Bomaderry Basketball Stadium

Environmental Noise Assessment

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Resonate

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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Daytime	Between 7 am and 6 pm as defined in the NPI.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
dB(A)	'A' Weighted sound level in dB.
Evening	Between 6 pm and 10 pm as defined in the NPI.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second. The human ear responds to sound in the frequency range of 20 to 20,000 Hz.
NPI	New South Wales Environmental Protection Authority's *Noise Policy for Industry*, 2017.
Intrusive Noise	Noise emission that when assessed at a noise-sensitive receiver (principally a residential premises boundary) is greater than 5 dB(A) above the background noise level.
L_{10}	Noise level exceeded for 10% of the measurement time. The L_{10} level is commonly referred to as the average maximum noise level.
L_{90}	Noise level exceeded for 90% of the measurement time. The L90 level is commonly referred to as the background noise level.
L_{eq}	Equivalent Noise Level—Energy averaged noise level over the measurement time.
L_{max}	Maximum measured sound pressure level in the time period.
Night-time	Between 10 pm on one day and 7 am on the following day as defined in the NPI.
Rating Background Level (RBL)	Overall single-figure A-weighted background level representing an assessment period (Day/Evening/Night). For the short-term method, the RBL is simply the measured $L_{90,15min}$ noise level. For the long-term method, it is the median value of all measured background levels during the relevant assessment period.

Table of Contents

1 Introduction 2

2 Project Description 3

2.1 Project details 3

2.2 Site details and noise sensitive receivers 5

3 Existing Noise Environment 6

4 Criteria – Noise Policy for Industry (NPI) 7

5 Noise Assessment 8

5.1 Operational noise emissions 8

5.2 Mechanical services noise emission 9

5.3 Discussions and recommendations 9

6 Conclusion 11

1 Introduction

Resonate Consultants (Resonate) has been engaged by CM+ to undertake a noise impact assessment for the proposed refurbishment of the Bomaderry Basketball Stadium located at 84 Cambewarra Rd, Bomaderry – Lot 100 DP 1237704. This assessment report forms part of the Development Application (DA) documentation to be submitted to Shoalhaven City Council for the project.

The principal purpose of this report is to:

- determine appropriate project specific noise trigger levels and acoustic criteria for nearby noise sensitive receivers;
- predict operational noise emission from the proposed development, including outdoor mechanical plant and associated activities, to nearby noise sensitive receivers; and
- assess the predicted noise emissions against industry standard noise criteria.

This report presents Resonate's noise impact assessment on the surrounding community, and presents noise mitigation recommendations to control operational noise from the refurbished Bomaderry Basketball Stadium. Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in the Glossary.

2 Project Description

2.1 Project details

The project involves the refurbishment of the existing sports hall at the Bomaderry Basketball Stadium with the addition of two new courts. The proposed development would consist of the addition of two courts to the existing Shoalhaven Indoor Sports Centre facility and associated amenities. The Basketball Stadium is naturally ventilated and has non-acoustic weather louvres at high level on the north, east and south facades. A single condenser unit is proposed at the north east corner of the development at ground level.

General arrangements of the development in context to the facility are presented in Figure 1 and Figure 2 below. It is understood that the Bomaderry Basketball Stadium will operate until 11:00pm.

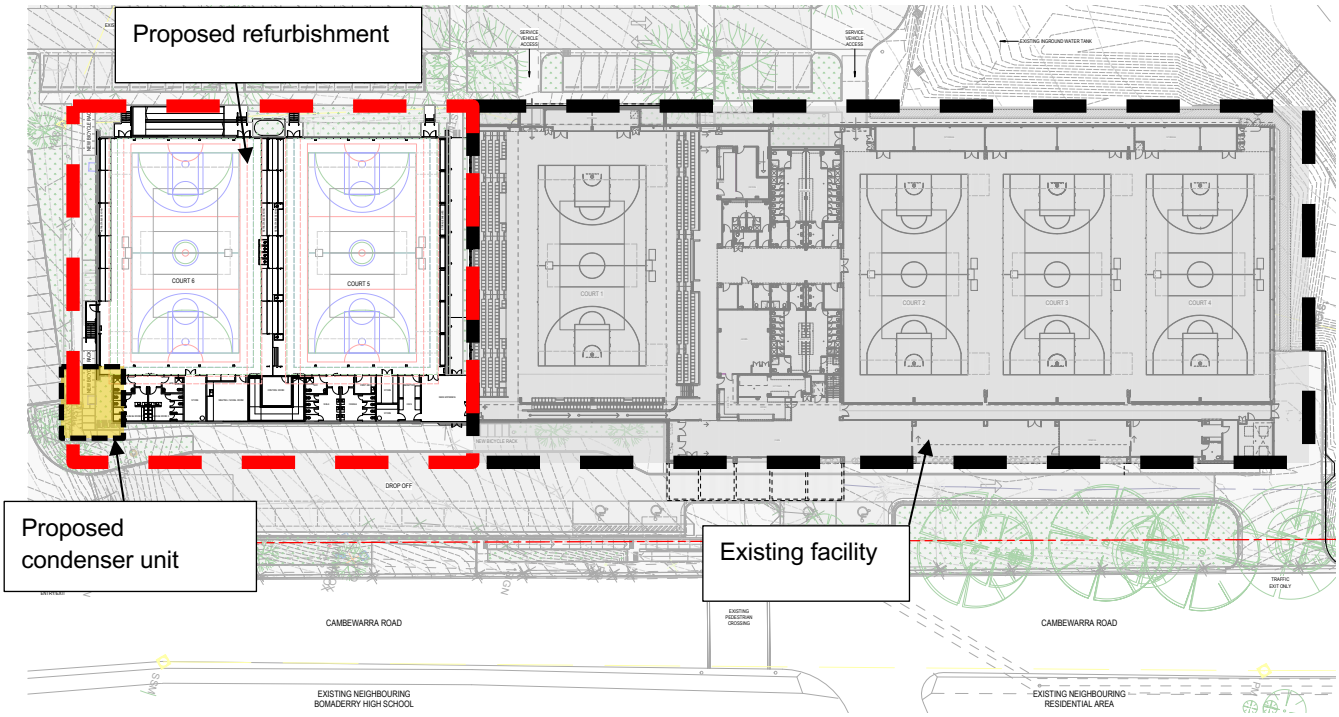

Figure 1 Proposed development general arrangement in context

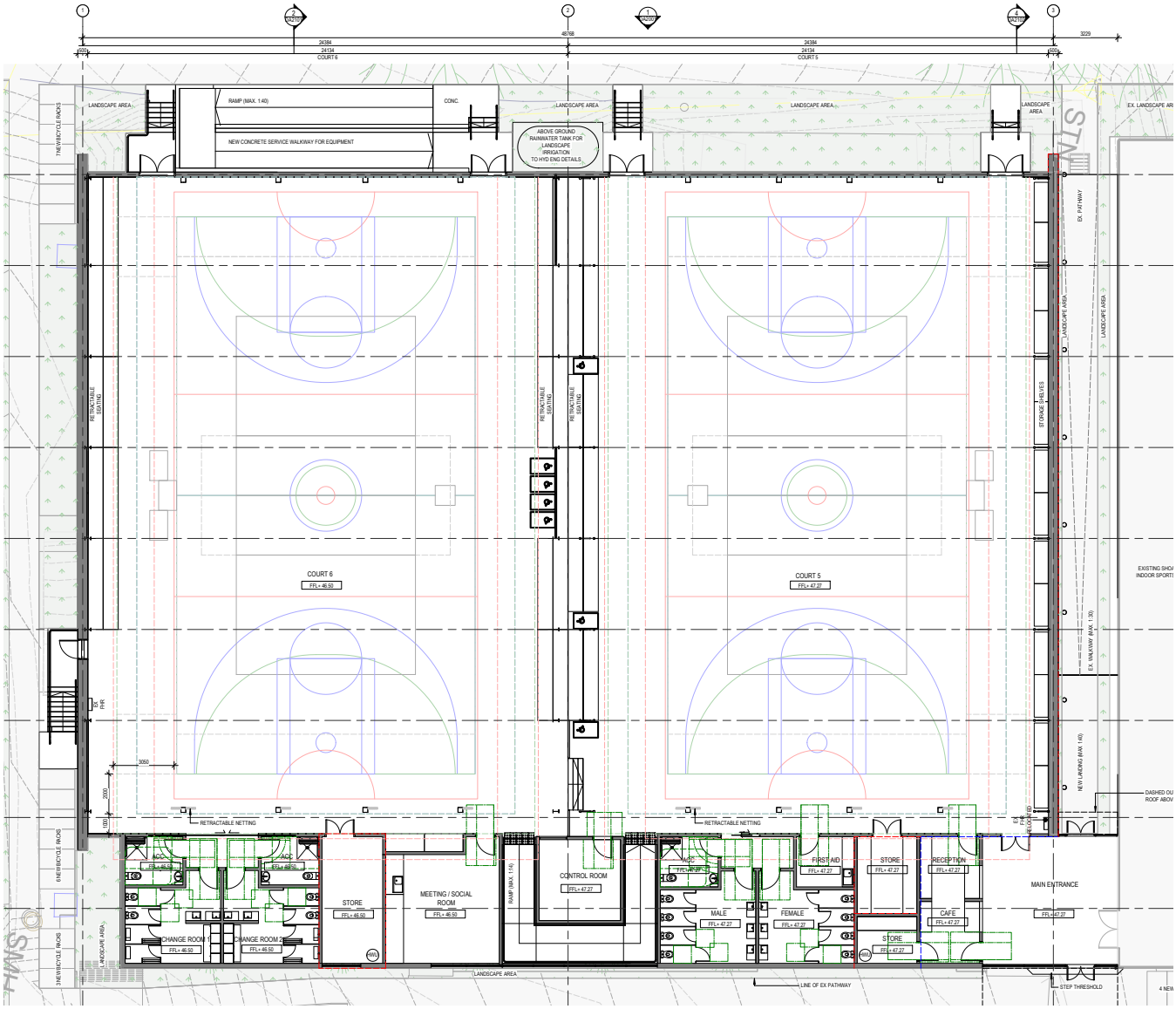

Figure 2 Proposed development general arrangement detail

2.2 Site details and noise sensitive receivers

The development is bound with residential receivers approximately 75 metres to the east on North Tarawal Street and 150 metres to the south on West Birriley Street. A commercial premises is located approximately 20 metres to the east at 78 Cambewarra Road, and Royal Artie Smith Oval is located to the west. Receiver locations are presented in Table 1 and shown in context in Figure 3.

Table 1 Receiver locations

Reference	Receiver	Receiver type
R1	North Tarawal Street	Residential
R2	West Birriley Street	Residential
R3	78 Cambewarra Road	Commercial
R4	Royal Artie Smith Oval	Active Recreation

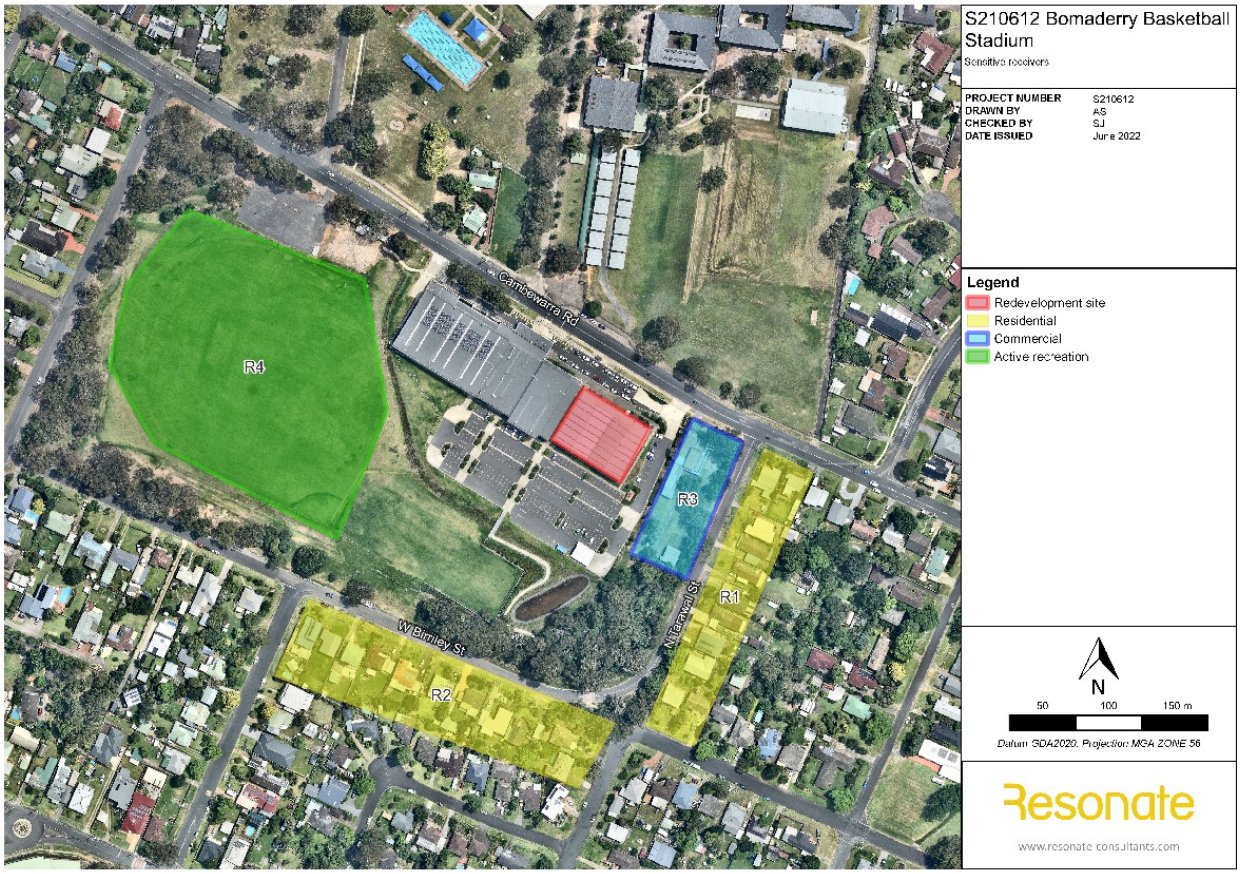

Figure 3 Proposed site in context

3 Existing Noise Environment

Attended and unattended noise monitoring was conducted for a previous Development Application at the project site and is detailed in the North Shoalhaven Indoor Sports Centre Noise Assessment for DA Purposes (*Ref: 670.10678-R1 Dated: 10 December 2015*) prepared by SLR Consulting. The previous noise assessment only presents a night-time criterion as it is the most stringent. In order to establish an acoustic criterion for each period, the measured night-time background noise level has been adopted to the daytime and evening periods. The adoption of the night-time background noise levels to the daytime and evening periods is likely to be conservative as night-time noise levels are typically the lowest among the three periods.

Table 2 presents the measured L_{eq} and L_{90} noise levels during the night time period, being the most stringent. These noise levels were used to establish the relevant noise criteria in accordance with the NSW EPA's *Noise Policy for Industry* (NPI). It was noted on site that the ambient environment was dominated by distant and nearby traffic, mostly associated with Cambewarra Road and the Princes Highway.

Table 2 Measured noise levels at background noise logging location

Description	Noise Level during Period – dB(A)
	Night-time 22:00 – 07:00
Background Noise Level (L_{A90})	40
Ambient Noise Level (L_{Aeq})	43

Refer to SLR Consulting's referenced acoustic report for a detailed description of the noise survey at the site.

4 Criteria – Noise Policy for Industry (NPI)

Noise emissions from the development should comply with the requirements of the NPI when in-operation.

The NPI sets out two separate noise criteria to meet desirable environmental outcomes:

- **Intrusiveness** – steady-state noise from the site should be controlled to no more than 5 dB(A) above the background noise level in the area. In this case, the steady-state L_{eq} noise level should not exceed the background noise level measured for different time periods in the environment.
- **Amenity** – amenity criteria are set based on the land use of an area. It requires noise levels from new industrial noise sources to consider the existing industrial noise level such that the cumulative effect of multiple sources does not produce noise levels that would significantly exceed the amenity criteria.

The most stringent of the intrusiveness and amenity is selected to be the limiting criterion.

Project specific noise trigger levels have been established in accordance with the NPI. Table 3 summarises the project specific noise criteria.

Table 3 Project specific noise criteria for residential receivers

NPI Criteria	**Noise emission criteria, $L_{Aeq,15\text{-}minute}$**		
	Daytime	**Evening**	**Night-time**
Rating background level (RBL)	40	40	40
Intrusive criterion (RBL + 5 dBA)	45	45	45
Acceptable Noise Level (ANL) Suburban	55	45	40
Amenity criterion (ANL - 5dBA + 3dBA)	53	43	38
Project trigger noise levels	**45**	**43**	**38**

Based upon Table 3 above, the project specific noise criteria for nearby noise sensitive receivers are presented in Table 4 below.

Table 4 Project specific noise criteria for nearby noise sensitive receivers

Location	**Noise Emission Criteria (dB L_{Aeq})**		
	Daytime 07:00 – 18:00	**Evening 18:00 – 22:00**	**Night-time 22:00 – 07:00**
Nearby residential premises	45	43	38
Commercial premises	65 (when in use)		
Active Recreation	55 (when in use)		

5 Noise Assessment

5.1 Operational noise emissions

Operational noise emissions from the proposed development were calculated to nearby noise sensitive receivers. Noise emissions were predicted using the acoustic calculation software SoundSurfer, which implements acoustic principles and formulas. The results of the predictions are presented below in Table 5. The acoustic predictions are based on the following assumptions:

- An $L_{eq\ (15\text{-}minutes)}$ of 75 dB(A) reverberant sound pressure level has been used for the assessment relating to the use of Courts 5 and 6. Reverberant internal noise levels of the sports centre were calculated using published sound power levels and Resonate's previous noise measurements in similar spaces.
- Specific services equipment has not been specified at this stage of the project. A maximum sound power level (SWL) of 82 dB(A) has been assumed. Refer to Section 5.2 for the more details.
- Distance and acoustic shielding have been considered to each receiver shown in Figure 3 as appropriate.
- Non-acoustic weather louvres are opened for natural ventilation of the courts.
- There is the potential for noise emission from the operation of redevelopment to be tonal, low frequency or intermittent in nature. A +5 dB penalty has been added to the predicted noise level to allow for annoying characteristics in accordance with Table C1 of the NPI.
- A cumulative noise assessment for indoor sporting activities has been considered for the proposed redevelopment in addition to the existing Shoalhaven Indoor Sports Centre facility. Assumptions of existing operational noise emissions for indoor sporting activities is based on information presented in SLR's previous Noise Assessment.

Table 5 Operational noise assessment results table

Receiver Location	Period	Noise Criteria – dB(A)	Predicted Noise Level $L_{eq(15\ minute)}$ – dB(A)	Compliance
R1 – North Tarawal Street	Daytime 07:00 – 18:00	45	43(1)	✓
	Evening 18:00 – 22:00	43	43(1)	✓
	Night-time 22:00 – 07:00	38	43(1)	✗
R2 – West Birriley Street	Daytime 07:00 – 18:00	45	39(1)	✓
	Evening 18:00 – 22:00	43	39(1)	✓
	Night-time 22:00 – 07:00	38	39(1)	✗
R3 - 78 Cambewarra Road	When in use	65 (when in use)	49(1)	✓
R4 – Royal Artie Smith Oval	When in use	55 (when in use)	43(1)	✓

(1) A +5 dB penalty has been added to the predicted noise level to allow for annoying characteristics in accordance with Table C1 of the NPI.

5.2 Mechanical services noise emission

Mechanical services plant has not been selected at this stage of the project and therefore no numerical assessment can be made. In order to comply with no additional noise mitigation strategy, a maximum sound power level of 82 dB(A) is required. If the condenser unit has a greater sound power level, additional noise mitigation measures are required.

In-principle methods of controlling mechanical services noise emission, to be considered at the design stage are:

- Selecting the quietest plant for a given task
- Judicious location and orientation
- Use larger fans at a slower speed rather than smaller fans at a higher speed
- Using variable speed drives to lower fan speed in response to lower duty/load requirements
- Use of barriers, both incidental and purpose designed

Given the above methods of noise emission control are adopted, no exceedance of the NPI criteria is expected during the daytime and evening periods. A full assessment of mechanical plant noise emission is recommended once the specification of the condenser unit has been determined.

5.3 Discussions and recommendations

Operational noise emissions from the Bomaderry Basketball Stadium refurbishment to nearby noise sensitive receivers are expected to comply with the NPI during the daytime and evening periods. Noise levels will be achieved at the most affected residential receivers during the night-time period; however, a +5 dB penalty will need to be applied to account for annoying characteristics of noise emissions, causing non-compliance with the NPI after 10:00pm.

The objective of the NPI is to achieve environmental amenity in a feasible and reasonable manner. As the development is only operational for 30 minutes into the night-time period, it may be considered unreasonable to assess against the night-time amenity criterion project trigger noise levels in accordance with Section A3 of the NPI. An alternative shoulder period criterion, based on the night-time period intrusiveness criterion noted in Table 3 between 10:00 pm to closing should be negotiated with the Regulatory Authority. If this shoulder period criterion is accepted, compliance is demonstrated in Table 6 and a minimal impact to the surrounding community is expected.

Table 6 Operational noise assessment results table – Proposed shoulder period criteria

Receiver Location	Period	Intrusive criterion (RBL + 5 dBA)	Predicted Noise Level $L_{eq(15\ minute)}$ – dB(A)	Compliance
R1 – North Tarawal Street	Night-time 22:00 – 07:00	45	43(1)	✓
R2 – West Birriley Street	Night-time 22:00 – 07:00		39(1)	✓

(1) A +5 dB penalty has been added to the predicted noise level to allow for annoying characteristics in accordance with Table C1 of the NPI.

If the shoulder period criterion is not accepted by the Regulatory Authority, then in order to comply at nearby residential receivers during the night-time period, one of the following noise mitigation options will need to be adopted to the construction or operational management:

- Option 1 – Acoustic or operable louvres:
  The proposed weather louvres should be replaced with acoustic louvres or operable louvres. Operable louvres should be closed during the night time period. These louvres should be installed on the north, east and south facades of the facility.
- Table 7 shows the minimum insertion loss performance of the louvre to achieve compliance after 10:00pm. This can be achieved by a 100 mm IAC Slimshield SL-100 louvre or acoustically equivalent, should be installed in lieu of the non-acoustic louvre.

Table 7 Insertion loss requirements

Description	dB(A) reduction	Minimum installed insertion loss (dB)							
		Octave band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Minimum insertion loss requirements	10	4	4	5	6	9	13	14	13

- Option 2 – Operational noise management:
  If non-acoustic weather louvres are to remain for natural ventilation, activities involving “annoying characteristics” (tonal, low frequency or intermittent characteristics) such as buzzers, whistles etc should be prohibited after 10:00pm.

6 Conclusion

Resonate has been engaged by CM+ to undertake a noise impact assessment for the proposed redevelopment of the Bomaderry Basketball Stadium located at 84 Cambewarra Rd, Bomaderry. Project specific noise criteria have been established in accordance with the Noise Policy for Industry guidelines based on unattended and attended noise monitoring conducted by SLR Consulting.

Operational noise emissions from the Bomaderry Basketball Stadium have been calculated to nearby noise sensitive receivers and compliance is expected with the NPI with no additional mitigation measures during the day and evening periods provided mechanical services recommendations detailed in Section 5.1 are adopted.

Due to the operational circumstances of the development's operational hours, an alternative shoulder period criterion, based on the night-time period intrusiveness criterion between 10:00 pm to closing should be negotiated with the Regulatory Authority. If this shoulder period criterion is accepted, compliance is demonstrated in Table 6 and a minimal impact to the surrounding community is expected.

If the shoulder period criterion is not accepted by the Regulatory Authority, in order to comply with the NPI during the night-time period, engineering noise control measure in the form of acoustic or operable louvres, or operational noise management measures recommended in Section 5.3 should be adopted.