Appendix C – Acoustic Report – Marshall Day Acoustics

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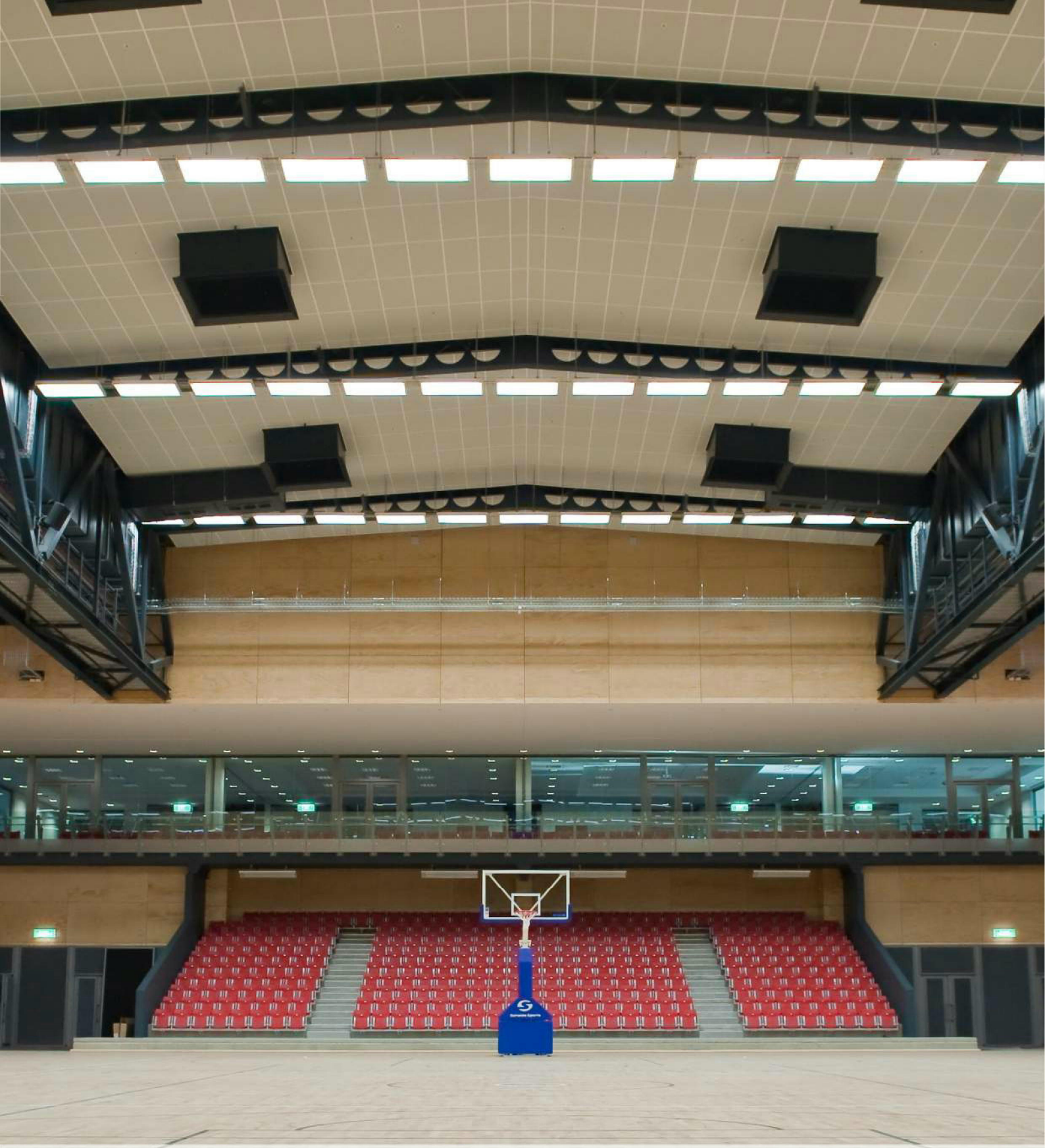

MARSHALL DAY Acoustics

KINGSWOOD HIGH SCHOOL MULTIPURPOSE HALL
NOISE EMISSION ASSESSMENT

Rp 001 20180099 R01 | 22 November 2018

Marshall Day Acoustics Pty Ltd
ABN: 53 470 077 191
4/46 Balfour St
Chippendale NSW 2008
Australia
T: +612 9282 9422
www.marshallday.com

Project: **KINGSWOOD HIGH SCHOOL MULTIPURPOSE HALL**

Prepared for: **Gran Associates Australia Pty Ltd**
597 Darling Street
Rozelle NSW 2039

Contract: **Contract No. SINSW-18-1442**

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Attention: **Mr Peter Reed**

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1.0 INTRODUCTION

It is proposed to build a multi-purpose school hall at Kingswood High School. The proposed hall includes a large floor space for sports and audiences, a stage for performances and presentations as well as change rooms, store rooms and amenities. The first floor includes staff offices, a control room for PA and audio and a cardio room.

Gran Associates has commissioned Marshall Day Acoustics to undertake a preliminary assessment of acoustic considerations for the DA stage of this project.

This report identifies noise that may be produced by the future development that could impact future or existing noise sensitive receivers.

The relevant assessment criteria for each identified noise source has been determined and preliminary guidelines for noise control treatments have been provided.

A glossary of acoustic terminology is provided in Appendix A.

2.0 DOCUMENTS REVIEWED

The assessment has been based on floor plans, and elevations as shown in drawings provided by Gran Associates as detailed below.

Drawing No.	Revision	Title	Date
SD-01	P3	Site Plan / Roof Plan	3/10/18
SD-02	P4	Ground Floor Plan	3/10/18
SD-03	P3	First Floor Plan	3/10/18
SD-04	P4	Roof Plan	3/10/18
SD-05	P4	Massing Diagram	3/10/18
SD-06	P3	View	3/10/18
SD-07	P3	Sections	3/10/18

3.0 SITE DESCRIPTION

3.1 Locality

The subject site is located at 131 Bringelly Road, Kingswood and is bounded by:

- 129 Bringelly Road, a single storey residential dwelling to the north
- School buildings and play areas to the east
- 133 Bringelly Road, a semi-detached terrace development to the south
- 84-90 Bringelly Road to the west. These four single story houses are approximately equidistant from the proposed school hall development.

An aerial photograph of the subject site and surrounds is provided in Figure 1.

Figure 1: Subject site and surrounds (Source: Google)

3.2 Nearest residential dwellings

The nearest identified residential dwellings considered in the assessment are provided in Table 1.

Table 1: Nearest residential dwellings

Address	Distance from subject site	Description
129 Bringelly Road	10 metres	Single storey, north of site
133 Bringelly Road	100 metres	Multi-storey, south of site
88 Bringelly Road	50 metres	Single storey, east of site

4.0 DESCRIPTION OF PROPOSAL

The proposal is for a multi-purpose school hall to cater for various school and community uses. The hall has the capacity to cater for the following uses:

- Sports activities, with single court operation only (with the exception of volleyball and badminton)
- Musical performances and presentations
- Community functions and meetings

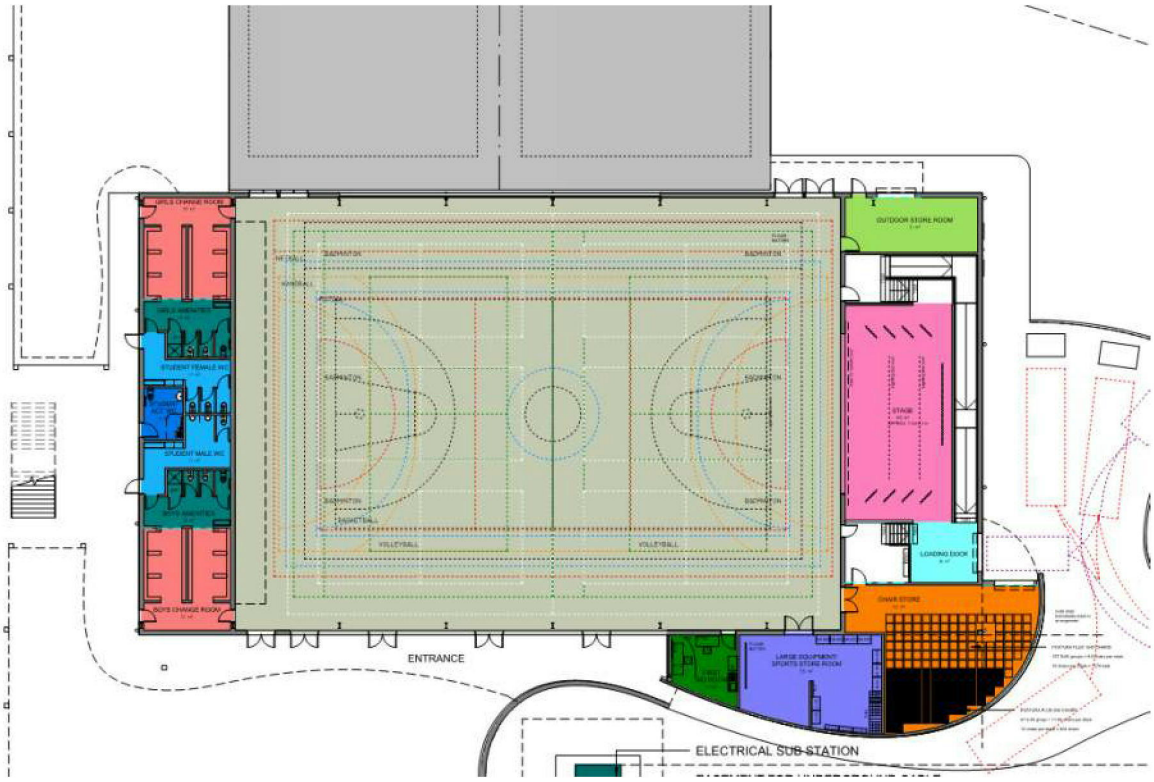
Due to the potential use of the hall by the community, there is no specific operating hours in place at this time. As such, MDA have undertaken the assessment of the use of the hall based on the following time periods:

- School use; Monday – Friday, 0800 to 1600hrs

- Community use; Monday – Friday, 1600 to 2200hrs, Weekends 0800 to 2200hrs

A floor plan of the proposed development is shown in Figure 2.

Figure 2: Floorplan of proposed multipurpose hall



The noise sources associated with the multipurpose hall ranges from patron and student noise, such as shouts, whistles and the use of the sports equipment. Further noise would be expected from the use of the PA and the stage during performances and presentations.

4.1 Mechanical services

The hall is expected to be primarily naturally ventilated. No mechanical plant is proposed.

4.2 Garbage Services

We have been advised by the client that approximately once per week, during the daytime period, a waste services vehicle will attend the site to remove rubbish.

5.0 EXISTING NOISE ENVIRONMENT

The assessment criteria applicable to the proposed development includes noise limits that are defined on the background noise levels in the absence of noise associated with the operation of the subject site. Therefore, it is necessary to establish background noise levels in the vicinity of the site.

Unattended noise measurements were taken at a single location adjacent to the residential receiver to the north between Tuesday 25 September and Monday 8 October 2018 with an ARL 316 Type 1 Environmental Noise Logger.

The microphone was mounted at a height of approximately 1.5 m above local ground level under free field conditions. Measurements were obtained using the 'Fast' response time and A-weighting frequency network. The equipment was checked before and after the survey and no significant calibration drift was observed.

The background noise levels for this project are summarised in Table 1 below. In the NPfI, the background noise level is called the Rating Background Level (RBL).

Table 1: Measured ambient and Rating Background Levels

Period	Time of day	RBL $L_{A90, 15min}$ dB	$L_{Aeq, 15min}$ dB
Day	0700*-1800hrs	48	62
Evening	1800-2200hrs	41	59

*0800 on Sundays and public holidays

6.0 NOISE EMISSION CRITERIA

Extracts from relevant noise guideline documents are provided in Appendix B. The EFSG notes that for noise from mechanical services, the Industrial Noise Policy (now superseded by the NPfI) is appropriate for assessment. For other noise sources such as sports and music within the hall, Schedule 2 of the EECF SEPP has been referred. As no mechanical services are proposed as part of the development, only the EECF SEPP has been referred for noise emissions.

Noise emissions criteria detailed in the EECF SEPP considers existing background noise levels. A background noise survey was conducted at a location within the proposed multi-purpose hall footprint between 26 July 2018 and 6 August 2018. Based on these measured levels, EECF SEPP noise emissions criteria have been derived and are shown in Table 2. Note that as the development will not operate during the night-time period, only Day and Evening criteria has been derived.

Table 2: Project assessment criteria for noise emissions

Time Period	Hours	Measured Background Noise Level, $L_{A90\ 15min}$, dB	Assessment Criteria, $L_{Aeq\ 15min}$, dB
Day	0700-1800hrs	48	53
Evening	1800-2200hrs	41	46

Noise criteria shown in Table 2 are applicable for all noise residential receivers.

7.0 NOISE DATA

The noise considerations associated with the operation of the proposed hall include:

- Music noise
- Noise from students and other users
- Noise from sports

We have been advised by Gran Associates that if possible, the Hall will be naturally ventilated. As such, no assessment of noise emission from mechanical plant has been undertaken.

Noise emissions from the hall have been assessed based on the assumed internal reverberant sound levels shown in Table 3. Any assumptions regarding frequency of these activities should be verified by others.

Table 3: Assumed internal reverberant sound pressure levels, dB

Use	Internal reverberant sound pressure level, L_{Aeq} dB	Comments
Assemblies and drama (with amplified speech)	75	To occur on a daily basis
Sports (e.g. basketball)	75	To occur on a daily basis
Music performance (with amplification)	85	Occasional, less than 5 times per year

Noise emission from the waste disposal truck has also been assessed as a weekly noise event, and is based on previously measured data of truck activities in loading docks.

Table 4: Assumed internal reverberant sound pressure levels, dB

Source	Sound Power Level, dB	Comments
Garbage Truck	90	Occurs weekly. Truck Idling.

8.0 CALCULATION METHODOLOGY

To predict noise levels to nearby neighbouring residences, the following factors have been considered:

- The amount of noise being generated within the subject site
- The distance between the sources and receivers
- The presence of obstacles such as buildings or screens that obstruct the noise path
- The ground between the source and receiver
- The presence of hard reflective surfaces that may enable additional noise paths.

A 3-dimensional digital model of the hall and surrounding built environment has been created using SoundPLAN proprietary modelling software (version 8). This model has been used to predict noise from the site to the nearest noise sensitive receivers.

Geometry data for the model has been sourced from public aerial photography, visual inspections of the area, and building heights estimated during site inspection. The geometries in the model are simplified representations of the built environment that have been configured to a level of detail that is appropriate for noise calculation purposes.

The SoundPLAN digital model has been used to calculate noise levels using the International Standard *ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613). ISO 9613 is a general environmental noise calculation standard that has been used extensively throughout Australia, New Zealand, and Europe since its publication in 1996.

The implementation of ISO 9613 within proprietary noise modelling software enables multiple sound transmission paths, including reflected and screened paths, to be accounted for in the calculated noise levels. While atmospheric effects are expected to have a negligible effect on the transmission of sound from the venue to neighbouring sensitive receiver locations, it is noted that the ISO 9613 predicts noise levels for meteorological conditions which favour the propagation of noise.

9.0 RECOMMENDED DESIGN MEASURES FOR NOISE CONTROL

It has been requested by Gran Associates that the noise emission levels presented below reflect that of the existing design. We note that the removal of the natural ventilation louvres in the roof extension will reduce the noise levels presented below. Our calculations assume that the reverberation time in the hall is in the order of 1.5 seconds, i.e. that acoustic treatment of the space is included as per our internal acoustic assessment report.

Further reductions to the noise level at the receivers could be achieved by modifying the Danpalon façade and the large glazed panel to the north to a construction with higher density.

10.0 PREDICTED NOISE LEVELS

It is anticipated that a 'worst-case' scenario for the Daytime and Evening period would include the use of the hall for active sporting or musical uses for within a continuous 15-minute period. We have assumed that the worst-case community use of the hall will be similar to that of the school operation, in that the hall will be used for sports or music performances.

For the waste services, a worst-case scenario in which a garbage truck is on site for 5 minutes during the daytime period to remove a skip bin.

Table 5 outlines the predicted cumulative noise level during for these activities.

Table 5: Noise assessment, L_{Aeq} dB at various receiver locations

Receiver	Activity	Predicted Noise Level (L_{Aeq})	Project Noise Trigger Level, $L_{Aeq, 15min}$, dB (Day/Evening)	
			Day	Evening
North 129 Bringelly Rd	Sports Use	42	53	46
	Amplified music	52	53	46
	Waste Removal	52	53	NA
South 133 Bringelly Rd	Sports Use	36	53	46
	Amplified music	47	53	46
	Waste Removal	42	53	NA
East 88 Bringelly Rd	Sports Use	40	53	46
	Amplified music	51	53	46
	Waste Removal	48	53	NA

From the above the proposed use of the hall for sports, assemblies or music recitals is capable of complying with the Daytime criteria for all activities. During the Evening period the use of the hall for sports or assemblies/drama would comply with the criteria.

However, the use of the hall for amplified music performances in the Evening could exceed the criteria. If this is only an occasional use by the school (e.g. up to 5 times per year) the impacts would be similar to many other public schools, and unlikely to give rise to significant issues. If the use of the hall for amplified music performance was proposed to be a regular activity (e.g. if hired for community use regularly) then acoustic upgrades to the building envelope would need to be considered. The use for smaller community functions without amplified music would be expected to comply at the neighbouring boundaries during the Evening.

Waste service removal will comply with the daytime criteria at all receivers.

11.0 CONCLUSION/SUMMARY

Marshall Day Acoustics has been commissioned by Gran Associates to undertake a noise emission assessment of the proposed hall to be built at Kingswood High School.

The hall is proposed for multi-purpose use, and various use cases have been assessed at the nearest residential receiver boundaries.

The following potential noise impacts have been assessed:

- Noise form the use for sport
- Noise from the use for music
- Noise from the use for administrative meetings and presentations
- Noise from garbage removal services

This assessment has been based on:

- The existing noise levels on the site
- The assumed use of the hall
- The specified materials for use in the façades, with doors and windows closed
- Limits determined in accordance with the relevant NSW requirements
- Detailed 3-dimensional modelling of the site and surrounding environment, accounting for proposed structure and noise source characteristics

No recommendations have been provided within this report for the control of noise. Modifications are able to made to the design to reduce the noise level at the receivers, however in the case of the lightweight components of the façade construction this is likely to have a significant impact on the aesthetics of the hall.

The proposed use of the hall for sports, assemblies or music recitals during the Daytime is capable of complying with relevant criteria.

During the Evening period the use of the hall for sports, assemblies/drama, administrative meetings and presentations would also comply with the criteria.

The use of the hall for amplified music performances in the Evening could exceed the criteria. If this is only an occasional use by the school (e.g. up to 5 times per year) the impacts would be similar to many other public schools, and unlikely to give rise to significant issues. If the use of the hall for amplified music performance was proposed to be a regular activity (e.g. if hired for community use regularly) then acoustic upgrades to the building envelope would need to be considered. The use for smaller community functions without amplified music would be expected to comply at the neighbouring boundaries during the Evening.

APPENDIX A GLOSSARY OF TERMINOLOGY

SPL or L_P	Sound Pressure Level A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
SWL or L_W	Sound Power Level A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 µPa i.e. dB = 20 x log(P/Pr)
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
$L_{Aeq\ (t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
$L_{A90\ (t)}$	The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.

APPENDIX B NOISE POLICY EXTRACTS

NSW EPA Noise Policy for Industry (NPfI)

The assessment of noise from a development should be undertaken in accordance with the relevant EPA documentation. In this instance, the development will be assessed to the NSW EPA's Noise Policy for Industry (NPfI). Whilst the NPfI is intended for the assessment of large industrial premises scheduled by the EPA it is also used by some Councils and consent authorities to assesses smaller commercial sites. The NPfI outlines noise levels to be achieved at the residential and commercial boundaries adjoining industrial development.

The NPfI provides guidance on noise trigger levels for Intrusive noise as well as Amenity noise levels. The Amenity noise level is based on noise levels that are acceptable for Suburban areas, while the Intrusive noise levels are based on the existing Rating Background Noise Level (RBL + 5 dB).

The NPfI Project Trigger Noise Levels are applicable at the property boundary of the nearest affected receivers.

As the hall is not expected to be used during the Night period, an assessment of sleep disturbance is not required.

State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017

For the use of the hall for school purposes, the Education SEPP provides the following information:

39 Existing schools—complying development

(4) Nothing in this clause authorises the carrying out of development in contravention of any existing condition of the most recent development consent (other than a complying development certificate) that applies to any part of the school, relating to hours of operation, noise, car parking, vehicular movement, traffic generation, loading, waste management, landscaping or student or staff numbers.

Schedule 2 Schools—complying development

6 Noise

A new building or (if the development is an alteration or addition to an existing building for the purpose of changing its use) an existing building that is to be used for the purpose of a school or school-based child care must be designed so as not to emit noise exceeding an LAeq of 5 dB(A) above background noise when measured at any lot boundary.

NSW Educational Facilities Standards and Guidelines (ESFG)

The ESFG contains the following information in regards to the assessment of developments such as the subject multipurpose school hall.

11.04

Noise Emission (To The Environment)

Noise emission considerations include:

- *Noise emission from school activity (e.g.: music performance, sporting activity)*
- *Noise emission from a mechanical services (such as air conditioning unit or fan)*

The extent to which noise emission will have to be considered and the extent of acoustic treatment required will depend upon:

- *Whether noisy activities take place in a room or space*
- *Whether the room or space is naturally ventilated and therefore windows and/or doors are expected to be open when noisy activities are taking place*

- *Room facade construction and orientation of 'acoustically weak' facades relative to noise-sensitive receivers*
- *Distance to noise-sensitive receivers*
- *Whether mandatory noise emission criteria are required to be satisfied at nearby boundaries and land uses.*

Assessment of Noise Emission

...

Noise associated with school activity (such as music or sport within a hall) are not a stationary noise source and is not subject to the INP [MDA note that the INP has now been superseded by the NPfI] *requirements. Where a condition of consent exists for the control of activity related noise, an acoustic engineer is to assess the noise emission. The acoustic engineer should define and state the activity, internal reverberant sound pressure level in the room or space and criteria (including sound pressure level and assessment location) in a report.*