ACOUSTICS AND AIR

2 MACARTHUR DRIVE, HOLSWORTHY

NOISE & VIBRATION IMPACT ASSESSMENT

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GLOSSARY OF ACOUSTIC TERMS

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 here defined.

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.

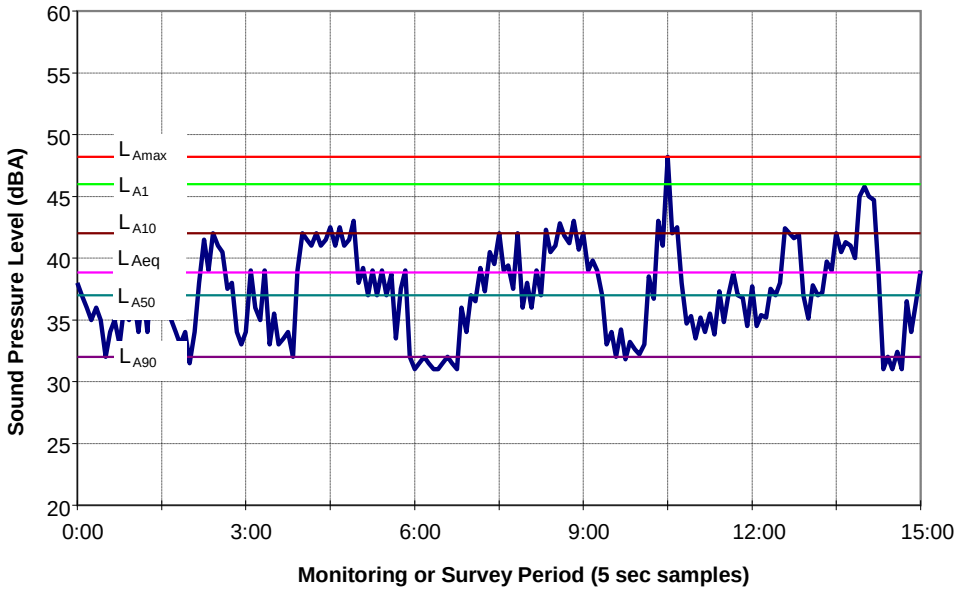
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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.

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.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray Pty Limited has been commissioned to assess noise and vibration for a proposed mixed use development located on the corner of Heathcote Road and MacArthur Drive, Holsworthy. The proposed development will consist of a retail centre with approximately 400 residential apartments above.

This report presents the findings of the assessment of impacts from road noise, as well as noise and vibration from the adjacent rail line.

2 SITE DESCRIPTION

The proposed site is approximately 18,600m^2 located at 2 MacArthur Drive, Holsworthy. An aerial overview of the site, including monitoring locations used for the assessment is presented in Figure 2-1.

Figure 2-1 Aerial Overview of the Site & Surrounding Area

The site is bounded by Heathcote Road to the north-east, MacArthur Drive and low density residential to the north-west, and a rail corridor to the south.

The development is proposed to consist of a single level of retail, including a supermarket that spans most of the site. Built on top of this will be 8 towers ranging from 8 to 14 stories high. Space has been allocated in the south-west corner of the site to potentially be used as a childcare centre.

A layout of the proposed site is provided in Figure 2-2.

Figure 2-2 View of the Proposed Site

3 NOISE & VIBRATION CRITERIA

Guidelines for developments near rail corridors and busy roads are outlined in the NSW Department of Planning document *Development Near Rail Corridors and Busy Roads – Interim Guideline.* This document references the *State Environment Planning Policy (Infrastructure) 2007 (Infrastructure SEPP)* and provides the following design criteria:

3.1 Road Noise Criteria

Clause 102 applies to a 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 transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data available on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise:

- building for residential use;
- a place of public worship;
- a hospital; or
- an educational establishment or childcare centre.

In other circumstances (eg. development adjacent to a road with an annual average daily traffic volume of 20,000–40,000 vehicles) these guidelines provide best practice advice.

Traffic data provided by Terraffic Pty Ltd as well as the RTA website data indicated that the average daily traffic volume was approximately 20,000–25,000 vehicles. Clause 102 will therefore be used to set the traffic noise goal.

For clause 102 where the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

- In any bedroom in the building: 35dB(A) at any time 10pm–7am, based on $L_{Aeq,9hr}$; and
- Anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time, based on $L_{Aeq,15hr}$.

3.2 Rail Criteria

Clause 87 applies to a development for any of the following purposes that is on land that is in or immediately adjacent to a rail corridor and the consent authority considers development is likely to be adversely affected by rail noise or vibration:

- building for residential use;
- a place of public worship;
- a hospital; or
- an educational establishment or childcare centre.

3.2.1 Rail Noise

For clause 87 where the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:

- In any bedroom in the building: 35dB(A) at any time 10pm–7am, based on $L_{Aeq,9hr}$; and
- Anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time, based on $L_{Aeq,15hr}$.

3.2.2 Groundborne Noise Criteria

The Interim Guidelines state that for groundborne noise, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-borne L_{ASmax} noise level of 40dBA (daytime) or 35dBA (night-time).

3.2.3 Vibration Criteria

The Interim Guidelines take vibration criteria from Department of Environment and Conservation (NSW) (2006) *Assessing Vibration: A Technical Guideline*.

Acceptable values of human exposure to vibration are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred and maximum values for vibration dose value (VDV) is set out in Table 3-1.

