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22-24 Raglan Street, Manly

Noise Impact Assessment

Para-ere Holdings

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PULSE WHITE NOISE ACOUSTICS Level 5, 73 Walker Street, North Sydney NSW 2060
P 1800 4 PULSE (1800 478 573) **E** info@pwna.com.au **pwna.com.au** ABN 95 642 886 306

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PREPARED BY:

Pulse White Noise Acoustics Pty Ltd
ABN 95 642 886 306
Level 5, 73 Walker Street, North Sydney, 2060
1800 4 PULSE

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1 INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (PWNA) has been engaged to undertake an acoustic assessment of the proposed mixed-use development to be located at 22-24 Raglan Street, Manly NSW 2095.

The assessment looks at the potential noise intrusion impacts on the development and noise emissions on nearby receivers from mechanical plant and communal areas. This report will discuss the acoustic criteria which have been adopted as well as the outcome of the assessment.

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

1.1 Relevant Guidelines

Acoustic criteria which have been adopted in this assessment include requirements from the local and state authorities and, in the absence of any applicable criteria from these bodies, Australian and International Standards will be utilised.

Noise intrusion into the development will be controlled by the requirements of the Australian / New Zealand Standard AS/NZS 2107:2016 *Acoustics–Recommended design sound levels and reverberation times for building interiors*.

The noise emission impacts from the proposed development on the adjacent receivers are regulated by the NSW EPA Noise Policy for Industry 2017.

1.2 Proposed Development

The Development Application (DA) proposes to demolish existing structures on the site to facilitate the construction of a mixed-use development consisting of ten (10) residential apartments, a retail tenancy on ground floor, and a basement car parking area. A communal roof terrace area is proposed for the third floor.

This assessment has been undertaken using the proposed architectural drawings from Carlisle Architects with job number 21-02, Revision A, dated 5 November 2021.

A render of the proposed mixed-use development is shown in the figure below.

Figure 1 Render of the proposed mixed-use development at 22-24 Raglan Street, Manly

1.3 Site Description

The project site is located at 22-24 Raglan Street, Manly NSW 2095. The surrounding area is a combination of residential, commercial and mixed-use buildings, including shop-top housing.

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

Receiver 1: Residential dwelling situated along the northern boundary of the site, located at 23-31 Whistler Street, Manly NSW 2095

Receiver 2: Mixed-use development situated along the eastern boundary of the site located at 18 Raglan Street, Manly NSW 2095.

Receiver 3: Commercial development situated across Raglan Street to the south of the site, located at 43 Belgrave Street, Manly NSW 2095.

Receiver 4: Commercial development situated along the western boundary of the site, located at 2 Pittwater Road, Manly NSW 2095.

A map showing the site location and all measurement locations, as well as nearest receivers, is provided in Figure 2 below.

Figure 2 Site Map, Measurement Locations and Surrounding Receivers – Sourced from SixMaps NSW

2 ACOUSTIC SURVEY

Measured noise levels from the unattended noise survey are outlined below.

2.1 Unattended Noise Monitoring

As part of this assessment an acoustic survey of the existing acoustic environment at the site and surrounding receivers was undertaken. An unattended noise survey was conducted between Thursday 17th November 2022 and Wednesday 30th November 2022 at the location shown Figure 2 above. Namely, the unattended noise monitor was positioned near the southern boundary of the project site along Raglan Street. This survey was conducted in order to measure the existing ambient noise level which is representative of the nearest noise affected receivers, as well as to characterise the existing road traffic noise incident on the proposed development façade.

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 066214).

Instrumentation for the survey comprised one RION NL-42 type noise monitor with serial number 00998079. Calibration of the logger was checked prior to and following the measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

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.

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 most relevant environmental noise descriptors are the L_{Aeq}, L_{A1}, L_{A10} and L_{A90} noise levels. The L_{Aeq} noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period. It represents the level that the fluctuating noise with the same acoustic energy would be if it were constant over the measured time period.

The L_{A1}, L_{A10} and L_{A90} 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.

Specific acoustic terminology is used in this assessment report. An explanation of common acoustic terms is included as Appendix A.

2.2.1 Results in accordance with the NSW EPA *Noise Policy for Industry (NPI) 2017* (RBL's)

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 $L_{A90\ (15minute)}$ and L_{Aeq} 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.

Table 1 Measured Ambient Noise Levels Corresponding to EPA Noise Policy for Industry Assessment Time Periods

Measurement Location	Daytime[1]		Evening[1]		Night-time[1]	
	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)
22-24 Raglan Street, Manly – Southern boundary	57	67	53	68	41	61

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 L_{A90} 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 L_{Aeq} 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 Calculated L_{Aeq} Noise Levels at Future Façades (Noise Intrusion)

In determining the required construction for the future building envelope, contributing L_{Aeq} noise levels from surrounding roads to each future façade need to be determined. The calculated noise levels at each façade are determined below. Where applicable, angle of view and distance corrections have also been applied.

