adjusted where feasible. During scheduled rail possessions, options such as amending construction practices and schedules to reduce noise impacts by carrying out the works during less noise sensitive times is not feasible due to a large majority of complex works occurring in limited track and platform possession windows. Additional respite offers have been in the form of customised noise attenuating ear plugs and extensive communications.

Generally, exceedances of predicted noise levels were typically attributed to extraneous noise rather than construction activities (comparing adjusted to non-adjusted). Zero non-conformances were raised during the reporting period for an exceedance attributed to the incorrect implementation of noise mitigation measures or AMM's.

### 3.1.1 [Possession based noise monitoring](#)

During this reporting period between February 2021 and July 2021, 19 rail possessions were planned, however only 17 were executed due to the COVID-19 construction shutdown. Several of these involved possessions occurring simultaneously on the Suburban Tracks, Intercity Platforms, or the North/Grand Concourse. The possessions likely to be associated with the greatest impact were associated with platform resurfacing/relevelling and drainage works within the Suburban platforms (refer Scenario 18 and 22 in the CNVIS). The works occurring on site included temporary works, excavation, spoil removal, jackhammering and saw cutting, platform relevelling and finishes works.

Platform relevelling works improve drainage, accessibility of the platforms by commuters moving between the platforms and trains, as well as improve the overall aesthetic of the platform surfaces. Re-levelling works typically comprise the removal of the upper layer of the platform surface (concrete, screed and tile) and coping edge, followed by the placement of a newly graded surface comprising concrete, screed and new tiles, as well as drainage channels and pits. The scope of works will occur in several stages across 2020 and 2021, and will require wall saws, road saws and excavators with hammer attachments to remove the entire platform surface.



To address the potential for high noise impacts at the location of the receivers, the Surry Hills OOHW Engagement Strategy was prepared with the objective of limiting disruption at sensitive receivers in three residential buildings on Chalmers Street and Randle Street (a total of 110 residential properties facing Central Station) and one business on Chalmers Street that operates 24/7.

To achieve this, the following was conducted prior to each noisy possession:

- Proactively engage with residents in advance / during cumulative noisy activities to address any specific requirements of sensitive receivers.
- Help residents to understand the reasoning why the work is undertaken out of hours. (due to strict staged program)
- Help residents understand the future benefits (end state) of Central Walk construction.

The outcome of the objectives was measured as follows:

- Ratio of complaints against repetitive complaints: 112 complaints in total during the reporting period:
  - 110 were related to noise
  - At least 84 of the 112 were repetitive complaints from the same individual.
  - At least another 21 of the 112 were called in as anonymous complaints but were regarded to be from the same individual.
- Number of residential places/businesses spoken to:
  - Quarterly letter goes to +20,000 letterboxes
  - Monthly letter goes to +3,000 letterboxes
  - Each specific notification has been distributed to about 150 letterboxes adjacent to the site (businesses & residents),
  - Weekly email reminder to a distribution list of 1,300 email addresses.

Generally, exceedances of predicted noise levels were typically attributed to extraneous noise rather than construction activities (comparing adjusted to non-adjusted). Zero non-conformance reports were raised during the reporting period for an exceedance attributed to incorrect noise mitigation measures being emplaced or a failure to implement the correct AMMs as per the CNVIS predictions.

A total of 17 rail possessions occurred during the reporting period and are discussed in greater detail in table 3-2 below. A total of 19 possessions were scheduled to occur during the reporting period, however only 17 were carried out due to the COVID-19 construction shutdown.

Table 3-2: Possession Monitoring Summary

Possession date and scope	Monitoring type and location	CNVIS prediction/ OOHW Prediction/ Observed result	Discussion of results
<b>WE31 Possession</b> <b>29/01/21 - 01/02/2021</b> Central Walk: <ul style="list-style-type: none"> <li>• Tile removal on Northern and Southern sides of P20/21</li> </ul>	Continuous	SCN20: 72 Pred: 75 Obs: 75	Possession noise levels within predictions. Refer to Appendix A.

<ul style="list-style-type: none"> <li>Platform Slab replacement southern end of P18/19</li> <li>Drainage works along P20/21 including installation of a deep pit on the south of platforms</li> <li>Canopy modifications including services diversions</li> </ul> <p>Northern Concourse:</p> <ul style="list-style-type: none"> <li>Removal of remaining canopy units from platform 8</li> <li>South of TCAC Upper concourse slab demolition western portion continuing from XMAS shutdown</li> </ul>		<p>SCN34: 74 Pred: 65 Obs: 75 (mitigated to the higher prediction as per SCN 20).</p>	
<p><b>WE32 Possession</b> <b>6-7/02/2021</b> Northern Concourse:</p> <ul style="list-style-type: none"> <li>South of TCAC Upper concourse slab demolition eastern portion continuing from XMAS shutdown</li> <li>NB: interface with overhead wire modernisation</li> </ul>	Continuous	<p>SCN34: 74 Pred: 65 Obs: 65</p>	Possession noise levels within predictions.
<p><b>WE33 Possession</b> <b>12-14/02/2021</b> Central Walk:</p> <ul style="list-style-type: none"> <li>Existing Canopy Modification on Platforms 16/17 including canopy services diversions</li> <li>Hazmat removal on Platforms 16/17 (inaudible)</li> <li>Installation of Temporary Track Slab support frame</li> <li>Subsurface excavation works</li> </ul> <p>Northern Concourse:</p> <ul style="list-style-type: none"> <li>Eastern canopy and lantern and glazing installation</li> </ul>	Continuous	<p>SCN20: 72 Pred: 65 Obs: 65</p> <p>SCN37: 76 Pred: 70 (YHA) &amp; 60 (CH) Obs: 70 (YHA) &amp; 60 (CH)</p>	Possession noise levels within predictions.





<p>Northern Concourse:</p> <ul style="list-style-type: none"> <li>• Precast plank demo</li> <li>• Cladding install on Road 16</li> <li>• Contingency date for weather awning</li> </ul>		<p>SCN34: 74 Pred: 65 Obs: 65</p>	
<p><b>WK38 Possession</b> <b>22-26/03/2021</b> ESR (Services):</p> <ul style="list-style-type: none"> <li>• Contingency date for submain, PA and CCTV installation</li> <li>• Core holing and HV cable feeding on ceiling of tunnel over tracks 24 and 25 using hi rail EWP</li> </ul>	Continuous	<p>SCN22: 72 Pred: 65 (CH) Obs: NA</p>	<p>Possession noise levels within predictions. No impact on sensitive receivers due to distance.</p>
<p><b>WE40 Possession</b> <b>2-4/04/2021</b> ESR:</p> <ul style="list-style-type: none"> <li>• Removal of existing tiles and temporary grout ramp in front of existing Lift 6 to Platform 24/25</li> <li>• Removal of temporary scaffold ramp section in front of stair access to Platform 24/25</li> <li>• Removal of existing tiles in front of stair access to Platform 24/25</li> <li>• Tiling in front of existing Lift 6 and stair access to Platform 24/25</li> <li>• Reinstatement of ESR temporary scaffold ramp section</li> </ul>	Continuous	<p>SCN22: 72 (CH) Pred: 65 Obs: 65</p>	<p>Possession noise levels within predictions.</p>
<p><b>WE42 Possession</b> <b>10-11/04/2021</b> Northern Concourse:</p> <ul style="list-style-type: none"> <li>• Remove Platform 8 temporary canopy structures</li> <li>• Platform balustrade installation near termination ends of Roads 9-12</li> <li>• Cladding works for the roof along Platform Road 8</li> <li>• Precast demolition</li> <li>• Lift demolition</li> </ul>	Continuous	<p>SCN34: 74 Pred: 65 (CH) Obs: 65</p>	<p>Possession noise levels within predictions.</p>





<ul style="list-style-type: none"> <li>Existing hoarding at CENA 140 to be demolished</li> </ul>			
<b>WE49 Possession</b> <b>5-6/06/2021</b> Northern Concourse: <ul style="list-style-type: none"> <li>Eastern Canopy, lantern and glazing installation</li> </ul>	Continuous	SCN35: 76 Pred: 75 (YHA) Obs: 70	Possession noise levels within predictions.
<b>WE50 Possession</b> <b>11-15/06/2021</b> Northern Concourse: <ul style="list-style-type: none"> <li>Concourse releveling (Platforms 8/9)</li> <li>Tiling to end of platform extensions &amp; in front of escalators</li> <li>Platform handrail/guard rail installation</li> <li>Western Canopy soffit, external cladding and ladder install (hi-rail EWP on Roads 7 to 8)</li> <li>Platforms 8 &amp; 11 CSR Trenches Tiling</li> </ul>	Attended, Continuous	SCN35: 76 Pred: 75 (YHA) Obs: 75	Possession noise levels within predictions.
<b>WE01 Possession</b> <b>3-4/07/2021</b> Central Walk: <ul style="list-style-type: none"> <li>Replace half of Northern Platform Slab on Platforms 18/19</li> <li>Lighting installation on Southern half of Platform 18/19</li> <li>Balustrade hazmat removal on second northern stairs of P18/19</li> <li>Fix slab section on southern end of P18/19</li> <li>Tiling on northern side of P20/21 (278m<sup>2</sup>)</li> <li>Add hoarding for lift on P20/21</li> <li>Northern fire hydrant route installation on P18/19</li> </ul> Northern Concourse: <ul style="list-style-type: none"> <li>Hoarding changes</li> <li>Roof cladding</li> </ul>	Continuous	SCN20: 72 Pred: 65 Obs: 65  SCN35: 76 Pred: 55 (YHA) Obs: 55	Possession noise levels within predictions.



<ul style="list-style-type: none"> <li>• Lift Hoarding Extended for Glass Flooring Prep- Works on Platform 16/17</li> <li>• Add hoarding for lift on Platform 22/23</li> </ul>			
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The possession monitoring results demonstrate that there were no exceedances of predictions associated with CSM works at sensitive receivers. The highest measured noise levels were associated with platform relevering works on the WE31 Possession (29/01/21 – 01/02/21) Platform 20/21, WE35 Possession (27-28/2/21) Platform 22/23, & WE42 (17-18/04/21) Platform 20/21. Noise levels exceeded at source (on the platforms), however dissipated significantly when measured at the facade of sensitive receivers on Chalmers St and further reduced internally when measured inside the buildings. Noise levels were validated and were within CSM predictions. No complaints were received from residential sensitive receivers during the WE31 Possession. A total of two complaints were received from one complainant during possession works WE32, and two complaints from the same complainant WE 35. All noise and vibration levels were validated and were within predictions.

### 3.1.2 [Verification monitoring for CoA E37/38](#)

During this reporting period, the potential for ground borne noise at sensitive receivers that may result in internal noise levels greater than  $L_{Aeq15min}$  60dB was identified to occur at 30-38 Chalmers Street. Key activities which occurred at these two work sites included excavation including pile detailing, hammering and material load out, and canopy tube drilling. CoA E38 was complied with during this reporting period. Refer to Appendix C.

Note: NSW Government Gazette 75 has extended construction hours on weekends for all works which are not high impact, and as such some minor works progressed past 13:00 on Saturdays until 18:00 throughout this reporting period. Refer to Appendix E for the NSW Government Gazette 75.

#### 3.1.2.1 [Eastern Entrance Works](#)

The vibration from the works at the Eastern Entrance (20-28 Chalmers St) can be subjectively considered as continuous or intermittent. Conservatively and based on site observations and what the receivers may experience, the vibration has been classified as continuous when applicable. Continuous vibration is measured in PPV (mm/s). PPV is the preferred parameter for measuring vibration impacts as it can be obtained in real time, whereas VDV is more of a retrospective measure based on time exposure over a prolonged period of operation (i.e. 8hrs or 16hrs). The Chalmers St vibration logger was decommissioned on the 29<sup>th</sup> June 2021 as bulk excavation at Eastern Entrance finished. Attended vibration monitoring was undertaken when necessary.

The measured vibration levels throughout this reporting period were below the screening criteria for cosmetic damage of 25mm/s for reinforced or framed structures. All readings that were measured throughout this period that were above 25mm/s were found to be transient, localised bumps of the geophone. The associated activities with the potential to cause ground borne noise were significantly less than the previous reporting period.

The CSM CNVIS identifies that works at 20-28 Chalmers Street would occur within the human comfort safe working distance of 7m. To minimise potential impacts to human comfort, additional mitigation and management measures were required. The following measures have been implemented in conjunction with community and stakeholder consultation and notification processes outlined in the Additional Mitigation Measures Matrix (AMMM) for ground-borne vibration in Section 8.2 of the CNVMP.

- In accordance with CoA E38, engagement with key stakeholders before the start of high noise/vibration generating activities with the potential to cause ground borne noise to inform, identify and discuss proposed respite periods was carried out. It was agreed with the café owner that respite would be provided for at least an hour around 12:00, and high vibration intensive works will be conducted after 14:30 where feasible, and the dental hospital would advise LORAC of any meetings to coordinate a non-routine respite in that period.
- Ongoing real-time noise and vibration monitoring in place
- Real time notification of exceedance of vibration criteria
- Attended noise and vibration monitoring as required by the construction activities
- Engagement with key stakeholders before high noise/vibration generating activities.

For ease of interpretation, the continuous vibration data for 30 Chalmers Street has been divided into monthly intervals as presented in Appendix B. The monthly graphs were reviewed and days that appeared to have high vibration activity were selected for further assessment at a greater resolution.

Conservatively assuming that vibration levels  $>0.56\text{mm/s}^*$  at the façade of 30 Chalmers St and later at the centre of the site result in ground borne noise within Columbus & Co Central, the maximum level of the human comfort criteria (for residences) may be exceeded resulting in an internal noise level  $L_{Aeq15min}$  greater than 60dB. As such, CoA E37/38 require internal noise limits (associated with ground borne noise) to remain below 60dB for 6.5hrs (or 50% of the time). The data collected throughout the reporting period verifies that works that may have the potential to generate ground borne noise resulting in an internal noise level of greater than 60dB has at no time exceeded 6.5hours per day. Refer to Appendix D for results.

The current reporting period experienced similar high impact activities over the first four months of this reporting period, when compared to previous reporting periods. The last two months of this reporting period showed a reduction of high impact activities with the completion of excavation. The monitoring results are documented in Appendix B.

*\*Max exposure for residences as per Table C1.1- The NSW Vibration Guidelines and reproduced in the CSM CNVMP- Perceptible Vibration Criteria for Exposure to Continuous and Impulsive Vibration*

### 3.2 Vibration

Attended and unattended vibration monitoring was undertaken before and during construction activities during the reporting period where buildings or structures exist within the safe work distances of vibratory plant. In accordance with CoA E31, the project heritage specialist was consulted on locations and methods for installing vibration monitoring equipment on heritage structures at the beginning of the project. A real time vibration logger was installed on the southern façade of the Train Crew Assignment Centre (TCAC) (formerly known as the Central Electric Building) located to the north of Platforms 12/13 and 14/15 on 11 January 2019. It was programmed to log the peak data point every minute. A real time vibration logger was also installed on the northern façade of 30 Chalmers St 10 October 2019. It was programmed to log the peak data point every minute. The TCAC vibration logger was decommissioned on the 29<sup>th</sup> June 2021 as works in the Northern Concourse were no longer deemed to be high vibratory.



The environmental team would review the program/schedule and attend progress meetings to ascertain which construction works may have a vibration impact on the heritage fabric of Central Station and impacts to human comfort at Chalmers St. Predictions of vibration levels based on the safe working distances of various plant as described in Table 8.3 of the CNVMP were made and monitored closely. A screening criteria of 5mm/s peak particle velocity (PPV) was also set (later changed to 7.5 due to excessive number of alerts) at TCAC and 3mm/s for Chalmers St. Alerts are sent to key project team members by the real time vibration logger when vibration management criteria are exceeded. The data would be reviewed, and a determination made as to the risk of the exceedance. Isolated spikes that are spurious and most likely associated with transient events (e.g. footfall) near the vibration monitoring device would typically result in no action, however a general increase in vibration levels would prompt further assessment. The results indicated relatively high ambient vibration levels from the movement of trains.

For ease of interpretation, the continuous vibration data has been divided into monthly intervals (refer to Appendix B). A logarithmic scale has also been applied to declutter and make sense of approximately 43,200 individual data points within any one month as the majority of data points fall below 2mm/s, however interest lies in the higher end of the scale. The major gridlines of the x-axis indicate a 24hr period from 12-midnight to 12 midnight. The minor gridlines of the x-axis indicate 6-hour intervals. The cluster shift can be observed forming a pattern increasing in the day with increase station operations and decreasing at night once trains either stop running or reduce in frequency. Refer to Appendix B for vibration data and interpretation.

## 4. Complaints

There was a total of 112 complaints received during the reporting period, with 110 relating to noise and/or vibration. A break-down of these complaints is shown below:

Month	Noise	Vibration	Other	Monthly Total
February	26	3*	1	27
March	26	0	0	26
April	22	0	0	22
May	11	0	0	11
June	15	2*	1	16
July	10	0	1*	10
Totals	110	5*	3*	112

Table 4-1: Complaint breakdown.

\* Note: Complaints with an asterisk were part of a noise related complaint.

Over this reporting period, 98% of complaints were related to noise & vibration, with 94% of all the complaints being classified as 'unavoidable'. It should be noted that at least 94% of all noise and vibration related complaints were from the same individual complainant. No complaints were received during the July COVID-19 construction shutdown period.

The table below summarised actions undertaken following complaints over the current and past reporting periods, as well as proactive actions undertaken to minimise the number of complaints. Actions listed are in addition to the monthly & quarterly notifications and email update to the overall project database. Any monitoring undertaken and listed below are in addition to the real time loggers installed around the construction site.

Table 4-2: Sensitive receiver monitoring

Sensitive receivers	Monitoring undertaken	Description of action
Sydney Trains / NSW TL	Yes – ongoing	Staff briefings and meetings to cascade information (Performed via virtual meetings due to COVID - restrictions)
GF01, 30 Chalmers St (Columbus & Co Central)	Yes (Feb-May), no longer required (June onwards)	Ad hoc noise monitoring inside the business as required by construction activities Regular catch up with business owner in person or via phone calls (less often due to COVID - restrictions) Weekly email (1WLA): Tailored communication to Café's owner with upcoming potential high noise/vibration impact activities. Note: A new grocery delivery service opened in this reporting period.
GF02, 30 Chalmers St (Gou Sushi)	Not required	Adhoc catch up with business owner, as required by construction activity (less often due to COVID-restrictions).
30 Chalmers St (Building owner/Strata company)	Yes - ongoing	Sharing monthly noise and vibration monitoring report with the building owner/strata manager.
GF, 38 Chalmers St (City Convenience Store, open 24/7)	Not required	Adhoc discussion with business owner (less often due to COVID – restrictions). Discussion with staff/owner about the status of Randle Lane and OOHW at Central Station as required.
2 Chalmers St (Dental Hospital)	Yes - ongoing	Weekly email (1WLA): Tailored email to Hospital's representative if upcoming high noise/vibration impact is scheduled Three work update briefings for key representatives during this reporting period.
GF, 1-5 Randle St (University Preparation College)	As required	Adhoc discussions with key representatives and staff (less often due to COVID – restrictions).
YHA	As required	Adhoc discussion with key representatives and staff (less often due to COVID – restrictions). Tailored email summary about work activities on Platform 1.
Lee Street buildings	As required	Tailored email summary about work activities on Platform 1 and in the Lee Street driveway.
30 Chalmers St + 38 Chalmers T + 1-5 Randle St (106 units)	Yes – real time only, offered as well if required	<ul style="list-style-type: none"> <li>Specific notification and tailored email to provide update related to status of Randle Lane and OOHW at Central Station with the potential to generate high noise/vibration impact.</li> <li>Attended monitoring was undertaken for a resident in 38 Chalmers St in July. Results are detailed in Appendix A.</li> </ul>
52 & 54 Regent Street	Yes – real time	<ul style="list-style-type: none"> <li>Installation of specific real time noise monitoring at the start of the project and noise assessment of truck movements.</li> </ul>

\* As part of the engagement strategy, the Community Relations team delivered a presentation to workers at 20-28 Chalmers Street site to raise awareness of the surrounding neighbourhood, construction work implications and key mitigation measures.

## 5. Conclusion

The requirements for noise and vibration monitoring are detailed in the CNVIS and CNVMP. A combination of both real time and attended monitoring has occurred at the closest sensitive receiver locations on Chalmers St, Platform 1 for YHA and 54 Regent St during this reporting period. These receivers are considered representative of the area and were used to validate the modelled construction noise. Monitoring records have validated modelled noise and are generally consistent with the predicted impact of construction activities on noise sensitive receivers. As discussed in Section 4, there were a total of 112 complaints related to noise and vibration that were received during the reporting period – 94% of which were from the same repeat complainant.

Real time noise and vibration monitoring was conducted 24/7 until the decommissioning of both vibration loggers and the YHA noise logger as works were not deemed significant enough to impact on the nearby sensitive receivers. Attended monitoring was undertaken only as required after the decommissioning of the loggers. The data is checked for compliance during relevant periods of construction including for the duration of rail possessions. Both real-time and attended noise and vibration monitoring has observed exceedances of noise predictions in the CNVIS due to non-construction sources, such as Sydney Trains operations, other non-CSM construction works, road, animal and pedestrian traffic noise.

As determined in the planning phase, the potential for physical at source mitigation was limited for platform releveling works on the suburban platforms. Over the reporting period, there were a few minor exceedances of individual  $L_{Aeq15min}$  periods, which did not change the application of the AMM's given the thorough notification and community engagement strategy emplaced by the Community and Stakeholder Management Team at CSM. The communications element (governed partly by the Communications Strategy and partly by the AMM's) was the key mitigation in meeting the best achievable performance objectives of the CNVIS and community expectation.

