

APPENDIX 9:
TRANSPORTATION NOISE ASSESSMENT

Transportation Noise Assessment

East Wanneroo Precinct 7, Mariginiup

Reference: 20115970-02A

Prepared for:
Hesperia

Reference: 20115970-02A

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1. INTRODUCTION

This report has been prepared to consider potential road traffic noise impacts to support the Local Structure Plan for the area of land referred to as East Wanneroo Precinct 7. *Figure 1-1* provides the Structure Plan considered in this report, noting land to the east containing a future Transport Corridor will be subject to future planning and therefore does not form part of this report. Being at Structure Plan stage only, the advice herein is considered preliminary and subject to further detailed design at subdivision stage.

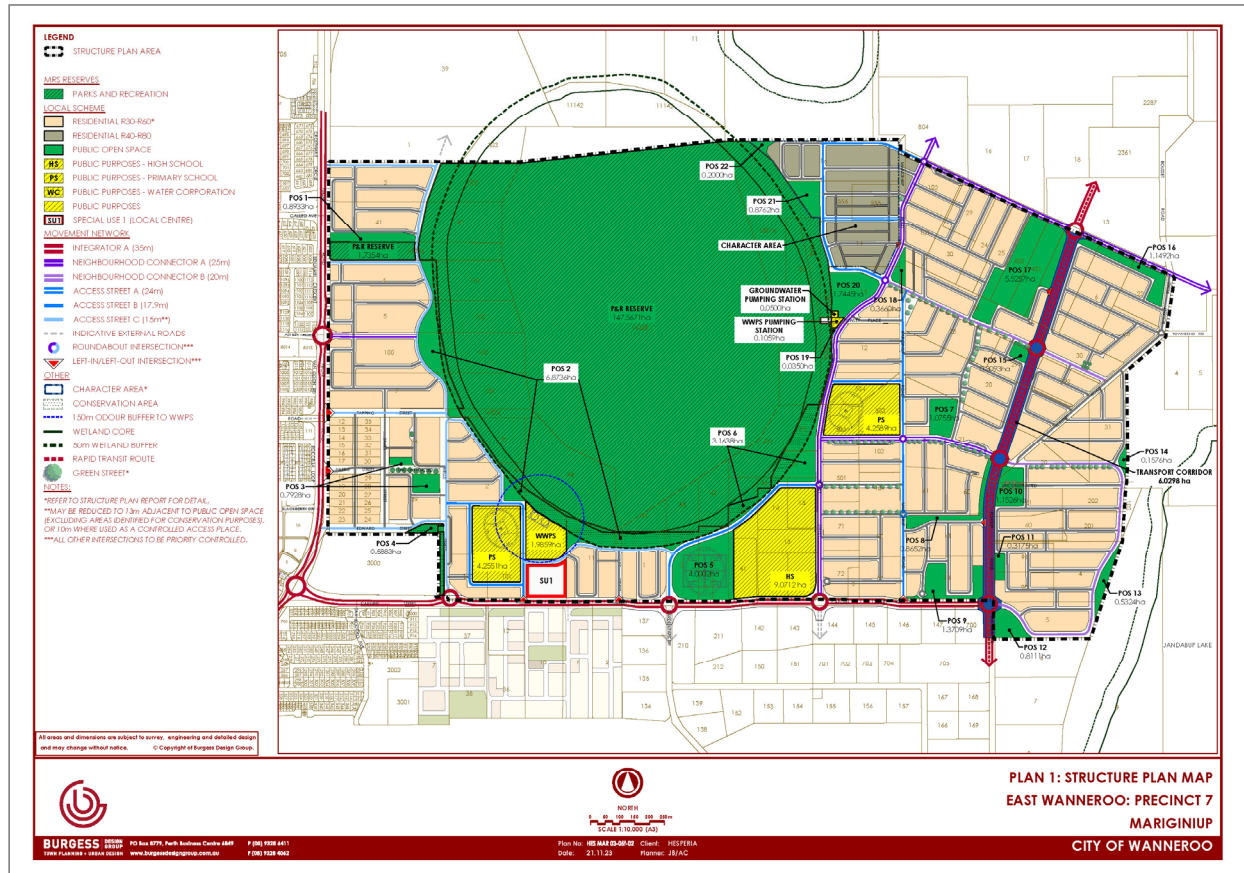


Figure 1-1: Proposed Structure Plan

Road traffic noise is assessed against *State Planning Policy No. 5.4 Road and Rail Noise (SPP 5.4)*. The current maps associated with SPP 5.4 do not show the area as being impacted by designated roads (refer *Figure 1-2*). However, for the purpose of this study, Pinjar Road, Caporn Street and Franklin Road are given consideration on the basis of work undertaken by Stantec¹.

