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CSL Reliance
Glebe Island Berth 1
Compliance Noise Monitoring Report

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Port Authority of New South Wales
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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by the Port Authority of New South Wales (Port Authority of NSW) to conduct monitoring of noise emissions during the unloading of the “CSL Reliance” (a bulk cargo vessel) at Glebe Island Berth 1 (GI-1), as required by Clause M4.1 of the EPA’s Environment Protection Licence (Licence No 13008). This report provides the results of the monitoring as required by Clause R3.5 of the Licence.

Noise measurements have been conducted whilst the ship was berthed at GI-1 (running ship auxiliary power unit (APU), ventilation fans) at three locations considered representative of the potentially most exposed residential receivers. The locations are at Balmain to the west, Glebe to the south and Pyrmont to the east of GI-1. Measurements at the three representative locations have been conducted with the vessel berthed during the night-time, noting the unloading of bulk salt from the ship to the wharf is restricted to daytime hours. The measurements were conducted after the ship arrived at GI-1 between 1.15 am and 2.58 am on 1 June 2017 after the ship arrived and had undertaken daytime unloading operations on 31 May 2017.

2 SITE DESCRIPTION

The Glebe Island Port facility is located north of Anzac Bridge between Johnsons Bay and White Bay on Glebe Island. The facility occupies approximately 40 hectares of waterfront land and forms a crescent around Glebe Island, with a water frontage of about 1,400 m in length.

The facility layout comprises the following main elements:

- Two berths on the eastern side of Glebe Island designated GI-1 and GI-2, and two berths on the western side designated GI-7 and GI-8;
- Concrete/asphalt area previously used for vehicle storage; and
- Internal road continuing from Sommerville Road providing truck access to the storage areas of Berths 1 to 2.

The adjacent White Bay facility to the west of Glebe Island consists of 5 berths on the northern side of White Bay.

Berth 1 is located approximately at the southern end of the eastern port side of Glebe Island, as shown in **Figure 1**. To the east of the site are a number of recently constructed multilevel apartments which are part of the Jackson’s Landing development. North of Glebe Island is located the Balmain peninsula, and to the south and on the opposite side of Blackwattle Bay is located Glebe Point.

2.1 EPA Environment Protection Licence

The licence specifies noise limits in the table of Section L2, these are reproduced in **Table 1**.

Table 1 Licence Noise Limits Measured in dBA

Residence Most Affected by Noise	Day		Evening		Night		
	LAeq (15minute)	LAeq (day)	LAeq (15minute)	LAeq (evening)	LAeq (15minute)	LAeq (night)	LA1 (1minute)
Balmain	Not applicable	Not applicable	53	50	48	45	56
Glebe	Not applicable	Not applicable	53	50	48	45	60
Pyrmont	Not applicable	Not applicable	53	50	48	45	61

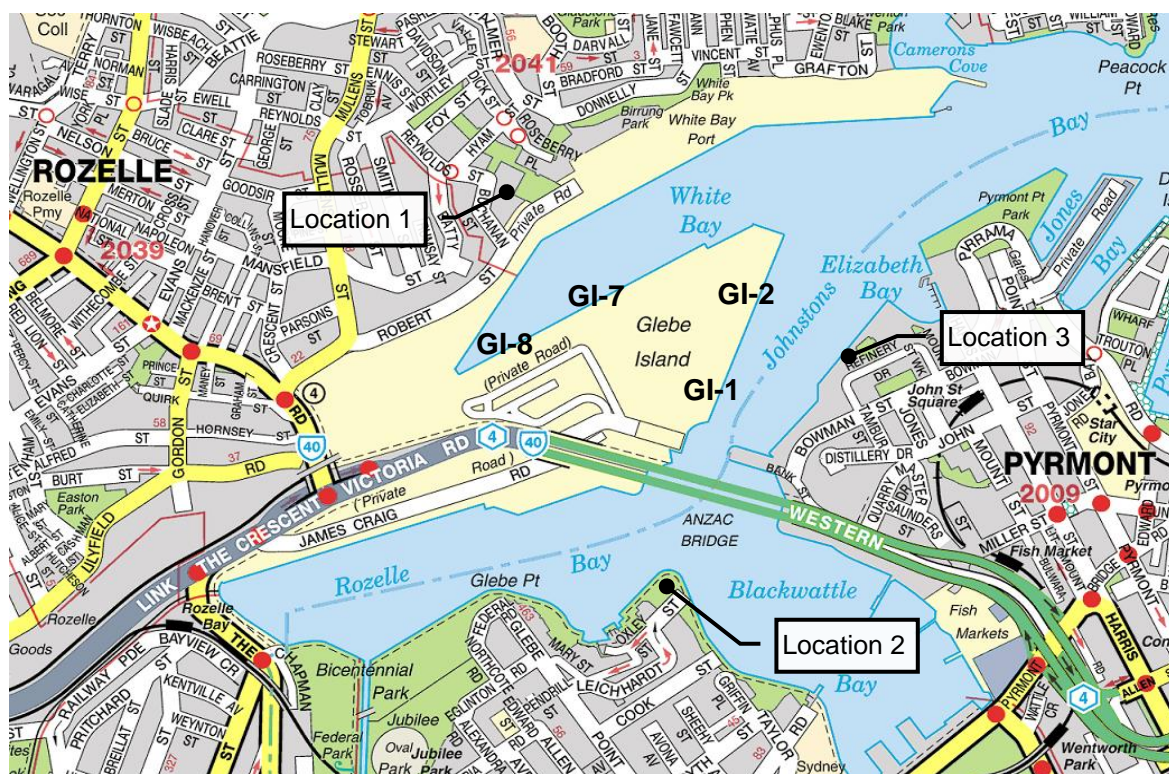
Section M4.1 of the licence requires that the licensee must arrange for an accredited acoustic consultant to monitor noise from the premises “at the most affected noise sensitive receiver in Balmain, Glebe and Pyrmont, to determine whether the activities at the premises comply with the noise limits specified in condition L2”.

2.2 Measurement Locations

The table from Section L2 specifies noise limits at ‘the residence most affected by noise’ at Balmain, Glebe and Pyrmont. Accordingly, we have measured ambient noise levels at the closest residences at these areas which are shown in **Figure 1** as follows:

- **Location 1:** Balmain - at ground level adjacent to and east of the apartment building located at 1 Reynolds Street. This location is 645 m north-west of GI-1.
- **Location 2:** Glebe - at ground level adjacent to and east of 53 Leichhardt St, Glebe. This location is 545 m south of GI-1.
- **Location 3:** Pyrmont - at ground level adjacent to and west of the Jackson’s Landing apartment building located at Refinery Drive, Pyrmont. This location is 220 m east of GI-1.

Figure 1 White Bay/Glebe Island Layout with Attended Noise Monitoring Locations



3 MEASUREMENT METHODOLOGY AND INSTRUMENTATION

The licence calls for L_{Aeq} (A-weighted equivalent continuous) sound pressure level measurements to be carried out at “*the residence most affected by noise*” at Balmain, Glebe and Pyrmont. Furthermore, the noise monitoring is required to be undertaken over a period of sufficient duration to ensure representative results from all activities and combinations of activities that would be expected to occur. The activities during this visit of the unloading of the bulk salt carrier were ship unloading to wharf located hoppers, with the loading of salt into trucks from the hoppers occurring during the day during the day, and auxiliary engines and associated ventilation systems during the evening and night-time. Accordingly, noise monitoring is required during the evening and/or night-time on order to determine compliance with the noise limits.

Attended noise level measurements were carried out at 1.5 m above ground level at Reynolds Street, Balmain, 1.5 m above ground at Leichhardt Street, Glebe, and 1.5 m above ground at Bowman Street, Pyrmont.

A “reference” measurement was conducted in close proximity to the CSL Reliance, where the noise environment was dominated by vessel related noise. The “reference” measurement was then used as a basis for the estimation of GI-1 activity related noise at the receivers of interest.

An equivalent ship sound power level was calculated based on the “reference” measurement and noise contributions related to the bulk cargo handling were estimated at each noise sensitive location.

In accordance with the licence the noise monitoring was undertaken in accordance with Australian Standard AS 2659.1-1988 “*Guide to the use of Sound-Measuring Equipment Part 1 - Portable Sound Level Meters*”, and monitoring guidance was provided by the Industrial Noise Policy (INP).

All items of acoustic instrumentation employed during the noise monitoring surveys were designed to comply with the requirements of AS IEC 61672.1 2004: “*Electroacoustics-Sound level meters-Specifications*” and carried appropriate and current NATA (or manufacturer) calibration certificates. Calibration was checked prior to and subsequent to the noise survey. Any drift in calibration was within 0.5 dBA and therefore considered acceptable.

The survey instrumentation used during the studies is set out in **Table 2**.

Table 2 Noise Survey Instrumentation

Type	Serial Number	Instrument Description
2270	3008204	Brüel & Kjær Modular Precision Sound Level Meter
4189	2983643	Brüel & Kjær 12.5 mm Pre-polarised Condenser Microphone
4231	2412474	Brüel & Kjær Calibrator

Given the relatively constant nature of noise related to the vessel, short-term measurements (of 15 minute duration) are usually considered to be sufficient to provide adequate information to enable an estimate of the $L_{Aeq(night)}$ noise levels at the selected residential receivers. On this occasion however, the ambient noise environment was dominated by other sources at Locations 1 and at Location 2 during the night-time and the $L_{Aeq(15minute)}$ and $L_{Aeq(night)}$ source noise levels were not able to be estimated accurately based on the measurements.

A brief description of acoustic terminology used in this report is presented in **Appendix A**

4 RESULTS AND ANALYSIS

The results of the attended noise measurements are summarised in **Table 3**. It should be noted that the measured noise levels presented below include noise from the bulk cargo handling facility at GI -1 as well as ambient noise unrelated to the facility.

Table 3 Measured Noise Levels - CSL Reliance Unloading Salt

Address	Start Time	LAeq	LA90	GI-1 Related LAmax Range	Comments
Reynolds Street (Balmain/Rozelle)	1.56 am 1/6/17 (night)	46 dBA	44 dBA	Non observed	CSL Reliance just audible. LAeq from Anzac Bridge/Victoria Rd, local traffic
Leichhardt Street (Glebe)	2.58 am 1/6/17 (night)	49 dBA	46 dBA	Non observed	LAeq dominated noise from Anzac Bridge. CSL Reliance not audible.
Bowman Street (Pyrmont)	1.15 am 1/6/17 (night)	54 dBA	52 dBA	Non observed	LAeq significantly influenced by CSL Reliance in addition to Anzac Bridge traffic, seagulls on occasion.

Note The measurement periods used were considered being representative of the 15 minute ambient.

One measurement was carried out at the representative receiver at the Balmain site at 1.56 am. At this location, the measurement was influenced by Anzac Bridge traffic, local traffic. The CSL Reliance was just audible above Victoria Road/City West Link/Anzac Bridge traffic and general urban hum noise.

One measurement was carried out at the representative Glebe location, at 2.58 am. At this location, noise from traffic on Anzac Bridge was dominating the ambient noise environment. The CSL Reliance was not audible above the Anzac Bridge traffic noise.

One measurement was carried out at the representative Pyrmont location at 1.15 am. At this location, noise from the CSL Reliance was clearly audible, with contributions mainly from Anzac Bridge traffic and party boat music.

In order to confirm the contribution to the ambient by bulk cargo related noise, noise levels were predicted based on the reference measurements taken in close proximity of the CSL Reliance, where the noise environment was dominated by the vessel auxiliary power unit and ventilation system related noise.

Table 4 presents the “reference” noise measurements carried out between 55 m and 70 m away from significant sources on the bulk cargo vessel CSL Reliance. The measurements were conducted on the GI-1 wharf. It was noted the main noise source from the ship was engine exhaust and ventilation fans.

Table 4 CSL Reliance “Reference” Noise Level

Reference	Location	Distance from Source	LAeq
1	GI-1	76 m	62 dBA

Calculations for the evening and night-time were performed using the reference measurements presented in **Table 4**. Predictions indicate bulk cargo unloading related LAeq noise levels of 40 dBA at Balmain, 37 dBA at Glebe and 53 dBA at Pyrmont. The predicted noise levels, at Balmain and Glebe, are well below the ambient and consistent with the CSL Reliance being not audible, or “barely audible”. At Pyrmont, the predicted noise level of 53 dBA is marginally lower than the measured overall LAeq level of 54 dBA during the night-time.

A comparison of the predicted noise levels with the noise limits listed in the Licence Conditions are presented in **Table 5** and **Table 6** for the evening and **Table 7** and **Table 8** for the night-time.

Table 5 Assessment of Measured/Predicted Noise Levels Against LAeq(15minute) Evening Noise Limits

Prediction Location	Predicted LAeq Noise Levels	LAeq(15 minute) Noise Limits	LAeq (15 minute) Exceedance of Licence Limits
Reynolds Street (Balmain / Rozelle)	40 dBA	53 dBA	No exceedance
Leichhardt Street (Glebe)	37 dBA	53 dBA	No exceedance
Bowman Street (Pyrmont) ¹	53 dBA	53 dBA	No exceedance

Table 6 Assessment of Predicted Noise Levels Against LAeq(evening) Noise Limits

Prediction Location	Predicted LAeq Noise Levels	LAeq(evening) Noise Limits	LAeq Exceedance of Licence Limits
Reynolds Street (Balmain / Rozelle)	40 dBA	50 dBA	No exceedance
Leichhardt Street (Glebe)	37 dBA	50 dBA	No exceedance
Bowman Street (Pyrmont)	53 dBA	50 dBA	3 dBA exceedance

Table 7 Assessment of Measured/Predicted Noise Levels Against LAeq(15minute) Night-time Noise Limits

Prediction Location	Measured/Predicted LAeq Noise Levels	LAeq(15 minute) Noise Limits	LAeq (15 minute) Exceedance of Licence Limits
Reynolds Street (Balmain/Rozelle)	46/40 dBA	48 dBA	No exceedance
Leichhardt Street (Glebe)	49/37 dBA	48 dBA	No exceedance
Bowman Street (Pyrmont)	54/53 dBA	48 dBA	5 dBA exceedance

Table 8 Assessment of Predicted Noise Levels Against LAeq(night) Noise Limits

Prediction Location	Measured / Predicted LAeq Noise Levels	LAeq(night) Noise Limits	LAeq Exceedance of Licence Limits
Reynolds Street (Balmain/Rozelle)	46/40 dBA	45 dBA	No exceedance
Leichhardt Street (Glebe)	49/37 dBA	45 dBA	No exceedance
Bowman Street (Pyrmont)	54/53 dBA	45 dBA	8 dBA exceedance

The results in the tables are also presented graphically in **Figure 2** and **Figure 3** with Locations 1, 2 and 3 referring to Balmain, Glebe and Pyrmont respectively.

Figure 2 Evening Noise Limits, Predicted and Measured Noise Levels

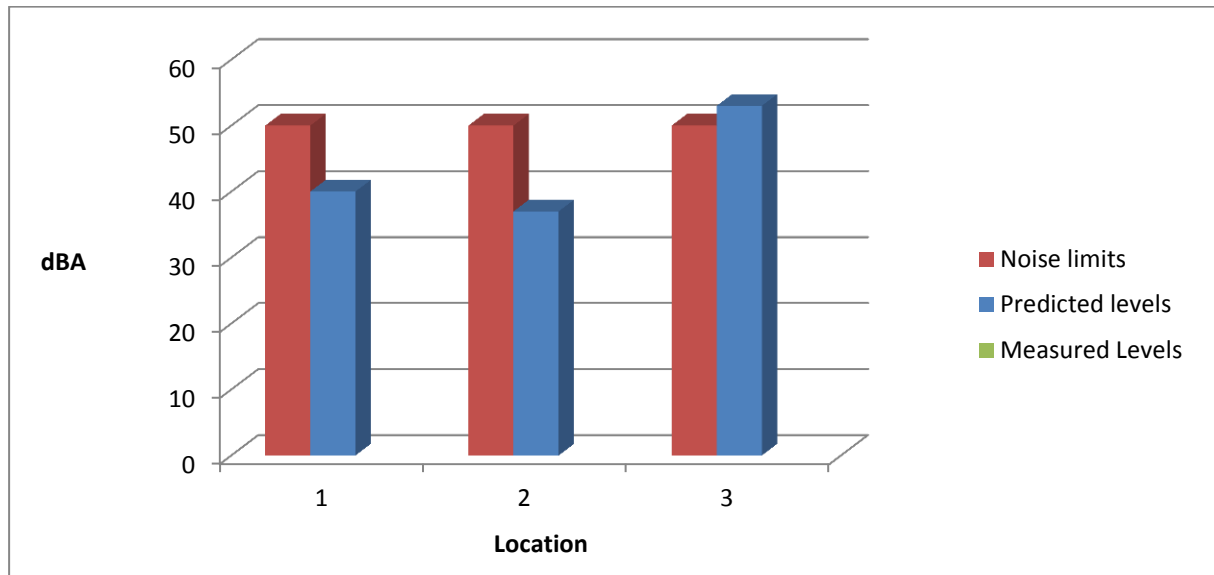
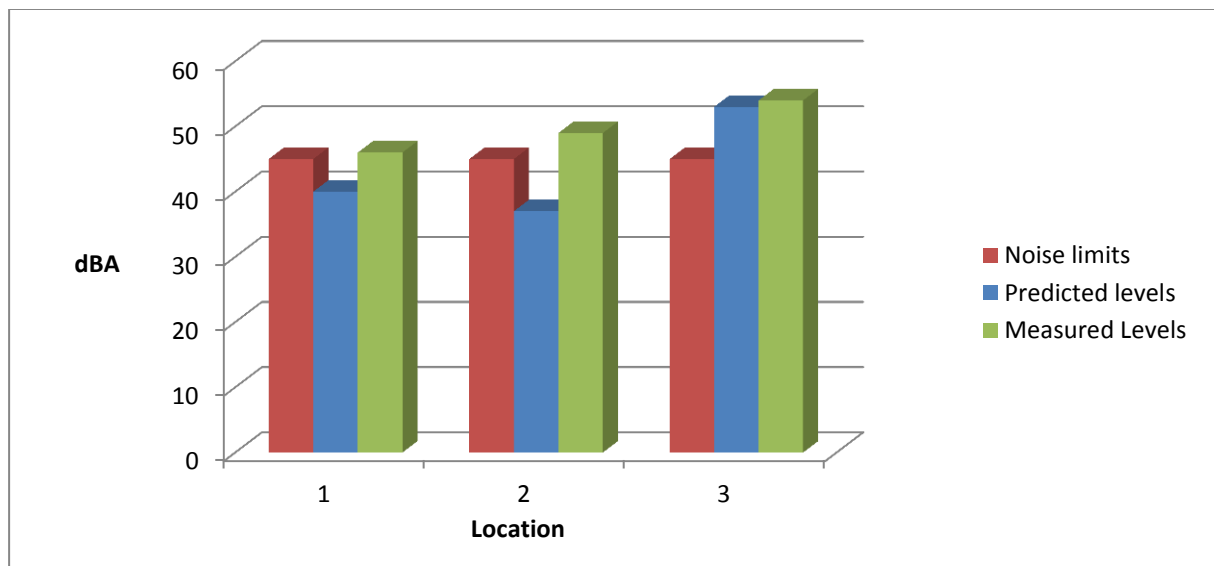


Figure 3 Night-time Noise Limits, Predicted and Measured Noise Levels



Clause R4.1(2)(v) of the Licence requires details of any remedial action. In this instance, no remedial action was taken, as the Port Authority received no complaints from the community regarding noise from the CSL Reliance activity at GI-1 whilst unloading of the vessel was being undertaken at night.

5 CONCLUSION

Noise measurements were carried out during the CSL Reliance being berthed between 1.15 am and 2.58 am on 1 June 2017 after the ship arrived and had commenced daytime unloading operations. A reference noise measurement was also carried out in close proximity of the CSL Reliance vessel, where the noise environment was dominated by the GI-1 based bulk cargo handling noise sources. The reference level was then used to predict noise levels at the representative receivers in the absence of other surrounding activity related noise.

During the night-time, it was found that $L_{Aeq(15\text{minute})}$ noise level exceeds the Licence imposed noise limit by 5 dB at the representative location in Pyrmont. Measured noise levels were marginally lower than predicted with contributions from other sources such as Anzac Bridge traffic, and local traffic. The $L_{Aeq(\text{evening})}$ noise level based on the $L_{Aeq(15\text{minute})}$ measured noise level exceeds the Licence imposed noise limit by 3 dB, and the $L_{Aeq(\text{night})}$ noise level exceeds the Licence imposed noise limit by 8 dB.

At Balmain, the night-time ambient noise environment was dominated by traffic from the Anzac Bridge, local traffic and the urban hum and the $L_{Aeq(15\text{minute})}$ and the $L_{Aeq(\text{night})}$ contribution to the ambient by the CSL Reliance could not be measured, for comparison with the Licence conditions. Predicted noise levels at Balmain from the CSL Reliance bulk cargo unloading activities comply with the licence noise limits at this location.

At Glebe, the night-time ambient noise environment was dominated by traffic from the Anzac Bridge and the $L_{Aeq(15\text{minute})}$ and the $L_{Aeq(\text{night})}$ contribution to the ambient by the CSL Reliance could not be measured, for comparison with the Licence conditions. Predicted noise levels at Glebe from the CSL Reliance bulk cargo unloading activities comply with the licence noise limits at this location.

Bulk cargo terminal related maximum (L_{Amax}) noise levels were not observed to cause an exceedance of the Licence imposed noise limits at Balmain, Glebe or Pyrmont during the evening and night-time measurement periods.

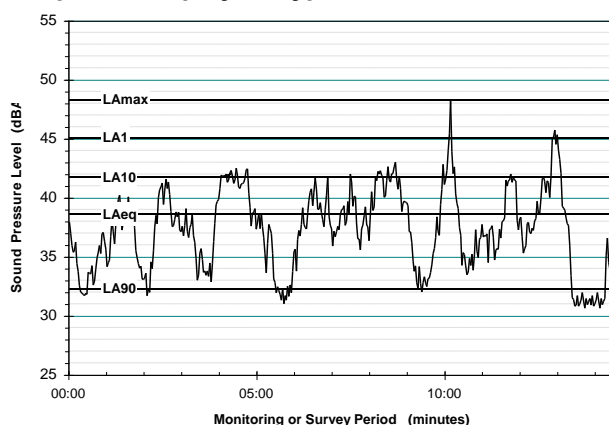
Acoustic Terminology Used in the Report

Typical Noise Indices

This Report makes repeated reference to certain noise level descriptors, in particular the LA10, LA90 and LAeq and LAm_{ax} noise levels.

- The LA10 is the A-weighted sound pressure level exceeded 10% of a given measurement period and is utilised normally to characterise typical maximum noise levels.
- The LAeq is essentially the 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 over the same measurement period. The LAeq(period) is the measurement parameter used to describe the average sound level over the period. For daytime the period is 7 am to 6 pm, for evening 6 pm to 10 pm, and for night-time 10 pm to 7 am.
- The LA90 noise level is the A-weighted sound pressure level exceeded 90% of a given measurement period and is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the “background” level.
- The LAm_{ax} is simply the maximum noise level and is often represented by the LA1(1min), being the level exceeded 1% of 1 minute, ie the noise level exceeded for 0.6 of a second.

Graphical Display of Typical Noise Indices



Typical Noise Levels

The following table presents examples of typical noise levels.

Typical Noise Levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerb side of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to Quiet
50	General Office	
40	Inside private office	Quiet to Very quiet
30	Inside bedroom	
20	Unoccupied recording studio	Almost silent

A-Weighting or dBA Noise Levels

The overall level of a sound is usually expressed in terms of dBA, which is measured using the “A-weighting” filter incorporated in sound level meters. These filters have a frequency response corresponding approximately to that of human hearing. People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the “loudness” of that sound. Different sources having the same dBA level generally sound about equally as loud, although the perceived loudness can also be affected by the character of the sound (eg the loudness of human speech and a distant motorbike may be perceived differently, although they are of the same dBA level).

Sensitivity of People to Noise Level Changes

A change of up to 3 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness.