RAPT CONSULTING

Acoustic Assessment – Cessnock Road Gillieston Heights, NSW

Prepared for

Loxford Project Management Pty Ltd

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Acoustic Assessment – Cessnock Road Gillieston Heights, NSW

Prepared For:

Loxford Project Management Pty Ltd

Prepared By:

RAPT Consulting

18&19 / 10 Kenrick Street

The Junction, NSW 2291

ABN: 30330220290

www.raptconsulting.com.au

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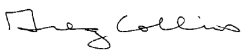
2221340_220131	0	Gregory Collins - MAAS	

Table of Contents

Table Index

Figure Index

1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake an acoustic assessment for Loxford Project Management Pty Ltd to inform a Development Application (DA) for a proposed Subdivision located at Cessnock Road, Gillieston Heights NSW. The subject site is shown in Figure 1-1.

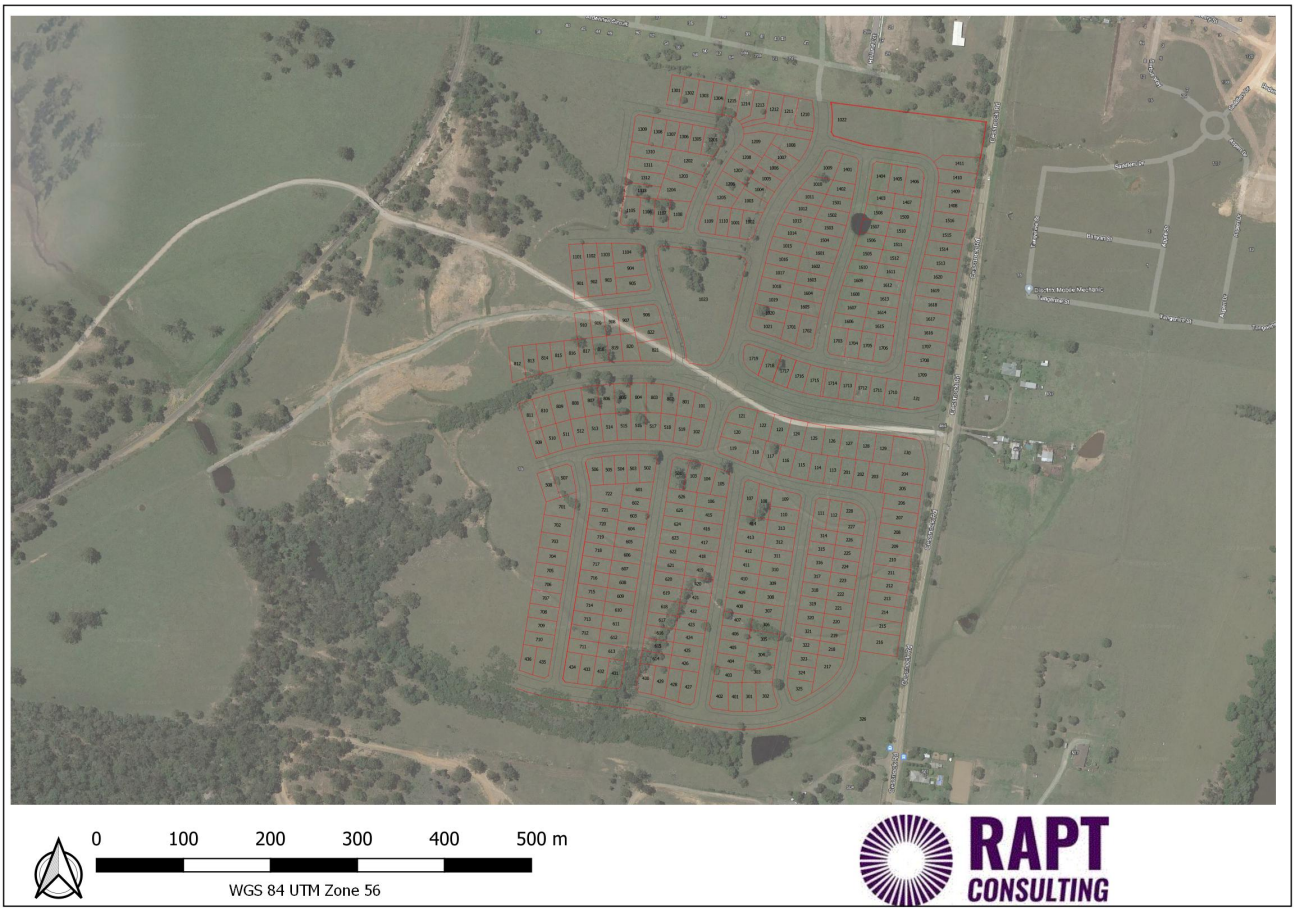


Figure 1-1 Subject Site

1.2 Limitations

The purpose of the report is to provide an independent acoustic assessment at to support the proposal.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the noise assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for acoustics were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

The site is currently zoned RU2 Rural Landscape. A map showing the land use zonings in the vicinity of the proposal are shown in Figure 2-1.

