Environmental Noise Assessment

Rosalind Park Planning Proposal

At Medhurst Road and Menangle Road, Menangle Park

On Behalf of Leda Holdings Pty Ltd

21GCA0202 R01_2

About TTM

For 30 years, we've been at the centre of the Australian development and infrastructure industry. Our unique combination of acoustics, data, traffic and waste services is fundamental to the success of any architectural or development project.

We have over 50 staff, with an unrivalled depth of experience. Our industry knowledge, technical expertise and commercial insight allow us to deliver an exceptional and reliable service.

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Acoustics Data Traffic Waste

Revision Record

No.	Author	Reviewed/Approved	Description	Date
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1.	J. Fox		Revision 1	15/07/2022
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3.				

Executive Summary

TTM conducted a noise assessment of the Rosalind Park Planning Proposal located on Medhurst Road and Menangle Road, Menangle Park. The assessment was carried out to determine the potential noise impact of the surrounding road network on the proposed residential and retail development.

Noise impact levels were predicted using SoundPLAN acoustic modelling software. Noise levels were predicted to exceed the NSW Road Noise Policy night-time façade corrected criterion of 55 dB(A) $L_{eq,Night}$ within approximately 420m of the western boundary. Acoustic design considerations for future dwellings on these residential lots will be required to meet the internal noise criteria.

The implementation of an acoustic barrier as a noise mitigation measure has been proven to be unreasonable and impractical, when considering the noise mitigation benefits versus the overall adverse social, economic and environmental effects, including the cost of the abatement measure.

The development is predicted to adhere to the criteria outlined in Section 5 with the inclusion of acoustic design to future dwellings affected by high road traffic noise levels.

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1 Introduction

TTM was engaged by Leda Holdings Pty Ltd to undertake a noise impact assessment of the Rosalind Park Planning Proposal located at Medhurst Road and Menangle Road, Menangle Park. This report will form part of the planning proposal to rezone land for lodgement with Campbelltown City Council.

1.1 References

The noise impact assessment is based on the following:

- NSW Road Noise Policy[1]
- NSW SEPP Infrastructure[2]
- NSW Noise Policy for Industry[3]
- Acoustic building envelope design in accordance with AS3671[4]
- Structure plans by Design + Planning
- Traffic Impact Assessment prepared by Stantec (ref: 300303568, Revision A-Dr) dated 1 July 2022
- Noise measurements, modelling, analysis and calculations conducted by TTM.

1.2 Scope

The assessment includes the following:

- Description of the Rosalind Park Planning Proposal.
- Measurement of existing ambient and road traffic noise levels.
- Statement of assessment criteria relating to road traffic noise intrusion.
- Prediction of road traffic noise from the surrounding road network on the development.
- Details of noise control recommendations to be incorporated to achieve predicted compliance.

[1] NSW Department of Environment, Climate Change and Water (2011), NSW Road Noise Policy

[2] NSW Department of Planning, State Environmental Planning Policy (SEPP) (Infrastructure) 2007

[3] NSW Environment Protection Authority (2017), Noise Policy for Industry

[4] AS 3671:1989. Acoustics - Road traffic noise intrusion - Building siting and construction

2 Site Description – Rosalind Park

2.1 Site Location

Menangle Park is a rural but developing residential area, with some existing residential dwellings, located within the Campbelltown City Local Government Area. Menangle Park is located approximately 65 kilometres' south-west of the Sydney CBD and six kilometres' south-west of Campbelltown City Centre.

Rosalind Park is bound by the Hume Highway to the west. Menangle Road, which is classified as an Arterial Road, is situated on the northwest corner of the site. Medhurst Road is currently a local road which is expected to be upgraded during construction to a sub-arterial road forming the major connection with Menangle Road. Noise impacts from these three roads will be the focus of the assessment.

2.2 Description of Acoustic Environment

The development is impacted by various levels of noise due to the large scale of the site. The western boundary, in proximity to the Hume Highway, is dominated by road traffic noise from this road. The north-western corner of the site is affected by road traffic noise from both the Hume Highway and Menangle Road.

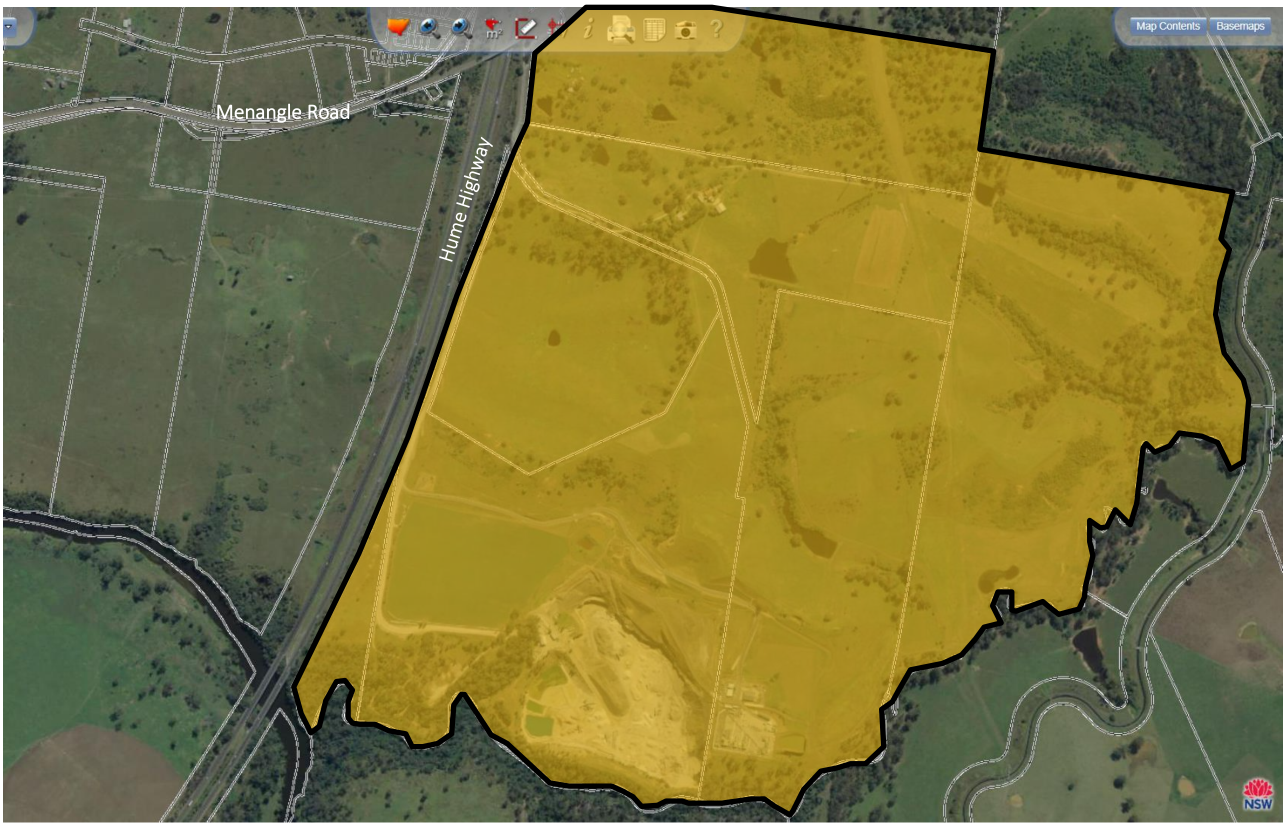
The central and eastern areas of the site are expected to be affected by a much lower level of road traffic noise. The ambient noise environment in these areas is typically dominated by the natural environment including sounds of insects, wildlife and wind in vegetation. The existing quarry at the south of the site is being decommissioned as part of the overall proposal and therefore will not form part of the acoustic environment once the development is complete.

3 Rosalind Park Proposal

The Rosalind Park proposal comprises of a mix of residential lots, retail areas, a School, open space areas, and Environmental Conservation land located on the eastern side of the Hume Highway at Menangle Park. The site location is identified in Figure 1. It comprises of six parcels legally described as:

- Lot 1 DP58924
- Lot 1, 2 and 3 DP 622362
- Lot 35 DP 230946
- Lot 58 DP 632328

Figure 1: Site Location and Parcels of Land



The development proposes a variety of residential lots with an approximate yield of 1,450 lots. The proposed Structure Plan is shown in Figure 2.

Figure 2: Proposed Structure Plan

4 Noise Survey

Ambient and road traffic noise measurements were undertaken on site between Wednesday 8th December and Wednesday 15th December 2021. Both attended and unattended noise measurements were conducted in accordance with the procedures outlined in Australian Standard AS1055[5].

4.1 Equipment

The equipment used to measure existing noise levels are summarised in Table 1.

Table 1: Acoustic Equipment

Purpose	Equipment	Serial Number	Location (Refer to Figure 3)
Unattended ambient and road traffic noise	ARL EL316 Environmental Noise Logger	16-707-028	Location 1 – Northern section of site
	Brüel & Kjær Model 2250L, Type 1 Sound Level Meter as a Logger	3006261	Location 2 – Southern section of site
Attended ambient and road traffic noise	Brüel & Kjær Model 2250, Type 1 Sound Level Meter	3004473	Next to corresponding noise logger
Calibrator	Brüel & Kjær Model 4231, Sound Calibrator	3009809	-

All equipment was calibrated by a National Association of Testing Authorities (NATA) accredited laboratory. The equipment was calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

4.2 Noise Monitoring Methodology

Two noise monitors were installed on site to conduct unattended noise monitoring of road traffic and ambient noise levels. The noise monitoring locations are shown in Figure 3.

The microphones of all monitors were in a free-field position at a height of 1.5 metres above ground level.

Average, maximum and statistical noise parameters were recorded by the noise monitors at 15-minute intervals in fast response. Rainfall occurred on the 9th and 10th December and was excluded from the analysis. Otherwise, the weather throughout the monitoring period was described as fine with light winds.

4.2.1 Unattended Road Traffic Noise

Noise Logger 1 was installed in the northern section of the site, approximately 170m south of Menangle Road. The noise monitor was placed as close as possible to the Hume Highway considering access, uneven topography and safety of equipment to capture road traffic noise levels from the road, shown as Location 1 on Figure 3. The monitor was approximately 54 metres from the edge of the closest lane of the Hume

[5] AS 1055:2018 Acoustics - Description and measurement of environmental noise

Highway. At that location, the monitor had a view of the road to capture noise levels representative of road traffic noise levels across the northern section of the site.

