Noise and Sound Services

# Noise Impact Assessment

For the: Proposed -
**W339 Tumut - Multipurpose Centre**

June 2025

Report No. nss24414 – Final - Rev B

Prepared at the Request of:-

**The Facility Design Group**
19 The Terrace,
Cambewarra, NSW 2540

Prepared by:-

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# C O N T E N T S

# EXECUTIVE SUMMARY

A noise assessment has been carried out for the proposed Multi-purpose Centre in Tumut. The purpose of this report is to provide an independent and accurate assessment of the potential noise impact generated by the centre including proposed mechanical plant. These are compared to relevant noise criteria, and/or guidelines, and provide recommendations for noise amelioration measures where necessary. The car parking spaces on the site is also considered.

The nearest residential and commercial properties to the development are at 1 and 3 Robertson Street and 1 Clunie Avenue to the South and 27 to 35 Richmond Street to the north. The Seventh-day Adventist Church is on the Corner of Russell and Richmond Streets, Beavan's Funeral Home is at 31 Richmond Street and Sefton House motel is at 29A Richmond Street. The site boundaries are over 20 metres from the proposed site. Proposed hours of operation are Monday to Saturday 7am – 10pm and Sunday – 7am – 6pm.

Existing ambient and background noise levels have been monitored at a neighbouring residence to the proposed Multi-purpose Centre i.e., 37 Richmond Street for a period of 7 days. Background levels ($L_{A90,\ 15\ minute}$) were found to be 30 dBA in the evening times. Noise goals for the proposed development have been based on the recorded evening background noise levels plus 5 dB for residential areas and 65 dB for commercial areas in line with NSW Government recommendations.

Noise models based on the International Standard ISO 9613-2:2024, '*Acoustics — Attenuation of sound during propagation outdoors. Part 2: Engineering method for the prediction of sound pressure levels outdoors'* have been developed for the roof top mechanical plant , car parking area and use of the hall.

Providing the recommendations are incorporated into the design and construction of the proposed Multi-purpose Centre, noise emissions are predicted to comply with the noise criteria provided by the NSW Government via the Environment Protection Authority (EPA) for the external noise environment.

# 1. INTRODUCTION

Noise and Sound Services Pty Ltd was requested by the Facility Design Group, of 19 The Terrace, Cambewarra, NSW 2540, to carry out a noise assessment for the proposed a Multi-purpose Centre in Richmond Park, Tumut which has sufficient capacity to double as an Evacuation Centre in times of emergency.

The purpose of this report is to provide an independent and accurate assessment of the potential noise impact generated by ongoing activities with the development of the proposed centre, compare these to relevant noise criteria and/or guidelines and provide recommendations for noise amelioration measures where necessary.

# 2. MULTI-PURPOSE CENTRE LOCATION

## 2.1 Location

The Multi-purpose Centre in Tumut which is proposed to be located on part of the existing Richmond Park site has the Tumut Bowling Club to the northeast and the remainder of Richmond Park to the southwest. The nearest residential and commercial properties to the development are at 2 and 4 Robertson Street and 1 Clunie Avenue to the southeast and 27 to 35 Richmond Street to the northwest as shown in Figure 1 below. The Seventh-day Adventist Church is on the Corner of Russell and Richmond Streets, Beavan's Funeral Home is at 31 Richmond Street. And Sefton House motel is at 29A Richmond Street. The neighbouring site boundaries are over 20 metres from the proposed site.


***Figure 1. Approximate Site and Noise Logger Location.***
***Original Source: Google Earth.***

The surrounding area of the site was inspected on Sunday and Saturday 12th and 13th November 2025. The noise environment of the area is typically affected by occasional road traffic using Richmond, Robertson and Russell Street, neighbours DIY, community noise and fauna such as birds and dogs barking.

## 2.2 Proposed Development

The proposal is for a Multi-purpose Centre in Tumut which has sufficient capacity to double as an Evacuation Centre in times of emergency. See Facility Design Group drawings Multipurpose + Evacuation Centre at Prelim. DA drawings, Job number W366, dated 21/02/2025. The proposed construction of the structures relevant to the acoustic assessment are the plant room and roof mounted mechanical plant as shown in Figure 2 below. The proposed car parking spaces on the site is for 47 vehicles to the northeast. The proposed hours of operation are Monday – Saturday 7am – 10pm and Sunday – 7am – 6pm.

### 2.2.1 Mechanical Plant

The proposed mechanical plant is shown in Table 1 below.

**TABLE 1. ROOF MOUNTED AND PLANT ROOM MECHANICAL PLANT**

| Mechanical Plant | Manufacturer's Type | Manufacturer's average sound power level. (dBA) |
|---|---|---|
| CU-01 | Daikin REYQ22BYM09 | 85 |
| | | Manufacturer's average sound pressure level at 3 metres. (dBA) |
| TEF-01 | Fantech GUA454V | 56 |
| TEF-02 | Fantech RIL150SW | 38 |
| TEF-02 | Fantech RIL150SW | 38 |
| KEF-01 | Fantech CHD718 | 49 |
| KSF-01 | Fantech PUEEC40 | 54 |
| | | Manufacturer's average sound pressure level at 7 metres. (dBA) |
| CF-01 | Airius Emerald 630 EC | 48 |
| CF-02 | Airius Emerald 630 EC | 48 |
| CF-03 | Airius Emerald 630 EC | 48 |
| CF-04 | Airius Emerald 630 EC | 48 |
| CF-05 | Airius Emerald 630 EC | 48 |
| CF-06 | Airius Emerald 630 EC | 48 |
| CF-07 | Airius Emerald 630 EC | 48 |
| CF-08 | Airius Emerald 630 EC | 48 |

The location of the plant is shown in Figure 2 and Figure 3 below.

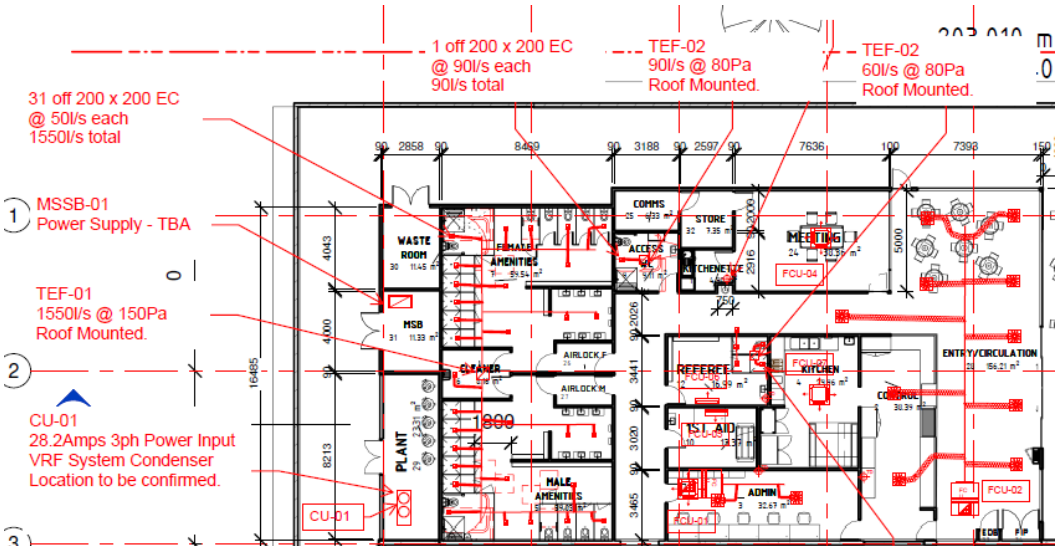



***Figure 2. Layout Showing the Location of the Proposed Mechanical Plant to the Northwest of the Site. Source: The Facility Design Group.***

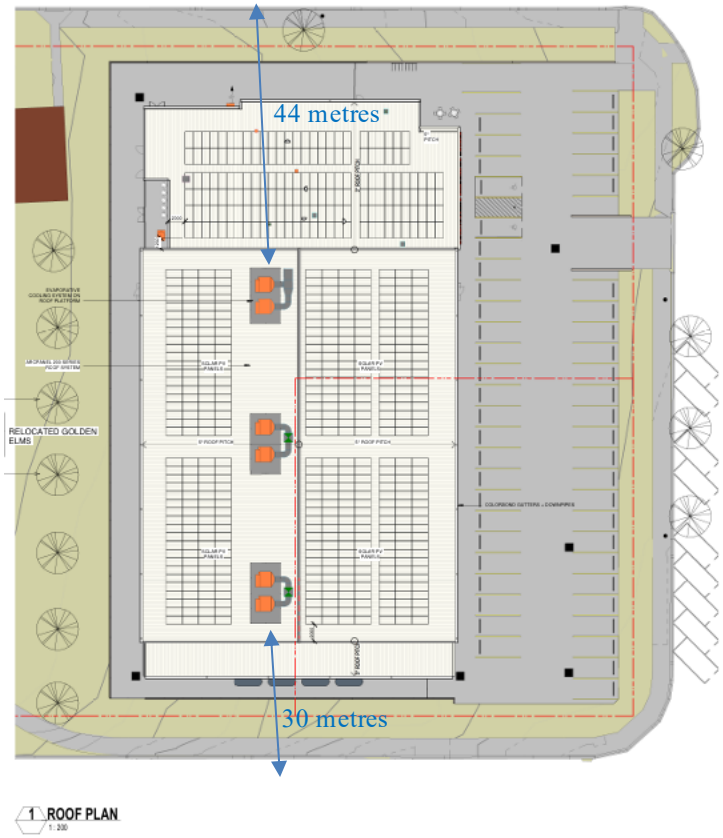



***Figure 3. Plan to Show the Location of the Proposed Basketball Roof Top Mechanical Plant to the Nearest Residential Boundaries. Source: The Facility Design Group.***

# 3. NOISE CRITERIA

The objectives of the noise assessment are to ensure surrounding noise sensitive locations are not unduly affected by noise emissions from the Multi-purpose Centre.

There are no specific Council, State or Federal criteria for noise emissions from Multi-purpose Centre. However, this section reviews the NSW Government criteria for other noise sources and developments. These may be used as a basis for realistic noise goals for the Multi-purpose Centre.

## 3.1 NSW Government Criteria

The NSW Government, via the Environment Protection Authority (EPA), provide guidelines for many industrial, commercial and domestic types of noise sources. The primary aim of environmental noise control is to minimise the occurrence of offensive noise in the community. To be both effective and equitable, the determination and application of environmental noise control measures must take into account many factors for example: -

- the variation in response between individuals to any noise;
- the inherently noisy characteristics of many activities;
- the circumstances within which the noise occurs;
- the technical and economic feasibility for noise control; and
- the social worth of the activity.

Offensive noise is defined in the NSW Protection of the Environment Operations Act 1997 (POEO Act) as being noise:-

a) *that, by reason is of its level, nature, character or quality, or the time at which it is made, or other circumstances:*
   i. *Is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
   ii. *interferes unreasonably with (or is likely to Interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*

b) *that, is of a level, nature, character or quality prescribed by the regulations or that is made at a time or in other circumstances, prescribed by the regulations.'*

The NSW Government, also state that social surveys have indicated that noise from any particular source will be audible to many people in the community when that noise exceeds the background level by more than 5 decibels (dB). The noise may have characteristics which are pleasant or unpleasant to the listener.

Technically the background is found from the noise level that is present for 90% of the measurement time periods (usually 15 minutes each) and this is known as the $L_{AF90,\,15\ minute}$. The source noise is found from the average of the sound energy (again usually 15 minutes samples), which is known as the $L_{Aeq,\,15\ minute}$. The 5 dB over background criterion is primarily aimed at industrial or commercial machine noise or domestic machine noise such as air conditioners.

## 3.2 NSW Noise Guide for Local Government

The NSW Government's Noise Guide for Local Government (NGLG) provides guidelines for the assessment of offensive and intrusive noise levels. Local councils are encouraged to develop noise policies which specify intrusive noise levels and appropriate descriptors for particular activities in certain situations and locations. Such a policy could, for example, specify that noise from mechanical plant located at commercial or industrial premises that exceeds the background noise at a residential boundary by more than 5 dB as measured over a 15-minute period ($L_{Aeq,\,15\ minute}$) is intrusive.

The noise is assessed at the most affected point on or within the neighbouring residential property (unless that residence is more than 30 metres from the boundary). Intrusive noise is not the same as offensive noise as defined in the POEO Act 1997. Intrusive noise can represent offensive noise, but whether this is always the case depends on the source of the noise, noise characteristics and cumulative noise levels.

For non-tonal air conditioners, the intrusive noise criteria can be taken as a measure of offensive noise, however sound from community activity within a leisure centre should not be automatically considered to be offensive just because it may exceed the 5 dB on background criterion.

## 3.3 NSW Government Noise Policy for Industry (2017)

The assessment procedure for industrial and commercial noise sources given in the Noise Policy for Industry (2017) has two components:-

- **Controlling intrusive noise impacts; and**
- **Maintaining noise level amenity;**

Both components are taken into account when determining a project noise trigger level. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response. The project noise trigger level reflects the most stringent noise level requirement.

### *3.3.1 Intrusive Noise Impacts*

The NSW Government in their Noise Policy for Industry (2017) states that:- '*The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the LAeq descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold.'*

The perception of noise and its level of offensiveness depend greatly on the broader situation within which it occurs. Noise that might intrude into a resting or sleeping place may be found offensive whereas the same noise occurring in a marketplace or noisy working area may pass unnoticed. The concept of *'background + 5 dB'* derives from this consideration.

The Noise Policy for Industry defines the background noise level as *'the underlying level of noise present in ambient noise, generally excluding the noise source under investigation, when extraneous noise is removed'*.

'*Sound levels contributing to background levels can include sound from nearby traffic, birds, insects, animals, machinery and similar sources, if these sounds are a normal feature of the location. The background noise level is represented by the* $L_{AF90,15min}$ *descriptor when undertaking short-term monitoring.'*

The Rating Background Level is used for assessment purposes. This is the single-figure background noise level derived from monitoring over a representative period of time, typically one full week. The outcome of this approach aims to ensure that the intrusiveness noise level is being met for at least 90% of the time periods over which annoyance reactions can occur (taken to be periods of 15 minutes).

### *3.3.2 Protecting Noise Amenity*

In the Noise Policy for Industry, it is stated that *'To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable.*' The relevant part of the NSW Government's recommended levels are given in Table 2 below.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

Where a receiver is affected by existing levels of industrial noise, a project amenity noise level applies for each new source of industrial noise. The project amenity noise level is then equal to the recommended amenity noise level minus 5 dB.

**TABLE 2: AMENITY NOISE LEVELS**

| Receiver | Noise amenity area | Time of day | Recommended amenity noise level - $L_{Aeq,}$ dB(A) |
|---|---|---|---|
| Residential | Rural | Day<br>Evening<br>Night | 50<br>45<br>40 |
| | Suburban | Day<br>Evening<br>Night | 55<br>45<br>40 |
| | Urban | Day<br>Evening<br>Night | 60<br>50<br>45 |
| Commercial premises | All | When in use | 65 |
| Industrial premises | All | When in use | 70 |
| Industrial interface – residential receiver only | All | All | Plus 5 dB(A) to recommended amenity noise level |

In cases where transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the $L_{Aeq}$ noise level from that industrial noise source may exceed the project amenity noise level, the project amenity noise level may be derived from the $L_{Aeq,\ period\ (traffic)}$ minus 15 dB (A) (other conditions may be applicable).

### *3.3.3 Modifying Factor Adjustments*

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same sound pressure level. A correction should be applied to both the intrusive and the amenity measurement before a comparison is made with the criteria. An abbreviated version of the correction factors is shown in Table 3 below:-

## TABLE 3 – MODIFYING FACTOR CORRECTIONS

| Factor | Assessment/ Measurement | When to Apply | Correction | Comments |
|---|---|---|---|---|
| Tonal Noise | One-third octave band or narrow band analysis | Level of one third octave band exceeds the level of the adjacent bands by 5 dB or more (500-10000 Hz) | + 5 dB | Narrow band frequency analysis may be required to precisely detect occurrence |
| Low Frequency Noise | Measurement of C-weighted and A-weighted level | Measure/assess C and A-weighted levels over same time period. Correction to be applied if the difference between the two is 15 dB or more | + 5 dB | C-weighted is designed to be more responsive to low frequency noise |
| Intermittent Noise | Subjectively Assessed | Level varies by more than 5 dB | + 5 dB | Adjustment to be applied for night time only |
| Duration | Single event noise 1.5 min to 2.5 hr | One event in any assessment period | 0 to 20 dB(A) | Conditional on duration |
| Maximum adjustment | | Where two or more modifying factors are indicated | 10 dB(A) | Excludes duration correction |

*Note: Tonal noise - Level of one third octave band exceeds the level of the adjacent bands on both sides by 5 dB or more if the centre frequency of the band containing the tone is in the range 500-10000 Hz; 8 dB or more if the centre frequency of the band containing the tone is in the range 160 to 400 Hz; or 15 dB or more if the centre frequency of the band containing the tone is in the range 25-125 Hz.*

## 4. BACKGROUND NOISE MEASUREMENTS

Existing ambient and background noise levels have been monitored at the nearest residence to the centre, i.e., 37 Richmond Street for a period of 7 days. The instrumentation, procedure and results are described below.

### 4.1 Background and Ambient Noise Monitoring Procedure

Free field continuous noise monitoring was carried out from Monday 13th January 2025 through to Sunday 20th January 2025. Noise measurements were carried out in accordance with Australian Standard AS 1055:2018, '*Acoustics – Description and measurement of environmental noise".* The noise logger was set for the 'A' frequency weighting and 'fast' time weighting.

The measured background noise levels ($L_{AF90,\ 15\ minute}$) are considered to be representative of background noise at all potentially affected residences in close vicinity of the proposed centre. The energy average noise levels ($L_{Aeq,\ 15\ minute}$) at the logger location include the intermittent noise generated by local and distant road traffic noise, fauna and community noise. Any extraneous noise from rain, wind or DIY construction works in the area was excluded from the background assessment.

## 4.2 Instrumentation

The instrumentation used during the unattended noise survey consisted of an 'ARL' - Rion NL-42A, Environmental Noise Logger with serial number: 422908. This instrument conforms to IEC 61672-1: 2013/2002 Class 2 and has an accuracy suitable for both field and laboratory use.

The environmental noise logger has been checked, adjusted and aligned to conform to the ARL factory specifications and issued with conformance certificates within the last 24 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O, Lindfield, NSW, Australia.

The calibrator has been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications and issued with a conformance certificate within the last 12 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O, Lindfield, NSW, Australia.

## 4.3 Noise Monitoring Results

Measured ambient noise levels are assessed according to the NSW Industrial Noise Policy in terms of ambient noise ($L_{Aeq}$) and background noise ($L_{AF90}$) for the time periods defined as: Day: 7:00 am – 6:00 pm, Evening: 6:00 pm – 10:00 pm and Night: 10:00 pm – 7:00 am.

The recorded $L_{AF90}$ levels determine the Rating Background Level (RBL). The RBL is defined as the median value of the tenth percentile value for the recorded $L_{AF90}$ levels for the complete monitoring period. The tenth percentile is also referred to as the Assessment Background Level (ABL). The resultant RBL ($L_{AF90}$) and ambient ($L_{Aeq}$) levels for each period are summarised below in Table 4. The full statistical noise measurement results are shown in graphical form in Appendix A below.

**TABLE 4 – SUMMARY OF EXISTING NOISE LEVELS.**

| Time of Day | Rating Background Noise Levels ($L_{A90}$) dBA | Log Average Existing Ambient Noise Levels ($L_{Aeq}$) dBA |
|---|---|---|
| Day (07:00 – 18:00) | 39 | 53 |
| Evening (18:00 – 22:00) | 35 | 49 |
| Night (22:00 – 07:00) | 28 | 38 |

*Note 1- All levels rounded to the nearest whole decibel.*

## 5. ENVIRONMENTAL NOISE GOALS

As discussed in Section 3.3 above the assessment procedure given in the Noise Policy for Industrial (2017) has two components to determine project-specific noise goals: Intrusive noise impacts and noise level amenity. The noise goals relevant to each assessment period based on logged noise levels are given below. The more stringent of the two apply.

### 5.1 Intrusive Criteria

To ensure that on-site noise sources are not intrusive, the $L_{Aeq,\ 15\ minute}$ noise level due to stationary sources should not exceed the background $L_{AF90,\ 15\ minute}$ level by more than 5 dB when measured at the affected residential property boundary. The intrusive noise goal is based upon the RBL level of 42 dBA for the day period, 43 dBA for the evening and 40 dBA for the night period. The intrusive $L_{Aeq,\ 15\ minute}$ noise goal for noise generated by the development is therefore 47 dBA for the day period, 48 dBA for the evening and 45 dBA for the night period at or within the nearest residential boundaries.

### 5.2 Amenity Criteria

The amenity noise criteria are used to limit the maximum ambient noise levels within an area from stationary noise sources associated with the proposed development. To protect the acoustic amenity of land users the combined noise from all stationary noise sources should not exceed the Acceptable Noise Level (ANL) calculated according to the procedures as given in chapter 2 of the NSW Noise Policy for Industry. The amenity assessment relates only to industrial-type noise and does not include road or community noise. Modifications are made to the recommended ANL to account for the existing level of industrial (or commercial) noise. As the existing environment is unaffected by industrial or commercial type noise (including mechanical services) the ANL is not modified are therefore represents the amenity criteria.

**TABLE 5 – SUMMARY OF AMENITY CRITERIA.**

| Type of Receiver | Time of Day | Recommended Acceptable Noise Level ($L_{Aeq, period}$) | Existing Amenity Level ($L_{Aeq, period}$) | Amenity Criterion ($L_{Aeq, period}$) |
|---|---|---|---|---|
| Residence urban location | Day | 55 | 53 | 50 |
| | Evening | 45 | 49 | 39 |
| | Night | 40 | 28 | 40 |

*Note - All levels rounded to the nearest whole decibel.*

## 5.3 Project Specific Noise Criteria

Applying both the amenity and intrusive criteria to the development and adopting the more stringent of the two, determines the project specific noise levels. Project specific noise criteria based on logged data are provided below in Table 6.

**TABLE 6 – PROJECT SPECIFIC NOISE CRITERIA RESIDENTIAL.**

| Time of Day | Intrusive Noise Criteria dB - ($L_{Aeq,15\ minute}$) | Amenity Noise Criterion dB - ($L_{Aeq, period}$) | Project Specific Noise Criterion dB - ($L_{Aeq,15\ minute}$) |
|---|---|---|---|
| Day (07:00 – 18:00) | 44 (39+5) | 55 | **44** |
| Evening (18:00 – 22:00) | 35 (30+5) | 39 | **35** |
| Night (22:00 – 07:00) | 35 (minimum 30+5) | 40 | **35** |

The project specific noise criteria dB - ($L_{Aeq,15\ minute}$)for Commercial premises when in use is **65 dBA**.

# 6. NOISE SOURCE MODELS

Noise models have been prepared for the occurrence of noise emissions from the proposed development. This section provides details of the calculations and noise models for each scenario.

## 6.1 Noise Modelling Specifications

The sound pressure level from a source noise has been modelled using the International Standard ISO 9613-2:2024, '*Acoustics — Attenuation of sound during propagation outdoors. Part 2: Engineering method for the prediction of sound pressure levels outdoors'.* This Standard specifies methods for the description of noise outdoors in community environments. The method described

in the Standard is general in the sense that it may be applied to a wide variety of noise sources and covers the major mechanism of attenuation. The method allows for downwind propagation conditions within an angle of ± 45° of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground.

## 6.2 Basic Noise Modelling Equation

As given in the International Standard ISO 9613-2:2024 the equivalent continuous downwind octave band sound pressure level at a receiver location, $L_{fT}$ (DW), shall be calculated for each point source, and its image sources, and for the eight octave bands with nominal mid-band frequencies from 63 Hz to 8 kHz from :

$$\boldsymbol{L_{fT}\,(D_W) = L_W + D_c - A}$$

Where :
$L_W$ is the octave band sound power level produced by the point sound source relative to a reference sound power of one picowatt (1 pW), expressed in decibels;
$D_c$ is the directivity correction, in decibels, that describes the extent by which the equivalent continuous sound pressure level from the point sound source deviates in a specified direction from the level of an omnidirectional point sound source producing the sound power level $L_W$, expressed in decibels; and

$A$ is the octave band attenuation that occurs during propagation from the point sound source to the receiver, expressed in decibels.

The attenuation term A in Formula above is given by :

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

Where:
$A_{div}$ is the attenuation due to geometrical divergence, expressed in decibels (dB);
$A_{atm}$ is the attenuation due to atmospheric absorption, expressed in dB;
$A_{gr}$ is the attenuation due to the ground effect, expressed in dB;
$A_{bar}$ is the attenuation due to a barrier, expressed in dB;
$A_{misc}$ is the attenuation due to miscellaneous other effects, expressed in dB.

The last term ($A_{misc}$) generally refers to miscellaneous propagation through foliage, industrial sites and areas of houses. Due to the vicinity of the development to the neighbouring dwellings the attenuation due to atmospheric absorption, ground effects and other miscellaneous effects are of minor significance at this site. For a first conservation approximation over relatively short distances (i.e. under 100 metres) only, $A_{div}$ needs to be considered, where :

$$\boldsymbol{A_{div} = 20\ \log_{10}\ (d/d_0) + 11 \text{ for spherical sound radiation and}}$$

$$A_{div} = 20 \log_{10} (d/d_0) + 8 \text{ for hemispherical sound radiation.}$$

Where:
*d* is the distance from the source to receiver, expressed in metres; and
*d*0 is the reference distance (= 1 m).

Hence, where sound power levels are known. the 'A' frequency weighted sound pressure level (dB) at the nearest residential boundaries receiver location can be found from:

$$L_{pA} = L_{WA} - 20 \log_{10} d - 10 \log_{10} (2\pi)$$

Or where the 'A' frequency weighted sound pressure levels are known at a certain distance ($L_{pA1}$) the 'A' frequency weighted sound pressure level at the nearest residential boundaries location ($L_{pA2}$) can be found from:

$$L_{pA2} = L_{pA1} - 20 \log_{10} (d_2/d_1)$$

Where $d_1$ is the given distance with known sound pressure level and $d_2$ is the distance to the nearest residential boundaries.

### 6.2.1 Mechanical Plant Located to the Northwest

*6.2.1.1 Daikin*

The CU-01, **Daikin REYQ22BYM09** heat recovery unit is proposed to be mounted in the plant room as shown in Figure 2 above. This has a sound power level of 85 dBA. The plant room is approximately 30 metres from the from nearest residential boundaries. Hence, without attenuation the sound pressure level would be 48 dBA (from 48 = 85 – 20 $\log_{10}$ – 8). This exceeds the daytime noise goal by 4 dB and the evening/nighttime noise goal 13 dB. The unit is situated within the plant room but will require ventilation. Hence, mitigation is recommended. See section 7 below.

*6.2.1.2 Fantech*

The stated sound pressure level of the **Fantech GUA454V** is given by the manufacturers as 58 dBA at 3 metres. This rooftop fan is proposed to be located approximately 30 metres to the nearest residential boundaries. Here the sound pressure level with be 38 dBA (from 38 = 58 – 20 $\log_{10}$ (30/3)) at the nearest residential boundaries. This meets the daytime noise goal but exceeds the evening and nighttime noise goal by 3 dB. Hence, mitigation is recommended. See Section 7 below.

The stated sound pressure level of the two **Fantech RIL150SW** fans is given by the manufacturers as 38 dBA at 3 metres. Here the sound pressure level with 22

dBA (from 22 = 38 – 20 $\log_{10}$ (20/3)) at the nearest residential boundaries. This meets the daytime, evening and nighttime noise goals.

The two **Fantech kitchen exhaust fans** have not yet been specified; however, it is recommended that these should be chosen in line with the manufacturers sound pressure level not more than 54 dBA at 3 metres. Here, the sound pressure level with be less than 37 dBA (from 37 = 54 – 20 $\log_{10}$ (20/3)) at the nearest residential boundaries. This should only be used at daytime hours 07:00 to 18:00 as it exceeds the noise goals for evening use.

### 6.2.2 Mechanical Plant Located on the Proposed Basketball Court

Mechanical Plant located to the Southeast consists of eight rooftop mounted coolers. These coolers are proposed in pairs at three difference distances from nearest residential boundaries as shown in Figure 3 above. These are given as 48 dBA each which equates to 51 dBA for two. To the southeast these are approximately 30, 50 and 70 metres. To the north these are approximately 40, 65 and 85 metres.

**TABLE 7 – PREDICTED NOISE LEVELS FROM THE AIRIUS EMERALD 630 EC.**

| Direction | Approximate distance ($d_2$) from nearest residential boundaries (m) | 'A' frequency weighted sound pressure level at the nearest residential boundaries location (dBA) 51 – 20 $\log_{10}$ ($d_2/d_1$) |
|---|---|---|
| Southeast | 30 | 38 |
| | 40 | 34 |
| | 70 | 31 |
| | Total | 40* |
| Northwest | 40 | 36 |
| | 65 | 32 |
| | 86 | 29 |
| | Total | 38* |

*Totals 40 =10*$\log_{10}$ ($10^{(38/10)} + 10^{(34/10)} + 10^{(31/10)}$) and
38 =10*$\log_{10}$ ($10^{(36/10)} + 10^{(32/10)} + 10^{(20/10)}$).

For noise generated within a building structure the following formula is used to predict the sound pressure level at each receiver point.

$$\mathbf{L_{Aeq} = (L_{Aeq,\ int} + 10\ log_{10}\ S - R) - 14 + D_c - \mathit{A}}$$

Where: $L_{Aeq, int}$ is the sound pressure level within the space;
S is the area of the building envelope radiating noise;
R is the sound reduction index of the building envelope component;
$D_c$ is directivity correction; and
*A* is the attenuation that occurs during the propagation from source to receiver.

### 6.2.3 Mechanical Plant Cumulative Noise Levels

To the southeast the only relevant mechanical plant noise will be the two closest rooftop mounted coolers which are predicted to exceed the evening time noise gaol by 3 dB. Hence, mitigation will be required See section 7 below.

The cumulative noise levels to the northeast will be from the CU-01, Daikin REYQ22BYM09 heat recovery unit, the Fantech GUA454V and the two closest rooftop mounted coolers. Here, the cumulative noise levels Hence, mitigation will be required See section 7 below.

### *6.2.4 Car Park*

The proposed car parking spaces on the site is for 50 vehicles to the northeast. Noise emissions generated by vehicle movements within the car park are based on measured noise data from previous numerous assessments of developments with car parking provisions.

Table 8 below provides the measured noise levels of intermittent and impulsive noise from typical car activities within a car park, normalised to 3 metres. Specific distances to residences and the number of cars accessing the car park are considered in this noise assessment.

**TABLE 8 – SOUND PRESSURE LEVELS AT 3 METRES FOR CAR MOVEMENTS.**

| Source | Duration | Sound Pressure Level (dBA) | | |
|---|---|---|---|---|
| | | at 3 metres | at 3 metres | at 20 metres |
| | | $L_{Aeq, T}$ | $L_{Aeq, 15\ minute}$ | $L_{Aeq, 15\ minute}$ |
| Arrival & parking | 45 secs | 57 | 22 | 6 |
| Departure | 40 secs | 62 | 27 | 11 |
| Car passage | 45 secs | 58 | 23 | 7 |
| Total for 10 car movements in one 15 minute period | | | | 32 |

Notes.
1. Arrival, parking and departure includes door closing and engine starts.

2. Car passage relates to a drive by over 20 metres.

The nearest residential façade to the car park is the dwelling at 29A Richmond Street to the northeast. This façade is located over 20 metres from nearest edge of the car parking space. Noise emissions ($L_{Aeq,\ 15\ minute}$) for 50 vehicles, taking into account distance to individual neighbouring residential boundaries are predicted to be less than 34 dBA at any time. This meets the noise goal.

### *6.2.5 Indoor to Outdoor Noise*

The assessment is based on a maximum of 250 people using the sports hall at any one time. Noise models have been developed for the calculation of vocal levels from a group of individuals. This is based on sound pressure level data for one person at 1 metre as given by Karl Kryter in *'The Effects of Noise on Man'* Academic Press (1985). This model has been verified by on site measurements by us and covers various types of voice as shown in Tables 9 below. Public addresses systems should only be used during emergency situations.

The estimated time of each type of voice is used to predict a 15-minute average for one person. An adjustment is made for the amount of people vocal at any one time. This is typically 20% to 35% of the number of people within the hall. Hence, for the hall with a maximum of 250 people, a maximum of 88 people could be expected to be vocal at any one time. Raise speech levels would be expected with an occasional loud or shout level voice. The predicted levels at 1 metre are adjusted to provide the reverberant level within the hall, see Table 9 below.

**TABLE 9 – SPORTS HALL NOISE LEVELS**

| **Type of voice** | **Sound Pressure Level (dBA) at 1 metre** | **Estimated time spent at each type of voice (minutes in 15)** | **Resultant sound level (dBA) 15-minute average ($L_{Aeq,\ 15\ minute}$)** |
|---|---|---|---|
| Casual | 53 | 0 | 0 |
| Normal | 58 | 5 | 53 |
| Raised | 65 | 5 | 60 |
| Loud | 74 | 3 | 67 |
| Shout | 82 | 2 | 73 |
| 15-minute Average for 1 Person at 1 metre Distance | | | 75 |
| 15-minute Average For 25 People at 1 metre Average Distance (From 75 + 10 $\log_{10}$ (88) dB) | | | **94** |
| Adjustment to Room Reverberant Level | | | 0 |
| Sound pressure level internally | | | **94** |

*Note 1- All levels rounded to the nearest whole decibel.*

Internal $L_{Aeq, (15\text{-minute})}$ noise levels within the sport hall are predicted to be **94 dBA** from students during activities or classes. This also takes into account ball games, whistles and similar. Other room noise will be significantly lower than the sport hall noise and will be inaudible at neighboring residential premises.

The indoor noise level and intelligibility of speech within a hall is dependent upon the room acoustics, in particular the amount of acoustic absorbent materials used as opposed to 'hard' surfaces.

The breakout from the hall (with no windows proposed) using the equation:-

$$\mathbf{L_{p2} = L_{p1} - R + 10\ Log_{10}\ S - 20\ Log_{10}\ r - 11 + DI \quad dBA}$$

Where:

S = Area of Partitions,
R = Weighted sound Reduction Index (52 dB),
r = distance to receiver (30 metres) and
DI = directivity Index (0 dB for wall facing the receiver, 8 dB for other facades).

This confirms noise levels not greater than **30 dBA** at distance to the residential boundaries. and compliance of the noise criteria.

The proposed internal finish will present reflective surfaces in each dimension which will affect speech intelligibility and present higher noise levels generated by the activities within the hall. The assessment has been carried out based on the providing minimal acoustic absorbent materials to the surface of the ceiling and/or walls. The predicted reverberation time of the hall without acoustic absorbent material added is predicted to be high. If, in the unlikely event that it is required, acoustic absorbent material (at least 50 mm thick and with an average sound absorption coefficient of at least 0.85 in the frequency range 250 Hz to 4 kHz) added to walls and ceiling could be employed. Further details are available upon request. Example suppliers of suitable materials are given in Appendix B below.

## 7. NOISE MITIGATION AND ASSESSMENT

Acoustical calculations have confirmed that the sports hall will be compliant with all NSW Government noise criteria and policy. This is based on the following:-

- The mechanical plant should not be used at nighttime (i.e., between 10:00 pm and 7:00 am on any day;

- A detailed design with the input from an acoustical consultant is recommended for the CU-01, Daikin REYQ22BYM09 heat recovery unit. The required noise reduction can be achieved with careful design involving

the use of acoustic louvers and acoustic absorbent lined ducted discharge for the exhaust air;

- A rooftop acoustic barrier is recommended for each of the two closest basketball rooftop mounted coolers to the southeast and the two to the northwest. These two acoustic barriers should be at least 1 metre larger than the coolers, have enough mass to reflect a significant amount of sound and has no holes or gaps (including at the base);

- It is recommended that the Fantech GUA454V fan is fitted with an Fantech (or equivalent) electronic speed-controller to enable the fan speed to be reduced at evening times.

- The mechanical plant should be well maintained to ensure that fan balance and/or faulty bearings (or similar) do lead to long term increase in noise levels;

- Signs should be place on, or near to, the car park areas advising users to people to minimise noise when arriving at and/or leaving the centre;

- No amplified music or public address systems should be used accepting in emergency situation unless acoustic absorbent treatment is added to the internal walls.

- A community relations program should be implemented as detailed below.

**Community Relations**

Community relations are addressed in Australian Standard AS 2436:2010. The following is based on this Standard.

An effective community relations program is essential to keep the neighbouring residents informed. The community is likely to be more understanding and accepting of the noise where the information provided (such as special events) is forthright, does not attempt to understate the likely noise impacts and where commitments made (such as start and stop times) are firmly adhered to. It is essential for all personnel on the site to be considerate of people who live or work nearby so they are not subjected to unnecessary or excessive noise. The hall staff personnel should be aware of the need to take all necessary steps to minimise such adverse impacts on neighbouring residents. Contact details for complaints and further information, including emergency phone numbers, should be readily available to the community. Complaints should be recorded and managed in conformity with the plan to ensure a prompt and fair response.

# 8. CONCLUSION

Noise emissions from the proposed Multi-purpose Centre in Tumut are predicted to comply with the noise goals as given in the NSW Government Noise Policy for Industry (2017). This is providing that the noise mitigation measures given above are incorporated into the design and construction of the centre.

| Date | Prepared by: | Status |
|---|---|---|
| 29th January 2025 | Ken Scannell MSc MAAS | Draft |
| **Date** | **Checked by:** | **Status** |
| 30th January 2025 | Mark Scannell BA MAAS | Draft |
| **Date** | **Issued by:** | **Status** |
| 26th February 2025 | Ken Scannell MSc MAAS | Final |
| **Date** | **Issued by:** | **Status** |
| 15th April 2025 | Ken Scannell MSc MAAS | Final Rev A |
| **Date** | **Issued by:** | **Status** |
| 10th June 2025 | Ken Scannell MSc MAAS | Final Rev B |

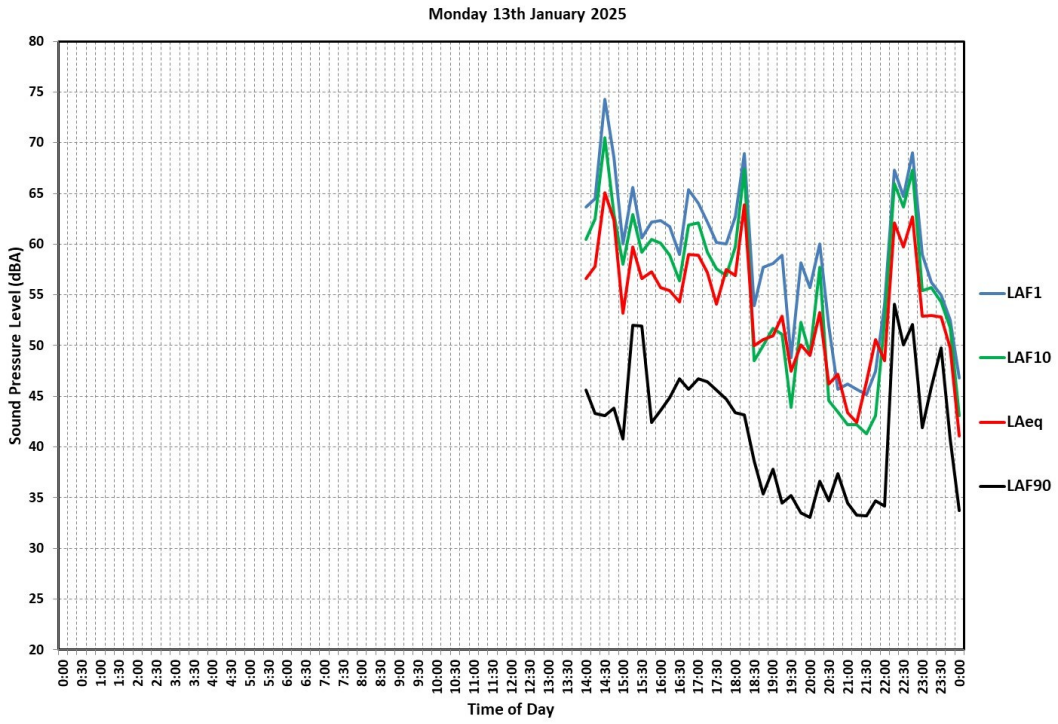
***Important Note.*** *All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as airflow, aesthetics, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, shrinkage, ventilation, etc are outside of 'Noise and Sound Services' field of expertise and* ***must be*** *checked with the supplier or suitably qualified specialist before purchase.*

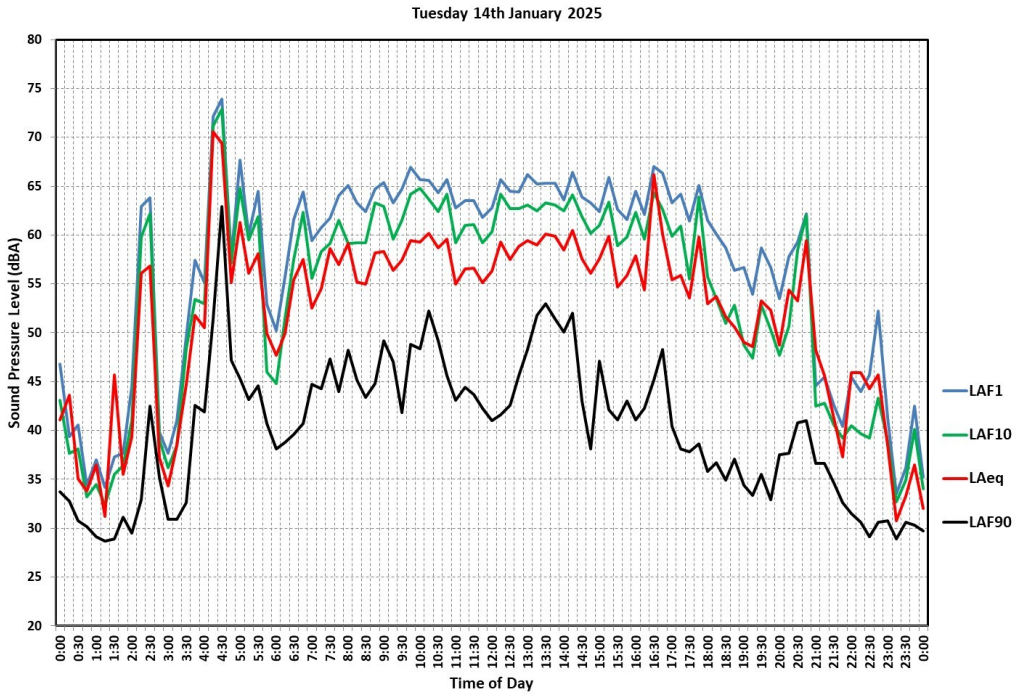
# APPENDIX A – MEASURED AMBIENT NOISE LEVELS

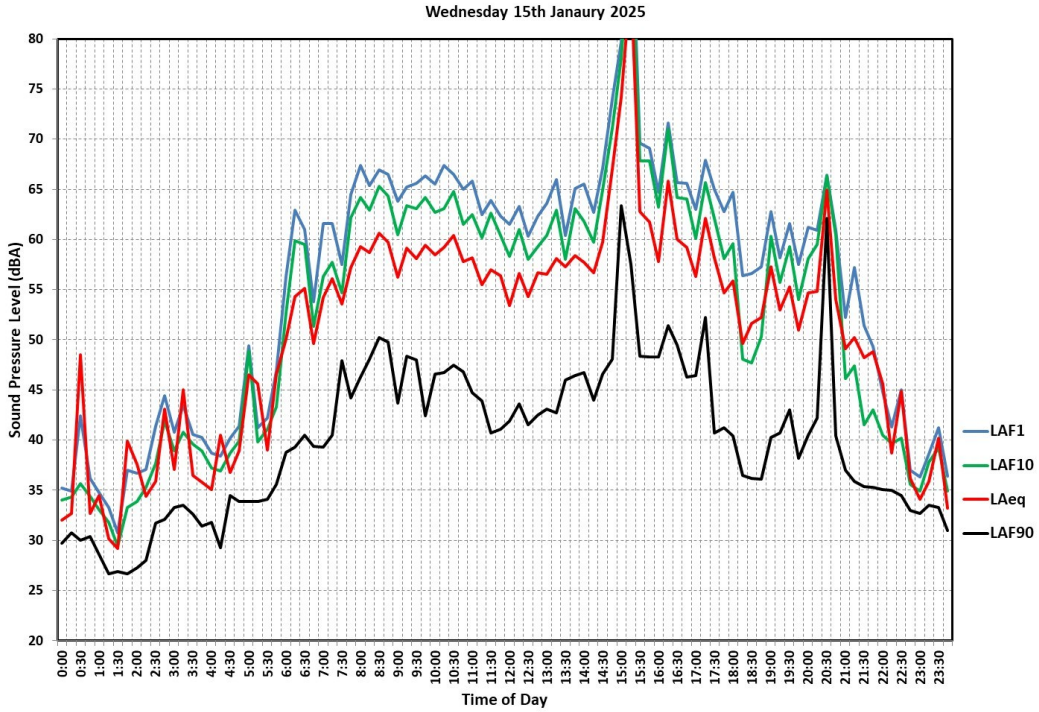
Environmental noise levels can vary considerably with time; therefore, it is not adequate to use a single number to fully describe the acoustic environment. The preferred, and now generally accepted, method of recording and presenting noise measurements is based upon a statistical approach. For example, the $L_{AF10}$ noise level is the level exceeded for 10% of the time and is approximately the average maximum noise level. The $L_{AF90}$ level is the noise level that is exceeded for 90% of the time and is considered to be approximately the average of the minimum noise level recorded. This level is often referred to as the "background" noise level. The $L_{Aeq}$ level represents the average noise energy during the measurement period. This level is often referred to as the 'ambient' noise level.

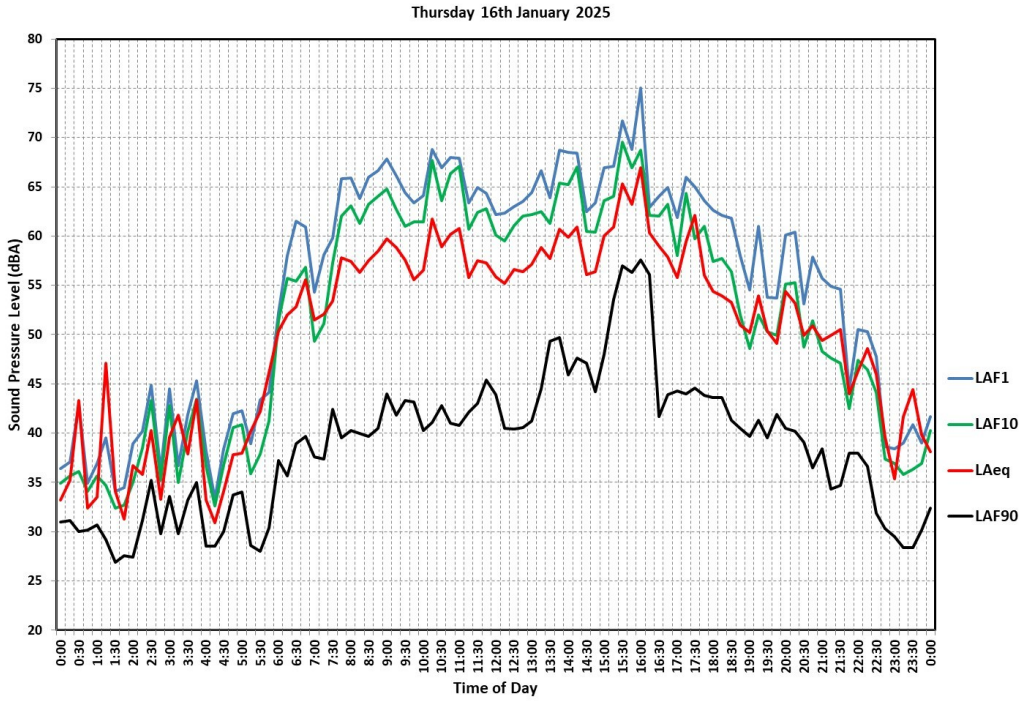
The measurement results from ambient noise monitoring are shown below.

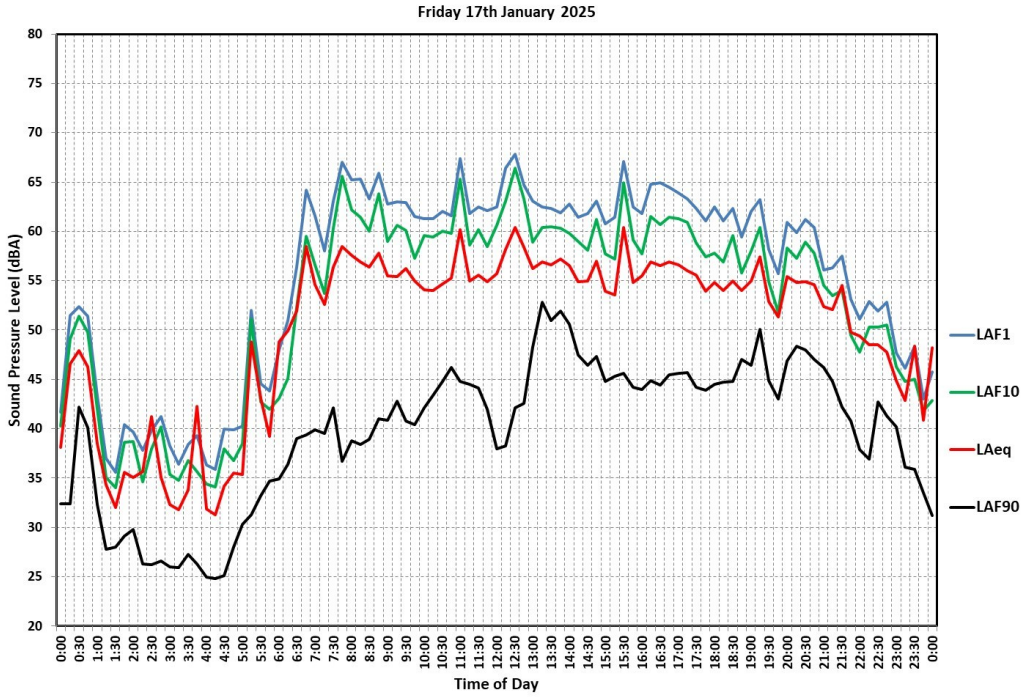
**Logged Ambient Noise Levels**
37 Richmond Street, Tumut, NSW2720

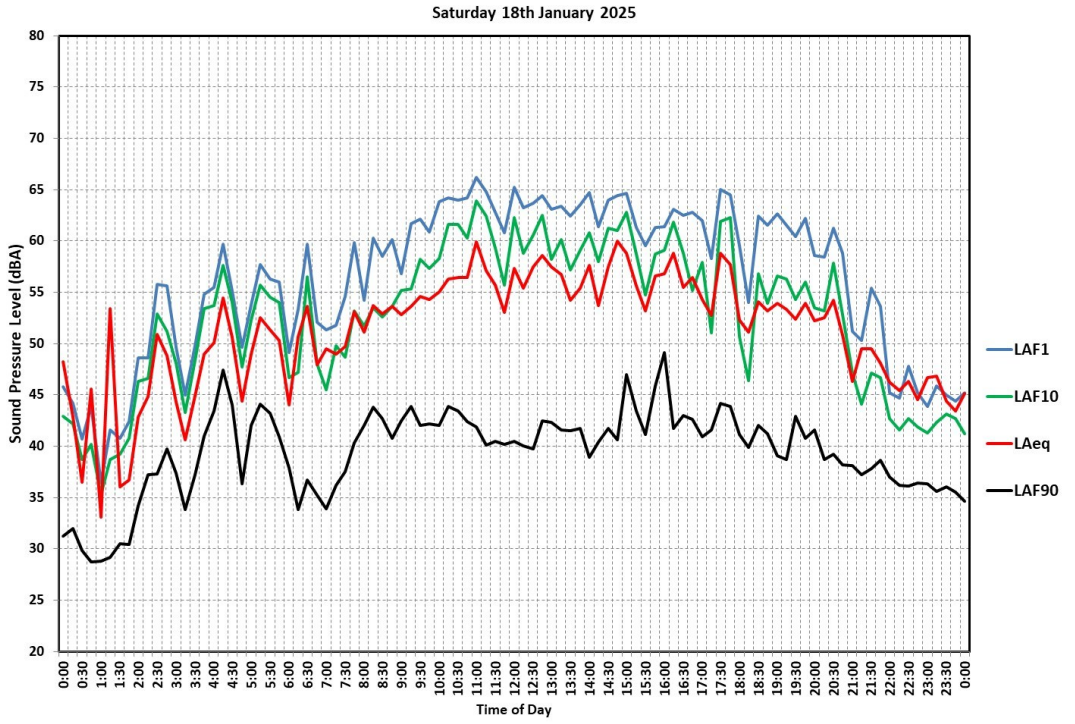


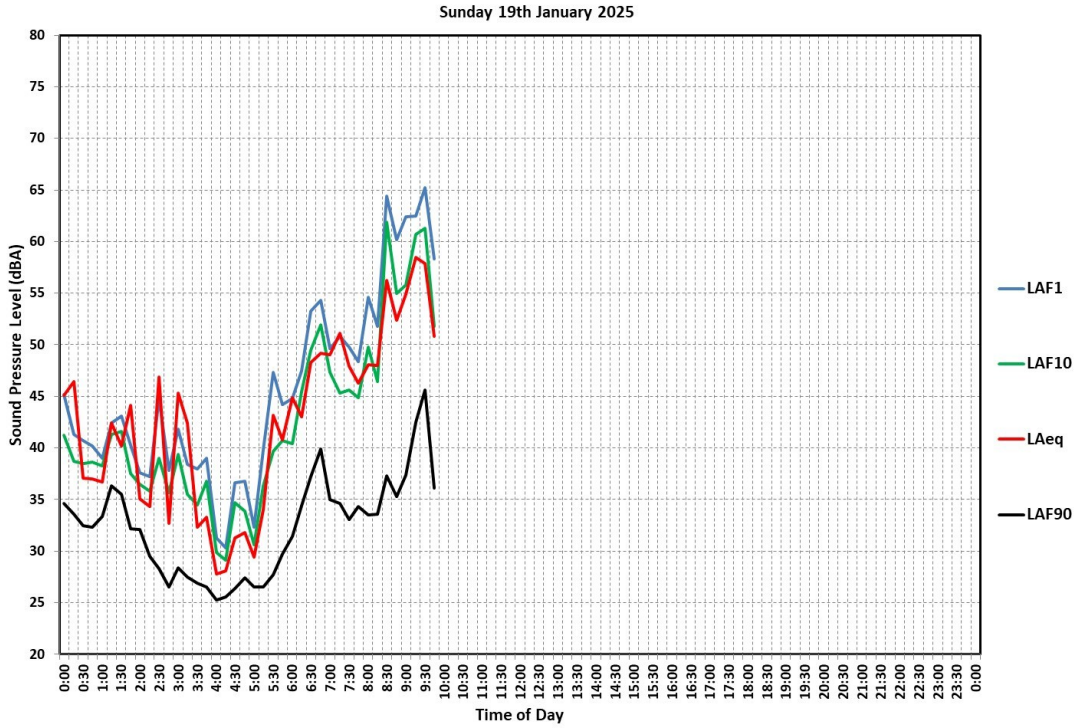

Tuesday 14th January 2025
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Wednesday 15th Janaury 2025
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Thursday 16th January 2025
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Friday 17th January 2025
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Saturday 18th January 2025
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90


Sunday 19th January 2025
Sound Pressure Level (dBA)
Time of Day
LAF1
LAF10
LAeq
LAF90

# APPENDIX B - EXAMPLE SOUND ABSORBING MATERIAL SUPPLIERS

Autex Australia Pty Ltd
166 Bamfield Road,
PO Box 5099,
West Heidelberg, Melbourne,
VIC 3081, Australia
*Tel:* 03 9457 6700
*Website:* *www.autexglobal.com/au*

Recommend material Horizon™ Floating acoustic panels

Pyrotek Noise Control
147/149 Magowan Road, Girraween NSW 2145
*Mobile:* 0416 146 806
*Tel:* 1300 928 322
*E-mail:* bruher@pyrotek-inc.com
*Website:* *www.**pyrotek**nc.com*

Recommend material white 50 mm thick Sorbermel® GC or light grey Sorbermel®

Megasorber Pty Ltd
*Building 1, 25 Chapman Street*
*Blackburn North, Vic. 3130, Australia*
*Mobile:* *0407 088 880*
*Tel:* *03 9077 2918*
*E-mail:* *harvey.law@megasorber.com*
*Website:* *www.megasorber.com*

Recommend material white 50 mm thick Megasorber ® FM50.

Soundblock® Solutions
Rosebery NSW
*Tel:* *1300 881 120*
*E-mail:* michael@soundblock.com.au
*Website:* www.soundblock.com.au

Recommend material white 50 mm thick Stratocell Whisper® ™ Sound Absorbing Polyethylene Foam.

# APPENDIX C – GLOSSARY OF TECHNICAL TERMS

**'A' Frequency Weighting –** The most widely used sound level frequency filter is the A scale, which roughly corresponds to the inverse of the 40 dB (at 1 kHz) equal-loudness curve. Using this filter, the sound level meter is less sensitive to very high and, in particular, very low frequencies. Sound pressure level measurements made with this filter are commonly expressed as **dBA.**

**Acoustic Barrier** – A wall or fence which has enough mass to reflect a significant amount of sound and has no holes or gaps (including at the base).

**Ambient Sound** – The all-encompassing sound associated with that environment being a composite of sounds from many sources, near and far.

**Assessment Background Level (ABL)** – The tenth percentile value of the recorded $L_{AF90}$ level for each day, evening and night period.

**Background Noise Level ($L_{AF90, T}$) –** A statistical parameter used for assessments of constantly varying noise levels. The $L_{AF90}$ is the 'A' frequency weighted noise level that is exceeded for 90 % of the measurement period, 'T'. The measurement period is normally 15 minutes. The background noise is therefore the lowest noise level that occurs for 1.5 minutes in any 15 minute period.

**Decibel (dB) –** The logarithmic ratio of any two quantities and relates to the flow of energy (power). A scale used in acoustical measurement related to power, pressure or intensity. Expressed in dB, relative to standard reference values.

**Energy Average Noise Level ($L_{Aeq, T}$) –** The $L_{Aeq}$ noise level is also known as the equivalent continuous sound pressure level. This is the 'A' frequency weighted logarithmic average of the sound energy of the measurement time 'T'. When measured over a 15 minute time period the symbol $L_{Aeq, 15\ minute}$ is used. This is the standard descriptor used for source noise measurements and ambient noise measurements.

**Percentile Level ($L_{90}$, $L_{10}$, etc)** – A statistical measurement giving the sound pressure level which is exceeded for the given percentile of a specified time period, e.g. $L_{90}$ is the level which is exceeded for 90% of a measurement period.

**Rating Background Level (RBL)** – The median value of the tenth percentile value (ABL) for the recorded $L_{AF90}$ levels for each day, evening and night period over the complete 7 days or more of noise monitoring. The tenth percentile is also referred to as the Assessment Background Level (ABL).

**Sound Pressure Level (SPL) –** 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure of 20 micro Pascals.