

COOGEE BAY HOTEL

Alterations and Additions - DA Acoustic Assessment

28 June 2021

Cotton Development Management Pty Ltd

TL270-01F02 CBH DA Acoustic Assessment (r2)

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Executive summary

Renzo Tonin & Associates have been engaged by Cotton Development Management Pty Ltd to undertake an acoustic impact assessment of proposed alterations and additions to the Coogee Bay Hotel site, including 5-7, 9 and 15a Vicar Street, 227- 233 and 237 Coogee Bay Road and 212 Arden Street, Coogee. This assessment included:

- Investigation of the existing acoustic environment;
- Assessment of the acoustic impacts from the use of the site on receivers external to the site and internal to the site;
- Assessment of acoustic impacts from the surrounding sources (predominantly road traffic noise) on future residents and users of the subject site.

Renzo Tonin & Associates have undertaken unattended noise measurements at the Coogee Bay Hotel site. Existing environmental noise impacts from road traffic noise on Arden Street and Coogee Bay Road do not require mandatory assessment under the SEPP (Infrastructure) 2007 and ISEPP Guideline 2008, but appropriate internal noise levels within the redevelopment are capable of being achieved with suitable acoustically rated glazing (final design in detailed design of the façade).

Noise emission goals from the use of mechanical plant and equipment and vehicles being driven on site have been set in accordance with the NSW EPA Noise Policy for Industry (NPfI). For vehicles being driven on site, feasible and reasonable mitigation measures have been nominated to reduce noise levels to surrounding receivers. For mechanical plant and equipment, compliance with NPfI goals to existing residential receivers is achievable subject to detailed design.

In respect of noise emissions from patron and music noise associated with the existing licensed premises, the proposed works are designed to maintain the existing noise levels from that source or, where practical and feasible to reduce future noise emissions compared to existing conditions.

For patron and music noise emissions from new licensed premises to existing residential receivers, goals were set for each tenancy in accordance with the NSW Office of Liquor and Gaming Special Noise Condition. In addition, cumulative noise emissions from patron and music noise from the restaurants/retail "eat street" were assessed at existing residential receivers and indicative mitigation nominated.

For noise emissions from new licensed premises to residential or Hotel receivers on the site itself, it is proposed to apply internal noise criteria. The façade will be used to achieve appropriate internal amenity within the habitable space.

Existing noise on site

Noise currently emitted from the site includes:

- patron and music noise (predominantly from the Beer Garden and to a lesser extent from Ground Floor areas fronting Coogee Bay Road and Arden Street),
- rooftop/ back of house mechanical plant and equipment,
- service vehicles and customer vehicles (Hotel and drive-thru bottle shop).

Apart from refurbishment, the uses of the ground floor of the Coogee Bay Hotel will remain essentially the same, incorporating Sports Bar, Gaming, Smoking, Beer Garden, restaurants, Hotel Rooms, offices and ancillary spaces. Whilst built form on the Southern side of the site is to be demolished as enabling works for construction of the basement loading dock and carpark, it is proposed to reinstate equivalent acoustic screening.

Future condition

Whilst the beer garden is to be retained, the majority of the mechanical plant and equipment serving the site will require replacement (or reconfiguration) and substantial alterations are proposed to move the loading underground. A new plant deck is proposed on Level 2 of the Coogee Bay Hotel, West of the Heritage elements.

The new development has been designed around a pedestrian laneway linking Coogee Bay Road and Arden Street. In the central portion of the site, entering from Coogee Bay Road the lane passes by activated street fronts (Eat Street) to a portion of public open space before discharging to Arden Street. This Eat Street has the potential to result in noise from patrons and music and from mechanical plant and equipment.

The DA for the use of a restaurant tenancy would be the responsibility of the future tenant, but a high-level assessment of noise emissions from the use of Eat Street was conducted as part of this study which determined that acoustic mitigation measures are required to maintain the acoustic amenity of surrounding residential receivers.

For residential receivers on the site, patron and music noise emissions have been assessed using the approach from Barangaroo South Precinct, with the project acoustic criteria being applied internally (as opposed to externally at the building façade), thus allowing the façade to be used as part of overall acoustic solution. This will limit obstructions to natural light and air over the laneway which might otherwise be required to protect the amenity of the new apartments (if noise screens were used).

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1 Introduction

Renzo Tonin & Associates was engaged to prepare a noise impact assessment for proposed alterations and additions to the Coogee Bay Hotel site. The proposed changes result in a smaller pub venture, with additional commercial (supermarket) and food and beverage offers within new built form.

The site overall encompasses 5-7, 9 and 15a Vicar Street, 227- 233 and 237 Coogee Bay Road and 212 Arden Street, Coogee. Existing Heritage elements on the site are to be retained including buildings fronting Coogee Bay Road and West of the beer garden, an original timber stair and the beer garden itself. It is proposed to demolish the remaining structures on the site including the existing Boutique Hotel, Selina's nightclub, the Coogee Bay Barrel Bottle Shop, the residential flat building at 15a Vicar Street and commercial / mixed-use buildings at 227-237 Coogee Bay Road as part of the development.

In the amended development, it is proposed to reduce the extent of the Coogee Bay Hotel to approximately 3,000m² including 19 existing/reinstated and 10 new Hotel Rooms, plus existing office space and to construct a new mixed-use development to the West of it, including 60 residential apartments (with associated common spaces), a Coles supermarket of approximately 1,800m², eight (8) restaurants with a total area of approximately 1,000m² and a Bottle Shop of approximately 90m². Basement parking for 94 cars is provided for the residential portion and 133 spaces for the supermarket, accommodation, restaurant, retail and pub including 3 loading bays and a truck turntable.

New underground carparking and loading dock will serve the amended development, including new lifts from the basement to Level 1 of the Hotel. Service and commercial patron vehicles shall enter/exit the site from/to Arden Street, whilst residents will utilise the Vicar Street driveway. The loading dock is designed to accommodate rigid trucks up to 12.5m length and will provide for five vehicles (two large trucks, two medium rigid trucks and one for small rigid trucks).

This assessment is based on the following:

- Traffic report by Colston Budd Rogers & Kafes Pty Ltd, Reference: 11437, dated 25 June 2021.
- Site Surveys by Higgins Surveyors, Reference: 31346, Dated: 28.02.2020, Sheets 1 to 4.
- Architectural drawings by Fender Katsalidis Architects, as tabulated below.

Drawing number	Revision
DA097	01
DA098	03
DA099	03
DA100	06
DA101	05
DA102	03
DA103	02
DA104	01
DA106	02




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. Appendix A contains a glossary of acoustic terms used in this report.

2 Site and Surrounds

The site encompasses the majority of the Coogee town centre block bound by Arden Street, Coogee Bay Road, and Vicar Street. The site overall is known as 212 Arden Street, 5-7, 9, and 15a Vicar Street, and 229-233, 235 and 237 Coogee Bay Road, Coogee. Refer Figure 1 below. Long term unattended noise monitoring was undertaken at 5 locations as shown on Figure 1.



Figure 1 - Aerial view of subject site, surrounding receivers and long term unattended noise monitoring locations

Marking	Item
	Subject site
	Residential receivers
	Long term unattended noise monitoring locations

Adjacent to the site to the South are residential receivers. There are also residential receivers opposite the site on Vicar Street. At 223 Coogee Bay Road (the corner of Vicar Street), the ground floor is occupied by commercial uses with residential uses above. On Coogee Bay Road near Vicar Street, there are residential receivers above some of the ground floor shops, although 260-266 Coogee Bay Road is

purely commercial (including a central courtyard which is open to the sky), as is 200 Arden Street, which is occupied by food and beverage on the ground floor and the Coogee Legion Club above. Opposite the Hotel on Arden Street is Goldstein reserve and Coogee Beach.

3 Long term unattended noise monitoring

Long term unattended noise monitoring was undertaken on site to quantify the existing acoustic environment - both in terms of the background noise and the noise impacts on the site from the surroundings.

3.1 Duration of monitoring

Long term unattended noise monitoring was undertaken at five (5) locations from 20/05/2021 to 28/05/2021, inclusive.

3.2 Monitoring locations

Five monitors in total were installed, at the locations shown in Figure 1.

Location 1 was on the Level 1 terrace, with the microphone protruding through the balustrade, facing Arden Street, near Coogee Bay Road.

Location 2 was on the Level 1 terrace overlooking the beer garden. Location 2 was at times impacted by noise from the Hotel during its hours of trade and so background noise levels recorded from this logger have only been used where not affected by on site operations. The periods of data not affected by the operation of the Hotel correlate with the Location 1 data and on that basis, Location 1 data is representative for the background noise for residential receivers at 230 Arden Street and traffic noise from Arden Street.

Location 3 was installed in the rear yard of 15a Vicar Street, approximately 1.5m above the ground. This location was impacted by mechanical plant and equipment including some from the site itself and so whilst data is presented, it has not been used in the setting of project noise emission goals to residential receivers on Vicar Street.

Location 4 was on Level 1 of the Boutique Hotel, facing Vicar Street. This logger location is representative of Vicar Street receivers opposite the site and has been nominated as representative of the residential receivers at 17 and 19 Vicar Street (given Location 3 was impacted by mechanical plant noise from the site).

Location 5 was located at Level 1 of 235 Coogee Bay Road (upstairs from the former Westpac branch) - protruding from the window. This location is representative for background noise for Coogee Bay Road receivers and traffic noise on Coogee Bay Road.

There were some periods of inclement weather, but these have been excluded from assessment in accordance with the NSW Environmental Protection Authority Noise Policy for Industry ("NPfI"). Note: NPfI exclusions were not applied to Location 2. Data from that location was only used to verify correlation with Location 1 levels.

3.3 Equipment used for unattended monitoring

The equipment used for noise measurements was an NTi Audio Type XL2 precision sound level analyser which is a class 1 instrument having accuracy suitable for field and laboratory use. The instrument was calibrated prior and subsequent to measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with IEC 61672 (parts 1-3) 'Electroacoustics - Sound Level Meters' and IEC 60942 'Electroacoustics - Sound calibrators' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

3.4 Results of long term unattended noise monitoring

The long-term unattended noise monitoring graphs are included in APPENDIX B.

Table 1 - Long-term unattended noise monitoring results

Location	Measured Rating Background Noise Levels ¹ dB(A) L ₉₀ (15min)				
	Day	Evening	Night	Morning shoulder (6am - 7am)	Night Shoulder (10pm - 12am)
L1- Level 1 terrace, Facing Arden Street	57	58	49	56	55
L2- Level 1 terrace, 1.5m above floor, south of beer garden	53 ²	- ³	50	52	- ³
L3- Rear of 15a Vicar Street, 1.5m above ground	48 ⁴	49 ⁴	47 ⁴	48 ⁴	48 ⁴
L4- Level 1 of Coogee Boutique Hotel	47	45	42	46	43
L5 - 235 Coogee Bay Road, Level 1, approx 1m from facade	54	54	47	52	49

1. Periods are as defined by the NSW EPA Noise Policy for Industry. Day is 7am – 6pm Monday to Friday and 8am – 6pm Saturday, Sunday and Public Holidays; Evening is 6pm – 10pm daily; Night is 10pm – 7am Monday to Friday and 10pm-8am Saturday, Sunday and Public Holidays. 2. Lowest 10th percentile of the data remaining after exclusion of the periods impacted by noise from operation of the Hotel 3. Data impacted by operation of the existing licensed premises. 4. Location impacted by continuous mechanical plant and occasional vehicle and truck movement from the Coogee Bay Hotel, Boutique Hotel and other commercial premises on the site overall.

Table 2 - Long-term unattended noise monitoring results - traffic noise at 1m from facade

Location	Environmental Noise (at 1m from a façade) dB(A) L _{eq} (period)	
	Day (7am -10pm)	Night (10pm – 7am)
L1- Level 1 terrace, Facing Arden Street	66	62
L4- Level 1 of Coogee Boutique Hotel	58	53
L5 - 235 Coogee Bay Road, Level 1, approx 1m from facade	62	59

Note: The noise level on the Level 1 terrace of the Boutique Hotel was 60dB(A) L_{eq} (worst 1hr, day) and 54dB(A) L_{eq} (worst 1hr, Night)

4 Noise Emission Assessment

This section presents the assessment of noise emissions from the subject development.

For external noise emissions from mechanical plant and vehicles being driven on the site, project noise emission trigger levels are from the NSW Environmental Protection Authority ("EPA") Noise Policy for Industry ("NPfI"), 2017.

The NSW EPA Road Noise Policy (RNP) nominates criteria for additional noise on existing roads from traffic generated by a development impacting residential receivers. The criteria are dependent on the type of road (e.g. Freeway / Arterial / Sub-arterial / Local Road etc).

For external noise emissions from existing patron and music noise from the Coogee Bay Hotel to existing residential receivers external to the site, there shall be no noticeable increase in noise to any residential receiver external to the site due to the proposed works. The intention is to reduce noise emissions where practical and feasible (and in keeping with Heritage protection).

For external noise emissions from restaurants in the proposed Eat Street, Renzo Tonin & Associates suggest application of controls similar to the Barangaroo South Precinct, which had/has numerous retail tenancies (including licensed premises) proximate to residential receivers and where an active streetscape was desirable. At Barangaroo South Precinct, separate controls were applied for receivers within the Precinct versus outside.

The same approach is proposed for the Coogee Bay Hotel redevelopment Eat Street. For patron and music noise from new licensed premises on site to existing residential receivers external to the site, each licensed premise shall assess its noise emissions to the nearest residential receivers external to the Precinct for compliance with the NSW Liquor and Gaming background + 5dB(A) L₁₀ spectrum assessment up to midnight (and inaudibility after midnight or before 7am). In addition, a control of Background + 5dB(A) L_{eq(15min)} shall be applied to the cumulative operation of the retail tenancies to any residential receiver external to the Site up to midnight.

4.1 Criteria - Noise Policy for Industry

Noise impacts from mechanical plant and equipment and vehicles being driven on site are assessed in accordance with the NSW 'Noise Policy for Industry' (NPfI), 2017. The assessment procedure has two components:

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

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise levels and project amenity noise levels. The EPA nominates that trigger levels are not hard and fast noise goals - but if the trigger levels are

exceeded, then feasible and reasonable measures to reduce noise emissions should be investigated and then the residual (if any) can be discussed.

4.1.1 Project intrusive noise levels

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

$L_{Aeq,15minute}$ Intrusiveness noise level = Rating Background Level ('RBL') plus 5dB(A)

Based on the background noise monitoring results and the proposed operating hours of the facility, the intrusiveness noise levels for residential receivers are reproduced in Table 3 below.

Table 3: Intrusiveness noise levels

Receiver	Intrusiveness noise level, $L_{Aeq,15min}$				
	Day ¹	Evening ²	Night ³	Early Morning 6am - 7am	Late Evening 10pm - 12am
230 Arden Street residences	$53^4 + 5 = 58$	$53^5 + 5 = 58$	$49 + 5 = 54$	$52 + 5 = 57$	$49^5 + 5 = 54$
Vicar Street residences	$47 + 5 = 52$	$45 + 5 = 50$	$42 + 5 = 47$	$45 + 5 = 50$	$43 + 5 = 48$
Coogee Bay Road residences	$54 + 5 = 59$	$54 + 5 = 59$	$47 + 5 = 52$	$52 + 5 = 57$	$49 + 5 = 54$

Notes:

1. Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays
2. Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays
3. Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 Sundays & Public Holidays
4. Minimum value between Location 1 and Location 2, after exclusion of data affected by operations noise from Site.
5. Unattended noise monitor at Location 1 recorded higher than 53, in which instance NPfI defines the evening / late evening period intrusiveness trigger to be the same as the daytime.

4.1.2 Amenity noise levels

The project amenity noise levels for different time periods of day are determined in accordance with Section 2.4 of the NPfI. The NPfI recommends amenity noise levels ($L_{Aq,period}$) for various receivers including residential, commercial, industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These "recommended amenity noise levels" represent the objective for total industrial noise experienced at receiver location. However, when assessing a single industrial development and its impact on an area, "project amenity noise levels" apply.

The recommended amenity noise levels applicable for the surrounding area are reproduced in Table 4 below.

Table 4: Project amenity noise levels

Type of Receiver	Noise Amenity Area	Time of Day	Recommended amenity noise level, LAeq, dB(A)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
Passive recreation (e.g. national park)	All	When in use	50
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.
 The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows:

$$L_{Aeq,period} \text{ Project amenity noise level} = L_{Aeq,period} \text{ Recommended amenity noise level} - 5\text{dB(A)}$$

The above applies with the assumption that a receiver could be impacted by 3-4 sources of industrial noise. For residential receivers at 230 Arden Street, it is highly unlikely that they will be impacted by industrial noise from anywhere other than the Site itself. On that basis, for 230 Arden Street, it is not necessary to apply the 5dB penalty to assume that the Amenity noise budget is shared.

Furthermore, given that the intrusiveness noise level is based on a 15 minute assessment period and the project amenity noise level is based on day, evening and night assessment periods, the NPfI provides the following guidance on adjusting the LAeq,period level to a representative LAeq,15minute level in order to standardise the time periods.

$$L_{Aeq,15minute} = L_{Aeq,period} + 3\text{dB(A)}$$

The project amenity noise levels (LAeq, 15min) applied for this project are reproduced in Table 5 below, based on a 'urban' noise amenity area.

Note that in the event the site operations exceed the simplified project amenity noise levels (LAeq, 15min), the NPfl does still permit a cumulative period assessment for Amenity levels (LAeq, period)

Table 5 Project amenity noise levels

Type of Receiver	Noise Amenity Area	Time of Day	Project Amenity Noise Level, dB(A)	
			LAeq, Period	LAeq, 15min
Residence (Vicar Street and Coogee Bay Road)	Urban	Day	60 – 5 = 55	55 + 3 = 58
		Evening	50 – 5 = 45	45 + 3 = 48
		Night	45 – 5 = 40	40 + 3 = 43
Residence (230 Arden Street))	Urban	Day	60	60 + 3 = 63
		Evening	50	50 + 3 = 53
		Night	45	45 + 3 = 48
Hotel receivers	Urban	Day	55 + 5 = 60	60 + 3 = 63
		Evening	45 + 5 = 50	50 + 3 = 53
		Night	40 + 5 = 45	45 + 3 = 48
Commercial Premises	All	When in use	65 – 5 = 60	60 + 3 = 63
Active recreation area (Goldstein reserve)	All	When in use	55 – 5 = 50	50 + 3 = 53

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.

4.1.3 Project noise trigger levels

In accordance with the NPfl the project noise trigger levels, which are the lower (i.e. more stringent) value of the *project intrusiveness* noise level (from Table 3) and *project amenity* noise level (Table 4), have been determined as shown in Table 6 below.

Table 6 Project noise trigger levels

Receiver Location	Project noise trigger levels, dB(A) _{Leq(15min)}		
	Day	Evening	Night
230 Arden Street residences	58	53	48
Vicar Street residences	52	48	43
Coogee Bay Road residences	58	48	43
Commercial	63 (when in use)		
Active recreation area	53 (when in use)		

4.1.4 Sleep disturbance noise levels

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. In accordance with NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- LAeq,15min 40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- LAFmax 52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

The sleep disturbance noise levels for the project are presented in Table 7.

Table 7: Sleep disturbance assessment levels

Receiver type	Assessment Level LAeq,15min	Assessment Level LAFmax
230 Arden Street residences	49 + 5 = 54	64
Vicar Street residences	42 + 5 = 47	57
Coogee Bay Road residences	45 + 5 = 50	60

4.2 Criteria - Road Noise Policy - residential land uses

Table 3 of the RNP, which is repeated in Table 8 below, sets out the assessment criteria for residences to be applied to particular types of project, road category and land use. These criteria are for assessment against façade corrected noise levels when measured in front of a building facade. In Table 3 of the RNP, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria.

Table 8: Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day 7:00am-10:00pm	Night 10:00pm-7:00am
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	LAeq,(15 hour) 55 (external)	LAeq,(9 hour) 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway / arterial / sub-arterial roads	LAeq,(15 hour) 60 (external)	LAeq,(9 hour) 55 (external)

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day 7:00am-10:00pm	Night 10:00pm-7:00am
	3. Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,(15 \text{ hour})}$ 60 (external)	$L_{Aeq,(9 \text{ hour})}$ 55 (external)
Local roads	4. Existing residences affected by noise from new local road corridors	$L_{Aeq,(1 \text{ hour})}$ 55 (external)	$L_{Aeq,(1 \text{ hour})}$ 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (refer to Appendix C10 of the RNP).

