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Desktop Traffic Noise Assessment for Stage 3, 4 & 5

9 April 2025

Cameron Brae Group

TM564-04F02 Desktop Traffic Noise Assessment for Stage 3, 4 and 5 (r2)

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE
Sydney Melbourne Brisbane Gold Coast Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

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Address:	975 The Northern Road Bringelly NSW 2556
Attention:	Mr Wesley Williams

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Contents

List of tables

List of figures

1 Introduction

Renzo Tonin & Associates was engaged to undertake a desktop traffic noise assessment for the Stages 3, 4 & 5 subdivision of the Lowes Creek Maryland Precinct on The Northern Road at Bringelly, also known as the Birling Development. The desktop traffic noise assessment assesses potential traffic noise from The Northern Road, Lowes Creek Road and future Road No. 10, which would run through the proposed subdivision, impacting future residential properties. The assessment is in accordance with the relevant noise criteria set out in the NSW 'Road Noise Policy' (RNP), the NSW 'State Environmental Planning Policy (Infrastructure)' 2007 (ISEPP) and the Camden Council Environmental Noise Policy 2018.

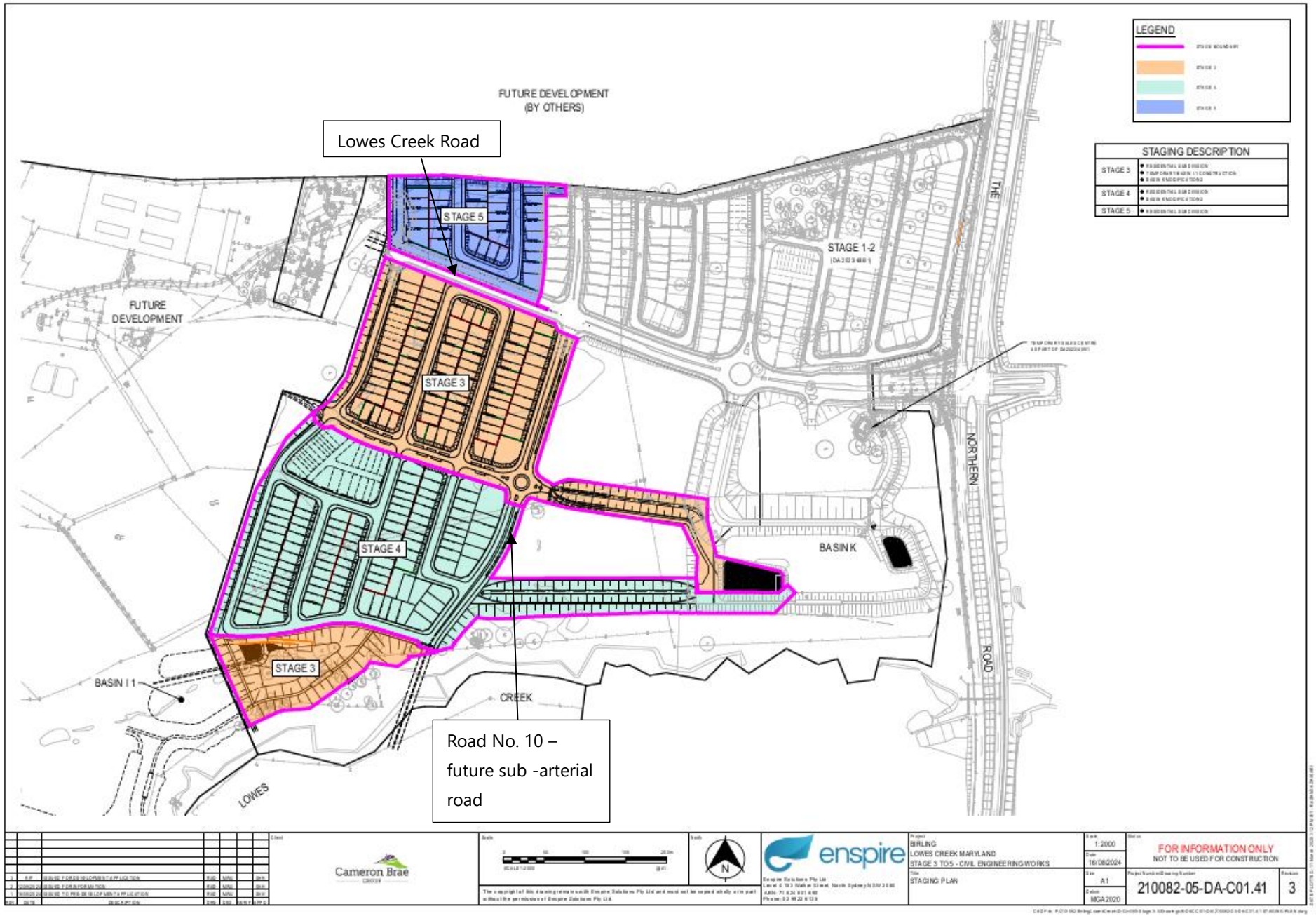
The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project Description

The Lowes Creek Maryland Precinct is located on The Northern Road at Bringelly. The Lowes Creek Maryland Precinct will provide approximately 7,000 new dwellings, as well as retail, commercial and recreational land uses. The Birling development occupies the northern portion of the Precinct and will provide approximately 2,100 new dwellings.

Potential traffic noise impacting future residential properties within the Stages 3, 4 & 5 subdivision includes The Northern Road, Lowes Creek Road and Road No. 10 which would run through the proposed subdivision. Figure 1 shows the location of the Birling development and the Birling Stages 3, 4 & 5 subdivision.

Figure 2-1 – Site Location



3 Road Traffic Noise Assessment

3.1 Road Traffic Noise Criteria

3.1.1 Camden Growth Centre Precincts Development Control Plan

The Camden Growth Centre Precincts Development Control Plan contains the following objectives and controls.

"**2.3.9 Noise**

Objectives

a. *To minimise the impacts of noise from major transport infrastructure, industrial and employment areas on residential amenity.*

b. *To achieve an acceptable residential noise environment whilst maintaining well designed and attractive residential streetscapes.*

Controls

1. **Figure 2-1** *provides guidance to applicants on measures to mitigate the impacts of rail and traffic noise within the Precinct.*

2. *Development Applications must be accompanied by an acoustic report where the development is in a location, shown on the Potential noise attenuation measures figure in the Precinct Schedule, such as:*

   - *Adjacent to a railway line, arterial road, sub-arterial road, transit boulevard or other road with traffic volumes predicted to exceed (or currently exceeding) 6,000 vehicles per day;*
   - *Potentially impacted upon by a nearby industrial/ employment area; or*
   - *Potentially impacting upon sensitive receivers such as residences within the precinct and outside the precinct.*

3. *The acoustic report shall demonstrate that the noise criteria in Development Near Rail Corridors and Busy Roads - Interim Guideline (Department of Planning 2008), and Council's Environmental Noise Policy have been considered.*

4. *Subdivision on land adjacent to significant noise sources is to consider and implement measures to attenuate noise within dwellings and in external areas that are classified as Principle Private Open Space (refer to clause 4.2.7)*

5. *Physical noise barriers (i.e. Noise walls or solid fencing) are not generally supported, and measures to attenuate noise through subdivision layout, such as setbacks, building orientation, and building design and materials selection should be implemented to achieve appropriate internal noise standards.*

4.2.9 Visual and Acoustic Privacy

Objectives

a. *To site and design dwellings to meet user requirements for visual and acoustic privacy, while minimising the visual and acoustic impacts of development on adjoining properties.*

b. *To minimise the impact of noise of other non-residential uses such as parking and sport areas, restaurants and cafes and waste collection and goods deliveries*

Controls

1. *Direct overlooking of main habitable areas and the private open spaces of adjoining dwellings should be minimised through building layout, window and balcony location and design, and the use of screening, including landscaping.*

2. *Living area windows on upper floors with a direct sightline within 9 metres to the Principal Private Open Space of an existing adjacent dwelling are to:*
   - *be obscured by fencing, screens or landscaping, or*
   - *be offset from the edge of one window to the edge of the other by a distance sufficient to limit views into the adjacent window; or*
   - *have sill height of 1.7 metres above floor level; or*
   - *have fixed obscure glazing in any part of the window below 1.7 metres above floor level.*

3. *Balconies are not permitted on the first floor of the side and / or rear portion of the dwelling except where the balcony faces a public road, or land zoned for public recreation or drainage.*

4. *The design of dwellings must minimize the opportunity for sound transmission through the building structure, with particular attention given to protecting bedrooms and living areas.*

5. *In attached and semi-detached dwellings, bedrooms of one dwelling are not to share walls with living spaces or garages of adjoining dwellings, unless it is demonstrated that the shared walls and floors meet the noise transmission and insulation requirements of the National Construction Code.*

6. *No electrical, mechanical or hydraulic equipment or plant shall generate a noise level greater than 5dBA above background noise level measured at the property boundary during the hours 7.00am to 10.00pm and noise is not to exceed background levels during the hours 10.00pm to 7.00am.*

7. *Dwellings along sub-arterial or arterial roads, or transit boulevards, or any other noise source, should be designed to minimize the impact of traffic noise, and where possible comply with the criteria in Table 4-7.*

8. *The internal layout of residential buildings, window openings, the location of outdoor living areas (i.e. courtyards and balconies), and building plant should be designed to minimise noise impact and transmission.*