Table 3-1 Vibration Guide Values for Intermittent Vibration

Place	Time	Vibration Dose ($m/s^{1.75}$)	
		Preferred	**Maximum**
Residences	Daytime	0.20	0.40
	Night time	0.13	0.26
Offices	Day or night time	0.40	0.80
Workshops	Day or night time	0.80	1.60

4 NOISE AND VIBRATION ASSESSMENT

4.1 Road Traffic Noise

Unattended noise monitoring was conducted at Location 3 (see Figure 2-1) in line with the residential façade to determine the existing traffic noise levels in the area. Monitoring took place from Monday 5 December 2016 until Monday 12 December.

The noise monitoring equipment used for this measurement consisted of ARL 215 environmental noise loggers set to A-weighted, fast response, continuously monitoring in 15-minute intervals. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary of Acoustic Terms for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events. This is used for the assessment of sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period.

The results of this monitoring are presented in Table 4-1.

Table 4-1 Results of Unattended Noise Monitoring

	Day	Evening	Night	AM Shoulder	PM Shoulder	Day 15hr	Night 9hr
L_{Aeq}	59	57	55	58	55	59	55
RBL	46	46	33	44	39	-	-

The measured L_{eq} levels are taken as the noise level at the façades facing Heathcote Road. The internal levels therefore use standard assumptions for transmission losses such as 10dBA through an open window and 20dBA through a closed window. These predictions are presented in Table 4-2, based on the 15 hour and 9 hour levels.

Table 4-2 Predicted Internal Levels due to Road Noise

Location	Period	External $L_{Aeq, period}$	Internal Level with Windows Open (dBA)	Internal Level with Windows Closed (dBA)	Criteria (dBA)
Windows Facing Heathcote Road	Day (7am-10pm)	59	49	39	40
	Night (10pm-7am)	55	45	35	35
Windows Perpendicular to Heathcote Road	Day (7am-10pm)	56	46	36	40
	Night (10pm-7am)	52	42	32	35

These predictions indicate that, for the four buildings along the north-eastern boundary, closing the windows may be required to meet the internal noise levels at both the facades facing and the facades perpendicular to Heathcote Road. If windows are to be closed, then adequate ventilation in accordance with the Building Code of Australia and Australian Standard 1668 – *The Use of Ventilation and Air Conditioning in Buildings* must be provided.

4.2 Airborne Rail Noise

Attended measurements were conducted where the L_{AE} of ten train pass bys were measured at both Locations 1 and 2. The average of these L_{AE} were then used to calculate the L_{eq} level for the day and night periods. The Sydney Trains website was used to determine that on any typical day approximately 120 trains will pass by during the day period with a further 30 during the night period. The predictions of airborne rail noise at the facades and inside are presented in Table 4-3, after adjusting for the distance to the facades.

Table 4-3 Predicted Internal Levels due to Airborne Rail Noise

Location	Average Measured L_{AE}	Period	$L_{Aeq, period}$	Internal Level with Windows Open (dBA)	Criteria (dBA)
Near Measurement Point 1	69	Day (7am-10pm)	43	33	40
		Night (10pm-7am)	39	29	35
Near Measurement Point 2	65	Day (7am-10pm)	39	29	40
		Night (10pm-7am)	35	25	35

The predicted levels for both measurement point 1 and 2 are below the required level. These levels are achieved even with the windows open and therefore standard openable windows with no additional mitigation will be sufficient.

4.3 Groundborne Rail Noise

Measurements of peak particle velocity vibration levels were also conducted during each train pass by. These levels were then converted to decibels and analysed to predict the potential groundborne noise being generated within the residential apartments. The average and maximum predicted levels at the building, are presented in Table 4-4.

Table 4-4 Predicted Internal Levels due to Groundborne Noise

	$L_{AS, Max}$ (dBA)	Criteria (dBA)
Average predicted internal level	22	-
Maximum predicted internal level	30	35

The criterion requires the 95th percentile train to comply with the 35dBA internal level. As 20 measurements were taken one would be allowed to exceed the criterion. All of the predicted train levels are well below the criterion and therefore no mitigation will be required in relation to groundborne noise.

4.4 Rail Vibration

During each pass by the VDV was recorded at locations 1 and 2. The average of these values was used to obtain a VDV for the total number of trains that would pass by each day and night, and this was adjusted to the building distance. The average measured VDV and the overall VDV for day and night are presented in Table 4-5.

Table 4-5 Measured and Predicted Vibration Dose Value

	Averaged Measured VDV ($m/s^{1.75}$)	Predicted VDV for Day/Night ($m/s^{1.75}$)	Preferred VDV Day/Night ($m/s^{1.75}$)
Near Location 1	0.013	0.041/0.029	0.2/0.13
Near Location 2	0.012	0.041/0.029	0.02/0.13

Again, these predicted levels are at the foundation of the building and would be lower if calculated to the residences on the higher floors. This isn't required however as the values are well below the preferred VDV level for both the day and night period indicating that there is no issue with human comfort.

5 CONCLUSION

The noise impact at the proposed development of a multistorey mixed use complex at 2 MacArthur Drive, Holsworthy has been assessed against the relevant NSW criteria for noise and vibration.

The proposed development meets all of the required criteria outlined in the NSW Department of Planning document *Development Near Rail Corridors and Busy Roads – Interim Guideline* for rail noise, ground borne noise and vibration. It has been determined that no additional mitigation will be required as a result of the nearby rail line.

To meet the criteria for road noise from Heathcote Road some windows of all four apartment blocks along the north eastern boundary are required to be closed. In particular, for these four buildings, the windows on the north eastern, north western and south eastern facades may need to be kept closed. Adequate ventilation in accordance with the Building Code of Australia and Australian Standard 1668 – *The Use of Ventilation and Air Conditioning in Buildings* therefore will be required, but standard windows and glazing is acceptable.