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Transportation Noise Assessment

Lot 806 (#401) Shanns Road, North Dandalup

Reference: 23037975-01A

Prepared for:
Corrib Developments

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1. INTRODUCTION

It is proposed to subdivide land at Lot 806 (#401) Shanns Road, North Dandalup (refer *Figure 1-1*) with the proposed subdivision plan shown in *Figure 1-2*. The site adjoins a freight railway on the southeast side, such that a noise assessment is required in accordance with *State Planning Policy No. 5.4 Road and Rail Noise*, being the subject of this report.

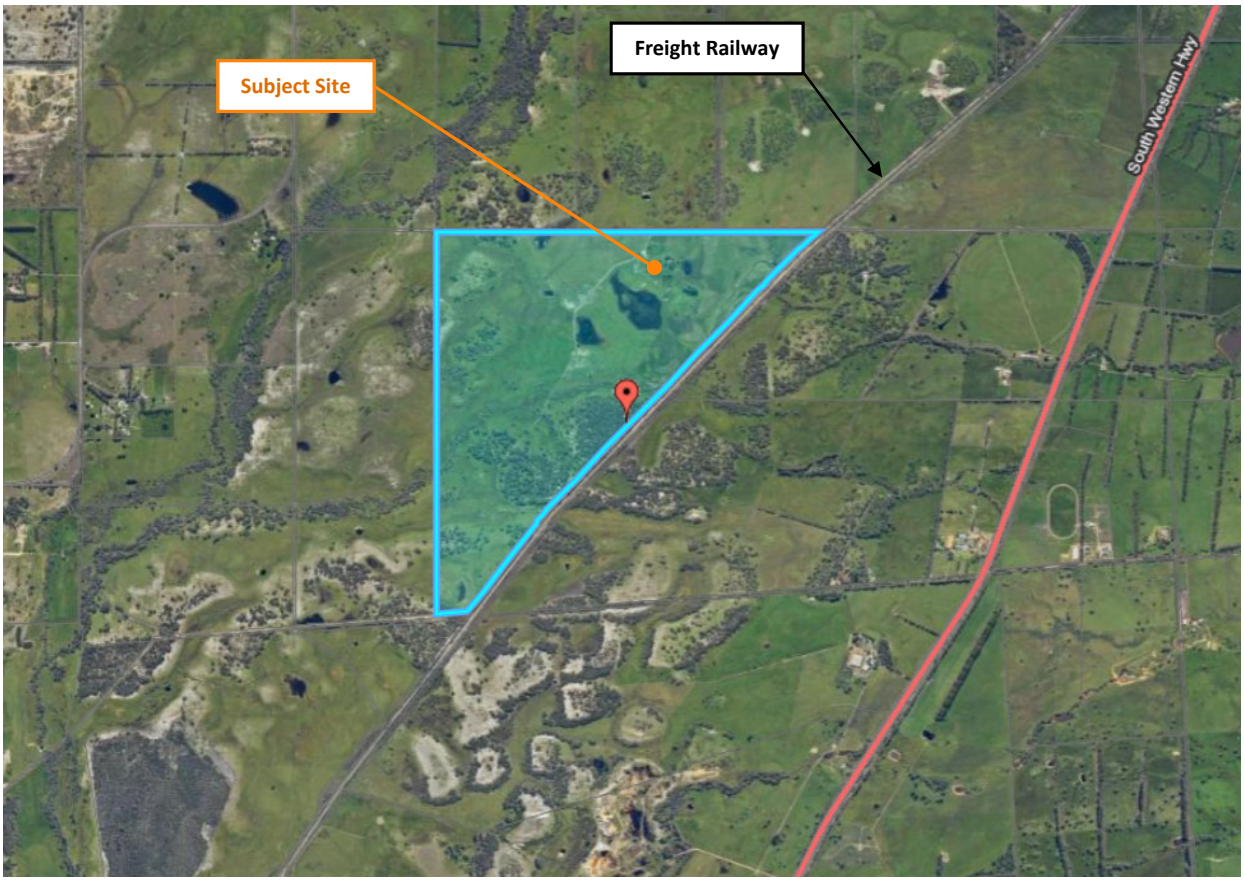

Figure 1-1: Subdivision Location (Source: DPLH PlanWA)

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

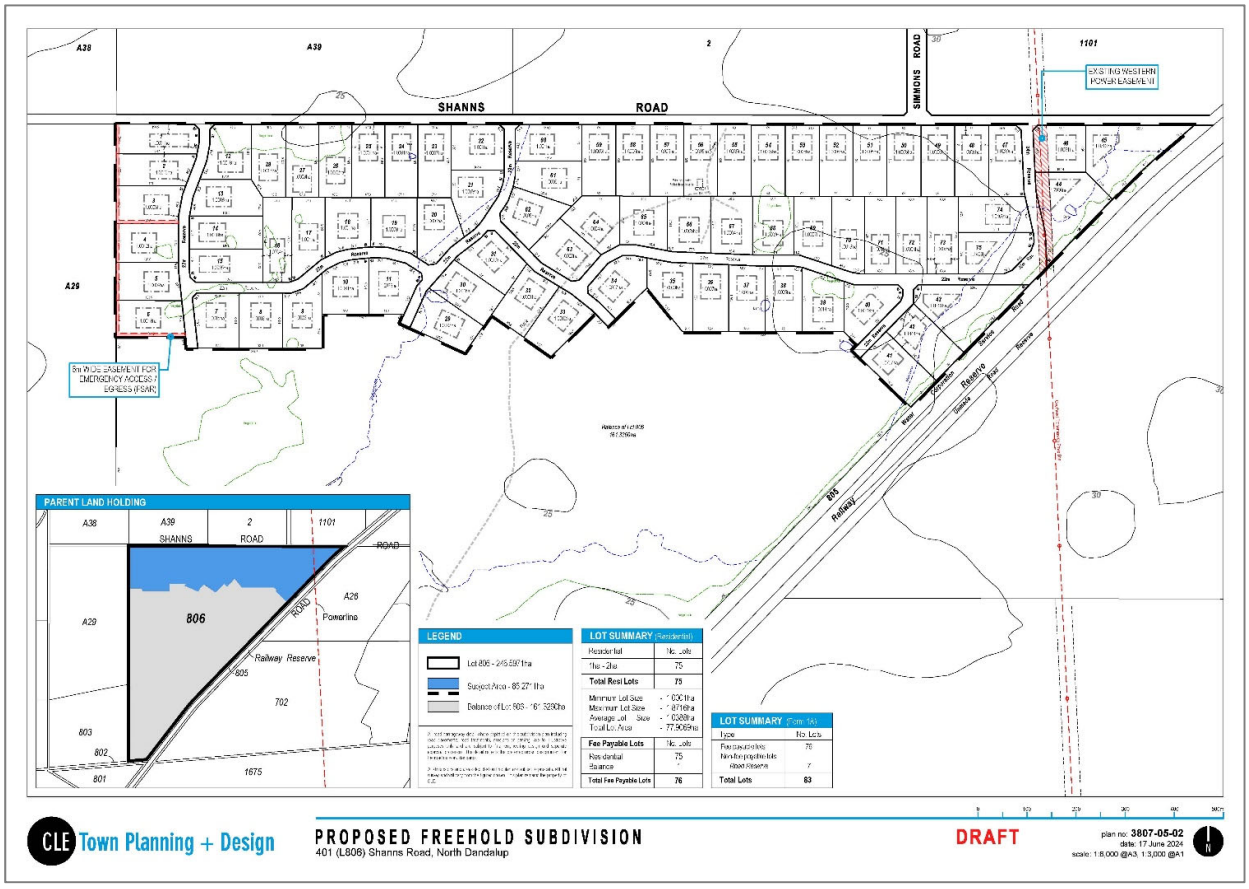

Figure 1-2: Subdivision Layout

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)	35 dB $L_{Aeq(Night)}$ (Bedrooms)

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, habitable[1] 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.

[1] *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 measurements and modelling have been undertaken in accordance with the requirements of SPP 5.4 and associated Guidelines, as described in *Section 3.1* and *Section 3.2*.

3.1. Site Measurements

Noise monitoring was undertaken on a nearby site adjacent the same freight railway (Lot 106 South Western Highway, Pinjarra) site using an ARL Ngara Noise Data Logger (S/N: 87803A) (refer *Figure 3-1*). The logger was programmed to record 1-minute L_{Aeq} and L_{Amax} levels. The logger was field calibrated before and after the measurement session and found to be accurate to within ± 1 dB. Lloyd George Acoustics holds current laboratory calibration certificate for the logger.

The microphone was approximately 1.4 metres above existing ground level and approximately 50 metres from the centre of the railway track. The measurements were recorded between 2 February 2023 and 13 February 2023.

Figure 3-1: Photograph of Noise Logger

3.2. Noise Modelling

The computer program *SoundPLAN 8.2* was utilised incorporating the *Nordic Rail Prediction Method (Kilde Rep. 130)*. Input data are described in *Section 3.2.1* to *Section 3.2.3*.

3.2.1. Ground Topography

Topographical data was taken from publicly available sources (e.g. *Google*) in the form of spot heights.

Indicative building outlines have been included as these can provide barrier attenuation when located between a source and a receiver, in much the same way as a hill or wall. All buildings are assumed to be single storey with heights of 3.5 metres and located within the building envelope shown on *Figure 1-2*.

Predictions are made at heights of 1.4 metres above ground floor level for single storey buildings. The noise is predicted at 1-metre from an assumed building façade, resulting in a + 2.5 dB correction due to reflected noise.

Future lot levels are assumed to be the same as existing levels.

3.2.2. Train Data

From the noise monitoring (refer *Section 4.1*), the train movements shown in *Table 3-1* were identified.

Table 3-1: Train Movements Used in Modelling

Day	Number of Movements During Day	Number of Movements During Night
Sunday, 5 February 2023	12	4
Monday, 6 February 2023	10	4
Tuesday, 7 February 2023	15	6
Wednesday, 8 February 2023	10	5
Thursday, 9 February 2023	9	6
Friday, 10 February 2023	11	6
Saturday, 11 February 2023	11	5

Given current volumes are less than 1 train per hour, future modelling assumes there will be at least 1 per hour in line with SPP 5.4 requirements. That is, 16 during the day and 8 during the night.

Trains are modelled at 80 km/hr throughout the study area and the track within the study area is assumed to be smooth, continuously welded track free of audible irregularities.

3.2.3. 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.

4. RESULTS

4.1. Noise Monitoring

To determine the daily noise levels from freight trains, the data and audio files were reviewed to extract freight train events for a complete week (Sunday to Saturday). This resulted in identifying the number of passbys (refer *Table 3-1*) and allowed the isolated train noise levels to be determined. The results of the freight train noise monitoring are shown graphically in *Figure 4-1* and *Figure 4-2*. The noise levels presented in *Table 4-1* are calculated from the data and then adjusted to assume 1 movement per hour as required by SPP 5.4.

Table 4-1: Measured Average Noise Levels at Logger: Freight Railway

Day	$L_{Aeq(Day)}$	$L_{Aeq(Night)}$
Sunday, 5 February 2023	49.9	50.5
Monday, 6 February 2023	49.5	51.3
Tuesday, 7 February 2023	49.0	50.6
Wednesday, 8 February 2023	49.6	50.9
Thursday, 9 February 2023	50.1	50.3
Friday, 10 February 2023	51.2	49.2
Saturday, 11 February 2023	49.4	50.8
Average	**49.8**	**50.5**

In this case, the $L_{Aeq(Night)}$ is very similar in noise level to the $L_{Aeq(Day)}$, such that it is the $L_{Aeq(Night)}$ parameter that will determine compliance for freight trains.

4.2. Noise Modelling

The noise model was initially set-up for existing conditions and calibrated to the noise measurement location. The model is then updated to include the proposed subdivision, indicative buildings and future traffic volumes, maintaining the same model calibration. The results of the noise modelling are provided as a noise contour plot in *Figure 4-3*.