9. *Noise walls are not permitted.*

10. *Development affected by rail or traffic noise is to comply with Development Near Rail Corridors and Busy Roads – Interim Guideline (Department of Planning 2008). The design of development is also to consider ways to mitigate noise in Principal Private Open Space areas with reference to Council's Environmental Noise Policy.*

11. *Architectural treatments are to be designed in accordance with AS3671 - Traffic Noise Intrusion Building Siting and Construction, the indoor sound criteria of AS2107 - Recommended Design Sound Levels and Reverberation Times for Building Interiors.*

Table 4-7 Noise criteria for residential premises impacted by traffic noise

	Sleeping areas	***Living areas***
Naturally ventilated/ windows open to 5% of the floor area (Mechanical ventilation or air conditioning systems not operating)	*LAeq 15 hours (day): 40dBA* *LAeq 9 hour (night): 35dBA*	*LAeq 15 hours (day): 45dBA* *LAeq 9 hour (night): 40dBA*
Doors and windows shut (Mechanical ventilation or air conditioning systems are operating)	*LAeq 15 hours (day): 43dBA* *LAeq 9 hour (night): 38dBA*	*LAeq 15 hours (day): 46dBA* *LAeq 9 hour (night): 43dBA*

Schedule 6 – Lowes Creek Maryland Precinct – 2.8 Noise

Objectives

a. *Provide an acceptable residential noise environment, whilst maintaining well-designed and attractive residential streetscapes*

b. *Minimise noise impacts on residential properties that are located in the vicinity of artieral, sub arterial collector , bus capable or heavy vehicle access roads and other significant noise sources within the Precinct*

c. *Minimise the impacts of noise on sensitive receivers through subdivision layout and building design*

Controls

1. *Development must be designed to comply with Camden Council's Environmental Noise Policy (2018).*

2. *An acoustic report is required to be submitted with any subdivision development applications that will result in residential dwelling adjoining principal arterial (i.e. The Northern Road), sub arterial, collector roads, and /or bus capable and heavy vehicle*

access roads. Acoustic reports must be prepared by a suitably qualified consultant. As a minimum, an acoustic report must:

a. identify receivers;

b. determine background noise levels (where required)

c. establish noise criteria;

d. provide predicted noise levels (including relevant assumptions)

e. assess potential impacts; and

f. consider reasonable and feasible mitigation measures

3. Council may determine whether an acoustic report is not required following consideration of a preliminary assessment from a suitably qualified acoustic consultant, justifying why an acoustic report is not required..

3.1.2 Camden Growth Centre Environmental Noise Policy 2018

The Camden Growth Centre Environmental Noise Policy 2018 contains the following objectives and controls for outdoor privates spaces impacted by road traffic noise.

3. The principle private open space of an equivalent area of useable open space of a dwelling within a new release area is not to exceed 57dBA LAeq (15hr) from 7am to 10pm.

Note: For clarification purposes, a new release area, includes land mapped as Urban Release Area within the Camden LEP 2010 and includes Growth Area Precincts that have been rezoned.

For dwellings in areas outside of the new release areas, the principle private open space area is to be attenuated to 55dBA LAeq (15hr) from 7am to 10pm.

Council may consider an increased decibel level where it can be demonstrated that the objectives of this policy are met and the above criteria is not able to be reasonably or feasibly achieved.

Note: The residential noise level criterion includes + 2.5 dBA allowance for noise reflected from the façade ('facade correction').

3.1.3 State Environmental Planning Policy (Transport and Infrastructure) 2021

The NSW 'State Environmental Planning Policy (Transport and Infrastructure)' 2021 (SEPP) is used to facilitate the effective delivery of infrastructure across the State. The aim of the policy includes identifying the environmental assessment category into which different types of infrastructure and service developments fall under and identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure.

Pertinent to noise assessments, the SEPP includes the following section:

"**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 the 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 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 section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section and published in the Gazette.

(3) If the development is for the purposes of 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 residential accommodation – 35 dB(A) at any time between 10pm and 7am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time.

(3A) Subsection (3) does not apply t0 a building to which State Environmental Planning Policy (Housing) 2021, Chapter 3, Part 7 applies.

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

The NSW Department of Planning '*Development Near Rail Corridors and Busy Roads – Interim Guideline*' (December 2008) (Guideline) is supplementary to the SEPP and assists in the planning, design and assessment of developments in, or adjacent to, major transport corridors in terms of noise, vibration and air quality. While the SEPP applies only to roads with an Annual Average Daily Traffic (AADT) greater than 20,000 vehicles, the guideline is also recommended for other road traffic noise affected sites.

The Guideline clarifies the time period of measurement and assessment. Section 3.4 '*What Noise and Vibration Concepts are Relevant*' and Table 3.1 of Section 3.6.1 confirms that the noise assessment is based over the following time periods:

- **Daytime:** 7am – 10pm $L_{Aeq,15\ hour}$

- **Night-time:** 10pm – 7am $L_{Aeq,9\ hour}$

The noise criteria nominated in the SEPP apply to internal noise levels with windows and doors closed. However, as the preliminary noise assessment is based on predictions at external locations, equivalent external noise criteria have been established. The equivalent external noise criteria are used to determine which areas of the development may require acoustic treatment in order to meet the internal noise requirements of the SEPP. The equivalent external criteria have been determined on the following basis:

- The Guideline states:

  "*If internal noise levels with windows or doors open exceed the 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, and also to meet the ventilation requirements of the Building Code of Australia*."

  The internal criteria with windows open are therefore 10 dB(A) above the criteria and should be applied when using the SEPP.

- The generally accepted noise reduction through an open window from a free-field external position is 10 dB(A). Windows / doors are assumed to be open no more than 5 % of the room's floor area, in accordance with the Building Code of Australia (BCA) ventilation requirements.

Based on the above, Table 3-1 presents the SEPP internal noise criteria along with the equivalent external noise criteria for residential premises.

Table 3-1 – SEPP Noise Criteria for New Residential Developments

Room	Location	$L_{Aeq,15\ hour}$ Day 7am – 10pm	$L_{Aeq,9\ hour}$ Night 10pm – 7am
Living rooms	Internal, windows closed	40	40
	Internal, windows open	50	50
	External free-field (allowing windows to remain open)[1]	60	60
Bedrooms	Internal, windows closed	40	35
	Internal, windows open	50	45
	External free-field (allowing windows to remain open)[1]	60	55

Notes: 1. SEPP Guideline states that where internal noise criteria are exceeded by more than 10 dB(A) with windows open mechanical ventilation is required.

2. External goals have been calculated on the basis of nominal 10 dB(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.

Based on the above table, the most stringent criteria for the day and night time periods will be used for the assessment of road traffic noise impacting the subject site. That is, for the day period the external free-field noise criterion will be **$L_{Aeq,15\ hour}$ 60 dB(A)** and for the night period the external free-field noise criterion will be **$L_{Aeq,9\ hour}$ 55 dB(A).** It is noted that Camden Growth Centre Environmental Noise Policy

2018 (refer to Section 3.1.2) day time criterion of 57 dB(A) is more stringent and will be used for private open spaces.

3.2 Road Traffic Noise Sources

The proposed development will potentially be affected by traffic noise along The Northern Road, Lowes Creek Road and Road No. 10. Forecast AM/PM peak hour traffic volumes for the year 2031 have been provided by GHD (ref. 12573453, dated 17 February 2023).

As road traffic noise is assessed based on the daytime (7am – 10pm) and night time (10pm – 7am) traffic flows, these volumes have been calculated based on the following assumptions, commonly used for such assessments:

- Peak hour traffic volumes are 10% of the 24hr volume;
- The 15hr daytime volume is 85% of the 24hr volume; and
- Percentage of heavy vehicles in traffic mix based on peak hour traffic mix.

The traffic volumes used for the assessment are set out in Table 3-2. It is noted that variations in the actual traffic volumes will affect the noise level impact at receiver locations, in particular heavy vehicle percentages.

Table 3-2 – Year 2031 Future Traffic Volumes and Composition Data (Two-Way)

Road	Section	AADT	Day 15 hour (7am-10pm)	Night 9 hour (10pm-7am)	% Heavy Vehicle	Posted Speed, km/h
The Northern Road	North of Lowes Creek Road	33,090	28,126	4,964	10.1	80
	South of Lowes Creek Road	29,645	25,198	4,447	9.4	80
Lowes Creek Road	Between The Northern Road and first roundabout west of The Northern Road	10,895	9,261	1,634	10	60
	West of first roundabout west of The Northern Road	8,840	7,514	1,326	10	60
Road No. 10	Between Lowes Creek Road first roundabout south of Lowes Creek Road	8,990	7,642	1,348	10	60
	South first roundabout south of Lowes Creek Road	2,100	1,785	315	10	60

Notes: 1. Data provided in GHD traffic report (ref. 12573453, dated 17 February 2023)

3.3 Road Traffic Noise Modelling

The noise prediction model used to predict traffic noise levels for the project are contained within the calculation algorithms of the noise model developed by the United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)" known as the CoRTN88 method. This

method has been adapted to Australian conditions and extensively tested by the Australian Road Research Board.

The model predicts noise levels for free flowing traffic and a modified method has been developed which enables an accurate prediction of noise from high truck exhausts to be taken into account. The method predicts the $L_{10(1hour)}$ noise levels within the daytime 15 hour (7am to 10pm) and night-time 9 hour (10pm to 7am) periods and a correction of -3 dB(A) is applied to obtain the $L_{eq,1\ hour}$ noise levels for each period. The $L_{eq,1\ hour}$ noise level for the time period 7am to 10pm is then equated to the daily $L_{eq,15\ hour}$ noise level. Similarly, the $L_{eq,1\ hour}$ noise level for the time period 10pm to 7am is then equated to the night time $L_{eq,9\ hour}$ noise level.

The noise prediction model takes into account the following modelling inputs.

Table 3-3 – Summary of Modelling Inputs

Input Parameters	Data Acquired From
Design	Design provided by client and dated 11/3/2025
Traffic volumes and mix	As described in Section 3.2
Vehicle speed	As described in Section 3.2
Gradient of roadway	Land contours provided by client
Source height	0.5 m for car exhaust, 1.5 m for car and truck engines and 3.6 m for truck exhaust and detailed within CoRTN88
Ground topography at receiver and road	Land contours provided by client
Angles of view from receiver	160 degrees for all receivers
Reflections from existing barriers, structures and cuttings on opposite side of road	Determined from Google Streetview and review of concept design. No structures or cuttings identified.
Proposed noise barrier	A 2.1m high noise barrier will be installed east of Local Road No.04 in order to provide shielding of traffic noise from The Northern Road 1.8m high fencing included as presented in Section 3.5.3. Refer to Section 3.5.3 for Specifications and Appendix B for locations.
Air and ground absorption	Detailed within CoRTN88, ground absorption varied along route. Numeric values varied between 0 (hard surface) to 1 (100% absorptive). A value of 0.75 was used in the model
Receiver Heights	• 1.5 m above local ground for Ground Floor • 4.5 m above local ground for First Floor
Future Dwellings	Each lot within the Stage 1 subdivision is assumed to have one double storey dwelling. Future dwellings are included in the modelling to allow for potential noise shielding from the first row of future dwellings fronting onto the modelled roads.
Free Field Noise Levels	Free field noise levels were used in this assessment as it is directly relevant to the assessment against the ISEPP criteria
Australian conditions correction	-0.7 dB(A) free field
Acoustic properties of road surfaces	Assumed dense graded asphalt
Roadside barriers	Assumes no existing noise barriers

3.4 Road Traffic Noise Assessment

3.4.1 Predicted Traffic Noise Levels

The noise prediction results are set out in a graphical format in APPENDIX B of this report. The results displayed in Figures B-1 & B-3 in APPENDIX B indicate that at ground floor level, facades of residential premises exposed to traffic noise that do not comply with the nominated criteria; however, the private open spaces for majority of the lots are compliant with the DCP requirement due to acoustic shielding provided by the residential building envelopes.

Second storey facades of the dwellings that are also exposed to noise levels above the ISEPP criteria. The results for the first floor level are displayed in Figures B-2 & B-4 in APPENDIX B

For facades that are exposed to noise levels above the nominated criteria, internal noise level criteria are required to be satisfied through appropriate design of the building envelope (e.g. glazing, doors and walls). Indicative acoustic design advice for affected building envelopes is set out in Section 3.5.

3.4.2 List of Affected Lots

Table 3-4 set out the identified noise affected lots. The lots were identified in accordance with the noise modelling presented in APPENDIX B.

Table 3-4 – Affected Final Residential Lots

3001	3002	3003	3004	3005	3006	3007	3008	3009
3010	3011	3012	3029	3030	3031	3032	3033	3062
3092	4001	4002	4003	4004	4005	4006	4031	4032
4033	4034	5010	5017	5018	5019	5020	5032	5033

3.5 Noise Control Treatment Recommendations

The noise modelling shows areas where the external noise goals have not been met. Therefore the recommended internal noise criteria should be achieved through proper building design and glazing selection.

The following recommendations provide in-principle noise control solutions to reduce noise impacts inside residential premises and are based on a number of assumptions relating to the built form. Furthermore the advice provided here is in respect of acoustics only. Supplementary professional advice should be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

3.5.1 Building Layout

Dwellings constructed in traffic noise affected areas can be designed so that their layouts minimise noise in living and sleeping areas. Best practice elements for good acoustic design of development around road transport corridors include:

- designing the layout of residential buildings to have bedrooms on the opposite side of the building to the road transport corridor. Non-habitable rooms (such as the bathroom, hallway, laundry, kitchen) can be placed on the road side of the building;
- provide adequate acoustic windows and doors with good quality acoustic seals (where applicable) on the residential building facades exposed to traffic noise.

3.5.2 Indicative Building Construction Requirements

On the basis of our noise modelling and in accordance with the internal noise goals set out in Section 4.1, recommendations for building element constructions are presented in Table 3-6 for the following room types. It is assumed that non-habitable rooms are separated from habitable spaces by doors (i.e. doors to studies, laundries and ensuites/bathrooms, etc.).

Table 3-5 – Assumed Room Parameters for a Conservative Assessment

Room	Item	Description
Bedroom	Dimensions (L x W x H)	4m x 4m x 2.7
	Surface Finishes	Carpeted floors with underlay, plasterboard walls, plasterboard ceiling, and bed
Living Room	Dimensions (L x W x H)	7m x 5m x 2.7
	Surface Finishes	Timber or tiled floors, plasterboard walls, plasterboard ceiling
Lounge	Dimensions (L x W x H)	6m x 4m x 2.7
	Surface Finishes	Carpeted floors with underlay, plasterboard walls, plasterboard ceiling

It is assumed that dwellings will be generally of typical construction equivalent to weatherboard, 100mm timber stud, minimum 50mm clearance between weatherboard and stud frame, R2.0 insulation batts in wall cavity and 10mm standard plasterboard internal lining. The roof has been assumed to be pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm plasterboard fixed to ceiling joists, R2.0 insulation batts in roof cavity.

Table 3-6 – Indicative Window Requirements for Habitable Rooms

Lots	Facade Orientation	Room	Construction Element	Indicative Construction	
Stage 3					
3001	Northern	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
	Eastern, Western	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
3002, 3003, 3004, 3005, 3006, 3007, 3008, 3009, 3010, 3011, 3012	Eastern	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
	Northern, Southern	Bedrooms First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
3029	Northern	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
	Eastern, Western	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	

Lots	Facade Orientation	Room	Construction Element	Indicative Construction	
			Walls/roof/ceiling	Standard constructions	
3030, 3031, 3032, 3033	Northern	Bedrooms (First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
3062, 3092	Northern	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
	Eastern, Western	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
Stage 4					
4001, 4002, 4003, 4004, 4005, 4006, 4031, 4032, 4033, 4034	Eastern	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
	Northern, Southern	Bedrooms First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
Stage 5					
5010	Southern	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	

Lots	Facade Orientation	Room	Construction Element	Indicative Construction	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
	Eastern, Western	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
5017, 5018, 5019, 5020	Southern	Bedrooms (First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
5032, 5033	Southern	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 33	6.38mm laminated glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	
	Eastern, Western	Bedrooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			Walls/roof/ceiling	Standard constructions	
		Lounge/living rooms (Ground and First Floor)	Windows/glazed doors*	R_W 26	4mm float glass with acoustic seals
			External Timber doors	30mm solid core timber - standard weather seals	
			Walls/roof/ceiling	Standard constructions	

The acoustic requirements for windows and doors have been provided on an RW basis so as to allow flexibility with the developer and variations in design due to other design requirements such as thermal performance.

3.5.3 Boundary Fences

1.8m high acoustically rated boundary fences are required, as shown in Figure 2:

- Partial fence on the northern boundary of Lot 3001 and Lot 3029, barrier to extend at least 5m beyond both side of the gap between dwellings, and a fence on the eastern boundary of Lot 301;
- Partial fence on the northern boundary of Lot 3062 and Lot 3092, barrier to extend at least 5m beyond both side of the gap between dwellings;
- Partial fence on the southern boundary of Lot 5010, barrier to extend at least 5m beyond both side of the gap between dwellings; and
- Partial fence on the southern boundary of Lot 5032 and Lot 5033, barrier to extend at least 5m beyond both side of the gap between dwellings.

Figure 3-1 – Boundary Fence Locations

An acoustically rated fence can be constructed of common building materials but needs to be from a durable material with sufficient mass (min. 10 kg/m^2) to prevent direct noise transmission e.g. colorbond masonry, fibrous-cement, lapped and capped timber fence, polycarbonate, or any combination of such materials, provided they withstand the weather elements. A natural barrier of trees or shrubs is not an effective noise screen. The boundary fence should be continuous with no gaps between panels or underneath panels (other than that required for gates). It is recommended that rebates be incorporated into any gates.

For the remaining lots, the provision of solid boundary fences between residential lots can be beneficial to the ground floor of properties that are directly exposed to the roads. Acoustically rated fences are not specifically required along common boundaries between individual dwellings.

3.5.4 Mechanical Ventilation

Where glazing requirements are specified in Table 3.6 windows are to be kept closed to meet the internal noise goals. It is noted that windows are not required to be sealed shut/fixed and can be operable.

It is recommended that a mechanical engineer is consulted to ensure the ventilation requirements of the Building Code of Australia and Australian Standard 1668 "The use of ventilation and air-conditioning in buildings" are achieved. The internal noise goals are to be met with mechanical ventilation systems not operating.

Mechanical ventilation with air filtering is a good solution for adequately ventilating a building adjacent to a busy road in terms of both noise and air quality. The 'Aeropac' acoustic ventilator is one such system which has previously been installed in dwellings around Sydney.

If the internal criteria can only be achieved with windows closed, then mechanical ventilation or air conditioning that meets the requirements of the Building Code of Australia must also be provided to ensure fresh airflow inside the dwelling. It is important to ensure that mechanical ventilation does not provide a new noise leakage path into the dwelling and does not create a noise nuisance to neighbouring residential premises.

4 Conclusion

Renzo Tonin & Associates have completed an investigation of traffic noise impacts for the proposed Biring Stages 3, 4 & 5 subdivision within the Lowes Creek Maryland Precinct. Traffic noise impacts have been quantified and compared to the relevant noise guidelines.

Any noise mitigation recommendations included in this report are in-principle only.

APPENDIX A Glossary of Terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.

L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Noise Modelling Results - Barriers Included as Marked

Figure B-1 – Design Year 2031 Day Time $L_{Aeq,15\ hour}$ Noise Contours (Ground Floor)

Figure B-2 – Design Year 2031 Day Time $L_{Aeq,15\ hour}$ Noise Contours (First Floor)

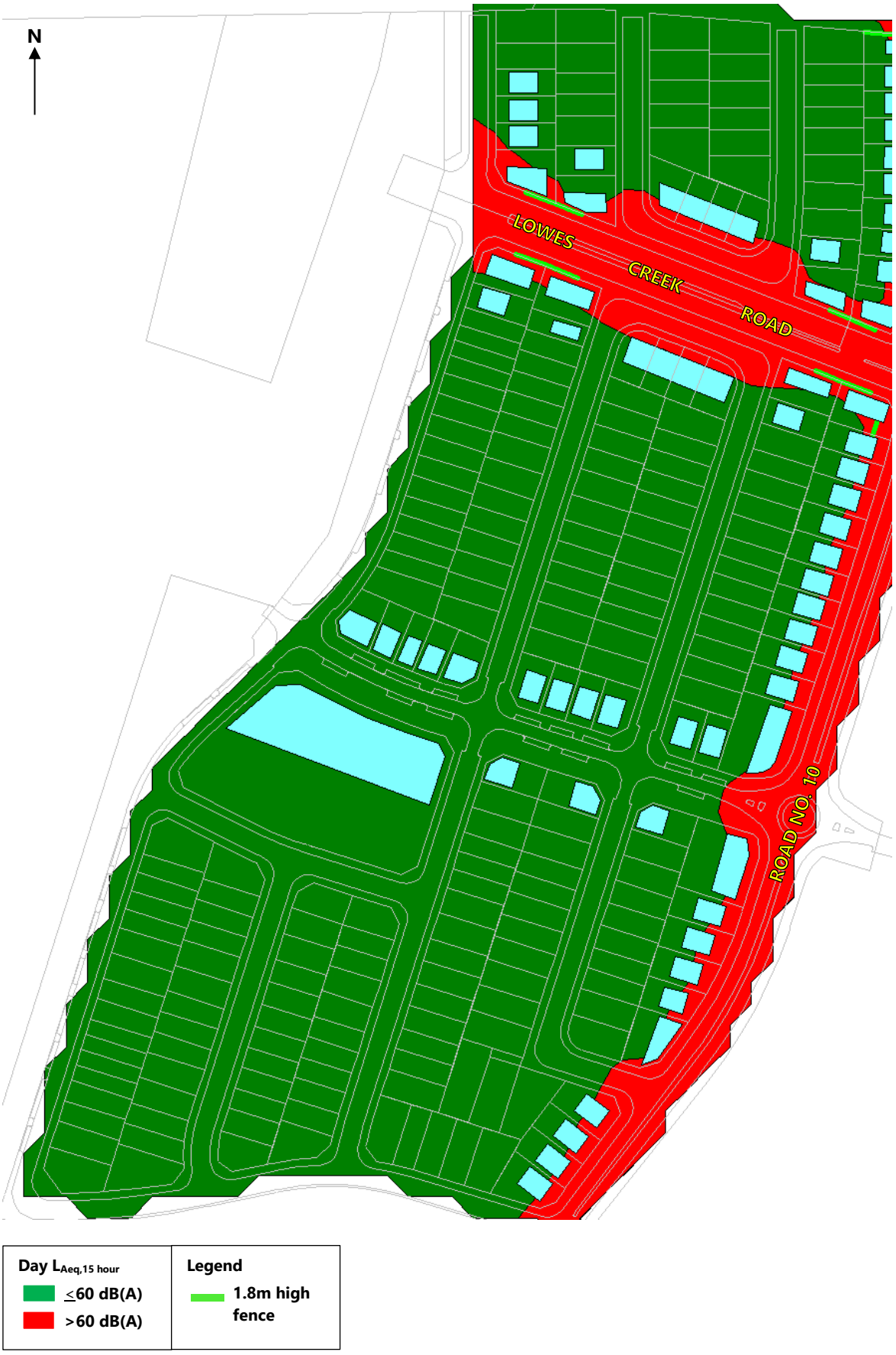


Figure B-3 – Design Year 2031 Night Time $L_{Aeq,9\ hour}$ Noise Contours (Ground Floor)

Figure B-4 – Design Year 2031 Night Time $L_{Aeq,9\ hour}$ Noise Contours (First Floor)

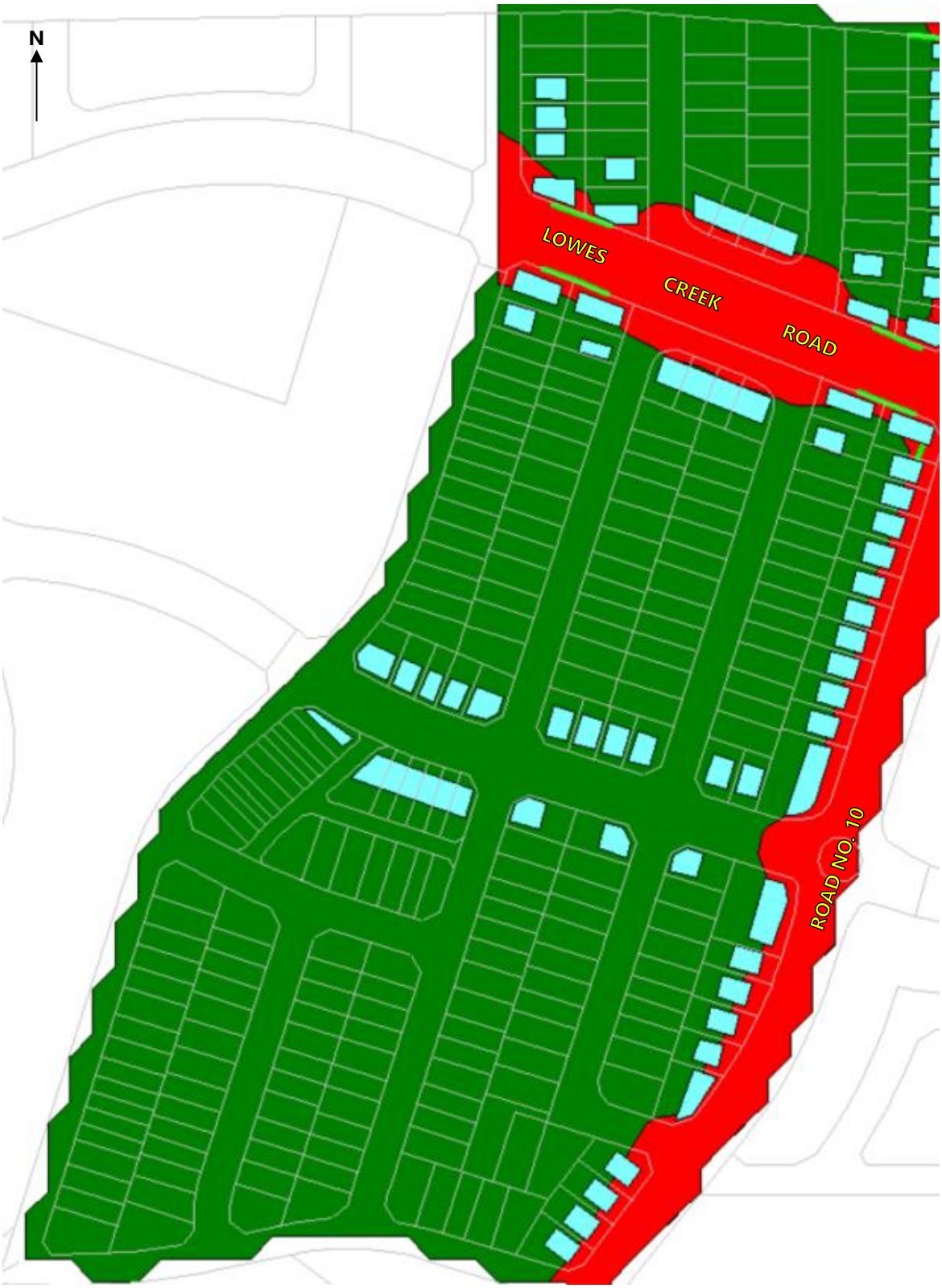


Figure B-5 – Design Year 2031 Day Time $L_{Aeq,15\ hour}$ Noise Contours (Camden Council Open Space Criteria)