Manly Warringah Gymnastics Club Centre of Excellence

Acoustic Development Application

Manly Warringah Gymnastics Club

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1 INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (PWNA) has been engaged by the Manly Warringah Gymnastics Club to undertake a noise impact assessment of the proposed project site to be located at the corner of Pitwatter Road and Kentwell Road, North Manly.

This assessment will address the following:

- Potential surrounding environmental noise intrusion impacts on the development (i.e. traffic and other external noise sources)
- Noise emissions on nearby receivers from the operation of the facility and any building services (i.e. electrical, hydraulic and mechanical plant)

This report will discuss the relevant acoustic criteria which have been adopted as well as the outcome of the assessment. The report has been prepared to form part of the Development Application (DA) package to be submitted to council.

A list of acoustic terminology used in this report is included in Appendix A of this report.

1.1 Relevant Guidelines

Acoustic Criteria that have been adopted in this assessment include requirements from the local and state authorities as well as Australian and International Standards, which will be adopted in the absence of any relevant requirement.

Noise intrusion into the development will be controlled by the requirements the Northern Beaches Council document – Manly Development Control Plan 2013 – Amendment 8 (DCP) and the objectives of Australian New Zealand Standard AS/NZS 2107:2016 Acoustics–Recommended design sound levels and reverberation times for building interiors has been adopted.

Furthermore, the noise emission impacts from the proposed development on the adjacent receivers are regulated by the Northern Beaches Council document – Manly Development Control Plan 2013 – Amendment 8 (DCP) and the NSW EPA Noise Policy for Industry (NPI) 2017.

1.2 Proposed Development

The development proposed to be on the project site includes a community gymnastics hall with open spaces for Competitive and Recreation Programs, Café, BBQ/Seating Areas as well as Office Spaces and Internal Amenities. Architectural drawings for the proposed project site have been provided to this office by Rich Carr Architects dated 28 March 2023.

1.3 Site Description/Nearest Sensitive Receivers

The project is located at the corner of Kentwell Road and Pittwater Road, North Manly to the western side of Nolan Reserve. The site is defined as being RE1 (Public Recreation) as described on the NSW eplanning website.

The nearest sensitive receivers to the site have been identified below.

Receiver 1: Commercial receiver located to the north of the project site to the northern side of Kentwell Road, Manly. Is situated the North Manly Squash and Tennis Clubs (see figure 1 below for further detail).

Receiver 2: To the northeast of the project site across Nolan Reserve and to the northeastern side of Pittwater Road are located a series of residential dule and single story dwellings. These residential receivers are located from 502A – 478 Pittwater Road, North Manly (see figure 1 below for further detail).

Receiver 3: Located to the northwest of the project site lies the Warringah Golf Club, this commercial receiver is located at 292 Condamine Street, North Manly (see figure 1 below for further detail).

Figure 1 Site Map and Receiver Locations - Site Sourced SixMaps

Project Site

Commercial Receiver

Residential Receiver

2 ACOUSTIC NOISE AND VIBRATION SURVEY

This section of the acoustic survey which has been undertaken at the site for the purpose of obtaining existing background noise levels, as well as noise levels incident on the future façades.

2.1.1 Unattended Noise Monitoring

An unattended noise survey was conducted between Monday the 31st of July 2023 to Thursday the 10th of August 2023 in the position as shown in Figure 1 above. This survey was conducted to measure the existing background noise level. All data in the graphs presented in Appendix B have not been corrected (i.e. raw data presented)

Noise logging was undertaken on the project site using a RION NL-42 type noise monitor with serial number 01000231. Calibration of the logger was checked prior to and following the measurements. Drift in Calibration did not exceed ±0.5dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

One unattended noise monitor was located at the front of the site, along the western boundary adjacent to Brougham Street. The purpose of noise monitoring at this location was to characterise the existing road traffic noise incident on the proposed development facade. The second unattended noise monitor was located towards the rear of the site, along the eastern boundary. This monitor was used to establish criteria for noise emissions (i.e., to determine the noise level representative of the nearest noise sensitive receiver locations to the proposed development).

The locations of the noise loggers are shown in Figure 1. The noise loggers were positioned such that they did not requires façade corrections.

Charts presenting summaries of the measured daily noise data are attached in Appendix B. The charts present each 24-hour period and show the L_{A1} L_{A10}, L_{Aeq} and L_{A90} 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.

Based in the unattended noise measurements, the results of the survey have been presented below.

2.2 Noise Descriptors & Terminology

Environmental noise constantly varies in level with time. Therefore, it is necessary to measure environmental noise in terms of quantifiable time periods and statistical descriptors. Typically, environmental noise is measured over 15 minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dBA, the "A" indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' arithmetic does not apply, e.g., adding two sound sources of equal values result in an increase of 3dB (i.e., 60 dBA plus 60 dBA results in 63 dBA). A change of 1 dB or 2 dB in the sound level is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The LA1, LA10 and LA90 levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels can be considered as the maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

2.3 Noise Monitoring Results

2.3.1 Results in accordance with the EPA Noise Policy for Industry (NPI) 2017 (RBLs)

In order to assess the acoustical implications of the development at nearby noise sensitive receivers, the measured background noise data of the logger was processed in accordance with the NSW EPA's Noise Policy for Industry (NPI, 2017)

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 LA90 (15minute) 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 results, and also excluded from the data used to determine the noise emission criteria. Meteorological information has been obtained from the Observatory Hill weather station (ID 066023).

Table 1 Measured Ambient Noise Levels corresponding to the NPI's Assessment Time Periods

Measurment Location	Daytime 7:00am to 6:00pm		Evening 6:00pm to 10:00pm		Night-Time 10:00pm to 7:00am	
	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)
Manly Warringah Gymnastics Club (see Figure 1 for further detail)	50	56	48	55	36	43

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 LA90 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.

2.3.2 Attended Noise Measurements

In addition to the unattended noise survey, an attended noise survey was carried out to establish levels at key locations within the and surrounding the site. These are summarised below.

The attended noise measurements were conduced using a Brüel & Kjær Type 2250 sound level meter (serial number 2709757). Calibration of the sound level meter was checked prior to and following the measurements using a Brüel & Kjær Type 4231 sound calibrator (serial number 3009148). The calibrator emitted a calibration tone of 94 dB at 1 KHz. The drift in calibration did not exceed ±0.5 dB. All equipment carries appropriate and current NATA (or manufacturer) calibration certificates.

Attended noise measurements were undertaken on Friday the results of the attended noise measurements are outlined in the table below.

Table 2 Measured Ambient Noise Levels corresponding to the COS Assessment Time Periods

Measurment Location	Date and time	Measured Noise Level (dBA)		Comments
		$L_{A90(15\text{-}min)}$[1]	$L_{Aeq(15\text{-}min)}$[1]	
Pittwater Road, North Manly	Thursday the 11th of August 2023	50	61	Traffic noise along Pittwater road was the main contributing noise source during the noise measurement.

Note 1: The LA90 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 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 ACOUSTIC CRITERIA

The acoustic criteria which has been adopted for this assessment has been outlined below. All criteria has been separated into the relevant assessment type these are:

- Noise Emission Criteria (Assessment of noise to surrounding receivers)

3.1 Noise Intrusion Criteria

External noise intrusion into the building will generally be via the building envelope (External wall, glazing or external roof). The design of the building envelope should be such that the requirements listed below are achieved.

3.1.1 Northern Beaches Council – Manly Development Control Plan 2013

The Northern Beaches Council document – Manly Development Control Plan 2013 – Amendment 8 (DCP) does not contain any applicable noise intrusion criteria for the proposed project site. A such in the absence of any such criteria/ applicable requirements, objectives listed in NSW/EPA Noise Policy for Industry 2017.

