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42 NORTH STEYNE, MANLY - ALTERATIONS AND ADDITIONS

Acoustic Assessment for DA

28 October 2021

Iris Capital

TL912-02F02 Acoustic Report for DA (r2)

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

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Executive summary

Renzo Tonin & Associates were engaged to conduct an environmental noise assessment of alterations and additions to 42 North Steyne, Manly.

The proposed development is for substantial alterations and additions (new building) to the site known as 75 The Corso and 42 North Steyne Manly, legally described as Lots 100, 101 and 102 in Deposited Plan 1069144 and Lot 1, DP 1034722. The works allow for the adaptive reuse of the existing buildings, with demolition of existing facade elements and internal elements, building services and amenities; construction of retail/office premises at the ground floor facing both the eastern and western exterior of the site, as well as construction of seven (7) apartments across four building levels, six (6) containing 3 bedrooms plus study and one (1) penthouse apartment containing four bedrooms, replacement of plant and installation of new plant on the rooftop. The proposal includes the retention of both the existing 42 North Steyne vehicular access driveway and majority of existing basement car park together with the extension of the existing basement generally into part of 75 The Corso (beneath the Steyne Cafe building), for the purpose of creating augmented car parking and amenities.

Stratum and strata subdivision will be required.

Note that at the time of writing, Northern Beaches Council is currently in the final stages of arranging consolidation of Lot 1, DP 1034722 with Lots 1, 2 and 3 DP 1042657. NBC Ref : DA2021/0532.

As a result of our assessment, the following potential issues were identified:

- Traffic noise associated with North Steyne (and to a lesser extent Henrietta Lane) intruding into the development
- Noise from the existing Hotel Steyne adjacent – predominantly patron and music noise
- Noise from the use of the proposed ground floor cafe

This report presents an assessment of the above acoustic components in terms of Council's Development Control Plans, State Environmental Planning Policy (infrastructure) Australian Standards and NSW Environment Protection Authority noise policies.

External Noise Intrusion into the Development

External noise intrusion into the development have been assessed in accordance with Local Council Development Control Plan, ISEPP 2007, Australian Standard AS2107 and EPA Noise Policy for Industry. The major noise intrusion sources were identified as road traffic noise and patron and music noise.

On the basis of the external noise impacting upon the development site, appropriate design of the building envelope is required to achieve a suitable indoor amenity for occupants. Our assessment has established laminated glass will be required on the majority of external building facades. One window would require large airgap double glazing.

Noise Emission Generated by the Development

Noise from mechanical plant such as building exhaust systems and air-conditioning associated with the development has the potential to impact on nearby noise-sensitive premises. As details of mechanical plant are not available at this stage of the development in-principle noise control advice are present in this report.

Construction Noise

The major construction activities proposed on this site are demolition and excavation works, concrete pours and general building works. Construction and building work will be adequately managed so as to minimise disruption to the local community and the environment. A separate construction noise and vibration management plan has been prepared.

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1 Introduction

Renzo Tonin & Associates were engaged by Iris Capital to undertake a noise impact assessment of 42 North Steyne, Manly.

The proposed development is for substantial alterations and additions (new building) to the site known as 75 The Corso and 42 North Steyne Manly, legally described as Lots 100, 101 and 102 in Deposited Plan 1069144 and Lot 1, DP 1034722.

The works allow for the adaptive reuse of the existing buildings, with demolition of existing facade and internal elements, building services and amenities; construction of retail/office premises at the ground floor facing both the eastern and western exterior of the site, as well as construction of seven (7) apartments across four building levels, six (6) containing 3 bedrooms plus study and one (1) penthouse apartment containing four bedrooms, replacement of plant and installation of new plant on the rooftop.

The proposal includes the retention of both the existing 42 North Steyne vehicular access driveway and majority of existing basement car park together with the extension of the existing basement generally into part of 75 The Corso (beneath the Steyne Cafe building), for the purpose of creating augmented car parking for 16 vehicles and amenities.

Stratum and strata subdivision will be required.

Note that at the time of writing, Northern Beaches Council is currently in the final stages of arranging consolidation of Lot 1, DP 1034722 with Lots 1, 2 and 3 DP 1042657. NBC Ref : DA2021/0532.

Acoustically, the main concerns are as follows:

- External noise emissions to neighbours from the use of rooftop mechanical plant and equipment; and
- Noise impacts on the future residential dwellings from
    - Use of the proposed café,
    - Use of the adjacent Hotel Steyne (beer garden, roof terrace and roof top mechanical plant noise), and
    - Road traffic noise/entertainment precinct noise.

A background noise survey was carried out on site by Renzo Tonin & Associates from 09/02/2021 to 19/02/2021 to establish the existing levels of external noise affecting development. These noise levels were used to set project noise emission goals to neighbours.

In addition, on 19/02/2021, short term attended measurements were undertaken of patron and music noise from the Steyne Hotel and road traffic noise on North Steyne, which formed the basis of the noise intrusion assessment.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

The following documents were reviewed for this assessment.

Table 1: Drawings Reviewed

Drawing No.	Issue	Date	Title
Architectural drawings prepared by Squillace			
DA Architectural drawing set dated 21 October 2021			
Concept spatial mechanical services sketches prepared by Erbas Consulting			
Concept mechanical plans dated June 2021, including Basement to Level 4 and roof.			

2 Site and Surrounds

The subject site is located at 42 North Steyne, Manly. The site is surrounded by residential and retail/commercial buildings on the north and west, and the Hotel Steyne to the South. Figure 1 below show site surrouds and location of long-term noise monitoring locations.

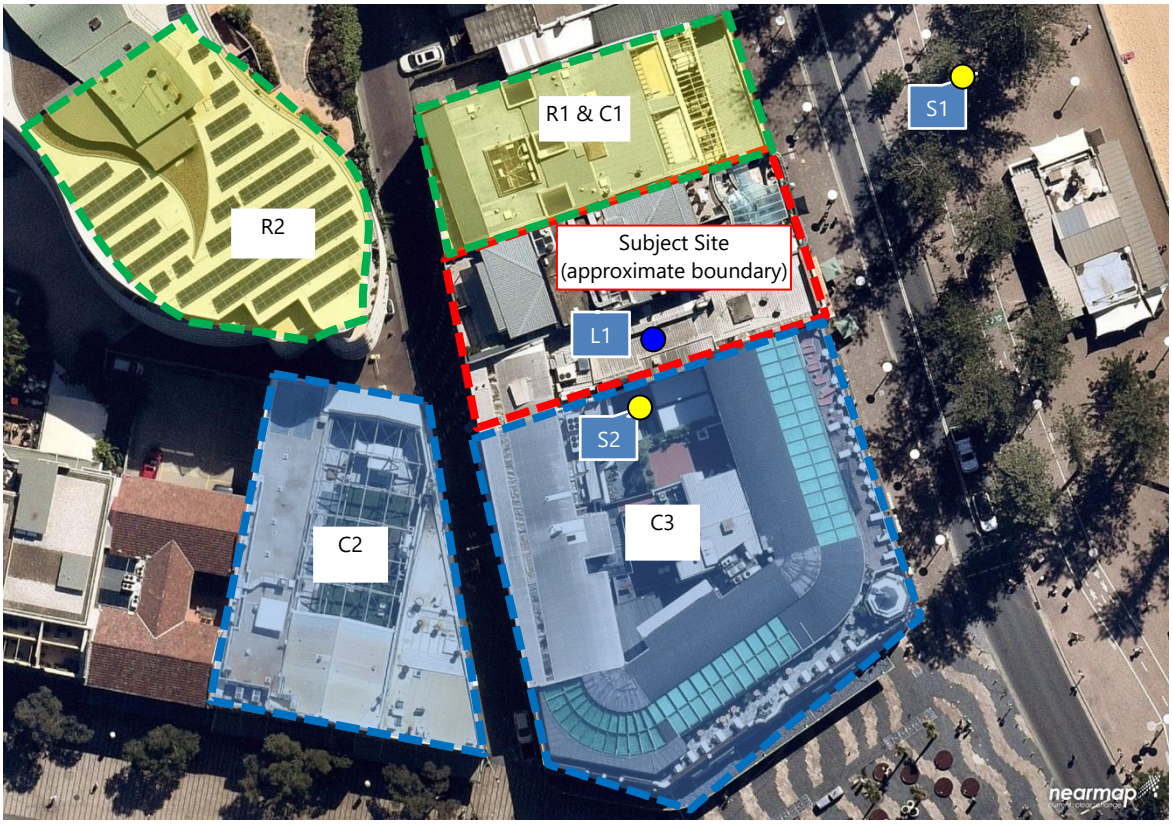

Figure 1: Site Surrounds and Noise Monitoring Locations

The nearest noise-sensitive receivers to the proposed development have been identified as follows and indicated in Figure 1 above. L1 denotes long term noise monitoring location. S1 and S2 denote short term measurement locations.

Table 2: Noise Sensitive Receiver Locations

Receiver ID	Address	Description
Residential Receivers		
R1	43-45 North Steyne	3 to 4 storey apartment buildings to North of development
R2	9-15 Central Ave	Pacific Waves – 9 storey residential apartment block West of the development
Commercial Receivers		
C1	43-45 North Steyne	Ground floor commercial adjacent to North
C2	2-8 Sydney Road	Commercial development to South
C3	75 The Corso	Hotel Steyne to the South

3 Measured Noise Levels

The noise environment at the site was determined by a combination of long term noise logging and attended noise measurements.

3.1 Long-term Noise Survey

Long term unattended noise monitoring was undertaken on the roof of 42 North Steyne from 09/02/2021 to 19/02/2021.

The noise logger recorded noise levels on a continuous basis and stored data every fifteen minutes. The noise logger was calibrated before and after measurements and no significant deviation in calibration was noted. The noise monitoring equipment used here complies with Australian Standard 1259.2-1990 "Acoustics - Sound Level Meters" and is designated as Type 1 instruments suitable for field use.

The results of the background and ambient noise monitoring conducted on site are presented in Table 3 and Table 4.

3.2 Existing Noise Environment

The results of the long-term noise monitoring have been summarised in accordance with Noise Policy for Industry requirements published by Environment Protection Authority's Noise Policy for Industry and are presented in the tables below.

Table 3: Measured Site Background Noise Levels

Noise Monitoring		Representative L_{A90} Background Noise Levels in dB(A)		
Location	Duration	Day[1]	Evening[2]	Night[3]
L1: 42 North Steyne, Manly	09/02/2021 to 19/02/2021	56	57	54

Notes:

Day, Evening & Night assessment periods are defined in accordance NSW EPA's Noise Policy for Industry as follows.

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays.
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

Table 4: Measured Site Ambient Noise Level

Noise Monitoring		Representative L_{Aeq} Ambient Noise Levels in dB(A)		
Location	Duration	Day[1]	Evening[2]	Night[3]
L1: 42 North Steyne, Manly	09/02/2021 to 19/02/2021	60	59	57

Notes:

Day, Evening & Night assessment periods are defined in accordance NSW EPA's Noise Policy for Industry as follows.

1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays.
2. Evening is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays
3. Night is defined as 10:00pm to 7:00am, Monday to Saturday; 10:00pm to 8:00am Sundays & Public Holidays

The measured background (L_{A90}) noise levels are representative of surrounding residential neighbours and are used in setting operational noise emission goals from the development such as mechanical ventilation and air-conditioning systems in accordance to EPA Noise Policy for Industry (NPfI).

3.3 Measured Traffic Noise Level

Short term attended measurements of traffic noise on North Steyne were undertaken on the 19th of February 2021, between 10pm and 11pm (a Friday night and representative of a peak time of entertainment precinct operation). The design external traffic noise levels are presented Table 5 below.

Table 5: Representative Day and Night Traffic Noise Levels

Monitoring Location	Survey Period	Measured Traffic Noise Level $L_{Aeq, T}$ [1,2]	Predicted Traffic Noise Level $L_{Aeq, T}$ [1,2,3] Worst Affected Residential Façade
L1: 42 North Steyne, Manly	Day time (7am to 10pm) 10/09/2020 to 18/09/2020	-	70 dB(A)
	Night-time (10pm to 7am) 10/09/2020 to 18/09/2020	68 dB(A)	68 dB(A)

Notes:

1. Noise levels presented are facade values.
2. Representative road traffic noise level in measured L_{Aeq} over 15 hour and 9 hour day and night period respectively.

3.4 Measured and Predicted Patron and Music Noise Levels

The southern façade of the propose development will over look the Steyne Hotel beer garden and roof terrace. The primary noise associated with the use of the beer garden was amplified music. Patron noise, while still significant, was a lesser impact.

Short term attended measurements of patron and music noise incident on the Southern façade of 42 North Steyne were undertaken on the 19th of February 2021, between 9pm and midnight.

Subsequent to these measurements, management controls were implemented to reduce noise impacts on 42 North Steyne. Following limitation of the beer garden PA music noise level, the noise level at the southern façade on Level 4 of 42 North Steyne is predicted to be 80dB(A)L_{10}. Use of balustrades or noise screens at 42 North Steyne will further reduce Hotel operational noise impact on the residential façade (see discussion – section 6).

Due to Covid restrictions, it was not possible to undertake attended measurements of patron and music noise in the Steyne roof terrace as part of this study. Noise emissions from that space have been assumed, based on a typical patron sound power in this area of 80dB(A) L_{10} per person (1 in 2 people speaking). This is typical of patron noise levels for using outdoor drinking/dining areas in our experience.

3.5 Calculated Internal Noise Levels Within Proposed New Apartments

Results from the noise surveys outlined above were used to calculate internal noise levels within the proposed development.

Acoustic criteria with respect to target internal noise levels as a result of external noise impacts are set out in section 4.

Acoustic treatments for the protection of apartment occupants from external noise are presented in section 6.

4 External Noise Intrusion Assessment

This section presents the assessment of noise intrusion from road traffic noise and rooftop mechanical plant and patron and music noise.

4.1 Noise Intrusion Criteria

4.1.1 Road Traffic Noise Criteria

The Standards, Government Policies, Guidelines and Council Development Control Plans (DCP) relevant to this development are as follows:

- Manly Development Control Plan 2013 (Amendment 11)
- State Environment Planning Policy (Infrastructure 2007)
- Department of Planning (DoP) publication "Development Near Rail Corridors & Busy Roads – Interim Guideline" 2008
- Australian Standard AS/NZS 2107:2016 "Acoustics – Recommended design sound pressure levels and reverberation times for building interior"

In the absence of specific noise criteria stipulated in Local Council DCP, design internal noise levels from the ISEPP2007, Department of Planning publication 2008 and Australian Standard AS/NZS 2107 has been recommended for this development and is outlined in Table 6 below.

Table 6: Recommended Maximum Internal Noise Levels

Type of Occupancy / Activity	Windows & Doors Condition	Maximum Internal Noise Level	
		Day, L_{Aeq} (15hour)	Night, L_{Aeq} (9hour)
Sleeping areas	Closed	-	35dB(A)
	Open	-	45dB(A)
All other habitable rooms	Closed	40dB(A)	40dB(A)
	Open	50dB(A)	50dB(A)
Lobbies and common areas	Closed	55dB(A)[1]	55dB(A)[1]
Retail	Closed	50dB(A)[1]	-

Notes:

1. Based on Australia Standard AS2107 "Acoustics – Recommended design sound pressure levels and reverberation times for building interior"

Relevant sections of the State Environment Planning Policy (Infrastructure) 2007, DoP "Development near rail corridors and busy roads – Interim guideline 2008", Australia Standard AS2107, Council DCP, and Government Policies are presented in APPENDIX A of this report. Results of the background and ambient noise monitoring conducted on site are presented in APPENDIX B.

4.1.2 Noise Intrusion from Hotel Steyne

The main noise intrusion path to habitable rooms is through light weight elements like external glazing.

The following table nominates the project noise intrusion goals for noise from Hotel Steyne.

Table 7: Recommended Internal Noise Levels for Patron and Music Noise

Type of Occupancy / Activity	Transmission path	Windows & Doors Condition	Internal Noise Level	
			Day, $L_{Aeq\ (15min)}$	Night, $L_{Aeq\ (15min)}$
Sleeping areas	Glazing	Closed	-	35dB(A)
All other habitable rooms	Glazing	Closed	35dB(A)	35dB(A)
	Common Wall to Beer Garden	NA	25dB(A)	25dB(A)
Lobbies and common areas	Any	Closed	55dB(A)	55dB(A)
Private open space	External	Balcony, or Wintergarden open to 5% of floor area	60-65dB(A)[1]	60-65dB(A)[1]

Note: 1. Design goal for patron and music noise in isolation (traffic discussed separately).

4.2 Recommendations

Refer to section 6 for recommendations to address external noise impacts on the site.

5 Noise Emission Assessment

This section presents the project criteria in respect of external noise emissions from the proposed development.

5.1 Noise Emission Criteria

5.1.1 External Noise Emission from Building Services

The NSW Environment Protection Authority (EPA) sets out noise criteria in its Noise Policy for Industry (NPfI) to control the noise emission from industrial sources.

The NPfI sets project noise trigger level to protect noise amenity for residential receivers. The project noise trigger level is set as the lower value of the following two assessment components:

- Controlling intrusive noise impacts in the short term for residences; and
- Maintaining noise level amenity for particular land uses for residences and other land uses.

Noise intrusiveness ensures that industrial noise does not exceed the background noise level by an excessive margin, preventing significant changes in the noise characteristic pertinent to the development site and surrounds. This is commonly referred to as the 'background plus 5' criterion. That is, the noise level from new industrial development, assessed in periods of 15 minutes, should not exceed the existing background noise level (measured in the absence of that development) by more than 5dB(A).

Noise amenity ensures that industrial noise levels do not increase without limit, for if a number of industrial noise sources are permitted to increase the background noise level by 5dB(A), in turn there would be a point where the ultimate noise level is unacceptable. A limit on the ultimate acceptable noise level is therefore included in the NPfI as a way of ensuring that cumulative noise impact from industrial growth is curtailed. This limit is referred to as the project amenity noise level. The appropriate limit in any circumstance relates to the land use category, for example, there are different limits for rural, suburban and urban areas.

The table below presents the recommended amenity noise level relevant to the receivers surrounding the proposed development site. The project amenity noise level is defined as the recommended amenity noise level minus 5dB(A).

Table 8: NPfI Amenity Noise Levels - Recommended L_{Aeq} Amenity Noise Levels from Industrial Noise Sources [EPA NPfI Table 2.1]

Receiver	Noise amenity area	Time of day	L_{Aeq}, dB(A)
			Recommended amenity noise level
Residential	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See Column 4	5dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
Commercial premises	All	When in use	65

Notes:

- Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
- On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
- The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

In accordance with Section 2.4 of the NPfI, the following **exceptions** to the above method to derive the project amenity noise level apply:

1. In areas with high traffic noise levels (see Section 2.4.1 of the NPfI).
2. In proposed developments in major industrial clusters (see Section 2.4.2 of the NPfI).
3. Where the resultant project amenity noise level is 10dB, or more, lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.
4. Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development.

The following table presents the site-specific noise production criteria from industrial noise sources, namely mechanical plant to neighbouring residential properties (R1, R2) identified in Figure 1.

Table 9: Project noise trigger level for noise emission from mechanical plant to residential neighbours R1 and R2 (EPA NPfI)

Time of Day	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
	Rating Background Level (RBL) LA90	Intrusive-ness Trigger Level, (RBL+5) $L_{Aeq,\ 15minute}$	Recommended Amenity Noise Level (RANL), $L_{Aeq,\ period}$	Project Amenity Noise Level (PANL), $L_{Aeq,\ period}$	Measured $L_{Aeq,\ period}$ existing noise levels	Traffic noise exceed the RANL by more than 10dB?	Existing noise level likely to decrease in future?	Exceptions to PANL $L_{Aeq,\ period}$?	Project Noise Trigger Level, $L_{Aeq,\ 15minute}$
Day (7am to 6pm)	56	61	60	55	60	No	No	None	58
Evening (6pm to 10pm)	57	61	50	45	59	No	No	None	48
Night (10pm to 7am)	54	59	45	40	57	No	No	None	43

Explanatory notes:

Column 1 – RBL measured in accordance with the NPfI and outlined in the results of the long-term noise monitoring has been summarised in accordance with NPfI requirements and are presented in Table 3 above. Where the evening time criterion is greater than the daytime criterion, the evening time goal is amended to be the same as the daytime criteria.

Column 4 – Project Amenity Noise Level determined based on 'Residential - Suburban' area in Table 2.2 (Amenity noise levels) of the EPA's NPfI minus 5dB

Column 5 – Measured in accordance with the NPfI

Column 6 – The existing environmental noise level does exceed the RANL by more than 10dB at night but it is not all traffic noise. As such, no correction is applicable. In respect of the North Steyne façade of 43-45 North Steyne, it would be considered traffic noise affected but it is not the worst affected location by sources applicable to the NPfI.

Column 8 - Determined in accordance with Section 2.4 of the NPfI.

Column 9 – Project Noise Trigger Level is the lower value of project intrusiveness noise level and project amenity noise level. In accordance with Section 2.2 of the NPfI, $L_{Aeq,\ 15minute}$ is calculated as $L_{Aeq,\ period}$ + 3dB(A)

Notes: Intrusiveness noise level for Evening must be set at no greater than the intrusiveness level for daytime in accordance with NPfI Section 2.3.

The following table below presents the site-specific noise production criteria from industrial noise sources, namely mechanical plant to neighbouring commercial properties (C1, C2, C3) identified in in Section 2 and Figure 1.

Table 10: Project noise trigger level for noise emission from mechanical plant to commercial neighbours (EPA NPfI)

Assessment / Receiver location	Intrusiveness[5] criteria, $L_{Aeq,15min}$ dB(A)			Amenity[4] criteria, $L_{Aeq, period}$ dB(A)		
	Day[1]	Evening[2]	Night[3]	Day	Evening	Night
Commercial buildings to the north, south and south west of the development	N/A	N/A	N/A	65 (when in use)		

Where necessary, noise mitigation treatments to mechanical plant such as carpark exhaust fans and air conditioning systems will be incorporated in the design to ensure that noise levels comply with the recommended NPfI noise emission criteria noted above.

5.1.2 Noise emissions from use of the Café

Café operational noise would be expected to comply with the requirements of the Office of Liquor and Gaming, which are as follows:

- *The LA10 noise level emitted from the use must not exceed the background noise level (LA90) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) by more than 5dB between the hours of 7.00am and 12.00 midnight when assessed at the boundary of any affected residence.*
- *The LA10 noise level emitted from the use must not exceed the background noise level (LA90) in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) between the hours of 12.00 midnight and 7.00am when assessed at the boundary of any affected residence.*
- *Notwithstanding compliance with (a), (b) and (c) above, the noise from the use must not be audible within any habitable room in any residential use between the hours of 12.00 midnight and 7.00am.*

The operating hours of the café are 6:30am to 4pm.

The Café Steyne space also incorporates the reception desk and access to the Hotel Steyne accommodation. As such, access/egress through this area is accessible to guests at all times.

Based on the above criteria specified above, the noise emission goals for licensed premises are as follows:

Table 11: Licensed Premises Noise Spectra Criteria

Receiver locations	Time of Day	Overall dB(A)	Octave band centre frequency – Hz, dB(Z)								
			31.5	63	125	250	500	1k	2k	4k	8k
Receivers located along North Steyne	7am-6pm (56dB(A)BG+5)	61	61	60	63	59	58	55	51	43	31
	6pm-10pm (57dB(A)BG+5)	62	62	61	64	60	59	57	52	45	32
	10pm-12am (57dB(A)BG+5)	62	60	60	64	59	59	57	52	44	31
	12am-7am (54BG-10)*	N/A	43	43	46	43	41	39	34	26	14
Apartment Located Above Cafe	When in use (BG+5)	27**	39	39	34	31	25	17	17	8	9

Notes: * BG-10 to meet inaudibility requirement

**Based on an assumed ambient noise level within an apartment habitable room (windows closed, air-conditioning off) of 22dB(A)L_{90}, which is a conservatively low assumed noise level.

5.2 Analysis and Recommendations

See section 6.

6 Recommendations

The acoustic treatments set out in this section are provided with a view to:

- Ensuring that external noise at the site is attenuated to the target internal noise levels as detailed in section 4.
- Noise emitted from the site is compliant with the noise goals set out in section 5.

6.1 Glazing Design Requirements

Table 12 below presents recommended glazing treatment for the building facades to achieve compliance with the maximum noise levels nominated in Table 6 above.

Table 12: Recommended Glazing Treatment

Level	Facade	Occupancy Type	Recommended Minimum Sound Insulation Rating of Glazing Assembly	Typical Compliance Glazing Thickness, Type and Configuration	Laboratory Test Reference
Ground	All	Commercial facing Lane	Rw 28	6mm standard float glass	ESTIMATE
		Café facing North Steyne	Rw 33	10.38mm laminated Bi-folds	ESTIMATE
Levels 1, Level 2, Level 3	All	Bedrooms facing North Steyne	Rw 37	12.38mm Laminated	ESTIMATE
		Bedrooms facing Lane	Rw 35	10.38mm Laminated	ESTIMATE
		Living Rooms facing North Steyne	Rw 37	12.38mm Laminated	ESTIMATE
		Living Rooms facing Lane	Rw 35	10.38mm Laminated	ESTIMATE
		Wintergarden External (North Stenye)	Rw 29	6mm standard float glass	ESTIMATE
		Habitable rooms facing light wells	Rw 31	6.38mm Laminated	ESTIMATE
Level 4	All	Bedrooms facing Lane or North Steyne	Rw 40	Schuco ASS50 or equal frame with glazing as follows: -10mm/16mm airgap /6.38mm Laminated OR -12.5mm V-lam hush	ESTIMATE
		Living Rooms	Rw 40	Schuco ASS50 or equal frame with glazing as follows: -10mm/16mm airgap /6.38mm Laminated OR -12.5mm V-lam hush	ESTIMATE
		Habitable rooms facing light wells	Rw 31	6.38mm Laminated	ESTIMATE

Level	Facade	Occupancy Type	Recommended Minimum Sound Insulation Rating of Glazing Assembly	Typical Compliance Glazing Thickness, Type and Configuration	Laboratory Test Reference
	South	Family Room	Rw 57	Indicatively 21.52mm laminated / 200mm airgap /16.38mm double glazed glass wall or suitable alternative	ESTIMATE
	West	Family Room	Rw 37	12.38mm laminated	ESTIMATE

By way of explanation, the Sound Insulation Rating Rw is a measure of the noise reduction property of the partition, a higher rating implying a higher sound reduction performance.

Note that the Rw rating of systems measured as built on site (R'w Field Test) may be up to 5 points lower than the laboratory result.

LEGEND where no appropriate test certificate exists:

1. ESTIMATE: The client is advised not to commence detailing or otherwise commit to partition construction systems which have not been tested in an approved laboratory or for which an opinion only is available. Testing of partition construction systems is a component of the quality control of the design process and should be viewed as a priority because there is no guarantee the forecast results will be achieved thereby necessitating the use of an alternative which may affect the cost and timing of the project. No responsibility is taken for use of or reliance upon untested partition construction systems, estimates or opinions. The advice provided here is in respect of acoustics only.
2. ESTIMATE – APPROVED FOR CONSTRUCTION: Use of the form of construction is approved prior to laboratory certification. To complete the quality control of the design process and confirm the acoustical performance of the construction, we recommend testing in a laboratory to confirm the Rw rating as soon as practicable. In the case of impact rating for floor systems, no particular impact rating is guaranteed to comply with either the Building Code of Australia or Strata Scheme Management Act and hence carpet runners may still be required.
3. ESTIMATE – TEST NOT REQUIRED: Use of the form of construction is approved without laboratory certification. The STC/Rw of the form of construction exceeds the project requirements.

The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

NOTES FOR GLAZING CONSTRUCTIONS:

4. The information in this table is provided for the purpose of Council approvals process and cost planning and shall not be used for construction unless otherwise approved in writing by the acoustic consultant.
5. The design in this table is preliminary and a comprehensive assessment shall be conducted prior to Construction Certification.
6. Before committing to any form of construction or committing to any builder, advice should be sought from an acoustic consultant to ensure that adequate provisions are made for any variations which may occur as a result of changes to the form of construction where only an "estimate" is available for the sound insulation properties of recommended materials.
7. The glazing supplier shall ensure that installation techniques will not diminish the Rw performance of the glazing when installed on site.
8. All openable glass windows and doors shall incorporate full perimeter acoustic seals equivalent to Q-Lon, which enable the Rw rating performance of the glazing to not be reduced.
9. The above glazing thicknesses should be considered the minimum thicknesses to achieve acoustical ratings. Greater glazing thicknesses may be required for structural loading, wind loading etc.

GENERAL

10. The sealing of all gaps in partitions is critical in a sound rated construction. Use only sealer approved by the acoustic consultant.
11. Check design of all junction details with acoustic consultant prior to construction.
12. Check the necessity for HOLD POINTS with the acoustic consultant to ensure that all building details have been correctly interpreted and constructed.
13. The information provided in this table is subject to modification and review without notice.
14. The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

6.2 Building Ventilation

Given the proximity of the bedrooms to the rear lane, and the fact that it is used for loading activities for multiple buildings, it is recommended that the bedrooms be provided with alternative ventilation such that they can keep the windows closed if they so choose.

In respect of traffic noise incident on the North Steyne façade, the level is sufficient that the internal noise levels would not comply with the natural ventilation windows open criterion (this is applicable to both living rooms and bedrooms), and it is recommended that the bedrooms be provided with alternative ventilation such that they can keep the windows closed if they so choose.

6.3 Facade & Roof Sound Insulation

In principle advice is provided below for the acoustic requirements of the roof and external walls for this proposed development.

6.3.1 External Walls

All external walls shall have sound isolation ratings, Rw, of at least 15dB higher acoustic performance than that of the acoustic glazing specified in Table 12 above. Any external wall constructed of masonry will meet this requirement. If light weight external wall elements are proposed, detailed acoustic design to be conducted at CC stage (once cladding selections are finalised).

The common walls between the Hotel Steyne courtyard and apartments are to be constructed of masonry (double brick with insulation in the cavity, or min 150mm concrete), plus a separate stud with insulation (with no connection to the masonry, 75mm thick 14kg/m3 insulation to cavity) and 2x16mm fire rated plasterboard lining internally. The specific construction will be determined during detailed design (following design of the masonry external wall element).

The courtyard side face of the wall shared between Hotel Steyne and 42 North Steyne is to be lined with absorptive material (NRC no less than 0.8) to a height of RL14. The roof deck side of the wall shared between Hotel Steyne and 42 North Steyne is to be lined with absorptive material (NRC no less than 0.8). The area to be lined is the maximum extent (around existing services) from nominally RL13.6 to RL14.7.

6.3.2 Roof and Ceiling

Roof/ceiling construction shall have a sound isolation rating, Rw, at least 10dB higher than that of the acoustic glazing on its facade walls. The proposed concrete roof is acoustically acceptable.

6.3.3 Glazing Assembly Requirements

The following acoustic measures should also be incorporated into the building design:

s1. All operable glass windows and doors shall incorporate full perimeter acoustic seals equivalent to Q-Lon, which enable the Rw rating performance of the glazing to not be reduced.

s2. The glazing thicknesses outlined in Table 12 should be considered the minimum thicknesses to achieve acoustical ratings. Greater glazing thicknesses may be required for structural loading, wind loading etc.

s3. The glazing supplier shall ensure that installation techniques will not diminish the Rw performance of the glazing when installed on site. Sliding door meeting stiles should form an airtight seal when closed and locked.

s4. The perimeter of all window and door frames are to be sealed airtight in the external facade using the following methods:

- For gaps less than 10mm - Fill all gaps around the window perimeter with an acoustic mastic sealer (minimum specific gravity 1.6sg) equivalent to Promat Promaseal. The depth of sealer shall be at least equal to the width of the gap.
- If the gap is greater than 10mm, fill the cavity with polyester insulation and a backing rod. Seal the gap airtight with an acoustic mastic sealer (min specific gravity 1.6sg) equivalent to Promat Promaseal. The depth of sealer shall be at least equal to the width of the gap. The gaps between frames shall also be sealed using aluminium angle brackets (approximately 25 x 25 x 3mm).

6.3.4 Café Noise to 45 North Steyne

Between 7am and 4pm it is assumed:

- The street frontage windows of the café are left open (and that they would stay open until 11pm in the evening when the space is still used for Steyne accommodation access).
- A sound pressure level (patron vocal noise and background music) of 80dB(A) L_{10} within internal areas of the café (indicative of a lively café with background music).

Between 6:30am and 7am it is assumed:

- The street frontage windows of the café are to be closed
- A sound pressure level (patron vocal noise and background music) of 80dB(A) L_{10} within internal areas of the café (indicative of a lively café with background music).

Provided that the noise management controls outlined in Section 6.3.6 are adopted, the predicted noise emissions are as follows:

Table 13: Predicted Noise Levels to 45 North Steyne (7am – 4pm, Windows Open Assessment)

	Overall dB(A)	Octave band centre frequency - Hz (dBZ)								
		31.5	63	125	250	500	1k	2k	4k	8k
Noise Goal (57dB(A) Background +5)	**62**	**60**	**60**	**64**	**59**	**59**	**57**	**52**	**44**	**31**
Predicted noise level at Receiver	56	49	53	52	52	56	53	45	36	24
Complies?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 14: Predicted Noise Levels to 45 North Steyne (6:30am – 7am Windows Closed Assessment)

	Overall dB(A)	Octave band centre frequency - Hz (dBZ)								
		31.5	63	125	250	500	1k	2k	4k	8k
Noise Goal 6:30am -12am-7am (54BG-10)	**44**	**43**	**43**	**46**	**43**	**41**	**39**	**34**	**26**	**14**
Predicted noise level at Receiver	41	34	38	37	37	41	38	30	21	9
Complies?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

6.3.5 Café Internal to Internal Noise Transmission

Analysis of noise through the ceiling/slab of the café to the apartment above is presented below.

For the purpose of analysis, it is assumed:

- A sound pressure level (patron vocal noise and background music) of 80dB(A) L_{10} within internal areas of the café (indicative of a lively café with background music).
- Ceiling upgrades to front of house areas as detailed in section 6.4.3 are adopted.

Predicted noise level in a guest room above the Bars is presented below:

Table 15: Predicted Noise Levels – Internal to Internal Noise Transmission to Guest Room above Bar

	Overall dB(A)	Octave band centre frequency - Hz (dBZ)								
		31.5	63	125	250	500	1k	2k	4k	8k
Noise Goal (22dB(A)Background + 5)	**27**	**39**	**39**	**34**	**31**	**25**	**17**	**17**	**8**	**9**
Predicted noise levels at Level 1 Apartment (L_{10})	11	24	24	13	13	10	2	2	-7	-11
Complies?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Provided that the ceiling treatments and noise limits identified in section 6.4.3 are adopted, noise from the use of the cafe will comply with the requirements of the internal noise transmission requirements for licenced venues, as identified in section 5.1.2.

6.3.6 Café Noise Control Recommendations

Windows are to be minimum 10.38mm laminated with full perimeter acoustic seals, Rw 33 (glass in frame system) and are to be closed before 7am and from 11pm at the latest.

Ceiling is to be constructed of 2x16mm plasterboard, resiliently suspended from the 200mm thick concrete slab, with 75mm thick 10kg/m3 glasswool or mineral wool insulation insulation in the cavity. This ceiling is to extend into the hallways and bathrooms at the rear of the café.

Background music in the café is to be limited to background music only, with a uniform sound pressure level in the space of 65dB(A) L_{10}.

Absorptive lining, NRC≥0.8 to be installed to a minimum of 65% of the Front of House ceiling area.

For all back of house zones, the doors referred to in Section 6.4 are to be kept closed, except where required for access/egress. For the café to Hotel door, it may be kept open until 10pm after which it should only be used for accessible entrance/exit purposes.

6.4 Separation of Hotel noise from Café and BOH

40mm thick solid core timber doors with full perimeter acoustic seals (or acoustically equivalent Rw30 system) shall be installed to provide acoustic separation between 42 North Steyne and the Hotel Steyne, including back of house zones (refer highlighted areas below).

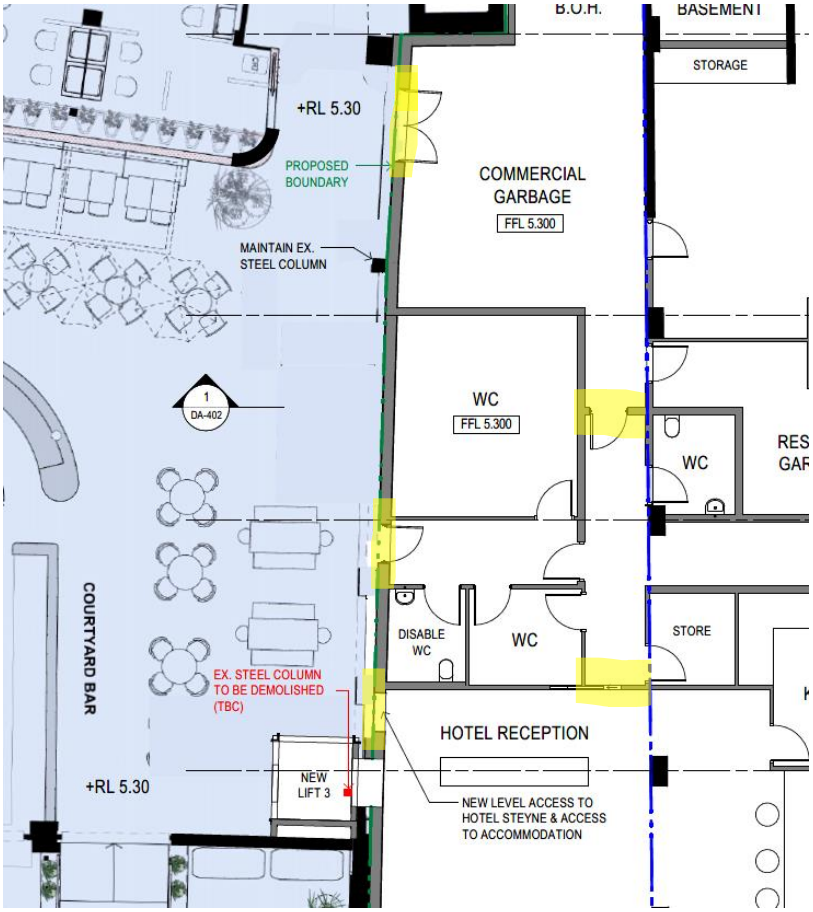

Figure 2 - Location of acoustic doors

6.5 Apartment Balcony Design (for Control of Hotel Steyne Beer Garden and Roof Terrace)

Glazing has been specified to maintain the amenity of the indoor areas. However, the acoustic amenity of balconies is also pertinent.

For Units 102, 202, 302 (the Southern apartments) the North Steyne facing balconies have been designed as winter gardens. This allows the residents to have private outdoor space which also includes a degree of protection from the surrounding environment.

Provided that the soffit of the balconies is lined with absorptive material with an NRC of not less than 0.7, the residents can open the northern end of the balcony glazing to at least 5% of the floor area of the balcony and the noise level on the balcony of the apartment would be 55-60dB(A)L_{eq} during periods of peak use at the Steyne Hotel. At 55-60dB(A), the resident will be able to maintain a conversation without raising their voice, and is a reasonable level of amenity for private outdoor space.

For apartments 101, 201 and 301 – these apartments are located on the far side of the development to the Hotel and less impacted by Hotel noise. A similar acoustic amenity can be achieved on these balconies without the need for wintergarden (absorptive lining is still recommended).

On Level 4:

- A 1.8m high glazed screen is to be installed along the southern edge of the balcony (6mm minimum glass thickness, or thicker if required for structural concerns). Barrier is to be solid (no holes/gaps at junction to floor level).
- A 1.5m high balustrade is to be installed along the eastern edge of the balcony (6mm minimum glass thickness, or thicker if required for structural concerns). Barrier is to be solid (no holes/gaps at junction to floor level).
- With these treatments, the noise level on the Level 4 east facing balcony during Hotel operation is predicted to be in the order of 62dB(A)L_{eq} for a standing receiver or 59dB(A) for someone seated, which is a suitable level of amenity for private open space for the apartment occupant.

6.6 Recommended Noise Control Measures for Mechanical Plant

6.6.1 Roof Air-Conditioning Condensers

It is our understanding that the proposed residential and commercial air-conditioning condensers will be installed on the roof of the building as in the Architectural drawings.

Noise emitted from operation of A/C condensers has the potential to impact on existing and future residences. The following in principle advice is provided to minimise potential noise impacts to nearby residences (subject to review during detailed design).

s1. A/C condensers shall be vibration isolated off concrete plinth/roof slab with neoprene pads or mounts equivalent to Embelton Shearflex or NR mounts to minimise potential structure-borne noise to residential spaces below.

s2. Install acoustic screens around A/C condensers located roof of the building. Height of the screens shall be equal or greater than the total height of A/C condenser plus its concrete

plinth and isolation mounts. The screen shall be of solid construction such as fibre cement sheeting, Colorbond, Villaboard,. Access door into the plant compound shall be of solid construction and of same height as the noise screen.

s3. In the event that openings are required in screens for airflow to/from the units, solid screen can be replaced by acoustic louvres. Acoustic louvres are recommended to be 150mm thick CVS or equal.

s4. In order to achieve appropriate internal amenity in the studies served by the light wells, glazing to studies opening into the light well is recommended to be 6.38mm laminated, Rw 31 (subject to review during detailed design following final equipment selection).

s5. All condensing pipes penetrating the concrete slab or wall shall be sealed with a mastic sealant density 1.6 sg.

s6. All air conditioning condensing pipes shall be vibration isolated from the concrete slab/soffit using rubber pads

s7. Noise emissions from final selection of A/C condensers shall be assessed for CC.

6.6.2 Carpark Exhaust & Supply Air Fans

Noise generated from operation of the basement car park ventilation system has the potential to impact on existing and future neighbours, although at this stage of the development sound power data of the unit is not available for detailed assessment, the following in principle advice are provided to minimise potential noise impacts to nearby neighbours.

s1. Install fans in basement plant room to control fan case-radiated noise breaking out to external environment via car park entry ramp or outside air louvres (where feasible)

s2. Fan shall be vibration isolated off concrete soffit or support structure by mounting the fans on isolation hangers having 25mm static deflection or equivalent Embelton Type SHS or SH to minimise potential structure-borne noise to noise-sensitive occupancies above

s3. Carpark exhaust shall discharge at roof level and positioned furthest away from windows and balconies of existing neighbours and future residence within the development

s4. Subject to review of sound power of the selected fans the following additional noise control measures may also be incorporated in the design to ensure that noise levels comply with the recommended NPfI noise emission criteria established in Table 9 above,

a. Silencers and/or acoustic louvres for air discharge and intake of plant,

b. Acoustic lining of rigid ductwork

c. Acoustic lagging of fan casing and duct work

s5. Final selection of fans shall have their noise specifications and their proposed locations checked prior to their installation on site

6.6.3 Other Mechanical Plant and Equipment

As details of other mechanical plant and equipment are not available at this stage of the development the following in principle noise control advice is provided.

- Acoustic assessment of mechanical services equipment will be required to be undertaken during the detail design phase of the development to ensure that they shall not either singularly or in total emit noise levels which exceed the noise limits in established in Table 9
- Mechanical plant noise emission can be controllable by appropriate mechanical system design and implementation of common engineering methods that may include any of the following;
  - procurement of 'quiet' plant
  - strategic positioning plant equipment away from sensitive neighbouring premises, maximising the intervening shielding between the plant and sensitive neighbouring premises
  - installation of commercially available silencers or acoustic attenuators for air discharge and air intakes of plant
  - acoustically lined and lagged ductwork
  - provide acoustic screens and/or acoustic louvres between plant and sensitive neighbouring premises
  - provide partially enclosed or fully enclosed acoustic enclosure over plant
  - Mechanical plant shall have their noise specifications and proposed locations checked prior to installation

Fans shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 "Rotating and Reciprocating Machinery - Mechanical Vibration

6.6.4 Roof top plant and equipment from the Steyne Hotel.

Steyne Hotel (the same owner as this site) is presently undertaking design for the replacement of Hotel plant and equipment.

Typical new roof top equipment consists of air-conditioner condensers. It would be expected that operational noise from the Hotel Beer Garden and Roof Terrace will be louder (as received at 42 North Steyne) compared to the plant and equipment. Given that the building shell of 42 North Steyne is acoustically designed to protect the future residents from Steyne Hotel patron/music noise, it is also adequate to address Hotel roof top plant noise.

If necessary, localised noise screens around the new Hotel plant and equipment (once selected) will be incorporated so as to ensure that their noise impact on 42 North Steyne does not exceed typical EPA requirements and impact the amenity of the future residents.

7 Internal Sound Insulation between Tenancies

Internal walls and floors shall comply with the National Construction Code of Australia relevant to the project at the time of lodging the construction certificate or s4.55 as applicable. Certifier to confirm the valid instrument prior to detailed design.

8 Conclusion

Renzo Tonin & Associates have completed an acoustic assessment of environmental noise impacts onto 42 North Steyne, Manly.

The study of external noise intrusion into the subject development has found that appropriate noise control measures can be incorporated such as acoustic glazing, acoustic screens, absorptive linings etc into the building design to achieve compliance with the nominated acoustic requirements.

Recommendations have been provided in Section 4 of this report to comply with the nominated internal noise criteria.

APPENDIX A Assessment and Design Methodology

A.1 Local Council Development Control Plan

The Northern Beaches Council (amalgamation of Manly, Warringah and Pittwater Councils) is the regulatory authority for the proposed development Section 3.4.2.3 of Manly DCP 2013 (Amendment 11) states the following in regard to noise generated from outdoor living spaces;

Section 1 "Development Near Road or Rail Noise" of its Local Centres DCP 2019 recommend all development potentially impacted by road and rail noise to be designed to acceptable internal noise levels defined in the NSW Department of Planning 'Development Near Rail Corridors and Busy Roads – Interim Guidelines' and Australian Standard AS 3671 and AS2107. Relevant section of Relevant sections of Council's DCP are re-iterated below.

Section 20 – Development Near Road or Rail Noise of the DCP states the following.

"3.4.2.3 Acoustical Privacy (Noise Nuisance)

See also Noise Guide for Local Government prepared by NSW Department of Environment, Climate Change and Water in 2010.

a) Consideration must be given to the protection of acoustical privacy in the design and management of development.

b) Proposed development and activities likely to generate noise including certain outdoor living areas

like communal areas in Boarding Houses, outdoor open space, driveways, plant equipment including pool pumps and the like should be located in a manner which considers the acoustical privacy of neighbours including neighbouring bedrooms and living areas.

c) Council may require a report to be prepared by a Noise Consultant that would assess likely noise and vibration impacts and may include noise and vibration mitigation strategies and measures. See particular requirements for noise control reports for licenced premises below at paragraph g) below.

…"

A.2 State Environmental Planning Policy (Infrastructure) 2007

The NSW State Environmental Planning Policy (Infrastructure) 2007 (known as 'ISEPP') came into force in NSW on 1 January 2008 to facilitate the effective delivery of infrastructure across the State. The aim of the policy includes identifying the environmental assessment category into which different types of infrastructure and services development fall and identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure.

Pertinent to noise assessment, the ISEPP includes the following clauses:

87 Impact of rail noise or vibration on non-rail development

- *This clause applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration:*
  - *a. a building for residential use,*
  - *b. a place of public worship,*
  - *c. a hospital,*
  - *d. an educational establishment or child care centre.*
- *Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*
- *If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
  - *e. in any bedroom in the building - 35 dB(A) at any time between 10 pm and 7am,*
  - *f. anywhere else in the building (other than a garage, kitchen, bathroom or hallway) - 40 dB(A) at any time.*

102 Impact of road noise or vibration on non-road development

- *This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
  - *g. a building for residential use,*
  - *h. a place of public worship,*
  - *i. a hospital,*
  - *j. an educational establishment or child care centre.*
- *Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*
- *If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
  - *k. in any bedroom in the building - 35 dB(A) at any time between 10 pm and 7am,*

l. anywhere else in the building (other than a garage, kitchen, bathroom or hallway) - 40 dB(A) at any time.

- *In this clause, "freeway", "tollway" and "transitway" have the same meanings as they have in the Roads Act 1993*

A.2.1 Department of Planning publication 'Development near rail corridors and busy roads – Interim guideline'

To support the Infrastructure SEPP, the NSW Department of Planning released the *Development in Rail Corridors and Busy Roads – Interim Guideline* (December 2008). The Guideline assists in the planning, design and assessment of developments in, or adjacent to, major transport corridors in terms of noise, vibration and air quality. While the ISEPP applies only to roads with an AADT greater than 40,000 vehicles, the guideline is also recommended for other road traffic noise affected sites.

A.2.2 Clarification of ISEPP noise limits

The Guideline clarifies the time period of measurement and assessment. Section 3.4 '*What Noise and Vibration Concepts are Relevant*' and Table 3.1 of Section 3.6.1 confirms that noise assessment is based over the following time periods:

- Daytime 7:00am - 10:00pm $L_{Aeq(15hr)}$
- Night-time 10:00pm - 7:00am $L_{Aeq(9hr)}$

The noise criteria nominated in the ISEPP apply to internal noise levels with windows and doors closed. However as the preliminary noise assessment is based on measurements/predictions at external locations, equivalent external noise criteria has been established. The equivalent external noise criterion is used to determine which areas of the development may require acoustic treatment in order to meet the internal noise requirements of the ISEPP. The equivalent external goals have been determined on the following basis:

- The ISEPP states: "*If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia*." The internal criteria with windows open is therefore 10dB(A) above the criteria explicitly outlined in the ISEPP.
- The generally accepted noise reduction through an open window from a free-field external position is 10dB(A). Windows/doors are assumed to be open no more than 5% of room floor area, in accordance with the Building Code of Australia (BCA) ventilation requirements.

Table 16 presents the ISEPP internal noise criteria along with the equivalent external noise criteria for residential premises.

Table 16: ISEPP noise criteria for new residential development

Room	Location	$L_{Aeq, 15hr}$ Day 7am – 10pm	$L_{Aeq\ 9hr}$ Night 10pm – 7am
Living rooms*	Internal, windows closed	40	40
	Internal, windows open	50	50
	External free-field (allowing windows to remain open)^	60	60
Bedrooms*	Internal, windows closed	40	35
	Internal, windows open	50	45
	External free-field (allowing windows to remain open)^	60	55

Notes: * Requisite for 40,000AADT Roads only under ISEPP 2007.

^ ISEPP Guideline states that where internal noise criteria are exceeded by more than 10dB(A) with windows open mechanical ventilation is required. External goals have been calculated on the basis of nominal 10dB(A) reduction through an open window to a free-field position. Windows open to 5% of floor area in accordance with the BCA 2011 requirements.

A.3 Australian/New Zealand Standard AS/NZS 2107:2016

As traffic noise levels are not constant, an L_{eq} noise level descriptor is used when assessing this type of noise source. The L_{eq} is the mean energy level of the noise being measured, and has been found to accurately describe the level of annoyance caused by traffic noise.

This standard provides recommended noise levels for steady state such as noise from building services and quasi-steady state sounds, such as traffic and industrial noise. The noise levels recommended in AS/NZS 2107:2016 take into account the function of the area and apply to the sound level measured within the space unoccupied although ready for occupancy.

This standard recommends the following noise levels for residential buildings.

Table 17: Design sound levels and reverberation times for different areas of occupancy in buildings

Item	Type of occupancy/activity	Design sound level (LAeq,t) range	Design reverberation time (T) range, s
7	**RESIDENTIAL BUILDINGS (see Note 5 and Clause 5.2)**		
	Houses and apartments in inner city areas or entertainment districts or near major roads -		
	Apartment common areas (e.g. foyer, lift lobby)	45 to 50	-
	Living areas	35 to 45	-
	Sleeping areas (night time)	35 to 40	-
	Work areas	35 to 45	-
	Houses and apartments in suburban areas or near minor roads -		
	Apartment common areas (e.g. foyer, lift lobby)	45 to 50	-
	Living areas	30 to 40	-
	Sleeping areas (night time)	30 to 35	-
	Work areas	35 to 40	-
	Houses in rural areas with negligible transportation -		
	Sleeping areas (night time)	25 to 30	-

Item	Type of occupancy/activity	Design sound level (LAeq,t) range	Design reverberation time (T) range, s
	Hotels and motels -		
	Bars and lounges	< 50	0.6 to 1.0
	Conference areas -		
	Without sound reinforcement -		
	Up to 50 persons	35 to 40	Curve 1*
	From 50 to 250 persons	30 to 35	Curve 1*
	With sound reinforcement	35 to 45	Curve 1*
	Dining rooms	40 to 45	See Note 1
	Enclosed carparks	< 65	-
	Foyers and recreation areas	45 to 50	See Note 1
	Kitchen, laundry and maintenance areas	< 55	-
	Sleeping areas (night time) -		
	Hotels and motels in inner city areas or entertainment districts or near major roads	35 to 40	-
	Hotels and motels in suburbs or near minor roads	30 to 35	-
	Washrooms and toilets	45 to 55	-
	Hostels, residential halls and barracks -		
	Cafeterias	45 to 50	< 1.0
	Common rooms	40 to 45	< 1.0
	Games rooms	45 to 50	< 1.0
	Kitchens and service areas	45 to 55	-
	Sleeping areas (night time) -		
	Hostels, residential halls and barracks in inner city areas or entertainment districts or near major roads	35 to 40	-
	Hostels, residential halls and barracks in suburbs or near minor roads	30 to 35	-
	Mining camps -		
	Sleeping areas	35 to 40	-
	Other facilities	See Item 3 or Item 5 in this Table	
	Retirement homes/villages	See Houses and apartments; and Clause 5.2	

* See Appendix A for all references to 'Curve' in this Table.

Item	Type of occupancy/activity	Design sound level (LAeq,t) range	Design reverberation time (T) range, s

NOTES:

1. Reverberation time should be minimized for noise control.
2. Certain teaching spaces, including those intended for students with learning difficulties and students with English as a second language, should have reverberation times at the lower end of the range.
3. Specialist advice should be sought for these spaces.
4. A very wide range of noise levels can occur in the occupied state in spaces housing manufacturing processes, and the levels are primarily subject to control as part of a noise management program (see AS/NZS 1269.2). The possibilities for segregating very noisy processes from quieter ones by partitioning vary between particular industries and plants. For reasons such as these, it is difficult to make generalized recommendations for desirable, or even maximum, design levels for the unoccupied state, but one guiding principle may still be observed-when the activity in one area of a manufacturing plant is halted, it is desirable that the local level should if possible drop to 70 dB(A) or lower to permit speech communication without undue effort.
5. In situations where traffic noise levels may vary widely over a 24 h period, measurement to assess compliance with this Standard should be taken at the relevant time and for an appropriate measurement period according to the area of occupancy or activity in the building. Where traffic noise fluctuates rapidly with the passage of individual vehicles, the community reaction may not correlate well with the equivalent continuous noise level as measured.
6. The overall sound pressure level in dB(A) should conform to the recommended design sound level given in Table 1. In these spaces, a balanced sound pressure level across the full frequency range is essential. These spaces should therefore be evaluated in octave bands across the full frequency spectrum. The recommended maximum sound pressure levels for the individual octave bands corresponding to the overall dB(A) value are given in Appendix C.
7. In spaces in which high quality sound recordings are to be made, the levels set for low frequency octave bands should not be exceeded (see Appendix C). Subsequent replay of the recordings might cause an amplification of the low-frequency sound resulting in an overemphasis of its low-frequency components. Specialist advice should always be sought when these spaces are being designed. In some circumstances, for purposes of very high quality recording, lower levels than those in Table 1 may be necessary.
8. Health requirements for hygiene and infection control may preclude achieving these recommended reverberation times.

APPENDIX B Results of unattended noise monitoring

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Acoustics
Vibration
Structural Dynamics

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Location 2

Background & Ambient Noise Monitoring Results - NSW 'Noise Policy for Industry', 2017

	L_{A90} Background Noise Levels[4]			L_{Aeq} Ambient Noise Levels		
Date	**Day[1]**	**Evening[2]**	**Night[3]**	**Day[1]**	**Evening[2]**	**Night[3]**
Tuesday-09-February-2021	55	55	53	61	56	55
Wednesday-10-February-2021	55	55	52	59	57	55
Thursday-11-February-2021	54	57	55	58	59	58
Friday-12-February-2021	56	57	55	59	60	57
Saturday-13-February-2021	56	57	53	60	58	57
Sunday-14-February-2021	55	56	54	58	58	56
Monday-15-February-2021	55	-	53	59	-	56
Tuesday-16-February-2021	56	57	56	58	58	58
Wednesday-17-February-2021	57	58	57	61	59	59
Thursday-18-February-2021	57	58	59	59	60	61
Friday-19-February-2021	58	59	-	60	60	-
Representative Weekday[5]	**56**	**57**	**55**	**60**	**59**	**58**
Representative Weekend[5]	**56**	**56**	**54**	**59**	**58**	**56**
Representative Week[5]	**56**	**57**	**54**	**60**	**59**	**57**

Notes:

1. Day is 7:00am to 6:00pm on all days except Sundays and Public Holidays when it is 8:00am to 6:00pm 2. Evening is 6:00pm to 10:00pm 3. Night is the remaining periods 4. Assessment Background Level (ABL) for individual days 5. Rating Background Level (RBL) for L_{A90} and logarithmic average for L_{Aeq} 6. Leq is calculated in the free field. 2.5dB is subtracted from results if logger is placed at façade 7. Number in brackets represents the measured (actual) RBL value, which is below the minimum policy value of 30 dB(A) during the evening or night period or 35 dB(A) during the day period.

Location 2

Road / Rail Noise Monitoring Results (at one metre from façade)

	L_{Aeq} Noise Levels		$L_{Aeq\ 1hr}$ Noise Levels			
Date	**Day[1]**	**Night[2]**	**Day - Up[4]**	**Day - Low[5]**	**Night - Up[4]**	**Night - Low[5]**
Tuesday-09-February-2021	63	58	64	59	59	57
Wednesday-10-February-2021	61	58	63	59	59	56
Thursday-11-February-2021	61	60	62	60	61	58
Friday-12-February-2021	62	60	63	61	61	59
Saturday-13-February-2021	61	60	63	60	62	57
Sunday-14-February-2021	60	58	62	59	59	57
Monday-15-February-2021	62	58	63	61	59	57
Tuesday-16-February-2021	61	60	61	60	61	60
Wednesday-17-February-2021	63	61	65	61	61	61
Thursday-18-February-2021	62	63	63	61	64	63
Friday-19-February-2021	62	-	63	61	-	-
Representative Weekday[3]	**62**	**60**	**63**	**61**	**61**	**59**
Representative Weekend[3]	**61**	**59**	**62**	**59**	**60**	**57**
Representative Week[3]	**62**	**60**	**63**	**60**	**61**	**58**

Notes:

1. Day is 7:00am to 10:00pm 2. Night is 10:00pm to 7:00am 3. Median of daily L_{Aeq}

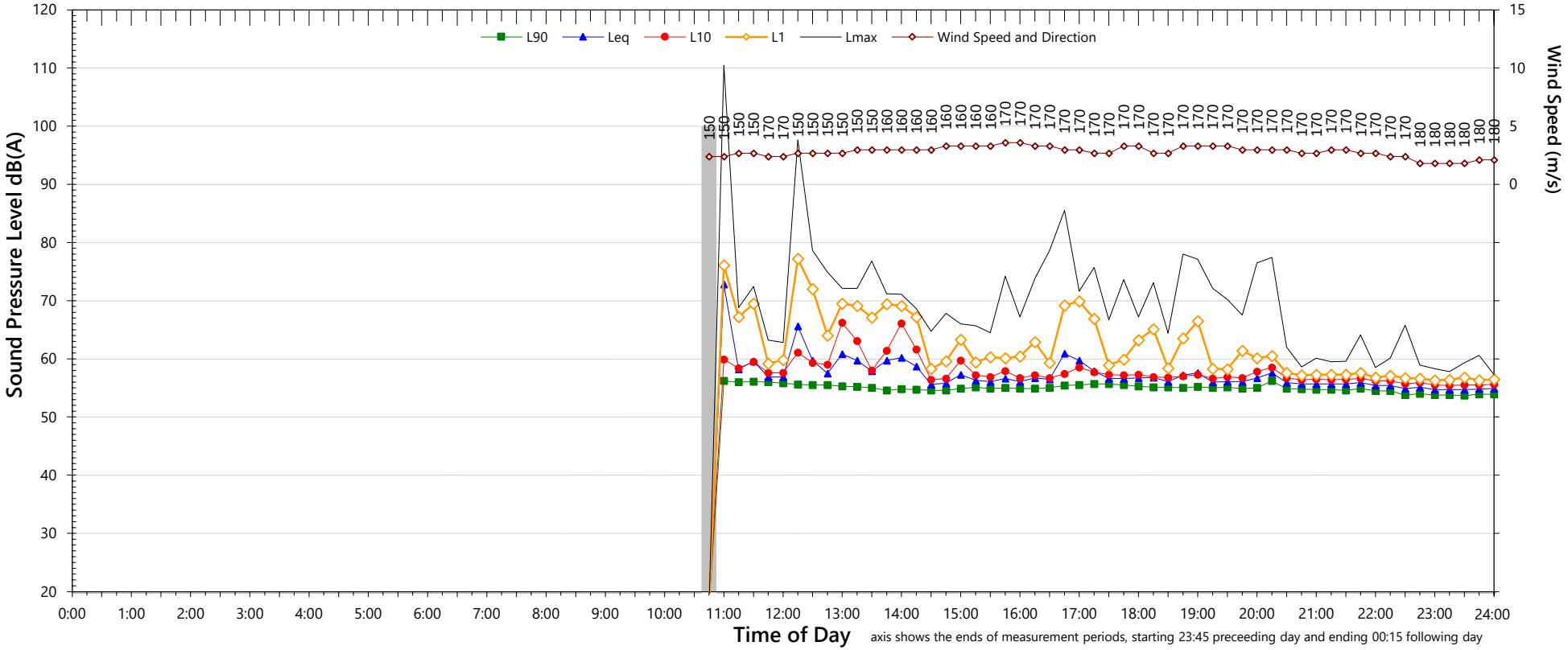
4. Upper 10th percentile $L_{Aeq\ 1hr}$ 5. Lower 10th percentile $L_{Aeq\ 1hr}$

6. Values are calculated at the facade. 2.5dB is added to results if logger is placed in the free field

Unattended Noise Monitoring Results

Location 2

Tuesday, 9 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	55	55	53
LAeq	61	56	55

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	85	to	88
L_{Max} - L_{eq} (Range)	29	to	30

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	63	58
$L_{eq\ 1hr}$ upper 10 percentile	64	59
$L_{eq\ 1hr}$ lower 10 percentile	59	57

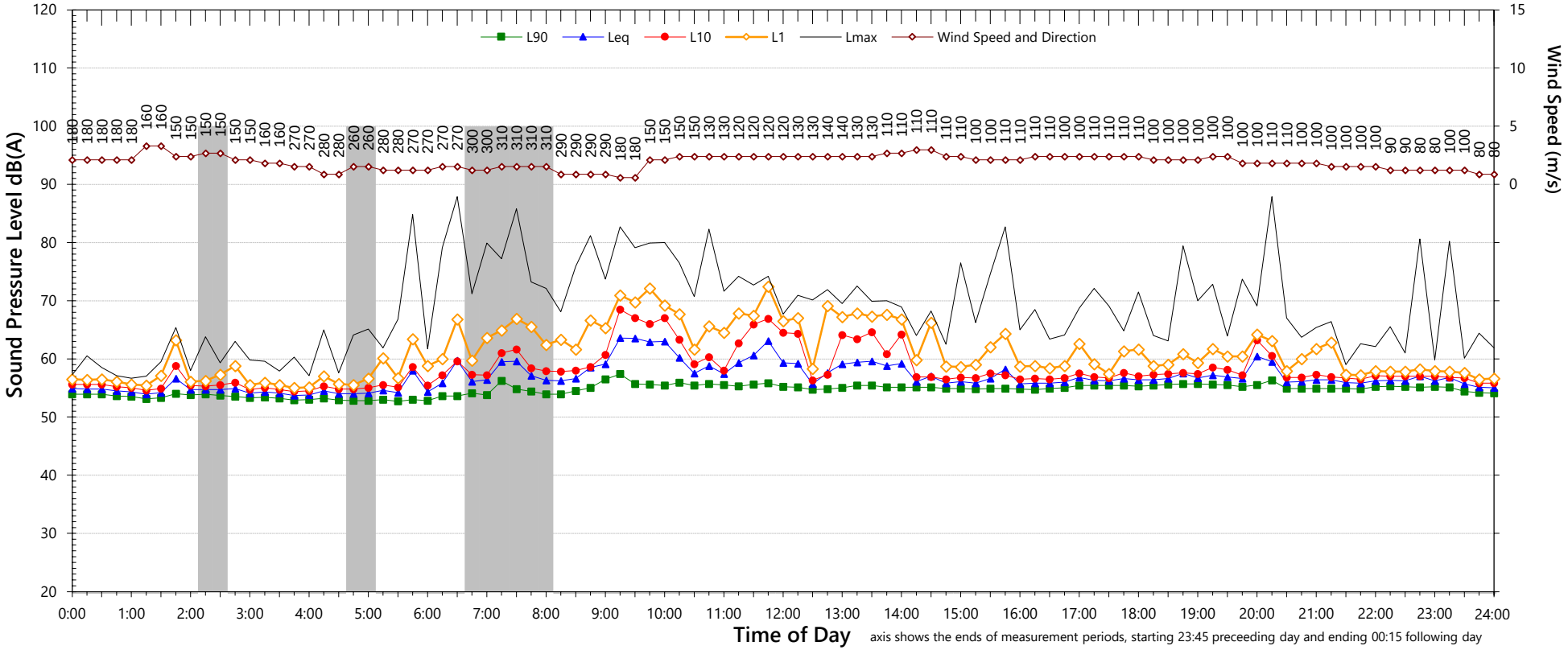
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Wednesday, 10 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	55	55	52
LAeq	59	57	55

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	77	to	88
L_{Max} - L_{eq} (Range)	22	to	30

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	61	58
$L_{eq\ 1hr}$ upper 10 percentile	63	59
$L_{eq\ 1hr}$ lower 10 percentile	59	56

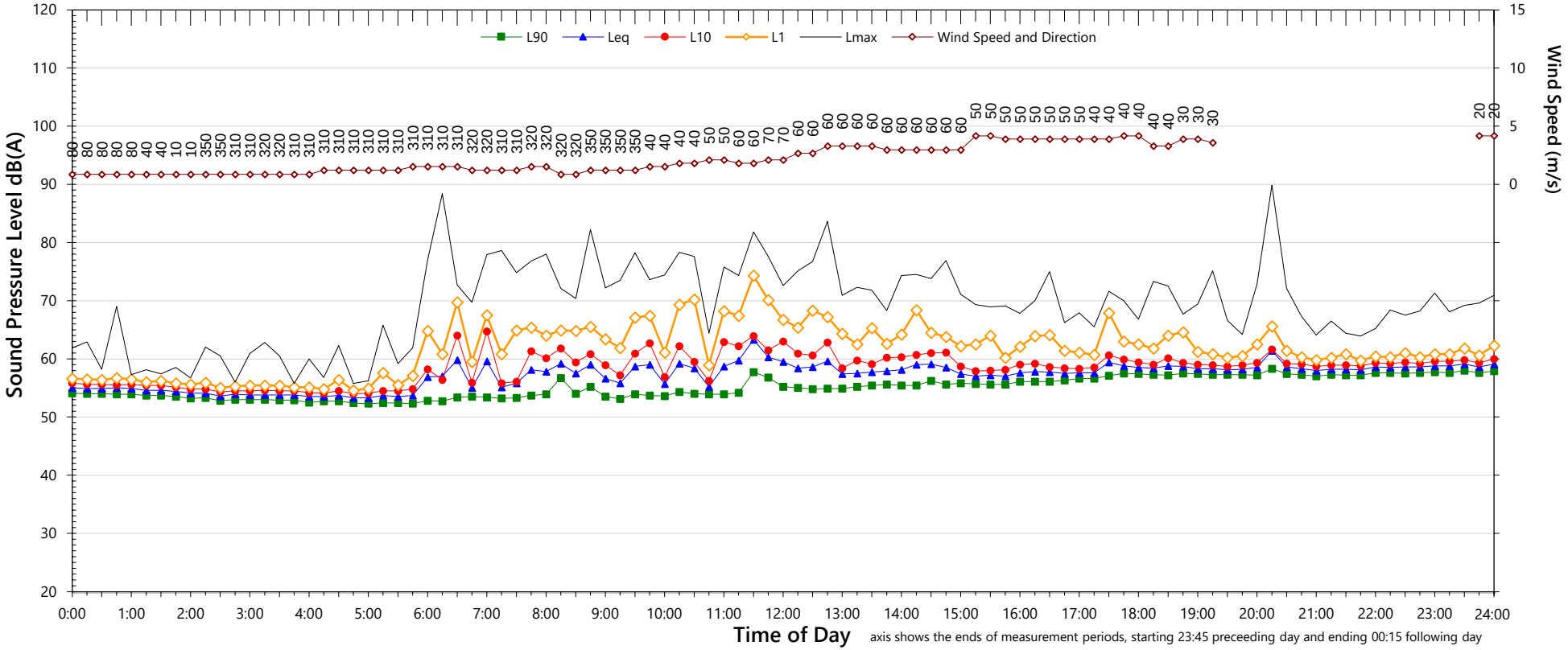
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Thursday, 11 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	54	57	55
LAeq	58	59	58

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	80	to	83
L_{Max} - L_{eq} (Range)	23	to	25

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	61	60
$L_{eq\ 1hr}$ upper 10 percentile	62	61
$L_{eq\ 1hr}$ lower 10 percentile	60	58

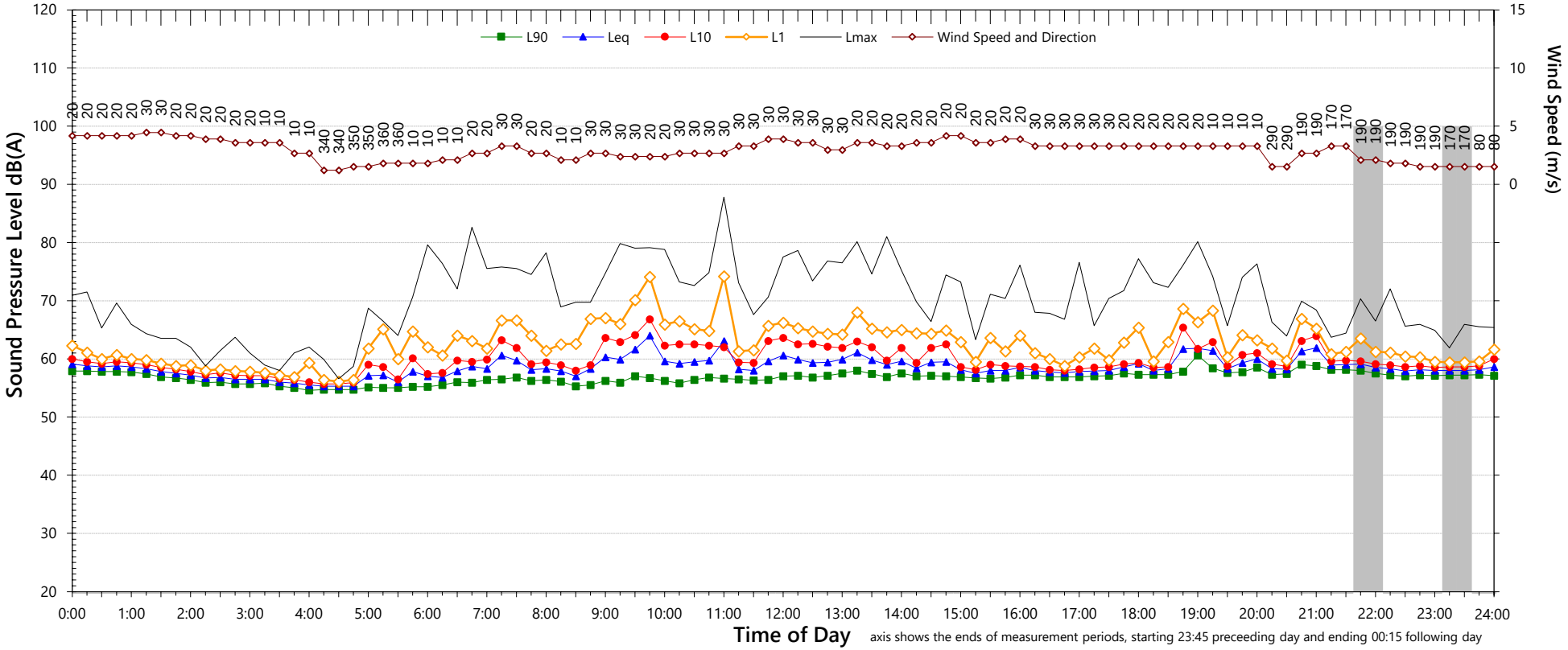
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Friday, 12 February 2021



axis shows the ends of measurement periods, starting 23:45 preceeding day and ending 00:15 following day

NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	56	57	55
LAeq	59	60	57

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	62	60
$L_{eq\ 1hr}$ upper 10 percentile	63	61
$L_{eq\ 1hr}$ lower 10 percentile	61	59

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	74	to	74
L_{Max} - L_{eq} (Range)	16	to	16

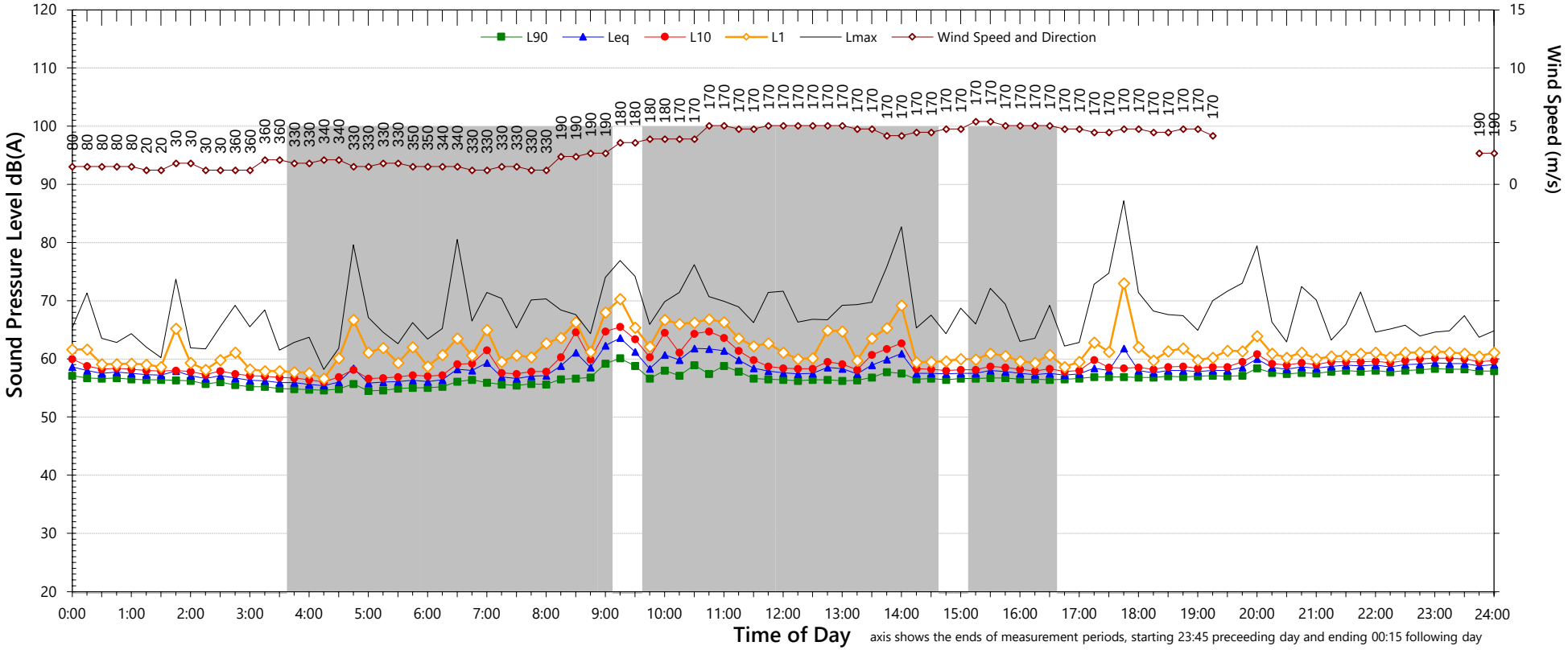
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Saturday, 13 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	56	57	53
LAeq	60	58	57

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	61	60
$L_{eq\ 1hr}$ upper 10 percentile	63	62
$L_{eq\ 1hr}$ lower 10 percentile	60	57

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	72	to	80
L_{Max} - L_{eq} (Range)	17	to	24

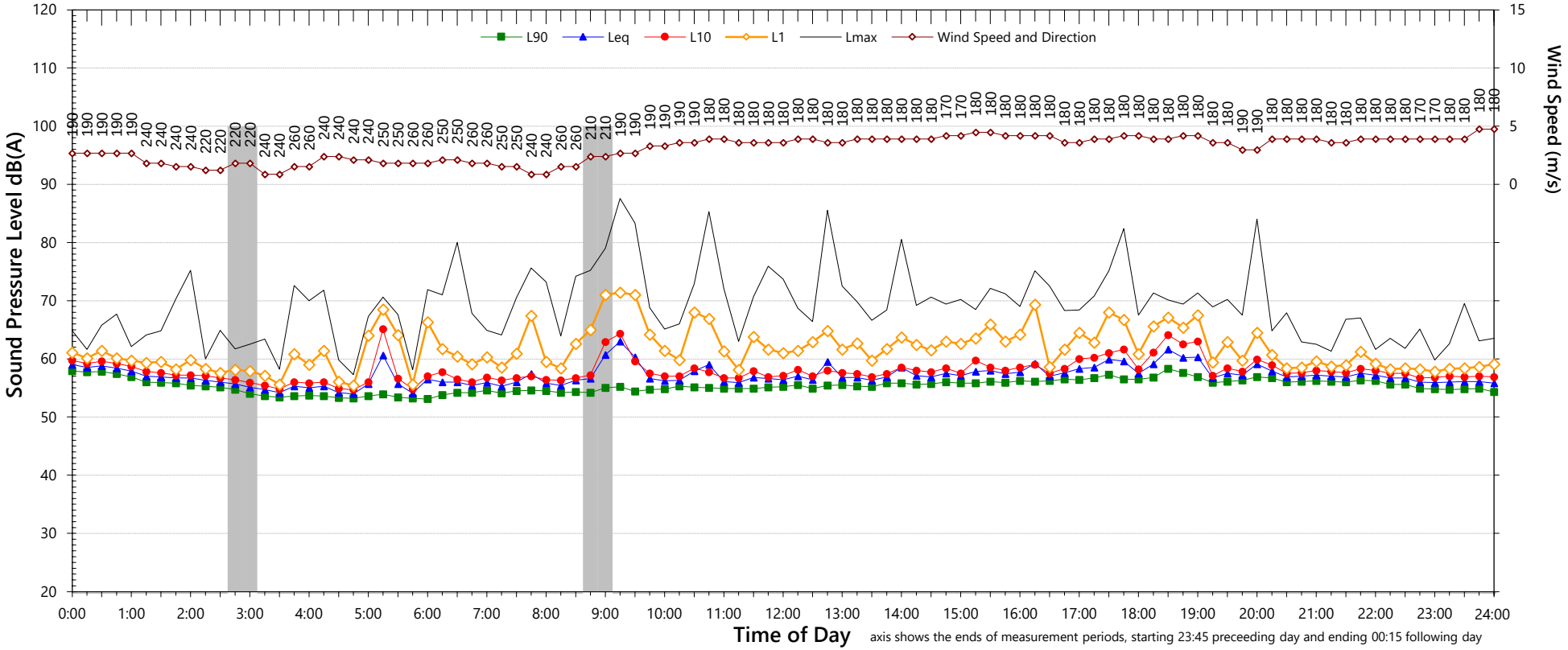
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Sunday, 14 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	55	56	54
LAeq	58	58	56

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	78	to	78
L_{Max} - L_{eq} (Range)	23	to	23

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	60	58
$L_{eq\ 1hr}$ upper 10 percentile	62	59
$L_{eq\ 1hr}$ lower 10 percentile	59	57

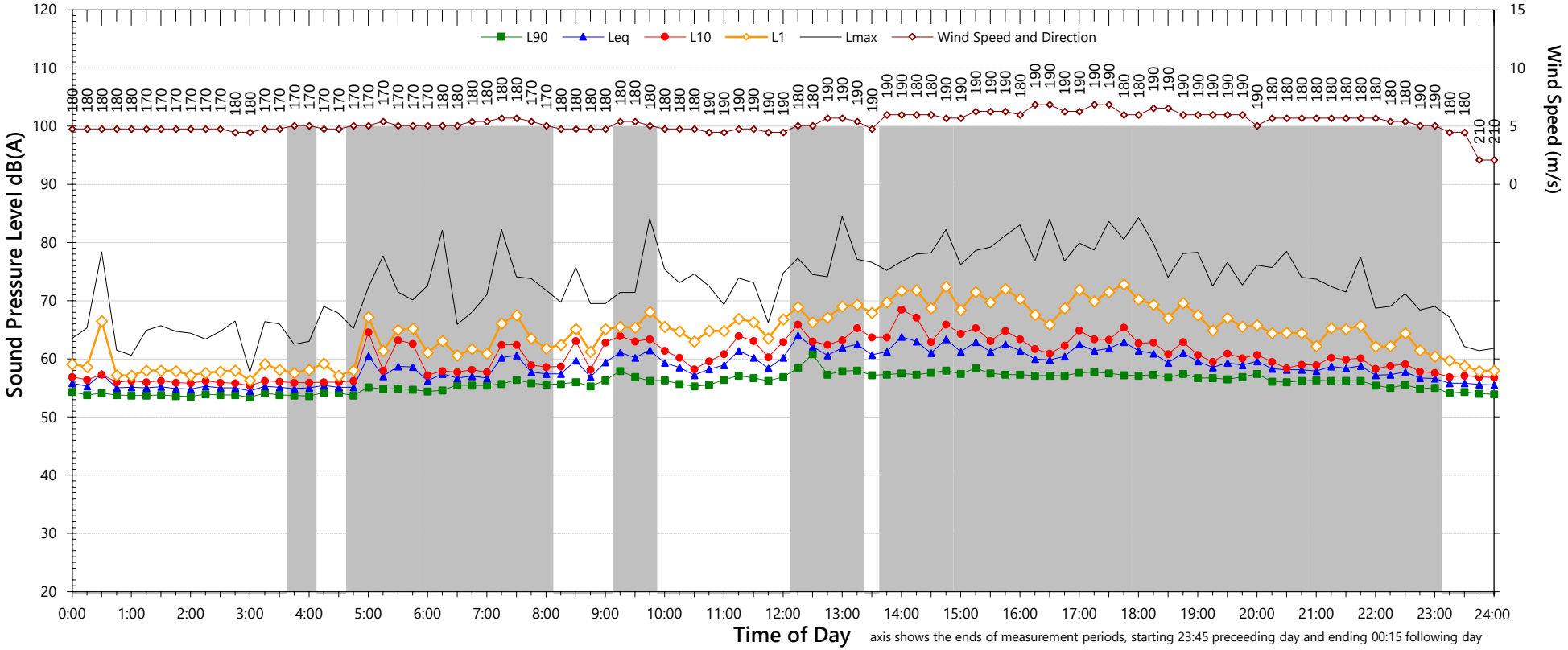
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Monday, 15 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	55	-	53
LAeq	59	-	56

NSW Road Noise Policy (1m from facade)	(see note 6)	
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	62	58
$L_{eq\ 1hr}$ upper 10 percentile	63	59
$L_{eq\ 1hr}$ lower 10 percentile	61	57

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	75	to	75
L_{Max} - L_{eq} (Range)	17	to	17

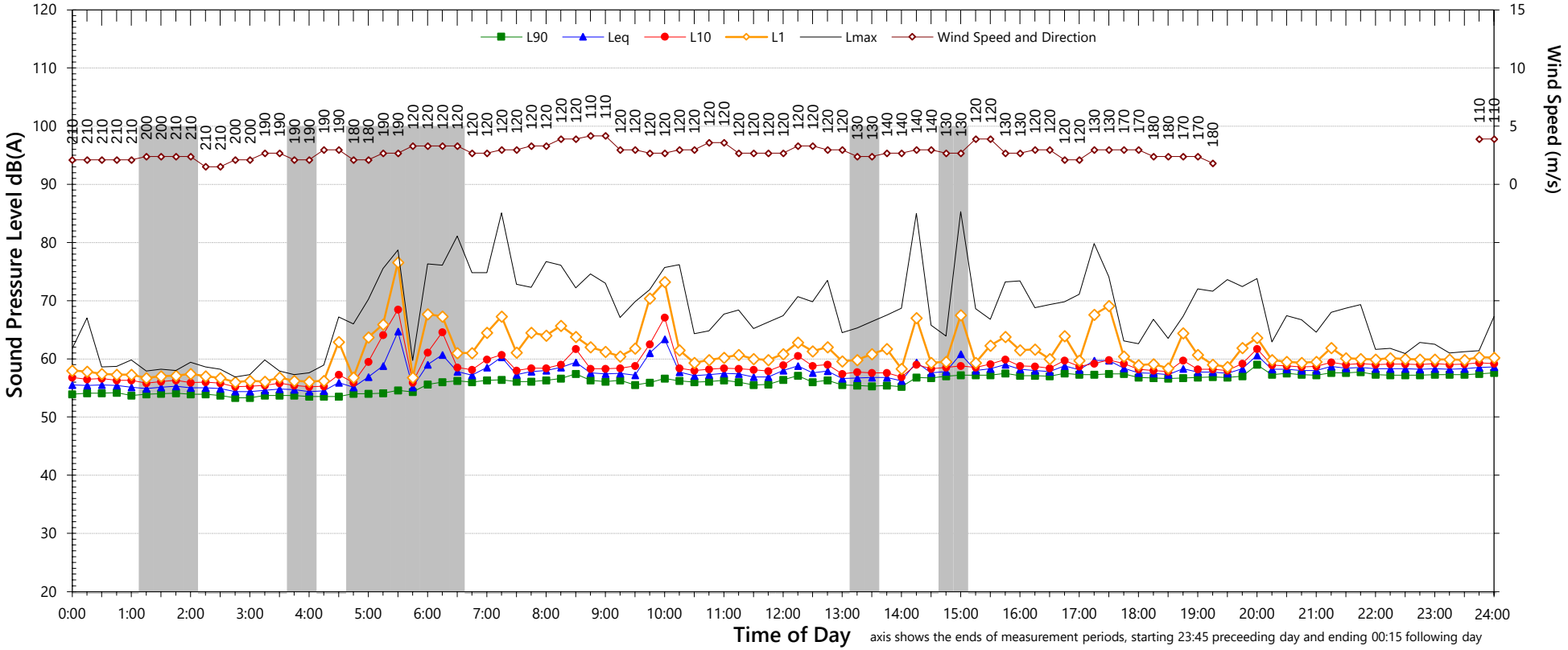
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Tuesday, 16 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	56	57	56
LAeq	58	58	58

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	74	to	74
L_{Max} - L_{eq} (Range)	17	to	17

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	61	60
$L_{eq\ 1hr}$ upper 10 percentile	61	61
$L_{eq\ 1hr}$ lower 10 percentile	60	60

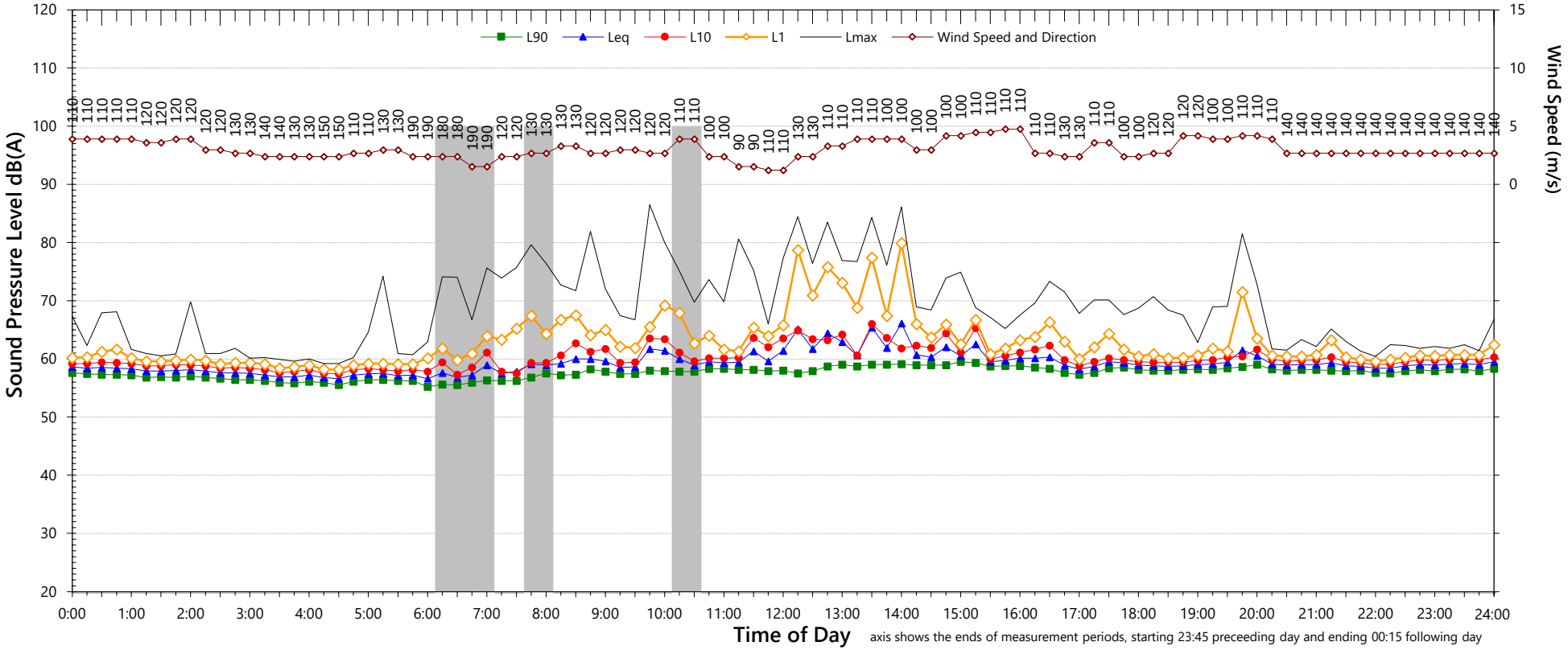
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Wednesday, 17 February 2021



axis shows the ends of measurement periods, starting 23:45 preceeding day and ending 00:15 following day

NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	57	58	57
LAeq	61	59	59

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	63	61
$L_{eq\ 1hr}$ upper 10 percentile	65	61
$L_{eq\ 1hr}$ lower 10 percentile	61	61

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	83	to	83
L_{Max} - L_{eq} (Range)	25	to	25

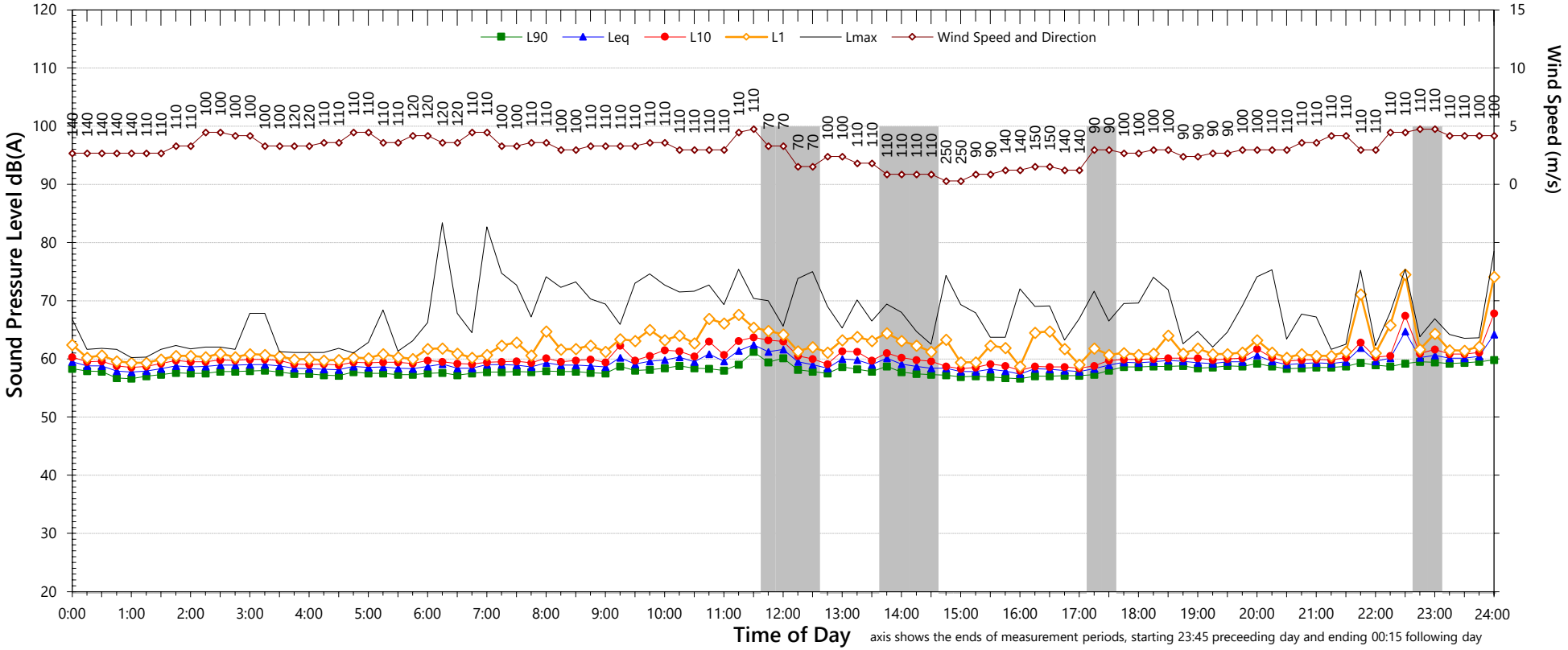
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Thursday, 18 February 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day[2]	Evening[3]	Night[4 5]
L_{90}	57	58	59
LAeq	59	60	61

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	Day	Night[5]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	62	63
$L_{eq\ 1hr}$ upper 10 percentile	63	64
$L_{eq\ 1hr}$ lower 10 percentile	61	63

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	79	to	82
L_{Max} - L_{eq} (Range)	17	to	21

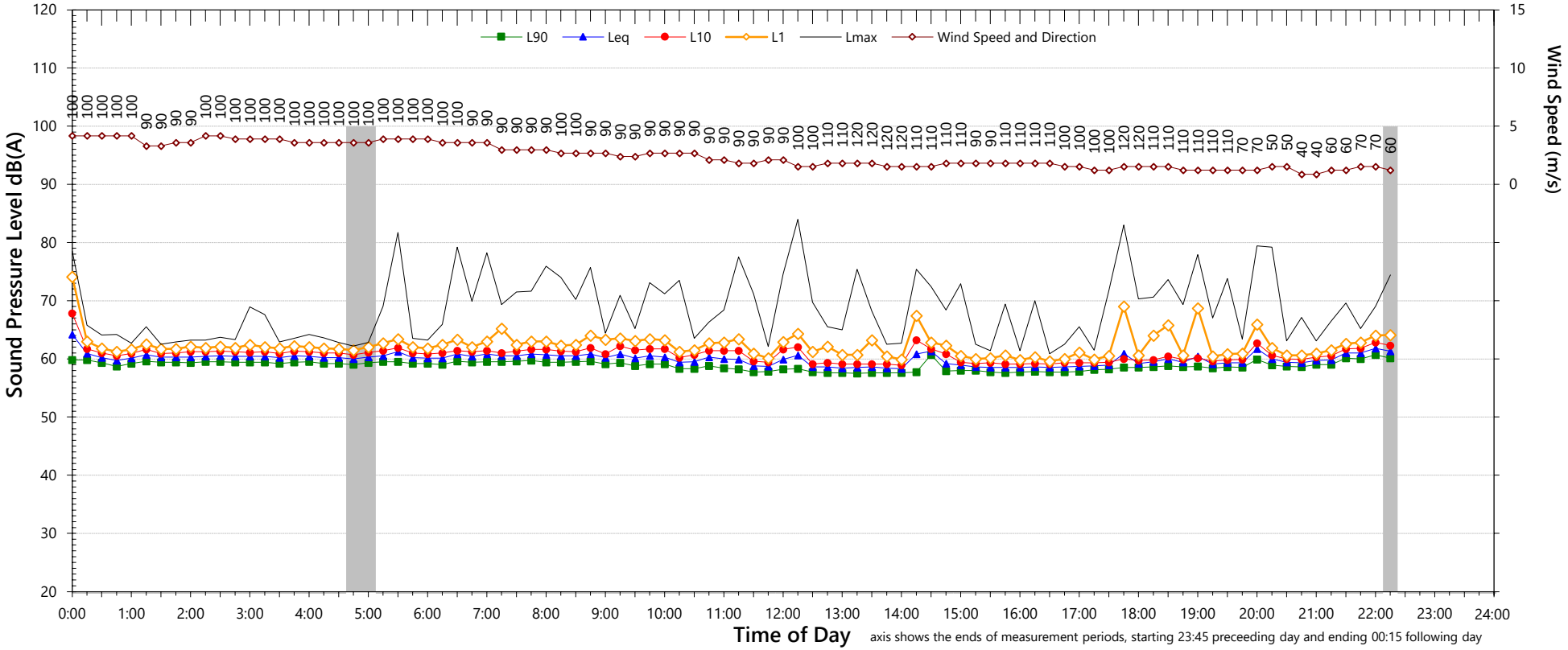
Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Location 2

Friday, 19 February 2021



axis shows the ends of measurement periods, starting 23:45 preceeding day and ending 00:15 following day

NSW Noise Policy for Industry (Free Field)			
Descriptor	**Day[2]**	**Evening[3]**	**Night[4 5]**
L_{90}	58	59	-
LAeq	60	60	-

NSW Road Noise Policy (1m from facade)		(see note 6)
Descriptor	**Day**	**Night[5]**
	7am-10pm	**10pm-7am**
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	62	-
$L_{eq\ 1hr}$ upper 10 percentile	63	-
$L_{eq\ 1hr}$ lower 10 percentile	61	-

Night Time Maximum Noise Levels			(see note 7)
L_{Max} (Range)	-	to	-
L_{Max} - L_{eq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. Night time L_{Max} values are shown only where L_{Max} >65dB(A) and where L_{Max}- Leq ≥15dB(A)