Table 2 Predicted Noise Levels at Future Façades

Prediction Location	Predicted Façade Noise Level $L_{Aeq\ (Period)}$ [1] (dBA)			
	Daytime (7:00am-10:00pm)		Night-time (10:00pm-7:00am)	
	$L_{Aeq\ (Whole\ Period)}$	$L_{Aeq\ (1\ Hour)}$	$L_{Aeq\ (Whole\ Period)}$	$L_{Aeq\ (1\ Hour)}$
Future Southern Façade (Along Raglan Street)	68	69	61	65

Note 1: *The L_{Aeq} 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 have been adopted for this assessment are outlined below. All criteria have been separated into; *Noise Intrusion* (Assessment of building envelope), and *Noise Emissions* (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 Manly Development Control Plan (DCP) 2013

Following a review of the current Manly Development Control Plan (DCP) 2013, we note that the document does not contain any applicable building envelope acoustic criteria for developments of this kind. As such, in the absence of any applicable requirements, objectives listed in AS/NZS standard below will be adopted.

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

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 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 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.

Table 3 AS2107 Design Sound Levels for Different Occupancies

Type of occupancy/activity	Design Sound Level Range $L_{Aeq\ (Period)}$ [1] (dBA)	Time Period
House and apartments in suburban areas or near minor roads –		
Apartment common areas (e.g., foyer, lift lobby)	45 to 50	Anytime
Living areas	30 to 40	Anytime
Sleeping areas (night-time)	30 to 35	Night-time
Work areas	35 to 40	Anytime
Shop Buildings		
Small retail stores (general)	<50	Anytime

Note 1: The L_{Aeq} 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 Noise Emission Criteria

Noise emissions from the operation of the site impacting on the adjacent land users are outlined below. Noise emissions expected from the use of the site include mechanical services and communal areas.

3.2.1 Manly Development Control Plan (DCP) 2013

Following a review of the current Manly Development Control Plan (DCP) 2013, we note that the document does not contain any applicable acoustic criteria for the assessment of noise emissions from mechanical plant for developments of this kind. As such, in the absence of any applicable requirements, objectives listed in the NSW EPA Noise Policy for Industry (NPI) 2017 below will be adopted.

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 NSW EPA has recently released a document titled *Noise Policy for Industry* (NSW NPI) which provides a 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 (L_{Aeq}), 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 L_{Aeq} 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 $L_{Aeq,15min}$ will be taken to be equal to the $L_{Aeq,period}$ + 3 decibels (dB).

3.2.2.3 Area Classification

The NSW NPI characterises the "Suburban Residential" noise environment as an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristics:

- Evening ambient noise levels defined by the natural environment and human activity.

For residential and non-residential receivers in a suburban residential area, the recommended amenity criteria are shown in Table 4 below.

When the existing noise level from industrial noise sources is close to the recommended "Amenity Noise Level" (ANL) given below, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the NSW NPI.

Table 4 NSW NPI – Recommended L_{Aeq} Noise Levels from Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level ($L_{Aeq, period}$)[2] (dBA)
Residence	Suburban	Day	55
		Evening	45
		Night	40
Commercial		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

Note 2: The L_{Aeq} 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

3.2.2.4 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, $L_{Aeq, period}$ (dBA)	Measured $L_{A90, 15 min}$ (RBL) [2] (dBA)	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15 min}$ Criterion for New Sources (dBA)	Amenity $L_{Aeq, 15 min}$ Criterion for New Sources (dBA)
Residential Receivers	Day	50	57	67	62	**53**
	Evening	40	53	68	58	**43**
	Night	35	41	61	46	**38**
Commercial Receivers	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: L_{A90} Background Noise or Rating Background Level.

Note 3: Project Noise Trigger Levels are shown in bold and underlined.

Note 4: L_{A90} noise level during the night-time period is equal to the recommended minimum noise level adopted by the NSW EPA NPI.

3.3 Traffic Generating Development

In 1999, the Environment Protection Authority published Environmental criteria for road traffic noise (ECRTN). This policy is used to establish the traffic noise criteria as follows:

- New traffic noise $L_{Aeq,1hour}$ ≤ Existing $L_{Aeq,1hour}$ + 2 dBA

The NSW Government approved the NSW road noise policy (RNP), to replace the ECRTN for road traffic noise with effect from 1st July 2011. This new policy outlines the range of measures needed to minimise road traffic noise and its impacts. It is intended for use by projects and land use developments that generate additional traffic on existing roads, as well as by determining authorities, regulators involved in the approval and construction of road projects, city and transport planners and policymakers and acoustic specialists to assess and mitigate the impacts of traffic noise from new and redeveloped road projects, and traffic-generating developments on residential and other sensitive lands.