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## Appendix A – Noise Monitoring Summary

Date	Time	LOR Works (potentially noisy as per diary entry)	Continuous Real Time or Attended (C or A)	CNVIS SCN	Sensitive Receiver	Observed LAeq15min (dB)	NML for sensitive receiver (dB) (NML=RBL+5dB)	Period Day/Evening/Night	LAeq15min Exceedance of NML (dB)	Adjusted calculation of LAeq15mins (dB) (if applicable)	Adjusted LAeq15mins exceedance of NML (dB) (if applicable)	RBL for Sensitive Receiver	Predicted Exceedance as per OOH for particular activity (RBL)	Exceedance of Predicted OOH (adjusted)	Exceedance of Predicted OOH (non-adjusted)	Comments
3/02/2021	9:30:00	Breaking at Eastern Entrance - northern and central sides throughout the day, 1 plant only.	C	25	Chalmers St	80	61	Day	19	79	18	56	25	0	0	Compliant received from 38 Chalmers St about excavation and groundborne noise at around 2pm on the 3rd. Complaint investigated - two loudest periods of noise listened to. Breaking audible with sporadic pauses. Continues for duration of recording.
3/02/2021	11:45:00	Breaking at Eastern Entrance - northern and central sides throughout the day, 1 plant only.	C	25	Chalmers St	79	61	Day	18	77	16	45	36	0	0	Compliant received from 38 Chalmers St about excavation and groundborne noise at around 2pm on the 3rd. Complaint investigated - two loudest periods of noise listened to. Breaking audible with sporadic pauses. Continues for duration of recording.
5/02/2021	13:15:00	Breaking and excavating close to northern wall of SDH in Eastern Entrance	A	25	Chalmers St	51	61	Day	-10	44	-17	45	36	0	0	Attended noise monitoring carried out at SDH conf room level 1. Breaking was audible until about 3 minute mark, after which respite period commenced. Works were measuring about 65 during breaking and 50 when breaking stopped. Groundborne noise was also evident.
8/02/2021	12:03:00	Breaking and excavating close to northern wall of SDH in Eastern Entrance	A	25	Chalmers St	54	61	Day	-7	51	-10	56	25	0	0	Attended noise monitoring carried out. Muffled breaking audible with some groundborne noise. Aircon running and SDH staff talking in adjacent rooms.
8/02/2021	21:45:00	Complaint received from 38 Chalmers resident at 22:00 complaining of jackhammering.	C	25	Chalmers St	65	58	Evening	7	40	-18	53	28	0	0	Complaint investigated - no loud noise or jackhammering audible during this time. No spike consistent with complaint.
9/02/2021	1:15:00	Breaking at EE - northern and southern sides. Two excavators.	C	25	Chalmers St	71	50	Night	21	70	20	45	36	0	0	Sawcutting audible until 11 minute mark, quiet afterwards. No breaking audible.
9/02/2021	3:00:00	Breaking at EE - northern and southern sides. Two excavators.	C	25	Chalmers St	69	50	Night	19	63	13	45	36	0	0	Sawcutting audible. Also a sharp piercing noise - unsure if related to construction activity or light rail (however believed to be light rail). Sawcutting stops around 4 minute mark and begins at 10 minutes.
12/02/2021	9:04:00	Breaking at eastern entrance - 2x5 tonne hammers, 1x14 tonne, 1x23 tonne. Northern and central northern side.	A	25	Chalmers St	50	61	Day	-11	50	-11	56	25	0	0	Noise monitoring conducted at SDH as breaking was taking place northern side. Groundborne noise, breaking was around 50-55 with intermittent pauses. SDH staff were also talking outside of room
13/02/2021	8:45:00	Breaking at EE - northern and southern sides. Two excavators.	C	25	Chalmers St	75	61	Day	14	70	9	56	25	0	0	Breaking and hammering audible until 10 minute mark.
16/02/2021	16:15:00	Breaking (jackhammering). 3 plant being used, north south and centre of EE. Craneage of spoil out of EE periodically throughout the day.	C	25	Chalmers St	83	61	Day	22	80	19	56	25	0	2	High peak alert. All three plant excavating at once. Light rail also audible in background during pauses in breaking. Intermittent pauses - enough that light rail is audible in background.
17/02/2021	9:45:00	Sawcutting/shotcrete at Eastern Entrance. Breaking also.	C	25	Chalmers St	82	61	Day	21	81	20	56	25	0	1	Spike investigated. Breaking and sawcutting audible on recording with intermittent pauses. High noise activity occurred for <6hrs in blocks not exceeding 3 continuous hours.
19/02/2021	10:00:00	Breaking and sawcutting northern side of eastern entrance.	A	25	Chalmers St	79	61	Day	18	79	18	56	25	0	0	Complaint received from SDH staff about breaking - needed to use rooms on the northern side for training and were concerned that breaking and groundborne noise would be a distraction. Complaint was investigated - breaking and ground borne noise audible, however within project criteria and there were intermittent pauses. Attended monitoring was undertaken in the stair well adjacent to works.
20/02/2021	9:15:00	Breaking and sawcutting at Eastern Entrance - multiple plant.	C	25	Chalmers St	83	61	Day	22	83	22	56	25	2	2	Breaking audible with multiple plant. Sawcutting also audible. Birds squawking in background. Highest noise level investigated. Compliant with internal noise criteria CoA E38. No further assessment required.
22/02/2021	8:00:00	Breaking and excavating at EE. Breaking primarily at northern side. Complaint received at 8:03 from resident at 30 Chalmers complaining about rock breaking and jackhammering noise causing groundborne noise.	C	25	Chalmers St	79	61	Day	18	79	18	56	25	0	0	Noise and vibration data was reviewed to validate the predictions for rock breaking at the Eastern Entrance. Breaking is audible in the recording, however the noise and vibration levels were within the CNVIS predictions for daytime hours.
22/02/2021	10:15:00	Breaking and excavating at EE. Breaking primarily at northern side.	C	25	Chalmers St	84	61	Day	23	84	23	56	25	3	3	Spike investigated. Breaking audible on recording with intermittent pauses. High noise activity occurred for <6hrs in blocks not exceeding 3 continuous hours. Internal noise limits compliant with CoA E38.
23/02/2021	2:15:00	Complaint received from 38 Chalmers resident at 2:04 complaining of loud construction noise and vibration that has woken him up.	C	25	Chalmers St	61	50	Night	11	61	11	45	36	0	0	Complaint investigated - no loud construction noise audible during this time - inconsistent with complaint.
23/02/2021	11:30:00	Breaking and excavating at EE.	C	25	Chalmers St	85	56	Day	29	85	29	51	30	4	4	Loudest noise level investigated. Breaking and excavating audible in recording. High noise spike, however, within E38 condition criteria. No further assessment required for day.
27/02/2021	3:06:00	WE35 possession. High noise activities: Central Walk: reveleving on P22/23 (tile removal with road saw).	A	18/25	Chalmers St	60	50	Night	10	60	10	45	37	0	0	Background monitoring on Chalmers St. No CSM works.
27/02/2021	3:15:00	WE35 possession. High noise activities: Central Walk: reveleving on P22/23 (tile removal with road saw).	A	18/25	Chalmers St	67	50	Night	17	67	17	45	36	0	0	5 measures from 03:15: all but one above 65dB outlier 61dB.  Road saw operating northern area of P22/23. back ground level in absence of work is ~60dB. Highest equivalent noise level at the continuous real time noise logger was 72dB, however the logger was closer to the works (78m Vs 110m).

27/02/2021	4:47:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw).	C	18/25	Chalmers St	65	50	Night	15	65	15	45	36	0	0	2 measures from 05:30. 66dB and 65dB.  Road saw operating northern area of P22/23. back ground level in absence of work is ~60dB. Highest equivalent noise level at the continuous real time noise logger was 72dB, however the logger was closer to the works (78m Vs 110m).
27/02/2021	5:30:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw).	C	18/25	Chalmers St	70	50	Night	20	70	20	45	36	0	0	2 measures from 04:47. 65dB and 62dB.  Road saw operating northern area of P22/23. back ground level in absence of work is ~60dB. Highest equivalent noise level at the continuous real time noise logger was 70dB, however the logger was closer to the works (78m Vs 110m).
27/02/2021	6:15:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw).	A	18/25	Chalmers St	84	50	Night	34	84	34	45	36	3	3	<b>Note: Attended monitoring location - P20/21 at source of high noise.</b>  Measurement taken to compare to noise level at guards room and stairs later on. Tile removal - road saw operating. No guards standing close. Adequate pauses. Other ST related noise audible.  Data extrapolated demonstrates compliance at facade of nearest sensitive receiver.
27/02/2021	6:30:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw).	A	18/25	Chalmers St	80	50	Night	30	80	30	45	36	0	0	Attended monitoring location - P20/21 at source of high noise. Measurement taken to compare to noise level at guards room and stairs later on. Tile removal - road saw operating. No guards standing close. Adequate pauses. Other ST related noise audible.
27/02/2021	7:00:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw).	A	18/25	Chalmers St	78	56	Day	22	74	18	51	30	0	0	Location: P20/21 guards room. Final measurement taken: 77.5 during tile removal. Other ST related noise audible.
27/02/2021	7:30:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw).	A	18/25	Chalmers St	75	56	Day	19	72	16	51	30	0	0	Location: Mid platform between noise blankets/ATF and works. Closest works are platform releveling and canopy modification. Microphone angled towards tile breaking. At mid platform, trains louder than works. Background noise in station also. At 5 minute mark, the logger was moved back from the works approx 5m because a ST customer almost ran into it without looking. Other ST related noise audible.
27/02/2021	8:35:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering.	A	18/25	Chalmers St	69	56	Day	13	66	10	51	30	0	0	Location: Chalmers St next to light rail. Drilling now audible at EE. Light rail is slightly louder than breaking at EE and works on P22/23. Logger was moved to Chalmers St café at around 12 minute mark because it started to rain. Other ST and city related noise audible.
27/02/2021	8:50:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering.	A	18/25	Chalmers St	68	56	Day	12	65	9	51	30	0	0	Location: Chalmers St café facade. Second monitor undertaken for EE breaking. Groundborne noise. Someone yells in monitor at 2 minute mark, woman from café comes out and complains about the noise at about 5 minutes. Other ST and city related noise audible.
27/02/2021	10:30:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering.	A	18/25	Chalmers St	79	56	Day	23	76	20	51	30	0	0	Second monitoring at source on P20/21. Other ST related noise audible.
27/02/2021	10:55:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering.	A	18/25	Chalmers St	88	56	Day	32	85	29	51	30	4	7	<b>Note: Attended monitoring location - P20/21 at source of high noise.</b>  Monitoring on southern side of P20/21. Road saw operating, noise very high so respite period asked for - drops the noise level by a few dB. NB: no noise blankets in one section closest to guards. Other ST related noise audible.  Data extrapolated demonstrates compliance at facade of nearest sensitive receiver.
27/02/2021	11:25:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering.	A	18/25	Chalmers St	81	56	Day	25	78	22	51	30	0	0	Monitoring same location as previous. Respite period until 9 minutes then road saw begins again. Other ST related noise audible.
27/02/2021	11:46:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering.	A	18/25	Chalmers St	80	56	Day	24	76	20	51	30	0	0	Location - middle of platform 21. Loading materials down drop chute on P22/23. No ATF or noise blankets erected. Other ST related noise audible.
27/02/2021	12:23:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering. Northern Concourse: removal of canopy units, south of TCAC upper concourse slab demolition western portion	A	35	Chalmers St	76	56	Day	20	64	8	51	30	0	0	Location: northern concourse. Quick assessment at source: 86. At guards area: 76.
27/02/2021	15:00:00	WE35 possession. High noise activities: Central Walk: releveling on P22/23 (tile removal with road saw). Canopy modification works. Breakthrough at EE - breaking and hammering. Northern Concourse: removal of canopy units, south of TCAC upper concourse slab demolition western portion	A	35	Chalmers St	79	56	Day	23	79	23	51	30	0	0	Northern concourse at P11 guards area. Hammering in NC with intermittent pauses.

1/02/2021	3:00:00	Arrival of truck & dogs for collection of spoil from CSM via SYAB. Rockpiling	C	39	Regent St	64	49	Night	15	49	0	44	20	0	0	Compliant received from Regent St resident about loud rockpiling the night before. Complaint investigated. Noises associated with LOR construction somewhat audible, however often drowned out by Syd Trains noise.
2/02/2021	1:00:00	Arrival of truck & dogs for collection of spoil from CSM via SYAB	C	39	Regent St	62	49	Night	13	41	-8	44	20	0	0	Compliant received from Regent St resident about loud rockpiling the night before. Complaint investigated. Truck drives into SY at around 2 min mark. Other than that, two trains go past every 7 minutes or so. No other construction noise audible.
20/02/2021	1:15:00	Arrival of truck & dogs for collection of spoil from CSM via SYAB	C	39	Regent St	63	49	Night	14	38	-11	44	20	0	0	No construction noise audible. Trains audible in background.
25/02/2021	4:15:00	Arrival of truck & dogs for collection of spoil from CSM via SYAB	C	39	Regent St	67	49	Night	18	42	-7	44	20	0	3	Motorbike revs at 1 minute mark - likely accounts for loud noise. Trains in background. No other construction noise audible.
2/02/2021	3:15:00	Works on Platforms 18-23 - reo, posts, panels for hoarding for install. Concrete breaking.	C	18	YHA	76	54	Night	22	51	-3	49	24	0	3	No construction noise audible - spike likely related to diesel train idling.
11/02/2021	3:15:00	Works on Platforms 18-23. Hammering P18/19.	C	18	YHA	73	54	Night	19	48	-6	49	24	0	0	No construction noise audible - spike likely related to diesel train idling.
18/02/2021	3:15:00	Works P22/23.	C	18	YHA	78	54	Night	24	53	-1	49	24	0	5	No construction noise audible - spike likely related to diesel train idling.
23/02/2021	3:15:00	Works on Platforms 18-23 and NC works.	C	18	YHA	75	54	Night	21	67	13	49	24	0	2	NC works audible. Many pauses in works.
26/02/2021	3:45:00	NC TCAC works.	C	18	YHA	73	54	Night	19	69	15	49	24	0	0	NC sawcutting and underpinning works audible. Plenty of pauses.

Date	Time	LOR Works (potentially noisy as per diary entry)	Continuous Real Time or Attended (C or A)	CNVIS SCN	Sensitive Receiver	Observed LAeq15min (dB)	NML for sensitive receiver (dB) (NML=RBL+5dB)	Period Day/Evening/Night	LAeq15min Exceedance of NML (dB)	RBL for Sensitive Receiver	Predicted Exceedance as per OOH for particular activity (RBL)	Exceedance of Predicted OOH (adjusted)	Exceedance of Predicted OOH (non-adjusted)	Comments
2/03/2021	12:15:00	Breaking at Eastern Entrance with two hammers. One north side one south side.	C	25	Chalmers St	84	61	Day	23	56	25	1	3	Breaking audible. Light rail also audible in background. Spike likely caused by 14T hammer operating close to logger, and also when working concurrently with other hammer. Adequate respite was observed for the day.
3/03/2021	8:15:00	Breaking and excavating at EE. Cranage of materials out of EE. Both excavators southern side.	C	25	Chalmers St	83	61	Day	22	56	25	1	2	Breaking audible, intermittent pauses yet fairly consistent throughout. Compliant with internal noise levels in accordance with CoA E38.
3/03/2021	17:15:00	Works at EE ended.	C	25	Chalmers St	76	58	Evening	18	53	28	0	0	Light rail and trains in background. Birds also squawking in background, particularly loud and right next to monitor at around 10 minute mark. Loud noise attributed to this.
4/03/2021	3:00:00	Central Walk excavate P22/23 escalator. Scaffold removal in Northern Concourse. No works in Eastern Entrance.	C	25	Chalmers St	66	50	Night	16	45	36	0	0	Very soft extraction fan in background. Train brakes squeaking causing relatively high pitched noise. High noise attributed to street sweeper going by - goes by same time each night, accounting for spikes around 3am each night. No construction noise can be attributed to spike.
6/03/2021	2:30:00	Sawcutting at Central Walk.	C	25	Chalmers St	73	50	Night	23	45	36	0	0	Street sweeper goes past at 5 minute mark. Light rail also audible. Bursts of sawcutting.
8/03/2021	1:45:00	Minor works on P16/17 - reinstating hoarding, unloading equipment using hi rail, sawcutting/drilling. Dewatering adit. Excavate P22/235 and P20/215. No works in Eastern Entrance.	C	25	Chalmers St	68	50	Night	18	45	36	0	0	Sawcutting most audible. Light rail also audible, about the same tone as cutting.
9/03/2021	14:25:00	Breaking with multiple plant at Eastern Entrance. Detailed excavation happening directly next to northern side (SDH).	A	25	Chalmers St	55	61	Day	-6	56	25	0	0	Attended noise monitoring undertaken as Enviro Advisor observed groundborne noise at EE. Location was Level 1 SDH adjacent to Clinical Directors room as conference room was busy. As a result, more noise was audible inside SDH from people talking as there was no buffer. No groundborne noise inside building. Both Clinical Director and another doctor noted that the noise was quiet today, despite breaking happening right next to SDH.
10/03/2021	14:34:00	Concrete breaking occurring underneath P20/21 at the southern side.	A	18	Chalmers St	86	61	Day	25	56	25	4	5	<b>Note: Attended noise monitoring undertaken at southern end of P20/21 next to hoarding (directly at works, not at sensitive receivers [SRs]).</b>  Instantaneous measurement taken first - during breaking, dB was between 88 and 92. Some ST noise also, but less audible than breaking. No guards standing next to worst affected area. Breaking pauses temporarily for 4 minutes between 14:37 and 14:41. Noise dissipates by the time it reaches Chalmers St SRs.
12/03/2021	19:30:00	Breaking and excavating - 2 hammers working on side, central and southern sides.	C	25	Chalmers St	74	58	Evening	16	53	28	0	0	Heavy downpour very audible. Loud thunder strike. At around 10:45, emergency response vehicle siren audible in background. Light rail audible in background. No construction noise audible.
15/03/2021	16:03:00	Sawcutting and breaking occurring at EE.	A	25	Chalmers St	66	61	Day	5	56	25	0	0	Attended noise monitoring occurred at the hoarding of Eastern Entrance (northern side) during sawcutting to garner a comparative measurement between noise at source and outside of hoarding. Light rail was significantly louder than sawcutting behind hoarding.
16/03/2021	13:07:00	Sawcutting and cranage of materials out of EE.	A	25	Chalmers St	66	61	Day	5	56	25	0	0	Attended noise monitoring occurred at the hoarding of Eastern Entrance (northern side) during sawcutting to garner a comparative measurement between noise at source and outside of hoarding. Light rail was significantly louder than sawcutting behind hoarding.
17/03/2021	1:30:00	Central Walk: muck out adit and create ramp down from P20/215, P20/21 hammer out and set stair access at shotcrete. Dewatering check in ghost platform. No works in EE.	C	25	Chalmers St	65	50	Night	15	45	36	0	0	High spikes in LaMax attributed to Light Rail going past and squeaking on tracks. No construction noise audible.
17/03/2021	2:45:00	Central Walk: muck out adit and create ramp down from P20/215, P20/21 hammer out and set stair access at shotcrete. Dewatering check in ghost platform. No works in EE.	C	25	Chalmers St	62	50	Night	12	45	36	0	0	LaMax spike attributed to bird squawking next to logger at around 5 minute mark and emergency response vehicle driving past at around 12 minute mark. No construction noise audible.
17/03/2021	3:15:00	Central Walk: muck out adit and create ramp down from P20/215, P20/21 hammer out and set stair access at shotcrete. Dewatering check in ghost platform. No works in EE.	C	25	Chalmers St	62	50	Night	12	45	36	0	0	Complaint received at 3:14am from 38 Chalmers St from Paul Stevenson regarding noise. Complaint was investigated. No construction noise audible. Slight spike in LaMax caused by bins being emptied/something being dragged adjacent to the logger on the street.
17/03/2021	12:37:00	Sawcutting and breaking on northern side at Eastern Entrance.	A	25	Chalmers St	75	61	Day	14	56	25	0	0	Attended noise monitoring carried out on Randle Lane behind works on northern side. Wanted to gauge sawcutting noise level by itself but was unable to without breaking for Randle Lane residents. Conditions very windy. Trucks drove past at 13 and 14 minute mark. Breaking much louder than sawcutting.



17/03/2021	13:20:00	TCAC works in Northern Concourse (drilling for load transfer and underpinning). NB: noise blankets now installed at NC adjacent to escalators. Windows covered.	A	25	Chalmers St	71	61	Day	10	56	25	0	0	Monitoring undertaken where guards stand at Northern Concourse. Instantaneous level at source was between 75 and 80dB. NC works audible, other ST noise audible. Man's wheelchair reversing at 7 minute mark very loudly beeping.
18/03/2021	12:00:00	Concrete escalator pour. TCAC works in Northern Concourse (drilling for load transfer and underpinning). Breaking/excavating at EE.	C	25	Chalmers St	77	56	Day	21	51	30	0	0	Breaking and hammering audible throughout recording. Only one hammer working at a time. Within predictions.
20/03/2021	19:00:00	Breaking/excavating at EE. Heavy rain.	C	25	Chalmers St	68	58	Evening	10	53	28	0	0	Slight evening spike. Light rail audible throughout recording. Squeaky train breaks from ST also audible, as well as announcements and doors closing. Heavy rain begins at around 7:00, likely accounting for the increase in LaEQ.
21/03/2021	23:00:00	Excavation of heading 23-5A Central Walk. Removal of noise blankets and ATF hoarding to P18 tiling area. Loaded onto hi rail and sent away.	C	18/25	Chalmers St	70	50	Night	20	45	36	0	0	Noise levels increase from normal Chalmers St levels at around 21:15. Bird sitting adjacent to logger chirping very loudly from the beginning of the recording. Light rail also audible. Bird continues throughout recording - source of loud noise.
23/03/2021	2:30:00	Hammering standstone in between the P18/19 C2 columns. Hammer out column footings. P22/23S excavation. Northern concourse: installation of formwork to wall for pour tomorrow. Ballustrade and handrail installation. Diversion of services in preparation for plank demo.	C	18/25	Chalmers St	66	50	Night	16	45	36	0	0	LAMAX spike at 9:15. Someone hitting something metal in distance (loud clanging). Unlikely to be construction noise related.
23/03/2021	22:15:00	Hammering standstone in between the P18/19 C2 columns. Hammer out column footings. P22/23S excavation. Northern concourse: installation of formwork to wall for pour tomorrow. Ballustrade and handrail installation. Diversion of services in preparation for plank demo.	C	18/25	Chalmers St	69	50	Night	19	45	36	0	0	Same chirping bird sitting adjacent to logger and chirping throughout recording. Light rail also audible in background. No construction noise audible
25/03/2021	20:30:00	1.7t excavator onsite at Central Walk. P22/23S excavation of tapered wall. East Entrance: excavator removal to Randle Lane. Lower Northern Concourses stair 1 balustrade and handrail installation.	C	18/25	Chalmers St	64	50	Night	14	45	36	0	0	Complaint received from PS at 20:35 in relation to jackhammering, which he says has been going on past 6pm. Community team believed that there was a chance that he was able to hear night time excavation coming from Central Walk. Some light construction noise audible from CW but no breaking audible. Light rail and trains/announcements from station are significantly louder than CW works.
26/03/2021	1:15:00	P18/19 excavate and hammer out. P20/21 remove ramp. P22/23 new permit to hammer out sandstone to make ramp. Lower Northern Concourses stair 1 balustrade and handrail installation.	C	18/25	Chalmers St	66	50	Night	16	45	36	0	0	Some light construction noise in background. Light rail and trains also (much louder). Emergency response vehicle drives by at around 5 minute mark - source of spike.
26/03/2021	11:45:00	Breaking and excavating at EE. Cranage out of materials.	C	18/25	Chalmers St	82	56	Day	26	51	30	1	1	Breaking audible. Two plant working simultaneously. Intermittent pauses. Light rail also audible. Larger breaker likely adjacent to SDH on the northern side due to the volume of breaking. High noise activity occurred for <6hrs in blocks not exceeding 3 continuous hours.  Compliant with internal noise levels in accordance with CoA E38.
26/03/2021	18:15:00	P18/19 excavate and hammer out. P20/21 remove ramp. P22/23 new permit to hammer out sandstone to make ramp. Lower Northern Concourse stair 1 balustrade and handrail installation.	C	18/25	Chalmers St	70	58	Evening	12	53	28	0	0	Light rail in background. No construction noise audible.
27/03/2021	23:00:00	Excavation of P22/23.	C	18/25	Chalmers St	66	50	Night	16	45	36	0	0	Complaint received at 23:25 about rock breaking or pneumatic hammer noise coming from site from PS. Light rail/trains in background. Light construction noise coming from Central Walk (extraction fan can be heard). Horn honks at 30 seconds. No breaking/hammering audible.
28/03/2021	17:45:00	Breaking and excavating at EE. Cranage out of materials.	C	18/25	Chalmers St	65	56	Day	9	51	30	0	0	Complaint is 18:03 from PS about "excessive noise from site". Light rail, trains and birds squawking audible. People talking on Chalmers St also. No construction noise audible.
28/03/2021	20:15:00	Breaking out works under soffit 19/20 CW. Green cut concrete. Excavating P22/23 and P18/19. Drilling bolts at P18/19 southern escalators. NC: ongoing balustrade installation. Continue demolition of TCAC column pockets.	C	18	Chalmers St	67	50	Night	17	45	36	0	0	Complaint at 20:13 from PS about jack hammering. Complaint investigated - jackhammering audible in distance. Intermittent pauses. Hammering not louder than passing light rail. No works happening at Eastern Entrance, noise likely from Central Walk P22/23. Noise levels still in predictions. Additional noise mitigation (noise blankets) will be implemented at the hoardings of each platform to mitigate noise coming from site at nights.
29/03/2021	15:45:00	Breaking and excavating at EE. Cranage out of materials. Sawcutting at EE also.	C	18/25	Chalmers St	83	56	Day	27	51	30	0	2	Loud unidentified noise audible for the first 15 seconds of recording, then abruptly stops. Unsure whether noise is construction related or not. Light breaking and sawcutting audible from EE. Light rail and train movements also. Noise investigated, attributed to Hanave works happening in Randle Lane.
30/03/2021	9:00:00	Breaking and excavating at EE. Cranage of materials out of EE.	C	18/25	Chalmers St	82	56	Day	26	51	30	1	1	Breaking audible. Two plant working simultaneously. High noise activity occurred for <6hrs in blocks not exceeding 3 continuous hours.  Compliant with internal noise levels in accordance with CoA E38.

31/03/2021	2:45:00	No potentially noisy works as per diary.	C	18/25	Chalmers St	77	50	Night	27	45	27	0	5	Loud noise from 7:00 to 10:00 minutes. Definitely a vehicle of some sort but unsure exactly whether construction related or not. Unidentified noise from an unidentified source. Not consistent with works for that night so likely non construction related. Noise investigated, attributed to Hanave works happening in Randle Lane.
31/03/2021	7:15:00	No potentially noisy works as per diary. Breaking works do not start until 8:00.	C	35	Chalmers St	76	56	Day	20	51	30	0	0	Loud noise from 7:00 am to 8:00 am. Definitely a vehicle of some sort but unsure exactly whether construction related or not. Unidentified noise from an unidentified source. Not consistent with works for that night so likely non construction related. Light rail also audible. Noise investigated, attributed to Hanave works happening in Randle Lane.
9/03/2021	10:45:00	Truck and dog movements over SYAB bridge.	C	39	Regent St	99	60	Day	39	55	9	10	35	LaMax: 117.4 dB. Works adjacent to logger - not related to CSM works. Sounds like metal clanging. Metal clanging sounds happen for duration of recording. Sounds almost like someone attempting to come into site, or something banging in the wind as repetitive and consistent. Cars and trains also audible in background.
12/03/2021	10:30:00	Truck and dog movements over SYAB bridge.	C	39	Regent St	87	60	Day	27	55	9	0	23	LaMax: 111 dB. Noise similar to a sucker/sweeper happens occasionally throughout the recording, most notably from the 13/14 minute mark - seems like something turns on that releases a rush of air, and a horn sound is heard at the same time. Not related to CSM however sounds most like the diesel train.
12/03/2021	11:30:00	Truck and dog movements over SYAB bridge.	C	39	Regent St	85	60	Day	25	55	9	0	21	LaMax: 111.3 dB. Train goes past at 13:30 approximately, accounting for loud spike. No CSM noise audible.
12/03/2021	19:15:00	Truck and dog movements over SYAB bridge.	C	39	Regent St	72	55	Evening	17	50	14	0	8	LaMax: 100.7 dB. Heavy rain audible on recording which is accounting for loud noise throughout. Also loud drips of rain falling close to monitor skewing results. No CSM or ST noise.
29/03/2021	5:15:00	Truck and dog movements over SYAB bridge.	C	39	Regent St	65	49	Night	16	44	20	0	1	Complaint received at 5:22 from resident at Park Lane overlooking Central Station complaining of noise the last few nights being woken up by trucks / moving rubbles in the yard at base of the bridge. Complaint was investigated - truck movements could be heard, but no tailgate banging or moving of rubble. Trains were also audible in the background that were equally as loud as truck.
1/03/2021	20:15:00	CW: 22/23 install steel work and form double column. Close out defects, housekeeping. 20/21 excavate hit 3. P18/19 east wall trim. NC: 20mm sawcut for control joints in new topping slab. Continuation of sprinkler pipe install.	C	18/34	YHA	78	57	Evening		52	22	0	4	Intercity trains idling on tracks.
6/03/2021	4:15:00	No CSM works happening that could affect sensitive receivers. SCN 34 chosen as closest works.	C	34	YHA	81	54	Night	27	49	25	0	7	Intercity trains idling on tracks.
9/03/2021	11:15:00	CW: excavate a trench in 22/235, excavate 20/215, fix 25t excavator and break baggage tunnel roof and northern wall. NC: installation of steel angles to stair 1 wall bolted connection to awning post. Hoarding amendment. Continuation of sprinkler pipe install and installation of catenary wires for upcoming cabling for fire systems.	C	18/34	YHA	94	64	Day	30	59	15	0	20	Intercity trains idling on tracks.
24/03/2021	20:45:00	NC: stair 1 balustrade and handrail installation. Framing to western canopy. Strip hoarding that is currently on precast planks adjacent to P16 and rebuild on the new x5 welded posts. Finalisation of rectification to the spoiler and installation of final flashing piece. Continuation of transitional roofing framing and panelling. Prop installation below track 16, topping slab removal	C	34	YHA	78	54	Night	24	49	25	0	4	Intercity trains idling on tracks.

Date	Time	LOR Works (potentially noisy as per diary entry)	Continuous Real Time or Attended (C or A)	CNVIS SCN	Sensitive Receiver	Observed LAeq15min (dB)	NML for sensitive receiver (dB) (NML=RBL+5dB)	Period Day/Evening/Night	LAeq15min Exceedance of NML (dB)	RBL for Sensitive Receiver	Predicted Exceedance as per OOH for particular activity (RBL)	Exceedance of Predicted OOH (adjusted)	Exceedance of Predicted OOH (non-adjusted, with HN penalty)	Comments
1/04/2021	7:15:00	Breaking/excavating at Eastern Entrance. Cranage of materials during day. No works during night.	C	25	Chalmers St	73	61	Day	12	56	16	0	1	Same spike from 31st March today at 3:15. Same generator/machine noise as yesterday. Comms team reaching out to Hanave/linewire to determine where the noise is coming from.
1/04/2021	3:15:00	Breaking/excavating at Eastern Entrance. Cranage of materials during day. No works during night.	C	25	Chalmers St	72	50	Night	22	45	27	0	0	Same spike from 31st March today at 7:15. Same generator/machine noise as yesterday. Comms team reaching out to Hanave/linewire to determine where the noise is coming from.
1/04/2021	22:45:00	Breaking/excavating at Eastern Entrance. Cranage of materials during day. No works during night.	C	25	Chalmers St	65	50	Night	15	53	19	0	0	Complaint received from P5 at 22:40, complaining of machinery noise from either from a generator or jackhammer. Complaint investigated - extraction fan audible, no other construction noise audible. Lightrail/ST announcements are louder. Linewire working on Elizabeth St - excavators, road saws and jackhammers were present and operating.
4/04/2021	20:45:00	Public holiday - no construction activity.	C	25	Chalmers St	71	50	Night	21	45	27	0	0	Spike at 20:45 - LAMax 93. Light rail squeaking very loudly at beginning of recording and throughout. No construction noise audible.
7/04/2021	3:00:00	Excavation of P22/235 for shotcrete. Install fencing on P20/21. Noise blankets installed.	C	25	Chalmers St	68	50	Night	18	45	27	0	0	Drilling noise audible sporadically - not very loud and could be construction related. Spike is caused however by train or light rail tracks squeaking. No other construction noise audible.
8/04/2021	10:00:00	Breaking/excavating at Eastern Entrance. 4 hammers (likely 1x23T, 2x14T and 1x6T)	C	25	Chalmers St	85	61	Day	24	56	25	0	4	Hanave works occurring adjacent to Eastern Entrance site - sandblasting of exterior of building on Randle Lane. Air compressor running, items being moved around. Birds also squawking in background. Works not caused by LOR.
8/04/2021	7:30:00	Breaking/excavating at Eastern Entrance. 4 hammers (likely 1x23T, 2x14T and 1x6T). Doesn't begin until 8am.	C	25	Chalmers St	72	61	Day	11	56	25	0	0	Breaking, excavating. Saw cutting also at same time - accounts for high noise
10/04/2021	3:00:00	Hammering and muck out in CW under platforms. First shift of hard slab demo to test controls in ESR.	C	18	Chalmers St	69	50	Night	19	56	16	0	0	Spike investigated. What sounds like sandblasting/air blasting occurring (consistent with Hanave works next door). Not related to LOR.
11/04/2021	21:30:00	ESR: soft demo of steel stud walls. Breakout of concrete slab. NC: topping slab removal and footing excavation.	C	22	Chalmers St	64	50	Night	14	56	16	0	0	Complaint received from P5 at 21:42 about "jackhammering on a Sunday night". Complaint investigated. No jackhammering noise audible. Only noisy thing during recording was two cats fighting on the street.
12/04/2021	12:00:00	Generator running during respite. Monitoring undertaken to determine the dB of the generator and whether or not it qualified as high noise.	A	25	Chalmers St	76	61	Day	15	56	25	0	0	First attended monitoring session undertaken inside the hoarding. Standing adjacent to the plant. Only spike at 12:05 due to site supervisor coming in and talking to me about the noise level. Noise level very consistent.
12/04/2021	12:07:00	Generator running during respite. Monitoring undertaken to determine the dB of the generator and whether or not it qualified as high noise.	A	25	Chalmers St	66	61	Day	5	56	25	0	0	Second attended monitoring undertaken outside the hoarding in front of the café. Generator barely audible outside of hoarding. People walking, talking and LR activity much louder.
12/04/2021	22:45:00	Central walk muck out. P22/235 excavation. ESR continuation of works: soft demo of steel stuff walls and high level ceiling and commence breakout of concrete slab. NC waterproofing.	C	18	Chalmers St	65	50	Night	15	56	16	0	0	Complaint received from resident at 34 Chalmers regarding "noise coming from Central Station, reverberating noise from an engine or fan". Complaint investigated. Normal extraction fan noise, no other construction noise audible. General LR/ST noise also.
13/04/2021	3:30:00	Central walk muck out. P22/235 excavation. ESR: soft demo of steel stud walls and high level ceiling and commence breakout of concrete slab	C	18	Chalmers St	70	50	Night	20	45	27	0	0	Noise spike at around 3:30 in the morning. Sounds like train squeaking on track, very loud. Only goes for 1 minute, not other noise for rest of recording. Does not appear to be construction related.
14/04/2021	3:15:00	CW: breaking out P18/19 escalator. P22/23 dig to final level, fix pipe. Noise blankets moved to expose the hole in the hoarding on the platform to allow for monitoring. P205 C2 excavate stub. ESR: load out broken concrete/rear material and breaking slab using brokk machine.	C	18	Chalmers St	65	50	Night	15	45	27	0	0	Complaint received from P5 at 3:22. Declined to provide specifics about what he was actually complaining about. No construction noise audible. Noise level within predictions.
14/04/2021	4:45:00	CW: breaking out P18/19 escalator. P22/23 dig to final level, fix pipe. Noise blankets moved to expose the hole in the hoarding on the platform to allow for monitoring. P205 C2 excavate stub. ESR: load out broken concrete/rear material and breaking slab using brokk machine.	C	18	Chalmers St	64	50	Night	14	45	27	0	0	Complaint received from resident at 38 Chalmers St (not P5) about "construction workers yelling". Recording listened to - definitely howling audible, very loud. Seems that the yelling starts from a distance, and moves closer to the logger, indicating that the yelling could be from the street. Also louder than any train/LR noise, which if coming from platforms, would be unlikely. Night shift supervisors confirm no yelling from platforms - likely coming from someone on Chalmers St.
15/04/2021	7:30:00	Breaking and saw cutting. Cranage of materials at EE.	C	25	Chalmers St	72	61	Day	11	56	25	0	0	Engine noise running, truck movements also audible. Also noises of metal materials being moved. Time-lapse indicates that materials were being craned out prior to excavation beginning.
19/04/2021	16:30:00	Breaking and saw cutting. Cranage of materials at EE.	C	25	Chalmers St	80	61	Day	19	56	25	0	0	Breaking audible until 13 minute mark.
19/04/2021	21:39:00	P235 C2 excavation. No works at EE. Complaint received from resident at 38 Chalmers complaining of "loud machinery operating from Central Station work site".	C	18	Chalmers St	64	50	Night	14	45	27	0	0	Complaint investigated. No construction noise audible.

20/04/2021	10:45:00	Finishes works on platforms - no noisy works on platforms. ESR breakthrough commenced for new beam location.	C	18/22	Chalmers St	77	61	Day	16	56	16	5	5	Machine noise audible, however does not seem consistent with extraction fan.
20/04/2021	2:45:00	Finishes works on platforms - no noisy works on platforms. ESR breakthrough commenced for new beam location.	C	18/22	Chalmers St	71	50	Night	21	45	27	0	0	15 minute exceedance due to high noise works due to respite. Air blower and generator operating during respite. Site engineer indicated he did not realise that air blowing constituted a high noise activity.
21/04/2021	4:16:00	Noise complaint from PS. No specifics.	C	25	Chalmers St	63	50	Night	13	45	36	0	0	Extraction fan audible from traffic deck. No other construction noise, esp. no noise at EE.
22/04/2021	10:23:00	Demolition south Northern Concourse - brokk and handheld jack hammer.	A	34	Chalmers St	79	61	Day	18	56	18	5	5	Attended monitoring undertaken adjacent to lifts where guards stand at Northern Concourse. Jackhammering and brokk both going. Handheld jackhammer was going, noise blankets were unable to be fully erected due to EWP needing to be raised. Distance from commuters <5m, exposure limited as commuters are transient.
23/04/2021	8:00:00	Breaking and excavating at Eastern Entrance. Saw cutting also. Tower crane operating.	C	25	Chalmers St	80	61	Day	19	56	25	0	0	Air blasting and generator operating prior to breaking/excavating works. Crane also audible. Sounds like saw cutting also happening from around 5 minute mark.
25/04/2021	18:45:00	CW: Hammer CB2 column and column footing, P20/21S break southern and northern footing as per permit, P18/19N under bore continue drilling. No other LOR works.	C	18	Chalmers St	72	58	Evening	14	53	19	0	0	Light rail and trains noise. At 1 minute mark, it sounds like a low flying plane goes over the site, accounting for the spike. No EE works during this time and no other construction noise audible.
25/04/2021	9:30:00	CW: Hammer CB2 column and column footing, P20/21S break southern and northern footing as per permit, P18/19N under bore continue drilling. No other LOR works.	C	18	Chalmers St	70	61	Day	9	56	16	0	0	Train and light rail noise with squeaky breaks. No construction noise.
28/04/2021	3:00:00	CW: Excavate north and south face to correct RL to get ready for blinding, North and South CB2 column footing to be excavated to correct RL and ensure notches are excavated to correct depth, Excavate P23 C2 South. Painting P22/23 guards room, cladding panel install.	C	18/25	Chalmers St	71	50	Night	21	45	36	0	0	Little spike at 3 am - seems to be attributed to both a street sweeper going past along with squeaky light rail brakes. Some construction noise in the background, however is likely attributed to LW working in area and not LOR.
29/04/2021	9:00:00	Noise complaint from PS about jackhammering and building shaking. Breaking/excavating at EE.	C	25	Chalmers St	80	61	Day	19	56	25	0	0	Excavating works heard throughout as definitive source of noise. However, due to day works, dB is within predictions. Vibration below 1mm/s PPV for the 15 minute period also.
30/04/2021	2:45:00	Muck out P20/21. Hi rail delivery P16/17. P22/23 cladding.	C	18/25	Chalmers St	73	50	Night	23	45	36	0	0	Trains audible, also loud clanging (I assume coming from Chalmers St because very loud) - sounds like someone hitting something against a pole. Could potentially be works on P22/23 but the clanging only happens for about 10 seconds. Also a buzzing sound which could be drilling? LR is louder than that overall however.
30/04/2021	1:15:00	Muck out P20/21. Hi rail delivery P16/17. P22/23 cladding.	C	18/25	Chalmers St	68	50	Night	18	45	36	0	0	Sounds like machine/engine powering on and increasing in volume. Goes for about 8 minutes. Burst of drilling at the end but only for a couple of seconds. This machine I really don't know what it could be but its happening at the same time most mornings.
6/04/2021	4:45:00	Trucks entering SYAB.	C	39	Regent St	68	49	Night	19	44	27	0	0	Plane flying overhead and cars driving past. Truck audible going over bridge at 13 minute mark. No other construction noise audible.
8/04/2021	3:30:00	Trucks entering SYAB.	C	39	Regent St	64	49	Night	15	44	27	0	0	Alarm audible (unsure whether from site or not), however it is very faintly in background and unlikely causing any disturbance. Cars driving past audible. Begins to rain at about 8 minute mark. Truck drives into site at about 12 minute mark.
14/04/2021	4:15:00	Trucks entering SYAB.	C	39	Regent St	68	49	Night	19	44	27	0	0	Birds chirping. Cars driving on Regent St. Trains in background. Truck enters at 10:30 minutes.
20/04/2021	3:45:00	Trucks entering SYAB.	C	39	Regent St	64	49	Night	15	44	27	0	0	Trains going by in background intermittently. A drilling/engine sound is audible intermittently also, however unsure whether related to site or not. No truck audible.
2/04/2021	12:15:00	Works in northern concourse - drilling, demo prep, tiling.	A	34	YHA	85	64	Day	21	54	20	6	11	Attended monitoring undertaken adjacent to lifts where guards stand at Northern Concourse. Jackhammering and brokk both going. handheld jackhammer was going, noise blankets were unable to be fully erected due to EWP needing to be raised. Distance from potential commuters <5m. Exposure would be limited due to transient area.  Negligible impact on YHA/Chalmers St.
5/04/2021	23:00:00	Works in northern concourse - drilling, demo prep, tiling.	C	34	YHA	78	54	Night	24	49	25	0	4	Spike related to diesel train idling on Platform 1 for duration of recording. Whistle from train conductor also being blown. No construction noise audible.
8/04/2021	20:15:00	Demolition in Northern Concourse	C	34	YHA	79	54	Night	25	49	25	0	5	Car idling on ambulance drive. Drives away at around 5 minute mark. After car drives away, light drilling audible, however much quieter than car. Extraction fan also audible very faintly in background. Car drives past YHA again at 6:08. Sound of pressure being released like steam - likely from a train idling on a platform nearby due to volume.
12/04/2021	7:15:00	Demolition in Northern Concourse	C	34	YHA	79	64	Day	15	54	20	0	5	Diesel train idling on Platform 1 throughout recording. Announcements also audible. No construction noise audible.

22/04/2021	10:23:00	Demolition south Northern Concourse - brokk and handheld jack hammer.	C	34	YHA	79	64	Day	15	54	20	0	5	Diesel train idling and letting off steam on Platform 1 throughout recording. No construction noise audible.
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Date	Time	LOR Works (potentially noisy as per diary entry)	Continuous Real Time or Attended (C or A)	CNVIS SCN	Sensitive Receiver	Observed LAeq15min (dB)	NML for sensitive receiver (dB) (NML=RBL+5dB)	Period Day/Evening/Night	LAeq15min Exceedance of NML (dB)	RBL for Sensitive Receiver	Predicted Exceedance as per OOH for particular activity (RBL)	Exceedance of Predicted OOH (adjusted)	Exceedance of Predicted OOH (non-adjusted, with HN penalty)	Comments
1/05/2021	23:45:00	Drilling/hammering P22/23	C	20	Chalmers St	65	50	Night	15	45	27	0	0	Drilling and hammering at Eastern Entrance audible. Relatively sporadic but constant throughout recording. LR is present also.
4/05/2021	2:15:00	CW: Excavate 20/21 escalator sump and launch pit. 20/21 guard room demo.	C	20	Chalmers St	69	50	Night	19	45	36	0	0	Construction noise audible in background. Excavation not audible, work on platforms audible however. Noise is consistent, no obvious spikes.
6/05/2021	8:30:00	Breaking and excavating and crange of materials at Eastern Entrance.	C	25	Chalmers St	86	61	Day	25	56	25	5	5	Breaking playing consistently in background, throughout recording. Only spike above 85 for whole day. Multiple plant audible.  Compliant with internal noise levels in accordance with CoA E38.
6/05/2021	23:00:00	P20/21 Escalator CW: Excavate until soffit pour starts, breaking after concrete pour. Saw cutting service trenches.	C	20	Chalmers St	68	50	Night	18	45	27	0	0	Light rail, trains, announcements and whistles. Heavy rain starts to pour at beginning of recording. Very light construction noise audible, some hammers, only sporadically. Rain pours heavier throughout recording, likely the source of spike.
10/05/2021	1:15:00	CW: excavate 20/21 underbore lauch pit, bolt barriers, hard demo CSA pod	C	20	Chalmers St	66	50	Night	16	45	27	0	0	Light rail goes by two times during audio, second time with very squeaky brakes. No construction noise audible.
11/05/2021	3:15:00	CW: excavate 20/21 underbore lauch pit, bolt barriers, hard demo CSA pod	C	20	Chalmers St	69	50	Night	19	45	27	0	0	Very light construction noise audible - extraction fan in background. Some hammering and drilling coming from platforms, goes for a couple of minutes sporadically.
11/05/2021	23:30:00	CW: woks on P20/21 north and south. Demo of P20/21 Pod and 22/23 Pod (contingency). Excavation and saw cutting in MB (likely not audible from Chalmers).	C	20	Chalmers St	71	50	Night	21	45	27	0	0	Construction noise audible on platforms. At about 4 minute mark, loud burst of drilling occurs for about 15 seconds, but likely accounts for spike. Same drilling noise happens periodically throughout recording. LR in background also.
12/05/2021	8:00:00	Breaking and excavating and crange of materials at Eastern Entrance. 3x8 ton excavators, 1x5 ton excavator. Sawcutting also.	C	25	Chalmers St	84	61	Day	23	56	25	3	3	Breaking audible, sawcutting audible in background. Both go for almost the entirety of recording.  Compliant with internal noise levels in accordance with CoA E38.
12/05/2021	8:45:00	Breaking and excavating and crange of materials at Eastern Entrance. 3x8 ton excavators, 1x5 ton excavator. Sawcutting also.	C	25	Chalmers St	85	61	Day	24	56	25	4	4	Breaking audible, sawcutting audible in background. Both go for almost the entirety of recording.  Compliant with internal noise levels in accordance with CoA E38.
12/05/2021	22:15:00	CW: excavate east/west walls of P20/21 south. Concrete pour in north.	C	20	Chalmers St	71	50	Night	21	45	27	0	0	Construction noise audible sporadically throughout recording. At around 3:35, a drill powers on and is used for about 1 minute. No other obvious noise is heard, so it can be assumed that the drill is the cause of the spike.
13/05/2021	1:00:00	CW: P22/23 core hole launch pit, saw cut and excavate. Adit over crash deck from 18/19 to 20/21 saw cut blinding and hammering. 22/23 saw cut for B5 beam. Remove scaffold from above existing guard rooms 20/21 and 22/23 (contingency for 20/21).	C	20	Chalmers St	70	50	Night	20	45	27	0	0	Some very minor construction noise can be heard - movement on platforms. Very sporadic, not likely to cause any impact.
14/05/2021	22:45:00	WE46 Possession works on tracks 20/21. Central Walk: •Replace Northern 23m of Platform Slab on Platforms 20/21 •Painting on Southern half of Platforms 20/21 (300m2) •Balustrade Hazmat Removal on most northern stairs of Platform 20/21	C	20	Chalmers St	70	50	Night	20	45	27	0	0	Complaint received from P5 about "concrete cutting or angle grinding at Central Station". Concrete saw is audible throughout recording, however does not appear to be too loud, especially when compared to LR. Cutting goes throughout recording but with multiple pauses. Complaint reviewed and was within predictions.
15/05/2021	3:00:00	WE46 Possession works on tracks 20/21. Central Walk: •Replace Northern 23m of Platform Slab on Platforms 20/21 •Painting on Southern half of Platforms 20/21 (300m2) •Balustrade Hazmat Removal on most northern stairs of Platform 20/21	C	20	Chalmers St	71	50	Night	21	45	27	0	0	Complaint received from P5 about "concrete cutting in middle of night". Concrete saw is audible throughout recording, however does not appear to be too loud, especially when compared to LR. Cutting goes throughout recording but with multiple pauses. Complaint reviewed and was within predictions.
15/05/2021	20:30:00	WE46 Possession works on tracks 20/21. Central Walk: •Replace Northern 23m of Platform Slab on Platforms 20/21 •Painting on Southern half of Platforms 20/21 (300m2) •Balustrade Hazmat Removal on most northern stairs of Platform 20/21	C	20	Chalmers St	69	50	Night	19	45	27	0	0	Excavation audible - likely slab replacement on P20/21. Consistent but not super loud at receiver.
16/05/2021	16:00:00	WE46 Possession works on tracks 20/21. Central Walk: •Replace Northern 23m of Platform Slab on Platforms 20/21 •Painting on Southern half of Platforms 20/21 (300m2) •Balustrade Hazmat Removal on most northern stairs of Platform 20/21	C	20	Chalmers St	71	61	Day	10	56	16	0	0	Trains and light rail audible. Seagulls also squawking in background. ST announcements and whistle blowing. Man skateboards by close to the noise monitor. Accounts for spike as no other construction noise is audible.
18/05/2021	3:30:00	CW: P22/23 hoarding fix peri props and box out on platform public area, continue B5 excavation and load out spoil. P20/21 install access stairs and handrails for shotcrete spray. Excavate adit walls for shotcrete spray.  NB: 25 noise blankets were taken to ESR breakthrough and hung on the back of ramp scaffold	C	20	Chalmers St	69	50	Night	19	45	27	0	0	Train movements audible - train braking with very squeaky brakes, likely on P22/23. Street sweeper goes past at 2 minute mark - likely accounts for spike. Heavy rain also audible. Noise levels stable after street sweeper.
18/05/2021	23:45:00	CW: remove steel set column north wall track 18 - ST excavator in the basement to clean it up. Continue B5 excavation under 22/23. Defects work on 20/21. MB: drilling work B1 and B2 soffit west	C	20	Chalmers St	67	50	Night	17	45	27	0	0	Bursts of drilling/hammering audible throughout recording. Sound close to logger (closer than P22/23 works). Not muffled, does not sound like it is coming from underground. Based on site diaries, no works happening in the ESR. Could be coming from other works happening in the area adjacent to 20/28 Chalmers St - under investigation.



20/05/2021	2:45:00	CW: P22/23 excavate C2 stub, form ramp on escalator. NC: suspended slab demolition: saw cutting and demolishing final suspended slab on Eddy Ave ramp next to track 16 and TCAC. Noise blankets set up for demo.	C	20/34	Chalmers St	66	50	Night	16	45	29	0	0	Slight drilling audible, likely from P22/23. Tonal noise audible for approx 1 minute, sounds like train brakes squeaking and not related to construction. Other than light drilling, no other construction noise audible. Generator powering on noise at about the 8 minute mark. Similar to the noise that has been present for the past couple months, identified to be Hanave works next door.
21/05/2021	3:15:00	CW: cut trench in north plenum under track 17/18. NC: suspended slab demolition: saw cutting and demolishing final suspended slab on Eddy Ave ramp next to track 16 and TCAC. Noise blankets set up for demo.	C	20/34	Chalmers St	67	50	Night	17	45	29	0	0	Sawcutting from NC audible throughout recording. When not audible, no other noise present. Same generator powering on noise happening today at 10 minute mark.
22/05/2021	3:15:00	WE47 Possession: CW: •Replace Northern 23m of Platform Slab on Platforms 22/23 •Existing Canopy Steelwork modification on Platforms 22/23 for future lift •Northern Fire hydrant route installation on Platforms 22/23 •Painting on Southern half of Platforms 22/23 (300m2) •Balustrade Hazmat Removal on second northern stairs of Platform 22/23	C	20	Chalmers St	71	50	Night	21	45	27	0	0	Road saw on P22/23 audible. Consistent throughout recording. Muffled sound however due to noise blankets, sound has dissipated over the distance.
22/05/2021	6:00:00	WE47 Possession: CW: •Replace Northern 23m of Platform Slab on Platforms 22/23 •Existing Canopy Steelwork modification on Platforms 22/23 for future lift •Northern Fire hydrant route installation on Platforms 22/23 •Painting on Southern half of Platforms 22/23 (300m2) •Balustrade Hazmat Removal on second northern stairs of Platform 22/23	C	20	Chalmers St	75	50	Night	25	45	30	0	0	Road saw on P22/23 audible. Consistent throughout recording. Sound is louder in this recording than in the last, likely due to moving closer to the logger throughout the possession. Intermittent pauses.
22/05/2021	6:45:00	WE47 Possession: CW: •Replace Northern 23m of Platform Slab on Platforms 22/23 •Existing Canopy Steelwork modification on Platforms 22/23 for future lift •Northern Fire hydrant route installation on Platforms 22/23 •Painting on Southern half of Platforms 22/23 (300m2) •Balustrade Hazmat Removal on second northern stairs of Platform 22/23	C	20	Chalmers St	76	50	Night	26	45	30	1	1	Light rail and trains audible. Roadsaw also audible on P22/23, however now with more external non construction activity, sound is lower than earlier in the morning. Sound is still muffled due to noise blankets. Road saw pauses intermittently, however is audible throughout the duration of the recording.
23/05/2021	17:15:00	WE47 Possession: CW: •Replace Northern 23m of Platform Slab on Platforms 22/23 •Existing Canopy Steelwork modification on Platforms 22/23 for future lift •Northern Fire hydrant route installation on Platforms 22/23 •Painting on Southern half of Platforms 22/23 (300m2) •Balustrade Hazmat Removal on second northern stairs of Platform 22/23	C	20	Chalmers St	73	58	Day	15	53	19	0	1	Spike at around 1700. Light rail and train activity audible. Some drilling noise also audible - likely canopy steelwork modification on P22/23, however noise is not significantly loud. Air compressor type of noise starts at around 7 minute mark, continues until around 8:30, followed by a few squeaks as it powers down. This noise is the loudest so is likely the source of the spike, however it only lasts for 1 minute 30 seconds.
24/05/2021	1:45:00	WE47 Possession: CW: •Replace Northern 23m of Platform Slab on Platforms 22/23 •Existing Canopy Steelwork modification on Platforms 22/23 for future lift •Northern Fire hydrant route installation on Platforms 22/23 •Painting on Southern half of Platforms 22/23 (300m2) •Balustrade Hazmat Removal on second northern stairs of Platform 22/23	C	20	Chalmers St	68	50	Night	18	45	27	0	0	Heavy rain audible on logger. Light rail also audible. Emergency response vehicle drives past at around 8:20. No other construction noise audible - possession works have almost wrapped up now according to site diaries and wouldn't be affecting any sensitive receivers.
24/05/2021	7:00:00	EE: craneage of materials. No high noise activity happening until 0800.	C	25	Chalmers St	73	61	Day	12	56	25	0	0	LaMax spike of 102.6. Light rail consistent throughout audio. ST announcements and trains throughout. Bird sitting on logger chirps at 8 minute mark, accounts for spike.
25/05/2021	3:30:00	CW: minor works. Clean up P22/23 hoarding. Saw cut adit and muck out.	C	20	Chalmers St	71	50	Night	21	45	27	0	0	Generator power on noise occurs at around 3 minutes and lasts for two full minutes. Air blasting noise audible at around 9 minute mark also. Likely due to other works in the area.
29/05/2021	14:45:00	CW: digging east and northern sides of 22/23 escalators. Crane movements in EE - delivering pipe for underbore and blow pipe. Broke out service trench and muck out via bogie.	C	25	Chalmers St	71	61	Day	10	56	25	0	0	Trains and light rail in background. Birds chirping. Bird sitting adjacent to logger chirps directly next to it at 5:50 mark, accounting for spike.
30/05/2021	23:00:00	CW: St excavator on P22/23 for defects work.	C	20	Chalmers St	71	50	Night	21	45	27	0	0	Complaint received at 8:52 31/5/21 regarding "extreme noise pollution" occurring past 11pm at Central Station. Complaint investigated. Breaking was audible throughout the recording, however, based on the volume, it did not seem that the breaking was compatible with CSM works. On further investigation, it was determined that the noise was related to City of Sydney works happening on Chalmers St.
3/05/2021	1:00:00	Trucks entering SYAB.	C	39	Regent St	69	49	Night	20	44	27	0	0	Machinery noise happening throughout duration of recording - unidentifiable whether CSM related or not - sounds like a truck idling. Stops at 3:30. Cars on Regent St also audible.
5/05/2021	15:15:00	Trucks entering SYAB.	C	39	Regent St	81	60	Day	21	55	16	0	10	ST trains going past in background. Sounds like a constant whirring occurring in background, unsure whether related to CSM works or other. Cars also audible going past on street. Beeping of truck reversing. Seemingly unrelated to CSM works. Motorbike drives past at 10:45 likely accounting for spike.
11/05/2021	13:30:00	Trucks entering SYAB.	C	39	Regent St	74	60	Day	14	55	16	0	3	What sounds like a chainsaw rewing in background throughout majority of recording. Unsure whether related to CSM.
25/05/2021	4:30:00	Trucks entering SYAB.	C	39	Regent St	66	49	Night	17	44	27	0	0	Trains going past audible. Same whirring noise occurring that sounds almost like air blasting. Goes very close to logger at approximately 3:30 mark. Can assumed to be either a car or related to construction noise. Assumed that the noise is related to CSM to be conservative, however ST noise is equally as loud.

3/05/2021	21:30:00	NC: de-loading of TCAC arch beam from needle beams. Move 6 bulka bags, other general clean up and movement of materials.	C	34	YHA	74	54	Night	20	49	25	0	0	Trucks can be heard idling outside the station. Trains also audible idling. Truck horn honking. Truck and train idling for the duration of recording.
4/05/2021	2:30:00	NC: de-loading of TCAC arch beam from needle beams. Move 6 bulka bags, other general clean up and movement of materials.	C	34	YHA	63	54	Night	9	49	25	0	0	Background noise quiet. At around 7 minute mark, a loud, long braking of a train is heard, along with it pulling into the station. No other noise for duration of recording.
8/05/2021	19:00:00	No potentially noisy works occurring. Scenario 34 chosen as closest potentially noise impacting scenario.	C	34	YHA	89	57	Evening	32	52	22	0	15	Spike occurs due to diesel train idling on Platform 1 - no CSM works audible.
11/05/2021	3:00:00	NC: double door installation for HR21. Form up back of arch beams. Sawcutting and excavation for services investigation. Flat plate installation over cable trough. Clearing out waste on Eddy Ave ramp and consolidate scaffold. Removal of panelling on ELC using scissor lifts up Eddy Ave ramp.	C	34	YHA	77	54	Night	23	49	25	0	3	Light "drilling/buzzing" noise audible - due to proximity to logger unlikely to be CSM works. Bursts of air audible - could be EWP being raised and lowered. Footsteps audible also.
13/05/2021	3:30:00	NC: material movements. Unblocking of drainage pipe. Sawcutting and excavation for services investigation.	C	34	YHA	76	54	Night	22	49	25	0	2	Same sound of air blasting audible - could be works or could be trains idling. Happens intermittently, but due to proximity to logger, likely a train idling.
15/05/2021	9:30:00	NC: preparation of zone behind archway hoarding, tiling. Removal of needle beams and megashor props.	C	34	YHA	94	64	Day	30	59	15	12	20	Drilling audible from NC, but low magnitude. Proximity to logger indicates CSM works, however dominant noise source remains train idling also. Announcements also audible. Drilling only occurs for 8 minutes.
15/05/2021	20:30:00	NC: preparation of zone behind archway hoarding, tiling. Removal of needle beams and megashor props.	C	34	YHA	79	54	Night	25	49	25	0	5	Train announcements. Trains idling. No CSM works audible.
18/05/2021	13:45:00	Calibration of YHA logger. Transport of tiles, sand and cement on pallets from yard to lower NC. Installation of hoarding next to Eddy Ave Pump Room, ATF set up, floor protection to lower NC installed. Slab/area preparation fo LNC. Concrete patching. Suspended slab demolition (sawcutting and demo adjacent to track 16 [noise blankets installed]). Spoiler insulation panels.	C	34	YHA	100	64	Day	36	59	15	1	26	Calibration of YHA noise logger. No other CSM works audible.
18/05/2021	20:15:00	Calibration of YHA logger. Transport of tiles, sand and cement on pallets from yard to lower NC. Installation of hoarding next to Eddy Ave Pump Room, ATF set up, floor protection to lower NC installed. Slab/area preparation fo LNC. Concrete patching. Suspended slab demolition (sawcutting and demo adjacent to track 16 [noise blankets installed]). Spoiler insulation panels.	C	34	YHA	80	54	Night	26	49	25	0	6	Diesel train idling at P1 throughout duration of recording. No CSM works audible.
30/05/2021	7:00:00	MEP works in Lower NC.	C	34	YHA	85	64	Day	21	59	15	0	11	Trains idling and announcements. Large machinery sound - likely a train idling as no works happening that would have overlapped. Happens for 11 minutes of recording.

Date	Time	LOR Works (potentially noisy as per diary entry)	Continuous Real Time or Attended (C or A)	CNVIS SCN	Sensitive Receiver	Observed LAeq15min (dB)	NML for sensitive receiver (dB) (NML=RBL+5dB)	Period Day/Evening/Night	LAeq15min Exceedance of NML (dB)	RBL for Sensitive Receiver	Predicted Exceedance as per OOH for particular activity (RBL)	Exceedance of Predicted OOH (adjusted)	Exceedance of Predicted OOH (non-adjusted)	Comments
1/07/2021	3:15:00	CW: general housekeeping. P18/19 continue demo of guards rooms.	C	20	Chalmers St	69	50	Night	19	45	27	0	0	People talking in background. Same noise as previous months. Confirmed unrelated to CSM works.
2/07/2021	3:30:00	CW: continue demo of P18/19 standby and guard room. WE01 prep works.	C	20	Chalmers St	72	50	Night	22	45	27	0	0	Same noise as previous months. Confirmed unrelated to CSM works.
2/07/2021	8:15:00	Breaking of SDH footings at Eastern Entrance.	C	25	Chalmers St	82	61	Day	21	56	25	1	1	Breaking of footings audible. Main source of noise.  Compliant with internal noise levels in accordance with CoA E38.
3/07/2021	3:15:00	CW: excavate adit drainage, P22/23 underbore launch pit excavation. P20/21 northern end temporary tactile removal.	C	20	Chalmers St	73	50	Night	23	45	27	0	1	Sounds like underbore is audible. Sawcutting/drilling noise, likely attributed to underbore launch pit excavation. Stops after about 8 mins. Other street noise audible once it stops.
3/07/2021	8:45:00	WE01 Possession works: P18/19 slab replacement - road saw, bulk excavation. Install slab reinforcement, concrete pour. P18 drainage (road saw, excavation, backfill). Pod demo.	C	20	Chalmers St	82	61	Day	21	56	19	5	7	Breaking noise audible - likely breaking out slab on pavements, but could be works not related to CSM. Happens intermittently throughout recording.  Compliant with internal noise levels in accordance with CoA E38.
6/07/2021	16:45:00	CW: muck out, P22/23 hit 2 panel, lift 3T excavator out of adit. Concrete/drainage/waterproofing works at Eastern Entrance.	C	25	Chalmers St	73	61	Day	12	45	36	0	0	Breaking noise audible - likely breaking out slab on pavements, but could be works not related to CSM. Happens intermittently throughout recording.
7/07/2021	8:15:00	Concrete/drainage/waterproofing works at Eastern Entrance.	C	25	Chalmers St	80	61	Day	19	56	25	0	0	Sawcutting audible. Light rail also audible. Sawcutting intermittent but continuous throughout entire recording.
7/07/2021	18:00:00	Concrete/drainage/waterproofing works at Eastern Entrance.	C	25	Chalmers St	71	58	Evening	13	53	28	0	0	LR and trains audible. Clanging metal audible also, likely from site/tools being moved. Intermittent and sporadic. A few loud yells from people in street. What sounds like air legging starts up at around 8 minute 30 second mark, but is not particularly loud. Occurs intermittently for remainder of recording.
8/07/2021	18:45:00	Concrete finishing works going later than standard construction hours as per EPL condition L4.15 at Eastern Entrance.	C	25	Chalmers St	65	58	Evening	7	53	19	0	0	Trains audible. Breaking audible, likely coming from platforms. Sporadic/intermittent. Tonal frequency noise heard just before 5 minute mark. Street sweeper goes past at 5 minute mark, louder than breaking happening in background.
8/07/2021	2:45:00	CW: muck out, excavate 23-6 N plenum and trench, excavate P22/23N, P20/21 south escalator existing canopy column sawcut the over poured concrete around the canopy column, drill dowels.	C	20	Chalmers St	68	50	Night	18	45	36	0	0	LAMax: 80.7. No works audible, spike attributed to light rail.
8/07/2021	22:00:00	Concrete finishing works going later than standard construction hours as per EPL condition L4.15 at Eastern Entrance. Works finished at 21:50.	C	25	Chalmers St	67	50	Night	17	45	36	0	0	LAMax: 80. No works audible, only trains, light rail and announcements. Spike attributed to light rail.
8/07/2021	19:30:00	Concrete finishing works going later than standard construction hours as per EPL condition L4.15 at Eastern Entrance.	C	25	Chalmers St	65	50	Night	15	45	36	0	0	Complaint received from resident at 38 Chalmers about "constant noise and being unable to sleep". Complaint investigated. LAMax: 87.8. No works audible. Spike attributed to multiple light rail going past, as well as an emergency response vehicle siren sounding. Within predictions.
9/07/2021	21:45:00	No potentially noisy works as per diary.	C	20	Chalmers St	64	50	Night	14	45	27	0	0	Complaint received from resident in Surry Hills called to complain of "excessive and constant construction noise". Complaint investigated. Trains, light rail audible. Extraction fan in background. Works within predictions.
11/07/2021	21:00:00	NC: concrete cutting works to P9-12 ends. CW: breakout remaining B1 overpour on P18 side.	C	20/36	Chalmers St	65	50	Night	15	45	29	0	0	Complaint received from resident in Surry Hills called to complain of "constant noise, predominantly jackhammering and droning". Complaint investigated. Extraction fan audible (likely the "droning" noise being referred to), as well as trains and light rail. No jackhammering. Works within predictions.
12/07/2021	21:15:00	CW: mucking out 8x VENM bins. Finish excavation of P21 N C2 stub. Excavate 23-6 "Y" plenum. Remove 3x steel columns. P22/23 lift pit - check exc trench and lift pit sump. Breakout small sections of concrete P18/19. MB: breakout hollowcore B3 level west. NC: concrete cutting works P9-12 ends.	C	20	Chalmers St	66	50	Night	16	45	27	0	0	Complaint received from resident in Surry Hills called to complain of "constant noise and vibration in his apartment". Complaint investigated. Extraction fan audible but no other construction noise. Light rail loudest thing in recording. Within predictions.
13/07/2021	2:45:00	CW: mucking out 8x VENM bins. Finish excavation of P21 N C2 stub. Excavate 23-6 "Y" plenum. Remove 3x steel columns. P22/23 lift pit - check exc trench and lift pit sump. Breakout small sections of concrete P18/19. MB: breakout hollowcore B3 level west. NC: concrete cutting works P9-12 ends.	C	20	Chalmers St	69	50	Night	19	45	27	0	0	Complaint received from resident in Surry Hills called to complain of "constant noise and vibration in his apartment". Complaint investigated. Jackhammering audible but faint, happens throughout recording. Also a loud bird chirping next to the logger for half the recording. Within predictions.
13/07/2021	12:28:00	RID: 33kv underbore reaming in progress.	A	21	Chalmers St	79	61	Day	18	56	16	0	7	Same noise as previous months. Confirmed unrelated to CSM works.
13/07/2021	12:43:00	RID: 33kv underbore reaming in progress.	A	21	Chalmers St	80	61	Day	19	56	18	2	6	Located at the RID stairs, about 3m in front of coffee cart and 5m back from site. Both power packs not on until about 2 minutes into recording - only 1 running, ~65dB instantaneous - lots of background noise audible. At about 7 minute mark, both powerpacks turn on, LAeq increases substantially.  Compliant with internal noise levels in accordance with CoA E38.

13/07/2021	17:30:00	RID: 33kv underbore reaming in progress. Works in Eastern Entrance (services, conduit, waterproofing).	C	20	Chalmers St	74	61	Day	13	56	18	0	0	Second attended monitor: located at the coffee cart, about 10m from site. Instantaneous measurement behind noise blankets - 89. In front of noise blankets - 92.
13/07/2021	1:45:00	CW: mucking out 8x VENM bins. Finish excavation of P21 N C2 stub. Excavate 23-6 "Y" plenum. Remove 3x steel columns. P22/23 lift pit - check exc trench and lift pit sump. Breakout small sections of concrete P18/19. MB: breakout	C	20	Chalmers St	63	50	Night	13	45	29	0	0	Train and light rail. Peak hour so lots of background noise. What sounds like airlegging starts up at around 2 minutes. Occurs for rest of recording.
14/07/2021	1:00:00	CW: ongoing forming walls in P20/21 south escalators - concrete pour. Scabbling works on P16.	C	20	Chalmers St	67	50	Night	17	45	27	0	0	Tonal noise audible - machine plant noise ongoing for the entirety of recording. Unknown whether related to CSM works or other. CSM works assumed as most conservative measure.
15/07/2021	1:00:00	CW: P22/23 lift pit - saw cut wall. NC: chemset anchor installation to P9/10 and 11. Door install at pump room.	C	20	Chalmers St	64	50	Night	14	45	27	0	0	Complaint received from P5 about machinery noise at Central Station throughout the night. Highest spike overnight analysed. Trains audible. What sounds like a truck idling outside site. Unknown whether related to CSM works or other. CSM works assumed as most conservative measure.
16/07/2021	16:45:00	NC deliveries, no other works.	C	36	Chalmers St	74	58	Evening	16	53	21	0	0	General suburban noise in background. Bird chirps loudly at the microphone at about 2 minute mark, accounting for spike.
19/07/2021	6:15:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	67	50	Night	17	45	27	0	0	Train and light rail. Announcements very audible. Lots of background noise. At around 7 minute mark, what sounds like an idling truck turns on close to microphone. Likely to be a vehicle from SDH in the loading dock. Lots of loud truck noises happen for a minute or so. Sounds also like there is a leaf blower being used. Unlikely to be CSM works as no works were occurring.
19/07/2021	14:45:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	70	61	Day	9	56	16	0	0	Loud seagulls chirping throughout recording. Trains, light rail and announcements.
20/07/2021	2:45:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	71	58	Evening	13	53	19	0	0	Trains, light rail and announcements but otherwise very quiet. Loud spike attributed to tonal squeak of trains braking, as well as the loud unknown noise that occurs each morning (not related to CSM works).
21/07/2021	3:00:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	66	50	Night	16	45	27	0	0	Same noise as previous months. Confirmed unrelated to CSM works.
21/07/2021	12:45:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	72	61	Day	11	56	16	0	0	Trains, light rail and announcements but otherwise very quiet. Loud spike attributed to tonal squeak of trains braking, as well as two light rail going past each other at the 8:30 minute mark.
22/07/2021	2:30:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	65	50	Night	15	45	27	0	0	Quiet for majority of recording. Loud spike attributed to two light rail going past each other at the 10 minute mark.
22/07/2021	1:15:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	60	50	Night	10	45	27	0	0	Other work in background audible - unsure who but voices talking, tools and metal clanging, plant running. Happens throughout recording. Not related to CSM works - due to COVID orders, likely emergency works being undertaken by Sydney Council. Spike however is related to the same noise as previous months. Confirmed unrelated to CSM works.
24/07/2021	9:30:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	76	61	Day	15	56	16	0	4	LaEQ attributed to loud bird squawking at 5:45 and two light rail going past each other at the 8:30 minute mark.
25/07/2021	3:30:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	68	50	Night	18	45	27	0	0	Trains and light rail. Spike related to two light rail going past each other at the beginning of the recording. Quiet for remainder of the recording.
25/07/2021	4:15:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	68	50	Night	18	45	27	0	0	Due to irregular pattern of noise on this day, and the day being particularly windy, it is likely that all spikes on this day (as this one is) is due to loud wind hitting the microphone. No other noise audible.
25/07/2021	2:00:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	65	50	Night	15	45	27	0	0	Due to irregular pattern of noise on this day, and the day being particularly windy, it is likely that all spikes on this day (as this one is) is due to loud wind hitting the microphone. No other noise audible.
26/07/2021	8:30:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	67	61	Day	6	56	16	0	0	Trains and light rail. Spike related to two light rail going past each other at the beginning of the recording. Quiet for remainder of the recording.
26/07/2021	11:45:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	76	61	Day	15	56	16	0	4	Trains, light rail and announcemnets. Truck sounds like its idling in the SDH loading dock.
26/07/2021	1:15:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	61	50	Night	11	45	27	0	0	Trains, light rail and announcemnets. Emergency response vehicle goes past at 9 minute mark.
27/07/2021	3:00:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	69	50	Night	19	45	27	0	0	Same noise as previous months. Confirmed unrelated to CSM works.
28/07/2021	19:00:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	72	50	Night	22	45	27	0	0	Same noise as previous months. Confirmed unrelated to CSM works.
28/07/2021	2:30:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	64	50	Night	14	45	27	0	0	Trains and light rail. Spike related to two light rail going past each other.
28/07/2021	10:00:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	66	61	Day	5	56	16	0	0	Lots of noise coming from wind hitting the microphone throughout recording.
28/07/2021	18:15:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	67	58	Evening	9	53	19	0	0	Trains and light rail. Spike related to two light rail going past each other.

29/07/2021	3:00:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	65	50	Night	15	45	27	0	0	Same noise as previous months, begins at approx 10 minute mark. Confirmed unrelated to CSM works.
29/07/2021	3:15:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	63	50	Night	13	45	27	0	0	Same noise as previous months. Confirmed unrelated to CSM works.
29/07/2021	16:30:00	Site shutdown due to COVID public health order. No works. SCN20 chosen as most conservative scenario for assessment.	C	20	Chalmers St	69	61	Day	8	56	16	0	0	Trains and LR. Announcements. People talking on Chalmers St. Spike at 13 minutes due to bird chirping very loudly next to microphone.
5/07/2021	4:45:00	Trucks entering SYAB, possession works.	C	39	Regent St	62	49	Night	13	44	27	0	0	Complaint received from resident in O'Connor Street Chippendale about noise coming from Sydney Yard. Complaint investigated. No evidence of elevated noise levels due to excessive or inappropriate site or driving behaviours. Some noise audible in background - likely to be due to possession works occurring with multiple contractors on tracks. Noise is within predictions.
15/07/2021	6:45:00	Trucks entering SYAB, deliveries, stockpile compacting.	C	39	Regent St	72	60	Day	12	55	16	0	1	Noise levels analysed as they were identified as being the highest noise levels in July. Construction noise audible - multiple plant running simultaneously. Unsure whether CSM related or other, assumed CSM related to be conservative. Noise levels within adjusted predictions.
16/07/2021	6:15:00	Trucks entering SYAB, deliveries, stockpile compacting.	C	39	Regent St	72	60	Day	12	55	16	0	1	Noise levels analysed as they were identified as being the highest noise levels in July. Construction noise audible - multiple plant running simultaneously. Unsure whether CSM related or other, assumed CSM related to be conservative. Noise levels within adjusted predictions.

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## Appendix B – Vibration Monitoring Summary

For ease of interpretation, the continuous vibration data has been divided into monthly intervals. A logarithmic scale has also been applied to meaningfully separate approximately 43,200 individual data points within any one month period as the majority of data points fall below 2mm/s, however interest lies in the higher end of the scale. Each data point represents the highest PPV (mm/s) within that particular one minute interval.

The major gridlines of the x-axis indicate a 24hr period from 12-midnight to 12 midnight. The minor gridlines of the x-axis indicate 6 hour intervals.

The residential criteria has conservatively been applied to present the monthly data at Chalmers St. The data points have been colour coded to represent the day time residential criteria for continuous vibration (refer to table 5.5 Perceptible Vibration Criteria for Exposure to Continuous and Impulsive Vibration of the CNVMP). The majority of data points fall below the preferred human comfort criteria of 0.28mm/s and below max criteria of 0.56mm/s during construction.

The TCAC building is located in a less sensitive area, and due to the nature of the works and sensitivity of the heritage fabric is monitored from a structural perspective in accordance with Table 5.6 Building Damage Vibration Management Levels (BS7385) of the CNVMP.



Date	Time	LOR Works (potentially noisy as per diary entry)	Continuous Real Time or Attended (C or A)	CNVIS SCN	Sensitive Receiver	Observed LAeq15min (dB)	NML for sensitive receiver (dB) (NML=RBL+SdB)	Period Day/Evening/Night	LAeq15min Exceedance of NML (dB)	RBL for Sensitive Receiver	Predicted Exceedance as per OOH for particular activity (RBL)	Exceedance of Predicted OOH (adjusted)	Exceedance of Predicted OOH (non-adjusted, with HN penalty)	Comments
3/06/2021	0:45:00	CW: muck out. Saw cut P20/21 lift shaft. Heading 23-6 excavate all GSW then sandstone. Excavate P20/21 northern escalator. P22/23 S excavate canopy column. NB noise blankets installed P20/21 northern hoarding. Hoarding install P22/23.	C	20	Chalmers St	65	50	Night	15	45	27	0	0	Complaint received from Anonymous in Chalmers St about "construction noise that has kept caller up all night". Complaint investigated. Some construction noise audible, however all within predictions. Based on proximity to logger, noise does not seem to be related to CSM works. Upon further investigation, noise levels were attributed to City of Sydney works happening in Chalmers St throughout the night.
5/06/2021	0:00:00	CW: ongoing closing adit walls. Waterproofing works.	C	20	Chalmers St	64	50	Night	14	45	27	0	0	Complaint received from PS about a general droning noise. Complaint investigated. Trains and announcements audible, as is light rail and birds. No particular construction noise audible.
5/06/2021	20:15:00	CW: muck out 23-6 and adit, excavate east face south side of C1 column. 20/21 and 22/23 northern escalators excavation.	C	20	Chalmers St	65	61	Day	4	56	16	0	0	Complaint received from anonymous in Chalmers St about "jack hammering since 8PM". Complaint investigated. Trains and announcements audible, as is light rail and birds. No particular construction noise audible and no jack hammering audible.
8/06/2021	3:00:00	Minor works in CW - not anticipated to impact on sensitive receivers. ESR: Ghost Platform - commence stripping crash deck above escalators 3&4 in the ESR concourse. ESR concourse CENA 2 ACM wall removal. NC: ATF fencing install. Cut handrails at the top of staircase. New handrails to be installed and welded.	C	21	Chalmers St	65	50	Night	15	45	29	0	0	Extraction fan audible in background. Minor construction works audible in background also. Long beep (could be attributed to a truck reversing). Seagulls audible. Very loud sound that has been happening for a few months happens midway through recording.
10/06/2021	1:15:00	CW: muck out, excavate 23-6 floor, north escalator excavation 20/21/22/23 and south escalator 22/23. Muck out adit. Excavate sewer riser at P22 between adit. ESR: ghost platform continuation of works, stripping crash deck above escalators. CENA 2 wall removal.	C	20/21	Chalmers St	69	50	Night	19	45	27	0	0	Light rail audible. Sawcutting audible, begins about 1 minute in. Sounds very very close to logger - unlikely to be CSM works, more likely to be works on the street.
10/06/2021	13:01:00	Railway Institute Drive 33kv underbore (4 bores x 86m length from Ghost Platform to Metro Box). Surface site is at Railway Institute Drive (RID).	A	21	Chalmers St	72	61	Day	11	56	18	0	0	Calibration - 114.5db. Power pack and shaker grid running. Pedestrians, cars trucks light rail and crossing also audible in background. Standing about 8m away from power pack. Background noise equal or louder to RID works Instantaneous about 75db. Standing more where pedestrians would enter central station. Would be much quieter at coffee cart. Note - sound fence removed because does not meet temp design. Noise blankets down on eastern side - need to be re-erected. At 12 minute mark - truck pulls in to RID.
10/06/2021	17:30:00	Central walk works occurring under platforms. ESR Cena 2 demolition, brick wall removal works. Ghost platform scaffold removal from crash deck strip.	C	21	Chalmers St	72	61	Day	11	45	29	0	0	Light rail. Air blasting audible. Sounds very close to logger, however could be ghost platform scaff removal. People talking on Chalmers street. Train and light rail announcements. Someone pulling something on a trolley on Chalmers St. Air blasts definitely source of spike - likely CSM day works.
12/06/2021	2:45:00	WE50 Possession. CW: patching and installation of GRC panels under P16/17. NC: scabble slab edge of the inner city platform balustrade areas. This is to be done on both platform between 9/10 and 10/11.	C	20	Chalmers St	66	50	Night	16	45	29	0	0	Construction noise audible in background, sounds like air blasting from a distance. Emergency response vehicle drives past at 12 minute mark, accounting for spike.
13/06/2021	22:30:00	WE50 Possession. Northern concourse works - slab replacement P8.	C	36	Chalmers St	63	50	Night	13	56	18	0	0	Complaint received from resident at Chalmers St about "jackhammering noise at Central Station". Complaint investigated. Very light jackhammering audible, likely from NC works. Happens intermittently throughout the recording. Light rail also audible, much louder. Trains and announcements. Noise levels within predictions.
14/06/2021	18:45:00	WE50 Possession. Northern concourse works. Installation of GRC panels under 16/17.	C	20	Chalmers St	66	58	Evening	8	56	18	0	0	Complaint received from resident at Chalmers St about "loud noise coming from Central Station". Complaint investigated. Train and light rail noise audible. Construction noise from possession in background - jackhammering audible. Noise levels within predictions.
15/06/2021	1:15:00	CW: muck out. Excavate 22/23 5 and commence excavation on the lift pit. Excavate P22/23 N tapered walls. Excavate 20/21. Extend southern hoarding on P18/19 and reattach yellow tactile on P22. NC: general clean up.	C	20	Chalmers St	64	50	Night	14	45	27	0	0	Complaint received from resident at Chalmers St about "jackhammering all night and being constantly woken up". Complaint investigated. Trains and light rail. Construction noise audible in background including jackhammering. Noise levels within predictions.
15/06/2021	3:00:00	CW: muck out. Excavate 22/23 5 and commence excavation on the lift pit. Excavate P22/23 N tapered walls. Excavate 20/21. Extend southern hoarding on P18/19 and reattach yellow tactile on P22. NC: general clean up.	C	20	Chalmers St	72	50	Night	22	45	27	0	0	Street sweeper audible on Chalmers St - goes past at around 1 minute mark. Mystery noise also audible for about a minute.
15/06/2021	20:00:00	CW: muck out. Excavate 22/23 5 and commence excavation on the lift pit. Excavate P22/23 N tapered walls. Excavate 20/21. Extend southern hoarding on P18/19 and reattach yellow tactile on P22. NC: general clean up.	C	20	Chalmers St	66	50	Night	16	45	27	0	0	Complaint received from resident at Chalmers St about the site "making too much noise and him being disturbed". Complaint investigated. Construction noise audible in background. Trains and light rail also audible and notably louder than construction noise.
16/06/2021	20:45:00	CW: P18/19 southern escalator canopy load transfer. Muck out. P22/23 southern escalator excavation, excavate escalator pit. P20/21 north excavate inside corridor. P22/23 north muck out and excavate. Adit drainage trench excavation. ESR: CENA 2 demo - brick wall removal works continuing.	C	20/21	Chalmers St	68	50	Night	18	45	27	0	0	Complaint received from resident at Chalmers St about "jackhammering all night and keeping him awake". Complaint investigated - time was chosen an hour prior to the complaint with the highest Laeq to be the most conservative. Jackhammering audible in distance. Trains and light rails also. Noise levels within predictions.
17/06/2021	21:30:00	ESR: CENA 2 demo - brick wall removal works continuing. NC: a number of saw cuts required on P8 slab to line up future tile joint lines.	C	21/36	Chalmers St	64	50	Night	14	45	29	0	0	Complaint received from resident at Chalmers St about "jackhammering noise at Central Station". Complaint investigated. Muffled construction noise in background. Trains and light rail louder than construction noise, as are people on the street. No jackhammering audible.
17/06/2021	23:00:00	ESR: CENA 2 demo - brick wall removal works continuing. NC: a number of saw cuts required on P8 slab to line up future tile joint lines.	C	21/36	Chalmers St	68	50	Night	18	45	29	0	0	Trains and light rail audible. Loud squawking from seagulls at about 3 minute mark. No construction noise audible.

18/06/2021	2:15:00	ESR: CENA 2 demo - brick wall removal works continuing. NC: a number of saw cuts required on P8 slab to line up future tile joint lines.	C	21/36	Chalmers St	64	50	Night	14	45	29	0	0	Construction noise audible in background - hammering audible. Consistent throughout duration of recording. Noise levels within predictions.
18/06/2021	4:30:00	ESR: CENA 2 demo - brick wall removal works continuing. NC: a number of saw cuts required on P8 slab to line up future tile joint lines.	C	21/36	Chalmers St	62	50	Night	12	45	29	0	0	Complaint received from resident at Chalmers St about "excessive noise from worksite and pounding outside his window". Complaint investigated. Construction noise audible in background - hammering audible. Consistent throughout duration of recording. Noise levels within predictions.
19/06/2021	15:00:00	No potentially noisy works as per diary.	C	25	Chalmers St	80	61	Day	19	56	25	0	0	Loud blaring noise in background - unsure whether construction related or not. Continues throughout the duration of recording. Trains and light rails audible in background. Emergency response vehicle audible at around 13:30.
20/06/2021	21:00:00	Some MB works, however not predicted to make an impact. No other potentially noisy works as per diary.	C	25	Chalmers St	75	50	Night	25	45	36	0	0	Trains and light rail. Spike attributed to very loud squawking by seagulls. No construction noise audible.
21/06/2021	22:15:00	CW: P18/19 escalator pit infill. Removal of P18/19 guard room hoarding. NC: complete two coreholes in external wall of pump room.	C	20	Chalmers St	65	50	Night	15	45	27	0	0	Complaint received from resident at Chalmers St - no specific complaint. Complaint investigated. Trains and light rail audible. No construction noise audible.
23/06/2021	2:00:00	CW: cut the corbel in P16/17 south escalators. Muck out adit and VENM from north plenums. P20/21N trim to profile. P22/23S clean up all muck, shovel edges, clean behind C2 stubs. NC: removal of external wall penetrations nad internal wall full height.	C	20/36	Chalmers St	66	50	Night	16	45	27	0	0	Complaint received from resident at Chalmers St about "being woken up and noise is causing vibration". Complaint investigated. Construction noise audible - very loud air blasting. Seems to be too loud to be attributed to CSM works. Trains and light rail same volume as construction noise.
23/06/2021	21:00:00	CW: remove T21-22 south column. Excavate T21-22 south plenum and adjacent trench. Excavate P22/23 lift pit on the northern side of the adit. Muck out adit. Excavate P22/23 north.	C	20	Chalmers St	65	50	Night	15	45	27	0	0	Complaint received from resident at Chalmers St about "being woken up every night and is getting ill due to the bombardment of noise consistently". Complaint investigated. Trains and light rail. Construction noise audible in background, quieter than trains and LR. Jackhammering begins at around 8 minute mark. Noise levels within predictions.
24/06/2021	23:45:00	CW: install waterbar for PL20/21N escalator. Geofab and membrane Zone 3 service tunnel slab. P18/19 south escalator fence reinstatement. NC: removal of existing wall penetrations.	C	20	Chalmers St	66	58	Evening	8	53	19	0	0	Complaint received from resident at Chalmers St about "having to take medication to sleep due to ongoing noise. Affecting physical health, working at time of call with no indication of stopping". Complaint investigated. Seagulls squawking. Trains and LR. Construction noise audible in background. Noise levels within predictions.
28/06/2021	1:45:00	CW: P18/19 hazmat removal roof existing guards room. No other potentially noisy works as per diary.	C	20	Chalmers St	67	50	Night	17	45	27	0	0	Extraction fan audible in background. Minor construction works audible in background also. Spike attributed to two LR passing each other at the same time.
28/06/2021	4:30:00	CW: P18/19 hazmat removal roof existing guards room. No other potentially noisy works as per diary.	C	20	Chalmers St	69	61	Day	8	56	16	0	0	Low tonal alarm sound audible - likely construction related. Audible throughout duration of recording.
5/06/2021	4:45:00	Trucks entering SYAB.	C	39	Regent St	67	49	Night	18	44	27	0	0	Member of public complained directly to EPA about noise from works in Sydney Yard. Complaint investigated. 2 truck movements audible, as well as 6 train movements in background. Loud motorbike also drives past close to the end of recording. Trains have a similar impact to trucks.
12/06/2021	6:15:00	Trucks entering SYAB.	C	39	Regent St	73	49	Night	24	44	27	2	2	Member of public complained directly to EPA about noise from works in Sydney Yard. Complaint investigated. No truck movements were scheduled on this day. Works audible throughout recording but loudest in the first 3 minutes. Sounds like trucks loading/unloading - lots of metal clanging, banging, trucks reversing. Mixed with cars going past on Regent St and trains.  Compliant with internal noise levels in accordance with CoA E41.
28/06/2021	4:00:00	Trucks entering SYAB.	C	39	Regent St	59	49	Night	10	44	27	0	0	Member of public complained directly to EPA about noise from works in Sydney Yard. Complaint investigated. Generally quiet throughout the duration of recording. 2 spikes: 1st one about 3 minutes in, sounds like a rusty gate swinging or something similar - only goes for about 20 seconds. second is about 8:30 in, loud train goes past. a few cars in the background but not significant enough to make an impact. does seem to be a few unloading noises or truck tailgates swinging throughout, but it is very faint so could be coming from Sydney Yard. No truck movements scheduled at this time, consistent with what is audible in recording.
1/06/2021	7:15:00	No potentially noisy works as per diary.	C	36	YHA	86	64	Day	22	59	15	0	12	Intercity trains idling on tracks.
2/06/2021	8:30:00	No potentially noisy works as per diary.	C	36	YHA	86	64	Day	22	59	15	0	12	Intercity trains idling on tracks.
12/06/2021	10:38:00	WE50 Possession. Concourse rellevelling P8 (sawcutting, excavating, muck out via MB).	A	36	YHA	63	64	Day	-1	59	16	0	0	Monitoring during WE50 possession. Excavator on platform 8. Talking for first 5 mins. Standing about 15-10 metres back from works in pedestrian area.
12/06/2021	11:38:00	WE50 Possession. Concourse rellevelling P8 (sawcutting, excavating, muck out via MB).	A	36	YHA	84	64	Day	20	59	16	0	9	Monitoring in walkway where breaking is occurring. About 15/20 metres away from excavator. Outside of the barricade, adjacent to traffic controller. 79-83 ish when breaking going. Approx high 80s at source. Tipper truck going back and forth. Cutting intermittently on P8. Only one breaker going at a time. Announcements. Nail gun on p10/11 going also. Breaker has a few intermittent pauses. Barely any commuters on platforms.
18/06/2021	20:30:00	No potentially noisy works as per diary.	C	36	YHA	85	54	Night	31	49	25	0	11	Intercity trains idling on tracks.

28/06/2021	15:45:00	No potentially noisy works as per diary.	C	36	YHA	86	64	Day	22	59	15	0	12	intercity trains idling on tracks.
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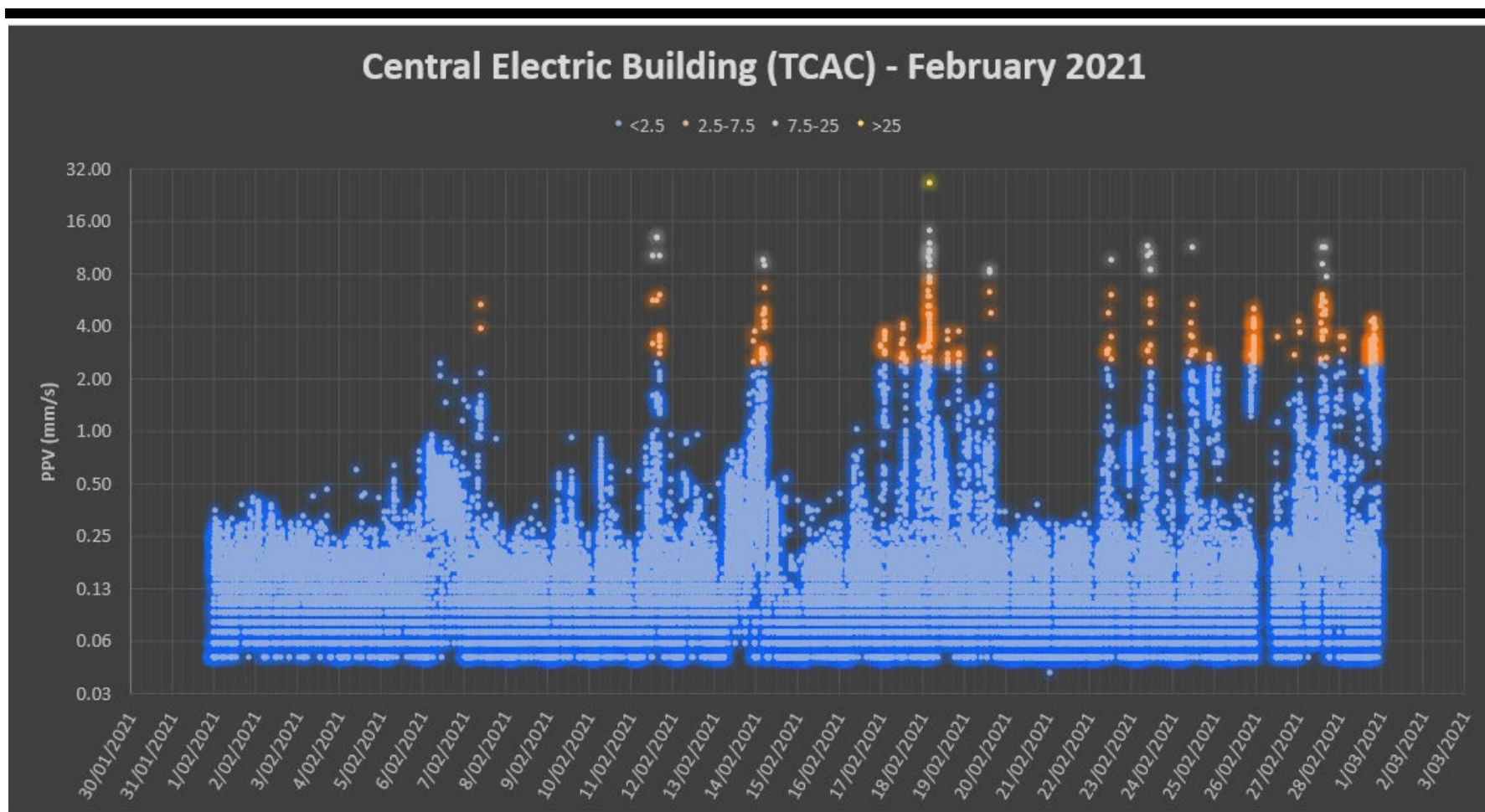


Figure B-1 TCAC - February 2021

The month of February had limited vibration intensive activities at the beginning of the month, however towards the end of February vibration increased due to the beginning of the load transfer and column breakout works.

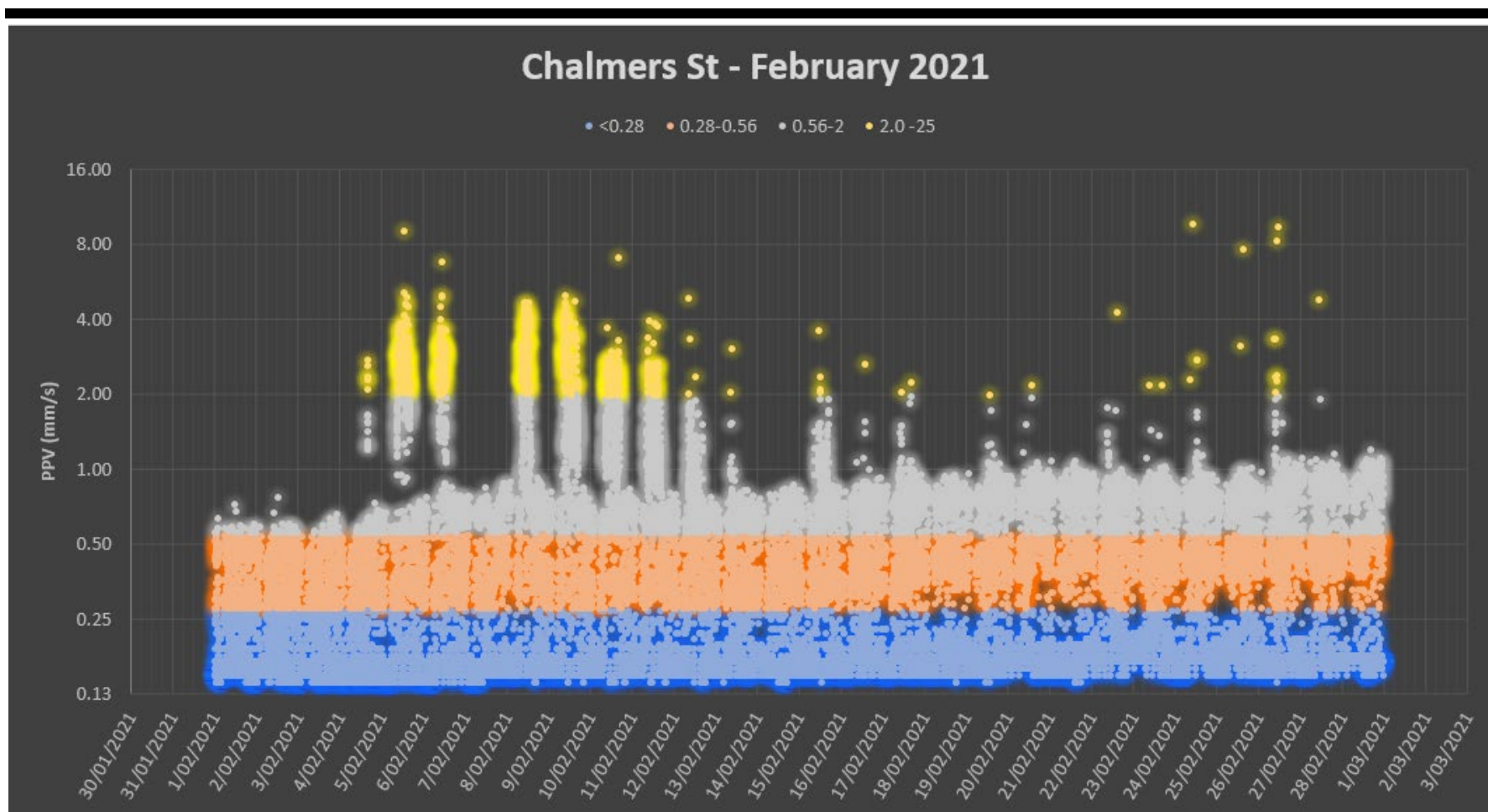


Figure B-2 Chalmers Street – February 2021

Works within Eastern Entrance throughout February consisted of excavation activities including rock breaking, shotcreting and saw cutting. There were no instances where vibration exceeded the structural damage trigger value of 25mm/s throughout February 2021.



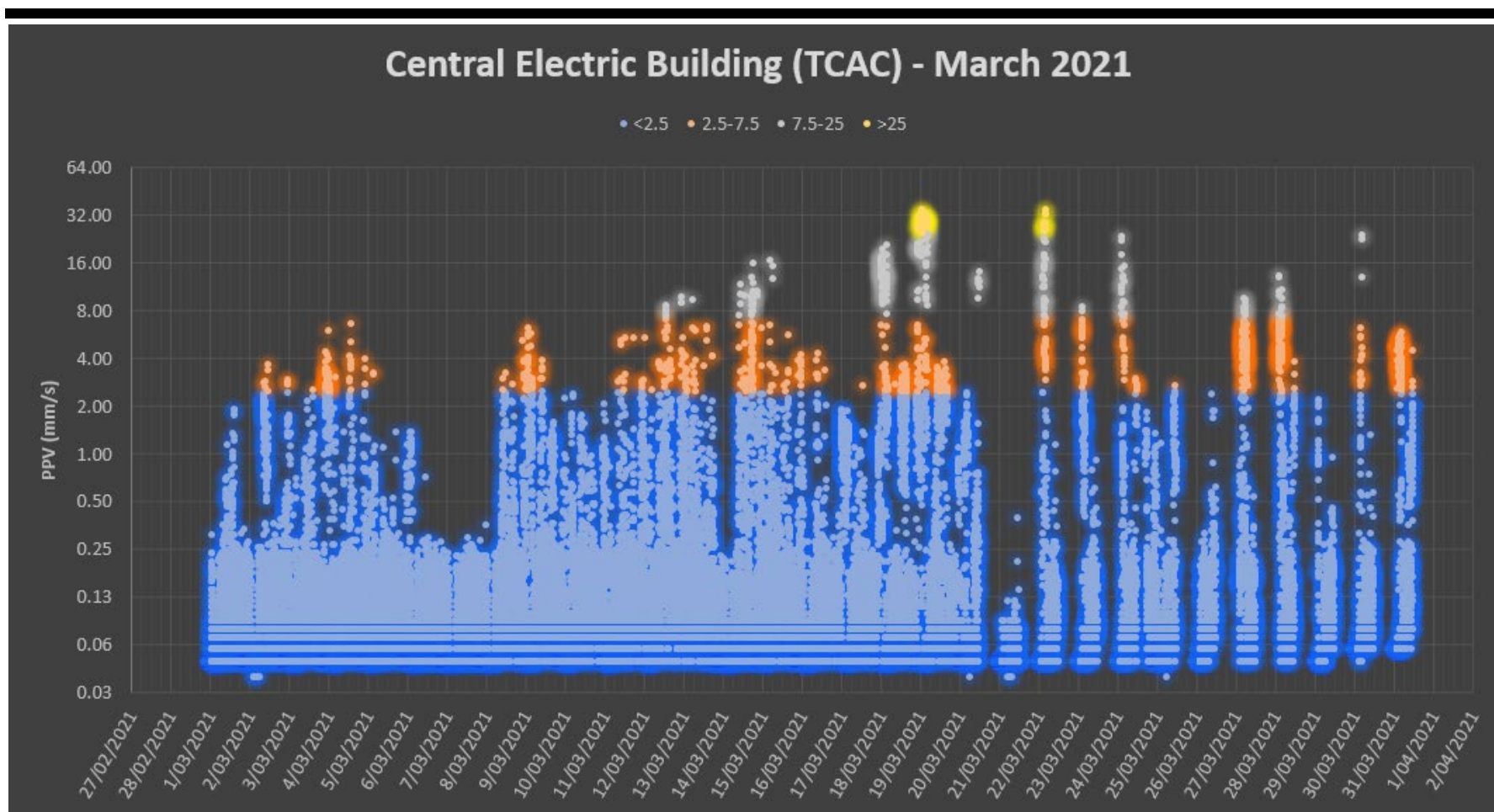


Figure B-3 TCAC – March 2021

The month of March had high vibration intensive activities in close proximity to the Central Electric Building (CEB/TCAC). The predominate scope of works occurring in the Northern Concourse involved the load transfer and column breakout of the TCAC building.



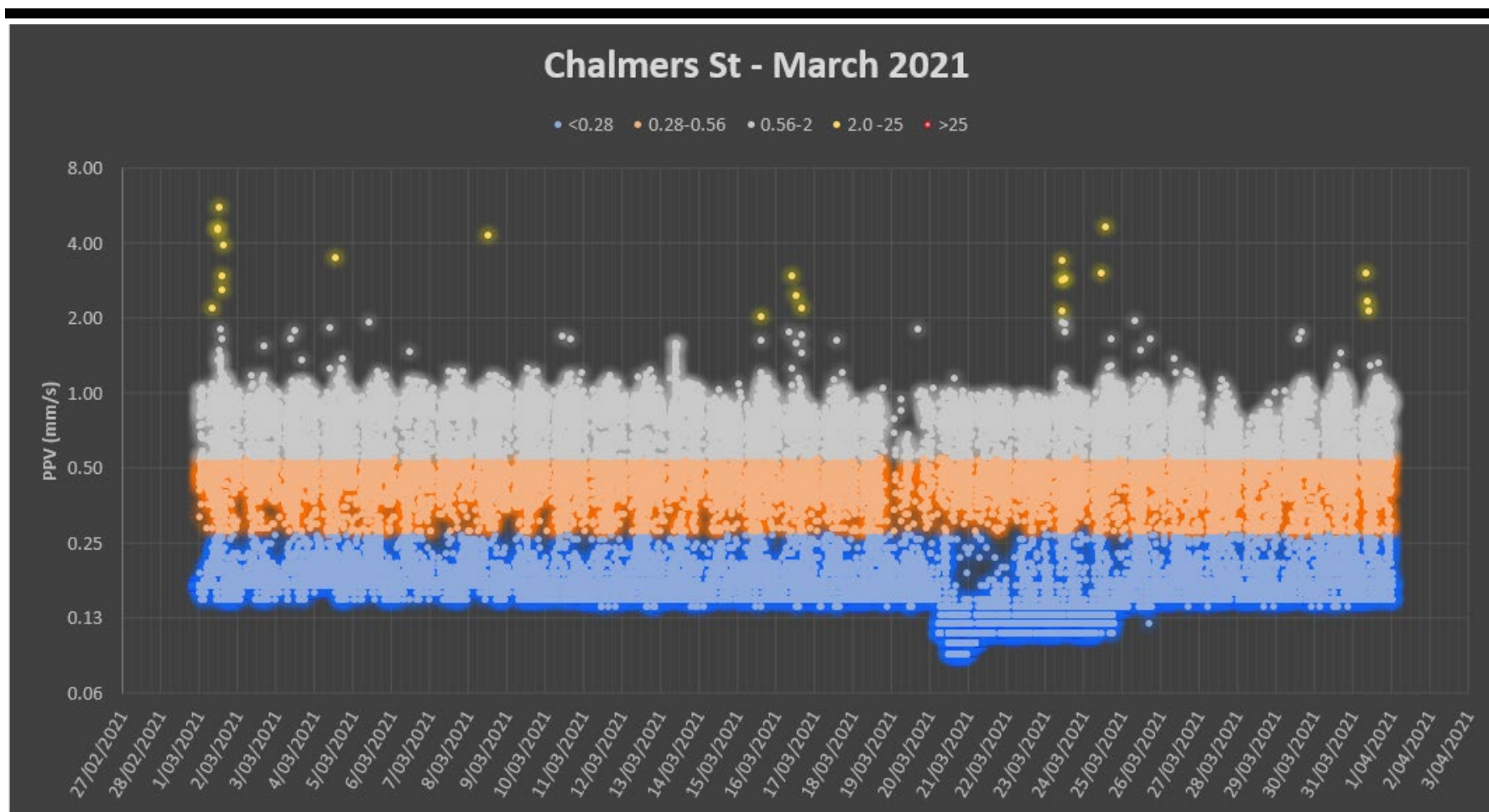


Figure B-4 Chalmers Street – March 2021

The works within the 20-28 Chalmers St site throughout March 2021 consisted of excavation activities including rock breaking. Typical vibration throughout the month was well below the cited 12.5 mm/s level corresponding to a near-zero probability of damage.

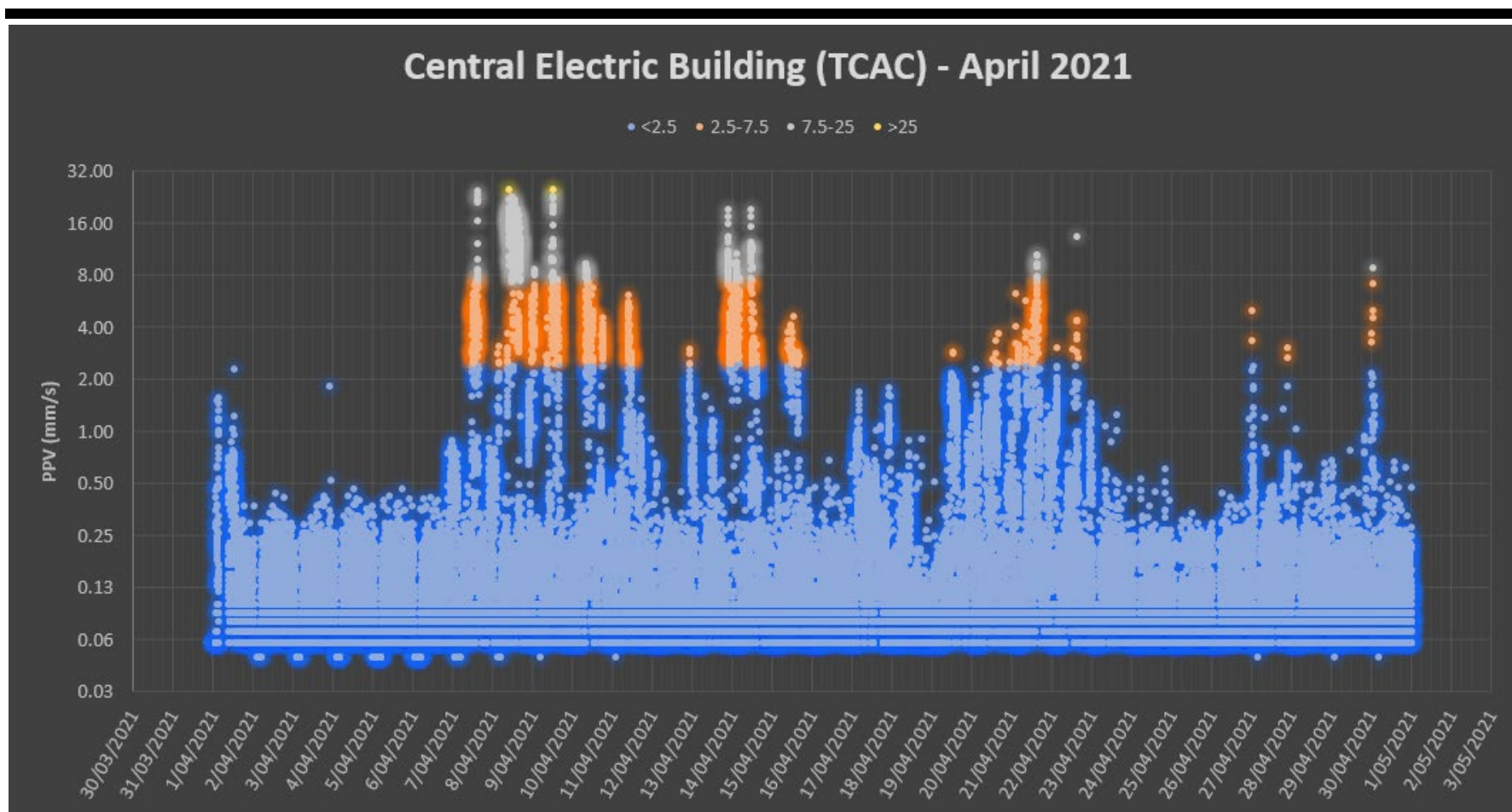


Figure B-5 TCAC – April 2021

April was a high vibratory month. The works in the Northern Concourse consisted of TCAC underpinning and load transfer, and demolition of the existing columns.

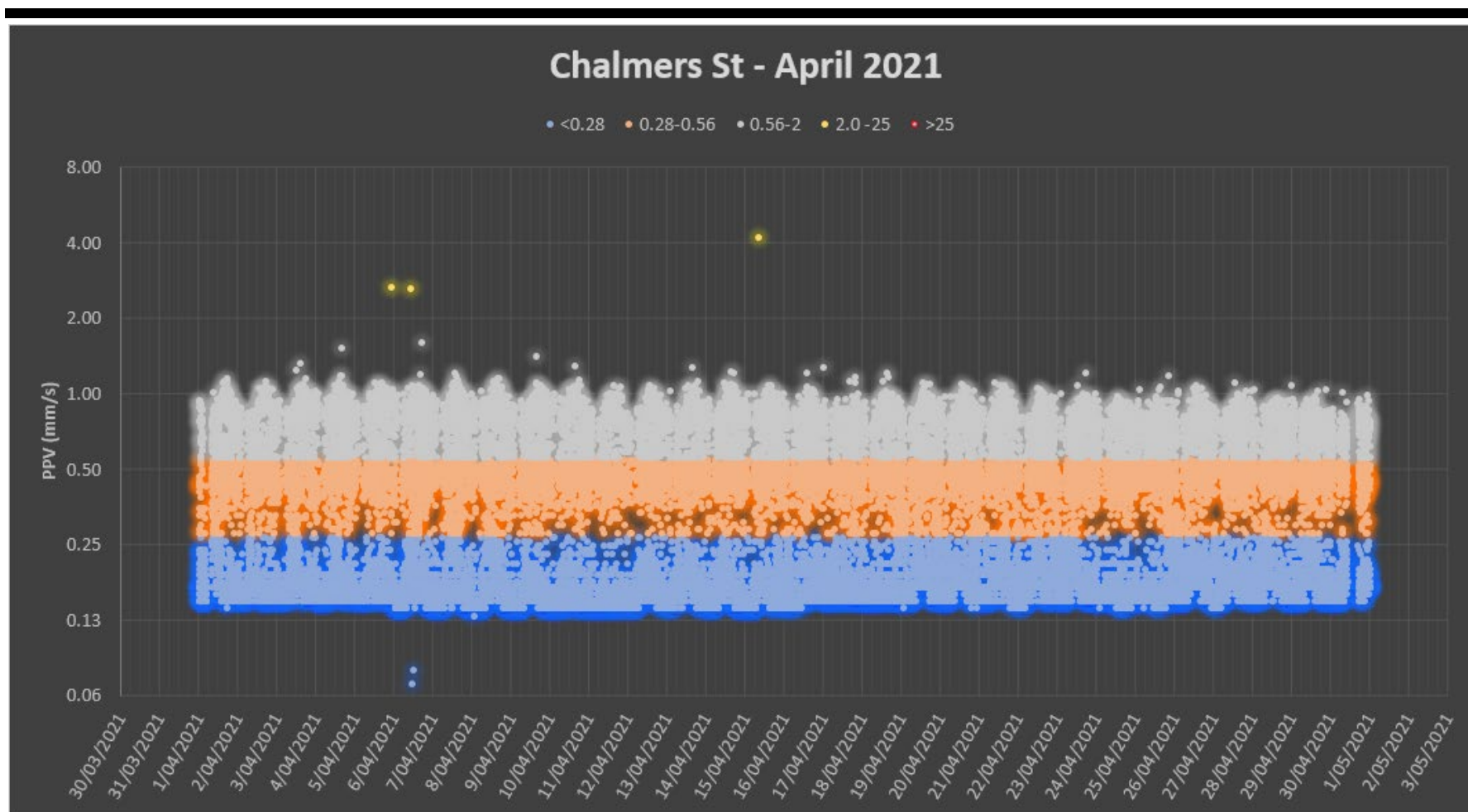


Figure B-6 Chalmers Street – April 2021

Predominant vibration generating activity at 20-28 Chalmers Street site was due to detailed excavation works including rock breaking. Typical vibration throughout the month was well below the cited 12.5 mm/s level corresponding to a near-zero probability of damage.

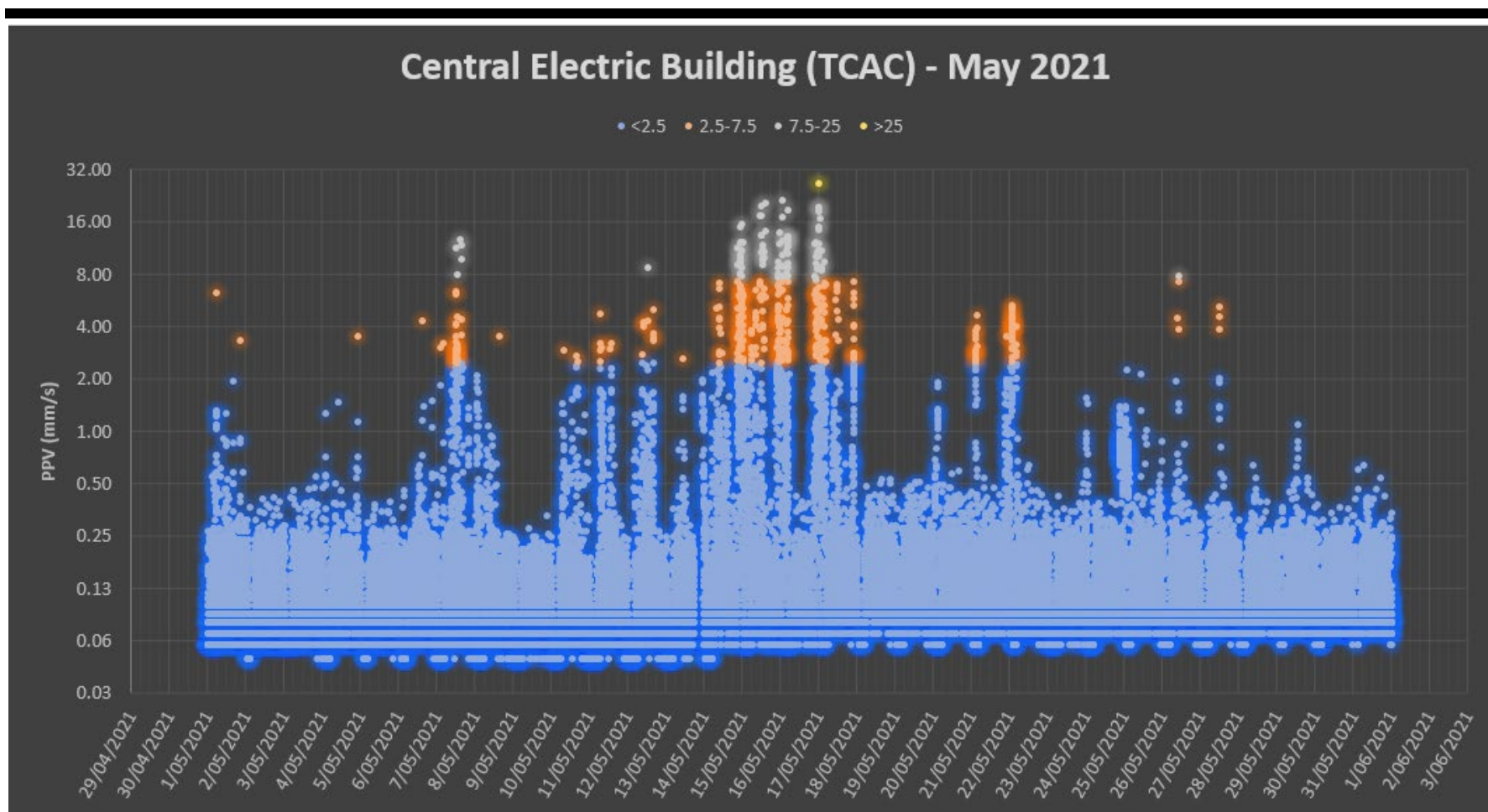


Figure B-7 TCAC – May 2021

Works in the Northern Concourse continue from the previous month for May and consisted of TCAC underpinning and load transfer, and demolition of the existing columns. Typically, vibration levels were below the cited 12.5 mm/s level corresponding to a near-zero probability of damage. The high vibration readings are from the final props being removed in the Northern Concourse.