Noise Logger 2 was installed to capture road traffic noise levels in the southern section of the site. The noise monitor was again placed as close as possible to the Hume Highway considering access and safety of equipment to capture road traffic noise levels from the road, shown as Location 2 on Figure 3. The monitor was approximately 72 metres from the edge of the closest lane of the Hume Highway and was representative of the road traffic noise levels across the southern section of the site.

Figure 3: Noise Monitoring Locations

4.2.2 Attended Noise Measurements

Attended noise measurements were also undertaken at the northern monitoring location during logger installation. The measurements were taken using a Brüel & Kjær Type 2250, Type 1 Sound Level Meter (S/N 3004473). The measurements were used to verify and supplement the unattended noise monitoring data.

The Sound Level Meter was secured on a tripod and its microphone was positioned in proximity to the unattended noise logger. Average, maximum and statistical noise parameters were recorded at 15-minute intervals in fast time response. The weather throughout the attended measurements was described as fine with a light breeze. The sound level meter was checked for calibration before and after the measurement and no significant drift was observed.

4.3 Results of Noise Survey

4.3.1 Ambient Noise Levels

Table 2 presents a summary of the measured noise levels at Locations 1 and 2 (Refer to Figure 3). The noise monitoring daily results are represented graphically in Appendix B.

Table 2: Summary of Noise Monitoring Results

Period	Existing Noise Levels in dB(A)			
	Rating Background Noise Levels, RBL L_{90}	L_{eq}	L_{10}	L_1
Location 1 – Close to Hume Highway, Northern Section of the Site				
Day	54	60	64	70
Evening	52	59	62	67
Night	46	58	63	68
Location 2 – Close to Hume Highway, Southern Section of the Site				
Day	55	64	66	74
Evening	55	63	66	72
Night	48	61	66	71
Note: - Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays) - Evening period is from 1800 to 2200 - Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800 (Sundays and Public Holidays)				

As expected, the existing noise levels at Location 1 are similar to Location 2, being at similar distances to the Hume Highway. The measured noise levels are generally similar throughout the day, evening and night, except for the L_{90} parameter, which drops during the night-time.

4.3.2 Road Traffic Noise Levels

The noise monitoring results at Location 1 and Location 2 are summarised in terms of the NSW road traffic noise descriptors and the CoRTN Method descriptor (*Calculation of Road Traffic Noise, Department of Transport, Welsh Office*, UK 1988) in Table 3. The monitoring results at Location 1 and 2 were used to calibrate the road traffic noise model.

Table 3: Road Traffic Noise Monitoring Results – NSW RTN Descriptors

Period (T)	Existing Noise Level in dB(A)		
	NSW Road Noise Policy descriptor		CoRTN $L_{10,18h}$ (6am to 12am)
	$L_{eq,T}$	$L_{eq,1h}$ (Average maximum 1 hour)	
Location 1 – Close to Hume Highway, Northern Section of the Site			
Day (7am - 10pm)	60	61	62
Night (10pm - 7am)	58	59	
Location 2 – Close to Hume Highway, Southern Section of the Site			
Day (7am - 10pm)	63	64	65
Night (10pm - 7am)	61	63	

Based on the noise measurements and site inspection, the western boundary of the site is predominately impacted by road traffic noise from the Hume Highway.

5 Noise Criteria

The noise criteria for the assessment are based on the following guidelines and standards:

- NSW Road Noise Policy
- NSW SEPP Infrastructure, and
- NSW Noise Policy for Industry.

5.1 NSW Road Noise Policy

The NSW Road Noise Policy sets out noise assessment criteria for residential land uses affected by road traffic noise on freeway/arterial/sub-arterial roads, which are summarised in Table 4.

Table 4: NSW Road Noise Policy noise assessment criteria

Road type	Period	Assessment criteria
Freeway/arterial/sub-arterial (Hume Highway and Menangle Road)	Day (7am - 10pm)	60 dB(A) $L_{eq,15\ hour}$ (external)
	Night (10pm - 7am)	55 dB(A) $L_{eq,9\ hour}$ (external)

5.2 NSW SEPP Infrastructure

The SEPP has been referred to investigate the impact of road traffic noise on the proposed development.

The relevant criteria for road traffic noise impact are contained in Division 17 *Roads and traffic,* Subdivision 2 *Development in or adjacent to road corridors and road reservations,* Paragraph 102 *Impact of road noise or vibration on non-road development*.

Relevant noise criteria contained in The NSW Department of Planning, *Development near Rail Corridors and Busy Roads – Interim Guideline* also refers to the NSW SEPP Infrastructure.

The criteria are summarised as follows:

- For the development that is on land in or adjacent to the road corridor with an annual average daily traffic (AADT) volume of more than 40,000 vehicles, the development is likely to be adversely affected by road noise or vibration
- Appropriate measures are required to be taken to ensure that the following L_{Aeq} noise levels are not exceeded for road traffic noise impact:
  - in any bedroom in the building—**35 dB(A)** at any time between 10 pm and 7am, and
  - anywhere else in the building (other than a garage, kitchen, bathroom or hallway)—**40 dB(A)** at any time.

5.3 NSW Noise Policy for Industry

The policy sets out the procedure to determine the project noise trigger levels relevant to assess noise from industrial developments. The project noise trigger level applies to existing noise-sensitive receivers.

The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

The project noise trigger level is the lower (that is, the more stringent) value of the project intrusiveness noise level and project amenity noise level determined in Sections 2.3 and 2.4 of the policy.

5.3.1 Project Intrusiveness Noise Level

The Noise Policy for Industry states:

> *The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.*

The intrusiveness noise level is determined as follows:

$$L_{Aeq,\ 15min} \leq \text{Rating Background Noise Level} + 5\ \text{dB}$$

5.3.2 Amenity noise levels and Project Amenity Noise Levels

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 of the Noise Policy for Industry where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance. The noise amenity area is defined as residential rural and the relevant noise amenity levels are given in Table 5.

Table 5: Amenity noise levels

Receiver/ Noise amenity area	Assessment period	Recommended amenity noise level, L_{eq} dB(A)
Residential Rural	Day	50
	Evening	45
	Night	40

Note:
- Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays)
- Evening period is from 1800 to 2200
- Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays)

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level for industrial developments = Recommended amenity noise level minus 5 dB(A)

To standardise the time periods for the intrusiveness and amenity noise levels, the policy assumes that the $L_{Aeq,15min}$ is equal to the $L_{Aeq, period}$ + 3 decibels. Therefore, a +3dB is applied to the project amenity noise level.

5.3.3 Project Noise Trigger Level

The project noise trigger level (PNTL) has been determined in Table 6 and are the most stringent of the intrusiveness and amenity noise criteria. Noise monitoring conducted at Location 1, given in Section 4.3.1, is representative of the ambient environment at development and therefore has been used to evaluate the project intrusiveness noise level.

Table 6: NSW Noise Policy for Industry Evaluated criteria

Assessment period	Project Intrusiveness Noise Level $L_{eq,15min}$ dB(A)*	Project Amenity Noise Level L_{eq} dB(A)	Project Noise Trigger Level L_{eq} dB(A)
Day	59	48	**48**
Evening	57	43	**43**
Night	51	38	**38**
Note: - Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays) - Evening period is from 1800 to 2200 - Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays) * Based on measured Rating Background Noise Levels at Location 3 as presented in Table 2.			

Table 6 shows that the PNTLs are set by the project amenity noise level for all assessment periods. The PNTLs apply for each new source of industrial noise.

By meeting the PNTLs at the identified NSRs, all other properties located further away from the development site are expected to comply with the noise requirements of this policy.

6 Road Traffic Noise Assessment

The proposed development is subject to road traffic noise intrusion from the Hume Highway, Menangle Road and future upgrade of Medhurst Road.

The Hume Highway is a dual carriageway with two lanes in each direction with a signed posted speed limit of 110 km/h. During the site inspection, it was observed that traffic was free flowing and vehicles were travelling at the posted speed. The percentage of heavy vehicles was observed to be quite high (over ~20%).

Menangle Road is a single carriageway with one lane in each direction and a signed posted speed limit of 80 km/h. A new signalised intersection is proposed at the Menangle Park Spine Road. Current civil plans show Menangle Road widened to four through lanes extending approximately 180m west and 150m east of the intersection. Traffic engineers have advised that Menangle Road is proposed to remain with limited property access and the existing speed limit of 80km/h is likely to be retained.

Medhurst Road will become a sub-arterial road upon completion of the development. The speed limit of the road is currently unknown and therefore a speed limit of 60km/h was assumed for the purposes of this assessment.

6.1 Noise Prediction Model

Road traffic noise levels were predicted using the CoRTN[6] method for a 10-year horizon to 2035 using SoundPLAN v8.2, a CoRTN based noise modelling software. The parameters used in the model are summarised in Table 7.

Table 7: Parameters used in SoundPLAN model

Parameter		Value
Noise modelling standard		CoRTN
Angle increment		1^{o}
Grid spacing (noise maps)		2m squares
Road surface correction		None
Façade receiver heights	Ground floor	1.8 m above pad level
	First floor	4.6 m above pad level
Speed limit	Hume Highway	110 km/h (Posted limit)
	Menangle Road	80 km/h (Posted limit)
	Medhurst Road	60 km/h (Assumed limit)
Façade correction		+2.5 dB

Current digital elevation survey data of the development site, the Hume Highway and Menangle Road was sourced from online databases and used in the SoundPLAN model to represent current topography of the

[6] Calculation of Road Traffic Noise, Department of Transport, Welsh Office, UK 1988

site for model verification purposes. Digital elevation data of the future cut and fill model is currently unavailable, and the future road traffic noise impact was also based on the current survey data.

The traffic volume and growth rate information used in the SoundPLAN model was obtained from previous work conducted in the Menangle Park area. Table 8 presents the traffic volumes and percentage of heavy vehicles (HV) used in the noise model.

Table 8: Traffic Data used in the Assessment

Road name	Existing – Year 2017		Growth rate (%)	% HV	Planning Horizon – Year 2035	
	AADT	18-hour traffic (95%)			AADT	18-hour traffic (95%)
Hume Highway – Northbound	25,700	24,415	4	21	49,460	46,987
Hume Highway – Southbound	26,750	25,413	4	20	51,481	48,907
Menangle Road	11,300	10,735	5.5	4[1]	29,953	28,455
Medhurst Road	n/a	n/a	n/a	2[2]	14,065	13,362

Note:
[1] Conservative assumption for a regional arterial road
[2] Conservative assumption for a regional sub-arterial road

6.1.1 Noise Model Verification

The measured and predicted free-field noise levels at Location 1 and Location 2 (Refer to Figure 3) for the existing year (2017 situation) are shown in Table 9.