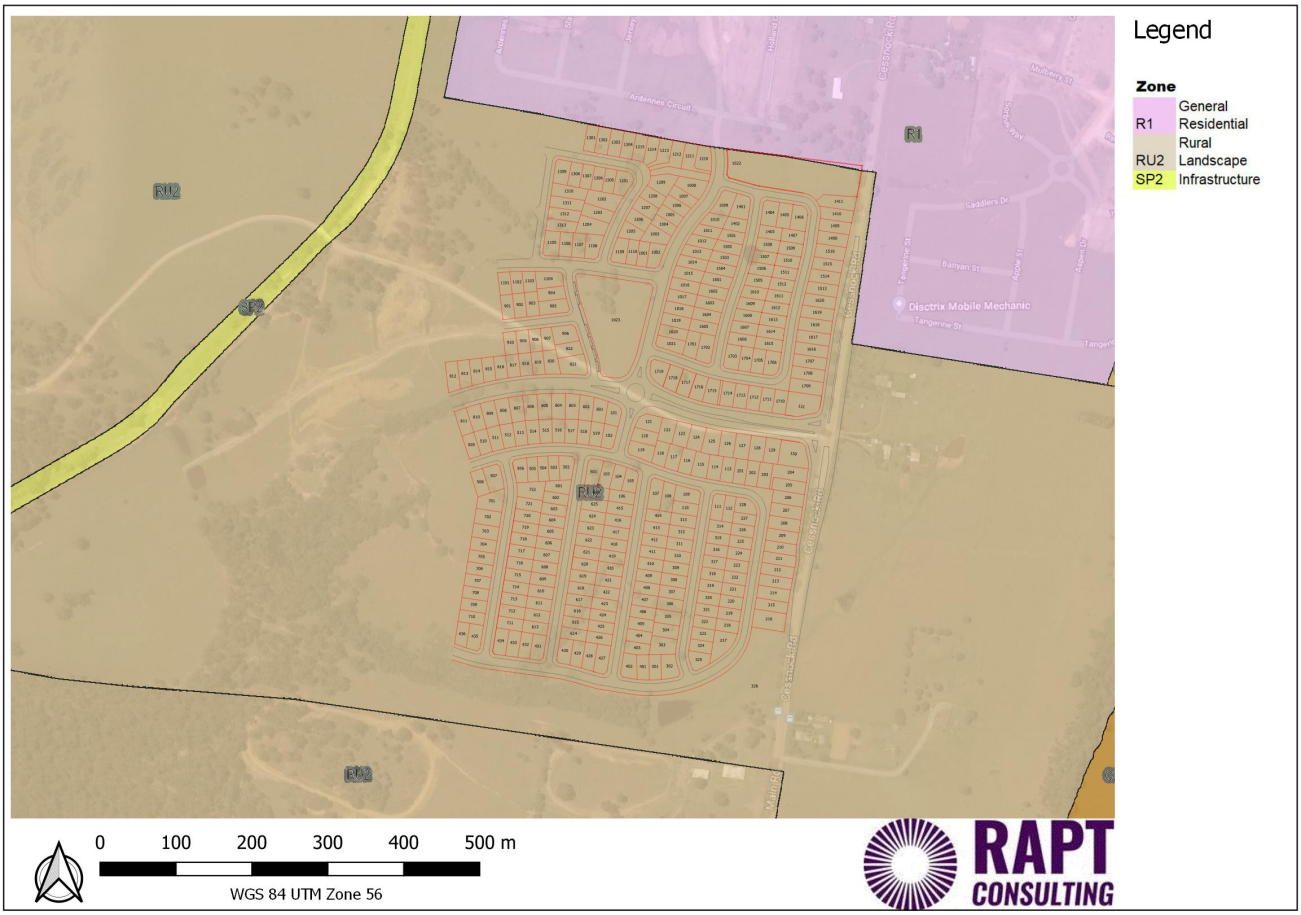


Figure 2-1 Land Use Zonings

To establish background and ambient noise levels, noise monitoring was undertaken by RAPT Consulting from 9 September to 15 September 2021 at the Eastern boundary of the site at 464 Cessnock Road. The site was selected as it provided an approximate location of the most potentially exposed residences to Cessnock Road noise, was indicative of the overall ambient noise environment for the project and it presented as a relatively secure location whereby minimising the risk of theft or vandalism to the monitoring equipment.

During site visits it was noted that that existing road traffic from Cessnock Road, and wildlife sources primarily described the ambient noise environment and was typical of a sub-urban area.

The monitoring location is shown in Figure 2-2 and 2-3.

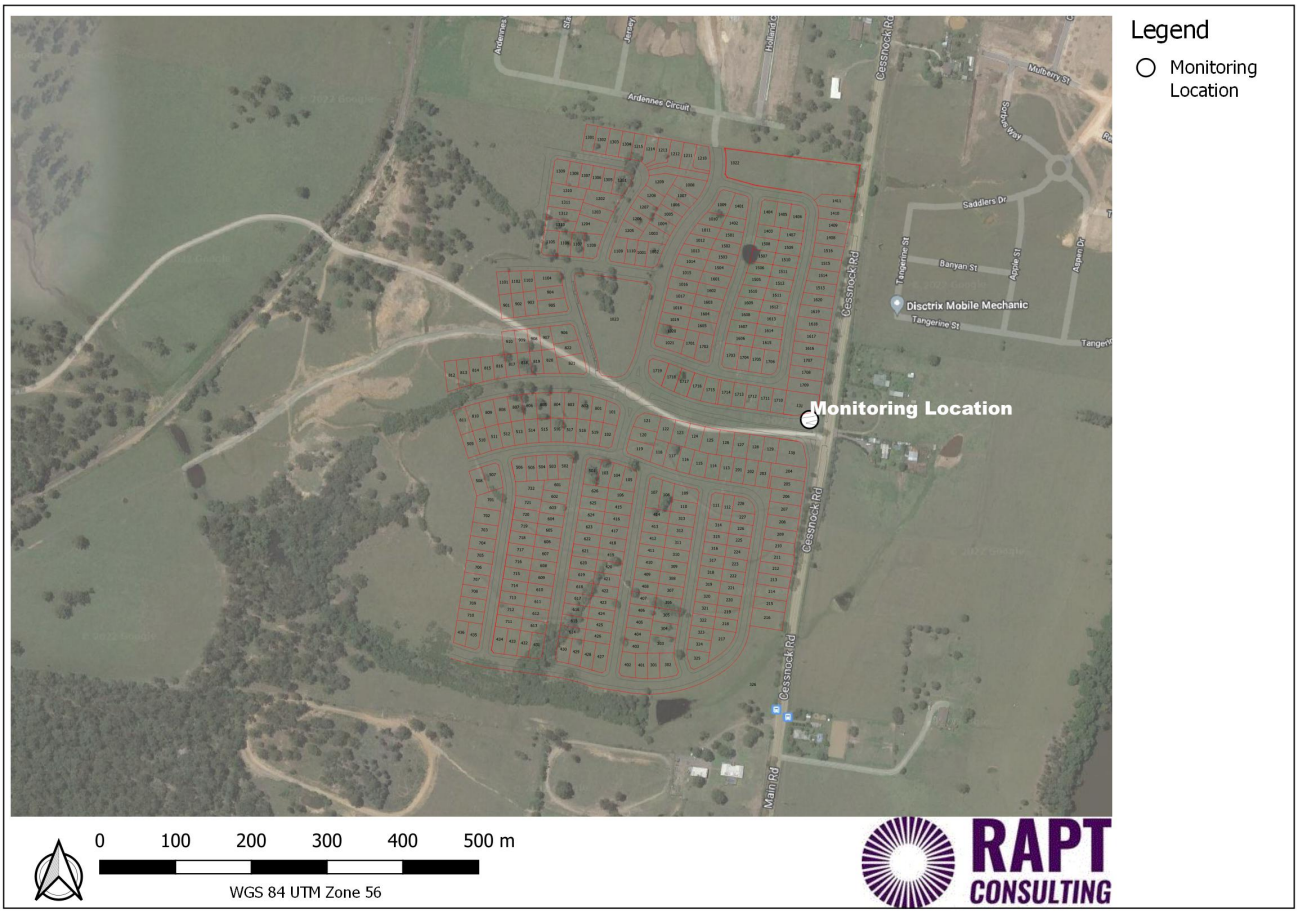


Figure 2-2 Noise Monitoring Location

Figure 2-3 Noise Monitoring Location

Monitoring was undertaken using a RION NL-42 noise logger with Type 2 Precision. Calibration was checked prior to and at the conclusion of the measurements with no significant drift. These loggers are capable of measuring continuous sound pressure levels and are able to record L_{Amin}, L_{A90}, L_{A10}, L_{Amax} and L_{Aeq} noise descriptors. The instrument was programmed to accumulate environmental noise data continuously over sampling periods of 15 minutes for the entire monitoring period.

The noise surveys were conducted with consideration to the procedures described in Australian Standard AS 1055:2018, "Acoustics – Description and Measurement of Environmental Noise" and the NSW Noise Policy for Industry (NPfI). Calibration was checked before and after each measurement and no significant drift occurred. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics – Sound level meters – Specifications.

The L_{A90} descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90 percent of the time over a relevant period of measurement. In line with the procedures described in the EPA's NPfI, the assessment background level (ABL) is established by determining the lowest tenth-percentile level of the

L_{A90} noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABL's determined over the entire monitoring duration. The RBL is representative of the average minimum background sound level, or simply the background level.

The L_{Aeq} is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average. Logged data was reviewed and filtered to exclude any extraneous data during the monitoring period. Table 7 of the NSW EPA Road Noise Policy provides guidance on the application of a façade correction factor. Due to the monitoring location not being within 3.5 metres of a wall that could reflect sound, a façade correction factor of 2.5 dB(A) has been added to the measurements.

Logged data was reviewed and filtered to exclude any extraneous data during the monitoring period. Weather information for the unattended noise logging was obtained from the Bureau of Meteorology Maitland all weather station for the monitoring period and any data adversely affected by rain, wind (more than 5 m/s as per NPfl) were discarded.

Table 7 of the NSW EPA Road Noise Policy provides guidance on the application of a façade correction factor. Due to the monitoring location not being within 3.5 metres of a wall that could reflect sound, a façade correction factor of 2.5 dB(A) has been added to the measurements.

The RBL and ambient LAeq levels are provided in Table 2-1 below.

Table 2-1 Background and Ambient Noise Monitoring Results

Descriptor	464 Cessnock Road Noise Level dB(A)	Time Interval
$L_{A90(11hr)}$	45	7:00am - 6:00pm
$L_{A90(4hr)}$	33	6:00pm – 10:00pm
$L_{A90(9hr)}$	30	10:00pm – 7:00am
$L_{Aeq(15hr)}$	61.8 +2.5=**64.3**	7:00am - 10:00pm
$L_{Aeq(9hr)}$	57.8 +2.5=**60.3**	10:00pm – 7:00am

3. Guidelines

3.1 Development Near Rail Corridors and Busy Roads

The Department of Planning Guideline "Development near Rail Corridors and Busy Roads – Interim Guideline" (Guideline) Section 3.5 of the guideline specifies the internal noise criteria outlined in Table 3-1 Below.

Table 3-1 Internal Noise Level Goals

Type of Occupancy	Noise Level	Time Period
Sleeping areas / Bedrooms	*35dB(A) Windows Closed	Night 10:00pm to 7:00am
Other Habitable Rooms (excluding garages, kitchens bathrooms and Hallways)	40dB(A) Windows Closed	Any Time

Note 1 Whilst not specified in the ISEPP, daytime criteria for bedrooms are set to 40dB(A), as per the other habitable rooms.

The guidelines outlined above originated from the Rail Infrastructure Corporation (RIC) publication Consideration of Rail Noise and Vibration in the Planning Process" (2003) where it is specific that the criteria apply with windows and doors closed. If noise levels with windows or doors open exceed these criteria by more than 10 dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire.

As noise modelling is undertaken for external locations, the above criteria and guidelines have been used to establish equivalent external noise criteria. This external noise criterion is used to determine which building facades may require specific acoustic treatment to meet the requirements of the Guideline. External goals have been calculated on the basis of nominal 10dB(A) reduction through an open window to a free-field position. Windows open to 5% of floor area in accordance with the BCA 2011 requirements. Table 3-2 provides road and rail traffic noise criteria for a new residential development

Table 3-2 Road and Rail Traffic Noise Criteria for a New Residential Development

Room	Location	Day 7am-10pm $L_{eq(15hr)}$ dB(A)	Night 10pm-7am $L_{eq(9hr)}$ dB(A)
Other Habitable Rooms (excluding garages, kitchens bathrooms and Hallways)	Internal, Windows Closed	40	40
	Internal, Windows Open	50	50

Room	Location	Day 7am-10pm $L_{eq(15hr)}$ dB(A)	Night 10pm-7am $L_{eq(9hr)}$ dB(A)
	External Free-Field (Allowing for Open Windows)	60	60
Sleeping areas / Bedrooms	Internal, Windows Closed	40	35
	Internal, Windows Open	50	45
	External Free-Field (Allowing for Open Windows)	60	55

4. Acoustic Assessment

The NSW Environmental Noise Management Manual specifies that standard window glazing of a building will typically attenuate the external noise levels by at least 20dB(A) with the windows closed and 10 dB(A) with the windows open (allowing for natural ventilation). This means that an external noise level of 60 Leq dB(A) during the day and 55 Leq dB(A) night would result in compliance with the internal noise level goals outlined in Table 3-1 and 3-2.

The predicted internal noise levels for standard façade glazing are presented in Table 4-1 based on the noise monitoring results.

Table 4-1 Internal Noise Goal Comparison

Type of Occupancy	Recorded Ambient Noise Level	Internal Noise Level	Noise Goal Level	Time Period
Sleeping areas / Bedrooms	60.3 dB(A)	40.3 dB(A)	35dB(A) Windows Closed	Night 10:00pm to 7:00am
Other Habitable Rooms (excluding garages, kitchens bathrooms and Hallways)	64.3 dB(A)	44.3 dB(A)	40dB(A) Windows Closed	Any Time

The predicted internal noise levels particularly for the closest facades to Cessnock Road indicate internal noise goals may be exceeded for both habitable rooms and bedrooms. To achieve noise goals with the windows shut on the eastern façade of the project, it is recommended mitigation measures during building design should be implemented. Additionally, internal noise levels with windows or doors open in sleeping areas are predicted exceed the criteria by more than 10dBA. Therefore, it is recommended the design of the ventilation for these rooms should be such that occupants can leave windows closed.

4.1 Traffic Noise Model

Traffic information contained in the SECA Solution Traffic Assessment *P1608SDA Gillieston Heights School TIA 27 October 2020* was reviewed and utilized to assist in calculating traffic noise levels at nearest lots to Cessnock Road.

The Calculation of Road Traffic Noise (CoRTN) method of traffic noise prediction was used. The CoRTN method accommodates the following factors affecting traffic noise.

- Posted Speed
- % Heavy Vehicle traffic
- Roadway Gradient
- Topographic features;

- Receiver / Source distance and heights;
- Intervening Ground Cover;
- Reflections from buildings.

The noise model of the existing situation is checked against the measured noise levels on Cessnock Road. If the predictions of the noise model are similar to the measured levels, then there is confidence that the future scenario noise predictions will also be accurate. The CoRTN algorithm and noise modelling process was validated against the road traffic noise monitoring data contained in the above mentioned SECA Solution report. The model is deemed to be verified if the average difference between the measured and calculated values of the descriptors is within +/- two dBA.

The model was verified with the noise data from the monitoring locations. The predicted $LA_{10(18hr)}$ was compared with the LA10(18hr) calculated from logging data, and a calibration factor was determined. Table 4-1 shows the measured and predicted $L_{10(18hr)}$ values used to calculate the calibration constants.

Table 4-2 Noise Model Verification

Descriptor	464 Cessnock Road Noise Level dB(A)
Measured $L_{A10(18hr)}$	66.6
Predicted $L_{A10(18hr)}$	66.4
Difference	0.2

The model is deemed to be verified if the average difference between the measured and calculated values of the descriptors is within +/- two dBA which in this instance is the case.

Noise modelling contours showing external traffic noise levels are provided in Figure 4-1 with the implementation of a 1.8 metre-high noise barrier (in blue) running north and south along the boundary of the subdivision parallel with Cessnock Road.

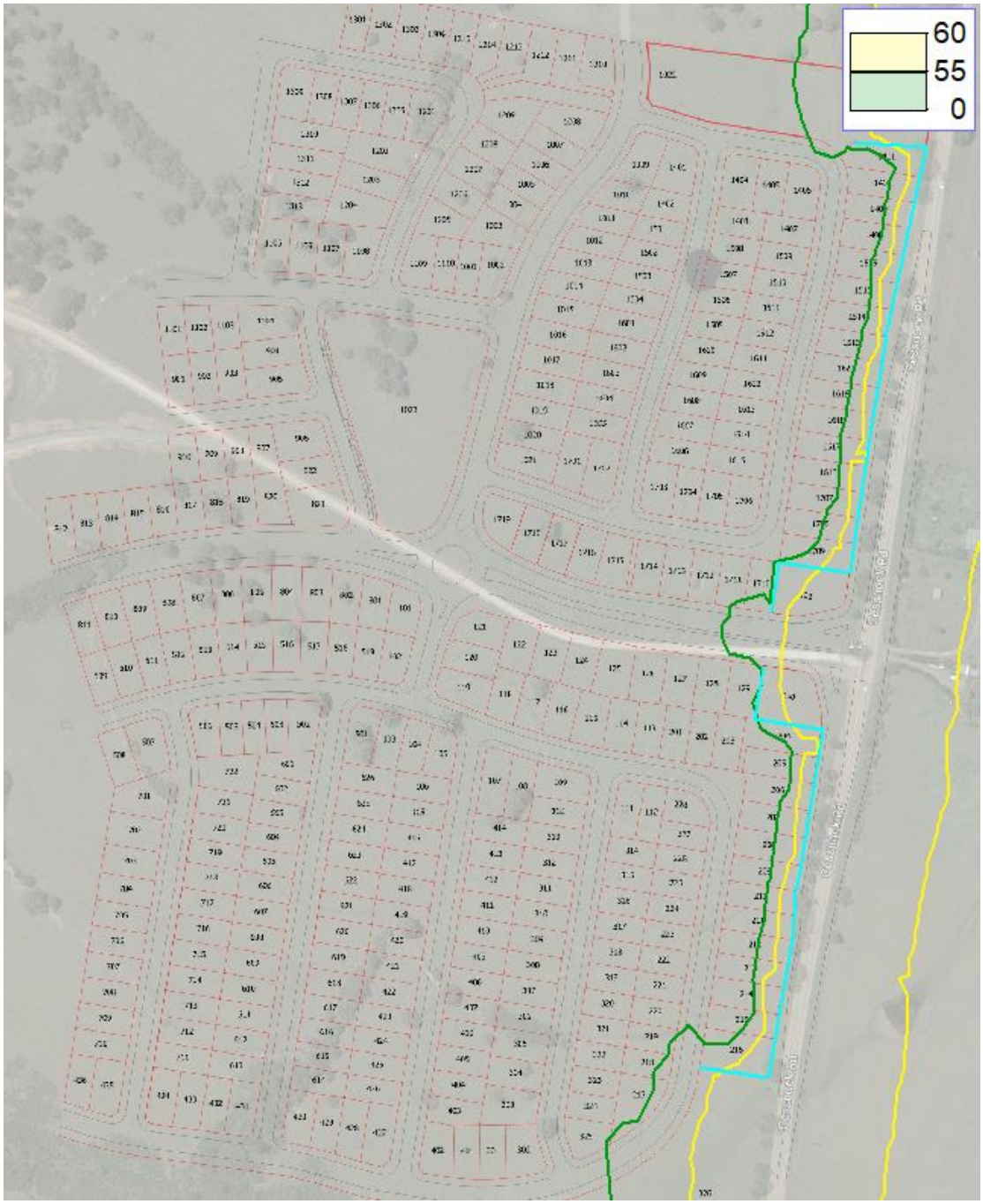


Figure 4-1 External Traffic Noise Levels dB(A)

4.2 Mitigation Measures

Based on the monitoring results, windows with direct line of sight to traffic such as areas on the eastern façade, sleeping area / bedroom would need to attenuate at least 26dB(A) of the traffic noise (60.3 calculated - 35 acceptable). The façade of any living areas would need to attenuate at least 25 dB(A) (64.3 – 40). Figure 4-1 is a reproduction of Figure B2 from the Guideline showing a typical situation of a dwelling adjacent to a busy road. The figure gives traffic noise loss for 3 construction specifications A-C.

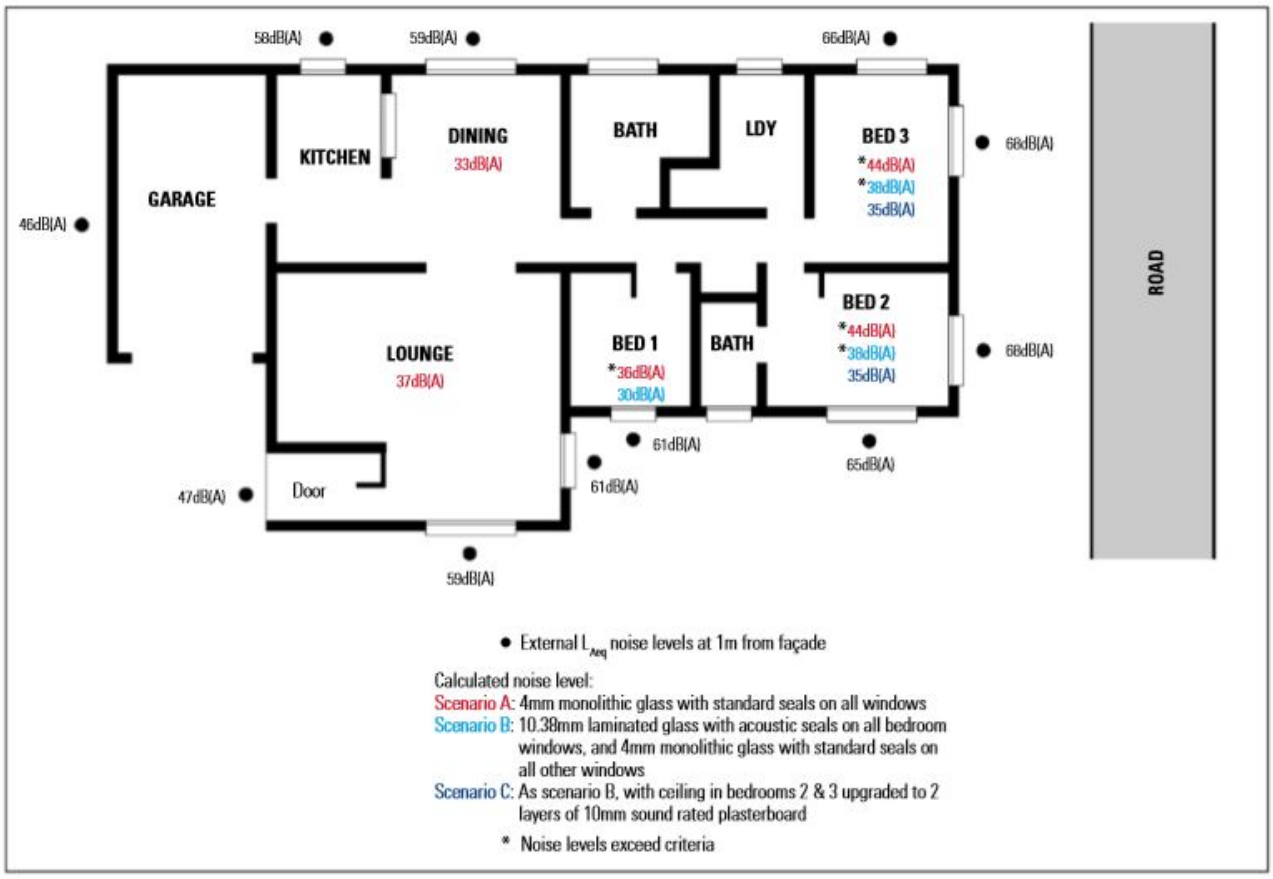


Figure 4-2 Traffic Noise Reduction for Different Construction Materials

Specification A

Windows	standard 4mm monolithic glass with standard weather seals on all windows	(Rw 25)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	tiled roof and standard plasterboard ceiling with insulation	(Rw 43)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Figure 4-3 Specification A

Specification B

Windows	10.38mm laminated glass with acoustic seals on all bedroom windows, standard 4mm monolithic glass with standard seals on all other windows	(Rw 35)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	tiled roof and standard plasterboard ceiling with insulation	(Rw 43)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Figure 4-4 Specification B

Specification C

Windows	10.38mm laminated glass with acoustic seals on all bedroom windows, standard 4mm monolithic glass with standard seals on all other windows	(Rw 35)
Doors	30mm solid core timber – lounge room aluminium framed glass sliding door – lounge and dining rooms	(Rw 24)
Walls	brick-veneer and standard plasterboard on timber studs with insulation in cavity	(Rw 52)
Roof	as per Specification B, except the single layer of standard plasterboard ceiling is replaced with a double-layer of 10mm sound-rated plasterboard ceiling	(Rw 52)
Floor	concrete slab	

Note: 'Rw' is the weighted sound reduction index of a building element

Figure 4-5 Specification C

Figure 4-1 shows a traffic noise level of 68 dB(A) at windows directly facing a busy road. The figure shows that this noise may be reduced by 30 dB(A) by the sound transmission loss associated with construction adhering at a minimum, to "Scenario B". Currently, there are no building plans on the lots. Therefore, as a minimum, the façade of any bedrooms or living areas which may front Cessnock Road are recommended to be constructed with consideration to Specification B from the Guideline.

The above relates to facades with a full line of sight to the traffic. Figure 4-1 also shows windows which are on facades perpendicular to the road. The noise impacting on these windows is consequently shielded from 50% of the traffic noise by the building structure, and noise levels are 2-3 dB below the traffic noise level for windows which have direct line of sight to the traffic. Figure 4-1 also demonstrates that as the distance from the road increases resulting noise levels at other windows shown in the figure decrease as well.

The recommendations are generally applicable to the eastern facades of the development that front Cessnock Road. Residences further removed from Cessnock Road will be, by definition, more distant from the traffic noise and may be shielded, or at least partially shielded, from the traffic noise by the intervening structure and other buildings closer to the road.

Ventilation Requirements

The Guideline also qualifies that if internal noise levels with windows and doors open sufficiently to provide adequate ventilation exceed the criteria by more than 10 dB(A) the design of the ventilation of these rooms should be such that occupants can leave windows closed, if they so desire, while meeting the ventilation requirements of the Building Code of Australia. This equates to an internal noise level, with windows open, of 45 dB(A) Leq during the night and 50 dB(A) Leq during the day.

Windows in facades with line of sight to Cessnock Road where the received noise is 60.3 dB(A) Leq (9hr) and 64.3 dB(A) Leq (15 hr) are predicted to exceed criterion if those windows are open. Therefore, it is recommended that the project be designed such that ventilation requirements are satisfied with consideration to the Building Code of Australia for occupants of all units may leave their windows closed if they so desire.

External Noise

The Guideline indicates that where a new residential development is planned to occur near a busy road appropriate building design, layout and construction techniques should be applied to minimise noise intrusion and provide suitable internal noise levels for sleeping and other uses. While the guideline generally applies to internal spaces, which are regarded as the most sensitive, external areas should be also be considered. Measured noise levels indicate exterior noise ranged from 64.3 dB(A) Leq(15hr) and 60.3 dB(A) Leq(9hr) at the eastern façade facing Cessnock Road. To minimise noise exposure and to provide residences with privacy particularly for residences facing Cessnock Road, it is recommended acoustic fences be installed on the eastern facades of the private space areas where appropriate. To act as an acoustic barrier any fencing or walls must be solid (minimum 10kg/m^2) and to be at least 1.8 metres high with no gaps for the passage of sound.

Building Treatments

Figure 4-4 provides acoustic performance of building elements taken from Appendix C of the Guideline.

Category of Noise Control Treatment	R_w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Figure 4-6 Categories of Noise Control Treatments

Specification A figure 4-1 demonstrated that internal noise targets could be achieved with consideration to measured exterior noise levels for residences with that level of window glazing with the exception of living areas and bedrooms of directly facing Cessnock Road that will require Specification B. Acoustically speaking, windows are usually the weakest parts of a facade. An open or acoustically ineffective window will adversely compromise the effect of an otherwise acoustically effective facade. Proper installation is critical to the effectiveness of noise attenuation of windows and other building elements. Therefore, given the measured and modelled exterior noise levels associated with the project, it is recommended that as a minimum, Category 2 of noise control treatment be utilised for residences particularly for eastern facades lining Cessnock Road in the design of this development. A minimum of category 1 is recommended for the remaining properties. Category 2 building treatment recommendations are shown in Figure 4-7

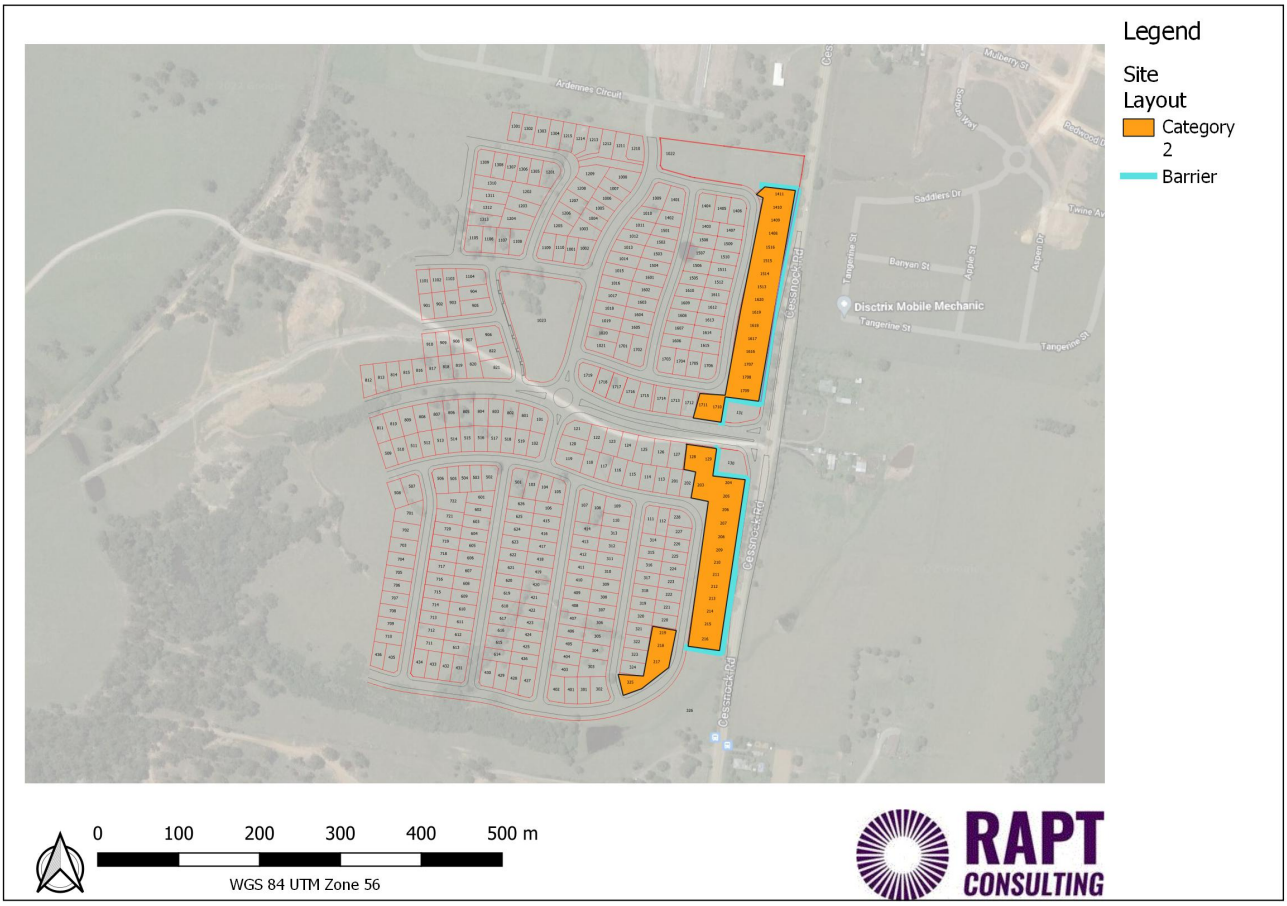


Figure 4-7 Category 2 Building Treatment Recommendations

It is also recommended building layouts be examined for example locating sleeping areas away from Cessnock Road where possible. Examples of category 1 and 2 building types are shown in Figures 4-8 and 4-9. Other options exist provided the right reduction index (Rw) is satisfied.

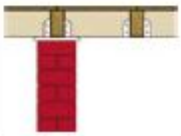
Category No.	Building Element	Standard Constructions	sample
1	**Windows/Sliding Doors**	Openable with minimum 4mm monolithic glass and standard weather seals	
	Frontage Facade	**Timber Frame or Cladding:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally	
		Brick Veneer: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally	
		Double Brick Cavity: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R1.5 insulation batts in roof cavity.	
	Entry Door	35mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Figure 4-8 Category 1 Building Element Examples

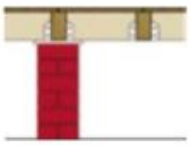
Category No.	Building Element	Standard Constructions	sample
2	**Windows/Sliding Doors**	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
	Frontage Facade	**Timber Frame or Cladding Construction:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally with R2 insulation in wall cavity.	
		Brick Veneer Construction: 110mm brick, 90mm timber stud frame or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	40mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Figure 4-9 Category 2 Building Element Examples

5. Conclusion

This acoustic assessment has been undertaken to inform a Development Application (DA) for a proposed Subdivision located at Cessnock Road, Gillieston Heights NSW

Based on the monitoring results inclusive of road traffic, natural sounds and the information provided regarding the development, it is expected compliance with all noise goals can be achieved provided design measures similar to what has been outlined in Section 4.2 of this report are investigated and implemented.