



Lot 642 Googong

# Noise Impact Assessment

## Base Developments

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## 1 INTRODUCTION

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged to undertake an acoustic assessment for the proposed residential development located at Lot 642 Googong, NSW.

This assessment includes the acoustic investigation into the potential for noise impacts from the operation of the completed project as well as potential noise impacts from existing noise sources within the vicinity of the site which predominantly includes traffic noise from surrounding noise sources.

## 2 PROJECT DETAILS

### 2.1 Site Location

The proposed residential development is located in the block 642 Googong and is bound by roadways to north, south and east of the site including Calthorpe Street, Glenrock Drive, Rucos Street and Perring Street. The surrounding receivers to the site include existing and future residential properties.

The site location is detailed in Figure 2-1 below.

**Figure 2-1 Proposed Development Site**





## 2.2 Project Description

The proposed development includes a residential subdivision development including residential dwellings to be located on the Lot 642 site which is located within a residential area of the Queanbeyan-Palerang Regional Council local government area.

## 3 EXISTING ACOUSTIC ENVIRONMENT

The proposed site is located with a residential area of Googong which is classified as a Suburban residential area as defined by the NSW EPA *Noise Policy for Industry*. The exiting noise levels at the site are predominantly as a result from traffic noise within the vicinity of the site on surrounding roadways. Existing receivers within the vicinity of the site include existing and future residential receivers.

### 3.1 Noise Descriptors and Terminology

Environmental noise constantly varies in level with time. Therefore, it is necessary to measure noise in terms of quantifiable time periods with statistical descriptors. Typically environmental noise is measured over 15 minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dBA, the "A" indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' linear arithmetic does not apply, e.g. adding two sound sources of equal values result in an increase of 3 dB (i.e. 60 dBA plus 60 dBA results in 63 dBA). A change of 1 dB or 2 dB in the sound level is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The most relevant environmental noise descriptors are the LAeq, LA1, LA10 and LA90 noise levels. The LAeq noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period. It represents the level that the fluctuating noise with the same acoustic energy would be if it were constant over the measured time period.

The LA1, LA10 and LA90 levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels can be considered as the maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

Specific acoustic terminology is used in this assessment report. An explanation of common acoustic terms is included in Appendix A.

## 4 INTERNAL NOISE LEVEL ASSESSMENT

Internal noise levels within the future residential occupancies have been based on the relevant noise levels as detailed within the Australian Standard AS2107:2000 *Acoustics - Recommended design sound levels and reverberation times for building interiors*.

The recommended levels for various areas of the project are detailed in the following table. The recommended noise levels for residential dwellings near major roadways detailed within AS2107:2016 have been used as the basis of this assessment.

For the purpose of this assessment the boarding house areas of the project have been assessed as a sleeping area of a residential tenancy.

**Table 4-1 Project Internal Noise Level Criteria**

Type of Occupancy/Activity	Design sound level maximum ( $L_{Aeq,t}$ ) <sup>1</sup>
Residential - Living areas	45
Residential - Sleeping areas (night time)	40
Toilets	55
Note 1: The relevant time period (t) for all areas detailed is 15 minutes.	

### 4.1 Environmental Noise Intrusion Assessment

This section of the report details the assessment of environmental noise intrusion into the proposed development and the recommended acoustic treatments to ensure the recommended internal noise levels detailed in the Sections above (including traffic noise intrusion) are achieved.

Internal noise levels within the future areas of the development will result from the noise intrusion into the building through the external façade including glass, masonry and other façade elements. Typically, the acoustic performance of building elements including the relatively light weight elements of the building façade, including glass and/or plasterboard constructions, will be the determining factors in the resulting internal noise levels.

Calculations of internal noise levels have been undertaken based on the measured traffic and calculated environmental noise levels at the site and the characteristics of the building, including window openings, buildings constructions and the like.

#### 4.1.1 External Glass Elements

The recommended acoustic constructions to the buildings external façade glass elements are detailed in the table below to ensure the recommended internal noise levels detailed above are achieved, with the façade building openings closed.

**Table 4-2 External Glass Acoustic Requirements**

Façade Orientation	Room Type	Recommended Glass Construction	Minimum Façade Acoustic Performance <sup>1</sup>
<b>All Façade Orientations</b>	Bedrooms	6mm Float/Toughened	Rw 28
	Living Rooms	6mm Float/Toughened	Rw 28
	Wet areas	6mm Float/Toughened	Rw 28
<i>Note 1: The acoustic performance of the external façade includes the installed glazing and frame including (but not limited to) the façade systems seals and frame. All external glazing systems are required to be installed using acoustic bulb seals.</i>			

The recommended glass constructions detailed in the table above include those required to ensure the acoustic requirements of the project are achieved. Thicker glazing may be required to achieve other project requirements such as structural, thermal, safety or other requirements and is to be advised by others.

#### 4.2 External Building Elements

The proposed external building elements including masonry or concrete external walls and roof are acoustically acceptable without additional acoustic treatment.

Any lightweight external pasteboard walls should be constructed from a construction with a minimum acoustic performance of Rw 45.

#### 4.3 External Roof

The required external roof and ceiling constructions for the project are required to include the following:

- Concrete external roof construction – no additional acoustic treatments required.
- Metal deck roof construction – no additional acoustic treatments required.

#### 4.4 External Opening and Penetrations

All openings and penetrations are required to be acoustically treated such that the performance of the building construction is not compromised. This may require lining of duct work behind mechanical service openings/grills, treatments to ventilation opening and the like.

## 5 EXTERNAL NOISE EMISSION ASSESSMENT

This section of the report details the relevant noise level criteria for noise emissions generated on the site once completed.

The relevant authority which provides the required noise level criteria for noise levels generated on the site includes the NSW Environmental Protection Authority's (EPA) Noise Policy for Industry (NPI).

This section contains noise criteria on the operational criteria, construction criteria and vibration criteria.

The following criteria are relevant for the assessment of noise and vibration emissions from the proposed training centre:

- For the assessment of the predicted operational noise emissions by the training facility: The criteria have been derived in accordance with the *Noise Policy for Industry* (EPA, 2017), details are included in the following sections of this report.

### 5.1 NSW Noise Policy for Industry

In NSW, the control of noise emissions is the responsibility of Local Government and the NSW Environment Protection Authority (NSW EPA). In October 2017, the NSW EPA released the *Noise Policy for Industry* (NSW NPI). The purpose of the policy is to ensure that noise impacts associated with particular industrial developments are evaluated and managed in a consistent and transparent manner. The policy aims to ensure that noise is kept to acceptable levels in balance with the social and economic value of industry in NSW.

The NSW NPI criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residential receivers in the short-term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

The project noise trigger level is derived from the more stringent value out of the project intrusiveness noise level and the project amenity noise level.

#### 5.1.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (LAeq), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPI. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

#### 5.1.2 Protecting Noise Amenity (All Receivers)

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPI. That is, the ambient LAeq noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.



The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

### 5.1.3 Area Classification

The NSW NPI characterises the “Suburban Residential” as an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.

For the considered receptors in the rural area, the recommended amenity noise level is shown in Table 5-1 below. When the existing noise level from industrial noise sources is close to the recommended “Amenity Noise Level” (ANL) given above, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the NSW NPI.

**Table 5-1 NSW NPI – Recommended  $L_{Aeq}$  Noise Levels from Industrial Noise Sources**

Type of Receiver	Indicative Noise Amenity Area	Time of Day <sup>1</sup>	Recommended Amenity Noise Level (L <sub>Aeq, period</sub> ) <sup>2</sup>
Residence	Suburban	Day	55
		Evening	45
		Night	40
<i>Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am</i>			
<i>Note 2: The L<sub>Aeq</sub> is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.</i>			

### 5.1.4 Project Trigger Noise Levels

The intrusive and amenity criteria for industrial noise emissions derived from the measured data are presented in Table 5-2. The amenity and intrusive criterion are nominated for the purpose of determining the operational noise limits for noise sources associated with the development which can potentially affect noise sensitive receivers.

For each assessment period, the project trigger noise levels are the lower (i.e. the more stringent) of the amenity or intrusive criteria. The project trigger noise levels are shown in bold text in Table 5-2.

**Table 5-2 External noise level criteria in accordance with the NSW NPI**

Location	Time of Day	Project Amenity Noise Level, LAeq, period <sup>1</sup> (dBA)	Representative Background Noise level LA90, 15 min (RBL) <sup>2</sup> (dBA)	Measured LAeq, period Noise Level (dBA)	Intrusive LAeq, 15 min Criterion for New Sources (dBA) <sup>3</sup>	Amenity LAeq, 15 min Criterion for New Sources (dBA) <sup>3, 4</sup>
Residence (Suburban)	Day	50	35	50	<b>40</b>	53
	Evening	40	30	48	<b>35<sup>1</sup></b>	43
	Night	35	30	44	<b>35<sup>1</sup></b>	38
<p><i>Note 1: Project Amenity Noise Levels corresponding to "suburban" areas, equivalent to the Recommended Amenity Noise Levels minus 5 dBA</i></p> <p><i>Note 2: LA90 Background Noise or Rating Background Level, including LA90 Background Noise or Rating Background Level based on the assumed minimum rating of the EPA NPI.</i></p> <p><i>Note 3: Project Noise Trigger Levels are shown in bold</i></p> <p><i>Note 4: According to Section 2.2 of the NSW NPI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB</i></p>						



## 6 OPERATIONAL ACOUSTIC ASSESSMENT

This section of the report details the assessment of potential noise generated as part of the proposed development.

The assessment of potential noise impacts from various sources of noise on the site are detailed in the following sections.

### 6.1 Mechanical Services Equipment

Detailed selections of the proposed mechanical plant and equipment to be used on the site are not available at this time. All future plant and equipment are to be acoustically treated to ensure the noise levels at all surrounding receivers comply with noise emission criteria detailed within this report. Experience with similar projects indicated that it is both possible and practical to treat all mechanical equipment such that the relevant noise levels are achieved. Examples of the possible acoustic treatments to mechanical equipment includes the following:

- Basement Supply and Exhaust Fans – location of fans within the building and treated using internally lined ductwork or acoustic silencers.
- General supply and exhaust fans – general exhaust and supply fans such as toilet, kitchen, lobby and other small mechanical fans can be acoustically treated using acoustic flex ducting or internal lined ducting.

Details of the required mechanical services equipment and acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the CC submission of the project.

Experience with similar projects indicates that the acoustic treatment of the proposed mechanical equipment to be installed on the project is both possible and practical.

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## 7 CONCLUSION

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged to undertake the Noise Impact Assessment of the proposed residential development located at Lot 642 Googong, NSW.

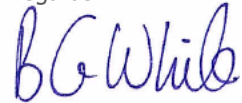
This report details the required acoustic constructions of the building's façade, including external windows, to ensure that the future internal noise levels comply with the relevant noise levels of the Australian Standard AS2107:2016. Providing the recommended constructions detailed in this report are included in the construction of the project the required internal noise levels will be achieved.

External noise emissions from the site have been assessed and detailed in accordance with the NSW Environmental Protection Authorities *Noise Policy for Industry*. The future design and treatment of all building services associated with the project can be acoustically treated to ensure all noise emissions from the site comply with the EPA NPFI criteria including the following:

1. Operation of mechanical services on the site.

For any additional information please do not hesitate to contact the person below.

Regards

A handwritten signature in blue ink that reads "BG White".

Ben White  
Director

Pulse White Noise Acoustics



## 8 APPENDIX A: ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

<i>Sound power level</i>	The total sound emitted by a source																						
<i>Sound pressure level</i>	The amount of sound at a specified point																						
<i>Decibel [dB]</i>	The measurement unit of sound																						
<i>A Weighted decibels [dB(A)]</i>	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).																						
<i>Decibel scale</i>	<p>The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:</p> <table> <tr><td>0dB(A)</td><td>Threshold of human hearing</td></tr> <tr><td>30dB(A)</td><td>A quiet country park</td></tr> <tr><td>40dB(A)</td><td>Whisper in a library</td></tr> <tr><td>50dB(A)</td><td>Open office space</td></tr> <tr><td>70dB(A)</td><td>Inside a car on a freeway</td></tr> <tr><td>80dB(A)</td><td>Outboard motor</td></tr> <tr><td>90dB(A)</td><td>Heavy truck pass-by</td></tr> <tr><td>100dB(A)</td><td>Jackhammer/Subway train</td></tr> <tr><td>110 dB(A)</td><td>Rock Concert</td></tr> <tr><td>115dB(A)</td><td>Limit of sound permitted in industry</td></tr> <tr><td>120dB(A)</td><td>747 take off at 250 metres</td></tr> </table>	0dB(A)	Threshold of human hearing	30dB(A)	A quiet country park	40dB(A)	Whisper in a library	50dB(A)	Open office space	70dB(A)	Inside a car on a freeway	80dB(A)	Outboard motor	90dB(A)	Heavy truck pass-by	100dB(A)	Jackhammer/Subway train	110 dB(A)	Rock Concert	115dB(A)	Limit of sound permitted in industry	120dB(A)	747 take off at 250 metres
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120dB(A)	747 take off at 250 metres																						
<i>Frequency [f]</i>	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.																						
<i>Ambient sound</i>	The all-encompassing sound at a point composed of sound from all sources near and far.																						
<i>Equivalent continuous sound level [L<sub>eq</sub>]</i>	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.																						
<i>Reverberation</i>	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)																						
<i>Air-borne sound</i>	The sound emitted directly from a source into the surrounding air, such as speech, television or music																						
<i>Impact sound</i>	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.																						
<i>Air-borne sound isolation</i>	The reduction of airborne sound between two rooms.																						
<i>Sound Reduction Index [R] (Sound Transmission Loss)</i>	The ratio the sound incident on a partition to the sound transmitted by the partition.																						
<i>Weighted sound reduction index [R<sub>w</sub>]</i>	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.																						
<i>Level difference [D]</i>	The difference in sound pressure level between two rooms.																						



<i>Normalised level difference <math>[D_n]</math></i>	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
<i>Standardised level difference <math>[D_{nT}]</math></i>	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
<i>Weighted standardised level difference <math>[D_{nT,w}]</math></i>	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
$C_{tr}$	A value added to an $R_w$ or $D_{nT,w}$ value to account for variations in the spectrum.
<i>-Impact sound isolation</i>	The resistance of a floor or wall to transmit impact sound.
<i>Impact sound pressure level <math>[L_i]</math></i>	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
<i>Normalised impact sound pressure level <math>[L_n]</math></i>	The impact sound pressure level normalised for the absorption area of the receiving room.
<i>Weighted normalised impact sound pressure level <math>[L_{n,w}]</math></i>	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
<i>Weighted standardised impact sound pressure level <math>[L'_{nT,w}]</math></i>	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
$C_I$	A value added to an $L_{nW}$ or $L'_{nT,w}$ value to account for variations in the spectrum.
<i>Energy Equivalent Sound Pressure Level <math>[L_{A,eq,T}]</math></i>	'A' weighted, energy averaged sound pressure level over the measurement period T.
<i>Percentile Sound Pressure Level <math>[L_{Ax,T}]</math></i>	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

\*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols"