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# NOISE MANAGEMENT PLAN

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**BADGERYS CREEK QUARRY AND BRICK MAKING FACILITY**

September 2013

# Contents

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1. Introduction	3
2. Environmental Context	4
3. Regulatory Framework	7
4. Training and Resource Requirements	10
5. Management of Noise and Vibration	11
6. Monitoring	16
7. Reporting and Record Keeping	18
8. NMP Forms and Procedures	19

# 1. Introduction

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## 1.1. Purpose

This Noise Management Plan (NMP) has been prepared to:

- outline the noise mitigation measures to be implemented to ensure the relevant conditions of approval for the Badgerys Creek Quarry and Brick Making Facility are complied with;
- describe the measures to ensure commitments in the Environmental Assessment in relation to noise are implemented;
- describe the noise monitoring program for construction and operation to evaluate the performance of the Badgerys Creek operations;
- describe the protocol to determine exceedence with relevant conditions of the project approval; and
- outline community engagement procedures in relation to noise issues

## 1.2. Scope and Application

This NMP is applicable to the quarrying, rehabilitation, brickmaking, and product storage and dispatch of Boral in its Badgerys Creek operations. It will also apply to the construction of the noise attenuation bund along the eastern and northern boundaries of the active quarry and plant areas.

## 1.3. Interface with Environmental Strategy

In operational terms, the NMP aims to minimise the noise impacts of the quarrying and brick making activities at Boral's Badgerys Creek facility on neighbouring agricultural producer and residential receptors. In this way, the NMP supports the Environmental Strategy of Badgerys Creek Quarry and Brick Making Facility by helping minimise harm to the environment.

## 1.4. Definitions and Abbreviations

*Refer to Attachment C Glossary of Acoustic Terms*

## 2. Environmental Context

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### 2.1. Environmental Context

Boral is operating an existing quarry in Badgerys Creek, extracting clay resources for the manufacture of bricks for the construction industry. These quarrying and brick making activities have been undertaken on the site for the past 30 years. Boral has received development approval to continue operations on the site, including extracting from existing and future new pits, and operating the existing brick making facility at a bigger throughput. The conditions of the approval require Boral to construct a noise attenuation bund along the eastern and northern sections of the facility prior to extracting material from the new pits. The noise berm section would be built in three stages corresponding to the overburden removal stages for Pits 3 and 4.

Quarrying is carried out in campaigns of two- to three-month periods per year with extracted clay stored in stockpiles for brick making operations which run the entire year. Finished products are stored within the site for dispatch by trucks. The site also receives other raw materials required for brick making.

Fifty-three (53) nearby rural residential receivers have been identified, with 27 locations assessed as falling within the recommended noise assessment criterion of 40dB(A).

In 2012, Boral reviewed its brick production capacity due to current uncertain economic conditions and downturn in residential housing activity. Boral determined that the reduced demand could be supplied by its Bringelly Brickworks and therefore decided to temporarily shut down production at its Badgerys Creek facility. Quarrying and brick production will be suspended during the shutdown period but ongoing facility and equipment maintenance will be carried out. Operation of the retail display facility and the occasional dispatch of bricks from the remaining inventory on-site will continue.

Boral has sought a Section 75W modification to the conditions of approval for the expansion of the Badgerys Creek operations so that relevant environmental management measures can be modified or deferred during the shutdown period.

### 2.2. Aspects and Impacts

The Badgerys Creek Quarry and Brickmaking facilities involve activities which result in potential noise impacts as shown in Table 1 below.

**Table 1 Potential Noise Impacts from Badgerys Creek Operations**

Activity	Noise Aspect	Potential Environmental Impacts
Removal of overburden	<p>Operation of earthmoving and haulage plant (dozer, excavator, dump trucks) at or near ground level</p> <hr/> <p>Impact noise from loading of dump trucks</p> <hr/> <p>Stockpiling of overburden by small dozer and dump trucks</p>	<ul style="list-style-type: none"> <li>Exceedence of daytime noise criteria at any residence (i.e. 44 dB(A) <math>L_{Aeq(15min)}</math>)</li> </ul>
Raw material extraction	<p>Operation of earthmoving and haulage plant (dozer, excavator, dump trucks) at 4m below ground level or deeper</p> <hr/> <p>Stockpiling of raw material by smaller dozer and dump trucks</p>	
Watering of haul roads	Operation of water cart	
Brick Making	<p>Operation of front end loader</p> <hr/> <p>Operation of fixed plant (including primary crusher, rollers, ventilation fans, etc)</p> <hr/> <p>Operation of standby diesel generator</p>	<ul style="list-style-type: none"> <li>Exceedence of daytime noise criteria at any residence (i.e. 44dB(A) <math>L_{Aeq(15min)}</math>)</li> <li>Exceedence of evening noise criteria at any residence (i.e. 38dB(A) <math>L_{Aeq(15min)}</math>)</li> <li>Exceedence of night noise criteria at any residence (i.e. 35dB(A) <math>L_{Aeq(15min)}</math> and 45dB(A) <math>L_{A1(5min)}</math>)</li> </ul>
Storage Yard	Operation of forklift/s	<ul style="list-style-type: none"> <li>Exceedence of daytime noise criteria at any residence (i.e. 44dB(A) <math>L_{Aeq(15min)}</math>)</li> <li>Exceedence of evening noise criteria at any residence (i.e. 38dB(A) <math>L_{Aeq(15min)}</math>)</li> </ul>
Traffic	<p>Truck movements along the site access road</p> <hr/> <p>Fuel and other supply deliveries</p>	<ul style="list-style-type: none"> <li>Exceedence of traffic noise criteria</li> </ul>

Activity	Noise Aspect	Potential Environmental Impacts
Construction of Noise Berm (in in three distinct stages at 38, 56 and 35-day duration respectively, corresponding to the staging of overburden removal)	Operation of dump trucks	<ul style="list-style-type: none"> <li>Exceedence of construction noise criteria</li> </ul>
	Operation of a dozer	
Shutdown Period	Occasional vehicle movements and storage yard activities	It is considered that noise from significantly reduced level of activities during the shutdown period are highly unlikely to exceed the operational noise criteria.
	Minor maintenance activities	

### 2.3. Risk Assessment

Boral maintains an Environmental Risk Register for the Badgerys Creek Quarry operation. This register ranks the following sources of noise impacts as low to medium risks:

- operation earthmoving equipment during quarrying operation of primary crusher
- operation of front end loader
- operation of wet pan, rollers, additive hoppers, exhaust fans, warning sirens, and other fixed plant;
- operation of fork lifts
- operation of standby diesel generator
- movement of trucks

The Noise Impact Assessment for the project identified the receptors where relevant noise criteria are exceeded during:

- specific overburden removal and raw material extraction stages of the project;
- construction of the noise attenuation bund;
- brick making and storage yard activities.

The above risks will be mitigated by the management measures outlined in this NMP.

## 3. Regulatory Framework

### 3.1. Relevant Legislation

- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Protection of the Environment (General) Regulation 2005* (POEO General Regulation)
- *Protection of the Environment (Noise Control) Regulation 2008* (POEO Noise Control Regulation)

### 3.2. Standards and Guidelines

NSW Industrial Noise Policy (OEH, 2000)

NSW Road Noise Policy (OEH, 2011) (*replacing the Environmental Criteria for Road Traffic Noise*)

AS1633:1985 Acoustics – Glossary of terms and related symbols

TCA Construction Noise Strategy (Rail Projects) (TCA, 2010)

### 3.3. Approval Requirements

- Project Approval (under Sec 75J of the EP&A Act 1979), with the following relevant noise quality criteria:

**Table 2 Noise criteria dB(A)**

Activity	Location	Day	Evening	Night	
		L <sub>Aeq</sub> (15 min)	L <sub>Aeq</sub> (15 min)	L <sub>Aeq</sub> (15 min)	L <sub>A1</sub> (1 min)
Quarrying	All residential premises	44	NA	NA	NA
Brick making and storage yard activities		44	38	35	45

*Note: Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

The noise criteria in Table 2 do not apply where Boral has a written agreement with the relevant landowner to exceed the criteria. The terms of this agreement will be advised in writing by Boral to the Department of Planning and Infrastructure.

**Table 3 Traffic noise impact assessment criteria dB(A)**

Road	Day / Evening $L_{Aeq}$ (15 min)
Martin Road	55

*Note: Traffic noise generated by the project is to be measured in accordance with the relevant procedures in the OEH Environmental Criteria for Road Traffic Noise / NSW Road Noise Policy.*

**Table 4 Operating hours**

Activity	Operating Hours / Day
Removal of overburden and construction of noise bunds	7am to 6pm /Monday to Friday 8am to 1pm / Saturday
Quarrying	7am to 6pm /Monday to Saturday
Brick making and storage yard	24 hours /Monday to Sunday
Deliveries and dispatch	6am to 10pm /Monday to Friday 6am to 6pm / Saturday

During the construction of acoustic bunds, the following noise criteria will apply:

**Table 5 Construction noise criteria dB(A)**

Construction Activity	Location (Street address, Badgerys Creek)	Day $L_{Aeq}$ (15 min)
Bund 3C	Residence 9 – 217 Martin Road	55
Bund 4A	Residence 27 – 200 Lawson Road Residence 31 – 235 Lawson Road	
Bund 4B	Residence 28 – 245 Lawson Road	
Bund 4A	Residence 26 – 210 Lawson Road Residence 28 – 245 Lawson Road Residence 42 – 245 Lawson Road	60
Bund 4A	Residence 5 – 255 Lawson Road Residence 25 – 211 Martin Road	65
Bund 4A	Residence 9 – 217 Martin Road	68
Bund 3C, 4A and 4B	All other residences	50



*Note: Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

### 3.4. Permits and Licences

- Environmental Protection Licence No. 684 (existing EPL is subject to variation following recent project approval), with the following noise limits:
  - Noise from the premises (excluding mobile plant) must not exceed:
    - an  $L_{A10(15 \text{ min})}$  noise emission criterion of 55dB(A) 0700 to 2200 Monday to Saturday and 0800 to 2200 Sundays and Public Holidays; and
    - an  $L_{A10(15 \text{ min})}$  noise emission criterion of 40dB(A) at all other times, except as expressly provided in the EPL.
  - Noise from the operation of mobile plant must not exceed:
    - an  $L_{A10(15 \text{ min})}$  noise emission criterion of 50dB(A) 0700 to 2200 Monday to Saturday and 0800 to 2200 Sundays and Public Holidays; and
    - an  $L_{A10(15 \text{ min})}$  noise emission criterion of 40dB(A) at all other times, except as expressly provided in the EPL.
  - Noise from the premises is to be measured or computed at the most affected point on or within the residential property boundary or, if that is more than 30m from the residence, at the most affected point within 30m of the residence to determine compliance with noise limits from premises (excluding mobile plant). 5dB(A) must be added if the noise is tonal or impulsive in character.
  - Noise from the operation of the mobile plant is to be measured or computed at the most affected point on or within the residential property boundary or, if that is more than 30m from the residence, at the most affected point within 30m of the residence to determine compliance with noise limits from premises (excluding mobile plant). 5dB(A) must be added if the noise is tonal or impulsive in character.

## 4. Training and Resource Requirements

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### 4.1. Training

The induction for all site personnel and contractors working on site will cover noise mitigation measures as spelt out in this NMP.

The following specialised training will be required for the stated plant personnel as part of the effective implementation of the NMP:

- inspection of noise reduction kits attached to mobile plant – Maintenance Manager;
- checking equipment noise levels – HSE Officer
- operation, maintenance and field calibration of equipment for attended noise monitoring.

### 4.2. Resource Requirements

Badgerys Creek Quarry will require a sound level meter for attended noise monitoring.

Boral will engage technical service providers for the following:

- unattended noise monitoring
- road traffic noise monitoring

## 5. Management of Noise and Vibration

### 5.1. Shutdown Period Management Measures

In April 2012, the proponent, Boral Clay and Concrete (NSW) announced the temporary shutdown of the quarry and brick making facility with effect from 30 March 2012. As at April 2013, the facility remained shut down. Boral will review its operations at a future stage, considering market conditions and business needs to determine when operations will recommence. During the shutdown period, activities at the facility will be limited. Hence, the opportunity for interactions with the environment during this period is limited. Potential noise sources during the shutdown period will be limited to employee vehicles (less than 20 movements per day), display centre customer vehicles, occasional truck movements despatching sundry finished products and forklift operations in the product yard. These activities are not expected to generate significant noise impact at nearby residences.

During the shutdown period, the site's Health Safety and Environment Manager will be based at Badgerys Creek and will maintain a weekly environmental inspection regime including:

- Property boundary integrity, internal dam levels and neighbouring creeks;
- Raw material quarry pits and access roads;
- Internal access roads (paved and unsealed);
- Water tanks - water recycling (empty) and fire fighting supply tanks;
- Waste material areas and sewage treatment plant;
- Oil store, diesel tank and chemical store;
- Internal drainage from hardstands and access roads; and
- Factory buildings (internal and external).

The HSE Manager will also maintain regular contact with neighbouring residents to resolve any issues.

### 5.2. Quarrying and Construction Activities

Where reasonable and feasible, apply best practice noise mitigation measures including the following:

Item	Actions	Responsible Staff	When
1	Maximise the offset distance between noisy plant items and nearby noise sensitive receivers	Operations Staff	At all times
2	Avoid the coincidence of noisy plants working simultaneously close together and adjacent to sensitive receivers, where practicable.	Operations Staff	At all times
3	Where possible, orient equipment with directional noise emissions away from sensitive receivers.	Operations Staff	At all times
4	Consider the proximity of noise sensitive receivers when selecting site access points.	Plant Manager	At all times

Item	Actions	Responsible Staff	When
5	Select routes for dump trucks moving off the berm during construction to minimise the distance required to travel along the top of the noise berm, so as to minimise the exposure time of nearby receivers to dump truck noise emissions.	Construction contractors	At all times
6	Carry out any maintenance work on berm construction equipment with the potential to generate noise impacts away from noise sensitive receivers and confined to standard daytime construction hours, where possible.	Construction contractors	At all times
7	Turn off plant that is not being used.	Operations Staff	At all times
8	Ensure plant is regularly maintained, and repair or replace equipment that becomes noisy.	Maintenance Manager	At all times
9	Arrange the work site to minimise the use of movement alarms on vehicles and mobile plant.	Plant Manager, Mining contractors	At all times
10	Undertake noise berm construction activities in accordance with the approved hours of work.	All staff	At all times
11	Unforeseen noisy activities will be subject to additional mitigation measures depending on the extent of predicted or measured impacts	All staff	At all times
12	In case high impact noise activities or activities likely to generate noise with intermittent, impulsive, tonal or low-frequency characteristics are required, appropriate notification prior to works commencing and respite periods (12-2pm) will be implemented.	Mining contractors, construction contractors	At all times

### 5.3. Mobile Plant Noise Reduction

Item	Actions	Responsible Staff	When
1	<p>Apply acoustic treatments to mobile plant to achieve noise reduction, including:</p> <ul style="list-style-type: none"> <li>- using an acoustic enclosure for the engine and sealing gaps around the engine bay;</li> <li>- using acoustic louvres/treatments on engine air intakes and cooling air exhausts;</li> <li>- installing high attenuation engine exhaust mufflers;</li> <li>- lining the trays of dump trucks with high impact rubber to reduce loading noise, or using specially designed suspended dump trucks.</li> </ul>	Maintenance Manager, mining and construction contractors	Prior to development of Pit 3
2	Apply acoustic treatments to all dozers and excavators operating in the quarry and noise berm to achieve a minimum 5dB(A) attenuation.	Maintenance Manager, mining and construction contractors	Prior to development of Pit 3
3	Apply acoustic treatment to all front end loader used in clay loading to achieve a minimum 5dB(A) attenuation.	Maintenance Manager	Prior to development of Pit 3
4	To minimise exceedences, remove overburden by excavator only, without use of a dozer.	Mining contractor	Overburden removal for Stages 4C, 5A, 5B and 5C
5	Use only a D9T dozer for raw material removal.	Mining contractor	Raw material extraction for Stages 5A, 5B

### 5.4. Equipment Selection and Maintenance

Item	Actions	Responsible Staff	When
1	Where economically feasible and suitable for purpose, select smaller equipment or rubber-tracked equipment.	Mining and construction contractor	At all times
2	Provide equipment with residential grade mufflers.	Maintenance Manager, Mining and construction contractor	At all times

Item	Actions	Responsible Staff	When
3	Operate and maintain all equipment in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse noise and vibration impacts.	Maintenance Manager, Mining and construction contractor	At all times
4	Regularly check equipment noise levels.	HSE Officer	At all times, except during shutdown period
5	Use broadband reversing alarms or other non-tonal vehicle movement and warning alarms.	Maintenance Manager, Mining and construction contractor	At all times
6	Where feasible, create turning circles at end points of vehicle work legs to avoid the need for reversing.	Mining and construction contractor	At all times

### 5.5. Heavy Vehicle Noise Mitigation – Local Road Traffic

Item	Actions	Responsible Staff	When
1	Keep all noise control equipment in good working order.	Maintenance Manager, Mining and construction contractor	At all times
2	As far as practical and considering safety, truck drivers and mobile plant operators would avoid: <ul style="list-style-type: none"> <li>• Heavy acceleration and braking</li> <li>• Compression braking</li> <li>• Reversing</li> <li>• High speeds</li> <li>• Idling in locations close to noise sensitive receivers.</li> </ul>	Truck drivers and mobile plant operators	At all times
3	Route dump trucks to and from the noise berm locations via internal haul roads, maximising possibilities of shielding from stationary objects and constructed sections of the noise berm.	Construction contractors	At all times

## 5.6. Community Engagement

Item	Actions	Responsible Staff	When
1	Contact potentially noise affected neighbours at the earliest possible time before the different construction stages for the noise berm and before quarry operations within the pits commence.	HSE Officer	At all times
2	Inform potentially noise affected neighbours about the nature of the construction stages and the duration of noisier activities, for example, location and nature of pit operations.	HSE Officer	At all times
3	Describe any noise controls, such as noise berms to be built first that will reduce noise, and the use of both alternate and silenced equipment.	HSE Officer	At all times
4	Keep potentially noise affected neighbours up to date on progress.	HSE Officer	At all times
5	Provide contact details to identified nearby sensitive receivers, and maintain a complaint register for all operations.	HSE Officer	At all times
6	Ask about any concerns that potentially noise affected neighbours may have (e.g. timing of noise berm construction) and discuss possible solutions.	HSE Officer	At all times
7	Establish a community environment liaison committee, comprising representatives of the community, Boral, and other stakeholders. This forum is to be used to raise matters of concern associated with the environmental impacts (in this case specifically noise) associated with the Boral quarry and brickworks site operations, with the aim of achieving mutually satisfactory solutions.	HSE Officer	At all times, following recommencement of operations
8	In case of noise complaints, investigate the source of the noise exceedence, and consult with the affected resident to determine a mutually agreeable solution.	HSE Officer	At all times

## 6. Monitoring

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### 6.1. Noise Monitoring Program

#### ***Unattended Noise Monitoring***

Unattended noise monitoring will be carried out on a monthly basis at the most affected receiver locations around the site boundary to monitor compliance with operational noise criteria (refer Table 2) and the noise limits specified in the EPL (refer Section 3.4 of the NMP).

Monitoring will be carried out by specialist acoustic consultants using suitable noise loggers. Levels will be measured continuously over a three-day period at 15-minute statistical intervals.

#### ***Attended Noise Monitoring***

During quarrying campaign periods, attended noise monitoring will be carried out by the HSE Officer at receiver locations to monitor compliance with operational noise criteria (refer Table 2). Monitoring will be scheduled during approved hours of quarrying, with at least one measurement taken from at least three locations. Attended noise monitoring will be carried out twice weekly frequency for the first month of a quarrying campaign and then weekly thereafter.

Receiver locations to be monitored will be selected to consider the worst-case scenario based on weather conditions and proximity to the noisy activity.

Targeted noise investigations, including attended noise monitoring, will also be carried out in response to a noise complaint from an affected receiver.

#### ***Construction Noise Monitoring***

Attended noise monitoring will be carried out by the HSE Officer during the noise berm construction stages to monitor compliance with the construction noise criteria (refer **Table 5**). The monitoring locations per construction stage will be those residences listed in **Table 5**, with other residential receivers to be selected considering the worst-case scenario based on weather conditions and proximity to the noisy activity.

#### ***Road Traffic Noise Monitoring***

Unattended noise monitoring will be carried out to monitor compliance with traffic noise criteria (refer



**Table 3)** on a three-monthly frequency, with the monitoring dates and period selected to be representative of typical activities inside and outside of quarrying campaigns.

Road traffic noise monitoring will be carried out by specialist acoustic consultants using providers.

### ***Equipment***

Unattended noise monitoring will be carried out by specialist acoustic consultants using suitable noise loggers. Attended noise monitoring will be carried out using an instrument with IEC Type 1 characteristics as defined in AS1259:1990 *Sound Level Meters*.

Calibration of equipment will be in accordance with manufacturer's requirements and will be recorded by the HSE Officer. Field calibration will be confirmed before and after measurement using a sound level calibrator.

## **6.2. Target Levels and Appropriate Actions**

The relevant noise criteria for each monitoring requirement are shown in Tables 2, 3 and 5.

## **6.3. Suspension of Noise Compliance Monitoring during the Shutdown Period**

Due to the significantly reduced level of activities limited to facility maintenance, operation of the retail display and occasional dispatch of bricks from the inventory remaining on-site during the shutdown period, it is considered that noise levels are highly unlikely to exceed noise criteria. Therefore, compliance monitoring for noise would not be carried out during the shutdown period, however, the noise criteria will continue to apply and Boral will respond to any complaints relating to noise and resolve potential issues.

## 7. Reporting and Record Keeping

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### 7.1. Monitoring Records

Results of noise monitoring will be recorded and retained. Monitoring records will be kept by the HSE Officer.

Records for monitoring required to be conducted under the EPL, and copies of Annual Returns (see below) will be kept for at least four (4) years.

### 7.2. Environmental Reporting

A summary of noise monitoring results will be reported by the HSE Officer to the Plant Manager on a monthly basis.

### 7.3. EPL Annual Returns

The HSE Officer will prepare the Annual Return in the approved form for submission to the EPA not later **than** 60 days after the end of each reporting period.

The Statement of Compliance in the Annual Return will be signed by the Plant Manager.

### 7.4. Corrective Action

Any noise exceedence will be investigated by the HSE Officer to determine the noise source. Actions will be determined to reduce noise levels to the relevant criteria.

Information on all complaints and exceedences will be provided to the OEH through the EPL annual return.

## 8. NMP Forms and Procedures

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### 8.1. Forms

- Attended Noise Monitoring Record (*to be developed in time for recommencement of operations*)
- Template for Community Notification of Upcoming Noisy Works (*to be developed in time for recommencement of operations*)

### 8.2. Standard Procedures

- Operation, Maintenance and Field Calibration of Sound Level Meters (*to be provided by manufacturer or equipment lessor*)
- Attended Noise Monitoring (*to be developed in time for recommencement of operations*)
- Targeted Noise Investigation in response to Complaint (*to be developed in time for recommencement of operations*)

### 8.3. Glossary of Acoustic Terminology

(Derived from AECOM's *Noise Assessment Report, Addendum Report – Continuation of Operations at Badgerys Creek Quarry*, 31 May 2011)

<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>	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:
	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
<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>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>L<sub>max</sub></i>	The maximum sound pressure level measured over the measurement period
<i>L<sub>min</sub></i>	The minimum sound pressure level measured over the measurement period
<i>L<sub>1</sub></i>	The sound pressure level exceeded for 1% of the measurement period. For 1% of the measurement period it was louder than the L <sub>1</sub> . This can also be representative of the maximum noise levels (L <sub>max</sub> ).
<i>L<sub>10</sub></i>	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L <sub>10</sub> .
<i>L<sub>90</sub></i>	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L <sub>90</sub> .
<i>Ambient noise</i>	The all-encompassing noise at a point composed of sound from all sources near and far.
<i>Background noise</i>	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L <sub>90</sub> sound pressure level is used to quantify background noise.
<i>Traffic noise</i>	The total noise resulting from road traffic. The L <sub>eq</sub> sound pressure level is used to quantify traffic noise.
<i>Day</i>	The period from 0700 to 1800h Monday to Saturday and 0800 to 1800h Sundays and Public Holidays.
<i>Evening</i>	The period from 1800 to 2200h Monday to Sunday and Public Holidays.
<i>Night</i>	The period from 2200 to 0700h Monday to Saturday and 2200 to 0800h Sundays and Public Holidays.
<i>Assessment background level [ABL]</i>	The overall background level for each day, evening and night period for each day of the noise monitoring.
<i>Rating background level [RBL]</i>	The overall background level for each day, evening and night period for the entire length of noise monitoring.
<i>Ambient sound</i>	The all-encompassing sound at a point composed of sound from all sources near and far.
<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 [D<sub>n</sub>]</i>	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
<i>Standardised level difference [D<sub>nT</sub>]</i>	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
<i>Weighted standardised level difference [D<sub>nT,w</sub>]</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.
<i>C<sub>tr</sub></i>	A value added to an R <sub>w</sub> or D <sub>nT,w</sub> 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 [L<sub>i</sub>]</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 [L<sub>n</sub>]</i>	The impact sound pressure level normalised for the absorption area of the receiving room.
<i>Weighted normalised impact sound pressure level [L<sub>n,w</sub>]</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 [L'<sub>nT,w</sub>]</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.
<i>CI</i>	A value added to an L <sub>nW</sub> or L' <sub>nT,w</sub> value to account for variations in the spectrum.
<i>Energy Equivalent Sound Pressure Level [L<sub>A,eq,T</sub>]</i>	'A' weighted, energy averaged sound pressure level over the measurement period T.
<i>Percentile Sound Pressure Level [L<sub>Ax,T</sub>]</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", the OEH's NSW *Industrial Noise Policy* and the DECC's *Environmental Criteria for Road Traffic Noise*.