Blackett Acoustics

Noise & Vibration Consultants

633-635 WARRINGAH ROAD, FORESTVILLE
DEVELOPMENT APPLICATION (DA)
ACOUSTIC ASSESSMENT

Report No BA200114A
Version A

November 2021

Prepared for

Walsh Architects Pty Ltd
Building 3.3/1 Dairy Road
Fyshwick, ACT 2609

Association of Australian Acoustical Consultants

Blackett Acoustics is an AAAC Member Firm Since 2014

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SGLOSSARY

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are defined below.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

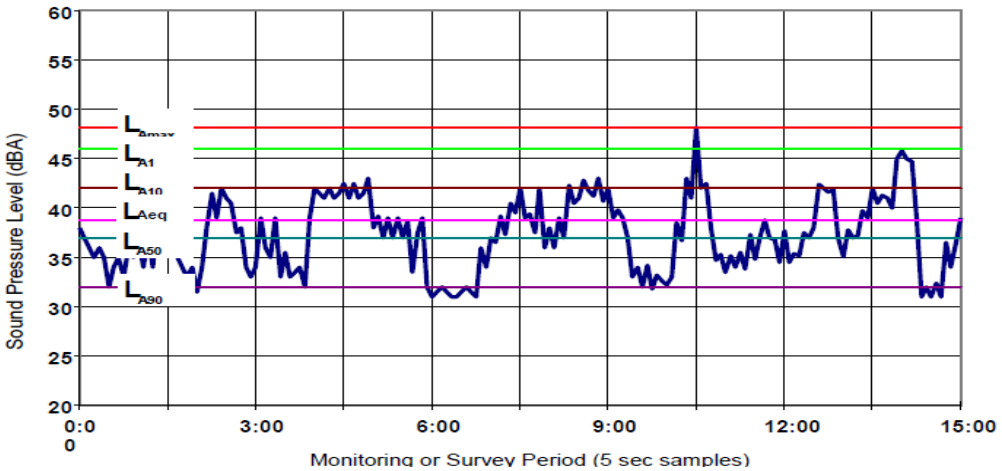
L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.



1 INTRODUCTION

Blackett Acoustics has been engaged to conduct a Development Application (DA) Acoustic Assessment for the proposed 'Seniors Housing' development comprising of 6 units in Forestville.

This report addresses the following acoustic issues:

- Traffic noise intrusion assessment to investigate the degree of traffic noise exposure and recommends construction to reduce traffic noise ingress for the development.
- Establish noise criteria for mechanical plant associated with air conditioning units.

2 SITE AND PROJECT DESCRIPTION

The Project Site location is situated at 633-635 Warringah Road, Forestville. The Project Site is primarily surrounded by residential receivers with the nearest identified residential receivers as shown in Figure 2-1.

Figure 2-1 Aerial of Project Site

At the time of assessment, a decision has yet to be made if the Senior Housing will be naturally ventilated or with mechanical ventilation such as air-conditioning. It is recommended that further acoustic assessment is to be conducted when a decision is made. It is recommended that the noise emission level associated with mechanical plant to adhere to the project specific noise trigger levels in Section 4.2.3 of this report ensure compliance.

The proposed internal layouts are shown in Figure 2-2 and Figure 2-3. Further details can be found in drawing package (dated 24 November 2021) provided by Walsh Architects Pty Ltd.

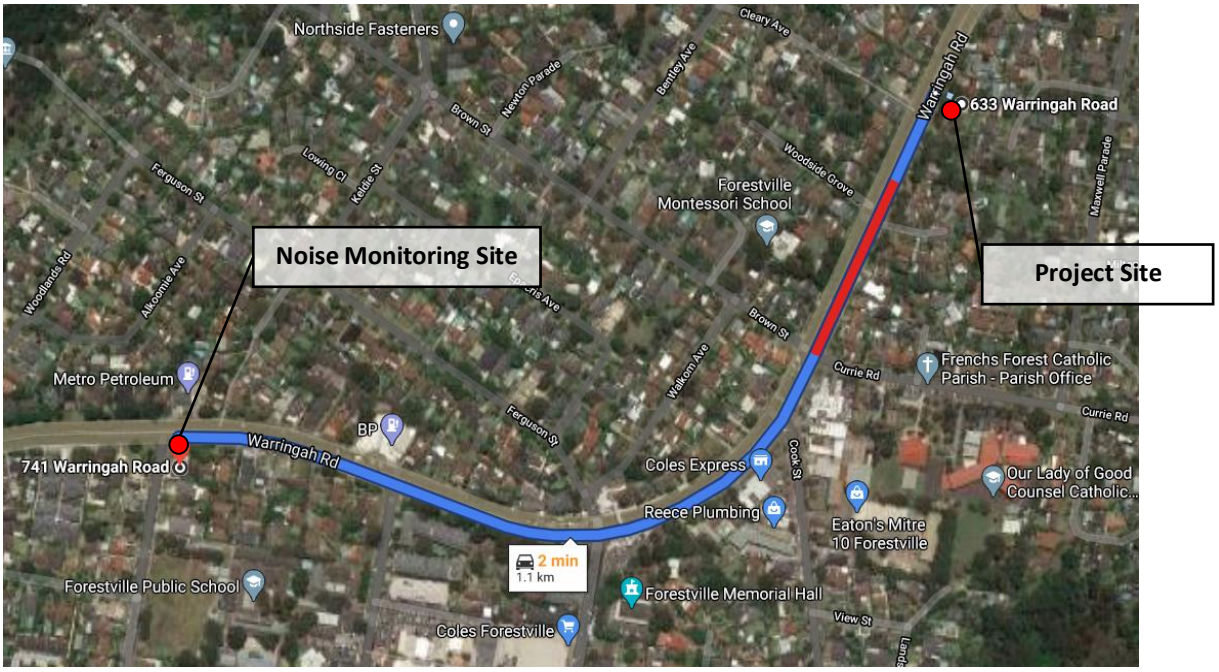
Figure 2-2 Ground Level Floor Plan

Figure 2-3 First Level Floor Plan

3 EXISTING ACOUSTIC ENVIRONMENT

Existing background noise and traffic noise impact associated with Warringah Road was previously established at 741 Warringah Road, Forestville. The noise monitoring location is located approximately 1km south of the Project Site and the noise logging was conducted in a free-field position. Figure 3-1 presents an aerial showing the Project Site relative to the noise logging location.