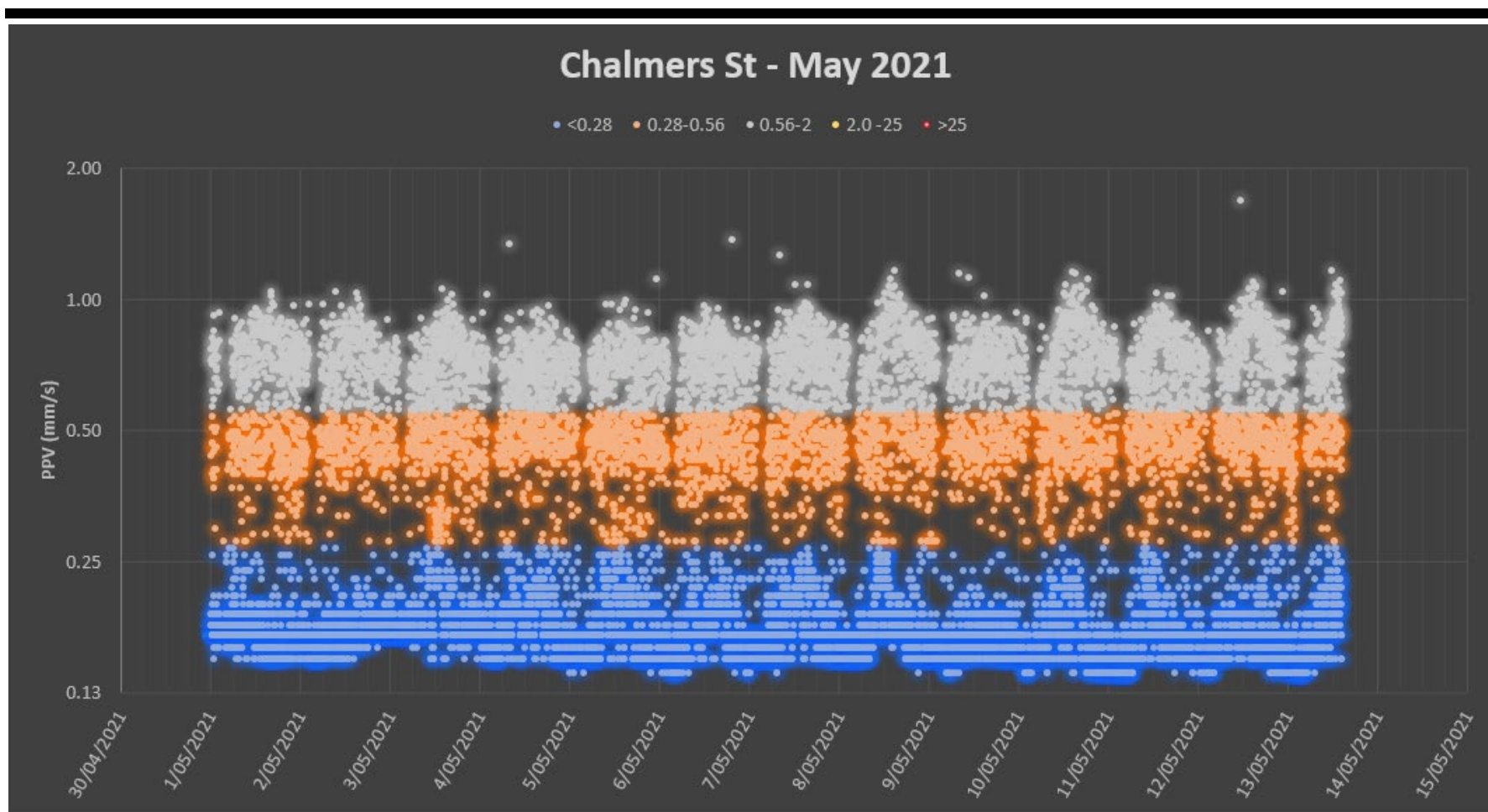


Figure B-8 Chalmers Street – May 2021

Excavation at 20-28 Chalmers St was 99% finished by the end of May. All excavators were removed from Eastern Entrance throughout May, only detailed excavation remained. The highest vibratory days were at the beginning of the month – as excavation finished up, vibration levels lowered. Vibration levels were significantly lower this month as compared to previous month.

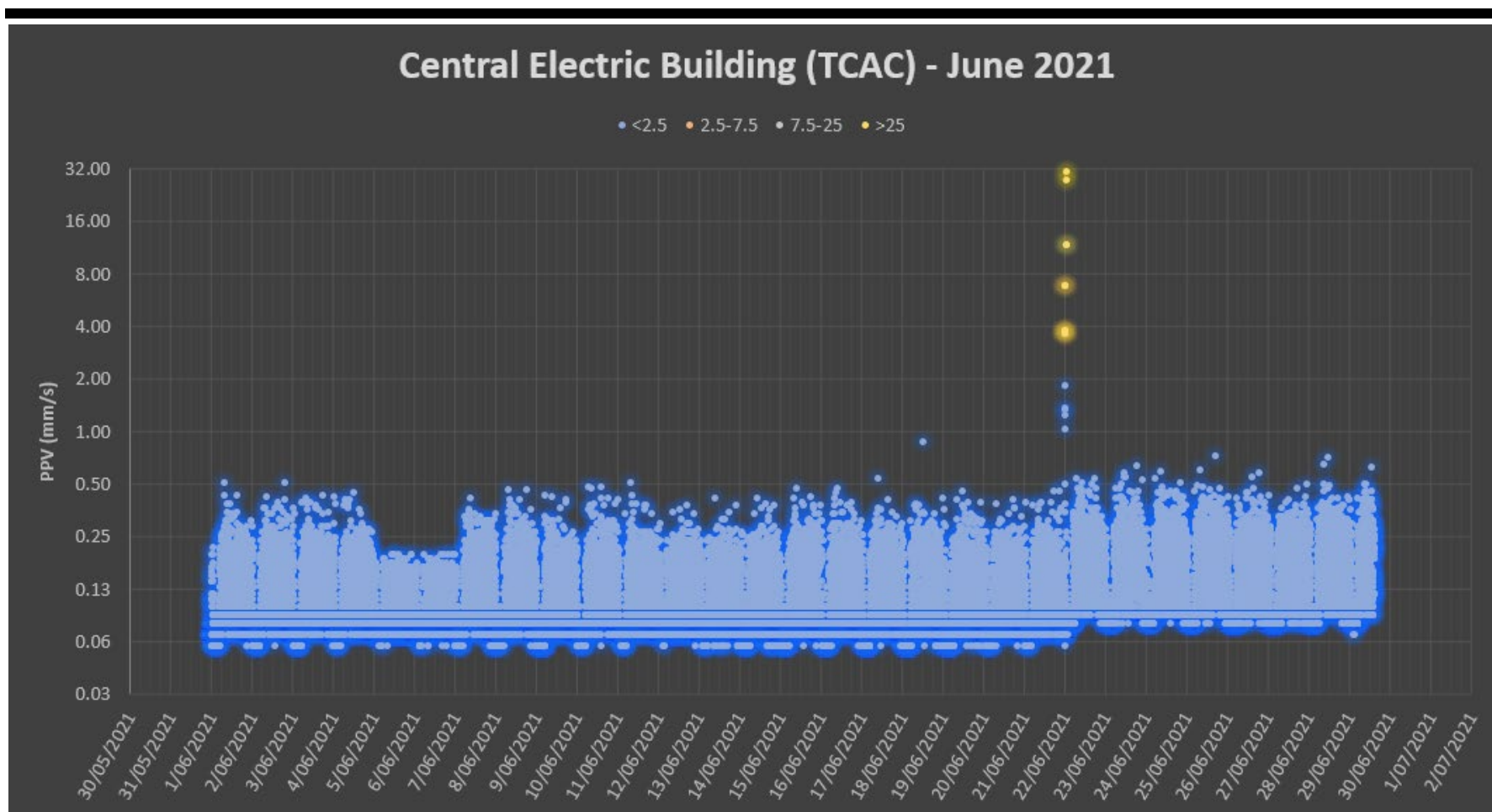


Figure B-9 TCAC - June 2021

The main vibratory activities throughout June at the Northern Concourse included multiple possession works including platform levelling and tiling. Works on the 22<sup>nd</sup> included the removal of external wall penetrations and internal wall at the Eddy Avenue pump room. The TCAC vibration logger was decommissioned on the 29<sup>th</sup> June 2021.

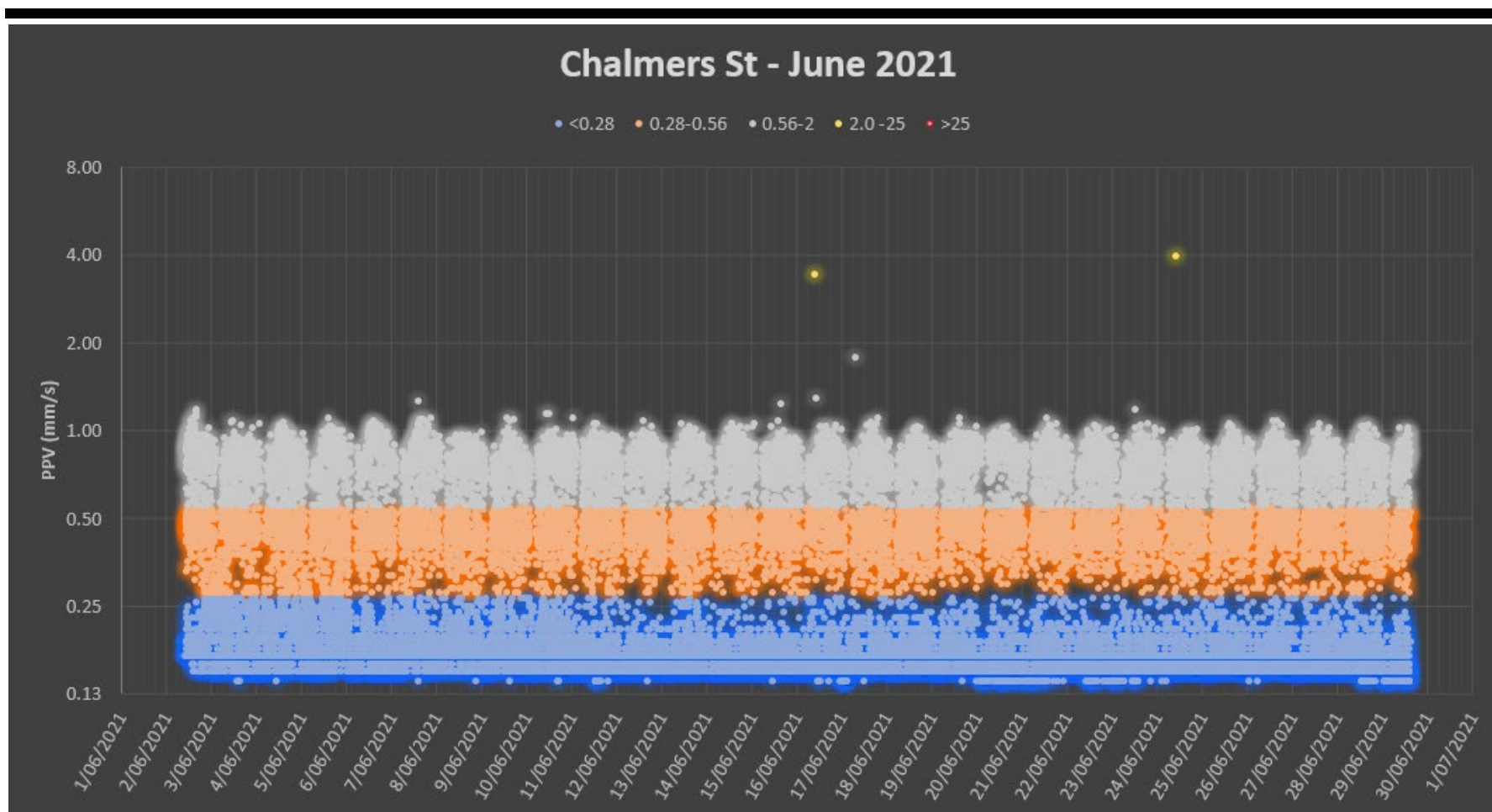


Figure B-10 Chalmers Street – June 2021

The high vibratory work within the 20-28 Chalmers Street site throughout June 2021 was the final detailed excavation around the Sydney Dental Hospital footings. Typical vibration throughout the month was below 12.5 mm/s corresponding to a near-zero probability of damage. The Chalmers St vibration logger was decommissioned on the 29<sup>th</sup> June 2021. Attended monitoring was used to monitor future high vibratory works

## Appendix C – CoA E37/E38 Internal Airborne Noise Levels Monitoring Summary

The below calculations were made to verify the predictions of the internal airborne noise levels for February - July 2021 at Chalmers St. A cumulative assessment of the highest days of noise levels throughout the 6-month period are demonstrated in Figures C1-C6. Noise and vibration levels are often correlated for high noise activities occurring at Chalmers St, such as breaking. However, other high noise activities such as saw cutting result in lower internal ground borne noise levels both in magnitude and duration. As such, airborne noise can be assessed in isolation of ground borne noise.

Greater resolution has been provided below further explain findings relating to noise. The 23<sup>rd</sup> of February, 25<sup>th</sup> of March, 29<sup>th</sup> of April, 4<sup>th</sup> of May, 25<sup>th</sup> of June and 2<sup>nd</sup> of July were selected as these days had the highest internal airborne noise levels of each month.

The individual LAeq15min data points over the 13-hour workday were then grouped into three categories based on magnitude (<55, 55-60 and >60dB) and summed to determine the duration of each. This data is presented in Figures and Tables C1-C6.



## Chalmers St Noise - 23/2/21 (duration during daytime hours)

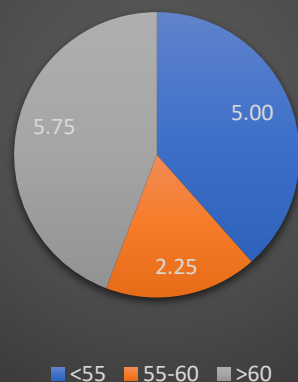


Figure C-1: 23 February 2021 distribution of noise data points (internal airborne noise levels)

Formula	CoA E38 (dB)	Criteria (hours)	Measured (hours)	Compliance with CoA E38
<b>Measured LAeq15mins + 5dB - 20dB</b>	<55	For more than 3.25	5.00	Complies
	55-60	For more than 6.5	2.25	Complies*
	>60	For less than 6.5	5.75	Complies

Table C-1: Verification of CoA E37/E38, 23 February 2021

## Chalmers St Noise - 25/3/21 (duration during daytime hours)

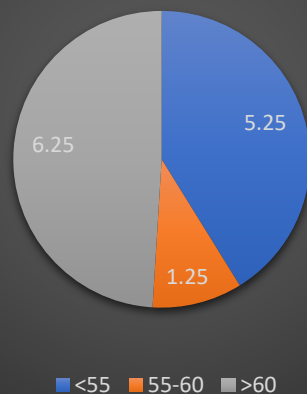


Figure C-2: 25 March 2021 distribution of noise data points (internal airborne noise levels)

Formula	CoA E38 (dB)	Criteria (hours)	Measured (hours)	Compliance with CoA E38
<b>Measured LAeq15mins + 5dB - 20dB</b>	<55	For more than 3.25	5:15	Complies
	55-60	For more than 6.5	1:15	Complies*
	>60	For less than 6.5	6:15	Complies

Table C-2: Verification of CoA E37/38, 25 March 2021

## Chalmers St Noise - 29/4/21 (duration during daytime hours)

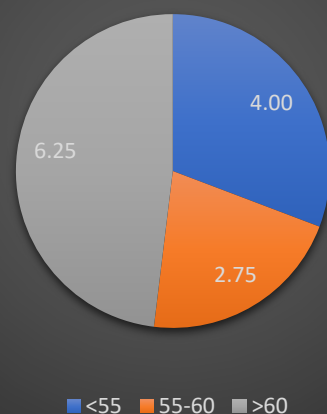


Figure C-3: 29 April 2021 distribution of noise data points (internal airborne noise levels)

Formula	CoA E38 (dB)	Criteria (hours)	Measured (hours)	Compliance with CoA E38
Measured LAeq15mins + 5dB - 20dB	<55	For more than 3.25	4:00	Complies
	55-60	For more than 6.5	2:45	Complies*
	>60	For less than 6.5	6:15	Complies

Table C-3: Verification of CoA E37/38, 29 April 2021

## Chalmers St Noise - 4/5/21 (duration during daytime hours)



Figure C-4: 4 May 2021 distribution of noise data points (internal airborne noise levels)

Formula	CoA E38 (dB)	Criteria (hours)	Measured (hours)	Compliance with CoA E38
<b>Measured LAeq15mins + 5dB - 20dB</b>	<55	For more than 3.25	5:30	Complies
	55-60	For more than 6.5	1:00	Complies*
	>60	For less than 6.5	6:30	Complies

Table C-4: Verification of CoA E37/38, 4 May 2021

## Chalmers St Noise - 25/6/21 (duration during daytime hours)

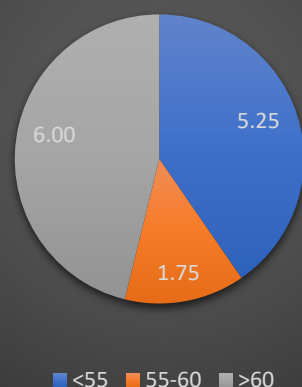


Figure C-5: 25 June 2021 distribution of noise data points (internal airborne noise levels)

Formula	CoA E38 (dB)	Criteria (hours)	Measured (hours)	Compliance with CoA E38
<b>Measured LAeq15mins + 5dB - 20dB</b>	<55	For more than 3.25	5:15	Complies
	55-60	For more than 6.5	1:45	Complies*
	>60	For less than 6.5	6:00	Complies

Table C-5: Verification of CoA E37/38, 25 June 2021

## Chalmers St Noise - 2/7/21 (duration during daytime hours)

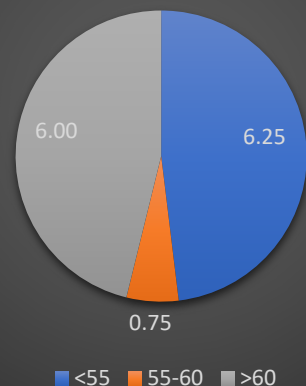


Figure C-6: 2 July 2021 distribution of noise data points (internal airborne noise levels)

Formula	CoA E38 (dB)	Criteria (hours)	Measured (hours)	Compliance with CoA E38
<b>Measured LAeq15mins + 5dB - 20dB</b>	<55	For more than 3.25	6:15	Complies
	55-60	For more than 6.5	0:45	Complies*
	>60	For less than 6.5	6:00	Complies

Table C-6: Verification of CoA E37/38, 2 July 2021

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## Appendix D – CoA E37/E38 Internal Groundborne Noise Levels

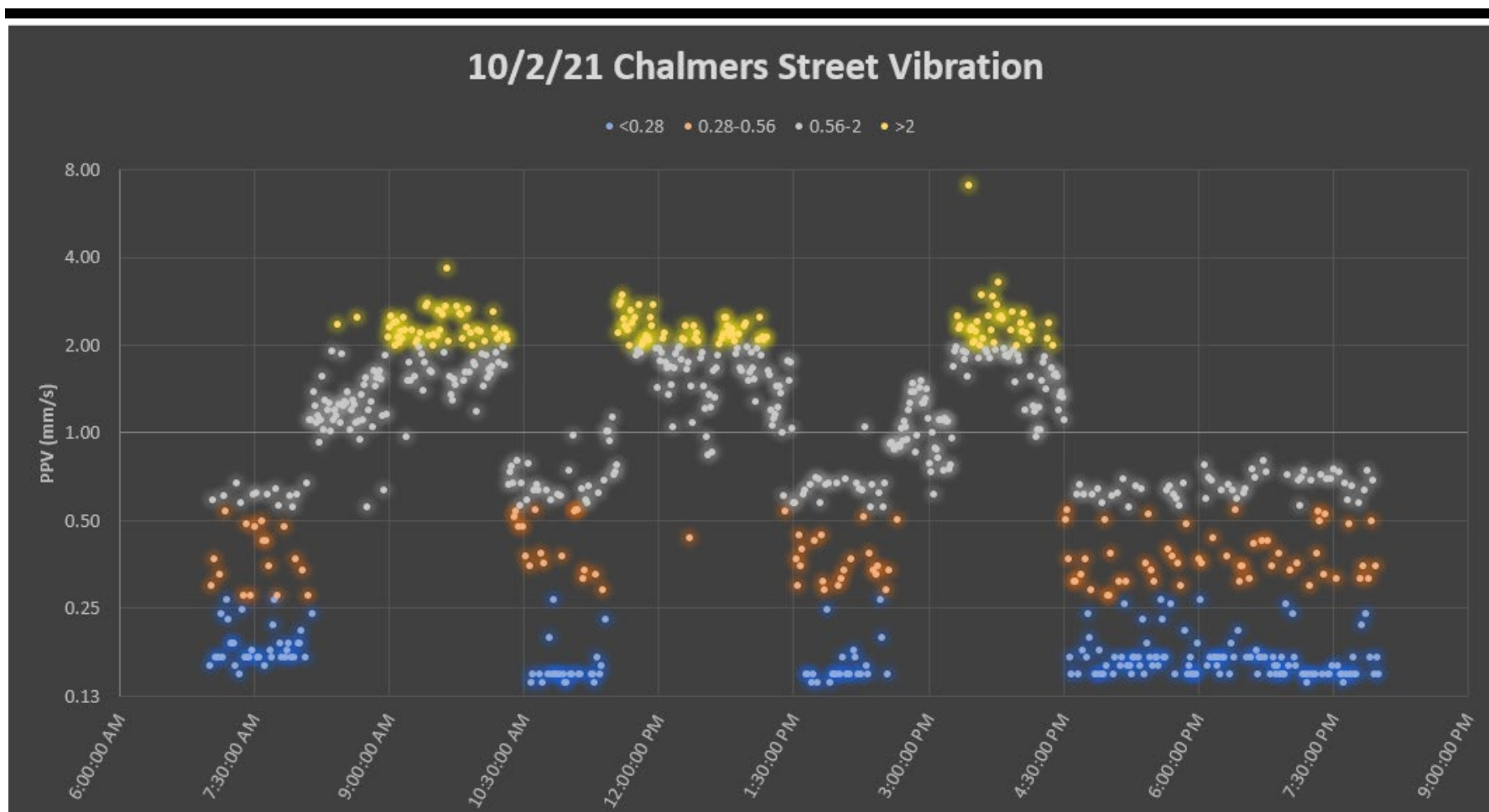


Figure D-1 10 February 2021

Typical activities that occurred on this day included breaking and excavating with two hammers. A review of the data validated the predictions for rock breaking at 20-28 Chalmers St and confirmed levels were within predictions.



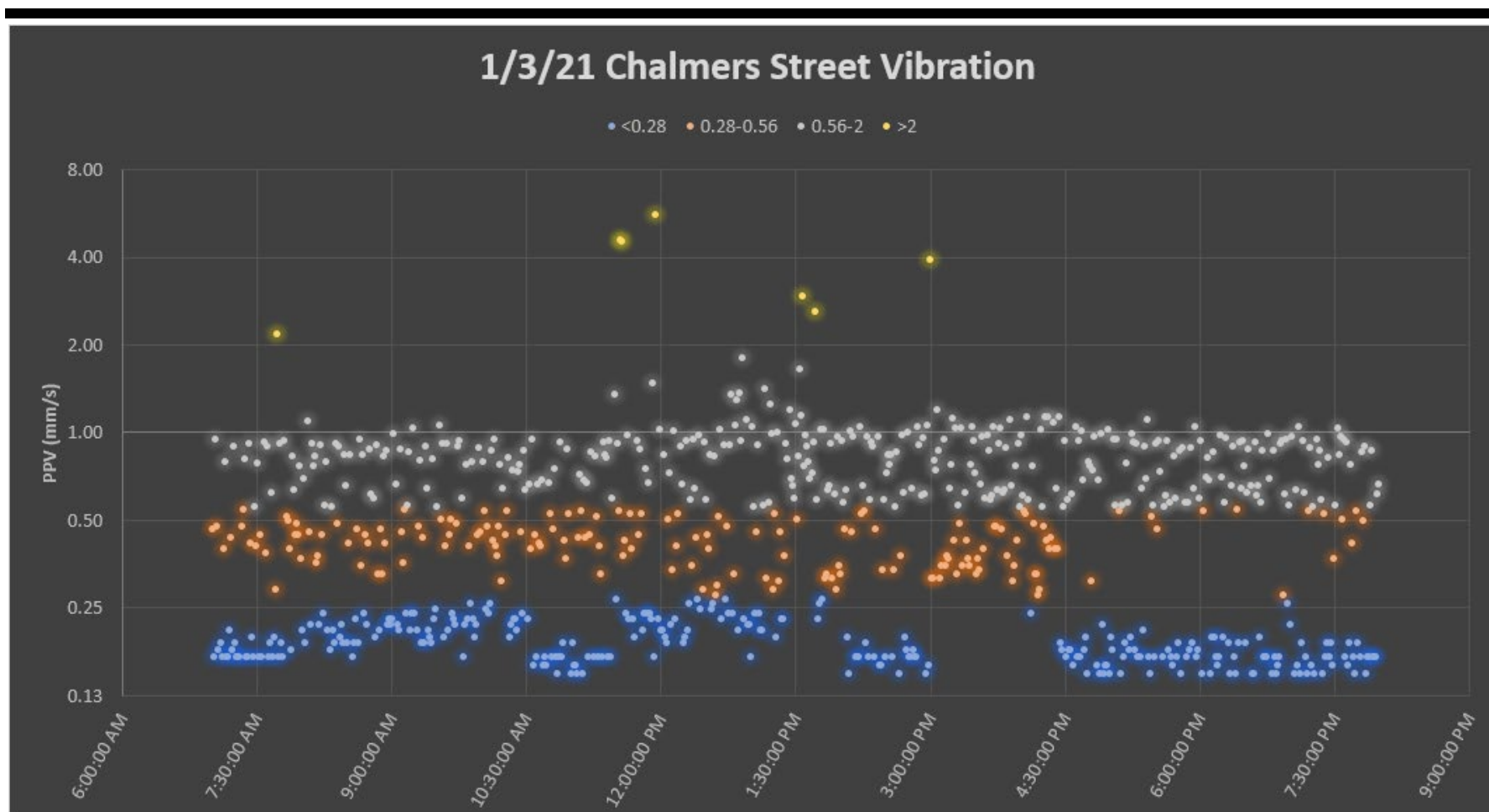


Figure D-2 1 March 2021

Typical activities on this day included breaking with two hammers 1x14T and 1x5T and craneage of materials. The spikes were identified to be the result of transient events.