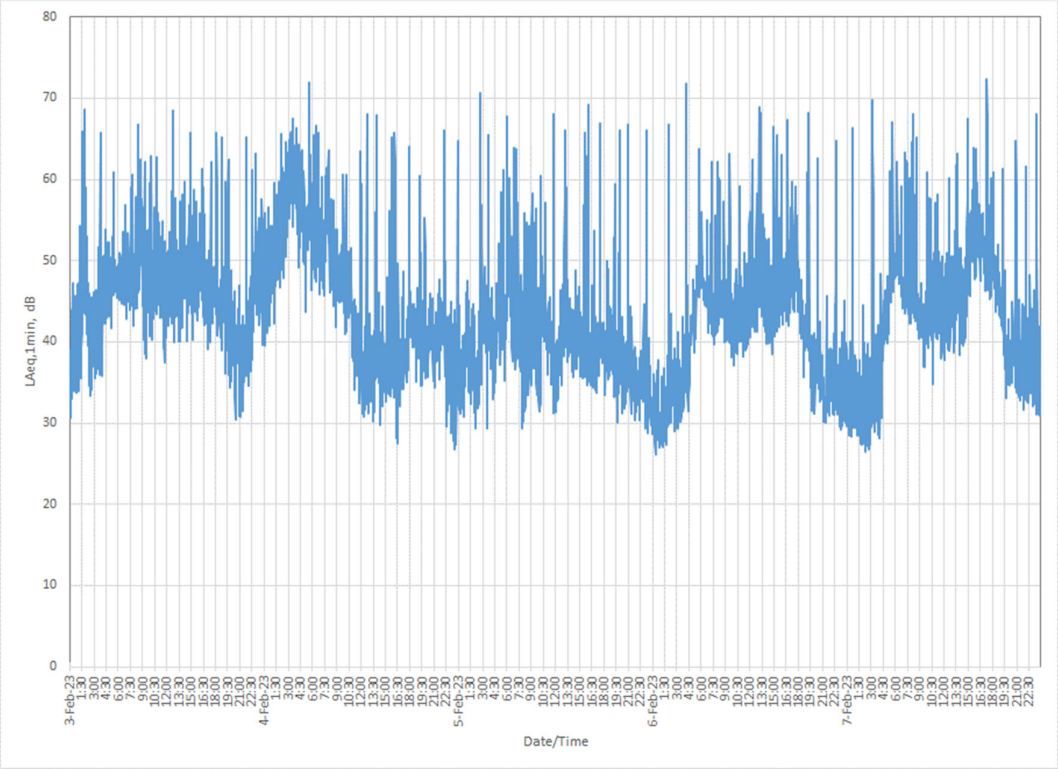

Figure 4-1: Graph 1 Results at Noise Logger: Freight Railway

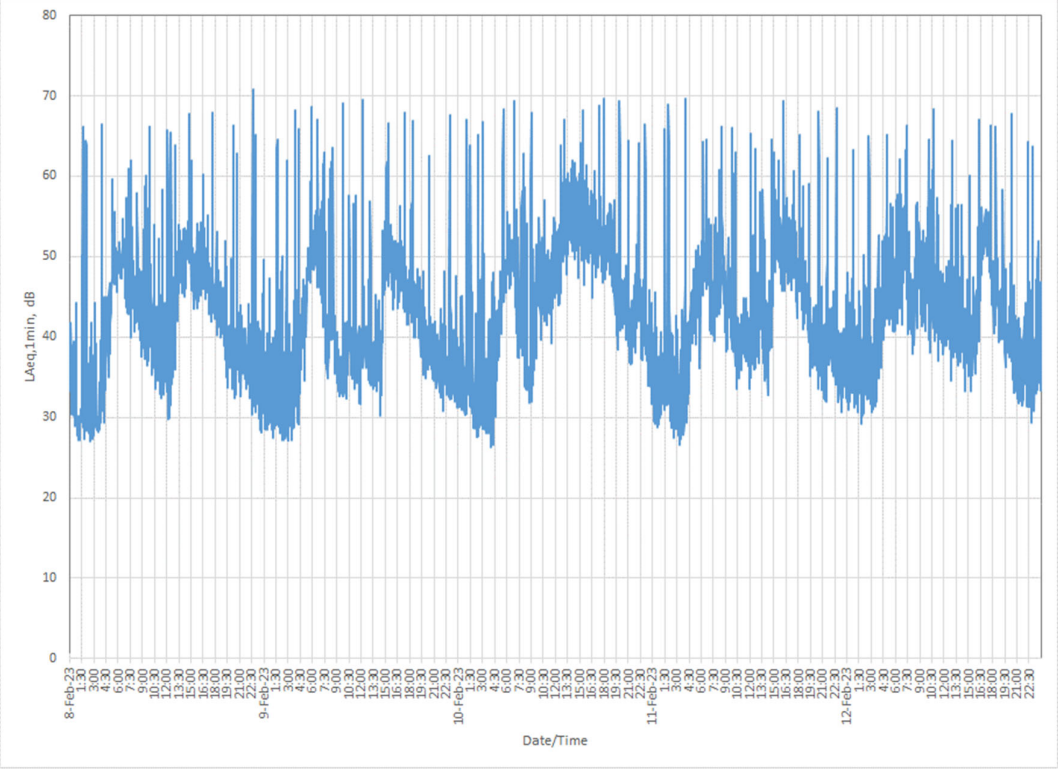

Figure 4-2: Graph 2 Results at Noise Logger: Freight Railway

Figure 4-3

Noise levels
$L_{Aeq(Night)}$ dB

<= 50	
<= 51	Exposure A
<= 52	
<= 53	
<= 54	Exposure B
<= 55	
<= 56	
<= 57	
<= 58	Exposure C
<= 59	
<= 60	
<= 61	
> 61	Exposure D

SPP 5.4 (Sep 2019)

Signs and symbols
- South Western Highway
- Freight Railway
- Building
- Application Area

N

Length Scale 1:7500

0 37.5 75 150 225 300 m

Lot 806 (#401) Shanns Road, North Dandalup
Proposed Residential Subdivision

$L_{Aeq(Night)}$ Noise Level Contours for Future Freight Railway
Ground Floor Level

SoundPLAN v8.2
Nordic (Kilde 130) Algorithms

21 June 2024

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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 or 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 *Section 4.2*, it is evident the outdoor noise target will be compliant at all proposed lots.

Whilst not mandatory, notifications on lot titles for the four closest lots (Lots 41 to 46, 74 to 75) could still be considered.

Appendix A – 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:

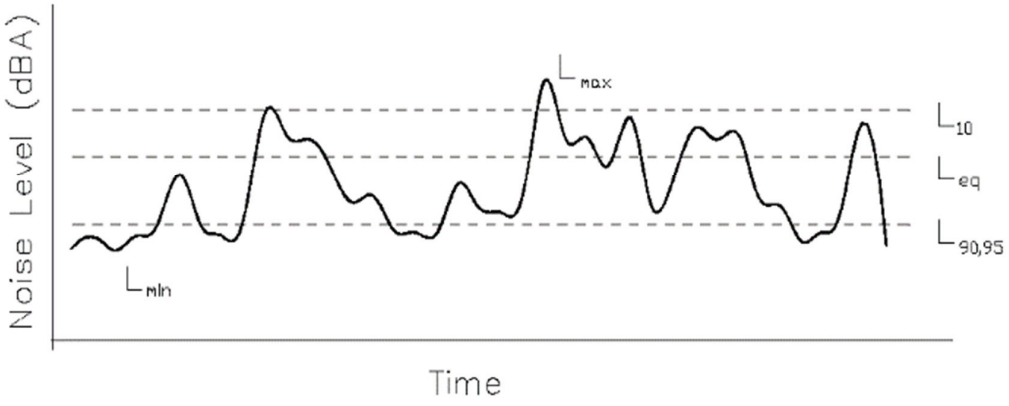
  - The noise reduction benefit provided;
  - The number of people protected;
  - The relative cost vs benefit of mitigation;
  - Road conditions (speed and road surface) significantly differ from noise forecast table assumptions;
  - Existing and future noise levels, including changes in noise levels;
  - 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'**

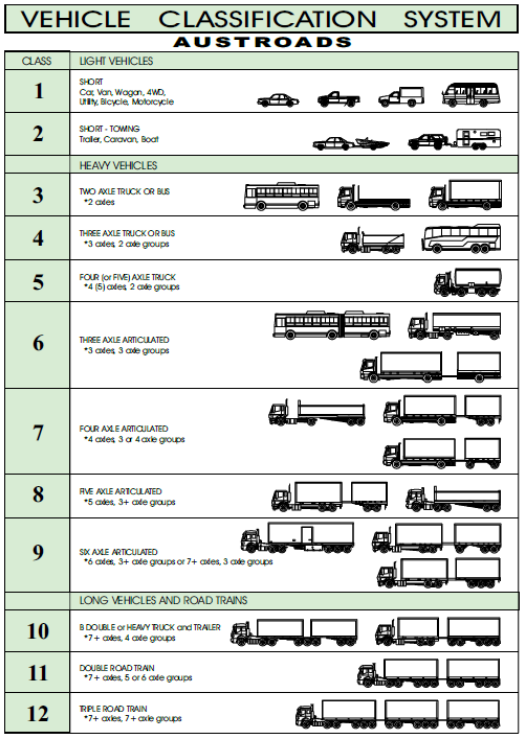
'Practicable' considerations for the purposes of the policy normally relate to the engineering aspects of the noise mitigation measures under evaluation. It is defined as "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current 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**



- **Austroads Vehicle Class**



- **Typical Noise Levels**