

# Annual Noise Monitoring Assessment 2019

Dunmore Lakes Sand Project, Dunmore, NSW  
July 2019.



# *Document Information*

## Annual Noise Monitoring Assessment 2019

### Dunmore Lakes Sand Project, Dunmore, NSW

July 2019

Prepared for: Boral Resources (NSW) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd

PO Box 262, Newcastle NSW 2300

ABN: 36 602 225 132

P: +61 2 4920 1833

[www.mulleracoustic.com](http://www.mulleracoustic.com)

| Document ID     | Status | Date         | Prepared By | Signed                                                                               | Reviewed By   | Signed                                                                                |
|-----------------|--------|--------------|-------------|--------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|
| MAC180747-02RP1 | Final  | 30 July 2019 | Rod Linnett |  | Oliver Muller |  |

#### DISCLAIMER

All documents produced by Muller Acoustic Consulting Pty Ltd (MAC) are prepared for a particular client's requirements and are based on a specific scope, circumstances and limitations derived between MAC and the client. Information and/or report(s) prepared by MAC may not be suitable for uses other than the original intended objective. No parties other than the client should use or reproduce any information and/or report(s) without obtaining permission from MAC. Any information and/or documents prepared by MAC is not to be reproduced, presented or reviewed except in full.

## CONTENTS

|                                |                                             |    |
|--------------------------------|---------------------------------------------|----|
| 1                              | INTRODUCTION .....                          | 5  |
| 2                              | NOISE CRITERIA .....                        | 7  |
| 3                              | METHODOLOGY .....                           | 9  |
| 3.1                            | LOCALITY .....                              | 9  |
| 3.2                            | ASSESSMENT METHODOLOGY .....                | 9  |
| 4                              | RESULTS .....                               | 13 |
| 5                              | NOISE COMPLIANCE ASSESSMENT .....           | 17 |
| 6                              | DISCUSSION .....                            | 19 |
| 6.1                            | DISCUSSION OF RESULTS - LOCATION DN-6 ..... | 19 |
| 6.2                            | DISCUSSION OF RESULTS - LOCATION DN-7 ..... | 19 |
| 6.3                            | DISCUSSION OF RESULTS - LOCATION DN-8 ..... | 19 |
| 7                              | CONCLUSION .....                            | 21 |
| APPENDIX A - GLOSSARY OF TERMS |                                             |    |

*This page has been intentionally left blank*

# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Boral for Dunmore Lakes Sand Project (DLSP), at Dunmore, NSW.

The monitoring has been conducted in accordance with the Dunmore Lakes Sand Project Noise Management Plan (NMP, 2017) and in general accordance with the Noise Policy for Industry (NPI). This assessment has been undertaken for the period ending July 2019 and forms the annual noise monitoring program to address conditions outlined in the Development Consent (DA 195-8-2004).

This report summarises the operator-attended noise monitoring results measured at three receivers in comparison to the relevant noise limits contained in the Development Consent and NMP.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- Dunmore Lakes Sand Project Noise Management Plan V5 (NMP), 2017;
- Discussion Paper - Validation of Inversion Strength Estimation Method (EPA) 2014; and
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

*This page has been intentionally left blank*

## 2 Noise Criteria

The DLSP Noise Management Plan (NMP), outlines the applicable noise criteria for residential receivers surrounding the operation, and are presented in Error! Reference source not found..

**Table 1 Noise Limits**

| Description     | Address              | Day             | Evening         | Night           | Morning                 |
|-----------------|----------------------|-----------------|-----------------|-----------------|-------------------------|
|                 |                      | (7am - 6pm)     | (6pm - 10pm)    | (10pm - 12am)   | Shoulder<br>(6am - 7am) |
|                 |                      | dB, LAeq(15min) | dB, LAeq(15min) | dB, LAeq(15min) | dB, LAeq(15min)         |
| Renton          | James Road           | 46              | 43              | 37              | 46                      |
| Dunmore Village | 31 Shellharbour Road | 49              | 44              | 41              | 47                      |
| Stocker         | Swamp Road           | 49              | 44              | 38              | 47                      |

*This page has been intentionally left blank*

### 3 Methodology

#### 3.1 Locality

DLSP is located at Dunmore near Shellharbour, NSW. Receivers in the locality surrounding DLSP are primarily rural and residential. Highway traffic is a dominant noise source for receivers as they are situated within 500m of the Princes Highway. The representative monitoring locations with respect to DLSP are presented in the locality plan in **Figure 1**. **Table 2** presents the relevant noise criteria for each assessed receiver.

**Table 2 Attended Monitoring Locations and EPL Noise Criteria**

| ID   | Description     | Day <sup>1</sup> | Evening <sup>1</sup> | Night <sup>1</sup> | Morning Shoulder <sup>1</sup> |
|------|-----------------|------------------|----------------------|--------------------|-------------------------------|
|      |                 | dB, LAeq(15min)  | dB, LAeq(15min)      | dB, LAeq(15min)    | dB, LAeq(15min)               |
| DN-6 | Renton          | 46               | 43                   | 37                 | 46                            |
| DN-7 | Dunmore Village | 49               | 44                   | 41                 | 47                            |
| DN-8 | Stocker         | 49               | 44                   | 38                 | 47                            |

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.

#### 3.2 Assessment Methodology

The attended noise measurements were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the DLSP NMP. Noise measurements of 15 minutes in duration were conducted at three locations (DN-6, DN-7, DN-8) using Svantek Type 1, 971 noise analysers on Monday 22 July 2019 and Tuesday 23 July 2019 to satisfy the requirements of the NMP. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2019- Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed  $\pm 0.5$  dBA.

To understand meteorological conditions during the evening and night period of Monday 22 July 2019 and the morning shoulder period of Tuesday 23 July 2019, direct measurement of temperature profile was undertaken at DN-8 (Stocker) at 2m above ground level and at 50m above ground level using a weather balloon. The results of the temperature measurements were used to determine the temperature lapse rate in general accordance with the Validation of Inversion Strength Estimation Method (2014). These measurements, in combination with the on site weather station provide a reference to validate the relevant meteorological conditions under which compliance is assessed.

Extraneous noise sources were excluded from the analysis to determine the  $L_{Aeq}(15min)$  DLSP noise contribution for comparison against the relevant criteria. In the event of quarry attributed noise being above criteria, prevailing meteorological conditions for the monitoring period are sourced from the onsite meteorological station and analysed in accordance with Fact Sheet A4 of the NPI to determine the stability category present at the time of each attended measurement.

Where DLSP is not audible, the contribution is estimated to be at least 10dBA below the ambient noise level.



*This page has been intentionally left blank*

## 4 Results

A summary of the operator attended measurements at location DN-6 to DN-8 are presented **Table 3** to Error! Reference source not found. and provide the following information:

- Monitoring location.
- Date, time and assessment period.
- Observed Wind Speed (WS, m/s), Wind Direction (WD) and Temperature (Temp) in °C at 1.5m above the ground measured at the monitoring location.
- Measured Temperature (Temp) in °C at 2.0m and 50.0m above ground level at a representative location.
- Average Wind Speed (WS, m/s), Wind Direction (WD) and Temperature (Temp) in °C at 10m above ground level at the on-site weather station.
- Atmospheric stability class derived from the on-site weather station.
- Calculated temperature inversion strength.
- Ambient measured noise levels LAeq(15min) and LA90(15min) in dBA re 20 µPa.
- DLSP LAeq(15min) and LA1(1min) noise level contribution.
- Noise Limit LAeq(15min) and LA1(1min).

Results of the attended noise survey identified that the DLSP was audible for short durations during the measurements, however extraneous sources such as distant traffic, insects, cattle, dogs barking were audible during the survey period and dominated the results. Temperature data indicated that inversion strengths calculated from on-site measurements during the evening and night periods of Monday 22 July 2019 and the morning shoulder period of Tuesday 23 July 2019 were outside the development consent conditions (ie greater than 6°C/100m), although DSLP noise contributions were compliant with the noise limits.

