-NOISE ASSESSMENT-

FOR ATTACHED TERRACE HOUSE DEVELOPMENT

AT

LOT 54, 61 HUME HWY., LANSVALE

REPORT NO.: T698071123

PREPARED FOR

SABTON & SON DEVELOPERS

159 WENTWORTH AVE.

WENTWORTHVILLE NSW 2145

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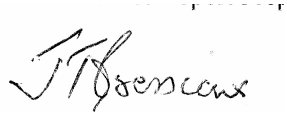
Assessment & Report Prepared by:



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1. INTRODUCTION

The proposed development at Lot 54, 61 Hume Hwy., at Lansvale is for a row of 10 attached town houses. The site has been identified as being affected by noise from traffic on the Hume Highway.

Interior noise levels for the development that must be complied with is set by Council. This will be discussed in section 3 of this report.

This report presents our assessment for the noise impact due to traffic on the envelope of the building, in order to satisfy the design criteria that are set. Sound insulation against inter-residential noise, is not within the scope of this report.

Traffic noise measurements taken at the site will be used to assess the noise impact on the development. Using this, the construction components in order to meet the imposed criteria for noise due to traffic, are recommended in principle.

2. DESCRIPTION OF SITE

The site at 61 Hume Hwy. is a newly developed estate which has been sub-divided for residential development. Lot 54 is a super lot that is south of the estate with its southern boundary about 4m from the Hume Hwy. A noise barrier about 1.8m high has been constructed along the entire southern boundary, to protect this residential estate from the noise impact of traffic on the Hume Hwy.

3. ASSESSMENT CRITERIA

In order to control the impact of noise on a residential estate from traffic movements on major roads and freeways, the noise criteria given in the NSW "Environmental Criteria for Road Traffic Noise" (ECRTN) that was published by the former EPA in 1999 is often considered. A summary of the criteria as applied to new residential land use developments affected by freeway/arterial traffic noise, is shown below:

$L_{eq(15hr)}$ $\leq$ 55 dB(A) [day-time]; and
$L_{eq(9hr)}$ $\leq$ 50 dB(A) [night-time]

This noise criterion is meant to be applied externally, and its purpose is to control the exterior noise levels in private open spaces within a development or at a residential facade. Where the criterion is exceeded the use of noise barriers is often used as ameliorative treatment. This option is viable when the land use is large and a substantial length of barrier can be built adjacent to the road. This has been done in this case and a noise barrier of about 1.8m high has been built bordering the estate along the southern boundary to shield the estate from noise from traffic on the Hume Hwy.

Generally noise barriers because of height restrictions, are ineffective for two-storey residences. Therefore the option to treat the facade of the building may sometimes be the only viable solution. The purpose for treating the facade is to control *internal* noise levels within the residence, and since the EPA criteria does not address internal noise levels; other noise criteria such as those contained in some Council's "DCPs" or those given in AS2107 would need to be used. This is discussed in the ECRTN under the heading

"Internal Noise Levels" (on page 14), where criteria similar to that given in AS2107 was recommended by the EPA for sleeping areas.

Further, the reporting of the maximum noise levels during each hour of the night-time period for a "typical" night is recommended in the ECRTN. The purpose for reporting this is to give an indication of the likelihood of sleep awakening. The document does also state that the relationship between noise, sleep disturbance and health is not fully understood at this stage, and therefore it is not possible to define fully how the different noise characteristics of road traffic should be measured to best estimate the effects on sleep. Hence a noise criterion that must be complied with, for sleep awakening due to traffic noise, *has not been recommended in this document.*

In the "Environmental Noise Control Manual" that was published by the former SPCC, the criterion for sleep arousal was set; and states that the L_{01} noise level emitted by the noise source, must not exceed the background noise level by more than 15 dB(A), *when measured outside* a *bedroom window.* This criterion is only relevant at night (after 10pm). This too is an *external* noise criterion and clearly if this criterion is exceeded, the only method of treatment is to introduce noise barriers or relocate bedroom windows, which may or may not achieve compliance, depending on the level of the exceedance. The only other form of treatment that is viable is to treat the façade of the building. Once again by treating the façade, only the internal noise level can be controlled; however there is *no interior* noise level for sleep arousal that has been set in any of the documentation. (The sleep arousal criterion given in the Noise Control Manual is a general criterion and not specific to traffic noise).

In the case of individual residences which are built within close proximity to major roads, the EPA criterion is almost always exceeded without there being any practical means of obtaining compliance. This is why the treatment of facades most exposed to the noise impact is the only viable option. When treatment of external facades is considered, *internal* noise criteria have to be employed. This is why the application of EPA's criteria contained in the ECRTN is not appropriate when applied to *individual residences* that are built adjacent to busy roads. Instead the internal design goals set out in AS2107 is a more appropriate criterion to be used for individual residences impacted upon by traffic noise.

3.1 Internal Noise Criteria for Development

For residential development such as single dwellings, duplexes, unit development etc. impacted upon by transportation noise, it is customary to use the guidelines provided in the Australian Standards in order to control the acoustic amenity inside the residences. These standards are:

- AS3671 – 1989: Acoustics - Road Traffic Noise Intrusion – Building Siting and Construction, and
- AS/NZS 2107:2000- Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors.

The procedure provided in AS3671 is usually adopted for the selection of building envelope construction required to achieve the internal sound levels recommended in AS2107.

A summary of the recommended design sound levels contained in AS2107, for residential buildings near major roads, is shown below:

Table 3-1: Internal Design Sound Level for Residential Buildings near Major Roads

Type of Occupancy/Activity	*Sound Level, L_{eq}, dB(A)*	
	Satisfactory	*Maximum*
Living areas	35	45
Sleeping areas	30	40

For the purpose of assessing the impact of traffic noise inside the proposed development at Lot 54, 61 Hume Hwy., Lansvale, the noise criterion given in AS2107 will be used.

3.2 Noise Monitoring Procedures

The noise monitoring procedures described in the ECTRN, applies to continuous long-term noise monitoring, where noise indices such as the $L_{Aeq(15hr)}$ and the $L_{Aeq(9hr)}$ can be measured and compared with noise criteria given in this document for the appropriate type of land use.

When using AS2107 to assess the impact of a continuous noise source on a development, the need for continuous long-term noise monitoring is not required. Instead noise monitoring at a time when the greatest impact is likely e.g. daytime, is the appropriate time to measure. At night the traffic noise impact is generally lower. Since the design criteria given in AS2107 apply to internal noise levels and are based on "worst case" scenarios, there are no daytime or night-time criterions given in this standard. Since compliance with this standard is generally sought for "worst case" conditions, for traffic noise therefore this would generally apply to the day-time period.

Compliance with this criterion is also generally achieved with windows and external façade doors closed.

Note: AS2107 does not provide a "windows open" criterion; but as a general rule if noise levels with windows or doors open exceed the "windows closed" criterion by more than 10 dB(A), then an alternate form of ventilating these rooms should be considered so that occupants may leave windows closed, if they so desire.

4. EXISTING ACOUSTIC ENVIRONMENT

Because environmental noise levels vary with time, it is not adequate to use a single number to describe the acoustic environment. The preferred and now generally accepted method of recording and presenting noise measurements is based upon a statistical approach. The L_{10} noise level is the level exceeded for 10% of the time, and is approximately the average maximum noise level. The L_{90} level is the 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_{eq} level represents the average noise energy during the measurement period.

The acoustic environment of the area is largely influenced by traffic on the Hume Hwy. Short-term noise monitoring was conducted on site on November 20 and 21, 2007. Equipment used for the noise survey is shown in Appendix I. The microphones of the sound level meter were located at heights of approximately 4.3m, 2.5m and 1.5m above ground. All measurements were taken with the meter set on 'A' frequency weighting and

in 'fast' time response. The weather conditions at the time of noise surveys were as follows:

20/11/07: Clear skies, variable wind and gusty at times. Temperature approximately 25^0C.

21/11/07: Cloudy. No wind. Temperature approximately 21^0C.

Shown in the table below is a summary of the noise survey:

Table 4-1: Measured Noise Levels

Date	*Location*	*Time*	*Noise Level, dB(A)*				
			L_{max}	L_{min}	L_{10}	L_{90}	L_{eq}
20/11/07	Approx. 10m from acoustic barrier. Microphone approximately 4.3m high	17:57-18:12	77	60	74	68	69
		18:12-18:27	91	58	74	68	70
		18:27-18:42	82	60	74	68	69
		18:42-18:57	77	57	74	67	68
	Microphone approximately 2.5m high	17:57-18:12	92	50	67	62	66
		18:12-18:27	91	51	67	61	66
		18:27-18:42	86	57	67	62	65
		18:42-18:57	92	57	67	61	65
21/11/07	Approx. 10m from acoustic barrier. Microphone approximately 4.3m high	08:39-08:54	75	56	72	64	67*
		08:54-09:09	83	57	75	66	69
		09:09-09:24	81	54	75	67	69
		09:24-09:39	79	55	75	67	69
		09:41-09:56	77	55	74	65	68
		09:56-10:11	79	55	74	64	68
	Microphone approximately 2.5m high	08:39-08:54	71	52	65	57	62*
		08:54-09:09	83	54	67	58	64
		09:09-09:24	80	52	67	60	64
		09:24-09:39	85	52	67	59	65
	Microphone approximately 1.5m high	09:41-09:56	71	50	64	55	61
		09:56-10:11	77	49	63	54	61

All results are rounded to the nearest whole decibel

* Peak traffic conditions – traffic not free flowing.

5. ASSESSMENT PROCEDURE

Using the measured $L_{eq(15\ min.)}$ noise levels shown in Table 4-1, as the external noise level (or exposure level) that the envelope of the building will be subjected to, calculations were performed based on the method described in AS 3671, to determine the traffic noise attenuation (TNA_c) of the building components required to achieve the recommended internal noise criterion. From this the R_w index (weighted sound reduction index) of each component that constitute the building facades exposed to road traffic noise, can be estimated.

Attenuation due to distance, barrier effects and angle of view corrections are applied where appropriate. An increase of 1.5 dB was also added to the results to account for the future growth of traffic in the area, over a ten-year period. Calculations are based on the plans provided by the client, job no. 159/07 issue A, dated November, 2007.

Building components required to achieve the recommended internal noise criterion, are shown below.

6. RECOMMENDED CONSTRUCTION COMPONENTS

The following construction components are considered suitable in order to meet the recommended noise criteria:

These recommendations are based on estimates or actual laboratory test results (where available) of the acoustic performance of the building products. Where possible laboratory test data to support acoustic ratings (R_w) of building products should be requested. However since the performance of these products are dependent on the quality of the installation process and workmanship, it is likely that the product may perform below its acoustic rating when installed. Therefore products recommended are meant as a guide only for the selection of building materials. No guarantees on the performance of the product can be offered post installation.

6.1 Roof/Ceiling Construction

Pitched roof clad with concrete tiles or metal roof over a layer of 16mm thick plasterboard ceiling plus 120mm thick 25 to 30 kg/m^3 acoustic insulation between ceiling joists and medium duty sarking over the roof rafters.

If skylights, ventilators, heat extraction units or other openings into the ceiling cavity for lighting, ventilation, decoration or other purposes are to be provided, then care should be taken to ensure that such units are properly attenuated and all penetrations are properly sealed off so as not to degrade the rating of the roof/ceiling construction system.

Care should also be taken to avoid any noise transmission paths into the ceiling cavity via the eaves.

6.2 External Wall Construction

Minimum Requirements:

Timber stud wall clad externally with 110mm bricks and 10 to 13mm plasterboard internally. Space between timber frame and bricks is to be at least 40mm and clear of all debris. Wall cavity filled with acoustic/heat insulation batts would be beneficial.

Where the external cladding is not brick, two layers of 13mm plasterboard to inside face, two layers of 13mm moisture resistant plasterboard to outside face over which the external cladding is fixed. Cavity is to be filled with 25 to 30 kg/m^3 acoustic insulation.

Note: Penetrations into external walls (including gables), for air vents, weep holes etc. must be avoided or where necessary must be properly attenuated. Should the need arise to provide mechanical ventilation or air conditioning for the residences, then care should be taken to ensure that the ratings of external walls and windows are not compromised.

6.3 Window Construction

The attenuation for airborne sound insulation for windows is given in terms of a weighted sound reduction index (R_w) see AS/NZS 1276.1:1999. This is numerically similar to the previously used term - sound transmission class (STC).