¹ *Transport Impact Assessment, East Wanneroo Local Structure Plan; Reference: CW1172800, 6 May 2022*

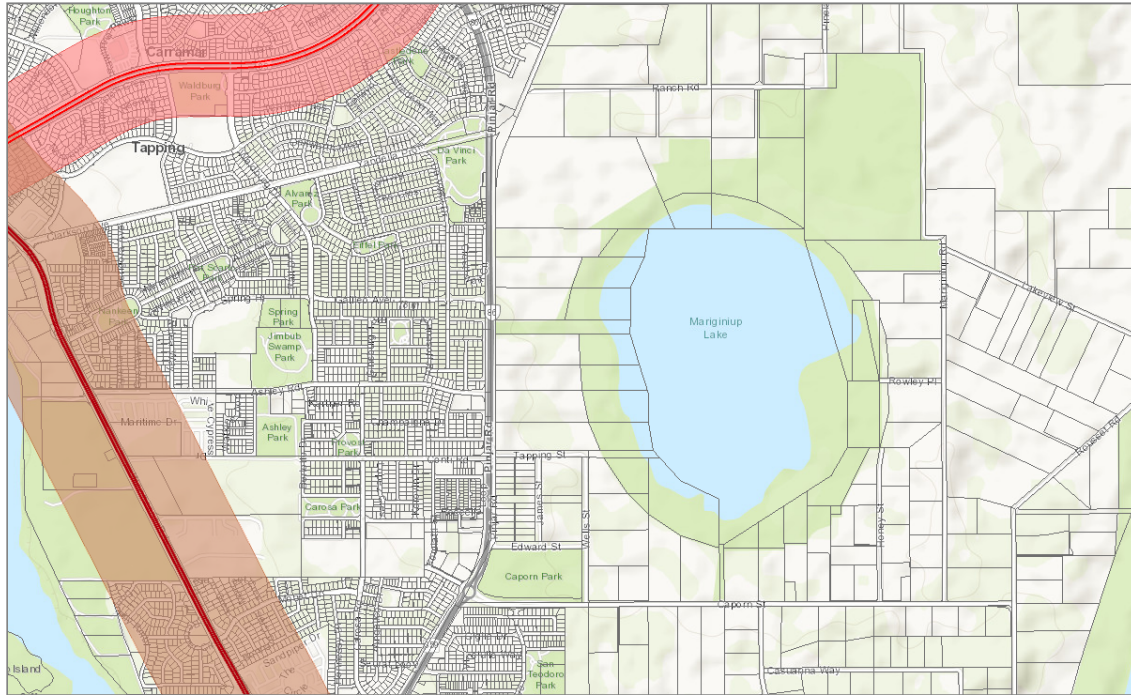


Figure 1-2: SPP 5.4 Designated Roads (Source: DPLH PlanWA)

Appendix B contains a description of some of the terminology used throughout this report.

2. CRITERIA

The criteria relevant to this project is provided in *State Planning Policy No. 5.4 Road and Rail Noise* (hereafter referred to as SPP 5.4) produced by the Western Australian Planning Commission (WAPC). SPP 5.4 is supported by the *Road and Rail Noise Guidelines* (the Guidelines) and the Department of Planning, Lands and Heritage mapping. The objectives of SPP 5.4 are to:

- Protect the community from unreasonable levels of transport noise;
- Protect strategic and other significant freight transport corridors from incompatible urban encroachment;
- Ensure transport infrastructure and land-use can mutually exist within urban corridors;
- Ensure that noise impacts are addressed as early as possible in the planning process; and
- Encourage best practice noise mitigation design and construction standards.

Table 2-1 sets out noise targets that are to be achieved by proposals under which SPP 5.4 applies. Where the targets are exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.

Table 2-1: Noise Targets for Noise Sensitive Land-Use

Scenario	Outdoor Noise Target		Indoor Noise Target	
	Noise-sensitive land-use and/or development	55 dB L _{Aeq} (Day)	50 dB L _{Aeq} (Night)	40 dB L _{Aeq} (Day) (Living and Work Areas)

Notes:

- Day period is from 6am to 10pm and night period from 10pm to 6am.
- The outdoor noise target is to be measured at 1-metre from the most exposed, habitable² facade of a noise sensitive building.
- For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* (as amended) for each relevant time period.
- Outdoor targets are to be met at all outdoor areas as far as is reasonable and practicable to do so using the various noise mitigation measures outlined in the Guidelines.

The application of SPP 5.4 is to consider anticipated traffic volumes for the next 20 years from when the noise assessment has been undertaken.

² A habitable room is defined in State Planning Policy 3.1 as a room used for normal domestic activities that includes a bedroom, living room, lounge room, music room, sitting room, television room, kitchen, dining room, sewing room, study, playroom, sunroom, gymnasium, fully enclosed swimming pool or patio.

3. METHODOLOGY

Noise modelling has been undertaken in accordance with the requirements of SPP 5.4 and associated Guidelines. The computer program *SoundPLAN 8.2* was utilised incorporating the *Calculation of Road Traffic Noise* (CoRTN) algorithms, modified to reflect Australian conditions. The modifications included the following:

- Vehicles were separated into heavy (Austroads Class 3 upwards) and non-heavy (Austroads Class 1 and 2) with non-heavy vehicles having a source height of 0.5 metres above road level and heavy vehicles having two source heights at 1.5 metres and 3.6 metres above road level;
- A -0.8 dB correction has been applied to the lower level heavy vehicle noise source and -8.0 dB to the higher level noise source based on the *Transportation Noise Reference Book*; Paul Nelson (1987), so as to provide consistent results with the CoRTN algorithms;
- Adjustments of -1.7 dB has been applied to the predicted levels for the 'at façade' case, based on the findings of *An Evaluation of the U.K. DoE Traffic Noise Prediction*; Australian Road Research Board, Report 122 ARRB – NAASRA Planning Group (March 1983).

Predictions are made at heights of 1.4 metres above ground floor level and at 1.0-metre from an assumed building façade, resulting in a + 2.5 dB correction due to reflected noise.

Various input data are included in the modelling and these are discussed in *Section 3.1* to *Section 3.5*.

3.1. Ground Topography

Topographical and road design data for this project was a combination of publicly available data e.g. *Google*, earthworks design from Tabec (7 July 2022), Landgate data and Pinjar Road design of June 2008 from City of Wanneroo.

Buildings have also been included as these can provide barrier attenuation when located between a source and receiver, in much the same way as a hill or wall provides noise shielding. All buildings are assumed to be single storey with a height of 3.5 metres.

3.2. Road Surface

The corrections applied for different road surface finishes are provided in *Table 3-1*.

Table 3-1: Noise Relationship Between Different Road Surfaces

Chip Seal				Asphalt			
14mm	10mm	5mm	Slurry	Dense Graded	Novachip	Stone Mastic	Open Graded
+3.5 dB	+2.5 dB	+1.5 dB	+1.0 dB	0.0 dB	-0.2 dB	-1.5 dB	-2.5 dB

The road surfaces are all assumed to be dense graded asphalt.

3.3. Vehicle Speed

The posted speeds for all assessed roads is 70 km/hr.

3.4. Traffic Volumes

Forecast (2031) 2-way traffic volumes were obtained from the Stantec reports. A 2% per annum growth rate was then applied to estimate the 2044 traffic volumes and these are provided below in *Table 3-2*. Percentage heavy vehicles were assumed to be 6% for all roads.

Table 3-2: Traffic Information Used in Noise Modelling

Road	Section	2044 Traffic Volume
Pinjar Road	South of Caporn Street	24,837
	North of Caporn Street	33,375
	North of Edward Street	32,728
	North of Ashley Street	41,654
Caporn Street	West of Franklin Road	27,554
	West of Rousset Road	26,519
	West of Mariginup Road	17,852
	East of Garden Park Drive	18,628
	West of Garden Park Drive	18,499
	East of Wells Street	18,757
	West of Wells Street	20,439
Franklin Road	South of Caporn Street	33,116

Note that SPP 5.4 is stated as applying to roads with daily traffic count of at least 23,000 vehicles per day. This means that parts of Caporn Street (west of Mariginup Road) may not require assessment, although for the purpose of continuity, these are included in the noise modelling.

3.5. Ground Absorption

The ground absorption has been assumed to be 0.0 (0%) for the roads, 0.5 (50%) outside of the roads and 1.0 (100%) for public open spaces, noting that 0.0 represents hard reflective surfaces such as water and 1.0 represents absorptive surfaces such as grass.

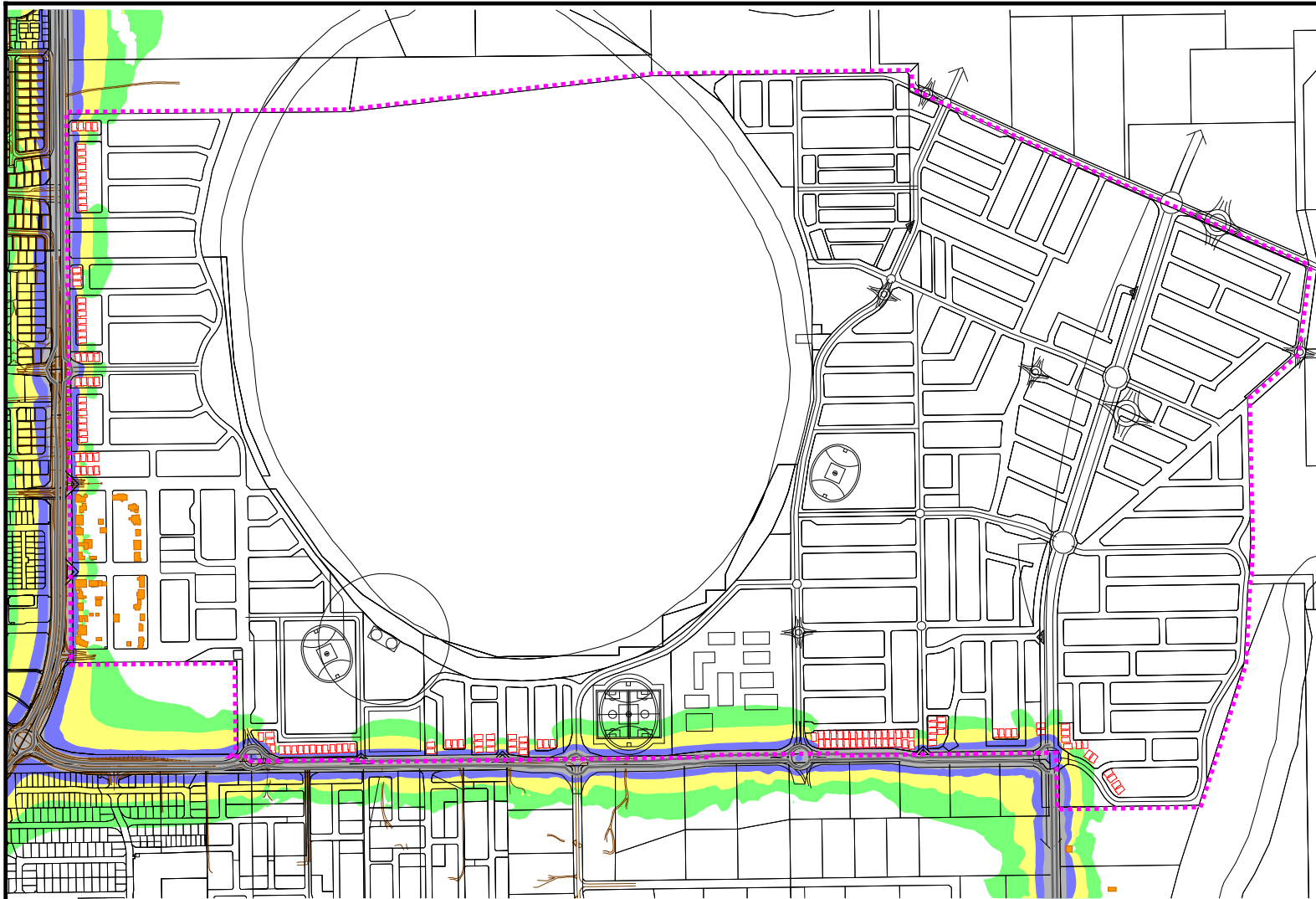
3.6. Parameter Conversion

The CoRTN algorithms used in the *SoundPlan* modelling package were originally developed to calculate the $L_{A10,18\text{hour}}$ noise level. SPP 5.4 however uses $L_{Aeq(\text{Day})}$ and $L_{Aeq(\text{Night})}$. The relationship between the parameters varies depending on the composition of traffic on the road (volumes in each period and percentage heavy vehicles). In this case, the in-built algorithm within *SoundPLAN* has been utilised, based on *Converting the UK Traffic Noise Index $L_{A10,18h}$ to EU Noise Indices for Noise Mapping*; TRL Limited. Night-time noise levels are considered to be at least 5 dB below the daytime noise levels so daytime will be critical.

4. RESULTS

The results of the noise modelling are provided as a noise contour plot in *Figure 4-1*.

Figure 4-1



Noise levels
L_{Aeq}(Day) dB

<= 55	Exposure A
<= 56	
<= 57	Exposure B
<= 58	
<= 59	
<= 60	Exposure C
<= 61	
<= 62	
<= 63	
<= 64	Exposure D
<= 65	
<= 66	
> 66	

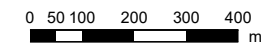
SPP 5.4 (Sep 2019)

Signs and symbols

- Road
- Indicative Building
- Existing Building
- Structure Plan Boundary



Length Scale 1:14500



East Wanneroo Precinct 7, Mariginiup -

L_{Aeq}(Day) Noise Level Contours Based on Future Conditions
Ground Floor Level

SoundPLAN v8.2
CoRTN Algorithms

13 December 2023



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5. ASSESSMENT

The objectives of SPP 5.4 are to achieve:

- Indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses); and
- A reasonable degree of acoustic amenity for outdoor living areas on each residential lot.

Where the outdoor noise targets of *Table 2-1* are achieved, no further noise controls are necessary.

With reference to the predicted noise levels in *Section 4*, it is evident the outdoor noise target will be exceeded at the nearest residences to the roads in question. As discussed in *Section 3.2*, SPP 5.4 only strictly applies where the daily volumes exceed 23,000 vehicles per day and therefore residences in the vicinity of Caporn Street, west of Mariginiup Road, may not require assessment.

Given the early stages of the Structure Plan, the noise mitigation is indicative only and would be further refined in detailed design. Outlined below are recommendations for road traffic noise to comply with SPP 5.4:

- Preference should be given to separating lots using a local internal road and orientating houses so the front of the dwelling will face the road of concern. This has been the approach for much of the development. The advantage of the local road is noise levels are expected to be within Exposure Categories B/C for the closest houses so that architectural treatments can be adopted (refer *Appendix A*) rather than constructing noise walls/bunds, which may not be desirable for other amenity reasons. The advantage of this orientation is that the outdoor living area (alfresco) will most naturally be located at the rear of the dwelling, opposite the road and thereby shielded from road traffic noise. Noise walls can still be considered in detailed design in an effort to minimise the architectural package (e.g. may reduce from Quiet House C to Quiet House A).
- There are circumstances where lot orientation is expected to be parallel with the road with no local internal road separation. In these circumstances, a noise wall will need to be allowed for and for the purpose of this study should be assumed to be minimum 2.4-metres high and possibly 3.0-metres high along Pinjar Road due to the higher traffic volumes. The 2.4-metre high wall minimum is adopted to align with the Quiet House B and C requirements for the alfresco area to be protected by such a wall. This will provide the home owner flexibility on positioning the alfresco area.

Note that any wall is to be solid, free of gaps and of minimum surface mass 15 kg/m². Where lots are above the outdoor noise target, notifications on lot titles are required as per SPP 5.4 – refer *Appendix A*.

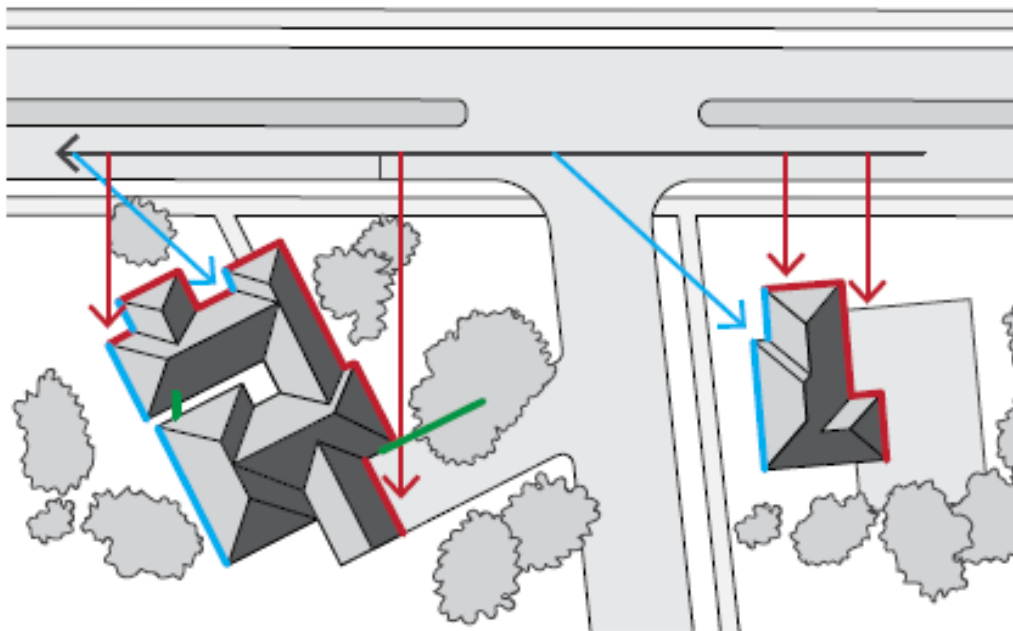
Appendix A – Quiet House Packages

The packages and information provided on the following pages are taken from *Road and Rail Noise Guidelines* (September 2019).

Where outdoor and indoor noise levels received by a noise-sensitive land-use and/or development exceed the policy's noise target, implementation of quiet house requirements is an acceptable solution.

With regards to the packages, the following definitions are provided:

- **Facing** the transport corridor (red): Any part of a building façade is 'facing' the transport corridor if any straight line drawn perpendicular (at a 90 degree angle) to its nearest road lane or railway line intersects that part of the façade without obstruction (ignoring any fence).
- **Side-on** to transport corridor (blue): Any part of a building façade that is not 'facing' is 'side-on' to the transport corridor if any straight line, at any angle, can be drawn from it to intersect the nearest road lane or railway line without obstruction (ignoring any fence).
- **Opposite** to transport corridor (green): Neither 'side on' nor 'facing', as defined above.



Quiet House Package A

56-58 dB $L_{Aeq}(\text{Day})$ & 51-53 dB $L_{Aeq}(\text{Night})$

Element	Orientation	Room	
		Bedroom	Indoor Living and Work Areas
External Windows	Facing	<ul style="list-style-type: none"> Up to 40% floor area ($R_w + C_{tr} \geq 28$): <ul style="list-style-type: none"> Sliding or double hung with minimum 10mm single or 6mm-12mm-10mm double insulated glazing; Sealed awning or casement windows with minimum 6mm glass. Up to 60% floor area ($R_w + C_{tr} \geq 31$): <ul style="list-style-type: none"> Sealed awning or casement windows with minimum 6mm glass. 	<ul style="list-style-type: none"> Up to 40% floor area ($R_w + C_{tr} \geq 25$): <ul style="list-style-type: none"> Sliding or double hung with minimum 6mm single or 6mm-12mm-6mm double insulated glazing; Up to 60% floor area ($R_w + C_{tr} \geq 28$); Up to 80% floor area ($R_w + C_{tr} \geq 31$).
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	No specific requirements	
External Doors	Facing	<ul style="list-style-type: none"> Fully glazed hinged door with certified $R_w + C_{tr} \geq 28$ rated door and frame including seals and 6mm glass. 	<ul style="list-style-type: none"> Doors to achieve $R_w + C_{tr} \geq 25$: <ul style="list-style-type: none"> 35mm Solid timber core hinged door and frame system certified to $R_w 28$ including seals; Glazed sliding door with 10mm glass and weather seals.
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less.	
	Opposite	No specific requirements	
External Walls	All	<ul style="list-style-type: none"> $R_w + C_{tr} \geq 45$: <ul style="list-style-type: none"> Two leaves of 90mm thick clay brick masonry with minimum 20mm cavity; or Single leaf of 150mm brick masonry with 13mm cement render on each face; or One row of 92mm studs at 600mm centres with: <ul style="list-style-type: none"> Resilient steel channels fixed to the outside of the studs; and 9.5mm hardboard or fibre cement sheeting or 11mm fibre cement weatherboards fixed to the outside; 75mm thick mineral wool insulation with a density of at least 11kg/m³; and 2 x 16mm fire-rated plasterboard to inside. 	
Roofs and Ceilings	All	<ul style="list-style-type: none"> $R_w + C_{tr} \geq 35$; Concrete or terracotta tile or metal sheet roof with sarking and at least 10mm plasterboard. 	
Outdoor Living Areas		At least one outdoor living area located on the opposite side of the building from the transport corridor or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2 metres height above ground level.	

Quiet House Package B

59-62 dB $L_{Aeq}(\text{Day})$ & 54-57 dB $L_{Aeq}(\text{Night})$

Element	Orientation	Room	
		Bedroom	Indoor Living and Work Areas
External Windows	Facing	<ul style="list-style-type: none"> Up to 40% floor area ($R_w + C_{tr} \geq 31$): <ul style="list-style-type: none"> Fixed sash, awning or casement with minimum 6mm glass or 6mm-12mm-6mm double insulated glazing. Up to 60% floor area ($R_w + C_{tr} \geq 34$): <ul style="list-style-type: none"> Fixed sash, awning or casement with minimum 10mm glass or 6mm-12mm-10mm double insulated glazing. 	<ul style="list-style-type: none"> Up to 40% floor area ($R_w + C_{tr} \geq 28$): <ul style="list-style-type: none"> Sliding or double hung with 6mm-12mm-10mm double insulated glazing; Sealed awning or casement windows with minimum 6mm glass. Up to 60% floor area ($R_w + C_{tr} \geq 31$); Up to 80% floor area ($R_w + C_{tr} \geq 34$).
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	As above, except $R_w + C_{tr}$ values may be 6 dB less or max % area increased by 20%.	
External Doors	Facing	<ul style="list-style-type: none"> Fully glazed hinged door with certified $R_w + C_{tr} \geq 31$ rated door and frame including seals and 10mm glass. 	<ul style="list-style-type: none"> Doors to achieve $R_w + C_{tr} \geq 28$: <ul style="list-style-type: none"> 40mm Solid timber core hinged door and frame system certified to R_w 32 including seals; Fully glazed hinged door with certified $R_w + C_{tr} \geq 28$ rated door and frame including seals and 6mm glass.
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	As above, except $R_w + C_{tr}$ values may be 6 dB less or max % area increased by 20%.	
External Walls	All	<ul style="list-style-type: none"> $R_w + C_{tr} \geq 50$: <ul style="list-style-type: none"> Two leaves of 90mm thick clay brick masonry with minimum 50mm cavity between leaves and 25mm glasswool or polyester (24kg/m³). Resilient ties used where required to connect leaves. Two leaves of 110mm clay brick masonry with minimum 50mm cavity between leaves and 25mm glasswool or polyester insulation (24kg/m³). Single leaf of 220mm brick masonry with 13mm cement render on each face. 150mm thick unlined concrete panel or 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face. Single leaf of 90mm clay brick masonry with: <ul style="list-style-type: none"> A row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres; A cavity of 25mm between leaves; 50mm glasswool or polyester insulation (11kg/m³) between studs; and One layer of 10mm plasterboard fixed to the inside face. 	
Roofs and Ceilings	All	<ul style="list-style-type: none"> $R_w + C_{tr} \geq 35$: <ul style="list-style-type: none"> Concrete or terracotta tile or metal sheet roof with sarking and at least 10mm plasterboard ceiling with R3.0+ fibrous insulation. 	
Outdoor Living Areas		At least one outdoor living area located on the opposite side of the building from the transport corridor or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2.4 metres height above ground level.	

Quiet House Package C

63-66 dB $L_{Aeq}(\text{Day})$ & 58-61 dB $L_{Aeq}(\text{Night})$

Element	Orientation	Room	
		Bedroom	Indoor Living and Work Areas
External Windows	Facing	<ul style="list-style-type: none"> Up to 20% floor area ($R_w + C_{tr} \geq 31$): <ul style="list-style-type: none"> Fixed sash, awning or casement with minimum 6mm glass or 6mm-12mm-6mm double insulated glazing. Up to 40% floor area ($R_w + C_{tr} \geq 34$): <ul style="list-style-type: none"> Fixed sash, awning or casement with minimum 10mm glass or 6mm-12mm-10mm double insulated glazing. 	<ul style="list-style-type: none"> Up to 40% floor area ($R_w + C_{tr} \geq 31$): <ul style="list-style-type: none"> Fixed sash, awning or casement with minimum 6mm glass or 6mm-12mm-6mm double insulated glazing. Up to 60% floor area ($R_w + C_{tr} \geq 34$): <ul style="list-style-type: none"> Fixed sash, awning or casement with minimum 10mm glass or 6mm-12mm-10mm double insulated glazing.
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	As above, except $R_w + C_{tr}$ values may be 6 dB less or max % area increased by 20%.	
External Doors	Facing	<ul style="list-style-type: none"> Not recommended. 	<ul style="list-style-type: none"> Doors to achieve $R_w + C_{tr} \geq 30$: <ul style="list-style-type: none"> Fully glazed hinged door with certified $R_w + C_{tr} \geq 31$ rated door and frame including seals and 10mm glass; 40mm Solid timber core side hinged door, frame and seal system certified to $R_w 32$ including seals. Any glass inserts to be minimum 6mm.
	Side On	As above, except $R_w + C_{tr}$ values may be 3 dB less or max % area increased by 20%.	
	Opposite	As above, except $R_w + C_{tr}$ values may be 6 dB less or max % area increased by 20%.	
External Walls	All	<ul style="list-style-type: none"> $R_w + C_{tr} \geq 50$: <ul style="list-style-type: none"> Two leaves of 90mm thick clay brick masonry with minimum 50mm cavity between leaves and 25mm glasswool or polyester insulation (24kg/m^3). Resilient ties used where required to connect leaves. Two leaves of 110mm clay brick masonry with minimum 50mm cavity between leaves and 25mm glasswool or polyester insulation (24kg/m^3). Single leaf of 220mm brick masonry with 13mm cement render on each face. 150mm thick unlined concrete panel or 200mm thick concrete panel with one layer of 13mm plasterboard or 13mm cement render on each face. Single leaf of 90mm clay brick masonry with: <ul style="list-style-type: none"> A row of 70mm x 35mm timber studs or 64mm steel studs at 600mm centres; A cavity of 25mm between leaves; 50mm glasswool or polyester insulation (11kg/m^3) between studs; and One layer of 10mm plasterboard fixed to the inside face. 	
Roofs and Ceilings	All	<ul style="list-style-type: none"> $R_w + C_{tr} \geq 40$: <ul style="list-style-type: none"> Concrete or terracotta tile roof with sarking, or metal sheet roof with foil backed R2.0+ fibrous insulation between steel sheeting and roof battens; R3.0+ insulation batts above ceiling; 2 x 10mm plasterboard ceiling or 1 x 13mm sound-rated plasterboard affixed using steel furring channel to ceiling rafters. 	
Outdoor Living Areas		At least one outdoor living area located on the opposite side of the building from the transport corridor or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2.4 metres height above ground level.	

Mechanical Ventilation requirements

In implementing the acceptable treatment packages, fresh air requirements of the National Construction Code must be satisfied on the basis of windows closed. Whilst not the only solution, the most common is mechanical ventilation / air-conditioning is installed with the following considerations:

- Acoustically rated openings and ductwork to provide a minimum sound reduction performance of R_w 40 dB into sensitive spaces;
- Evaporative systems require attenuated ceiling air vents to allow closed windows;
- Refrigerant based systems need to be designed to achieve National Construction Code fresh air ventilation requirements;
- Openings such as eaves, vents and air inlets must be acoustically treated, closed or relocated to building sides facing away from the corridor where practicable.

Notification

Notifications on title advise prospective purchasers of the potential for noise impacts from major transport corridors and help with managing expectations.

The Notification is to state as follows:

This lot is in the vicinity of a transport corridor and is affected, or may in the future be affected, by road and rail transport noise. Road and rail transport noise levels may rise or fall over time depending on the type and volume of traffic.

Appendix B – Terminology

The following is an explanation of the terminology used throughout this report:

- **Decibel (dB)**

The decibel is the unit that describes the sound pressure levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

- **A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A , dB.

- **L_{eq}**

The L_{eq} level represents the average noise energy during a measurement period.

- **L_1**

The L_1 level represents the noise level exceeded for 1 percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

- **L_{10}**

The L_{10} level represents the noise level exceeded for 10 percent of the measurement period and is considered to represent the “intrusive” noise level.

- **L_{90}**

The L_{90} level represents the noise level exceeded for 90 percent of the measurement period and is considered to represent the “background” noise level.

- **$L_{Aeq(Day)}$**

The $L_{Aeq(Day)}$ level is the logarithmic average of the L_{Aeq} levels from 6.00am to 10.00pm.

- **$L_{Aeq(Night)}$**

The $L_{Aeq(Night)}$ level is the logarithmic average of the L_{Aeq} levels from 10.00pm to 6.00am.

- **$L_{A10,18hour}$**

The $L_{A10,18hour}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00am and midnight.

- **$L_{Aeq,24hour}$**

The $L_{Aeq,24hour}$ level is the logarithmic average of the L_{Aeq} levels from over an entire day.

- **Noise-sensitive land use and/or development**

Land-uses or development occupied or designed for occupation or use for residential purposes (including dwellings, residential buildings or short-stay accommodation), caravan park, camping ground, educational establishment, child care premises, hospital, nursing home, corrective institution or place of worship.

- **R_w**

This is the weighted sound reduction index. It is a single number rating determined by moving a grading curve in integral steps against the laboratory measured transmission loss until the sum of the deficiencies at each one-third-octave band, between 100 Hz and 3.15 kHz, does not exceed 32 dB. The higher the R_w value, the better the acoustic performance.

- **C_{tr}**

This is a spectrum adaptation term for airborne noise and provides a correction to the R_w value to suit source sounds with significant low frequency content such as road traffic or home theatre systems. A wall that provides a relatively high level of low frequency attenuation (i.e. masonry) may have a value in the order of – 4 dB, whilst a wall with relatively poor attenuation at low frequencies (i.e. stud wall) may have a value in the order of -12 dB.

- **About the Term ‘Reasonable’**

An assessment of reasonableness should demonstrate that efforts have been made to resolve conflicts without comprising on the need to protect noise-sensitive land-use activities. For example, have reasonable efforts been made to design, relocate or vegetate a proposed noise barrier to address community concerns about the noise barrier height? Whether a noise mitigation measure is reasonable might include consideration of:

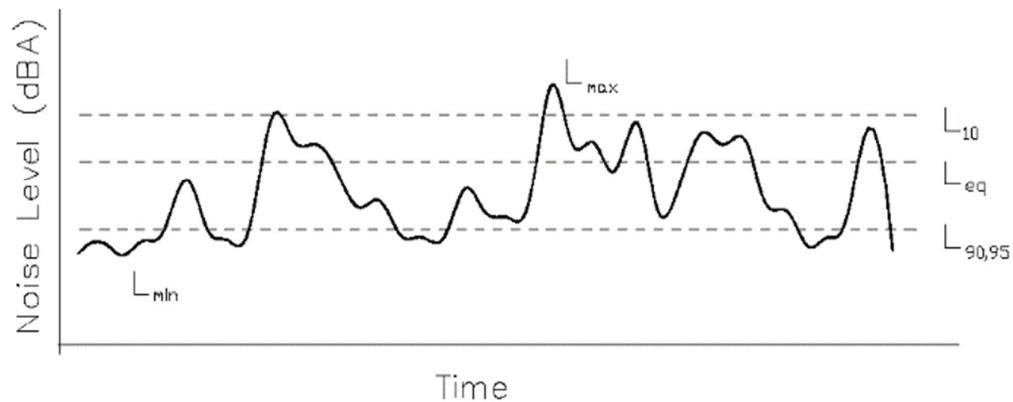
- The noise reduction benefit provided;
- The number of people protected;
- The relative cost vs benefit of mitigation;
- Road conditions (speed and road surface) significantly differ from noise forecast table assumptions;
- Existing and future noise levels, including changes in noise levels;
- Aesthetic amenity and visual impacts;
- Compatibility with other planning policies;
- Differences between metropolitan and regional situations and whether noise modelling requirements reflect the true nature of transport movements;
- Ability and cost for mobilisation and retrieval of noise monitoring equipment in regional areas;
- Differences between Greenfield and infill development;
- Differences between freight routes and public transport routes and urban corridors;
- The impact on the operational capacity of freight routes;
- The benefits arising from the proposed development;
- Existing or planned strategies to mitigate the noise at source.

- **About the Term 'Practicable'**

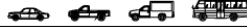











'Practicable' considerations for the purposes of the policy normally relate to the engineering aspects of the noise mitigation measures under evaluation. It is defined as "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge" (*Environmental Protection Act 1986*). These may include:

- Limitations of the different mitigation measures to reduce transport noise;
- Competing planning policies and strategies;
- Safety issues (such as impact on crash zones or restrictions on road vision);
- Topography and site constraints (such as space limitations);
- Engineering and drainage requirements;
- Access requirements (for driveways, pedestrian access and the like);
- Maintenance requirements;
- Bushfire resistance or BAL ratings;
- Suitability of the building for acoustic treatments.

- **Chart of Noise Level Descriptors**



- Austrroads Vehicle Class

VEHICLE CLASSIFICATION SYSTEM	
AUSTRROADS	
CLASS	LIGHT VEHICLES
1	SHORT Car, Van, Wagon, 4WD, UTV, Bicycle, Motorcycle 
2	SHORT - TOWING Trailer, Caravan, Boat 
HEAVY VEHICLES	
3	TWO AXLE TRUCK OR BUS *2 axles 
4	THREE AXLE TRUCK OR BUS *3 axles, 2 axle groups 
5	FOUR (or FIVE) AXLE TRUCK *4 (5) axles, 2 axle groups 
6	THREE AXLE ARTICULATED *3 axles, 3 axle groups 
7	FOUR AXLE ARTICULATED *4 axles, 3 or 4 axle groups 
8	FIVE AXLE ARTICULATED *5 axles, 3+ axle groups 
9	SIX AXLE ARTICULATED *6 axles, 3+ axle groups or 7+ axles, 3 axle groups 
LONG VEHICLES AND ROAD TRAINS	
10	8 DOUBLE or HEAVY TRUCK and TRAILER *7+ axles, 4 axle groups 
11	DOUBLE ROAD TRAIN *7+ axles, 5 or 6 axle groups 
12	TRIPLE ROAD TRAIN *7+ axles, 7+ axle groups 

- Typical Noise Levels