**Table 3 DN-6 Renton Attended Noise Monitoring Summary**

| Date & Period                     | Time (hrs) | 1.5m WS WD Temp      | Descriptor |      | EPL Limits 15min | Observed Meteorology  |                 |            |             |               |                                 |                              | Description and SPL, dBA                                          |
|-----------------------------------|------------|----------------------|------------|------|------------------|-----------------------|-----------------|------------|-------------|---------------|---------------------------------|------------------------------|-------------------------------------------------------------------|
|                                   |            |                      | LAeq       | LA90 |                  | WS (m/s) <sup>1</sup> | WD <sup>1</sup> | 2m Temp °C | 50m Temp °C | Delta Temp °C | Lapse Rate °C/100m <sup>2</sup> | Stability Class <sup>1</sup> |                                                                   |
| 23/07/2019<br>Morning<br>Shoulder | 06:00      | Calm<br>10°C         | 56         | 53   | 46               | 1.7                   | WSW             | 4          | 13          | 9             | 19                              | F                            | Highway Traffic 50-65<br>DLSP Not Audible                         |
| DLSP Contribution                 |            |                      |            |      |                  |                       |                 |            |             |               |                                 |                              | <46dB LAeq(15min)                                                 |
| 22/07/2019<br>Day                 | 16:30      | 0.5m/s<br>NW<br>20°C | 55         | 50   | 46               | 1.3                   | NNE             | N/A        | N/A         | N/A           | N/A                             | N/A                          | Highway Traffic 48-65<br>Birds 58-60<br>DLSP Not Audible          |
| DLSP Contribution                 |            |                      |            |      |                  |                       |                 |            |             |               |                                 |                              | <45dB LAeq(15min)                                                 |
| 22/07/2019<br>Evening             | 21:25      | 1.0m/s<br>NW<br>11°C | 52         | 47   | 43               | 1.9                   | W               | 7          | 16          | 8             | 16                              | E                            | Highway Traffic 48-65<br>Birds 50-54<br>DLSP Not Audible          |
| DLSP Contribution                 |            |                      |            |      |                  |                       |                 |            |             |               |                                 |                              | <42dB LAeq(15min)                                                 |
| 22/07/2019<br>Night               | 22:32      | 1.0m/s<br>NW<br>14°C | 44         | 40   | 37               | 2.2                   | WSW             | 7          | 16          | 9             | 18                              | F                            | Highway Traffic 38- 64<br>Insects 36-38<br>Industrial Noise 39-46 |
| DLSP Contribution                 |            |                      |            |      |                  |                       |                 |            |             |               |                                 |                              | <34dB LAeq(15min)                                                 |

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 50m temperature.

**Table 4 DN-7 Dunmore Village Attended Noise Monitoring Summary**

| Date & Period               | Time (hrs) | 1.5m WS WD Temp | Descriptor |      | EPL Limits 15min | Observed Meteorology  |                 |            |             |               |                                 |                              | Description and SPL, dBA                                                        |
|-----------------------------|------------|-----------------|------------|------|------------------|-----------------------|-----------------|------------|-------------|---------------|---------------------------------|------------------------------|---------------------------------------------------------------------------------|
|                             |            |                 | LAeq       | LA90 |                  | WS (m/s) <sup>1</sup> | WD <sup>1</sup> | 2m Temp °C | 50m Temp °C | Delta Temp °C | Lapse Rate °C/100m <sup>2</sup> | Stability Class <sup>1</sup> |                                                                                 |
| 23/07/2019 Morning Shoulder | 06:25      | Calm 11°C       | 67         | 63   | 47               | 1.7                   | WSW             | 3.9        | 14          | 10            | 20                              | F                            | Highway Traffic 65-70<br>DLSP Not Audible                                       |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |            |             |               |                                 |                              | <47dB LAeq(15min)                                                               |
| 22/07/2019 Day              | 16:55      | 0.5m/s N 18°C   | 66         | 63   | 49               | 0                     | Calm            | N/A        | N/A         | N/A           | N/A                             | N/A                          | Highway Traffic 58-69<br>Train 69<br>Birds 65<br>Dogs 60-66<br>DLSP Not Audible |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |            |             |               |                                 |                              | <49dB LAeq(15min)                                                               |
| 22/07/2019 Evening          | 21:45      | 0.5m/s N 10°C   | 58         | 52   | 44               | 2.2                   | WSW             | 7.3        | 16          | 8             | 16                              | E                            | Highway Traffic 49-70<br>Dog 56<br>DLSP Not Audible                             |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |            |             |               |                                 |                              | <44dB LAeq(15min)                                                               |
| 22/07/2019 Night            | 22:10      | 0.5m/s N 10°C   | 60         | 59   | 41               | 2.2                   | WSW             | 7.3        | 15          | 8             | 16                              | E                            | Highway Traffic 39-61<br>Insects 45-55<br>DLSP Not Audible                      |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |            |             |               |                                 |                              | <41dB LAeq(15min)                                                               |

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 50m temperature.

**Table 5 DN-8 Stocker Attended Noise Monitoring Summary**

| Date & Period               | Time (hrs) | 1.5m WS WD Temp | Descriptor |      | EPL Limits 15min | Observed Meteorology  |                 |           |            |              |                                 |                              | Description and SPL, dBA                                                                          |
|-----------------------------|------------|-----------------|------------|------|------------------|-----------------------|-----------------|-----------|------------|--------------|---------------------------------|------------------------------|---------------------------------------------------------------------------------------------------|
|                             |            |                 | LAeq       | LA90 |                  | WS (m/s) <sup>1</sup> | WD <sup>1</sup> | 2m Temp°C | 50m Temp°C | Delta Temp°C | Lapse Rate °C/100m <sup>2</sup> | Stability Class <sup>1</sup> |                                                                                                   |
| 23/07/2019 Morning Shoulder | 06:05      | 0.5m/s S 8°C    | 58         | 54   | 47               | 1.7                   | WSW             | 44.6      | 14         | 9            | 18                              | F                            | Highway Traffic 53-63<br>Local Vehicles 56-62<br>Train 58-61<br>DLSP Not Audible                  |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |           |            |              |                                 |                              | <47 dB LAeq(1min)                                                                                 |
| 22/07/2019 Day              | 17:36      | Calm 18°C       | 55         | 52   | 49               | 0.7                   | WSW             | N/A       | N/A        | N/A          | N/A                             | N/A                          | Highway Traffic 48-60<br>Local Traffic 52-56<br>People 52-54<br>Insects 52-54<br>DLSP Not Audible |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |           |            |              |                                 |                              | <45 dB LAeq(15min)                                                                                |
| 22/07/2019 Evening          | 21:00      | Calm 10°C       | 50         | 45   | 44               | 1.9                   | W               | 7.4       | 15         | 8            | 16                              | E                            | Highway Traffic 40-56<br>Residential 40-52<br>Train 52<br>DLSP Not Audible                        |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |           |            |              |                                 |                              | <40 dB LAeq(15min)                                                                                |
| 22/07/2019 Night            | 22:33      | Calm 10°C       | 49         | 41   | 38               | 1.7                   | W               | 6.8       | 15         | 9            | 18                              | F                            | Highway Traffic 44-61<br>Residential 46-48<br>Insects 44-48<br>DLSP Not Audible                   |
| DLSP Contribution           |            |                 |            |      |                  |                       |                 |           |            |              |                                 |                              | <39 dB LAeq(15min)                                                                                |

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 50m temperature.

## 5 Noise Compliance Assessment

The compliance assessment summary for each monitoring location (DN-6, DN-7, DN-8) is presented in **Table 6** and for the three assessment periods.

**Table 6 Noise Compliance Assessment Summary**

| Location No. | Period           | DLSP Contribution | Criteria        | Compliant |
|--------------|------------------|-------------------|-----------------|-----------|
|              |                  | dB, LAeq(15min)   | dB, LAeq(15min) |           |
| DN-6         | Day              | <45               | 46              | ✓         |
| DN-7         | Day              | <49               | 49              | ✓         |
| DN-8         | Day              | <45               | 49              | ✓         |
| DN-6         | Evening          | <42               | 43              | ✓         |
| DN-7         | Evening          | <44               | 44              | ✓         |
| DN-8         | Evening          | <40               | 44              | ✓         |
| DN-6         | Night            | <34               | 37              | ✓         |
| DN-7         | Night            | <39               | 41              | ✓         |
| DN-8         | Night            | <30               | 38              | ✓         |
| DN-6         | Morning Shoulder | <46               | 46              | ✓         |
| DN-7         | Morning Shoulder | <47               | 47              | ✓         |
| DN-8         | Morning Shoulder | <47               | 47              | ✓         |

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.

*This page has been intentionally left blank*

## 6 Discussion

### 6.1 Discussion of Results - Location DN-6

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the east. DLSP noise was not audible during any measurements and the noise contribution was calculated to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included rail noise, insects and birds.

### 6.2 Discussion of Results - Location DN-7

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the west. DLSP noise was not audible during any measurements and the noise contribution were calculated to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included rail noise, insects and birds and dogs barking.

### 6.3 Discussion of Results - Location DN-8

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the east. DLSP noise was not audible during any measurements and the noise contribution were calculated to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included rail noise, local traffic on Swamp Road, insects and local residential activity.

*This page has been intentionally left blank*

## 7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Boral for Dunmore Lakes Sand Project (DLSP), Dunmore, NSW.

Attended noise monitoring was undertaken on Monday 22 July 2019 and Tuesday 23 July 2019 at three representative monitoring locations. The assessment has identified that noise emissions generated by DLSP were not audible during all measurements for all assessment periods. DLSP contributed noise emissions were below the relevant noise criteria at all locations during all measurement periods thus satisfying the relevant noise limits.

*This page has been intentionally left blank*

# Appendix A - Glossary of Terms

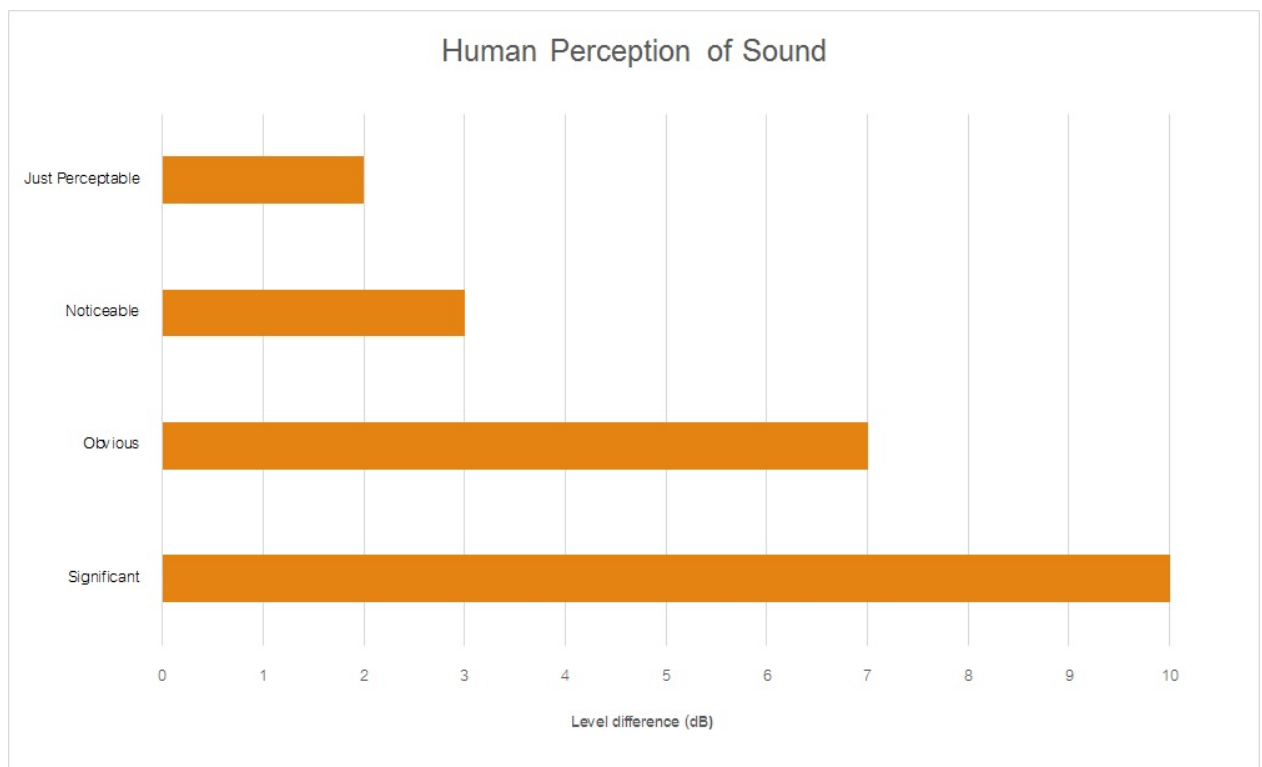
Table A1 provides a number of technical terms have been used in this report.

| Table A1 Glossary of Terms |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Term                       | Description                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1/3 Octave                 | Single octave bands divided into three parts                                                                                                                                                                                                                                                                                                                                                                    |
| Octave                     | A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.                                                                                                                                                                                                                                                                                     |
| ABL                        | Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.                                                                                                                                                                                      |
| Adverse Weather            | Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).                                                                                                   |
| Ambient Noise              | The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.                                                                                                                                                                                                                                               |
| A Weighting                | A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.                                                                                                                                                                                                                                                                                                     |
| dBA                        | Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.                                                                                                                                                                                     |
| dB(Z), dB(L)               | Decibels Linear or decibels Z-weighted.                                                                                                                                                                                                                                                                                                                                                                         |
| Hertz (Hz)                 | The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.                                                                                                                                                                                                                                                                                                       |
| LA10                       | A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.                                                                                                                                                                                                                                                                                        |
| LA90                       | Commonly referred to as the background noise, this is the level exceeded 90 % of the time.                                                                                                                                                                                                                                                                                                                      |
| LAeq                       | The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.                                                                                                                                                                                                                                 |
| LAm <sub>ax</sub>          | The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.                                                                                                                                                                                                                                                                                                |
| RBL                        | The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.                                                                                                                                      |
| Sound power level (LW)     | <p>This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by :</p> $= 10 \cdot \log_{10} (W/W_0)$ <p>Where : W is the sound power in watts and W<sub>0</sub> is the sound reference power at 10-12 watts.</p> |

Table A2 provides a list of common noise sources and their typical sound level.

| Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA |                     |
|----------------------------------------------------------------------------------|---------------------|
| Source                                                                           | Typical Sound Level |
| Threshold of pain                                                                | 140                 |
| Jet engine                                                                       | 130                 |
| Hydraulic hammer                                                                 | 120                 |
| Chainsaw                                                                         | 110                 |
| Industrial workshop                                                              | 100                 |
| Lawn-mower (operator position)                                                   | 90                  |
| Heavy traffic (footpath)                                                         | 80                  |
| Elevated speech                                                                  | 70                  |
| Typical conversation                                                             | 60                  |
| Ambient suburban environment                                                     | 40                  |
| Ambient rural environment                                                        | 30                  |
| Bedroom (night with windows closed)                                              | 20                  |
| Threshold of hearing                                                             | 0                   |

Figure A1 – Human Perception of Sound



Muller Acoustic Consulting Pty Ltd  
PO Box 262, Newcastle NSW 2300  
ABN: 36 602 225 132  
P: +61 2 4920 1833  
[www.mulleracoustic.com](http://www.mulleracoustic.com)