Recommended glazing for windows/sliding doors is minimum requirements for acoustic purposes. In some cases thicker glass may be required for safety or other purposes.

In some instances the types of glazing systems shown on plans may have to be varied in order to achieve the recommended window ratings. Laboratory test data to support window/sliding door ratings (R_w) should be requested.

Table 6-1: Glazing Requirements

Window/Door Location	*Minimum R_w Requirements*
All bedroom windows facing south (Hume Hwy.)	34
Family room sliding doors facing south (Hume Hwy.)	30
Kitchen windows	30
Sliding door & window facing north of main bedroom	25
Lounge room sliding doors	25
Bay windows for bedroom 1 for units 1 and 10	30
Bay windows for lounge room for units 1 and 10	25
All other windows	23

6.4 External doors

Solid core doors with acoustic seals around sides and top, and drop seal at the base. The seals should be similar to the Raven RP47 for top and sides, and RP38 for the threshold.

6.5 Mechanical Ventilation

The recommended components for building construction are based on the assumption that windows and external façade doors are shut. If windows and doors are opened, then required internal noise criteria may not be met.

The main purpose for opening windows is to introduce fresh air into a room. This can be achieved by providing mechanically ventilated systems, with silenced air intakes and outlets. This will overcome the need for windows to be opened in order to supply fresh air into noise sensitive areas. Alternatively the residences may be air-conditioned.

The assessment for noise due to mechanical ventilation or air conditioning of the residences is not within the scope of this report. Such an assessment would need to be undertaken separately when the plans for such services are prepared.

However if providing mechanical ventilation or air-conditioning for the residences, then the following general guidelines should be followed:

Note i. When providing mechanical ventilation or air conditioning for the residences, care should be taken to ensure that the ratings of external walls, ceilings and windows are not compromised. The use of mechanical services equipment can also introduce noise problems, and therefore the choice and location of such units is very important. Generally locate external units as far as possible from neighbouring boundaries. The provision of barriers or enclosures for external units may also have to be considered.

ii. If providing air-conditioning for the residences, noise from the external unit must comply with the general criterion of "background plus 5" at the common boundaries, or any other criterion that may be in Council's DCP that applies specifically to noise emanating from air-conditioning units for domestic use.

6.6 Benefits of Continuously Attached Residences

In the plans provided to us, the development is shown to consist of a group 10 attached dwellings on super lot 54. However we are given to understand that the original plan submitted and approved by Council was for 9 dwellings to be constructed on this lot consisting of 3 groups of 3 attached town houses with a gap of about 5m between each block. Clearly from the acoustic point of view this would be undesirable since the three blocks with large gaps between them would offer less acoustic protection for the residences further behind. On the other hand if the front row of town houses were all attached, this would provide a "continuous" noise barrier for the residences behind.

From the measured noise levels shown in Table 4-1 above it will be seen that the attenuation afforded by a continuous noise barrier along with distance attenuation, would reduce the impact of traffic noise at these rear building blocks by at least 10 dB; whereas the attenuation offered by distance alone may not reduce the impact of traffic noise sufficiently, not to require some acoustic treatment having to be provided for these residences.

6.7 Installation

The acoustical effectiveness of the fitting out of a building with acoustic windows, doors and other products will also be dependent on the quality of the installation and associated workmanship. It is important to ensure that products are installed adequately and fully sealed to ensure that air gaps do not occur either within the products or at the perimeter and so reduce the attenuation of the building.

7. CONCLUSION

An assessment for the noise impact inside the proposed development at Lot 54, 61 Hume Hwy., Lansvale, due to traffic on the Hume Hwy., has been carried out. The assessment indicates that appropriate acoustical treatment of the facades exposed to traffic noise would be required to meet the noise criterion that is imposed. General guidelines for the selection of materials to treat these facades have been recommended. The acoustic treatment recommended in section 6 of our assessment when implemented into the construction of the building, is intended to achieve the internal noise goals set out in AS2107.

APPENDIX I

List of Equipment Used for Noise Survey

Equipment	*Model/Type*	*Serial No.*
Sound Level Meter	SVAN 948	6965
Pre-amplifier	SV12L	7811/12
Microphone	SV22	4011459/60
Calibrator	B&K 4230	724711

Calibration was checked periodically, and no significant drift in calibration was detected.