3.1.2 Australian / New Zealand Standard AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors - (AS/NZS 2107:2016)

Recommended ambient noise levels and reverberation times for internal spaces are given in a number of publications including Table 1 of Australian / New Zealand Standard 2107:2016 "Acoustics - Recommended design sound levels and reverberation times for building interiors". Unlike the previous version of this Standard, this latest edition recommends a range with lower and upper levels (rather than "satisfactory" and "maximum" internal noise levels) for building interiors based on room designation and location of the development relative to external noise sources. This change has occurred due to the fact that sound levels below 'satisfactory' could be interpreted as desirable, but the opposite may in fact be the case. Levels below those which were listed as 'satisfactory' can lead to inadequate acoustic masking resulting in loss of acoustic isolation and speech privacy.

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 4 below. The mid to maximum points of the internal noise level ranges are generally adopted as the internal design noise criteria for the combined effect of mechanical services and external noise intrusion. In this report we will confine our recommendations to dBA levels, however, where the background noise appears to be unbalanced, AS/NZS 2107:2016 provides direction in terms of suitable diagnostic tools that can be used to assess the spectrum distribution of the background noise.

Table 3 Recommended Design Sound Levels

Type of Occupancy/Activity	Design sound level range dBA ($L_{Aeq,t}$)
Sports and Clubs Buildings	
Leisure centre and gaming	40 to 50

Note 1 Overall recommended level for mechanical services noise and intrusive noise, combined.

Section 6.18 of AS/NZ 2107:2016 notes that the presence of discrete frequencies or narrow band signals may cause the sound level to vary spatially within a particular area and be a source of distraction for occupants. Where this occurs, the sound level shall be determined as the highest level measured in the occupied location(s).

If tonal components are significant characteristics of the sound within a measurement time interval, an adjustment shall be applied for that time interval to the measured A-weighted sound pressure level to allow for the additional annoyance. If the background sounds include spectral imbalance, then the RC (Mark II) levels indicated in the Standard should be referenced (see also Appendix D of AS/NZ 2107:2016 for additional guidance).

Generally, where the final noise levels are within +/- 2 dB of the specified level given above, 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 is to be avoided.

3.2 Noise Emission Criteria

External Noise intrusion into the building will generally be via the building envelope (External wall, glazing or external roof). The design of the building envelope should be such that the requirements listed below are achieved.

3.2.1 Northern Beaches Council – Manly Development Control Plan 2013

The Northern Beaches Council document – Manly Development Control Plan 2013 – Amendment 8 (DCP) does not contain any applicable noise emission criteria for the proposed project site. A such in the absence of any such criteria/ applicable requirements, objectives listed in NSW/EPA Noise Policy for Industry 2017.

3.2.2 NSW EPA Noise Policy for Industry (NPI) 2017

In NSW, the control of noise emissions is the responsibility of Local Governments and the NSW Environment Protection Authority (NSW EPA).

The Noise Policy for Industry (NSW NPI) which provides framework and process for determining external noise criteria for the assessment of noise emission from industrial developments. The NSW NPI 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 particular land uses for residents and sensitive receivers in other land uses.

3.2.2.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (LAeq), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPI. Using the rating background noise level approach 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.

3.2.2.2 Protecting Noise Amenity (All Receivers)

To limit continuing increase in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPI. That is, the ambient LAeq noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.

The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

Project amenity noise level for industrial developments is specified as the recommended amenity noise level (Table 2.2 of the NPI) minus 5 dB(A). 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).

Where the resultant project amenity noise level is 10 dB or more lower than the existing traffic noise level, the project amenity noise levels can be set at 15 dB below existing traffic noise levels (i.e. LAeq,period(traffic) minus 15 dBA).

3.2.2.2.1 Area Classification

The NSW NPI characterises the "Suburban Residential" noise environment as an area that has the following characteristics:

- An acoustical environment that:
  - Suburban –
    - sound of many unidentifiable, mostly traffic and/or industrial related sound sources.
    - Has through-traffic with characteristically heavy and continuous traffic flows during peak periods.
    - Is near commercial districts or industrial districts.
    - Has any combination of the above.

Table 4 NSW NPI – Recommended LAeq Noise Levels from Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day1	Recommended Amenity Noise Level (LAeq, period)2 (dBA)
Residence	Suburban Residential	Day	55
		Evening	45
		Night	40
Commercial		When in use	63

Note 2 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 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.

3.2.3 Project Trigger Noise Levels

The intrusive and amenity criteria for industrial noise emissions, derived from the measured data, are presented in Table 5. These criteria are nominated for the purpose of determining the operational noise limits for 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, which are shown in bold text in Table 5.

Table 5 External noise level criteria in accordance with the NSW NPI

Location	Time of Day [1]	Project Amenity Noise Level, LAeq, period [2] (dBA)	Measured LA90, 15 min (RBL) [3] (dBA)	Measured LAeq, period Noise Level (dBA)	Intrusive LAeq, 15 min Criterion for New Sources (dBA)	Amenity LAeq, 15 min Criterion for New Sources (dBA)
Suburban Residences	Day	50	50	56	55	**53**
	Evening	40	48	55	53	**43**
	Night	35	36	43	41	**38**
Commercial	When in use	60	N/A	N/A	N/A	**63**

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

*Note 2 Project Amenity Noise Levels corresponding to the discussion in Section **Error! Reference source not found.** (i.e. existing LAeq noise level -15dBA).*

Note 3 LA90 Background Noise or Rating Background Level.

Note 4 Project Noise Trigger Levels are shown in bold and underline.

Note 5 Calculated based on the attended and unattended noise surveys.

Note 6 As outlined in section 2.3 of the NSW NPI, evening project intrusiveness noise levels cannot be set higher than the day project intrusiveness criteria. Therefore, adoption of the daytime intrusiveness criteria has occurred.

3.3 Project Noise Emission Criteria

Based on the above outlined captured noise data, the noise emission criteria that this assessment will adopt is as follows:

Table 6 Project Trigger Noise Levels

Location	Time of Day [1]	Project Amenity Trigger Level
Suburban Residences	Day	53
	Evening	43
	Night	38
Commercial	When in use	63

4 ACOUSTIC ASSESSMENT

In addressing the noise and vibration criteria which are established above, each component of the development is assessed and presented below.

4.1 Operational Noise

Operational Noise from the use of the gymnastics hall has been undertaken using the following parameters:

- Maximum capacity of 250 patrons
- Amplified music to be played within the premises.

The following sound spectrums have been used as a basis for this assessment:

Table 7 Octave band spectra for Male talker Klark Teknik

Frequency	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Overall dBA
Typical Speech Lw (Raised)	66	72	75	71	67	61	56	76

Table 8 Octave band spectra for amplified music – (Adult Listening)

Frequency	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Overall dBA
Amplified Music	66	75	72	70	66	64	48	75

An assessment of noise breakout from the venue has been conducted using the above listed Noise levels, the resultant breakout noise levels from the venue are compliant with the noise emission trigger levels as outlined in Table 5.

The below table outlines the resultant noise levels expected to be experienced by each of the receivers.

Table 9 Calculated External Noise Emissions

Receiver	Criteria dBA L_{Aeq}	Calculated Noise Level dBA L_{Aeq}	Compliant?
Receiver 1: North Manly Squash/Tennis Clubs	(Most Stringent Nighttime Criteria) 38 dBA L_{Aeq}	34 dBA L_{Aeq}	Yes
Receiver 2: Residential Receivers 502A-478 Pittwater Road, North Manly	(Most Stringent Nighttime Criteria) 38	31 dBA L_{Aeq}	Yes
Receiver 3: 292 Condamine Street, North Manly (Warringah Gold Club)	(Most Stringent Nighttime Criteria) 38	<30 dBA L_{Aeq}	Yes

4.1.1 Operational Noise Provisions

The following provisions should be incorporated into the operation of the premises to ensure compliance with the project noise emission requirements:

- Windows are to be closed after 9:30pm; and
- Music no louder than 75dB SWL to be played in the venue.

4.2 Noise from Engineering Service

At this stage of the project, the exact location of key plant items has not been selected, and or the selection of items to be installed. As such a detailed assessment of noise associated from engineering services cannot be undertaken.

However, to ensure that future selections of plant items meet external noise levels at neighbouring properties a proof-of-concept approach has been considered.

In our experience, for this type of development the following mechanical systems would be installed, and their associated sound power levels are outlined below.

- Air Conditioning Condensers – 75dB(A) (L_w)

It is anticipated toilet exhaust fans for the units will individually discharge along the façade utilising a façade louvre above the glazed elements. It is recommended that 1m with acoustic flexible ducting is used on the intake and discharge side of the fan. On this assumption, compliance would be achieved.

Air conditioning condensers could be located in a central part of the roof of the building or in a plant room. Based on a typical sound power level of a condenser unit, the following acoustic treatments are recommended to be installed.

- Condenser plant are to be isolated from the base building structure with a rubber pad.
- Night operation mode must be in operation between 9:00pm and 7:00am and provided a minimum of 4-5dBA.

High performing acoustic louvres which will provide a high level of noise reduction whilst maintaining the required airflow may be required. However, this is subject to final selections and should be reviewed prior to installation.

4.3 Additional Traffic on Public Roads

Noise impacts from the increase in vehicle movements along Kentwell Road are to be assessed in accordance with the NSW EPA Road Noise Policy (RNP) 2011.

A review of the project traffic assessment results in a minor increase in traffic along Kentwell Road and will not exceed a 2dBA increase as summarised in the NSW EPA RNP to be barely perceptible to the average person and therefore considered acoustically acceptable.

5 CONCLUSION

Pulse White Noise Acoustics Pty Ltd (PWNA) has been engaged by the Manly Warringah Gymnastics Club to undertake a noise impact assessment of the proposed project site to be located at the corner of Pitwatter Road and Kentwell Road, North Manly. From this assessment we note the following:

- To control noise impacts at external receivers, recommended indicative treatments for major engineering services have been provided in section 4.2. From our review we have formulated the following opinion that at this stage of the project the exact selections/locations of plant items are not known. A preliminary assessment however has been carried out using our experience with similar types of developments and the typical plant items installed.
- Noise associated with the operational use of the proposed subject site can be compliant with the requirements outlined in the Noise Policy for Industry 2017, provided that the recommendations provided in section 4.1.1 are incorporated into the operation of the premises.
- Noise associated with additional traffic on Public Roads has been reviewed and determined to not exceed the existing conditions by 2dBA, therefore compliance with the NSW Road Noise Policy is achieved.

For any additional information, please so not hesitate to contact the undersigned.

Kind regards,

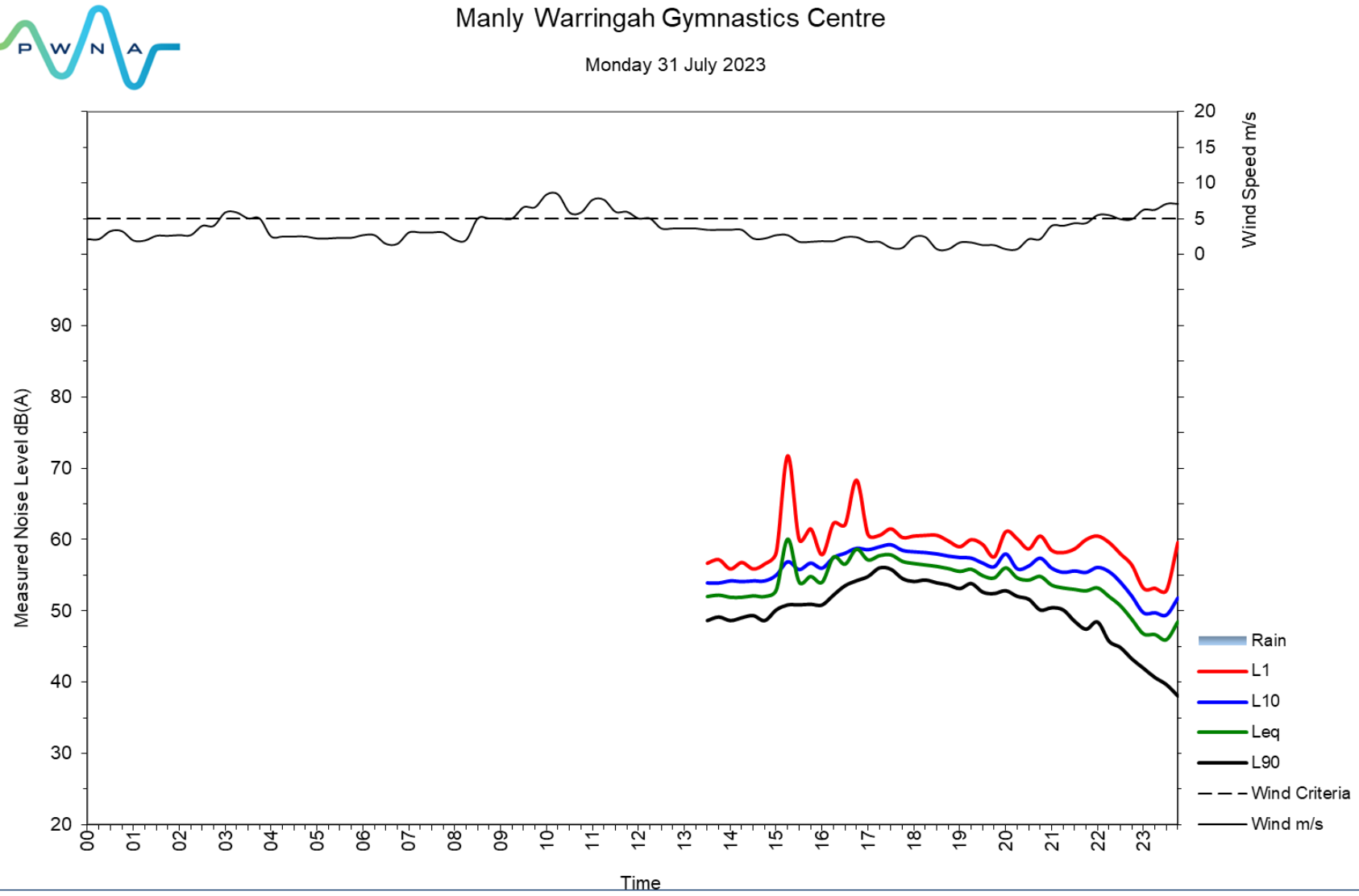
George Kinezos
Acoustic Engineer
PULSE WHITE NOISE ACOUSTICS PTY LTD

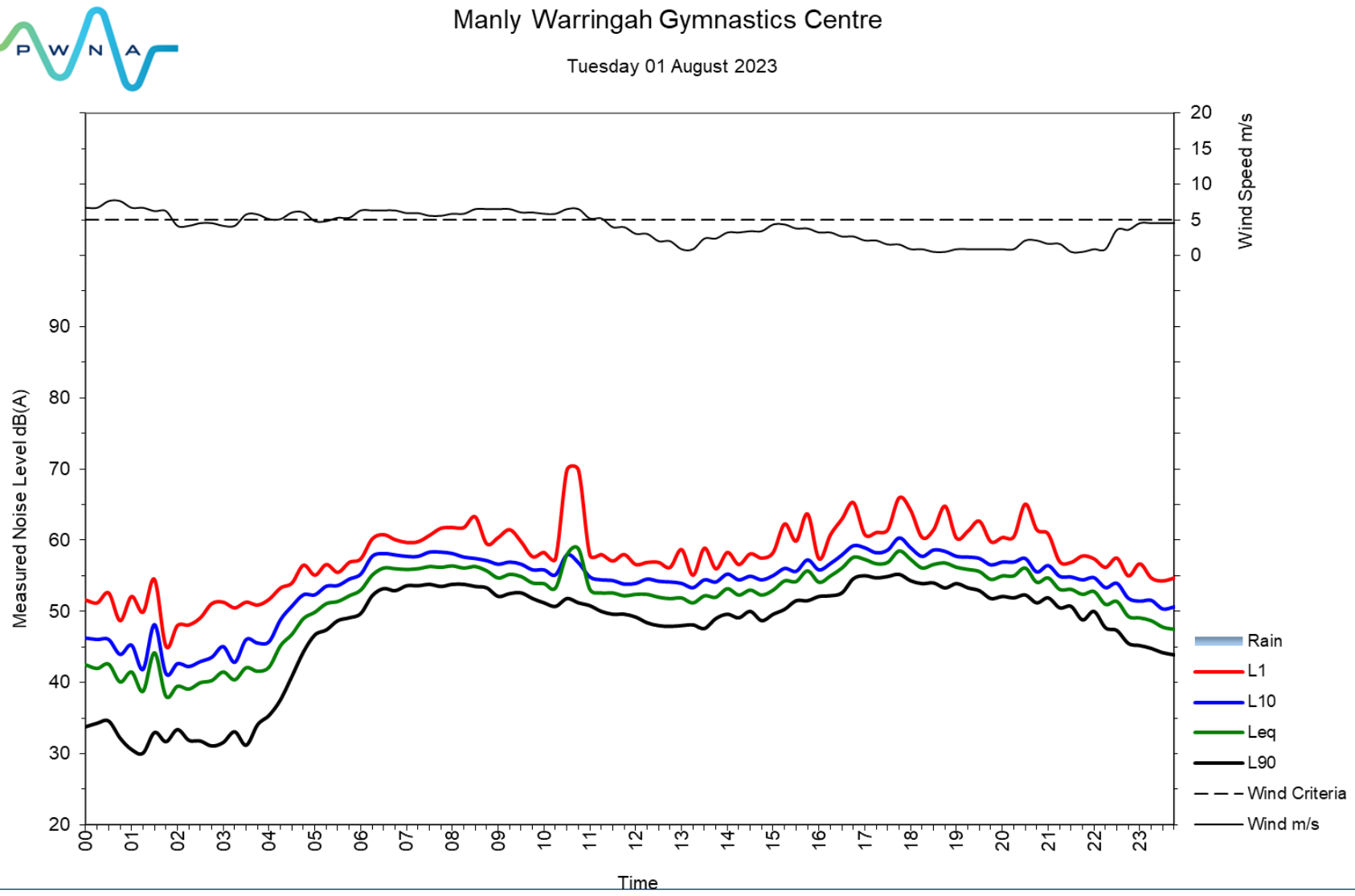
APPENDIX A. ACOUSTIC TERMINOLOGY

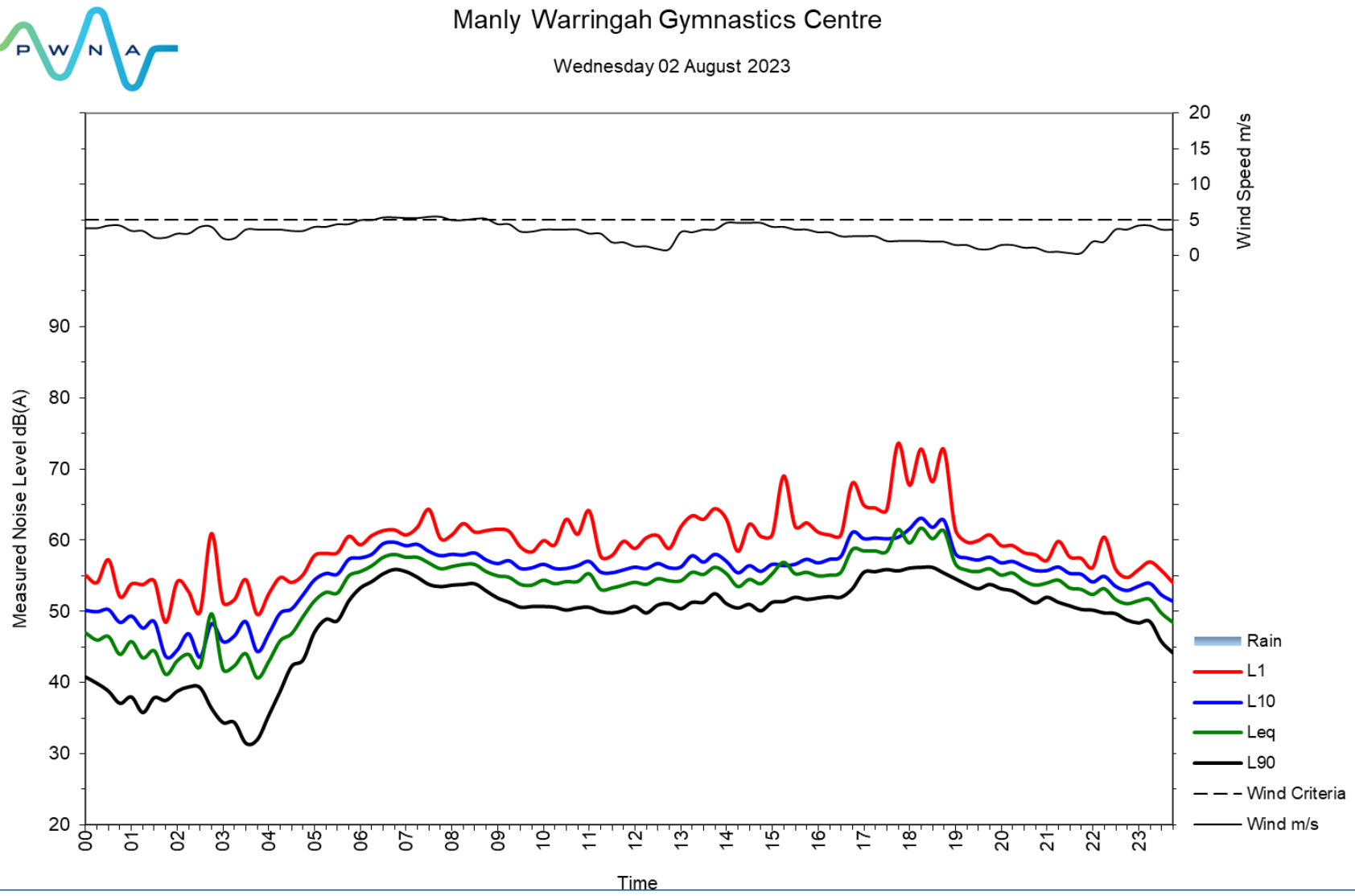
Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:
	0dB(A) Threshold of human hearing 30dB(A) A quiet country park 40dB(A) Whisper in a library 50dB(A) Open office space 70dB(A) Inside a car on a freeway 80dB(A) Outboard motor 90dB(A) Heavy truck pass-by 100dB(A) Jackhammer/Subway train 110 dB(A) Rock Concert 115dB(A) Limit of sound permitted in industry 120dB(A) 747 take off at 250 metres
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Ambient sound	The all-encompassing sound at a point composed of sound from all sources near and far.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Reverberation	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)
Air-borne sound	The sound emitted directly from a source into the surrounding air, such as speech, television or music
Impact sound	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.
Air-borne sound isolation	The reduction of airborne sound between two rooms.
Sound Reduction Index [R] *(Sound Transmission Loss)*	The ratio the sound incident on a partition to the sound transmitted by the partition.
Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.
Level difference [D]	The difference in sound pressure level between two rooms.
Normalised level difference [D_n]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
Standardised level difference [D_{nT}]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
Weighted standardised level difference [$D_{nT,w}$]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.

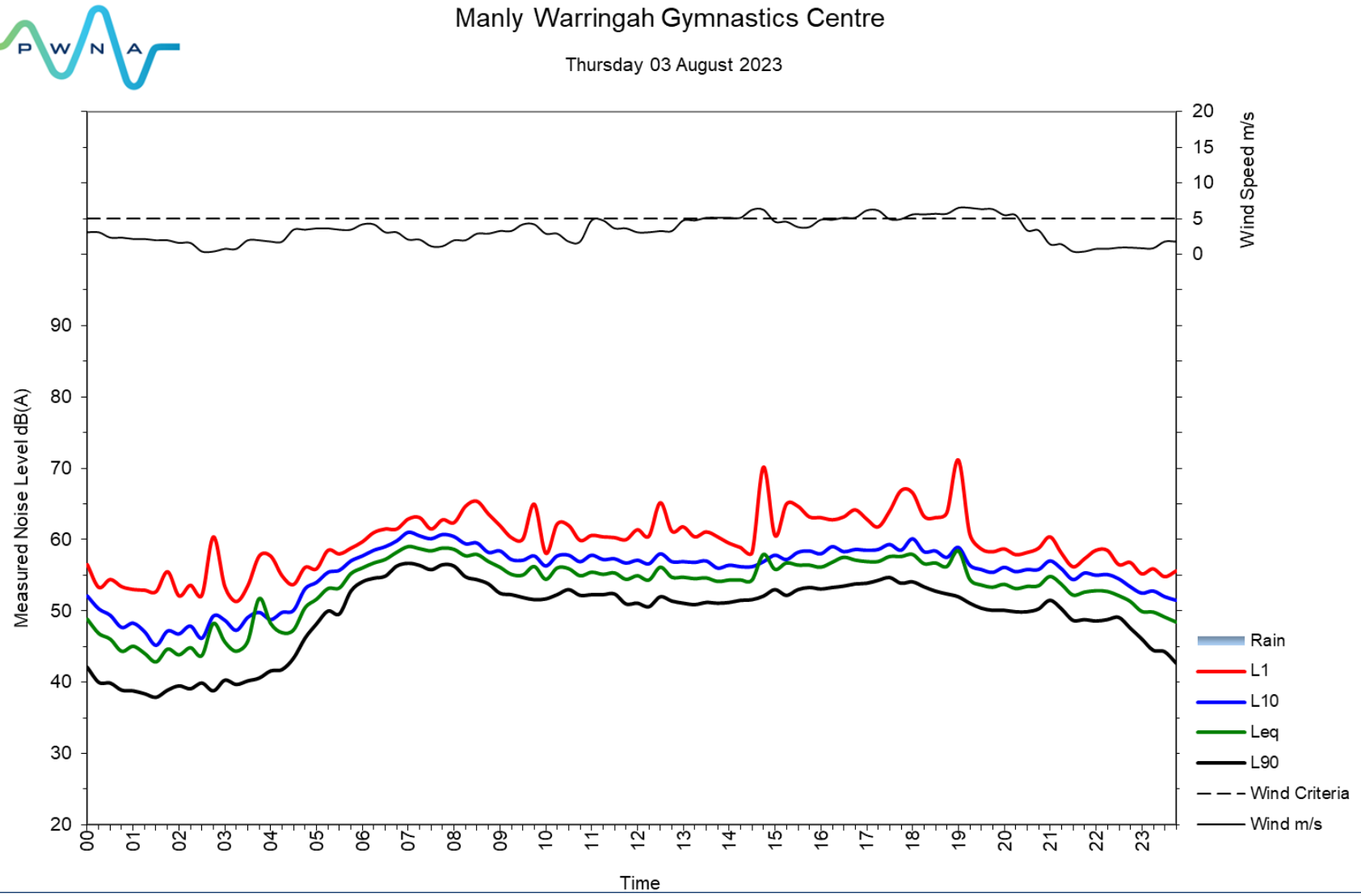
Impact sound isolation	The resistance of a floor or wall to transmit impact sound.
Impact sound pressure level [L_i]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
Normalised impact sound pressure level [L_n]	The impact sound pressure level normalised for the absorption area of the receiving room.
Weighted normalised impact sound pressure level [$L_{n,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
Weighted standardised impact sound pressure level [$L'_{nT,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
C_I	A value added to an L_{nW} or $L'_{nT,w}$ value to account for variations in the spectrum.
Energy Equivalent Sound Pressure Level [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
Percentile Sound Pressure Level [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.
Speech Privacy	A non-technical term but one of common usage. Speech privacy and speech intelligibility are opposites and a high level of speech privacy means a low level of speech intelligibility. It should be recognised that acceptable levels of speech privacy do not require that speech from an adjacent room is inaudible.
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
Noise Reduction	The difference in sound pressure level between any two areas. The term "noise reduction" does not specify any grade or performance quality unless accompanied by a specification of the units and conditions under which the units shall apply
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.
Background Sound Low	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted, external ambient noise sources. Usually taken to mean the LA90 value
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.
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
LMax	The maximum sound pressure level measured over a given period.
LMin	The minimum sound pressure level measured over a given period.
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.

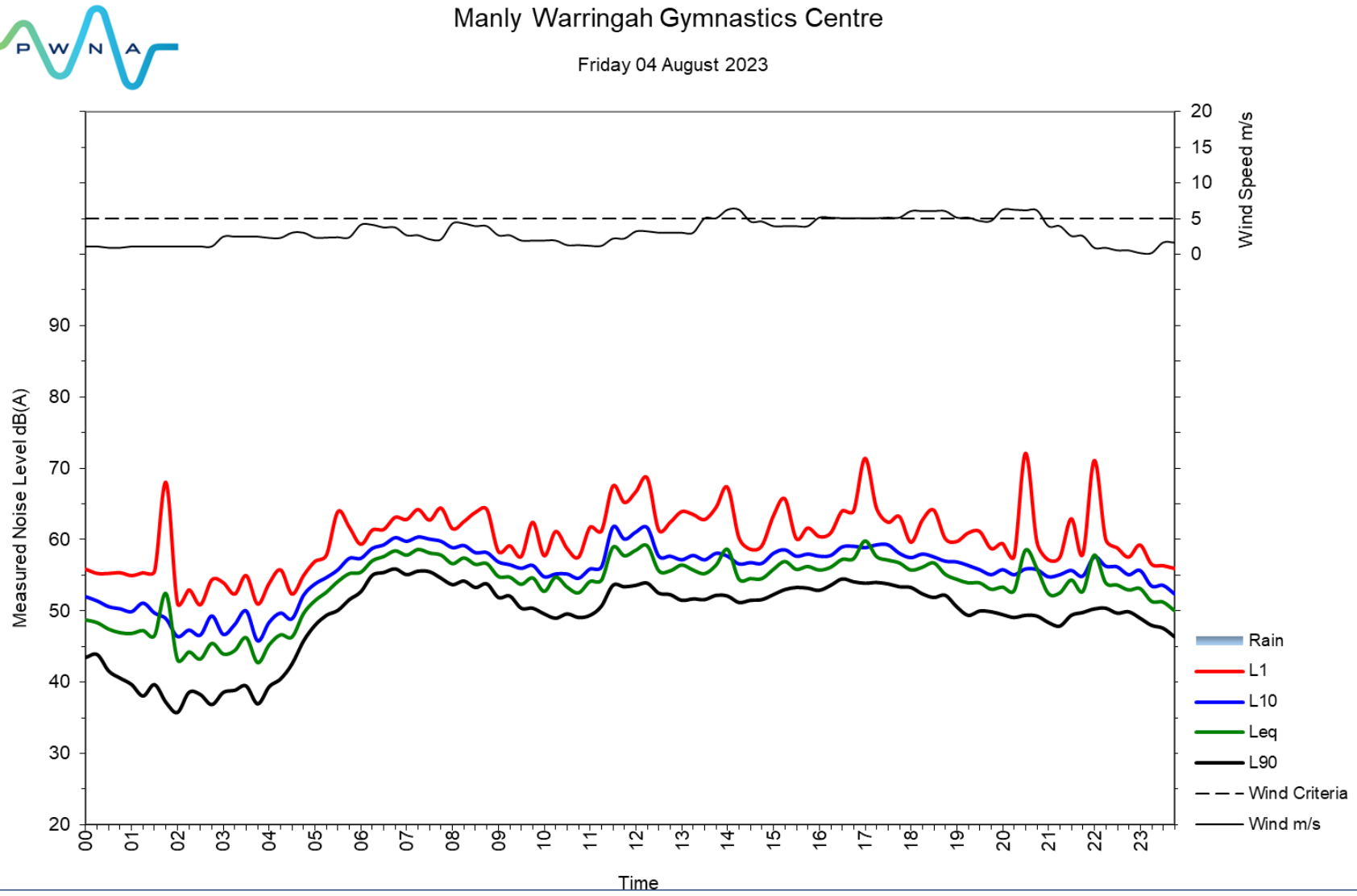
APPENDIX B. NOISE MONITORING DATA

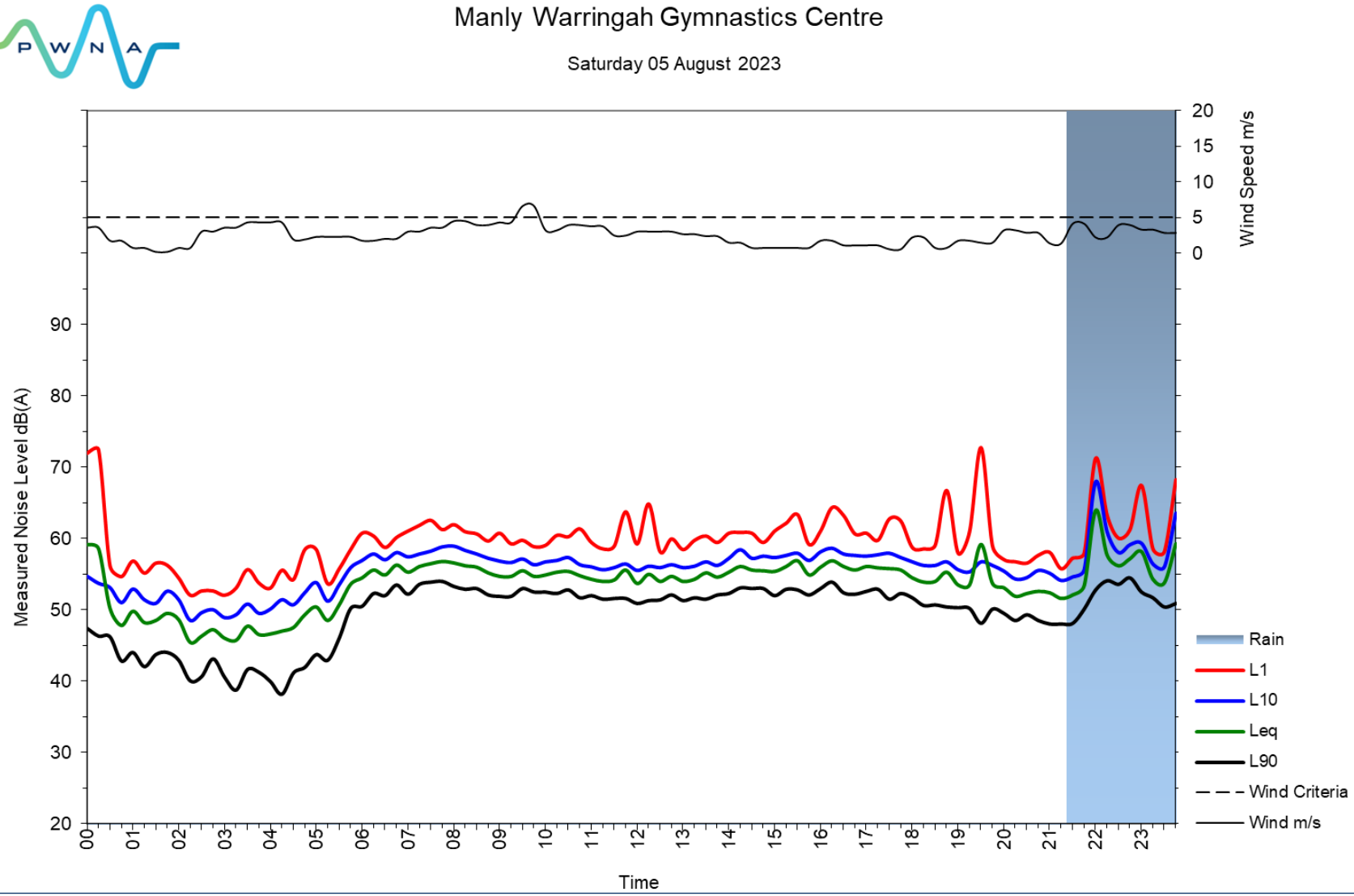

Manly Warringah Gymnastics Centre
Monday 31 July 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

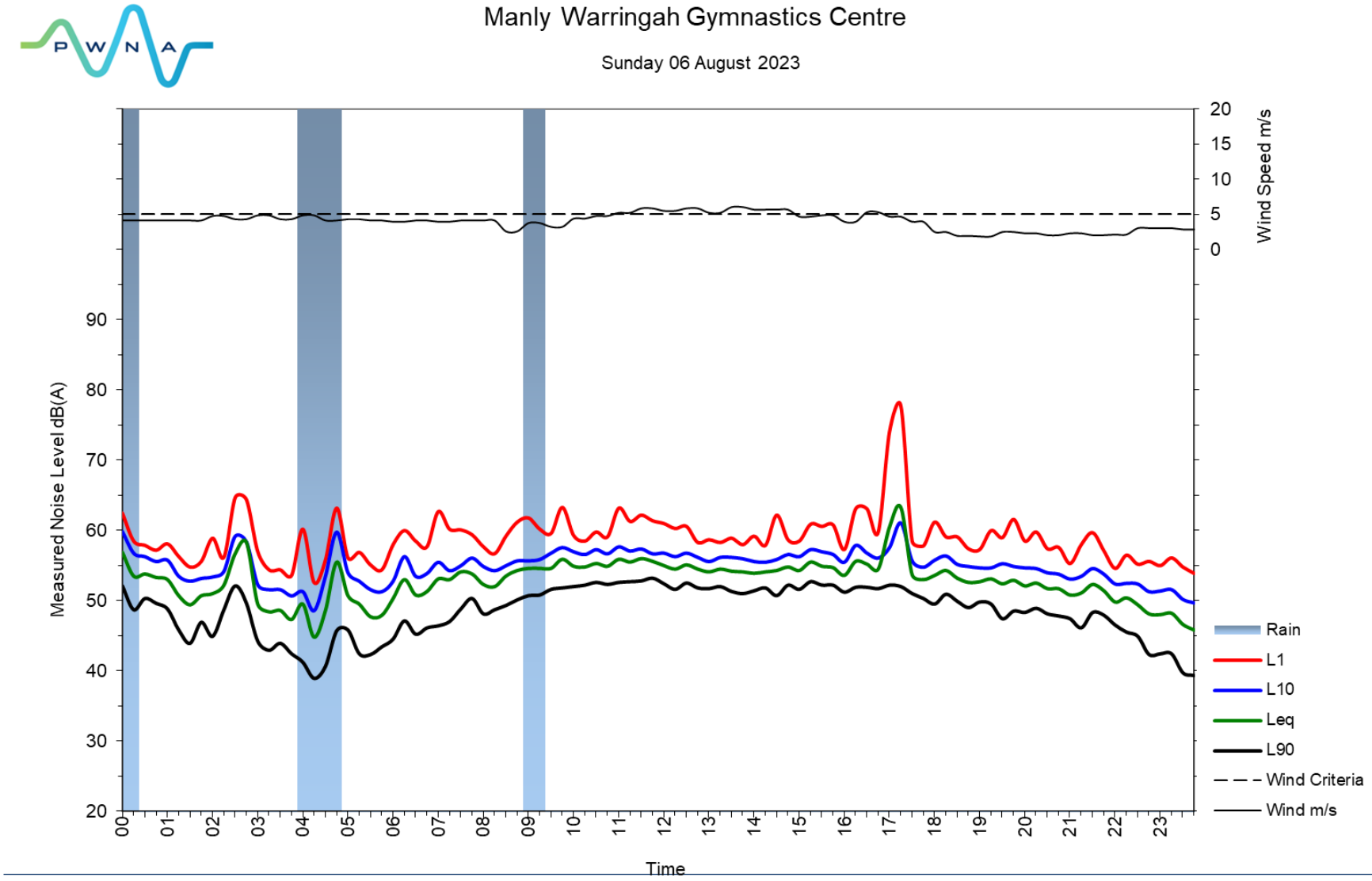

Manly Warringah Gymnastics Centre
Tuesday 01 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

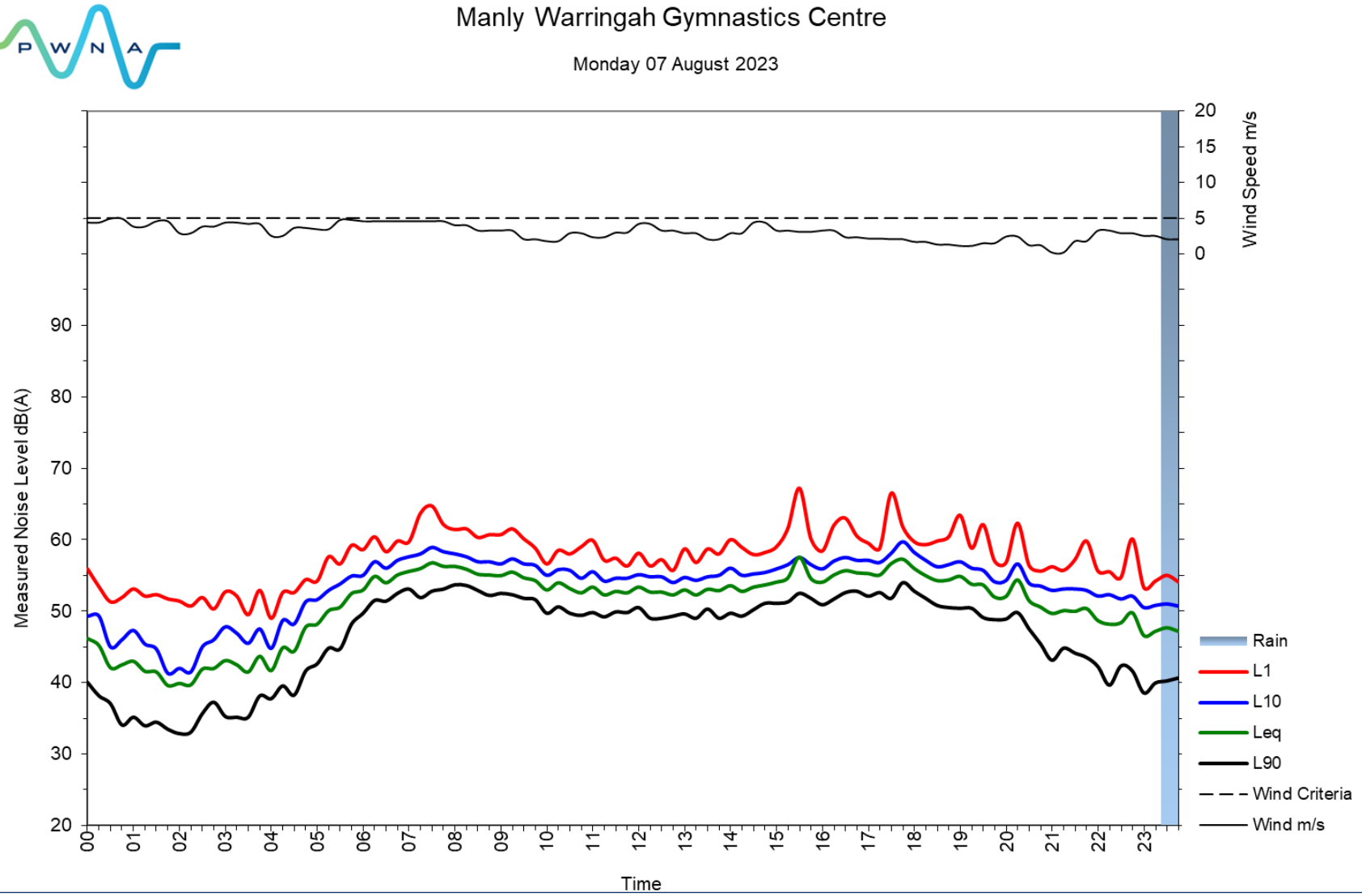

Manly Warringah Gymnastics Centre
Wednesday 02 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

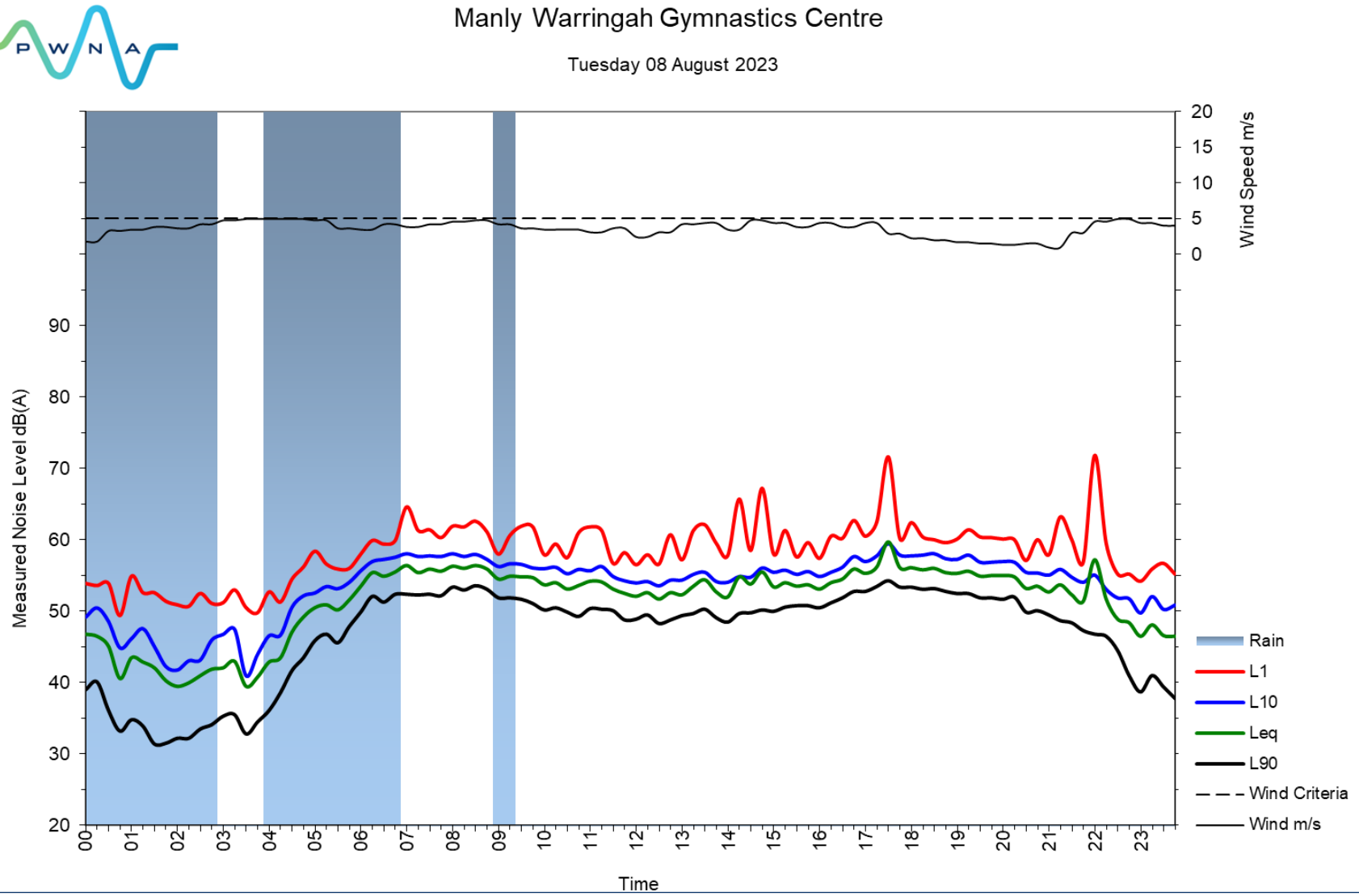

Manly Warringah Gymnastics Centre
Thursday 03 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

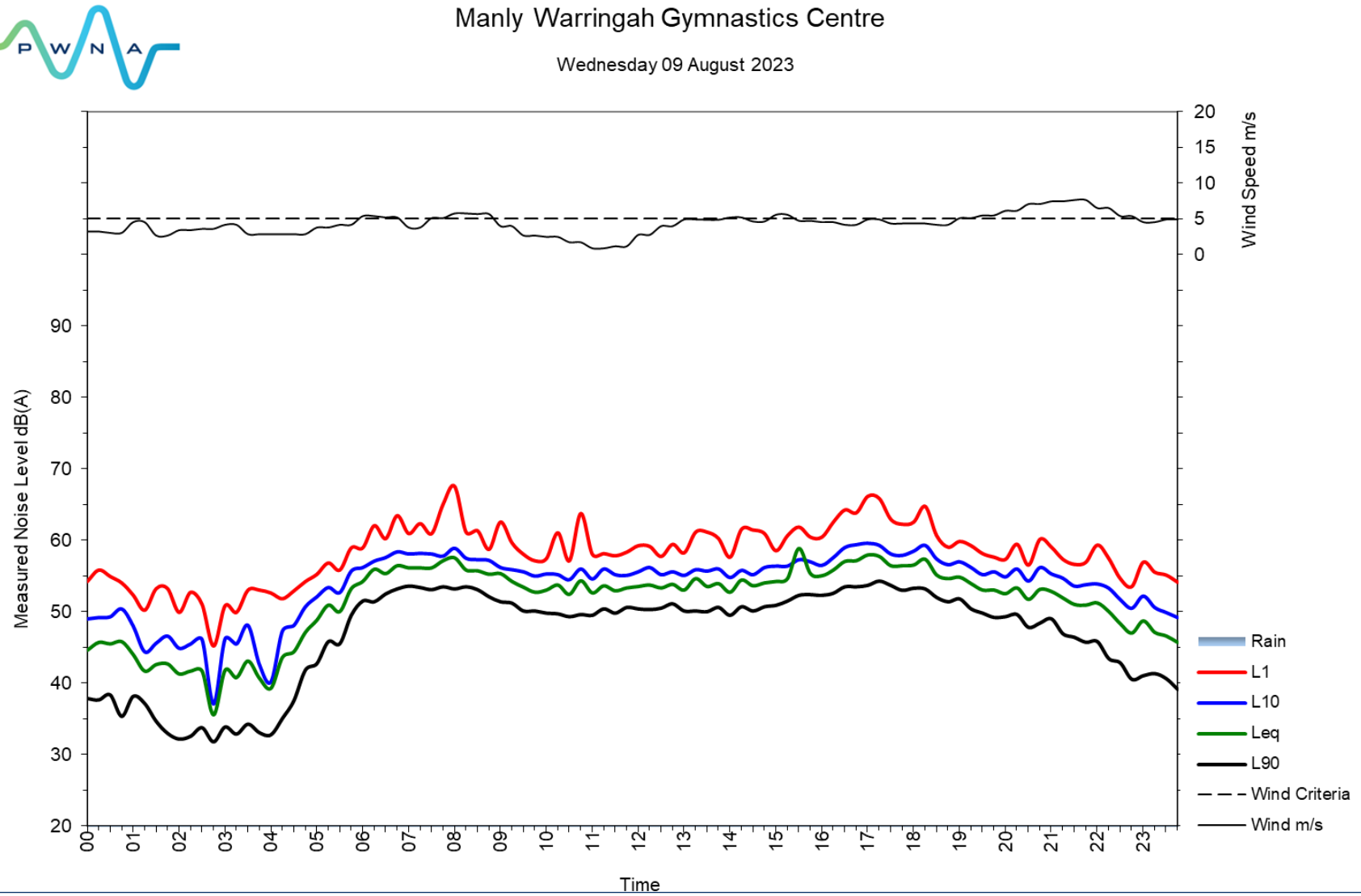

Manly Warringah Gymnastics Centre
Friday 04 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

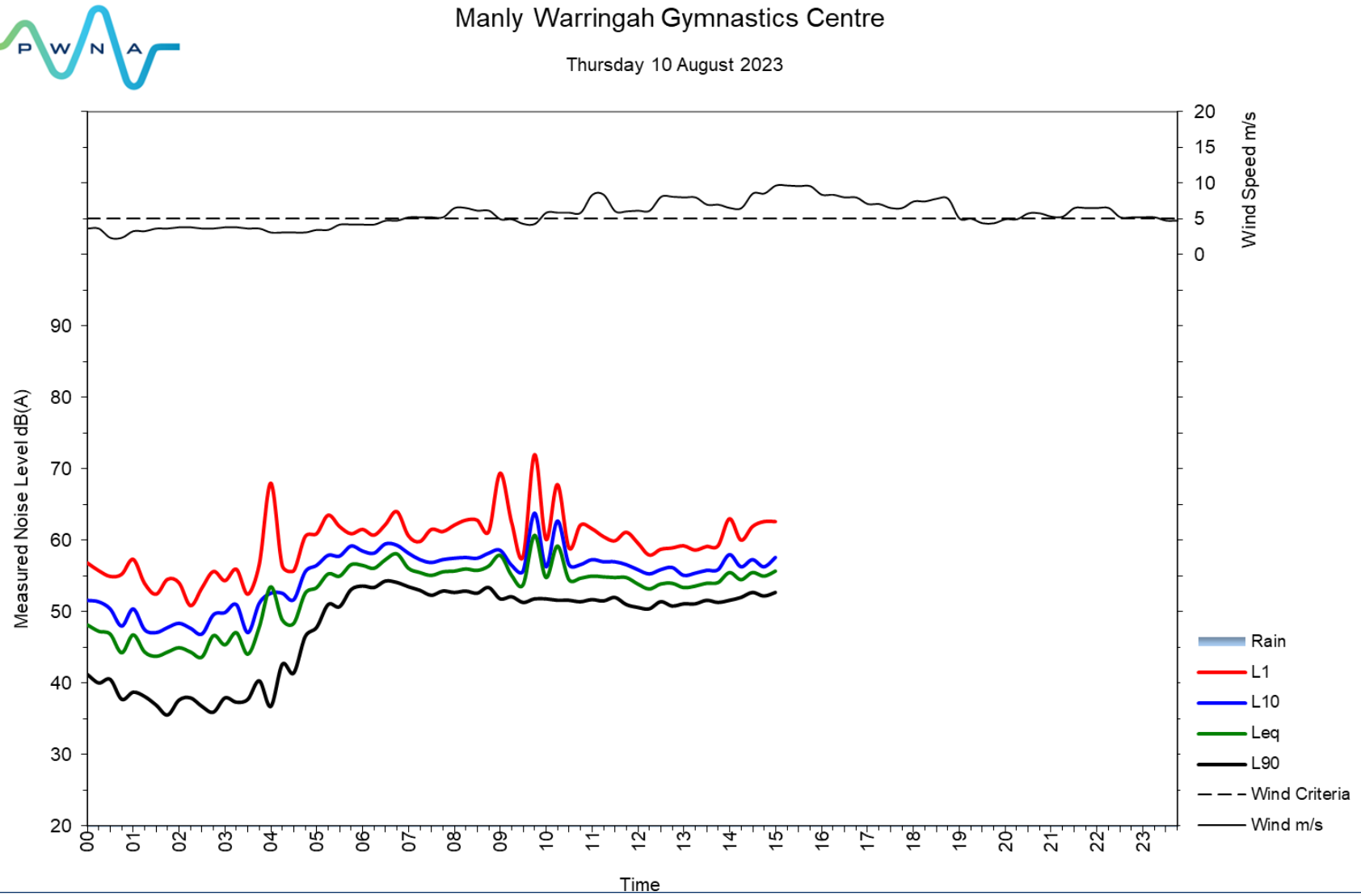

Manly Warringah Gymnastics Centre
Saturday 05 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Manly Warringah Gymnastics Centre
Sunday 06 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Manly Warringah Gymnastics Centre
Monday 07 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Manly Warringah Gymnastics Centre
Tuesday 08 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Manly Warringah Gymnastics Centre
Wednesday 09 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


Manly Warringah Gymnastics Centre
Thursday 10 August 2023
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s