Figure 3-1 Project Site Relative to Noise Logging Location



Unattended noise monitoring equipment consisted of an Infobyte Environmental Noise Logger. This was previously deployed by Blackett Acoustics at a development site located 1km south of the Project Site at 741 Warringah Road, Forestville. The logger was setup in an elevated position within the backyard of the above-mentioned address.

Due to the close proximity of the Project Site at 633-635 Warringah Road and the unattended noise monitoring location, the measured noise levels can be used for the purposes of this assessment.

The monitoring period was from Tuesday, 28 May 2019 to Monday, 3 June 2019. The calibration of the logger was checked prior to and following the measurement period and the variation in calibration was found not to exceed 0.5dB. The noise logger was set to record statistical noise descriptors in continuous 15-minute sampling periods for the duration of its deployment.

Table 3-1 presents a summary of recorded noise levels from the unattended noise measurements.

Table 3-1 Measured RBL Noise Levels – dBA

Time Period	RBL
Daytime (7.00am-6.00pm)	54
Evening (6.00pm-10.00pm)	52
Night Time (10.00pm-7.00am)	32

Based on the monitoring data, it has been established that the traffic noise level recorded during daytime and night time hours are as follows:

Front Yard of 741 Warringah Road, Forestville

- Daytime $L_{Aeq,15hr}$ (7.00am - 10.00pm) : 72dBA
- Night time $L_{Aeq,9hr}$ (10.00pm - 7.00am) : 68dBA

These established noise levels will be used for the purpose of this assessment. The unattended noise monitoring data are graphically presented in Appendix A.

4 NOISE REQUIREMENTS

This Section presents relevant noise requirements.

4.1 Traffic Noise Ingress Requirements

The Department of Planning and Infrastructure's (DoPI) document entitled *"Development near Rail Corridors and Busy Roads – Interim Guideline"* (DRCBR) provides guidance in relation to mitigation of noise sensitive developments in order to provide a minimum deemed acceptable level of acoustic amenity near road and rail.

The DRCBR Guideline provides guidance in relation to mitigation of noise sensitive developments to achieve acceptable acoustic amenity by meeting the internal noise criteria specified in Clause 102 of the NSW Infrastructure SEPP.

Extracted from DRCBR, Table 4-1 provides a summary of the recommended internal noise levels under Clause 102 of the NSW Infrastructure SEPP, where noise sensitive spaces are likely to be impacted by traffic noise ingress.

Table 4-1 NSW Infrastructure SEPP Recommended Internal Noise Levels

Residential Buildings		
Type of occupancy	**Internal L_{Aeq} Noise Level (dBA)**	**Applicable time period**
Sleeping areas (bedroom)	35	Night time 10.00pm to 7.00am
Other habitable rooms (excluding garages, kitchens, bathrooms & hallways)	40	At any time

Note: Airborne noise is calculated as $L_{Aeq,15hr(day)}$ and $L_{Aeq,9hr(night)}$.

In referenced to the established daytime and night time traffic noise levels presented in Section 3; For design purposes, the maximum traffic noise levels impacting the project site will be used. Accordingly, the reductions required for each space are shown in Table 4-2 below.

Table 4-2 Required Noise Reductions for Each Space – dBA

Type of occupancy	**Internal L_{Aeq} Noise Level (dBA)**	**Traffic Noise Reduction (TNR) Required**
Sleeping areas (bedroom)	35	33
Other habitable rooms (excluding garages, kitchens, bathrooms & hallways)	40	32

4.2 Operational Noise Requirement

The NSW Industrial Noise Policy (2000) has now been withdrawn and is replaced by the Noise Policy for Industry (NPfI) in October 2017.

The NPfI provides a process for in determining the “project noise trigger levels” which provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. 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; for example, further investigation of mitigation measures.

The project noise trigger level, feasible and reasonable mitigation, and consideration of residual noise impacts are used together to assess noise impact and manage the noise from a proposal or site.

The project noise trigger levels are the more stringent of the “project intrusiveness noise levels” and the “project amenity noise levels”. The project noise trigger levels

are assessed at a height of 1.5 metres above ground, at the most affected point within the receiver boundary within 30 metres of a dwelling.

4.2.1 Project Intrusiveness Noise Levels

The intrusiveness of a noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the RBL by more than 5dBA when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.

Based on the established background noise levels in Section 3, Table 4-3 presents the project intrusiveness noise levels.

Table 4-3 Project Intrusiveness Noise Level – dBA

Established $L_{Aeq,15min}$ Intrusiveness Noise Levels		
Daytime	**Evening**	**Night Time**
59	57	37

Note: Daytime (7.00am-6.00pm), Evening (6.00pm-10.00pm) and Night time (10.00pm-7.00am).

The noise criteria in presented Table 4-3 is only applicable to residential receiver locations.

4.2.2 Project Amenity Noise Levels

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 NPfI where feasible and reasonable.

The NPfI recommend amenity noise levels for various receiver types and times of day to protect against noise impacts such as speech interference, community annoyance and some sleep disturbance. 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. Table 4-4 presents the NPfI amenity noise levels.

Table 4-4 NPfI Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day	Recommended Amenity Noise Level $L_{Aeq,period}$ (dBA)
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	5dBA above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35
Hospital ward - Internal Hospital ward - External	All All	Noisiest 1-hour period when in use	35 50
Place of worship – internal	All	When in use	40
Areas specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5dBA to recommended noise amenity area

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

> *Project amenity noise level for industrial developments = recommended amenity noise levels (outlined in Table 4-2) minus 5dBA.*

Due to the different averaging periods for the $L_{Aeq,15min}$ and $L_{Aeq,period}$ noise descriptors, the numerical values of project intrusiveness and amenity noise levels cannot be directly compared when assessing the amount of noise incident upon a receiver, or to identify which noise levels are more stringent.

To standardise the time periods for the intrusiveness and amenity noise levels, NPfI assumed that the $L_{Aeq,15min}$ will be taken to be equal to the project amenity noise level of $L_{Aeq,period}$ plus 3dB.

The surrounding receiver locations will be under the category of "urban" residential receivers and the established project amenity noise levels for the surrounding residential receiver locations are presented in Table 4-5.

Table 4-5 Project Amenity Noise Levels (Residential Receivers) – dBA

Established $L_{Aeq,15min}$ Amenity Noise Levels		
Daytime	**Evening**	**Night Time**
58	48	43

Note: Daytime (7.00am-6.00pm), Evening (6.00pm-10.00pm) and Night time (10.00pm-7.00am).

4.2.3 Project Noise Trigger Levels

Based on intrusiveness and project amenity noise levels determined in Table 4-3 and Table 4-5 respectively, the project noise trigger level is the lower (that is, the most stringent) value of the intrusiveness and amenity noise levels. Therefore, the project trigger noise levels are presented in Table 4-6.

Table 4-6 Project Noise Trigger Levels (Residential Receivers) – dBA

Established $L_{Aeq,15min}$ Project Noise Trigger Levels		
Daytime	**Evening**	**Night Time**
58	48	37

Note: Daytime (7.00am-6.00pm), Evening (6.00pm-10.00pm) and Night time (10.00pm-7.00am).

5 NOISE ASSESSMENT

5.1 Traffic Noise Assessment

Acoustic calculation, taking into account the low frequency characteristic of noise, has been carried out to determine the building construction requirements of the external building envelope for different space types when fully furnished. The following sections detail the construction necessary to achieve the desired TNR values. Note that external windows and doors must be kept closed and all gaps must be sealed airtight, otherwise the TNR of the building envelope will be significantly reduced.

Roof-ceiling system

In order to achieve the desired ANR, it is recommended that the ceiling construction to consist of the following:

- Selected metal roof cladding.
- Minimum cavity depth of 300mm if it is a flat roof or a raked ceiling.
- Cavity insulation equivalent to or greater than R2.0 cavity insulation (nominal thickness of 75mm and density of 20kg/m^3).
- Internal ceiling lining consisting of 1 layer of 13mm Fyrchek with a minimum mass of 10.5kg/m^2 or equivalent.

Wall system

The proposed wall construction for all levels is assumed to be of masonry and lightweight timber stud wall construction.

The masonry wall construction will have an internal lining of plasterboard and insulation batts in the wall cavity. Such constructions have a sound insulation rating of at least R_w of 50 and does not require any further upgrade for sound insulation purposes.

The following provide options for the proposed wall construction on all levels.

Option 1 – Brick Veneer Construction (Applicable to All Units):

- 110mm brick, 90mm timber stud frame or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.

Option 2 – Double Brick Cavity Construction (Applicable to All Units):

- 2 leaves of 110mm brickwork separated by 50mm gap.

Option 3 – Light-weight Timber Stud Construction (Applicable to Unit TH 1 & TH 6):

The lightweight timber stud wall construction will consist of the following:

- Selected wall cladding such as 9mm Scyon Axon cladding with a minimum mass of 12.5kg/m^2 or equivalent .
- 90mm timber stud frame.
- Cavity insulation equivalent to or greater than R2.0 cavity insulation (nominal thickness of 75mm and density of 20kg/m^3).
- Rondo STWC furring channel clip.
- Internal wall lining consisting of 2 layers of 13mm Fyrchek with a minimum mass of 10.5kg/m^2 or equivalent.

Option 4 – Light-weight Timber Stud Construction (Applicable to Unit TH 2 & TH 5):

The lightweight timber stud wall construction will consist of the following:

- Selected wall cladding such as 9mm Scyon Axon cladding with a minimum mass of 12.5kg/m^2 or equivalent .
- 90mm timber stud frame.
- Cavity insulation equivalent to or greater than R2.0 cavity insulation (nominal thickness of 75mm and density of 20kg/m^3).
- Internal wall lining consisting of 2 layers of 13mm Fyrchek with a minimum mass of 10.5kg/m^2 or equivalent.

Option 5 – Light-weight Timber Stud Construction (Applicable to Unit TH 3 & TH 4):

The lightweight timber stud wall construction will consist of the following:

- Selected wall cladding such as 9mm Scyon Axon cladding with a minimum mass of 12.5kg/m^2 or equivalent .
- 90mm timber stud frame.
- Cavity insulation equivalent to or greater than R2.0 cavity insulation (nominal thickness of 75mm and density of 20kg/m^3).
- Internal wall lining consisting of 1 layer of 13mm Fyrchek with a minimum mass of 10.5kg/m^2 or equivalent.

Entry door

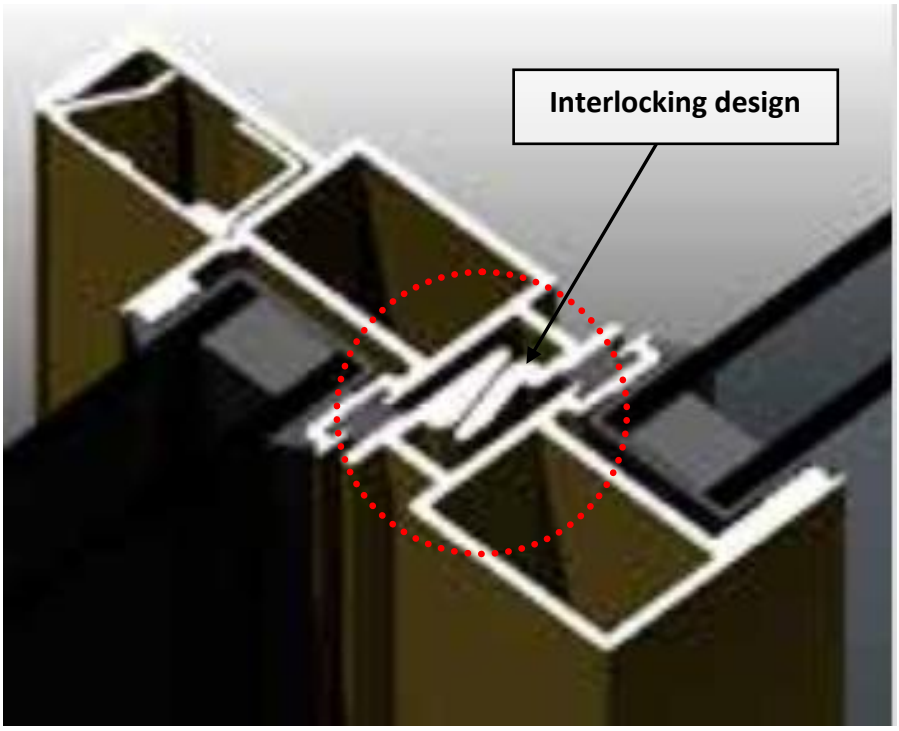
All entry doors must be solid-core doors with a minimum thickness of 35mm and must be fitted with acoustic perimeter/astragal seals as well as threshold/drop seals. Door seals equivalent to Raven RP47 (door frame) and RP38 (door bottom) are recommended. Where there is glazed area within a door, it is recommended that the minimum R_w rating for the glazing is 35. This can typically achieve with 10.38mm laminated glass.

It should be noted that the acoustic performance of a closed door is a result of the combination of door, seals and frame. The performance of the frame depends on the air tightness provided by the seals and the construction of the frame itself. The gap between the door jamb casing and timber frame needs to be filled with oversized backing rod and silicone sealant (1:1 depth to width ratio for joint widths less than 12mm and 2:1 ratio for joint widths greater than 12mm). Where void is larger than the 30mm, install timber packer to take up void around door jamb and timber frame instead of using backing rod and seal remaining gap with silicone sealant.

Window / Sliding Door

It is recommended that the selected window frames to have the panels with an interlocking design feature between each sash. This feature is typically designed to improve the water penetration resistance; However, it will also provide benefits to the acoustic properties of the overall window frame system. The design feature is graphically illustrated in Figure 5-1.

Figure 5-1 Interlocking Design Between Each Sash



Acoustic seals only provide suitable performance if they are fitted properly. Seals should be selected based on their acoustic performance, simplicity of use, life cycle and maintenance requirements. Generally, Q-lon seals are more effective than brush seals. Standard mohair seals should be avoided where possible.

Table 5-1 to Table 5-6 present summaries of recommended glazing for the window system in the proposed development.

Table 5-1 Recommended Glazing for Window System – Building TH 1

Level	Room	Recommended Construction
Ground	Living Area & Bedroom	10.5mm VLam Hush glazing by Viridian Glass with a minimum rating of R_w 38.
First	Rumpus & Study	10.5mm VLam Hush glazing by Viridian Glass with a minimum rating of R_w 38.
	Bedrooms	6.38mm laminated glass with 200mm airgap and 10.38mm laminate glass. This system is to have a minimum rating of R_w 55.

Table 5-2 Recommended Glazing for Window System – Building TH 2

Level	Room	Recommended Construction
Ground	Living Area & Bedroom	10.38mm laminated glass with a minimum rating of R_w 35.
First	Bedrooms, Rumpus & Study	10.5mm VLam Hush glazing by Viridian Glass with a minimum rating of R_w 38.

Table 5-3 Recommended Glazing for Window System – Building TH 3

Level	Room	Recommended Construction
Ground	Living Area	6.38mm laminated glass with a minimum rating of R_w 32.
	Bedrooms	10.38mm laminated glass with a minimum rating of R_w 35.
First	Stair Void	6.38mm laminated glass with a minimum rating of R_w 32.
	Bedroom	10.38mm laminated glass with a minimum rating of R_w 35.

Table 5-4 Recommended Glazing for Window System – Building TH 4

Level	Room	Recommended Construction
Ground	Living Area	6.38mm laminated glass with a minimum rating of R_w 32.
	Bedrooms	10.38mm laminated glass with a minimum rating of R_w 35.
First	Study	6.38mm laminated glass with a minimum rating of R_w 32.
	Bedroom	10.38mm laminated glass with a minimum rating of R_w 35.

Table 5-5 Recommended Glazing for Window System – Building TH 5

Level	Room	Recommended Construction
Ground	Living Area & Bedroom	10.38mm laminated glass with a minimum rating of R_w 35.
First	Void	10.38mm laminated glass with a minimum rating of R_w 35.
	Bedrooms, Rumpus & Study	10.5mm VLam Hush glazing by Viridian Glass with a minimum rating of R_w 38.

Table 5-6 Recommended Glazing for Window System – Building TH 6

Level	Room	Recommended Construction
Ground	Living Area & Bedroom	10.5mm VLam Hush glazing by Viridian Glass with a minimum rating of R_w 38.
First	Rumpus & Study	10.5mm VLam Hush glazing by Viridian Glass with a minimum rating of R_w 38.
	Bedrooms	6.38mm laminated glass with 200mm airgap and 10.38mm laminate glass. This system is to have a minimum rating of R_w 55.

Please note that the acoustic performance of 10.38mm laminated glass is not the same as the 10.5mm VLam Hush which is a proprietary system by Viridian Glass.

Figure 5-2 to Figure 5-6 present photographs of the proposed double-glazing system installed in previous projects.

Figure 5-2 Double Glazed Window System with 200mm Airgap

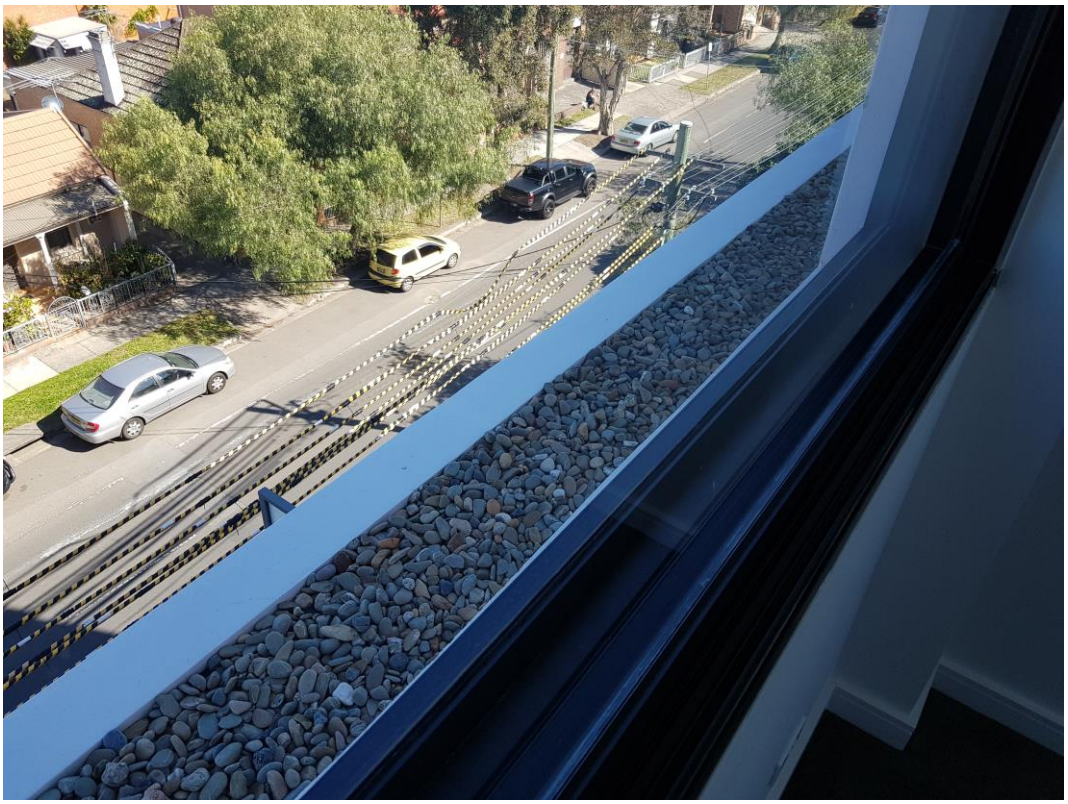


Figure 5-3 Double Glazed Window System with 200mm Airgap

Figure 5-4 Double Glazed Sliding Door System with 200mm Airgap

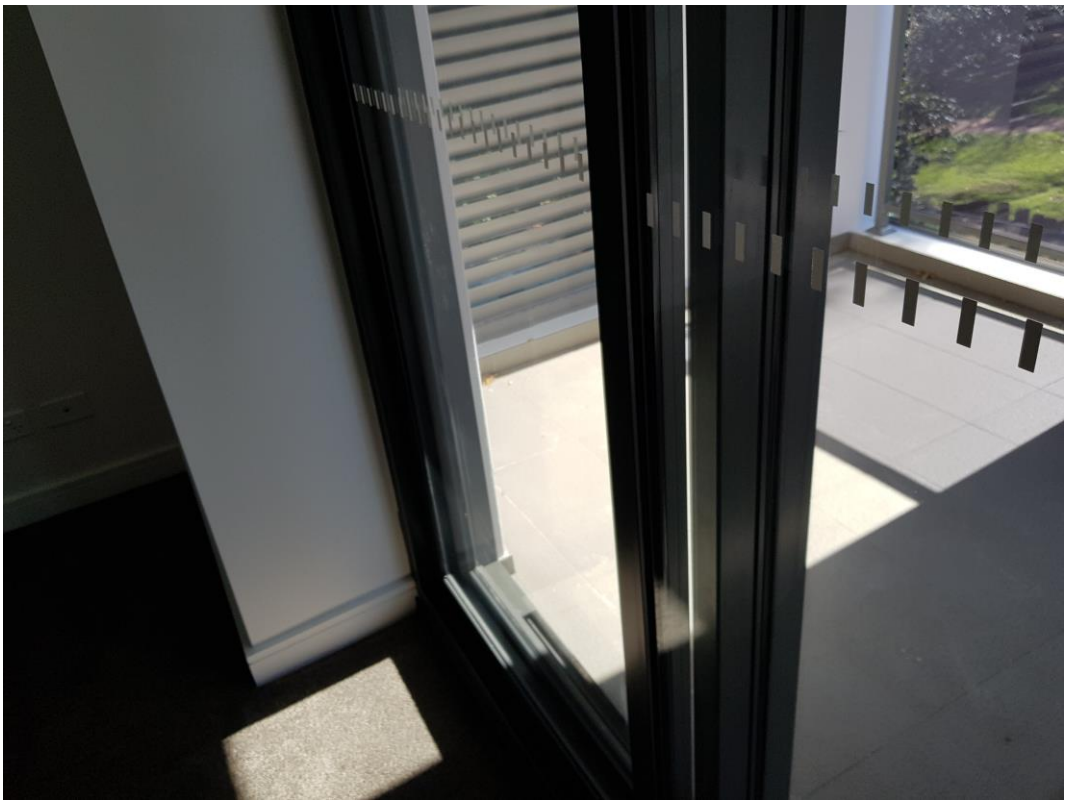


Figure 5-5 Double Glazed Sliding Door System with 200mm Airgap

Figure 5-6 Double Glazed Sliding Door System with 200mm Airgap

5.2 Mechanical Plant Noise

The total number of air-conditioning units is yet to be determined at the time of this assessment. The recommended noise goals will be based on the established daytime and evening time noise criteria of **58dBA and 48dBA respectively**.

The Protection of the Environmental Operations (POEO) Act (2008) Part 4 Clause 52 of the has the following legislative requirements:

1) *A person must not cause or permit an air conditioner or heat pump water heater to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless whether any door or window to that room is open):*
    a) *before 8am or after 10pm on any Saturday, Sunday or public holiday, or*
    b) *before 7am or after 10pm on any other day.*

In order to comply with the POEO Act (2008) inaudibility requirements, it is recommended that the noise emission levels associated with mechanical plant must comply with measured night time background noise levels minus 10dBA. The established **night time $L_{Aeq,15min}$ noise criterion for this project is 22dBA**.

Based on experiences from similar projects, noise emanating from mechanical plant can be controlled by appropriate equipment selected based on siting and implementation of noise controls.

6 CONCLUSION

Blackett Acoustics has been engaged to conduct DA acoustic assessment of the proposed Seniors Housing' development comprising of 6 units located at 633-635 Warringah Road, Forestville.

Assessment of traffic noise ingress has been conducted in accordance with the requirements of The Department of Planning and Infrastructure's (DoPI) document entitled *"Development near Rail Corridors and Busy Roads – Interim Guideline".* To ensure compliance with the guideline, recommendations have been made for building elements to control noise ingress to within design levels recommended.

Project specific relevant time period noise trigger levels have been established to govern noise emission levels associated with mechanical plant in Section 5.2. Based on experiences from similar projects, noise emanating from mechanical plant can be controlled by appropriate equipment selected based on siting and implementation of noise controls.

Note

All materials specified by Blackett Acoustics have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose.

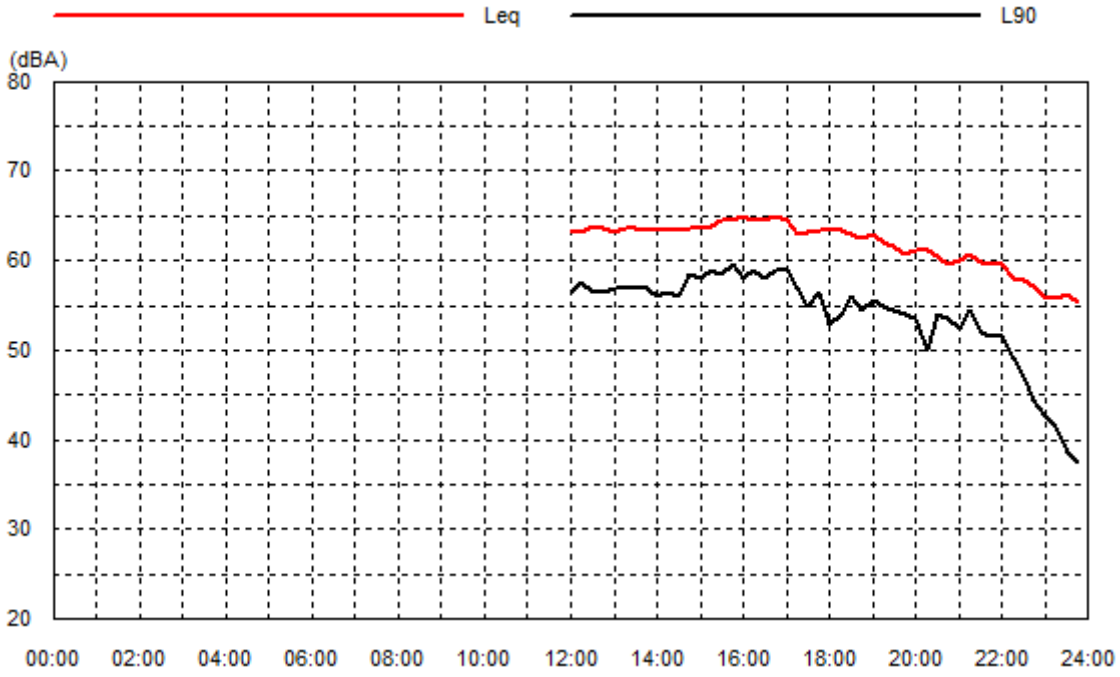
Version	Status	Issue Date	Prepared by
A	Final	11 May 2020	Jimi Ang

Appendix A

Noise Logger Graphs

Location: 741 Warringah Rd, Forestville

Tue 28 May 19



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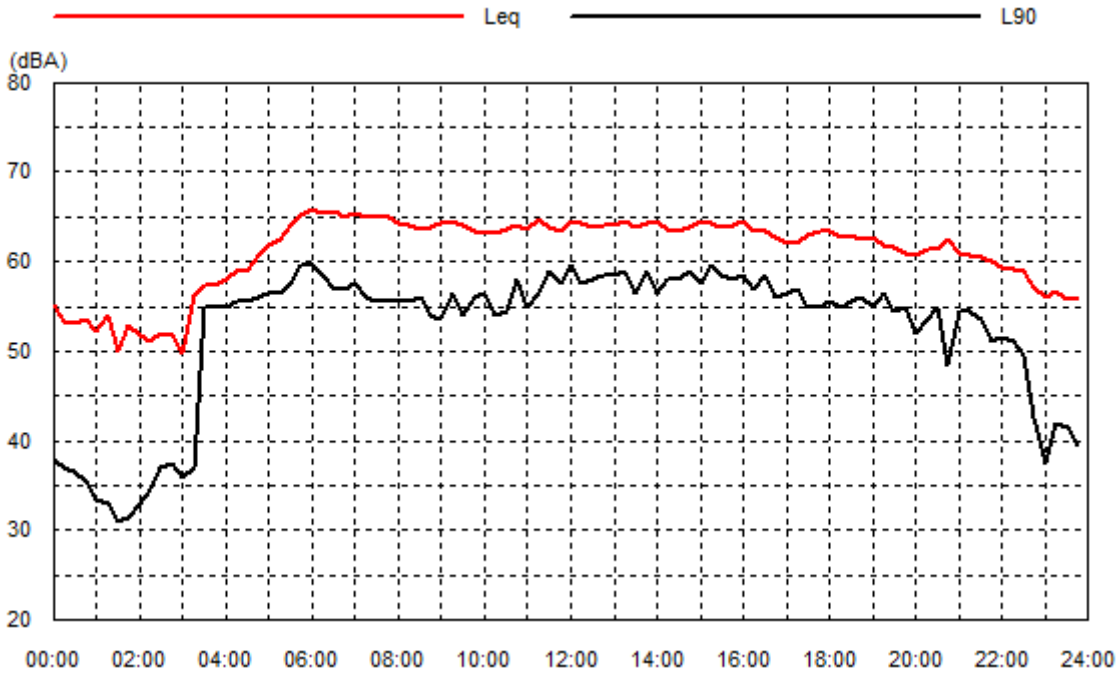

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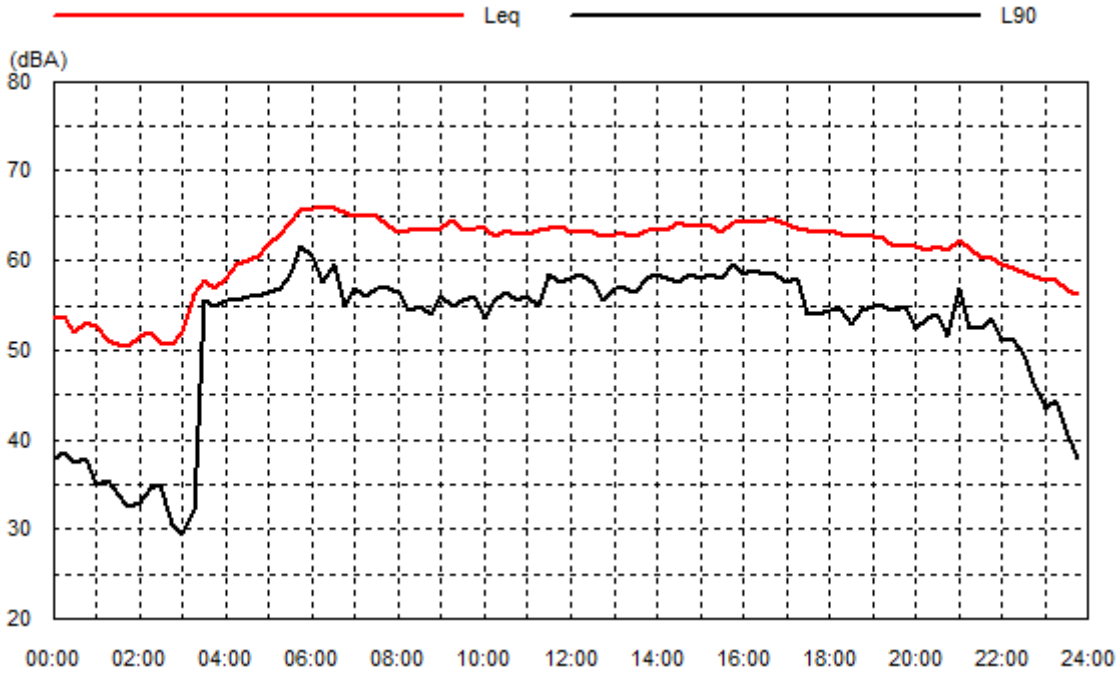

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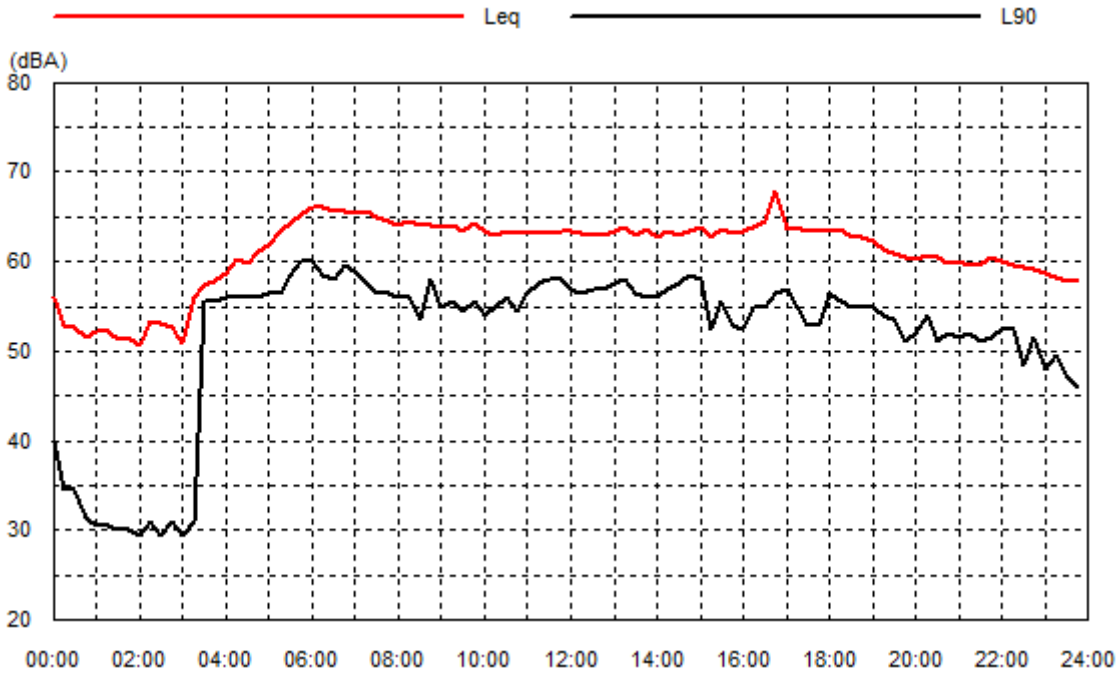

Location: 741 Warringah Rd, Forestville

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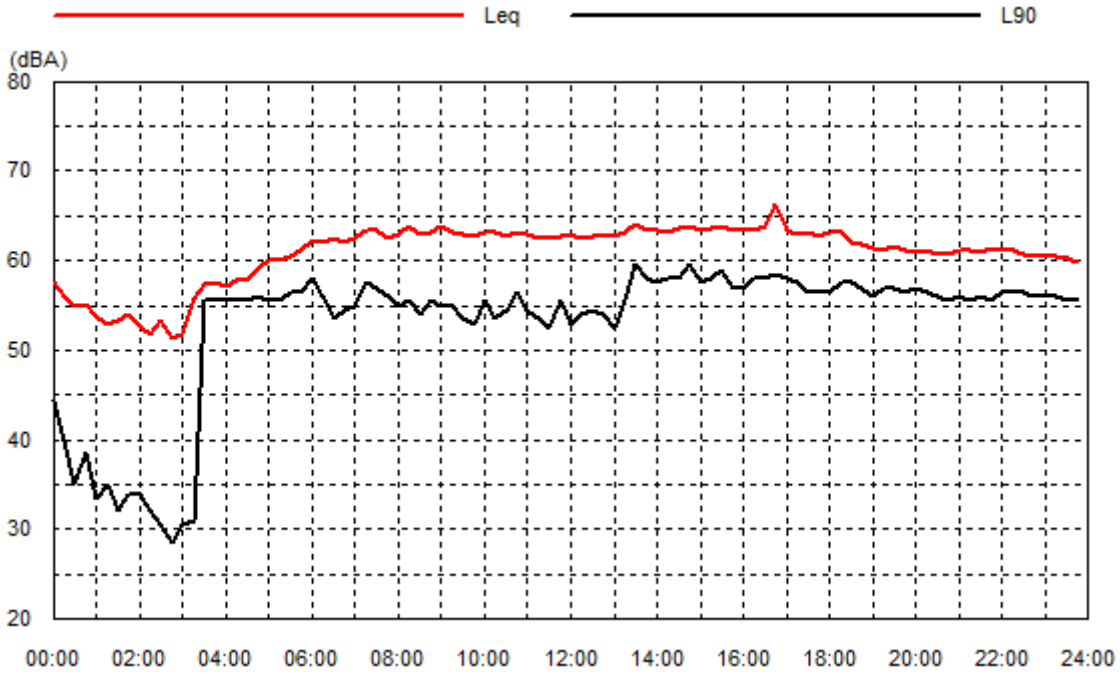
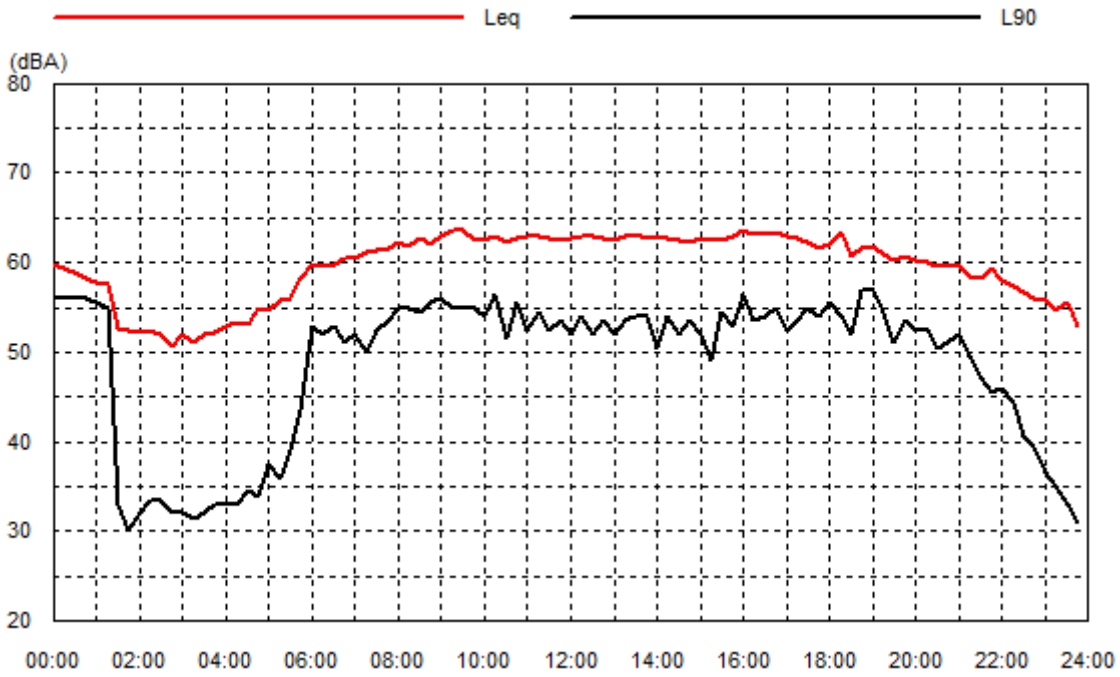


Sun 02 Jun 19



Location: 741 Warringah Rd, Forestville

Mon 03 Jun 19