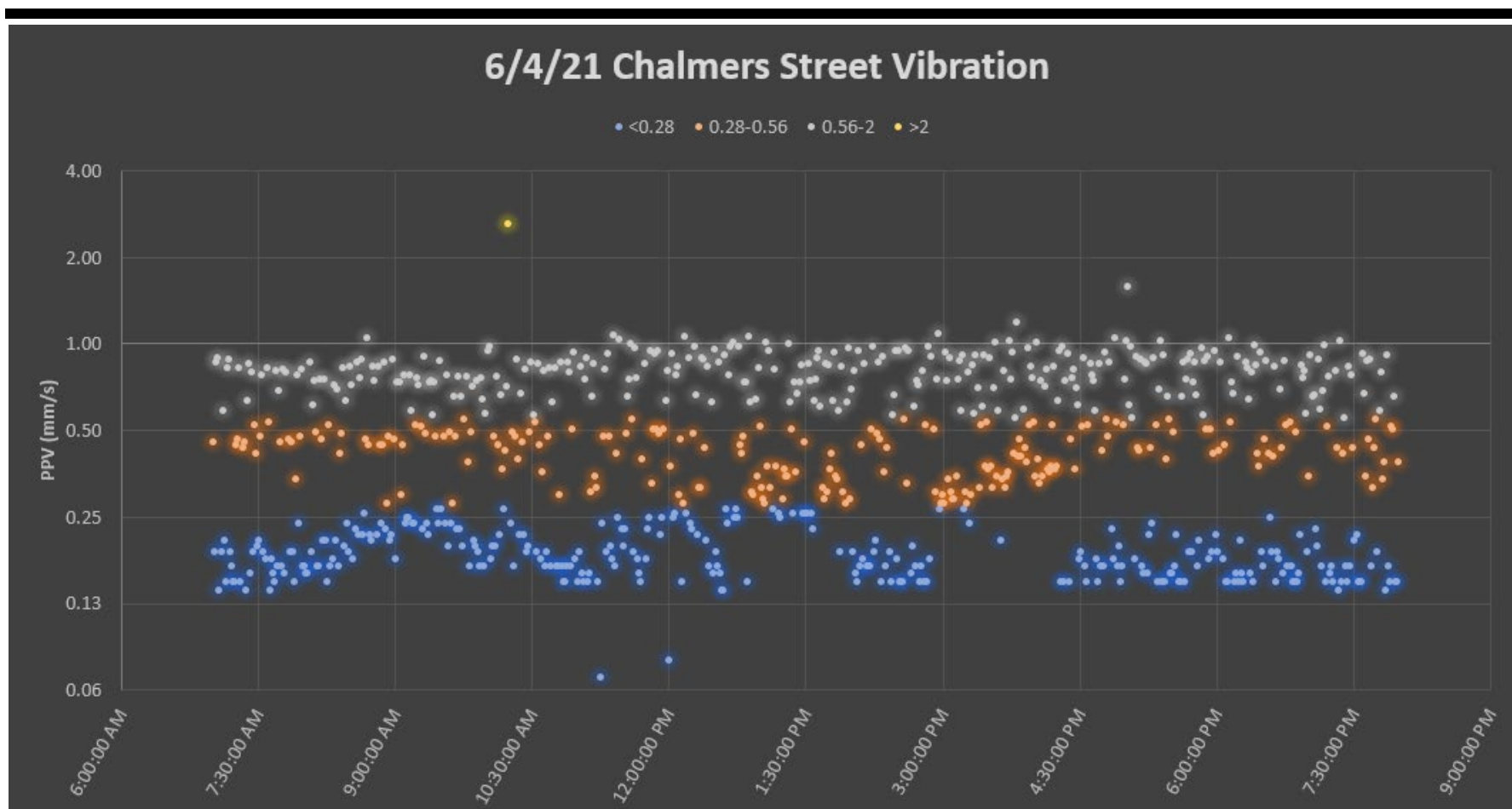


Figure D-3 6 April 2021

Typical activities that occurred on this day included rock breaking with two excavators (1 x 23T and 1 x 14T) and mucking out of trench. The spike was identified to be the result of a transient event.

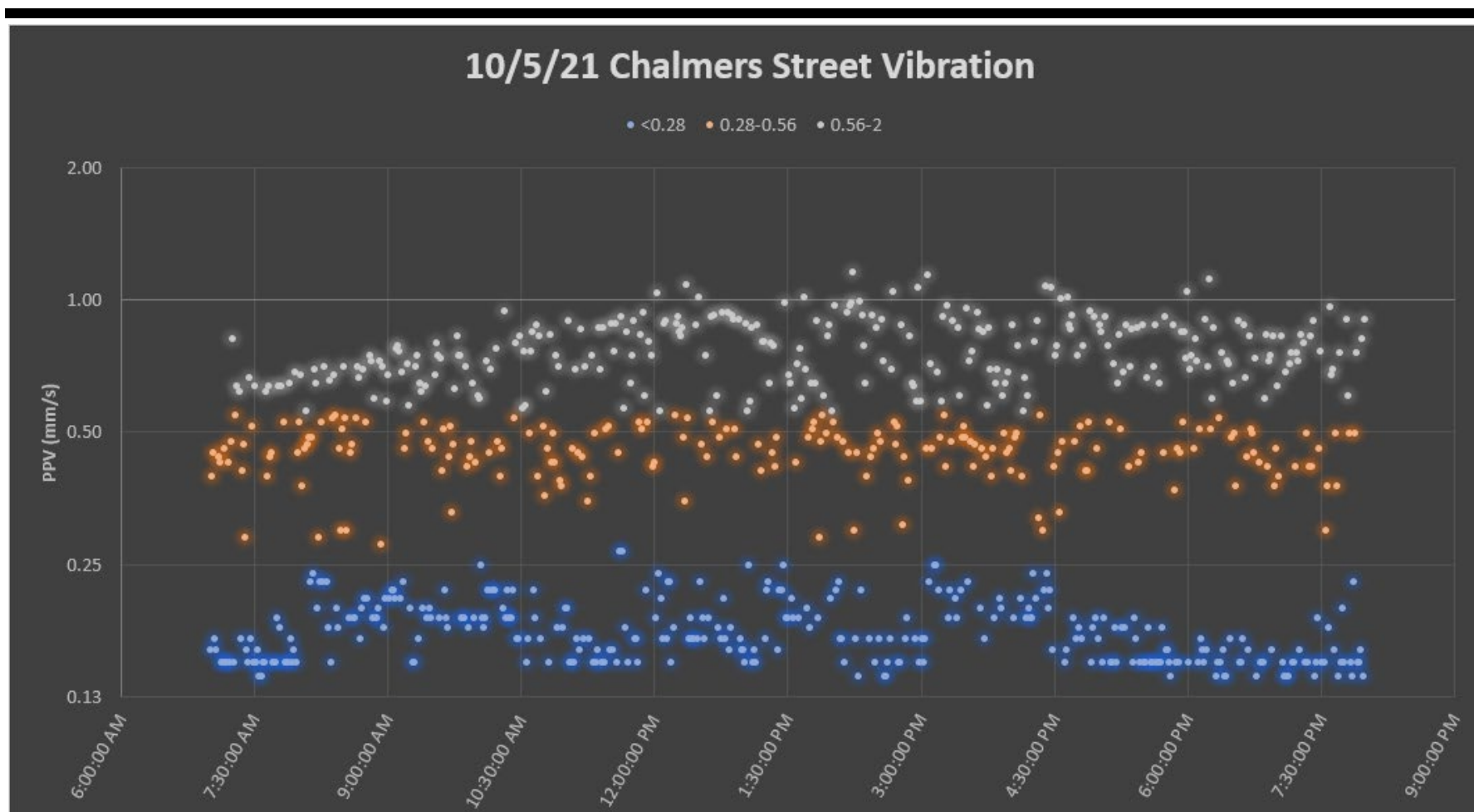


Figure D-4 10 May 2021

The main activity on site that resulted in elevated vibration levels was detailed excavation and craning of materials. This was the highest vibration day of the month, indicating that May was a low vibratory month.

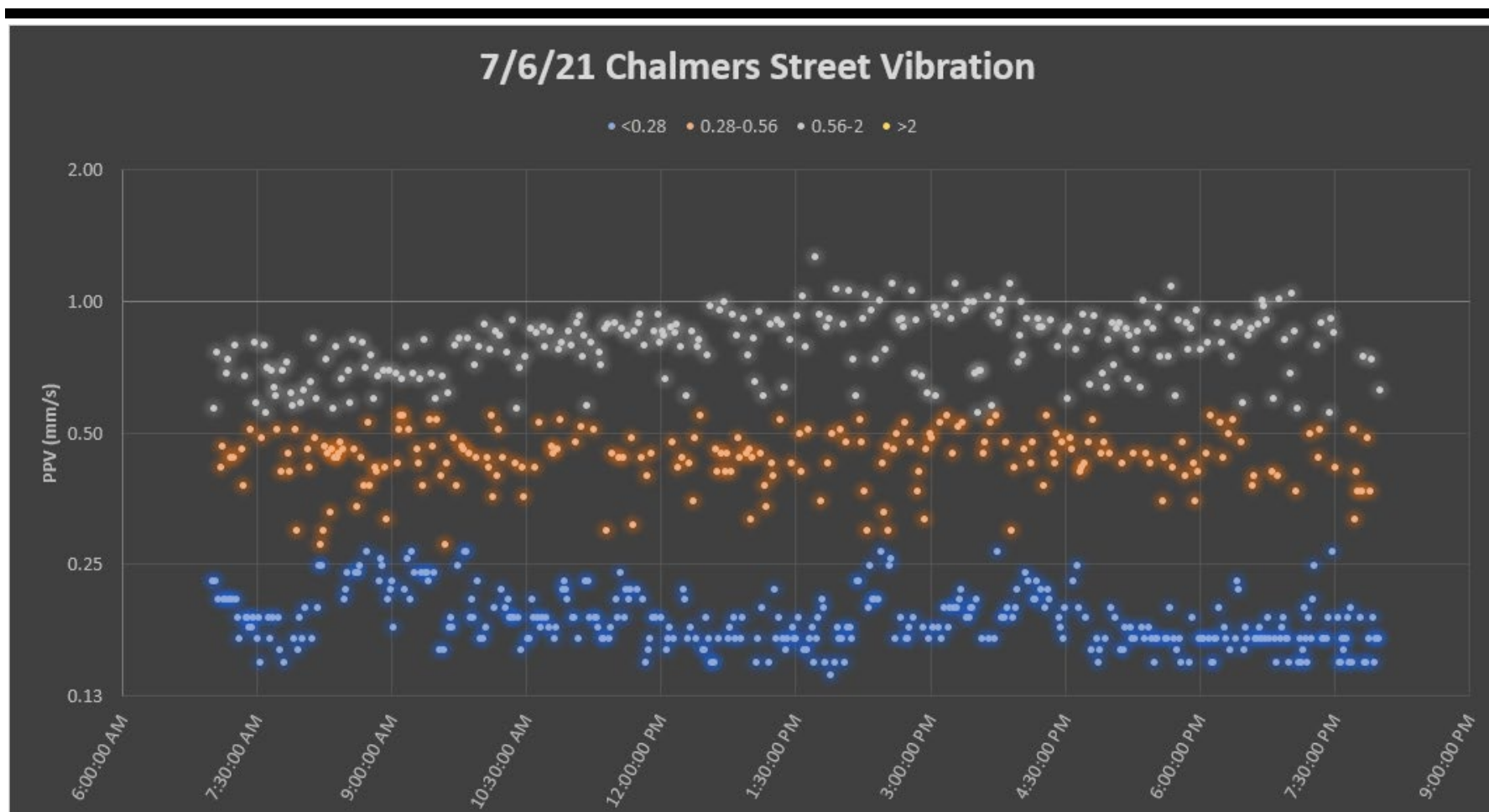


Figure D-5 7 June 2021

Works at 20-28 Chalmers St on the 7<sup>th</sup> June consisted of 33kv underbore works, including installation of conduits, piping load out works, and erection of sound proofing. Although detailed excavation began on the 24<sup>th</sup> June 2021, vibration levels remained steady throughout the month, as excavation was far enough away from the Chalmers St vibration logger to generate a stronger impact.

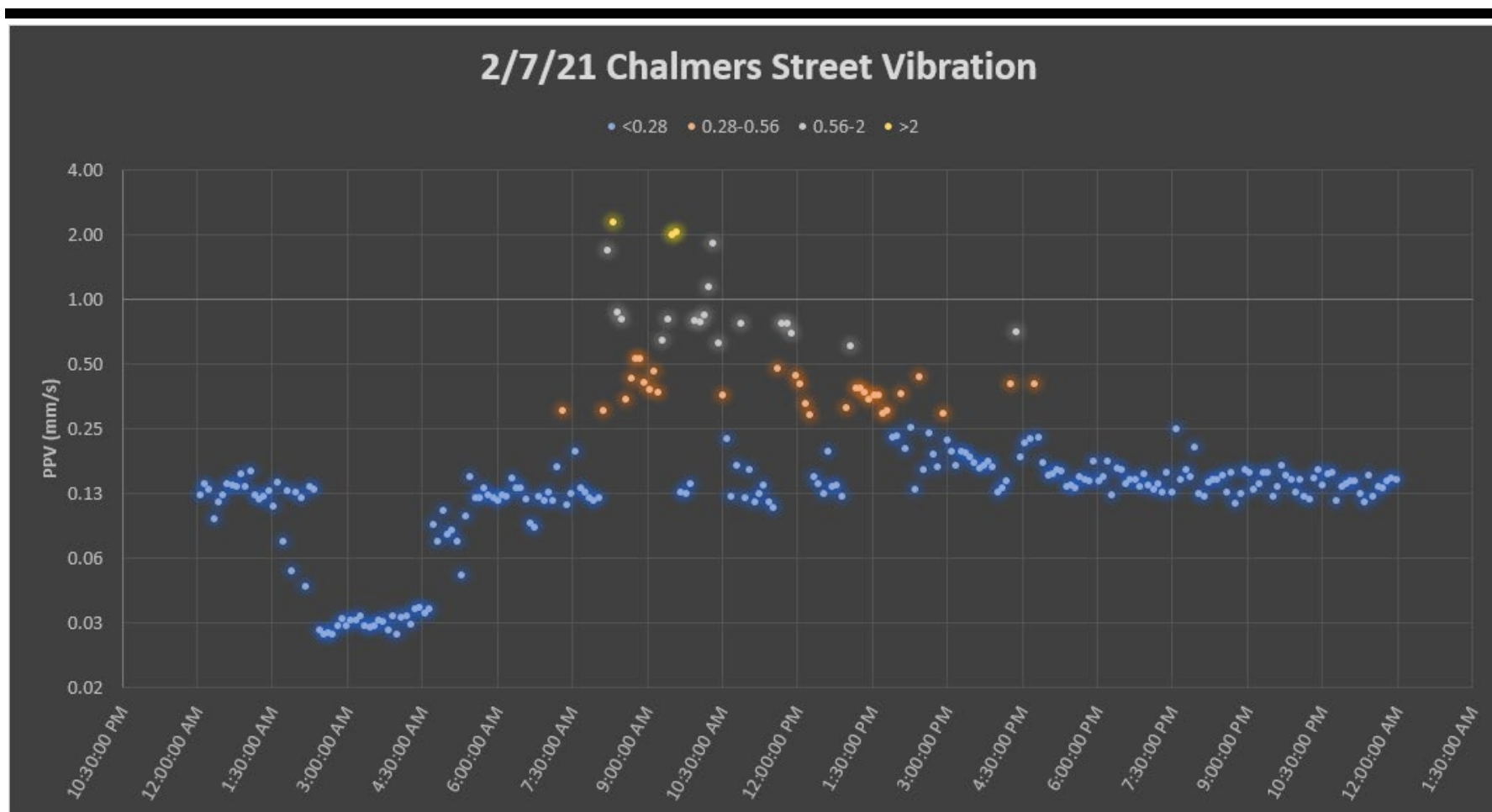


Figure D-6 2 July 2021

Works at 20-28 Chalmers St throughout July were largely non vibrational, other than the breakout of the SDH footings, which were monitored within the Dental Hospital stairwell. The graph above demonstrates the vibration activity within the hospital on the day of highest vibration in July. Data points are further apart as the attended logger monitors data points every five minutes.

Table D-1: Summary of highest duration of PPV distribution (all durations are h:mm)

Perceptible Vibration Criteria for Exposure to Continuous Vibration	PPV (mm/s) Distribution	Comment	Duration: 10 February 2021	Duration: 1 March 2021	Duration: 6 April 2021	Duration: 10 May 2021	Duration: 7 June 2021	Duration: 2 July 2021
Preferred human comfort level	<0.28mm/s	Typical vibration level in the absence of construction. Conservatively assuming that <0.28mm.	3:13	4:36	4:47	5:14	5:38	3:32
Maximum human comfort level	0.28- 0.56mm/s	Occasional transient events occur in this range in the absence of construction (assumed to be associated with Light rail and Central Station train operations). Some works may be perceivable within the café depending on frequency (Hz) of activity, location on site and substrate.	1:49	2:46	3:24	3:15	3:24	0:30
Above maximum human comfort level	0.56- 2mm/s	Transient and isolated events may occur in this range in the absence of construction, most likely with an impact in close proximity to the geophone (localised bump).	5:46	5:31	4:48	4:31	3:58	0:17
Above maximum human comfort level	>2mm/s	Typical vibration level associated with construction, subject to activity, frequency (Hz) location on site and substrate. Larger values are checked to determine whether the event is associated with construction or as a result of a transient event.	2:12	0:07	0:01	0:00	0:00	0:03

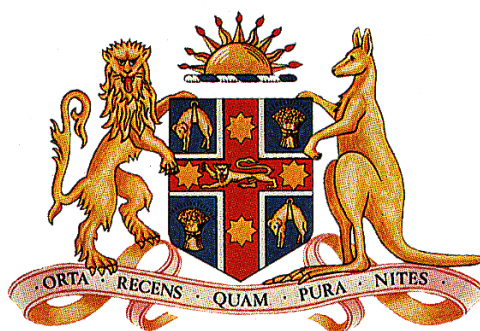
Perceptible Vibration Criteria for Exposure to Continuous Vibration	PPV (mm/s) Distribution	Comment	Duration: 10 February 2021	Duration: 1 March 2021	Duration: 6 April 2021	Duration: 10 May 2021	Duration: 7 June 2021	Duration: 2 July 2021
<b>Total above maximum human comfort level</b>	>0.56mm/s (assuming this level results in ground borne noise)	Complies with CoA E37/38; <6.5hrs of potential ground borne noise.	7:58*	5:38	4:49	4:31	3:58	0:20

\*On the 10<sup>th</sup> February, vibration occurred for 7:58. Some transient vibration events occurred on this day, evidenced by high peaks of vibration that were not consistent with breaking activities. Ground borne noise generated as a result of these activities was negligible and was within the CoA E38 Condition – high noise levels generated because of breaking occurred for less than 6.5 hours with adequate respite observed.

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## Appendix E – NSW Government Gazette 75





# *Government Gazette*

of the State of

New South Wales

**Number 75**

**Thursday, 9 April 2020**

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The New South Wales Government Gazette is the permanent public record of official NSW Government notices. It also contains local council, non-government and other notices.

Each notice in the Government Gazette has a unique reference number that appears in parentheses at the end of the notice and can be used as a reference for that notice (for example, (n2019-14)).

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To submit a notice for gazettal, see Gazette Information.

# **Environmental Planning and Assessment (COVID-19 Development—Infrastructure Construction Work Days) Order 2020**

I, the Hon. Rob Stokes, MP, the Minister for Planning and Public Spaces, make the following Order under section 10.17 of the *Environmental Planning and Assessment Act 1979*.

I am satisfied this Order is necessary to protect the health, safety and welfare of members of the public during the COVID-19 pandemic, as it will facilitate social distancing by spreading infrastructure construction work over more days in a week.

I have consulted with the Minister for Health and Medical Research in relation to the making of this Order.

## **1 Name of Order**

This Order is the *Environmental Planning and Assessment (COVID-19 Development—Infrastructure Construction Work Days) Order 2020*.

## **2 Commencement**

This Order commences on the day it is published in the Gazette and remains in force for the prescribed period within the meaning of section 10.17 of the Act.

## **3 Definitions**

(1) In this Order—

**the Act** means the *Environmental Planning and Assessment Act 1979*.

**Note.** The Act and the Interpretation Act 1987 contain definitions and other provisions that affect the interpretation and application of this Order.

(2) Notes included in this Order do not form part of this Order.

## **4 Relationship with orders under the *Public Health Act 2010***

To the extent that this Order is inconsistent with an order under Part 2 of the *Public Health Act 2010*, the order under that Part prevails.

## **5 Development authorised by this Order**

The development specified for this Order may be carried out without the need for any approval under the Act if it complies with the conditions specified for the development.

## 6 Infrastructure construction work days

- (1) The carrying out of any building work or work, or the demolition of a building or work, on a Saturday, Sunday or public holiday is development specified for this Order.
- (2) The conditions specified for the development are that the development must—
  - (a) must be the subject of an approval granted before the commencement of this Order, and
  - (b) must comply with all conditions of the approval other than any condition that restricts the hours of work or operation on a Saturday, Sunday or public holiday, and
  - (c) for work or operation on a Saturday, Sunday or public holiday—
    - (i) comply with the conditions of the approval that restrict the hours of work or operation on any other day as if the conditions applied to work or operation on a Saturday, Sunday or public holiday, and
    - (ii) not involve the carrying out of rock breaking, rock hammering, sheet piling, pile driving or similar activities during the hours of work or operation that would not be permitted but for this Order, and
    - (iii) take all feasible and reasonable measures to minimise noise.

- (3) In this clause—

**approval** means:

- (a) a State significant infrastructure approval,
- (b) an approval within the meaning of Division 5.1 of the Act that is granted in relation to an activity the subject of environmental assessment under Division 5.1 of the Act, and
- (c) an authorisation under Part 3 of the *Water Supply (Critical Needs) Act 2019*.

**condition** includes a limitation on the carrying out of an activity required by the determining authority when granting an approval in relation to the activity.

## **7 Suspension of regulatory instruments**

- (1) For the purpose of enabling development to be carried out in accordance with clause 6 of this Order, the following regulatory instruments do not apply to the extent necessary to serve that purpose:
- (a) any agreement, covenant or other similar instrument that restricts the carrying out of that development, and
  - (b) an environment protection licence under the *Protection of the Environment Operations Act 1997* that was issued before the commencement of this Order.

**Note.** All other conditions of an environment protection licence continue to apply.

The Hon. Rob Stokes, MP  
Minister for Planning and Public Spaces

Reference number:(n2020-975)