Table 9: Comparison of measured and predicted free-field noise levels – Existing Year 2017 situation

Measurement location (Refer to Figure 3)	Sound Pressure Levels, $L_{10,18h}$ in dB(A)		
	Measured	Predicted	Difference
Location 1 – Hume Highway North	62.0	63.9	+1.9
Location 2 – Hume Highway South	65.4	65.1	-0.3

The SoundPLAN predicted road traffic noise levels at the noise monitoring locations are within the accepted model variance of ±2 dB and therefore the noise model is validated.

6.2 Model Parameter Offsets

Road traffic noise predictions using the CoRTN method on SoundPLAN are output in the $L_{10,18h}$ parameter. To convert from $L_{10,18h}$ to the L_{eq} parameters referenced in NSW policies, the offset values based on the measured road traffic noise levels were determined. The offsets are summarised in Table 10.

Table 10: Offsets between $L_{10,18h}$ and L_{eq} parameters

Period (T)	Offset in measured noise levels, in dB	
	Between $L_{10,18h}$ and $L_{eq,T}$	Between $L_{10,18h}$ and $L_{eq,1h}$
Day (7am - 10pm)	-2	-1
Night (10pm – 7am)	-4	-2

6.3 Future Situation Model – Year 2035

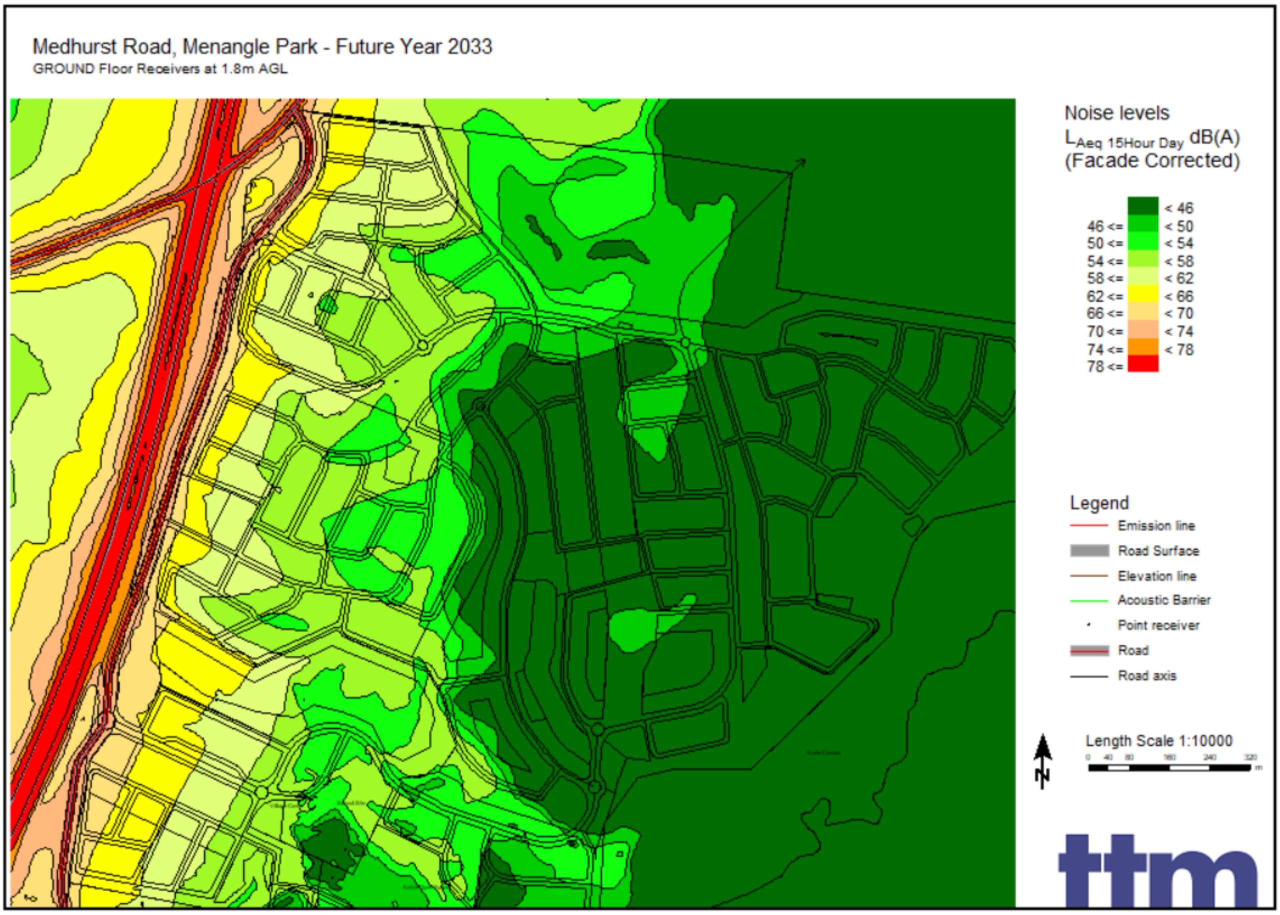
The façade-corrected road traffic noise levels were predicted with noise contours across the development site using the SoundPLAN model, to represent the future road traffic noise impact for Year 2035. The offsets given in Table 10 and a façade correction of +2.5 dB were applied to the predicted noise levels to determine the façade corrected L_{eq}.

The existing Year 2017 model was updated with ultimate traffic volume data to represent the future Year 2035 scenario.

6.3.1 Noise Contours Year 2035 – Façade-corrected $L_{eq,Day}$

The predicted future façade-corrected $L_{eq,Day}$ noise contours are presented in Figure 4.

Figure 4: Future Situation Year 2035 Noise Contours – $L_{eq,Day}$ Façade-corrected



The following noise contour map in Figure 5 shows areas of the development which comply with (Green shading) and exceed (Yellow shading) the NSW Road Noise Policy day-time criteria of 60 dB(A) $L_{eq,Day}$.

Figure 5: Year 2035 Comparison with Criteria - $L_{eq,Day}$ Façade-corrected

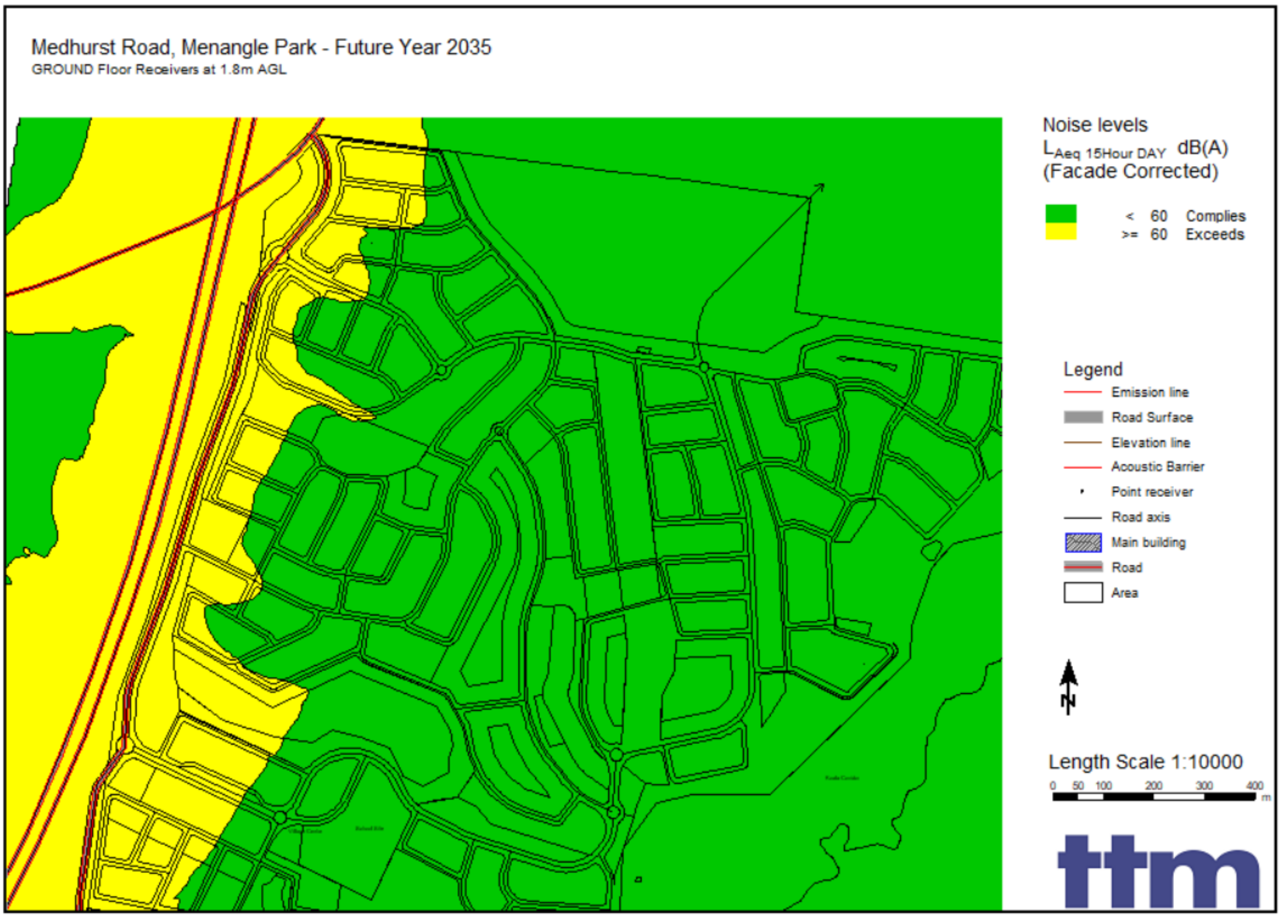
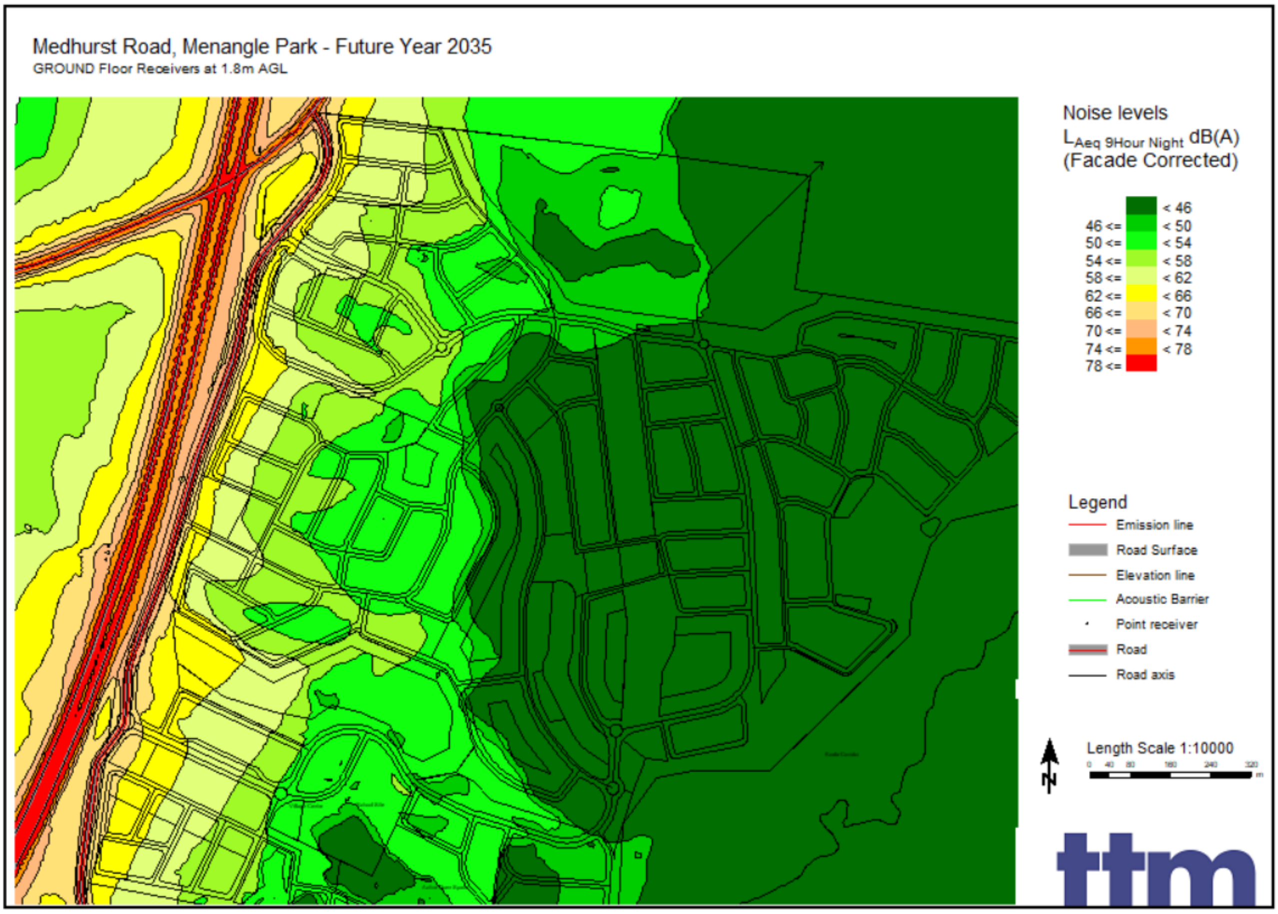


Figure 5 shows that road traffic noise levels are predicted to exceed the day-time criteria of 60 dB(A) $L_{eq,Day}$ at the western side of the development in some instances. Additional noise attenuation measures will be required for the future dwellings proposed to be built on the noise affected lots.

6.3.2 Noise Contours Year 2035 – Façade-corrected $L_{eq,Night}$

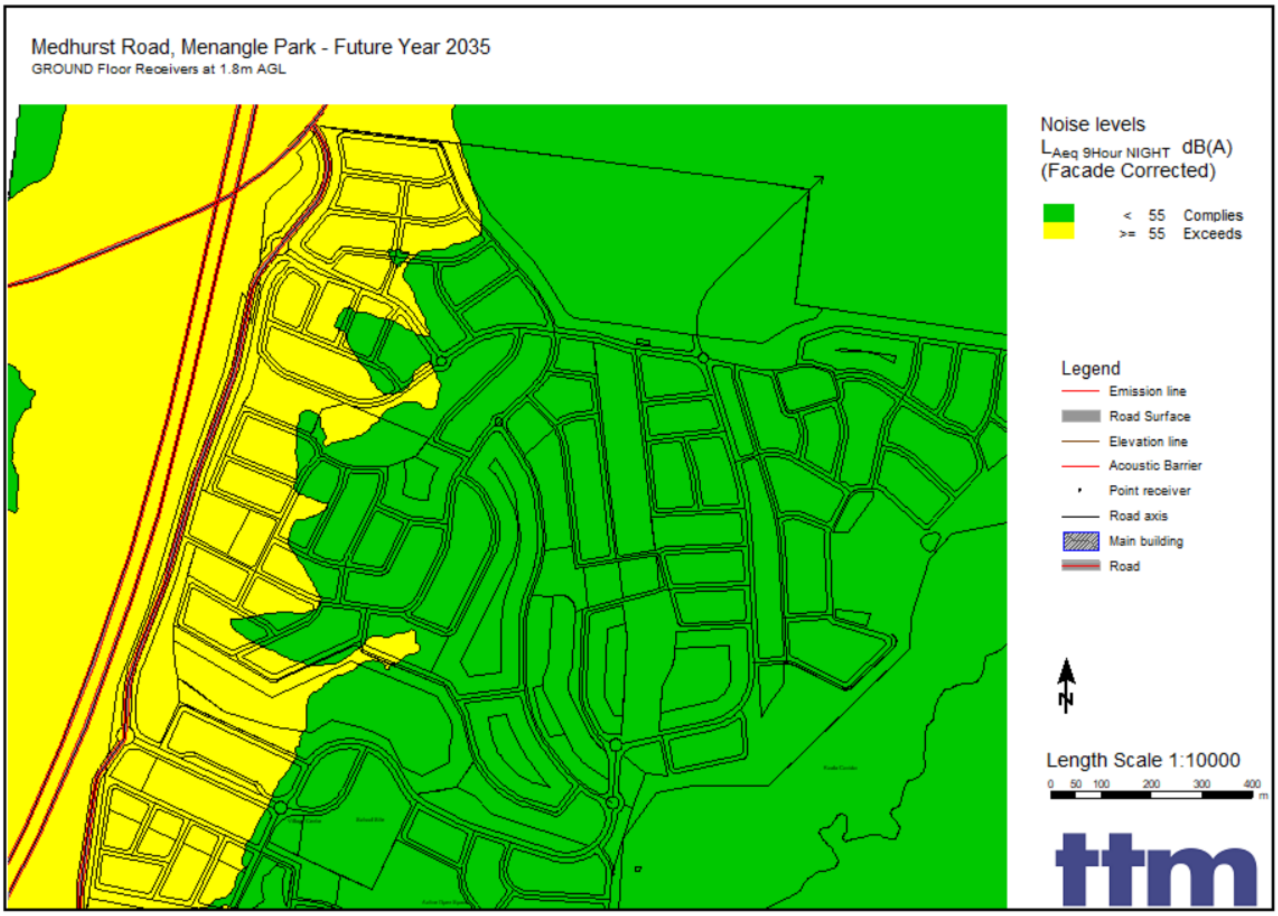
The predicted future façade-corrected $L_{eq,Night}$ noise contours are presented in Figure 6.

Figure 6: Future Situation Year 2035 Noise Contours – $L_{eq,Night}$ Façade-corrected



The following noise contour map in Figure 7 shows areas of the development which comply with (Green shading) and exceed (Yellow shading) the NSW Road Noise Policy night-time criteria of 55 dB(A) $L_{eq,Night}$.

Figure 7: Year 2035 Comparison with Criteria - $L_{eq,Night}$ Façade-corrected



Road traffic noise levels are predicted to exceed the night-time criteria of 55 dB(A) $L_{eq,Night}$ at a greater level than the day-time criteria. Therefore, the night criteria is the most stringent and will determine the noise affected lots of the development. Additional noise attenuation measures will be required for the future dwellings proposed to be built on these noise affected lots.

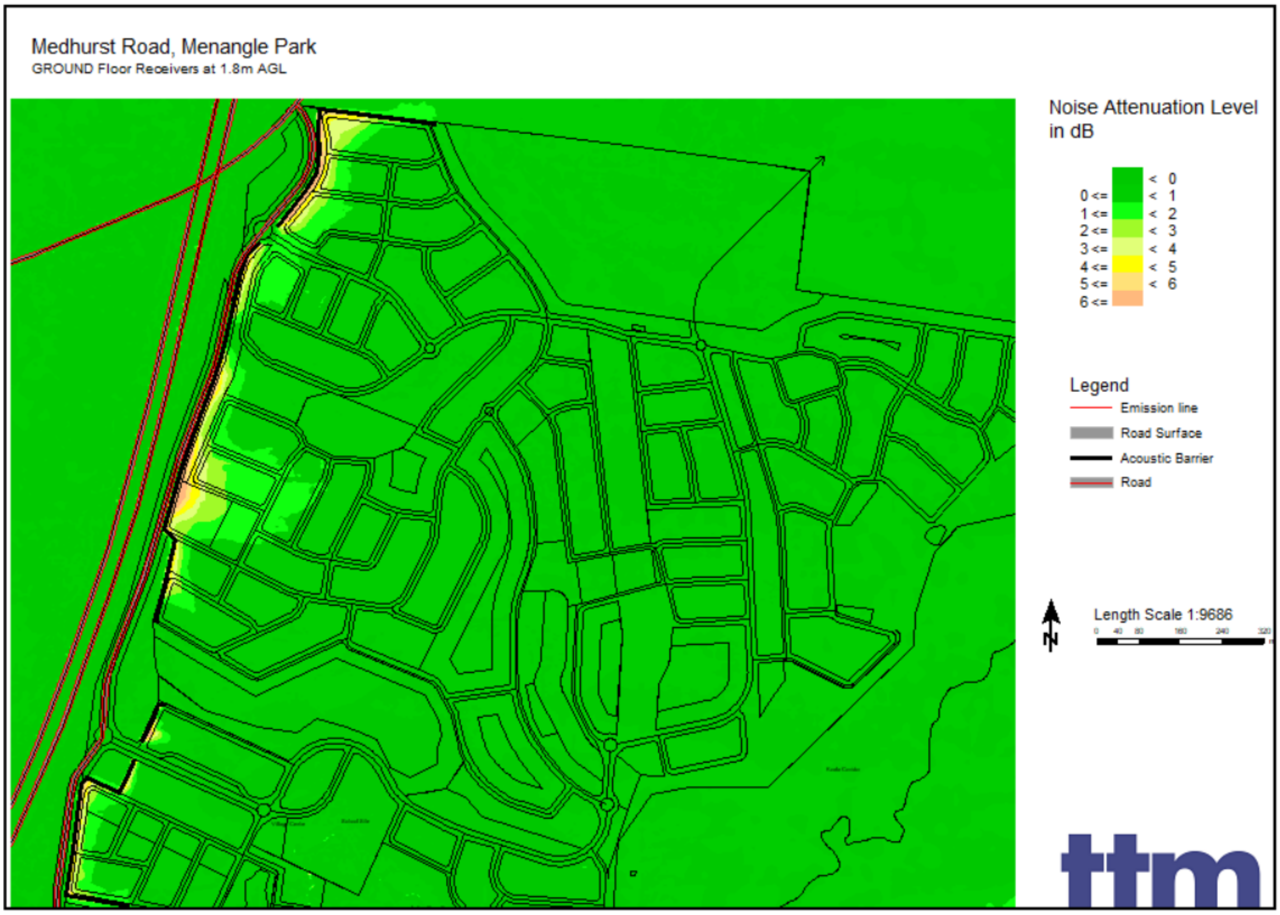
6.3.2.1 Impact of an Acoustic Barrier

The impact of an acoustic barrier on the development was investigated to assess whether it would provide beneficial additional noise shielding within the constraints of being feasible, practical and reasonable.

