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Xing Rong Hai

Glebe Island Berth 1

Compliance Noise Monitoring Report

Report Number 610.04309-R72

28 October 2016

Port Authority of New South Wales

Level 4, 20 Windmill Street

Walsh Bay NSW 2000 Australia

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Reference	Date	Prepared	Checked	Authorised
610.04309-R72-v1.0	28 October 2016	Nicholas Vandenberg	John Sleeman	John Sleeman

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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 "Xing Rong Hai" (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 during cargo handling operations (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 no unloading operations taking place, as unloading of the ship is limited to day-time hours only. The measurements were conducted after the ship arrived at G1-1 between 10.00 pm on the 23 October 2016 and 1.39 am on 24 October 2016 after the ship arrived at approximately 9:00 pm.

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

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 and north 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

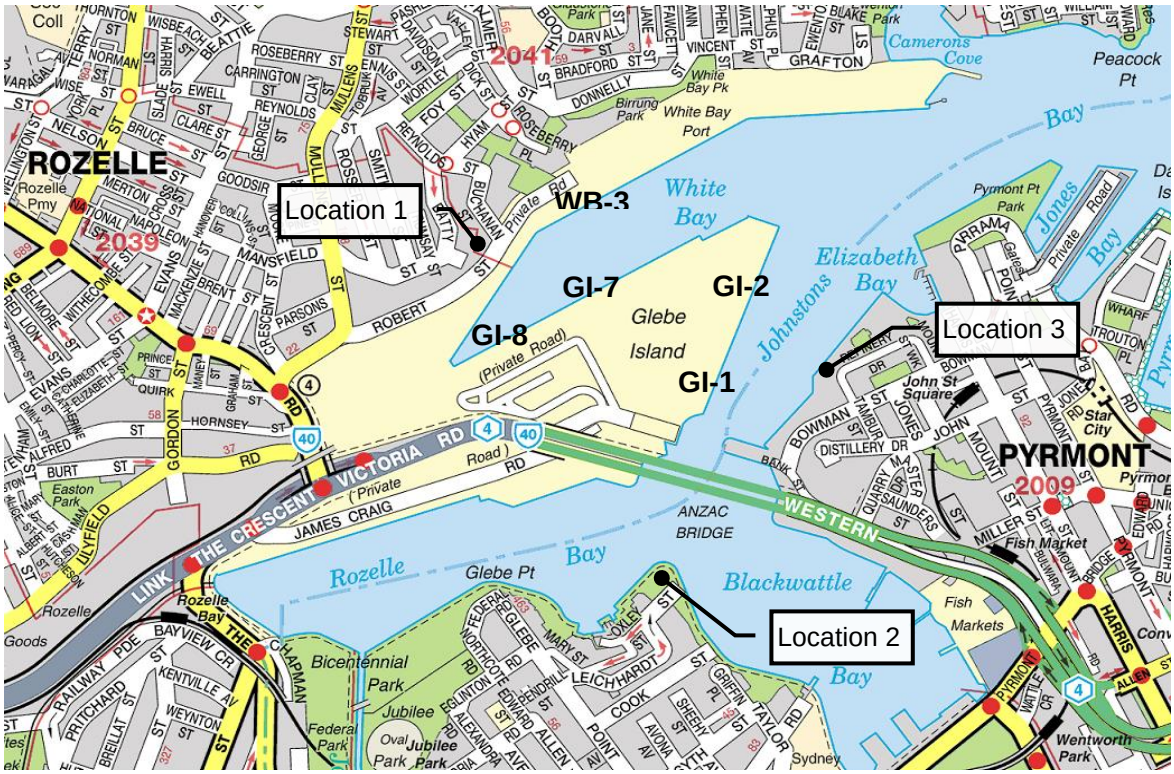
Section M4.1 of the licence requires that the licensee must arrange for an accredited acoustic consultant to monitor noise from the premises "*at the most affected noise sensitive receiver in Balmain, Glebe and Pyrmont, to determine whether the activities at the premises comply with the noise limits 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 Batty Street. This location is 640 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 the apartment building located at 32 Refinery Drive, Pyrmont. This location is 200 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 during the evening and night-time periods. Furthermore, no unloading activities are proposed to be taking place at GI-1 during the evening and night-time periods. All unloading activities including unloading the bulk salt carrier to the wharf and loading the salt into trucks using a front end loader will only occur during daytime hours.

Accordingly, noise monitoring is required during the evening and night-time on order to determine compliance with the noise limits. However, as the ship only arrived at 9:00 pm on the 23 October 2016, noise monitoring was only conducted during the night-time period. This is considered representative of the evening period as no unloading operations will be taking place in these periods.

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 the Refinery Drive resident, Pyrmont.

A "reference" measurement was conducted in close proximity to the Xing Rong Hai, where the noise environment was dominated by the engine 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	2412472	Brüel & Kjær Calibrator

Given the relatively constant nature of noise related to the engine and ventilation fan noise, 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 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.

4 RESULTS AND ANALYSIS

The results of the attended noise measurements conducted during the night-time period 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 (Xing Rong Hai Engine Noise) as well as ambient noise unrelated to the facility.

Table 3 Measured Noise Levels – Xing Rong Hai Evening and Night-time Operations

Address	Start Time	LAeq	LA90	GI-1 Related LAmax Range	Comments
Reynolds Street (Balmain/Rozelle)	00.58 pm 23/10/16 (night	46	45	Non observed	LAeq from Xing Rong Hai , Anzac Bridge/Victoria Rd, vessel at GI-7
Leichhardt Street (Glebe)	00.31 pm 24/10/16 (night)	49	47	Non observed	LAeq dominated noise from Anzac Bridge. Xing Rong Hai not audible.
Bowman Street (Pyrmont)	10.15 pm 23/10/16 (night)	54	53	Non observed	LAeq dominated by Xing Rong Hai. Contribution from Anzac Bridge traffic
	23.55 am 23/10/16 (night)	54	53	Non observed	LAeq dominated by Xing Rong Hai. Contribution from Anzac Bridge traffic

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

One measurement was carried out at the representative receiver at the Balmain site at 00.58 am. At this location, the measurement was influenced by Anzac Bridge traffic, local traffic and vessels at GI 7 unloading material/maintenance. The Xing Rong Hai was observed to be audible at the monitoring location.

One measurement was carried out at the representative Glebe location at GI-1, at 0.31 am. At this location the noise from traffic on Anzac Bridge was dominating the ambient noise environment. The Xing Rong Hai was not audible above the Anzac Bridge traffic noise and other industry observed from Pyrmont.

Two separate measurements were carried out at the representative Pyrmont location at GI-1, at 10.15 pm and 11.55 pm. At this location, during both surveys, noise from the Xing Rong Hai was clearly audible above the ambient noise environment, with other ambient noise sources mainly from Anzac Bridge traffic having a minor impact on the LAeq noise levels.

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 Xing Rong Hai, where the noise environment was dominated by the engine noise.

Table 4 presents the “reference” noise measurements carried out between 40 m and 60 m away from significant sources on the bulk cargo vessel Xing Rong Hai. 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 Xing Rong Hai “Reference” Noise Level

Reference	Location	Distance from Source	LAeq
1	GI-1	42 m	68 dBA
2	GI-1	55 m	67 dBA

Calculations for the evening and night-time were performed using the reference measurements presented in **Table 4**. Predictions indicate that the engine and ventilation fan L_{Aeq} noise level is 42 dBA at Balmain, 37 dBA at Glebe and 53 dBA at Pyrmont.

The predicted noise level of 42 dBA at Balmain is lower than the measured level of 46 dBA and consistent with the ambient being influenced by other sources. The predicted noise level at Glebe is below the ambient and consistent with the Xing Rong Hai being not audible, or "barely audible". At Pyrmont, the predicted noise level of 53 dBA is marginally lower than the measured overall L_{Aeq} 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 $L_{Aeq(15minute)}$ Evening Noise Limits

Prediction Location	Measured L_{Aeq} Noise Level	Predicted Contribution L_{Aeq} Noise Level	$L_{Aeq(15\ minute)}$ Noise Limits	$L_{Aeq\ (15\ minute)}$ Exceedance of Licence Limits
Reynolds Street (Balmain / Rozelle)	-[1]	42 dBA	53 dBA	No exceedance
Leichhardt Street (Glebe)	-[1]	37 dBA	53 dBA	No exceedance
Bowman Street (Pyrmont)	-[1]	53 dBA	53 dBA	No exceedance

Note 1: No measurement was conducted during the evening period as the ship only arrived at 9:00 pm.

Table 6 Assessment of Predicted Noise Levels Against $L_{Aeq(evening)}$ Noise Limits

Prediction Location	Measured L_{Aeq} Noise Level	Predicted Contribution L_{Aeq} Noise Level	$L_{Aeq(15\ minute)}$ Noise Limits	$L_{Aeq\ (15\ minute)}$ Exceedance of Licence Limits
Reynolds Street (Balmain / Rozelle)	-[1]	42 dBA	50 dBA	No exceedance
Leichhardt Street (Glebe)	-[1]	37 dBA	50 dBA	No exceedance
Bowman Street (Pyrmont)	-[1]	53 dBA	50 dBA	3 dB exceedance

Note 1: No measurement was conducted during the evening period as the ship only arrived at 9:00 pm.

Table 7 Assessment of Measured/Predicted Noise Levels Against $L_{Aeq(15minute)}$ Night-time Noise Limits

Prediction Location	Measured L_{Aeq} Noise Level	Predicted Contribution L_{Aeq} Noise Level	$L_{Aeq(15\ minute)}$ Noise Limits	$L_{Aeq\ (15\ minute)}$ Exceedance of Licence Limits
Reynolds Street (Balmain / Rozelle)	46 dBA	42 dBA	48 dBA	No exceedance
Leichhardt Street (Glebe)	49 dBA	37 dBA	48 dBA	No exceedance
Bowman Street (Pyrmont)	54 dBA	53 dBA	48 dBA	5 dB exceedance

Table 8 Assessment of Predicted Noise Levels Against $L_{Aeq(night)}$ Noise Limits

Prediction Location	Measured L_{Aeq} Noise Level	Predicted Contribution L_{Aeq} Noise Level	$L_{Aeq(15\ minute)}$ Noise Limits	$L_{Aeq\ (15\ minute)}$ Exceedance of Licence Limits
Reynolds Street (Balmain / Rozelle)	46 dBA	42 dBA	45 dBA	No exceedance
Leichhardt Street (Glebe)	49 dBA	37 dBA	45 dBA	No exceedance
Bowman Street (Pyrmont)	54 dBA	53 dBA	45 dBA	8 dB 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 and Predicted Noise Levels

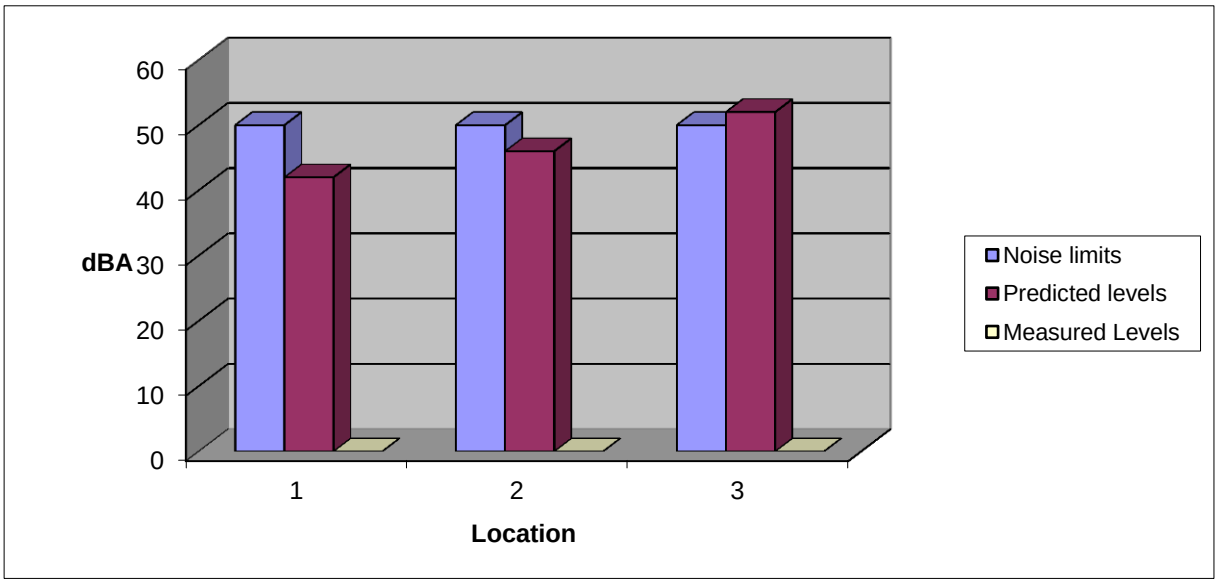
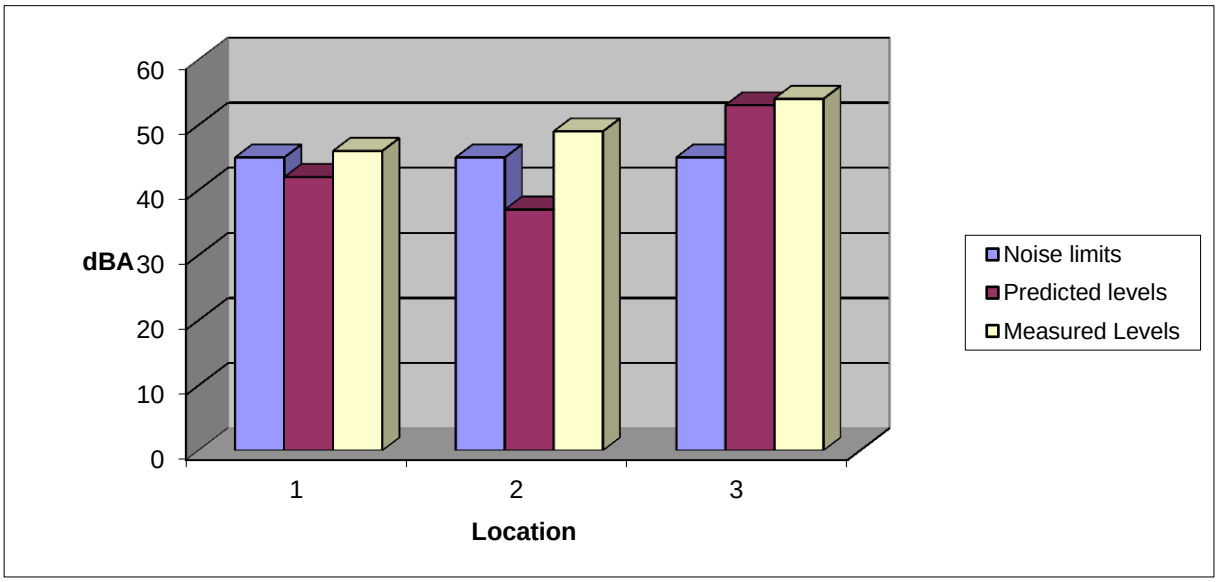


Figure 3 Night-time Noise Limits, Predicted and Measured Noise Levels



Clause R4.1(2)(v) of the Licence requires details of any remedial action. In this instance, no remedial action was taken, as the SPC received no complaints from the community and no unloading operations are taking place during the evening and night-time periods.

5 CONCLUSION

Noise measurements were carried out during the Xing Rong Hai bulk cargo handling operations between 10.15 pm on the 23 October 2016 and 1.39 am on 24 October 2016 after the ship arrived at approximately 9:00 pm. No unloading activities were taking place during the evening and night-time periods. A reference noise measurement was also carried out in close proximity of the Xing Rong Hai vessel, where the noise environment was dominated by the engine noise from the Xing Rong Hai. 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 $L_{Aeq(15minute)}$ predicted noise level exceeded the Licence imposed noise limit by 5 dB at the representative location in Pyrmont. The predicted noise levels were marginally lower than measured noise levels which were dominated by the Xing Rong Hai with contributions from other sources such as Anzac Bridge traffic. The $L_{Aeq(night)}$ noise level based on the $L_{Aeq(15minute)}$ predicted noise level exceeds the Licence imposed noise limit by 8 dB.

At Balmain, the night-time ambient noise environment was dominated by noise generated from the Xing Rong Hai, traffic from Anzac Bridge and operations occurring at GI-7. Predicted noise levels at Balmain from the Xing Rong Hai engine noise 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 $L_{Aeq(15minute)}$ and the $L_{Aeq(night)}$ contribution to the ambient by the Xing Rong Hai could not be measured, for comparison with the Licence conditions. Predicted noise levels at Glebe from the Xing Rong Hai bulk cargo unloading activities comply with the licence noise limits at this location.

No GI-1 related maximum (L_{Amax}) noise levels were observed during the monitoring period at Balmain, Glebe or Pyrmont during the night-time measurement periods, as no unloading operations are taking place during the evening and night-time periods.

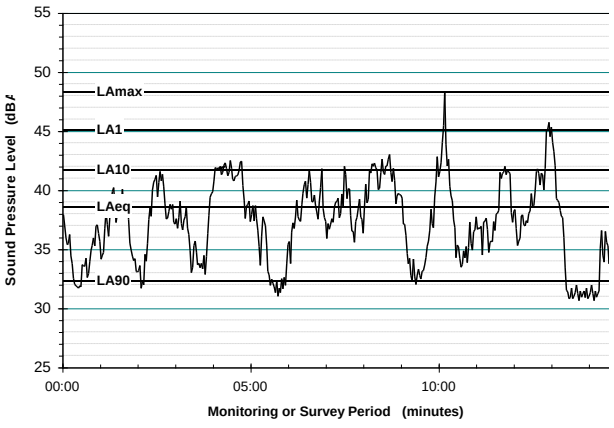
Acoustic Terminology Used in the Report

Typical Noise Indices

This Report makes repeated reference to certain noise level descriptors, in particular the L_{A10}, L_{A90} and L_{Aeq} and L_{Amax} noise levels.

- The L_{A10} 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 L_{Aeq} 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 $L_{Aeq(period)}$ 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 L_{A90} 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 L_{Amax} is simply the maximum noise level and is often represented by the $L_{A1(1min)}$, 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
130 120 110	Threshold of pain Heavy rock concert Grinding on steel	Intolerable Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerb side of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to Quiet
40 30	Inside private office Inside bedroom	Quiet to Very quiet
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.