

# Longueville Hospital Noise Impact Assessment

**Macquarie Health Corporation** 301 Catherine Street, Leichardt NSW 2040

Report Reference: 230042 – Longueville Hospital – Noise Impact Assessment – Ru

Date: 12 April 2023

Revision: R0

Project Number: 230042



#### **DOCUMENT CONTROL**

Project Name:	Longueville Hospital	
Project Number:	230042	
Report Reference:	230042 - Longueville Hospital - Noise Impact Assessment - R0	
Client:	Macquarie Health Corporation	

Revision	Description	Reference	Date	Prepared	Checked	Authorised
1	R0	For issue	12/04/23	MA	BW	BW

#### **PREPARED BY:**

Pulse White Noise Acoustics Pty Ltd

ABN: 95 642 886 306

Address: Level 5, 73 Miller Street, North Sydney, 2060

Phone: 1800 4 PULSE

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# **CONTENTS**

1	INTRODUCTION	3
1.1	Proposal description	3
2	EXISTING ENVIRONMENT	5
2.1	Overview	5
2.2	Unattended noise monitoring	6
2.3	Noise Monitoring Results	6
3	NOISE CRITERIA	7
3.1	Operational noise criteria	7
3.1.1	Lane Cove Council Development Control Plan	
3.2	Noise Policy for Industry	
3.2.1	Intrusive noise impacts – residential receivers	7
3.2.2	Protecting noise amenity	8
	3.2.2.1.1 Area Classification	8
3.2.3	Noise Policy for Industry noise trigger levels	
3.2.4	Overall project specific noise criteria	
3.3	Noise intrusion	
4	OPERATIONAL NOISE IMPACTS	
4.1	Operational noise impacts	11
4.2	Noise intrusion	12
5	CONCLUSION	13
APPENI	DIX A. ACOUSTIC GLOSSARY	14
APPENI	DIX B. UNATTENDED NOISE MONITORING	15
AI I LIVI		
Figure	es	
Figure 1	Site location	5
Tables	S	
Table 1	Ambient noise measurement results, dB(A)	F
Table 2	NPfI – Recommended LAeg noise levels from industrial noise sources	
Table 3	Project noise trigger levels, L <sub>Aeq,15min</sub>	
Table 4	Overall project specific noise criteria.	
Table 5	Design sound levels and reverberation times for different areas of occupancy in buildings	
Table 6		



## 1 INTRODUCTION

As part of the alteration works at the Longueville Private Hospital, Lane Cove Council has identified that an acoustic assessment is required to assess noise impacts for the proposed Hydrotherapy pool and lift.

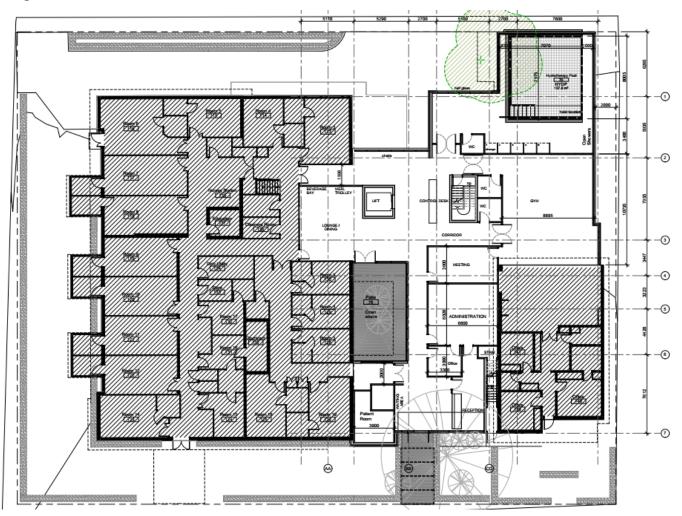
The Council has specifically identified an:

• acoustic report is to address the impact of the use of the lift and the plant/equipment (hydrotherapy pools) on the surrounding area

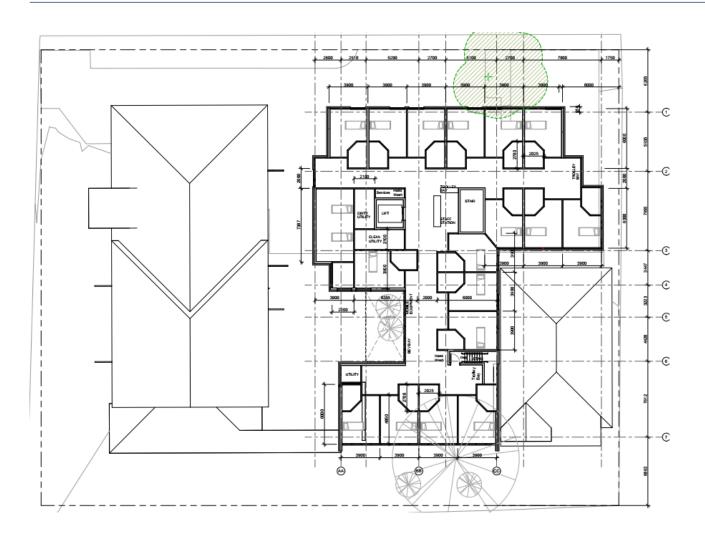
This report provides an assessment of the noise impacts from the proposed site, including all main noise emitting equipment.

# 1.1 Proposal description

The proposal is for alterations and additions to an existing hospital building to include an additional 11 additional car parking including an ambulance bay underneath the hospital at the north-western corner of the site. The proposal includes a new lift, a rehabilitation gym, hydrotherapy pool, toilets and changing rooms will be located on the ground floor level. The new first floor level will include new 18 rooms.









## 2 EXISTING ENVIRONMENT

## 2.1 Overview

The site is located at 45-47 Kenneth Avenue, Longueville with frontage to Kenneth Avenue, Christina Street and Lorna Leigh Lane. The site is zoned R2 Low Density Residential under Lane Cove Local Environmental Plan 2009.

The existing premise is a single storey private hospital building which contains approximately 39 rooms, a part basement level and two administration or medical type buildings which were former dwelling houses. The site is adjoined by detached dwellings and a place of worship building. There is vehicular access from Christina Street adjacent to the lane at the rear.

While sensitive receivers are located on most sides, the Longueville Wellness Centre is located directly to the northeast of the site. This is a commercial receiver, and part of the hospital.

The site and nearest sensitive receivers are illustrated below in Figure 1.



#### **Figure 1 Site location**

The noise environment of the area is controlled by local road traffic noise from Kenneth Street, William Edward Street, and other local roads. Given the existing noise environment and the surrounding receivers, the site is considered to be located in a suburban noise environment.



# 2.2 Unattended noise monitoring

Unattended noise monitoring was undertaken from Friday 3 February to Wednesday 15 February at the Wellness Centre, 43 Kenneth Street, Longueville. The purpose of the noise monitoring was to characterise the existing noise environment and use the results to determine applicable operational noise criteria.

The noise logger was positioned in the backyard of the property, providing a shielded noise environment. This is considered representative of the rear backyards of the surrounding sensitive receivers.

## 2.3 Noise Monitoring Results

In order to assess the acoustical implications of the development at nearby sensitive receivers, the measured background noise data was processed in accordance with the Environmental Protection Authority (EPA) *Noise Policy for Industry* (NPI).

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. RBL levels LA90 (15 minute) and LAeq noise levels are presented in Table 1.

Data affected by adverse meteorological conditions and by spurious and uncharacteristic events have been excluded from the analysed results used to determine the noise emission criteria, in accordance with the requirements of the EPAs Noise Policy for Industry. Meteorological information has been obtained from the Observatory Hill weather station (ID 066214).

Charts presenting summaries of the measured daily noise data are attached in Appendix B. The charts present each 24-hour period and show the La1, La10, Laeq and La90 noise levels for the corresponding 15-minute periods. This data has been filtered to remove periods affected by adverse weather conditions based on weather information

Ambient noise monitoring results are presented in Table 1. Noise measurement undertaken previously on Walker Street have also been included. This location is considered representative of commercial sensitive receivers on Walker Street.

Table 1 Ambient noise measurement results, dB(A)

Measurement	Daytime <sup>1</sup>		Evening <sup>1</sup>		Night-time <sup>1</sup>	
Location	RBL <sup>2</sup>	LAeq <sup>3</sup>	RBL <sup>2</sup>	LAeq <sup>3</sup>	RBL <sup>2</sup>	LAeq <sup>3</sup>
43 Kenneth Street	44	58	42	54	30	45

- Note 1 For Monday to Saturday, Daytime 7:00 am 6:00 pm; Evening 6:00 pm 10:00 pm; Night-time 10:00 pm 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am 6:00 pm; Evening 6:00 pm 10:00 pm; Night-time 10:00 pm 8:00 am.
- Note 2 The RBL noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.
- Note 3 The LAeq is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.



## 3 NOISE CRITERIA

## 3.1 Operational noise criteria

## **3.1.1 Lane Cove Council Development Control Plan**

Section 5.4 of Part D of the Lane Cove Council Development Control Plan (DCP) provides noise requirements for commercial developments.

#### 5.4 Noise

#### **Provisions**

a) Noise generated by residents, visitors, retail or commercial part and mechanical plant and equipment should not exceed the following repeatable maximum L<sub>Aeq(1hour)</sub> level on weekdatys

Day 7am – 6pm	55 dB(A)
Evening 6pm - 10 pm	45 dB(A)
Nigh 10pm – 7 am	40 dB(A)

and on weekends:

 $\begin{array}{lll} \text{Day 8am} - 7 \text{pm} & 50 \text{ dB(A)} \\ \text{Evening 7pm} - 10 \text{ pm} & 45 \text{ dB(A)} \\ \text{Night 10pm} - 8 \text{ am} & 40 \text{ dB(A)} \end{array}$ 

Or in any case not more than 5 dB(A) above the background level during the day and evening and not exceeding the background level at night when measured at the boundary of the property.

- b) Incorporate noise reduction measures on plant and machinery.
- c) Use design features tor planning that will reduce noise.
- d) Incorporate adequate measures for tonal, low frequency, impulsive, or intermittent noise.

# **3.2** Noise Policy for Industry

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW Environment Protection Authority (EPA).

The EPA oversees the Noise Policy for Industry (NPfI) which provides a framework and process for deriving the applicable noise management levels (NMLs). The NPfI criteria for industrial noise sources have two components:

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

## **3.2.1** Intrusive noise impacts – residential receivers

The NPfI provides the following advice for the assessment of intrusive noise impacts for residential receivers:

'The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the  $L_{Aeq}$  descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.'



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

## 3.2.2 Protecting noise amenity

The NPfI provides the following advice for the amenity noise management levels:

'To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance.

Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)

Where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.

The LAeq is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the LAeq, 15min will be taken to be equal to the LAeq, period + 3 decibels (dB), unless robust evidence is provided for an alternative approach for the particular project being considered.

Project amenity noise level (ANL) is urban ANL (Table 2.1) minus 5 dB(A) plus 3 dB(A) to convert from a period level to a 15-minute level (dB = decibel; dB[A] = decibel [A-weighted]; RBL = rating background noise level).'

Noise levels used in the assessment of noise emission from the site have been based on the noise level survey conducted at the site and detailed in this section of the report.

Consequently, the resulting noise level criteria are summarised in the table below, with project noise trigger levels shown in bold text. The criteria are nominated for the purpose of determining the operational noise limits for the operation of the site, including mechanical plant associated with the development, which can potentially affect noise sensitive receivers. For each assessment period, the lower (i.e., the more stringent) of the amenity or intrusive criteria are adopted. The calculated *Project Amenity Noise Level* is equal to either the *Recommended Amenity Noise Level* minus 5 dB(A) plus 3 dB(A) (for a 15-minute period) or the measured existing Laeq noise level minus 10 dB if this is greater as determined by the NPfI.

#### 3.2.2.1.1 Area Classification

The NPI characterises the suburban noise environment as an area with an acoustical environment that:

- · has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry
- · evening ambient noise levels defined by the natural environment and human activity

The area surrounding the proposed development falls under the suburban area classification. For commercial and residential receivers in a suburban area, the recommended criteria are shown in Table 2 below.



Table 2 NPfI – Recommended Laeq noise levels from industrial noise sources

Receiver	Noise amenity area	Time of day <sup>1</sup>	Recommended L <sub>Aeq</sub> noise level (dBA) <sup>2</sup>
Residence	Suburban	Day	55
		Evening	45
		Night	40
Commercial premises	All	When in use	65

Note 1 For Monday to Saturday, Daytime 7:00 am -6:00 pm; Evening 6:00 pm -10:00 pm; Night-time 10:00 pm -7:00 am. On Sundays and Public Holidays, Daytime 8:00 am -6:00 pm; Evening 6:00 pm -10:00 pm; Night-time 10:00 pm -8:00 am

## 3.2.3 Noise Policy for Industry noise trigger levels

The intrusive and amenity criteria for industrial noise emissions derived from the measured data are presented in Table 3. The project noise trigger levels developed for the project and detailed in the table below are based on the noise logging undertaken at the site and detailed in the sections above.

For each assessment period, the lower (i.e., the more stringent) of the amenity or intrusive criteria are adopted. These are shown in bold text in Table 3.

Table 3 Project noise trigger levels, LAeq,15min

Location	Period	Measured RBL	Intrusive noise criteria	Amenity noise level	PNTL
Residential	Day	44	49	53	49
	Evening	42	47	43	43
	Night	30	35	38	35
Commercial receivers	When in use	NA	NA	63	63

## 3.2.4 Overall project specific noise criteria

The noise emission criteria taking into account the requirements of both the NPfI and LCC DCP, are presented below in Table 4. Note that the NPfI was more stringent in all time periods.

Table 4 Overall project specific noise criteria

Location	Time of Day <sup>1</sup>	Max 1 hour noise level (LAeq Hour)
Residential	Day	49
	Evening	43
	Night	35
Commercial	When in use	63

Note 2 The LAeq is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.



## 3.3 Noise intrusion

Recommended ambient noise levels for office spaces are given in a number of publications including Table 1 of Australian Standard AS/NZS 2107:2016 "Acoustics - Recommended design sound levels and reverberation times for building interiors". This document recommends design sound levels and reverberation times for building interiors based on room designation and location of the development relative to external noise sources.

Internal noise levels due to the combined contributions of external noise intrusion and mechanical ventilation plant should not exceed the maximum levels recommended in this Standard. The levels for areas relevant to this development are given in Table 5 below. The mid to maximum points of the internal noise level ranges are generally adopted as the internal design noise criteria for noise intrusion. In this report we will confine our recommendations to dBA levels.

For most of these areas, the design noise levels should be considered as the noise target, as noise levels that are too low can be just as problematic (through creating poor speech privacy) as noise levels that are too high (poor intelligibility and annoyance).

Generally, where the final noise levels are within  $\pm$ 0 dB of the specified level given below, the design criteria will be considered met. Both the upper and lower limits will need to be satisfied especially where privacy is important or where noise intrusion to be avoided.

Table 5 Design sound levels and reverberation times for different areas of occupancy in buildings

Occupancy/ activity Recommended design sound level range <sup>1</sup>		Project design noise level <sup>2</sup> , dBA	Design reverberation time range, s				
Health buildings	Health buildings						
Consulting rooms	40 to 45	43	0.4 to 0.6				
Office areas	35 to 45	43	0.4 to 0.7				
Staff rooms	40 to 45	43	0.4 to 0.6				

Note 1 Applied from AS/NZS 2107:2016

Note 2 Recommended level for mechanical services noise and intrusive noise, combined

Note 3 It is often desirable to design office areas to the maximum noise levels recommended in AS/NZS 2107:2016 to help improve the acoustic privacy conditions between spaces, particularly open plan areas and areas adjoining meeting rooms/consultation rooms. However the recommended design noise level for private offices, boardrooms and meeting rooms is 35-40 dB(A). Design of the area to achieve a noise levels of 40 dB(A) may be desirable.

Note 4 Reverberation time should be minimised for noise control



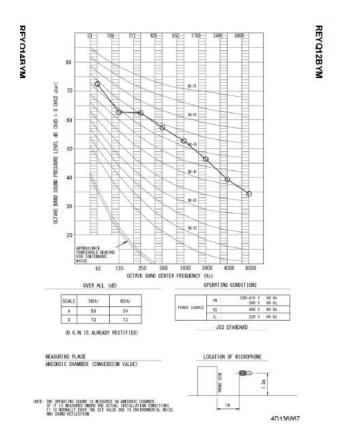
## 4 OPERATIONAL NOISE IMPACTS

# 4.1 Operational noise impacts

Precise mechanical selection for the plant areas is unknown at this stage, as plant selection will take place during the detailed design phase of the project. However, locations of indicative plant have been assessed.

Two condenser units are proposed to be located on the roof. With the fans surrounded by acoustic louvres, or alternative noise mitigation measures providing sufficient noise attenuation, the combined sound power level of the condenser units should not exceed 77 dB(A) at night-time. During the daytime the allowable sound power levels are 85 dB(A) and 89 dB(A). In the absence of acoustic louvres, significantly lower sound power levels would be allowable.

Typical selections for the proposed condenser unit can include Dakin type REYQ12BYM type with details included in the figure below.



A pool fan will be located underneath the hydrotherapy pool on the north-eastern side of the property. The fan outlet should have a maximum sound power level of 70 dB(A). This proposed fan will comply with the proposed criteria, with one metre of lined duct between the inlet fan and the opening.

Alterative equipment and design options may be possible which can be considered during the detailed construction of the project providing the resulting noise emissions comply with the project noise trigger levels as detailed in Section 3.2.3 of this report.

Given the location of the lift and associated mechanical equipment, compliance would be achieved with the applicable noise criteria.



## 4.2 Noise intrusion

Noise levels on the eastern façade are controlled by road traffic noise associated with the Warringah Freeway. Noise measurement results are presented in Section 2.3. The façade will need to be designed to provide adequate attenuation of these noise levels.

Presented below in Table 6 is a summary of the recommended glazing requirements to achieve the internal noise goals identified in Section 3.3.

**Table 6 Glazing recommendations** 

Location	Design criteria	Measured external level	Performance requirement	Indicative glazing construction
All facades	43 dB(A)	58 dB(A)	Rw 30	6 mm float

Detailed design of the glazing will be conducted during design development and detailed design stages of the project to identify any special requirements for the internal spaces that will be located along the building perimeter.



## 5 CONCLUSION

As part of the alteration works at the Longueville Private Hospital, Lane Cove Council has identified that an acoustic assessment is required to assess noise impacts for the proposed Hydrotherapy pool and lift.

The proposal is for alterations and additions to an existing hospital building to include an additional 11 additional car parking including an ambulance bay underneath the hospital at the north-western corner of the site. The proposal includes a new lift, a rehabilitation gym, hydrotherapy pool, toilets and changing rooms will be located on the ground floor level. The new first floor level will include new 18 rooms.

Unattended noise monitoring was undertaken from Friday 3 February to Wednesday 15 February at the Wellness Centre, 43 Kenneth Street, Longueville. The purpose of the noise monitoring was to characterise the existing noise environment and use the results to determine applicable operational noise criteria.

The noise logger was positioned in the backyard of the property, providing a shielded noise environment. This is considered representative of the rear backyards of the surrounding sensitive receivers.

A review of operational noise impacts has been assessed in accordance with the EPAs Noise Policy for Industry and the local council requirements. Mechanical plant with standard attenuation measures would be incorporated in the design to meet the applicable noise criteria. Specific noise attenuation measures would be confirmed during the detailed design stage when plant selection is completed.

An assessment of noise intrusion has been undertaken to meet requirement from AS/NZS 2107:2016 "*Acoustics - Recommended design sound levels and reverberation times for building interiors*". Presented in this report are glazing performance requirements and indicative constructions which should be considered to meet the defined internal noise criteria.

Regards,

Michael Allan Technical Director

Pulse White Noise Acoustics

Michael Ille



## APPENDIX A. ACOUSTIC GLOSSARY

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

Ambient Sound The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources

near and far.

Audible Range The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound

having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies

outside these limits.

Character, acoustic

The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency

content (spectrum) dictate a sound's character.

Decibel [dB] The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel

readings of every day sounds;

0dB the faintest sound we can hear

30dB a quiet library or in a quiet location in the country

45dB typical office space. Ambience in the city at night

60dB Martin Place at lunch time

70dB the sound of a car passing on the street

80dB loud music played at home

90dB the sound of a truck passing on the street

100dB the sound of a rock band

115dB limit of sound permitted in industry

120dB deafening

dBA A-weighted decibels The ear is not as effective in hearing low frequency sounds as it is hearing high frequency

sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dBA. Practically all noise is measured using the A filter. The sound pressure level in dBA gives a close indication of the subjective loudness of the

noise.

Frequency Frequency is synonymous to *pitch*. Sounds have a pitch which is peculiar to the nature of the sound generator.

For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency

or pitch can be measured on a scale in units of Hertz or Hz.

Loudness A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound

of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on

L<sub>max</sub> The maximum sound pressure level measured over a given period.

L<sub>min</sub> The minimum sound pressure level measured over a given period.

 $\mbox{L}_{1}$  The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.

 $L_{10}$  The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.

L<sub>90</sub> The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the  $L_{90}$  noise level expressed

in units of dBA.

Leq The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.

Sound Pressure Level, LP dB A measurement obtained directly using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms sound pressure to the reference sound pressure of 20 micro

Pascals.

Sound Power Level, Lw dB Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of

the sound power of the source to the reference sound power of 1 picoWatt.



## APPENDIX B. UNATTENDED NOISE MONITORING