A 3-metre high acoustic barrier along the site boundaries was modelled to assess the likely noise attenuation from an acoustic barrier.

The following noise contour map in Figure 8 shows the noise attenuation achieved by the installation of the 3-metre acoustic barrier.

Figure 8: Predicted Noise Attenuation Achieved by an Acoustic Barrier on the Western Site Boundaries



The above noise contour map shows that the 3-metre acoustic barrier provides a maximum noise reduction of 3-4 dB at only a few selected locations. Additionally, the noise attenuation diminishes quickly as distance is increased from the barrier.

The NSW Road Noise Policy provides recommendations on reasonable road traffic noise mitigation measures. The feasibility of any acoustic barrier is judged on whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the abatement measure. The document states that ideally, an acoustic barrier should be able to reduce the noise levels by at least 5dB.

Based on the above recommendations of the NSW Road Noise Policy, an acoustic barrier as a noise mitigation measure is not considered feasible and reasonable.

6.3.3 Summary of Predicted Noise Levels

Noise levels at single receiver points were predicted at various points on the western side of the development to complement the noise contours using the SoundPLAN model. The prediction points are representative of the most exposed locations on the development site.

The noise levels were predicted at 1.8 metres above ground level and are inclusive of façade correction. The offsets given in Table 10 have also been applied to determine the L_{eq} values. The modelling prediction results are presented in Table 11.

Table 11: Future Road Traffic Noise Predictions at Sample Locations – Façade-corrected

Receiver Reference (Refer to Appendix C for location)	Predicted Noise Levels $L_{10,18h}$, in dB(A)	Adjusted Noise levels, in dB(A)*	
		$L_{eq,Day}$	$L_{eq,Night}$
1	67	**65**	**63**
2	63	**61**	**59**
3	63	**61**	**59**
4	69	**67**	**65**
Note: ***BOLD** represents non-compliance with NSW Road Noise Policy criteria			

The results show that at the prediction points, the most exposed façades of future dwellings will exceed the criteria of **60 dB(A)** $L_{eq,Day}$ and **55 dB(A)** $L_{eq,Night}$.

Additional noise attenuation measures such as, acoustic design and noise control treatments, including lot/dwelling orientation, internal space planning, architectural and mechanical noise control treatments, will be required for the affected lots to achieve the internal noise criteria contained in the NSW SEPP Infrastructure.

6.4 Road traffic generated by development

Based on the traffic generation estimates from the Stantec Transport Impact Assessment Report (Report Ref.: 300303568, dated 1 July 2022), the development will generate approximately 1,435 vehicle movements in the AM peak hour and approximately 1,378 vehicle movements in the PM peak hour on Menangle Road.

The current AM and PM peak hour traffic counts at the Menangle Road /Medhurst Road intersection are approximately 964 and 949 respectively. With a 2.5% annual growth and additional traffic from the Menangle Park URA, the AM and PM peak hour traffic counts for Year 2035 are expected to be approximately 3,537 and 3,444 respectively.

This proposed development will therefore generate approximately 40% additional vehicle movements on Menangle Road for both the AM and PM peak hour traffic. The approximate increase in traffic equates to an increase in road traffic noise levels of 1.5 dB, which is considered minor as a 1-2dB change in noise level is generally not detectable to the human ear. Therefore, traffic generated from the development is not expected to cause any significant increase in road traffic noise to other developments.

7 TTM Recommendations

7.1 General

The impact of road traffic noise from the Hume Highway, Menangle Road and Medhurst Road onto the development has been assessed. The predicted results show that the future dwellings to be built on the western side of the development will require acoustic design consideration to meet the internal noise criteria.

Acoustic design considers lot/dwelling orientation and internal space planning, to ensure the most cost-effective solution is provided. This is done by ensuring less noise sensitive spaces, such as bathrooms and laundries, are located closest to the most exposed façade to road traffic noise and shield the more noise sensitive spaces, such as bedrooms and living areas.

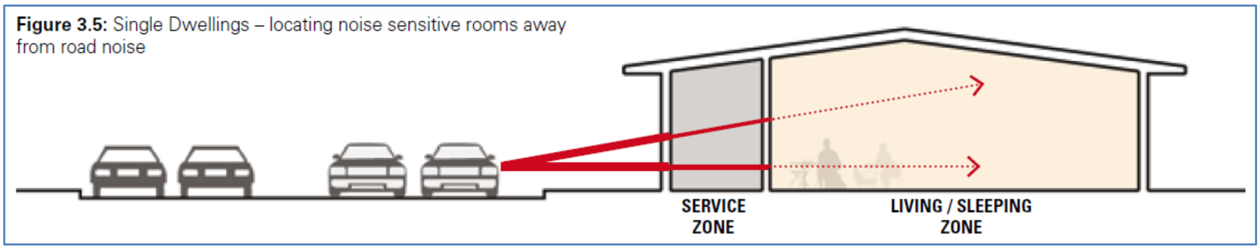
Architectural and mechanical acoustic treatments, such as, building envelope design and provision of mechanical ventilation, are also recommended.

7.2 Future Dwelling Internal Layout

The NSW Department of Planning (DoP) guideline *Development Near Rail Corridors and Busy Roads* recommends particular building layouts to minimise potential noise from road traffic. The document can be used as a guide to assist with internal layout design of the noise affected lots.

The concept of service zones could be incorporated into the future dwellings. This is particularly beneficial acoustically as the non-noise sensitive spaces facing the road noise source act as a noise buffer to the noise sensitive spaces, such as living rooms and bedrooms, as illustrated in Figure 9.

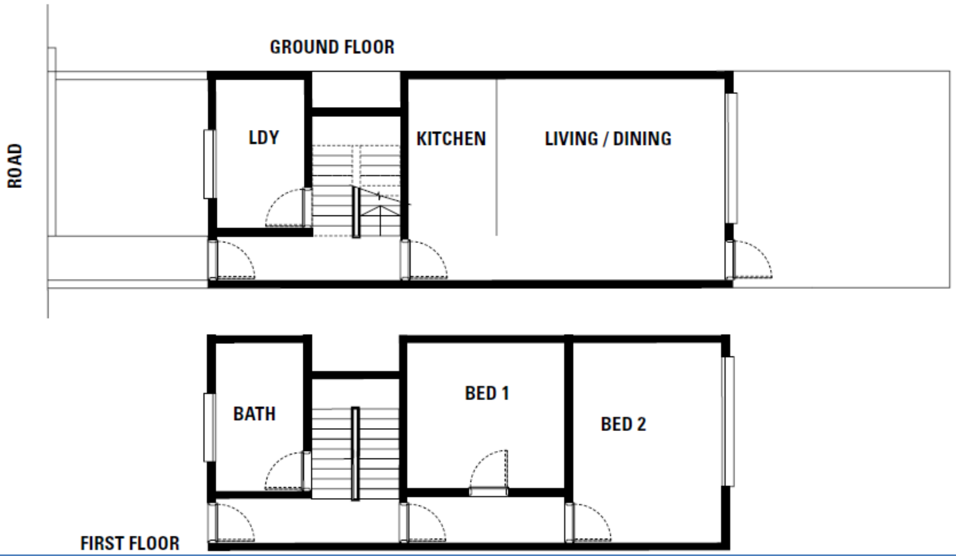
Figure 9: Illustration of noise buffer to noise sensitive spaces



Similarly, for noise sensitive areas located on upper floors, the upstairs layout would preferably include non-noise sensitive areas positioned towards the most exposed façade to the road noise source, as illustrated in Figure 10.

Figure 10: Illustration of building orientation

Figure 3.8: Double storey building orientation which reduces traffic noise intrusion



For positioning of private courtyards, the principle remains the same as illustrated in Figure 11.

Figure 11: Illustration of orientation of private courtyards

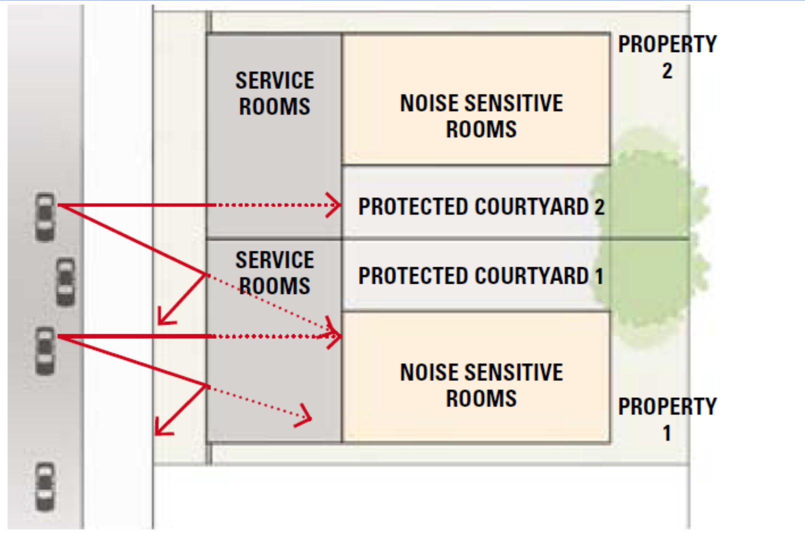


Figure 3.17: Noise shielded courtyards

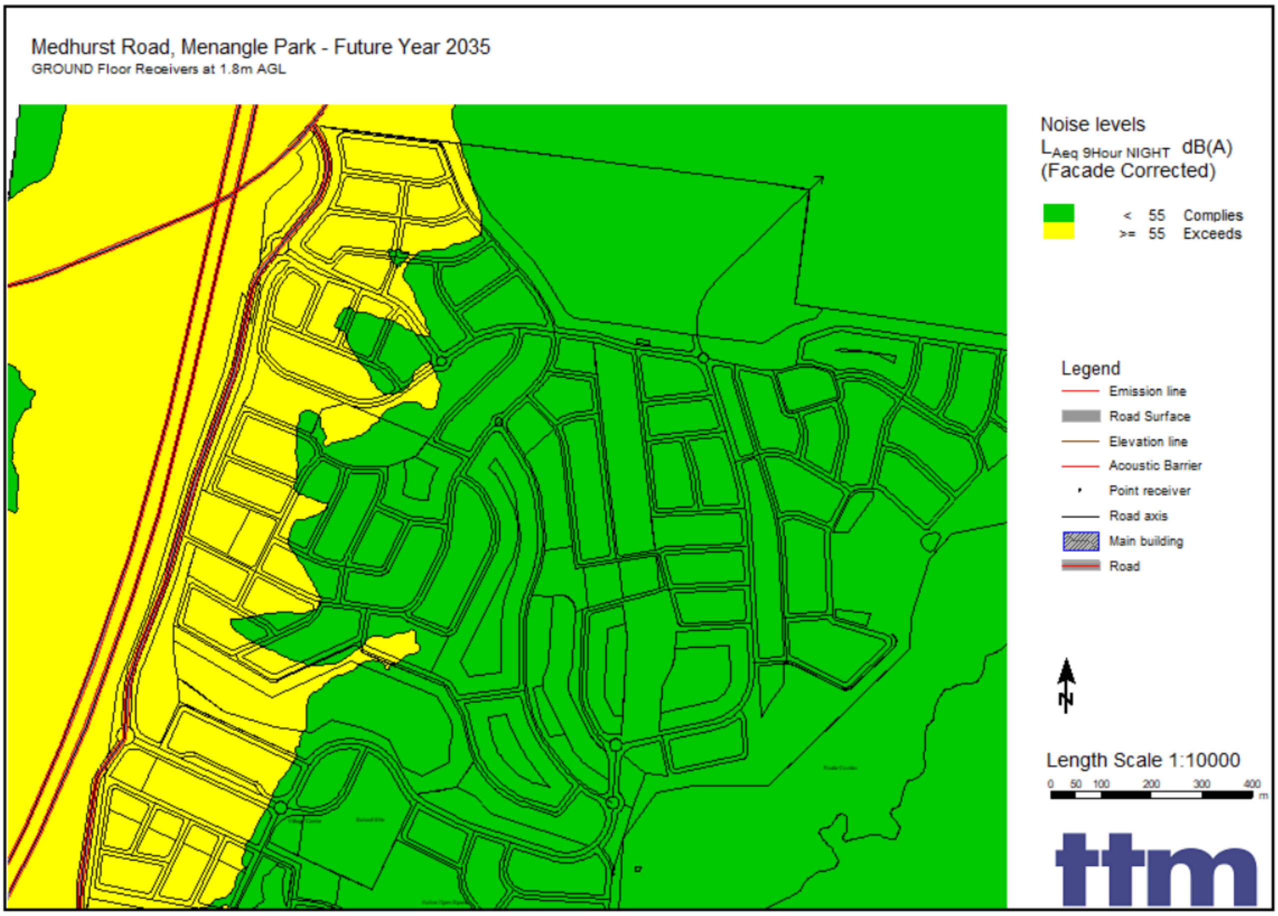
For facades of the dwellings that comply with the NSW Road Traffic Noise criteria, internal layout design is not required.

In cases where it is not possible to redesign the internal layout, or where this is insufficient, it is required to incorporate acoustic treatments to the building envelope to satisfy the internal design noise levels stated in the NSW SEPP Infrastructure. Walls, roof, glazing and other building components are required to meet minimum acoustic ratings.

7.3 Dwelling Acoustic Treatment

Road traffic noise levels are predicted to exceed the criteria at lots on the western aspect of the site. The noise affected lots are those shown in yellow shading in Figure 7 which is reproduced below.

Figure 12: Noise Affected Areas of the Development (shown in Yellow Shading)



The future dwellings on the noise affected lots will require building envelope acoustic design to ensure compliance with the internal design levels given the NSW DoP *Development near Rail Corridors and Busy Roads – Interim* Guideline. Acoustic design is recommended to be conducted once final architectural plans of individual dwellings are available.

Building treatment requirements will ultimately be dependent on the individual building design (i.e. the ratio of glazing compared to floor area, etc.). However, based on the predicted road traffic noise impact levels and a typical dwelling design, it is not expected that treatments would be significantly onerous on the purchaser.

As a guide, the potential range of acoustic ratings for each building component have been listed in Table 12, which should be treated as a guide only and not be implemented for construction.

Table 12: Guide performance for typical Building Façade Treatments for Noise Affected Lots[7]

Building Component	Acoustic Rating Required	Indicative Requirements/Construction
Glazing	R_W24-35	4mm float to 10.38mm laminate glass with acoustic seals
Walls	R_W40-45	Standard masonry or brick veneer OR Upgraded lightweight constructions
Roof/ceiling	R_W40-42	Pitched sheet metal roof with Anticon insulation blanket, R2.5-R3.5 ceiling insulation, 10mm plasterboard ceiling. OR Pitched tiled roof with sarking, R2.5-R3.5 ceiling insulation, 10mm plasterboard ceiling.

Acoustic design should be conducted by a suitably qualified acoustic consultant once building plans are available to ensure that the proposed dwellings are designed to achieve the internal design noise levels.

7.4 Mechanical Ventilation

Mechanical ventilation may be required for dwellings impacted by road traffic noise to meet the internal design sound levels. External windows and doors are to be kept closed, since if these are opened for ventilation purposes, road traffic noise reduction of the building envelope will be significantly reduced. If it is necessary to close windows and doors to comply with NSW SEPP Infrastructure indoor design levels, building ventilation should be in accordance with the National Construction Code on the assumption that windows and doors are not openable. Mechanical ventilation or air conditioning systems complying with AS 1668.2[8] should be installed.

Air conditioning plant may need to be acoustically treated to prevent noise emissions from adversely impacting adjacent residential dwellings. This may include selecting the quietest plant possible, or treating the plant equipment with enclosures, barriers, duct lining and silencers, etc.

Air conditioning plant must be installed away from residential boundaries and bedroom windows, to minimise impact during the night-time assessment period.

Mechanical plant noise levels should be checked by a suitably qualified person once plant selections are made. The noise assessment should include noise source levels of plant, location, adjustments for mechanical plant noise characteristics and application of practical, and effective noise control to verify compliance with the NSW Noise Policy for Industry Project Noise Trigger Level (PNTL) derived in this report (38 dB(A) $L_{eq,Night}$ at the residential noise affected boundary for each individual plant).

[7] NSW Department of Planning (2008), Development Near Rail Corridors and Busy Roads - Interim Guideline, Appendix C – Acoustic Treatment of Residences, pp.63

[8] AS 1668.2:2012. The use of ventilation and air conditioning in buildings - Mechanical ventilation in buildings

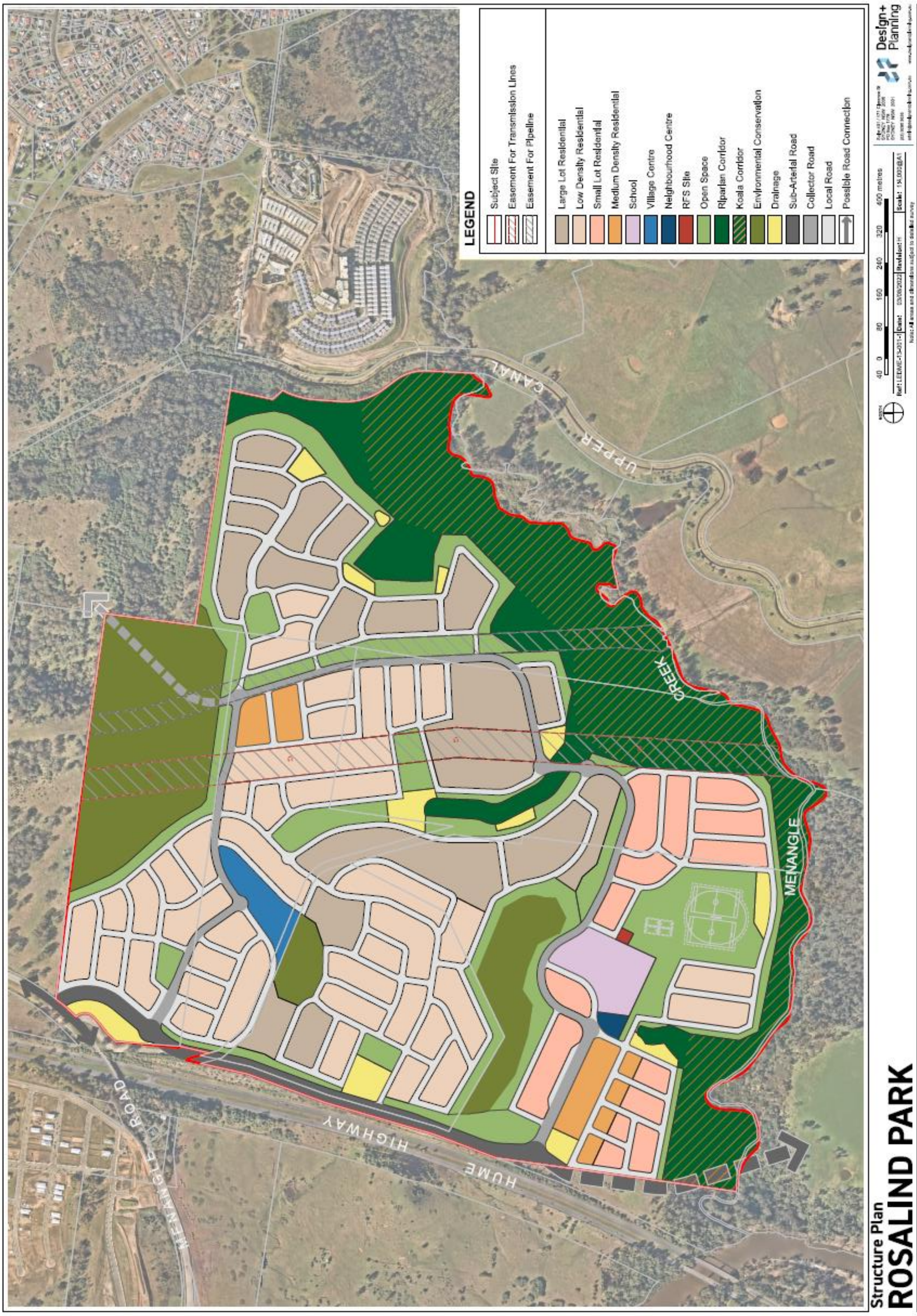
8 Conclusion

Following a noise impact assessment conducted by TTM for the proposed residential development, TTM concludes the following:

- The night time criteria is the most stringent criteria and is the defining factor in determining noise affected lots. Areas up to 420m from the western site boundary are predicted to exceed the criteria of 55 dB(A) $L_{eq,Night}$ and are considered to be noise affected.
- Acoustic design consideration of the future dwellings will be required for the Lots referenced above to meet internal noise criteria.
- Mechanical ventilation may be required for future dwellings where the internal criteria cannot be met with open windows or natural ventilation.
- Traffic generated from the development is not expected to cause a significant increase in road traffic noise to existing noise sensitive properties.

The assessment and recommendations contained in this report demonstrate the development is practical and feasible while keeping an appropriate acoustic amenity and controlled noise impact onto the local community.

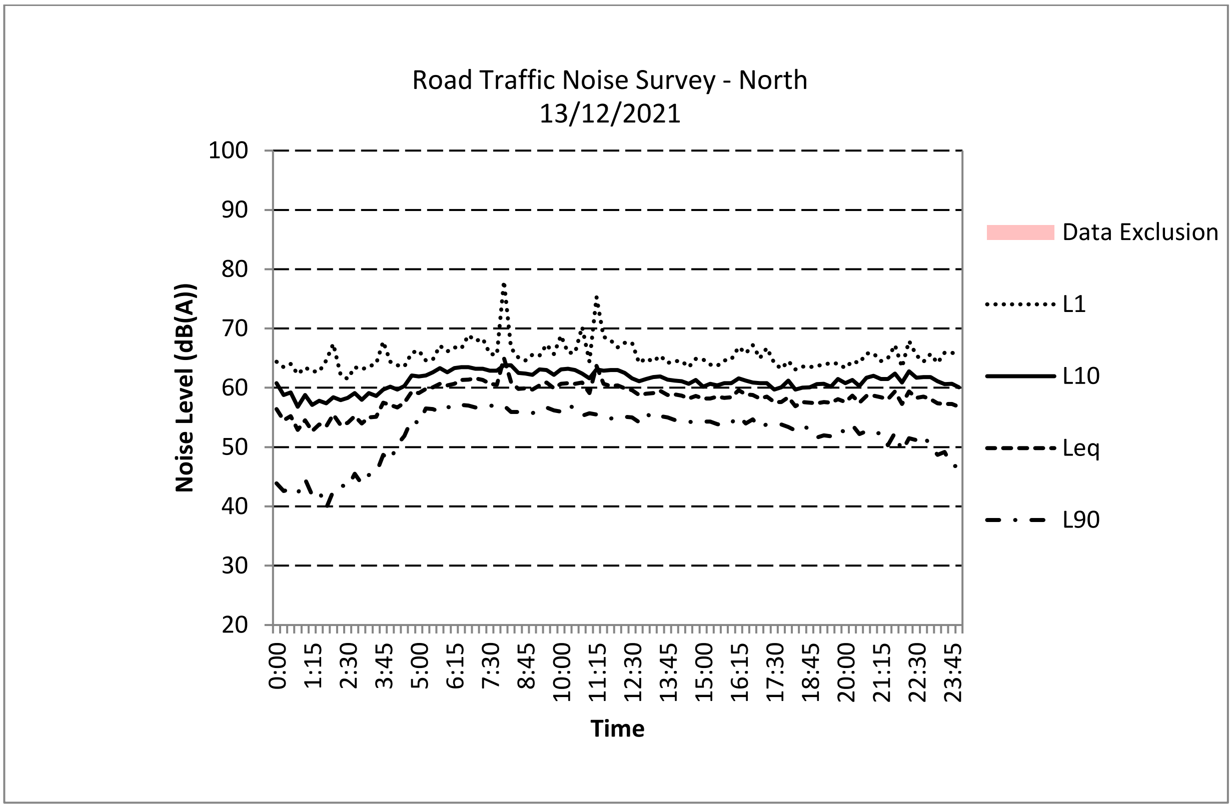
Appendix A Structure Plan

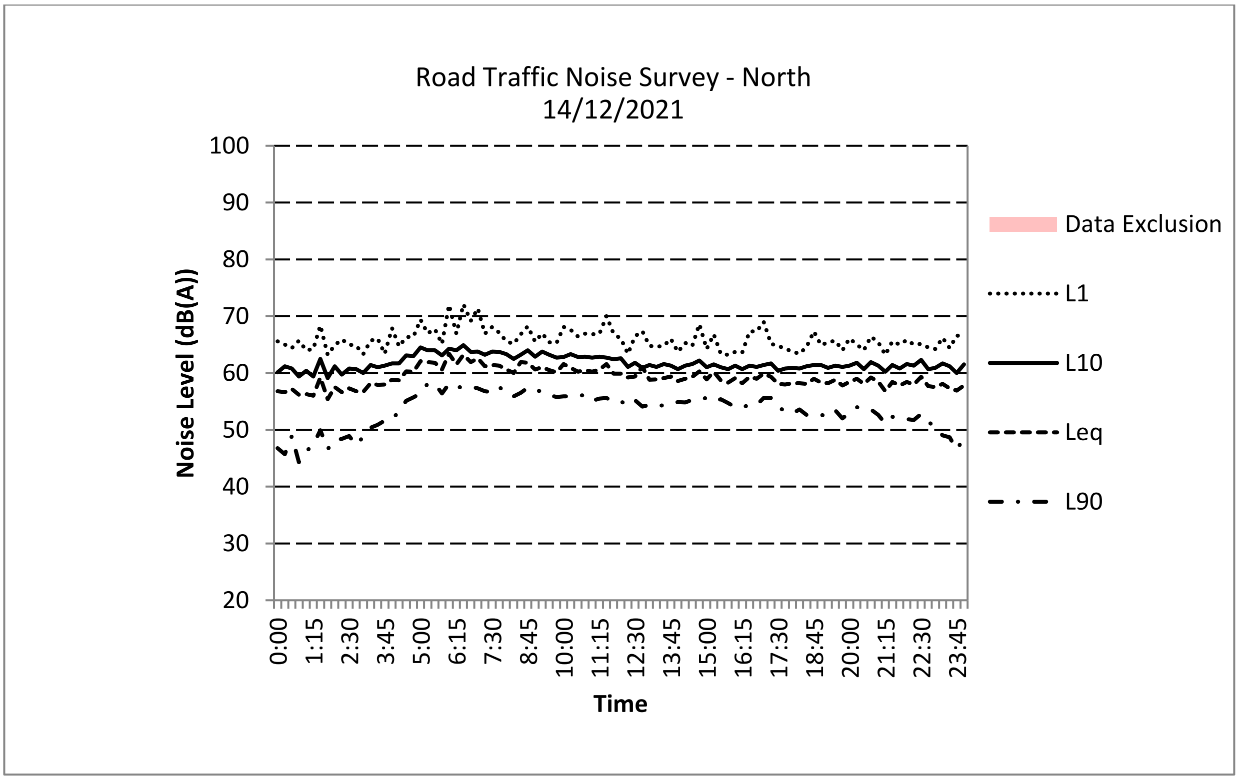


Structure Plan
ROSALIND PARK
LEGEND
Subject Site
Easement For Transmission Lines
Easement For Pipeline
Large Lot Residential
Low Density Residential
Small Lot Residential
Medium Density Residential
School
Village Centre
Neighbourhood Centre
RFS Site
Open Space
Riparian Corridor
Koala Corridor
Environmental Conservation
Drainage
Sub-Arterial Road
Collector Road
Local Road
Possible Road Connection
400 metres
Design+ Planning
UPPER CANAL
CREEK
MENANGLE
HUME HIGHWAY
MENANGLE ROAD

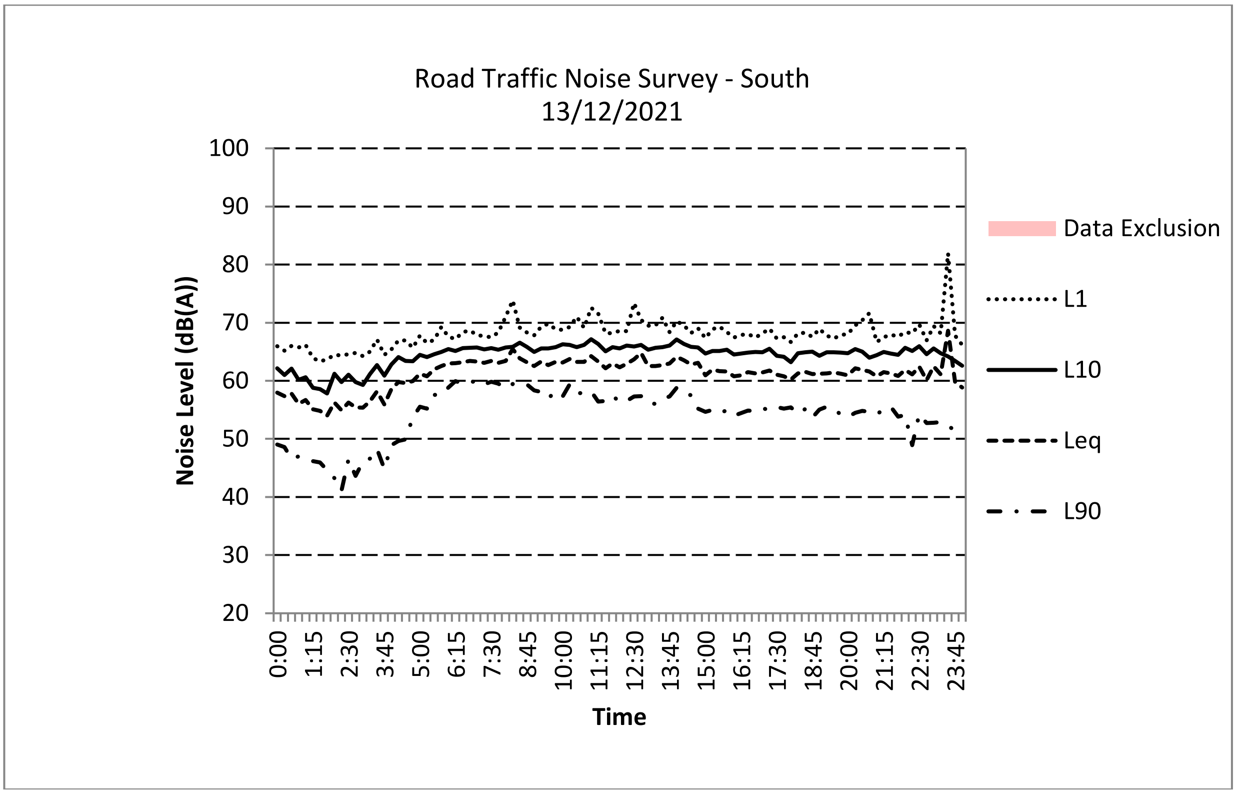
Appendix B Unattended Noise Monitoring Graphs

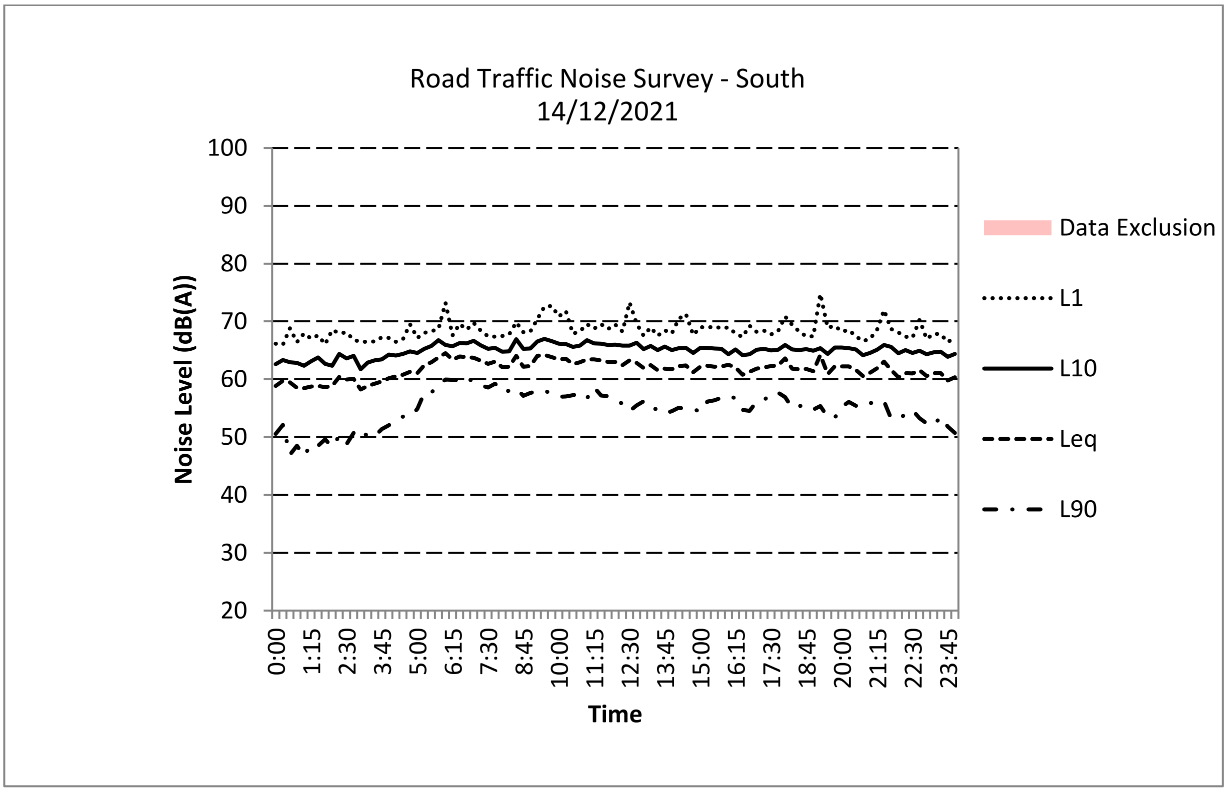
Location 1 – Northern Part of Site, Close to Hume Highway





Location 2 – Southern Part of Site, Close to Hume Highway





Appendix C SoundPLAN Noise Modelling Results

Medhurst Road, Menangle Park
M05 - Logger Verification

Receiver	FI	Ground Height m	L10(18h) Free-Field dB(A)
North Logger 62.0dB	G	128.46	63.9
South Logger 65.4dB	G	84.86	65.1

SAMPLE RECEIVER POINTS

Medhurst Road, Menangle Park
M12 - Base Prediction 2035 - Receivers

Receiver	Floor	Ground Height m	L10(18h) Free-Field dB(A)	
1	G	112.48	64.4	
2	G	119.14	60.8	
3	G	116.12	60.6	
4	G	88.72	66.6	

TTM Consulting Pty Ltd

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SoundPLAN 8.2

Appendix D Glossary of Acoustic Terminology

GLOSSARY

In this acoustic report unless the context of the subject matter otherwise indicates or requires, a term has the following meaning:

TERM	DEFINITION
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.
Adverse Weather	Weather effects that increases noise (i.e. wind and temperature inversion) that occurs at a site for a significant period of time (i.e. wind occurring more than 30% of the time in any assessment period in any season and / or temperature inversion occurring more than 30% of the nights in winter).
Ambient Noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources both near and far.
Assessment Period	The period in a day over which assessments are made: day (0700 to 1800h), evening (1800 to 2200h) or night (2200 to 0700h) or actual operating period if only a part of a period(s).
A – Weighting Filter	A-weighting is the most commonly used of a family of curves defined in the International standard IEC 61672:2003 and various national standards relating to the measurement of sound pressure level. A-weighting is applied to instrument-measured sound levels in effort to account for the relative loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is excluded. Usually described using the L90 measurement parameter.
C – Weighting Filter	The C-weighting approximates the sensitivity of human hearing at industrial noise levels (above about 85 dB(A)). The C-weighted sound level (i.e., measured with the C-weighting) is more sensitive to sounds at low frequencies than the A-weighted sound level and is sometimes used to assess the low-frequency content of complex sound environments and entertainment noise.
Decibel	The ratio of sound pressures which we can hear is a ratio of 106 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.
dB(A)	The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). An A-weighting network can be built into a sound level measuring instrument such that sound levels in dB(A) can be read directly from a sound level meter. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. It is worth noting that an increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.
Equivalent Continuous Sound Level (Leq)	Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq}. This is a notional steady level which would, over a given period of time, deliver the

	same sound energy as the actual time-varying sound over the same period, similar to the average. Hence fluctuating levels can be described in terms of a single figure level.
Extraneous Noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated during holiday periods and during special events such as concert or sporting events.
Fast Time Weighting	125 ms integration time while the signal level is increasing and decreasing.
Frequency	The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2 kHz = 2000 Hz. Human hearing ranges approximately from 20 Hz to 20 kHz. For design purposes, the octave bands between 63 Hz to 8 kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.
L_{Aeq}	See equivalent continuous sound level definition above. This is the A-weighted 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 environmental. This measure is also a common measure of environmental noise and road traffic noise.
$L_{Aieq,T}$	Equivalent continuous A-weighted sound pressure level over the measurement period T with impulse time weighting.
$L_{Ceq,T}$	The equivalent continuous C-weighted sound pressure level (integrated level) that, over the measurement period T, has the same mean square sound pressure (referenced to 20 µPa) as the fluctuating sound(s) under consideration.
$L_{C, Peak}$	The C weighted Peak sound pressure level during a designated time interval or a noise event.
Low Frequency	Noise containing major components in the low-frequency range (20Hz to 250Hz) of the frequency spectrum.
Maximum Noise Levels L_{max}	The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125 ms (millisecond). Fast time weighting has an exponential time constant of 125 ms, which reflects the ear's response. The maximum A weighted level measured with fast time weighting is denoted as L_{AMax}, f. Slow time weighting (S) with an exponential time constant of 1second is used to allow more accurate estimation of the average sound level on a visual display. Impulse (I) time weighting has a fast rise (35 ms) and a slow decay and is intended to mimic the ear's response to impulsive sounds.
Minimum Noise Levels L_{min}	The minimum noise level over a sample period is the minimum level, measured on fast response, during the sample period.
Noise Sensitive Receiver (NSR)	A noise sensitive receiver is any person or building or outside space in which they reside or occupy that has the potential to be adversely impacted by noise from an outside source, or noise not generated by the noise sensitive receiver.

Project-Specific Noise Levels	They are target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive or amenity criteria derived from the NSW Industrial Noise Policy.
RBL	The Rating Background Level for each period is the median value of the ABL values for the period over all the days measured. There is a therefore an RBL value for each period – daytime, evening and night-time.
Shoulder Periods	Where early morning (5 am to 7 am) operations are proposed, it may be unduly stringent to expect such operations to be assessed against the night-time criteria (especially if existing background noise levels are steadily rising in these early morning hours). In these situations, appropriate noise level targets may be negotiated with the regulatory/consent authority on a case-by-case basis.
Slow Time Weighting	1 second integration time while the signal level is increasing and decreasing.
Sound Reduction Index (R)	The sound reduction index (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its attenuation properties. It is a property of the component, unlike the sound level difference which is affected by the common area between the rooms and the acoustic of the receiving room. The weighted sound reduction index, R_w, is a single figure description of sound reduction index which is defined in BS EN ISO 717-1: 1997. The R_w is calculated from measurements in an acoustic laboratory. Sound insulation ratings derived from site (which are invariably lower than the laboratory figures) are referred to as the R'_w ratings.
Statistical Noise Levels	For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{10}, the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The L_{90}, the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_1, the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A-weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T) is normally included, e.g. $dBL_{A10, 5min}$ or $dBL_{A90, 8hr}$.
L_{A1}	The L_{A1} level is the A-weighted noise level which is exceeded for 15 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 A-weighted 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_{A50}	The L_{A50} level is the A-weighted noise level which is exceeded for 50% of the sample period.
L_{A90}	The LA90 level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the LA90 level for 10% of the time. This measure is a commonly referred to as the background noise level.
Temperature Inversion	An atmospheric condition in which temperature increases with height above the ground.
Tonality	Noise containing a prominent frequency and characterised by a definite pitch.
Typical Levels	Some noise levels of some common noise sources are given below:

Noise Level dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside disco
90	Heavy lorries at 5 m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing