REVERB ACOUSTICS

Noise and Vibration Consultants

Road Traffic Noise Impact Assessment Senior Housing Development 17-21 Kimberley Street Merrylands NSW

May 2023

Prepared for Brewster Murray Pty Ltd
Report No. 23-2854-R1

Building Acoustics-Council/EPA Submissions-Modelling-Compliance-Certification

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1 INTRODUCTION

Reverb Acoustics has been commissioned to conduct a noise impact assessment for a proposed senior housing development at 17-21 Kimberley Street, Merrylands. The purpose of this assessment is to theoretically determine the noise impact, within habitable areas of the development from passing road traffic on Woodville Road, and to ensure that noise levels comply with the requirements of the Roads and Maritime Services (RMS), NSW Environment Protection Authority (EPA), AS/NZS2107-2016 and Department of Planning and Environment (DPE).

The assessment was requested by Brewster Murray Pty Ltd to ensure any noise control measures for the development are incorporated during the design stages.

2 TECHNICAL REFERENCE / DOCUMENTS

AS 2107-2016 *"Acoustics-Recommended Design Sound Levels and Reverberation Times for Building Interiors".*

AS 1276.1-1999 *"Acoustics – Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation".*

Department of Planning, Industry & Environment (2008). *"Development near Rail Corridors and Busy Roads - Interim Guidelines".*

NSW Environment Protection Authority (2011). *NSW Road Noise Policy.*

Plans supplied by Brewster Murray Pty Ltd, Rev E, dated 18 April 2023. Note that variations from design, supplied to us, may affect our acoustic recommendations.

A Glossary of commonly used acoustical terms is presented in Appendix A to aid the reader in understanding the Report.

3 CRITERIA

State Environmental Planning Policy (Transport and Infrastructure) 2021 states the following:

2.120 Impact of road noise or vibration on non-road development
(1) This section applies to development for any of the following purposes that is on land in or adjacent to a road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of the TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration—

(a) residential accommodation,
(b) a place of public worship,
(c) a hospital,
(d) an educational establishment or centre-based child care facility.

(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this clause and published in the Gazette.

(3) If the development is for the purposes of a building for residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

(a) in any bedroom in the building - 35dB(A) at any time between 10.00 pm and 7.00 am,
(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway) - 40dB(A) at any time.

(4) In this clause, freeway, tollway and transitway have the same meanings as they have in the *Roads Act 1993*.

Cognate performance requirements for residential developments can be sourced from DPE's *"Development near Rail Corridors and Busy Roads - Interim Guidelines*" (released in December 2008). Limits specified within the Policy, which are identical to SEPP (Transport and Infrastructure) 2021, will be used for the purpose of this assessment, are shown below:

Type of Occupancy	*Noise Level in dB(A)*	*Applicable Time Period*
Sleeping areas (bedroom)	35	Night 10pm to 7am
Other habitable rooms (excluding garages, kitchens bathrooms & hallways)	40	At any time

If criteria are exceeded by more than 10dB(A) with windows open, mechanical ventilation should be incorporated into the design of affected rooms.

Criteria for the assessment of quasi-steady-state noise sources, such as continuous road traffic and mechanical services, are sourced from AS/NZS 2107-2016 *"Acoustics-Recommended Design Sound Levels and Reverberation Times for Building Interiors"* and are detailed below.

Room Type	dBA
RESIDENTIAL BUILDINGS	
Houses and apartments near major roads	
Living areas	35 – 45
Sleeping areas	35 – 40
Common areas (foyer, lobby)	45 – 50

Note that limits specified in the DPE documents and AS/NZS 2107-2016 are in agreement with those contained in SEPP 2021. Therefore, the aim of the assessment is to ensure that the allowable noise levels shown above and in Table 1 are not (theoretically) exceeded within any habitable room due to road traffic noise. Transmission paths considered in the assessment are windows and doors with allowances made for shielding by balconies, intervening structures, etc.

Table 1: Internal Traffic Noise Level Criteria (Residential)

Location	Criteria – dB(A),Leq		Remarks
	Day	Night	
Sleeping areas	-	35	Windows closed
	-	45	Windows open
Other habitable rooms	40	-	Windows closed
	50	-	Windows open

Note that the development is more than 160 metres from Woodville Road and outside the minimum screening distance of 60 metres where vibration impacts may become an issue for residential development. Therefore, road traffic vibration has not been considered further.

Figure 1: Site Plan

4 ANALYSIS AND DISCUSSION

4.1 Road Traffic Noise Levels

A road traffic noise level survey was conducted using a Class 1, Svan 977 environmental noise logging monitor, installed along the west site boundary of No.17 Kimberley Street, approximately 195 metres from the near lane of traffic on Woodville Road. The instrument was calibrated with a Brüel and Kjaer 4230 sound level calibrator producing 94dB at 1kHz before and after the monitoring period, as part of the instrument's programming and downloading procedure, and showed an error less than 0.5dB. A summary of measured noise levels is shown in Table 1. Noise level data are not shown, but available upon request.

Table 1: Summary Traffic Noise Levels – 17 Kimberley Street

Descriptor	Noise Level dB(A)	Time Interval
Leq,1hr (day)	56.1	07:00 to 22:00
Leq,1hr (night)	49.4	22:00 to 07:00
Leq,9hr	47.0	22:00 to 07:00
Leq,15hr	52.9	07:00 to 22:00
Leq,24hr	51.7	06:00 to 06:00

Site, weather and measuring conditions were all satisfactory during the noise survey. We therefore see no serious reason to modify the results because of influencing factors related to the site, weather or our measuring techniques.

Applicable noise level metrics, namely, Leq (day peak) and Leq (night) are those calculated from our measurements at the site, following the methodology outlined in the EPA's RNP. A +2.5dB(A) facade adjustment must be applied to results as measurements were conducted in free-field conditions.

Measured noise level (2023) + facade correction = received noise (2023)

Applying the above formula gives:

Day	52.9dB(A) + 2.5dB(A) = **55.4dB(A) Leq, 15hr**	7am – 10pm
Night	47.0dB(A) + 2.5dB(A) = **49.5dB(A) Leq, 9hr**	10pm – 7am

4.2 Road Traffic Noise Impact

Shown below are sample calculations detailing the procedure followed in order to calculate required glazing for the windows in Bedroom 2 and the Living Room of Unit 15, located on the First Floor west facade facing Woodville Road. The traffic noise level at the outer face of the glazing is calculated as follows:

Table 3: Sample Calculation - Traffic Impact at Unit 15 – dB(A),Leq

		Octave band Sound Pressure Levels, dB(A)							
Propagation calculation	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Facade traffic noise - NIGHT	50	31	39	40	44	46	43	37	29
Facade traffic noise - DAY	55	36	44	45	49	51	48	42	34
Directivity/distance Correction[3]		+1	+1	+1	+1	+1	+1	+1	+1
Traffic noise - NIGHT	51	32	40	41	45	47	44	38	30
Traffic noise - DAY	56	37	45	46	50	52	49	43	35

As the criterion for the Bedroom is 35dB(A), see Section 3, the required traffic noise reduction is *TNR* = 51-35 = 16dB(A). The traffic noise attenuation, *TNA*, required of the glazing is calculated according to the equation given in Clause 3.4.2.6 of AS 3671,

$$TNA = TNR + 10\log_{10}[(S/S_f) \times 3/h \times 2T_{60} \times C] \qquad \textit{equation 1}$$

where
- S = Surface area of glazing = 1.9m^2
- S_f = Surface area of floor = 11m^2
- h = Ceiling height, assumed to be 2.6m
- T_{60} = Reverberation time, s
- C = No. of components = 3 (glazing, wall, roof)

Assuming that the room is acoustically average (neither too 'live' nor too 'dead') equation 9.26 in *Noise and Vibration Control*, L.L. Beranek, 1971, gives a reverberation time of 0.76s. Consequently, the value of 0.8s was used in equation 1.

Using the values listed above gives
TNA = 13dB(A) for the glazing

Substituting this value into the equation given in Clause 3.4.3.1 of AS3671 gives
Rw = *TNA* + 6 ≈ 19.

As the criterion for the Living Room is 40dB(A), see Section 3, the required traffic noise reduction is *TNR* = 56-40 = 16dB(A). The traffic noise attenuation, *TNA*, required of the glazing is calculated according to the equation given in Clause 3.4.2.6 of AS 3671,

$$TNA = TNR + 10\log_{10}[(S/S_f) \times 3/h \times 2T_{60} \times C] \qquad \textit{equation 1}$$

where
- S = Surface area of glazing = 1.9m^2
- S_f = Surface area of floor = 12m^2
- h = Ceiling height, assumed to be 2.6m
- T_{60} = Reverberation time, s
- C = No. of components = 3 (glazing, wall, roof)

Assuming that the room is acoustically average (neither too 'live' nor too 'dead') equation 9.26 in *Noise and Vibration Control*, L.L. Beranek, 1971, gives a reverberation time of 0.76s. Consequently, the value of 0.8s was used in equation 1.

Using the values listed above gives
TNA = 13dB(A) for the glazing

Substituting this value into the equation given in Clause 3.4.3.1 of AS3671 gives
Rw = *TNA* + 6 ≈ 19.

As can be seen by the above results, the glazing in the Bedroom and Living Room must have a tested Rw19 rating. RMS publication, *"Development Near Rail Corridors and Busy Roads-Interim Guideline"* Specifies different Categories of treatment based on the required Rw rating of each building component. The lowest Category 1 requires treatment for windows that have an Rw24 rating. Given that the Living Room and Bedroom windows in Unit 15 only require a rating of Rw19, standard glazing will suffice. Similar calculations to those above were performed for all building components on affected facades, confirming standard construction is adequate.

5 CONCLUSION

A noise impact assessment for a proposed senior housing development at 17-21 Kimberley Street, Merrylands, has been completed. The report has shown that the site is suitable for the intended purpose.

An assessment of external noise impacting upon the development has confirmed that no special acoustic features need to be incorporated into the design to comply with the requirements of the RMS, EPA, AS/NZS2107-2000 and DEP. We therefore see no acoustic reason why the proposal should be denied.

Steve Brady M.A.S.A. A.A.A.S.
Principal Consultant

APPENDIX A
Definition of Acoustic Terms

Definition of Acoustic Terms

Term	Definition
dB(A)	A unit of measurement in decibels (A), of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
Rw	Weighted Sound Reduction Index. The ability of a partition to attenuate sound, in dB. Given as a single number representation.
Leq	Equivalent Continuous Noise Level - which, lasting for as long as a given noise event has the same amount of acoustic energy as the given event.
L(A)eq,15hr	The L(A)eq noise level for the period 7am to 10pm
L(A)eq,9hr	The L(A)eq noise level for the period 10pm to 7am
L90	The noise level which is equalled or exceeded for 90% of the measurement period. An indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dBA).
L10	The noise level which is equalled or exceeded for 10% of the measurement period. L_{10} is an indicator of the mean maximum noise level, and is generally used in Australia as the descriptor for intrusive noise (usually in dBA).