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

For existing residences and other sensitive land uses affected by *additional traffic on existing roads generated by land use developments*, any increase in the total traffic noise level (where the assessment criteria cannot be achieved) should be limited to 2 dB above that of the corresponding 'no build option'.

4.3 Criteria - Noise from new licensed premises

For the subject Site, which is redevelopment of a Precinct, Renzo Tonin & Associates suggest application of controls similar to the Barangaroo South Precinct, which had/has numerous retail tenancies (including licensed premises) proximate to residential receivers and where an active streetscape was desirable. At Barangaroo South Precinct, separate controls were applied for receivers within the Precinct versus outside. The same approach is proposed for the Coogee Bay Hotel Precinct (the Site).

For residential receivers outside of the Site, each licensed premise shall assess its noise emissions to the nearest residential receivers external to the Precinct for compliance with the NSW Liquor and Gaming background + 5dB(A) L_{10} spectrum assessment up to midnight (and inaudibility after midnight). In addition, a control of Background + 5dB(A) $L_{eq(15min)}$ shall be applied to the cumulative operation of the retail tenancies to any residential receiver external to the Site up to midnight. After midnight or before 7am, patron and music noise from Eat Street restaurants shall be inaudible within any habitable room of a residential dwelling external to the site.

Given that the Vicar Street receivers are impacted by up to 5 tenancies, it is suggested that the background + 5 cumulative noise budget be shared evenly across those 5 tenancies. This would give each tenancy an allocation of Background minus 2dB(A) $L_{eq(15min)}$ contribution to the nearest residential

receivers at 17 and 15 Vicar Street and 230 Arden Street. Alternatively, the noise budget could be apportioned by a tenancies floor area relative to the total for all 5 restaurants. As long as a consistent approach is applied (this can be included in the leasing arrangements), cumulative noise emissions can be managed appropriately. It is a similar case on Coogee Bay Road, with the worst affected receivers most affected by up to 5 tenancies. This would give each tenancy an allocation of Background minus 2dB(A) $L_{eq(15min)}$ - contribution (broadband) to the nearest residential receivers (e.g. 250 Coogee Bay Road).

4.3.1 Noise impacts from restaurants on site to residential receivers on site

For noise impacts within the Precinct, design internal noise goals (cumulative) are proposed. The goals are those applied by Wilkinson Murray at the Barangaroo South Precinct which were informed by controls applied in New York and San Francisco.

The proposed combined patron and music internal noise levels from the active street-fronts of Eat Street are follows:

- Daytime/Evening (7am to 10pm):
 - 38dB(A) $L_{eq(15min)}$ in bedrooms (internally, windows closed); and
 - 43dB(A) $L_{eq(15min)}$ in living rooms (internally, windows closed);
- Late Evening (10pm - midnight):
 - 35dB(A) $L_{eq(15min)}$ in bedrooms (internally, windows closed); and
 - 40dB(A) $L_{eq(15min)}$ in living rooms (internally, windows closed) from 7am up to midnight.
- Overnight (midnight to 7am):
 - Each of the new tenancies inaudible at any residential receptor.

Note: Application of internal noise criteria requires that the affected residential apartments could not be conventionally "naturally ventilated" unless the façade noise level is within 10dB of the project internal noise goal (i.e. so that once the noise travels to inside through the window open for natural ventilation, it would be compliant internally).

Based on the proposed outdoor seating plans (assuming no music outside), Renzo Tonin & Associates have determined the indicative noise level to the residential facades within the Precinct. On that basis, it is determined that upgraded, laminated glazing with full perimeter acoustic seals would be sufficient to achieve the nominated project internal noise goals, subject to detailed design.

4.3.2 Noise from a new restaurant tenancy to an existing residential receiver

Noise from the use of a licensed premise on the Site to existing residential receivers external to the Coogee Bay Hotel Precinct shall be assessed for compliance with the Liquor and Gaming NSW

(L&GNSW) standard noise criteria. Noise emission from licensed premises in NSW, such as restaurants, bars and clubs, should aim to comply with the standard noise criteria set by L&GNSW. The L&GNSW criteria applies to all noise emission associated with activities from the licensed area of the premises, including music and patron noise, but excludes mechanical services equipment.

L&GNSW, through the Liquor Act 2007, is the regulatory authority that deals with noise pollution issues pertaining to licensed premises. L&GNSW recommends the use of their standard noise criteria when assessing noise impact from licensed premises and when determining the occurrence of noise nuisance and annoyance. Noise emissions are assessed in terms of the following 'Standard Noise Condition':

"The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) by more than 5dB between 7:00am and 12:00 midnight at the boundary of any affected residence.*

The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in an Octave Band Centre Frequency (31.5Hz – 8kHz inclusive) between 12:00 midnight and 7:00am at the boundary of any affected residence.*

Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 7:00am.

Interior noise levels which still exceed safe hearing levels are in no way supported or condoned by the NSW Office of Liquor, Gaming and Racing.

This is a minimum standard. In some instances the Board may specify a time earlier than midnight in respect of the above condition.

**For the purposes of this condition, the LA10 can be taken as the average maximum deflection of the noise emission from the licensed premises."*

For the determination of octave band criteria, octave band noise levels measured by the long-term noise loggers at L1 and L2 have been utilised.

Based on current planning, it is anticipated that Eat Street would operate 7am -12am but that there could be a café that may wish to open from 6am for early morning coffee trade. On that basis, the assessment periods for the proposed operations are;

- 6am - 7am (included as a contingency for early morning café service)
- 7am - 6pm
- 6pm - 10pm
- 10pm - 12am; and
- 12am - 7am

The long term noise logger measurements were analysed between the above time periods to establish the L&GNSW noise goals and are set out in Table 9: L&GNSW noise goals Table 9 below.

Table 9: L&GNSW noise goals - $L_{10(15min)}$ dB(Z)

Assessment period	Octave band centre frequency - Hz (dBZ)								
	31.5	63	125	250	500	1k	2k	4k	8k
15 & 17 Vicar Street and 230 Arden Street									
6am - 7am*	47	45	47	45	42	39	35	28	18
7am – 6pm	54	51	52	50	48	46	43	36	26
6pm - 10pm	51	48	50	49	47	45	40	32	22
10pm - 12am	48	46	49	48	45	42	38	30	21
12am - 7am*	42	40	44	42	39	35	32	24	16
Coogee Bay Road									
6am - 7am	57	54	53	51	48	47	43	36	24
7am – 6pm	63	62	59	57	56	54	50	43	33
6pm - 10pm	58	64	59	59	55	53	49	43	34
10pm - 12am	56	55	55	54	51	49	45	37	26
12am - 7am*	48	49	48	48	44	41	36	28	19

Notes: * Background + 0dB criteria. In addition, an inaudibility assessment must also be undertaken for overnight operations.
 ^ Threshold of hearing in accordance with AS3657.1, taken as the lowest third octave level for the respective octave band.

For the assessment of inaudibility Renzo Tonin and Associates adopt a design criterion of 10dB below the background noise level in each octave band for intermittent noise sources such as patrons and music, with the exception of any noise levels below the threshold of hearing, in which case the threshold shall be the criterion. It is assumed that if inaudibility is achieved externally at a residential window the internal inaudibility criterion will also be achieved within the associated room (unless there is an internal-to-internal path which would need to be assessed separately).

In addition to the controls presented in Table 9, as the development of the Coogee Bay Hotel Precinct could result in numerous licensed premises impacting a receiver, to protect existing residential receivers from cumulative impacts from multiple licensed premises, it is proposed to limit cumulative impacts to any existing residential receivers external to the Site to background + 5dB prior to midnight, and background + 0dB after midnight. This same approach was applied for the redevelopment of the Barangaroo South Precinct which also included activated street-fronts with the potential for existing receivers (i.e. external to the precinct) to be impacted by noise from multiple licensed premises.

Based on the site measured background noise levels, Table 10 presents the Site cumulative patron and music noise limits at existing external residential receivers.

Table 10 - Cumulative Eat Street patron and music noise levels dB(A) $L_{eq}(15min)$

Location	Cumulative patron and music noise levels dB(A) $L_{eq}(15min)$			
	Day (7am - 6pm)	Evening (6pm - 10pm)	Late Evening (10pm - 12am)	Overnight (12am - 7am)
Vicar Street residences	52	50	48	42
230 Arden Street (rear half)	52	50	48	42
230 Arden Street (front half)	58	58	54	49
Coogee Bay Road Residences	59	59	54	47

4.4 Assessment of operational noise emissions

Assessment of operational noise emissions from the operation of the Coogee Bay Hotel precinct is to be undertaken during future DAs when the detailed equipment data and layouts are known.

4.4.1 In principle treatment of mechanical plant and equipment

Mechanical plant associated with the development has the potential to impact on nearby noise sensitive properties. In order to carry out a quantitative assessment of mechanical equipment, a complete specification of equipment is required.

At this stage of the development appropriate detail for mechanical plant is not typically available. A qualitative assessment has therefore been carried out and in-principle noise management measures outlined. However, based on equipment noise levels from previous similar projects, Renzo Tonin & Associates have undertaken preliminary modelling of external noise emissions from the rooftop plant and equipment. This indicated that an acoustic screen approximately the same height (nominally 1.8m high) as the Coles condensing equipment will likely be required to protect the amenity of neighbouring residential receivers and residential receivers on the site.

Acoustic assessment of mechanical services equipment should be undertaken during the detail design phase of the development to ensure that the cumulative noise of all equipment does not exceed the applicable noise criteria. Development Consent Conditions typically require detailed assessment of mechanical plant and equipment prior to issue of the Construction Certificate.

Noise control treatment can affect the operation of the mechanical services system. An acoustic engineer should be consulted during the initial design phase of mechanical services system to reduce potential redesign of the mechanical system.

Mechanical plant noise emission can be controlled by appropriate mechanical system design and implementation of common engineering methods, which may include:

- procurement of 'quiet' plant

- strategic positioning of plant away from sensitive neighbouring premises to maximise intervening acoustic shielding between the plant and sensitive neighbouring premises
- commercially available acoustic attenuators for air discharge and air intakes of plant
- acoustically lined and lagged ductwork
- acoustic barriers between plant and sensitive neighbouring premises
- partial or complete acoustic enclosures over plant.
- The specification and location of mechanical plant should be confirmed prior to installation on site, and
- Fans shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 '*Rotating and Reciprocating Machinery – Mechanical Vibration*'.

With respect to emergency/back up generator serving Coles:

- The generator is proposed to be housed in an acoustic enclosure.
- Emergency generators are excluded from the Noise Policy for Industry.
- EPA guidance (Noise Control Manual) with respect to noise from generators is that generator noise not exceed background noise levels by more than 10dB(A) during the day and evening, and no more than 5dB(A) at night.
- Based on the proposed equipment selection, generator noise is expected to comply with a "background+5dB(A)" noise goal, if operated at night (including the additional 1.8m high acoustic screen).

4.4.2 Arden Street Driveway - Loading dock and carpark

The loading dock is designed to accommodate trucks up to 12.5m in length. The trucks shall enter and exit the site in a forward direction. This is enabled with a truck turntable within the basement loading dock.

The site overall is anticipated to have up to 35 trucks or vans per day for deliveries / retrievals. It is estimated that on average, during the peak periods one truck may go in and one come out in any 15minute period.

The dock is proposed to operate between 6am and 12am (same hours as the store). The late evening period allows for delivery of goods main goods for night fill restocking of the shelves, whilst the early morning allows for bread and fresh produce for display at the commencement of trade. It is anticipated that the restaurant, retail, Hotel, and pub deliveries would occur during the day/evening but would not typically need to occur before 6am or after 10pm.

Based on the traffic report traffic generation rates and the total number of parking spaces for the various uses, in the worst 1 hour of the day the driveway is expected to carry 185 vehicle movements (in the evening peak hour).

After application of a 2.2m high acoustic screen to the Southern boundary of the site, the predicted noise to 230 Arden Street, Level 1 (the worst affected location on that receiver) was 54dB(A) $L_{eq(15min)}$. Whilst this level exceeds the project Amenity noise trigger by 1dB, there are no feasible and reasonable means to reduce the noise levels to this receiver, as it overlooks the Site. Increasing the height of the boundary screening to 2.8m above ground could reduce the noise by approximately 1dB, but could result in unreasonable visual impact.

The 1dB residual would be considered "negligible" under the NPfI tables 4.1 and 4.2. Given that reasonable and feasible acoustic treatments have already been applied, in our opinion the 1dB(A) exceedance is reasonable.

In respect of night-time use of the loading dock (6am to 7am and 10pm to midnight), this is predominantly to satisfy the requirements of the Coles supermarket i.e. movements will be limited. Taking into account the proposed 2.2m high boundary screen, the predicted peak noise to the Level 2 receiver of 230 Arden Street is 76dB(A) L_{max} . Whilst this is above the screening test nominated by the NPfI, the level is in keeping with the maximum noise levels already in existence at unattended monitoring Location 2, after exclusion of the hours of trade of the Coogee Bay Hotel. Given that the movements are limited and the levels in keeping with the area which has historically been impacted by transportation noises, no additional treatment is warranted at this time.

4.4.3 Vicar Street Driveway

The Vicar Street driveway serves only the residential portion of the development. Based on the generation rates (0.15 per apartment in peak hour) nominated in the traffic report (refer traffic report reference: 11473, dated 25 June 2021 by Colston Budd Rogers & Kafes Pty Ltd), the typical worst case period is the evening peak hour, when 12 vehicle movements are predicted to occur. Assuming an even split entering / exiting the site (i.e. either coming up or going down the ramp), levels to 15 Vicar Street are predicted to comply with the evening period project noise emission goals.

The residential driveway could be used at night time and on that basis an assessment of sleep disturbance was undertaken. A level of up to 72dB(A) L_{max} is predicted at the adjacent receiver at 15 Vicar Street from a car being driven on the access ramp. This is a 5dB exceedance of the screening test for sleep disturbance, however that is not to say that use of the ramp will result in disrupted sleep. It is likely that vehicle movements through the night time period would not occur very often and the existing noise environment surrounding this receiver already has L_{max} events in excess of 72dB(A) overnight, typically 5 or more times per night. On that basis, further acoustic treatment over and above a 2.2m high screen is not warranted.

4.4.4 Noise from additional traffic generated by the development

The existing noise from traffic on Vicar Street, Coogee Bay Road and Arden Street already exceed the noise criteria nominated in the NSW EPA Road Noise Policy. On that basis, the development should not cause an increase of more than 2dB in noise to existing receivers.

The project traffic engineers (refer traffic report reference: 11473, dated 25 June 2021 by Colston Budd Rogers & Kafes Pty Ltd) predict no change in traffic on Vicar Street as a result of the development. On Arden Street and Coogee Bay Road, they predict an increase of less than 20% and such an increase in traffic volumes is predicted to result in no noticeable increase in noise. Compliance with the RNP is achieved.

4.4.5 Existing patron noise

Built form on the Southern side of the site needs to be demolished as enabling works for the construction of the basement carpark. In order to maintain the existing noise environment, it is proposed to reinstate an acoustic screen to the southern side of the beer garden, after construction of the basement. This screen is to be constructed nominally of masonry, although the materiality would be reviewed during detailed design. It is to extend from the Eastern façade of the Hotel Lobby to the Eastern boundary of the site. The placement is to be nominally in line with the existing (non-Heritage) Level 1 terrace. The top of the wall is to be at nominally RL 12.5 (i.e. wall height of 3.6m). The beer garden side of this wall is to be lined with absorptive material with an NRC of not less than 0.6. If any door is to be placed in this wall, it shall be constructed minimum 45mm thick solid core timber (or acoustic equivalent) with full perimeter acoustic seals, nominally Rw 30 performance. During the daytime it can be used for access/egress but must be fitted with automatic closers. After 6pm, it shall not be used for access/egress, except in an emergency (only if a door is required in this location).

The removal of 15a Vicar Street and the reduced roof ridge are not predicted to result in any noticeable increase in noise from existing operations to residential receivers external to the site.

The Hotel rooms which overlook the Beer Garden are re-instatement of their previous use and so do not require formal assessment.

4.4.6 Future patron noise to existing residential receivers

Based on the proposed outdoor seating arrangements, external noise emissions from patrons seated and dining in the outdoor areas of Eat Street (no music playing externally) were modelled in CadnaA and are predicted to comply with both the L&GNSW goals and the cumulative BG+ 5 goal to the nearest residential receivers. This calculation assumed that the doors and windows of the restaurant tenancy were closed. Whilst these particular arrangements may not suit the future tenant, it will be their responsibility to assess noise emissions from their proposed operations as part of their DA for the use of the tenancy and their specific requirements can be taken into account at that point (including their proposed hours of operation, capacity, internal finishes etc).

4.4.7 Future patron noise to future receivers on site

Based on the proposed outdoor seating arrangements, external noise emissions from patrons seated and dining in the outdoor areas of Eat Street (no music playing externally) were modelled in CadnaA and predicted to the future residential and Hotel facades.

The predicted patron noise to the worst affected locations on the proposed residential apartment block was up to approximately 55dB(A) $L_{eq(15min)}$ (Level 2 north wing, facing south over Eat Street). On that basis, it is anticipated that upgraded laminated glazing with full perimeter acoustic seals will be required to achieve the project patron noise levels internally. This construction shall be confirmed during the detailed design phase. Given that the external level is >10dB above the project internal noise goal at the worst affected receivers on the site, those affected windows would need to be able to be kept closed within the ventilation strategy (although they may be openable by the resident).

Given that parts of the façade are being used as part of the acoustic envelope to maintain residential amenity, in the detailed design phase it will be necessary to review the ventilation strategy and nominate those rooms and/or apartments that might require alternative ventilation (e.g. a fan, an outside air source connected to the air conditioning, or an alternative solution such as borrowing air from another facade). It is anticipated that some glazing facing East, South, or North is likely to be required to be closed acoustically (but could still be openable).

5 Noise Intrusion Assessment

This section presents the assessment of environmental noise intrusion into the future residential apartments and new Hotel rooms. Note that as the prior use of the North wing of the Coogee Bay Hotel was for Hotel accommodation, the existing building shell is deemed acceptable. For alterations to the existing glazing to the Coogee Bay Hotel, the existing construction shall be considered the minimum requirement for any new or amended elements.

5.1 Internal criteria - Existing / Refurbished Hotel rooms

The existing and refurbished/reinstated Hotel rooms are an existing use. At the time of their original construction, there were no numerical criteria for assessment or management of noise (either for environmental noise intrusion or acoustic separation from other internal spaces). As such, it remains that there are no numerical criteria applicable to the environmental noise intrusion and no acoustic upgrade to the existing building shell would be required (other than making good / general maintenance).

5.2 Internal criteria – New apartments / Hotel rooms

The site is not implicated by the SEPP (Infrastructure) 2007 mandatory traffic noise assessment. On that basis, for new spaces, project internal criteria shall be set using Australian Standard AS2107:2016.

Australian/New Zealand Standard AS/NZS 2107:2016 "Acoustics - Recommended design sound levels and reverberation times for building interiors" recommends design criteria for conditions affecting the acoustic environment within building interiors to ensure a healthy, comfortable and productive environment for the occupants and the users. The background sound levels recommended take into account the function of the area(s) and apply to the sound level measured within the space unoccupied but ready for occupancy. The Standard is applicable to steady-state or quasi-steady-state sounds such as mechanical services equipment and road traffic noise intrusion, but not intended for transient or variable sources such as aircraft noise, railways and construction noise. The reverberation times recommended are for the occupied state of the space.

The sound levels given in this Standard are for the design of spaces in buildings and are provided as a range with a recommended lower level and upper level. Sound levels within the given ranges have been found to be acceptable by most people for the space under consideration. When the sound level is greater than the upper level of the range most people occupying the space will become dissatisfied with the level of sound. When the sound level is below the lower level of the range, the inadequacy of background sound to provide masking sound can become problematic, for example, by allowing other intermittent noise sources to cause distraction, annoyance, or lack of privacy.

The criteria in the following table are applicable when the windows are closed.

Table 11: 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
5	OFFICE BUILDINGS		
	Board and conferences rooms	30 to 40	0.6 to 0.8
	Corridors and lobbies	45 to 50	< 1.0
	Executive office	35 to 40	0.4 to 0.6
	General office areas	40 to 45	0.4 to 0.6
	Meeting room (small)	40 to 45	< 0.6
	Open plan office	40 to 45	0.4 (see Note 1)
	Public spaces	40 to 50	0.5 to 1.0
	Reception areas	40 to 45	0.6 to 0.8
	Rest rooms and break-out spaces	40 to 45	0.4 to 0.6
	Toilets	45 to 55	-
	Undercover carpark	<65	-
6	PUBLIC BUILDINGS		
	Corridors and lobbies	45 to 50	0.6 to 0.8
	Parking stations (carpark areas)	55 to 65	-
	Restaurants and cafeterias -		
	Cafeterias	40 to 50	See Note 1
	Food courts	45 to 55	See Note 1
	Coffee shops	40 to 50	See Note 1
	Restaurants	40 to 50	See Note 1
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	-
	Hotels and motels -		
	Bars and lounges	< 50	0.6 to 1.0
	Dining rooms	40 to 45	See Note 1
	Enclosed carpark	< 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	-

Item	Type of occupancy/activity	Design sound level (LAeq,t) range	Design reverberation time (T) range, s
8	SHOP BUILDINGS		
	Enclosed carparks	< 65	-
	Small retails stores (general)	< 50	See Note 1
	Shopping malls	< 55	See Note 1
	Specialty Shops (where detailed discussion is necessary in transactions)	< 45	See Note 1
	Supermarkets	< 55	See Note 1

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.

5.3 Façade noise levels

Based on the results of long term unattended noise monitoring conducted on site, the façade noise levels were determined to be as follows.

Table 12 - Long-term unattended noise monitoring results - traffic noise at 1m from facade

Location	Environmental Noise (at 1m from a façade) dB(A) L _{eq} (period)	
	Day (7am -10pm)	Night (10pm – 7am)
L1- Level 1 terrace, Facing Arden Street	66	62
L4- Level 1 of Coogee Boutique Hotel	58	53
L5 - 235 Coogee Bay Road, Level 1, approx 1m from facade	62	59

Note: The noise level on the Level 1 terrace of the Boutique Hotel was 60dB(A) L_{eq} (worst 1hr, day) and 54dB(A) L_{eq} (worst 1hr, Night)

5.4 Indicative treatment to building shell

Compliance with AS2107:2016 is practical, subject to detailed design (noting it is not applicable to the Hotel rooms of the North wing as it was not in existence when they were constructed). Indicative acoustic ratings are provided in this section, however internal noise levels are driven by contributions through the various transmission paths (the main paths typically being glazing, walls and roof). Provided that the internal noise levels are satisfied, the acoustic performance of any of the paths can be adjusted to suit (i.e. it might be necessary to reduce the wall/roof rating for buildability, which would necessitate an upgrade to the glazing requirements).

5.4.1 Existing / Refurbished Hotel rooms

As there were no numerical requirements for the existing or reinstated Hotel rooms at the time that they were originally construction, there are no acoustic requirements for the external building shell of these rooms, other than making good and/or general maintenance.

5.4.2 New apartments / Hotel rooms

Particular glazing treatments will be determined during detailed design, but based on the site noise levels, for the new apartments / rooms, the indicative requirement would be upgraded laminated glazing with full perimeter acoustic seals nominally Rw 31 to 38 i.e. from 6.38mm laminated glazing with full perimeter acoustic seals to 12.5mm vlam Hush with full perimeter acoustic seals.

For the roof, the required acoustic rating shall be nominally 10dB better than the glazing- nominally Rw41 to Rw48 as a minimum (which is achievable either in masonry or light weight construction).

For external walls, the required acoustic rating shall be nominally 15dB better than the glazing i.e. Rw46 to Rw53 as a minimum (which is achievable either in masonry or light weight construction).

5.4.3 Commercial tenancies

It is assumed that all the retail/restaurant will be air conditioned and mechanically ventilated.

External glazing of the restaurant tenancies shall be 12.38mm laminated with full perimeter acoustic seals, nominally Rw36. Entry doors alone can be Rw35.

Entry doors to Coles are assumed to be frameless glass and this is acoustically acceptable.

Glazing for the bottle shop shall be minimum 6mm float glass with standard weather seals, nominally Rw27.

6 Construction Noise and Vibration

Construction noise and vibration shall be managed in accordance with the NSW EPA *Interim Construction Noise Guideline* (ICNG, 2009) and *Assessing Vibration: A Technical Guideline* which provide guidelines for assessing noise and vibration generated during the construction phase of developments.

It is a standard condition of approval that a detailed construction noise and vibration management sub-plan is prepared prior to commencement of works detailing predicted construction noise and vibration impacts, and reasonable and feasible noise mitigation measures where exceedances of “trigger levels” (see below) are predicted.

6.1 Interim construction noise guideline

The key components of the guideline that are incorporated into this assessment include:

- Use of L_{Aeq} as the descriptor for measuring and assessing construction noise.

NSW noise policies, including the INP, RNP and RING have moved to the primary use of L_{Aeq} over any other descriptor. As an energy average, L_{Aeq} provides ease of use when measuring or calculating noise levels since a full statistical analysis is not required as when using, for example, the L_{A10} descriptor.

- Application of reasonable and feasible noise mitigation measures
- As stated in the ICNG, a noise mitigation measure is feasible if it is capable of being put into practice, and is practical to build given the project constraints.
- Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects.

The ICNG provides two methods for assessment of construction noise, being either a quantitative or a qualitative assessment. A quantitative assessment is recommended for major construction projects of significant duration, and involves the measurement and prediction of noise levels, and assessment against set criteria. A qualitative assessment is recommended for small projects with a duration of less than three weeks and focuses on minimising noise disturbance through the implementation of reasonable and feasible work practices, and community notification.

Given the scale of the construction works proposed for the rest area, a quantitative assessment is warranted, consistent with the ICNG requirements. It is not possible to prepare a meaningful assessment of construction noise and vibration impacts at DA stage. A proper assessment will be required for construction certificate, after the appointment of the builder so that the proposed methodologies and equipment can be modelled and controlled appropriately.

Table 13, reproduced from the ICNG, sets out the noise management levels and how they are to be applied for residential receivers.

Table 13: Noise management levels at residential receivers

Time of day	Management level L _{Aeq} (15 min) *	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured L _{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 [of the ICNG].

* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Table 14 sets out the ICNG noise management levels for noise sensitive receiver locations other than residential receivers. As identified for residential receivers, a 'highly affected' noise objective of $L_{Aeq(15min)}$ 75dB(A) is adopted for all noise sensitive receivers, with exceedances addressed as described in Table 13.

Table 14: Noise management levels at other noise sensitive land uses

Land use	Where objective applies	Management level L_{Aeq} (15 min)
Classrooms at schools and other educational institutions	Internal noise level	45 dB(A)
Hospital wards and operating theatres	Internal noise level	45 dB(A)
Places of worship	Internal noise level	45 dB(A)
Active recreation areas	External noise level	65 dB(A)
Passive recreation areas	External noise level	60 dB(A)
Community centres	Depends on the intended use of the centre.	Refer to the 'maximum' internal levels in AS2107 for specific uses.
Commercial premises	External noise level	70 dB(A)
Industrial premises	External noise level	75 dB(A)

Notes: Noise management levels apply when receiver areas are in use only.

6.2 Assessing Vibration; a technical guideline

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with the DECC 'Assessing Vibration; a technical guideline' (DECC, 2006). The guideline provides criteria which are based on the British Standard BS 6472-1992 'Evaluation of human exposure to vibration in buildings (1-80Hz)'. Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent'. Table 15 provides definitions and examples of each type of vibration.

Table 15: Types of vibration

Type of vibration	Definition	Examples
Continuous vibration	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive vibration	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	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

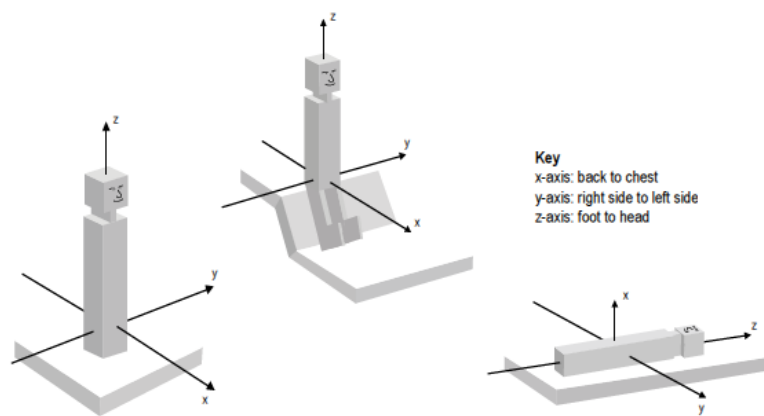
Source: Assessing Vibration; a technical guideline, Department of Environment & Climate Change, 2006

The vibration criteria are defined as a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

'Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).'

When applying the criteria, it is important to note that the three directional axes are referenced to the human body, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). Vibration may enter the body along different orthogonal axes and affect it in different ways. Therefore, application of the criteria requires consideration of the position of the people being assessed, as illustrated in Figure 2. For example, vibration measured in the horizontal plane is compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y- and z- axis criteria if the concern is for people in the lateral position.

Figure 2: Orthogonal axes for human exposure to vibration



The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 16.

Table 16: Preferred and maximum levels for human comfort

Location	Assessment period ^[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (weighted RMS acceleration, m/s², 1-80Hz)					
Critical areas ²	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration (weighted RMS acceleration, m/s², 1-80Hz)					
Critical areas ²	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92

Location	Assessment period ^[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

- Notes:
- Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am
 - Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 17

Table 17: Acceptable vibration dose values for intermittent vibration (m/s^{1.75})

Location	Daytime ¹		Night-time ¹	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas ²	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

- Notes:
- Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am
 - Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous of impulsive criteria for critical areas.
Source: BS 6472-1992

7 Conclusion

Renzo Tonin & Associates have undertaken a noise impact assessment of the proposed alterations and additions to the Coogee Bay Hotel site. This has included the assessment of the impact of the changes to the built form in the mitigation of noise emissions from existing patron and music noise associated with the Coogee Bay Hotel to ensure no noticeable increase at residential receivers.

For future restaurant tenancies in Eat Street, separate criteria have been set for patron and music noise to residential receivers external to the site (including controls for cumulative impacts from all of the new restaurants). Computer modelling in CadnaA has determined that compliance with the nominated criteria is feasible, subject to detailed design.

For future residents on the site impacted by noise from Eat Street, it is proposed to apply acoustic criteria internally and utilise the façade to provide some acoustic mitigation. This allows residential receivers to be within a vibrant development with active street fronts but also provides them with acoustic refuge behind a closed façade (with alternative ventilation) where required. The precise constructions will be determined in detailed design.

External noise emission goals for mechanical plant noise emissions and noise from vehicles being driven on site have been set in accordance with the NPfl. It is anticipated that the external noise emissions from the mechanical plant serving the residential apartments will be readily controllable given their placement on the roof. For noise emissions from the Hotel and Coogee Bay Hotel, care will need to be taken with plant selection and placement to ensure an efficient design. Detailed mechanical plant noise assessments will be undertaken for Construction Certificates.

Environmental noise impacts on the proposed alterations and additions have been assessed, and indicative façade ratings proposed in order to comply with AS2107:2016 internally. Final façade constructions will be determined for Construction Certificate.

Traffic generated by the development is predicted to result in no perceptible increase in noise and so is compliant with the Road Noise Policy.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																															
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																															
Assessment period	The period in a day over which assessments are made.																																															
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																															
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																															
Decibel [dB]	<p>The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment:</p> <table border="0"> <tr> <td>threshold of hearing</td> <td>0 dB</td> <td>The faintest sound we can hear</td> </tr> <tr> <td></td> <td>10 dB</td> <td>Human breathing</td> </tr> <tr> <td>almost silent</td> <td>20 dB</td> <td></td> </tr> <tr> <td></td> <td>30 dB</td> <td>Quiet bedroom or in a quiet national park location</td> </tr> <tr> <td>generally quiet</td> <td>40 dB</td> <td>Library</td> </tr> <tr> <td></td> <td>50 dB</td> <td>Typical office space or ambience in the city at night</td> </tr> <tr> <td>moderately loud</td> <td>60 dB</td> <td>CBD mall at lunch time</td> </tr> <tr> <td></td> <td>70 dB</td> <td>The sound of a car passing on the street</td> </tr> <tr> <td>loud</td> <td>80 dB</td> <td>Loud music played at home</td> </tr> <tr> <td></td> <td>90 dB</td> <td>The sound of a truck passing on the street</td> </tr> <tr> <td>very loud</td> <td>100 dB</td> <td>Indoor rock band concert</td> </tr> <tr> <td></td> <td>110 dB</td> <td>Operating a chainsaw or jackhammer</td> </tr> <tr> <td>extremely loud</td> <td>120 dB</td> <td>Jet plane take-off at 100m away</td> </tr> <tr> <td>threshold of pain</td> <td>130 dB</td> <td></td> </tr> <tr> <td></td> <td>140 dB</td> <td>Military jet take-off at 25m away</td> </tr> </table>			threshold of hearing	0 dB	The faintest sound we can hear		10 dB	Human breathing	almost silent	20 dB			30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library		50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time		70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home		90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert		110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	threshold of pain	130 dB			140 dB	Military jet take-off at 25m away
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dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																															
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																															

Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B **Long term unattended noise monitoring data**

B.1 **Location L1 – Arden Street near Coogee Bay Road – Level 1 facing East**

B.2 Location L2 – Level 1 terrace (South of Beer Garden, North of Driveway)

B.3 Location L3 – Rear Yard of 15a Vicar Street

B.4 Location L4 – Level 1 of Coogee Boutique Hotel – facing Vicar Street

**B.5 Location L05 – Level 1, 235 Coogee Bay Road (above former Westpac tenancy)
facing Coogee Bay Road**