The noise assessment criteria contained in Table 4 of Section 2.3.2 of the RNP should be applied for assessing the impact and of a land use development with the potential to generate additional traffic on local, sub-arterial or arterial roads.

For isolated residences in a commercial zone, internal noise levels are more appropriate in assessing any road traffic noise impacts. Suitable internal noise level targets can be established by using the recommended levels contained in Australian Standard 2107:2016.

Although a relative change in traffic noise levels to noise sensitive receivers, as recommended in the ECRTN, is not a specified criterion in the RNP, an assessment of this change will provide an indication of whether increased traffic noise levels are likely be noticeable or problematic.

4 ACOUSTIC ASSESSMENT

4.1 Road Traffic Noise Intrusion

The results of the monitoring that provides the façade noise levels of the proposed building are presented in Table 2. The relevant noise intrusion criterion relating to AS 2107 are summarised in Table 6 below, together with the monitored external noise levels.

Table 6 Summary of Façade Noise Levels and Relevant Assessment Criteria

Facade Location		Day Time [1, 2] (dBA)		Night Time [1, 2] (dBA)	
		L_{Aeq} (Whole Period)	L_{Aeq} (1 Hour)	L_{Aeq} (Whole Period)	L_{Aeq} (1 Hour)
Measured/Predicted Noise Levels					
Future Southern Façade (Along Raglan Street)		68	69	61	65
Noise Criteria Applicable (All Facades)					
Apartment common areas	AS 2107 – Anytime	**45 to 50 (anytime)**			
Living areas	AS 2107 – Anytime	**40**		N/A	
Sleeping areas	AS 2107 – Night-time	N/A		**35**	
Commercial	AS 2107 - Anytime	**<50**		N/A	

Note 1: Daytime 7:00 am – 10:00 pm; Night-time 10:00 pm – 7:00 am.
Note 2: For internal noise level criteria which are presented as a range, compliance is determined based on the highest level in the range.

4.1.1 Glazing Recommendations

The recommended sound transmission loss requirements required to satisfy the specified internal noise level criteria outlined above are summarised in Table 7 below.

Table 7 In-principle Glazing Recommendations

Location	Occupancy Area [1]	Minimum Glazing System Rating Requirements	Indicative Construction [2, 3]
Future Southern Façade (Along Raglan Street)	Sleeping Areas	Rw (C;Ctr): 35 (0;-3)	Windows with min. 10.38mm laminated glass.
	Living Areas	Rw (C;Ctr): 35 (0;-3)	Windows with min. 10.38mm laminated glass.
	Retail	Rw (C;Ctr): 31 (0;-3)	Windows with min. 6.38mm laminated glass.
All Other Façades	Sleeping Areas	Rw (C;Ctr): 31 (0;-3)	Windows with min. 6.38mm laminated glass.
	Living Areas	Rw (C;Ctr): 31 (0;-3)	Windows with min. 6.38mm laminated glass.

Note 1: Recommended constructions are identical for each level of the development.
Note 2: These are preliminary selections and will be confirmed in the detailed design stage once the layouts and façade orientations are approved.

Please note for windows, this performance is not only subject to the glazing selection but also to the construction of the window frame and the frame seal selection. Therefore, it is recommended that the window manufacturer should confirm that the required sound insulation can be achieved. It is anticipated that the window system should comprise Q-Lon (or equivalent) or fin seals with deep C channels as part of the window track **(i.e., Performance levels outlined above need to be achieved with glazed panels + frame + seals).**

4.1.2 External Wall Construction

If external wall constructions are constructed either from existing concrete or masonry construction no further acoustic upgrading is required. If penetrations through any external skin are required, all gaps remaining in the penetration are to be filled with an acoustic grade sealant which provides an equal or better performance to the system being penetrated.

Any light-weight external plasterboard walls should be constructed from a construction with a minimum acoustic performance of Rw 55.

4.1.3 External Roof Construction

The required external roof and ceiling constructions for the project are required to include the following:

1. Concrete external roof construction – no additional treatments required.

2. Light Weight Construction – Install an acoustic insulation within the external roof/ceiling cavity similar to a 75 mm thick 14 kg/m^3 insulation.

If penetrations through any external skin are required, all gaps remaining in the penetration are to be filled with an acoustic grade sealant which provides an equal or better performance to the system being penetrated.

4.1.4 External Openings and Penetrations

All openings and penetrations are required to be acoustically treated such that the performance of the building construction is not compromised. This may require lining of ductwork behind mechanical service openings/grills, treatments to ventilation opening and the like.

4.2 Noise from Engineering Services

Detailed selections of the proposed mechanical plant and equipment to be used on the site, and the exact location of key plant items, are not available at this time. All future plant and equipment are to be acoustically treated to ensure the noise levels at all surrounding receivers comply with noise emission criteria detailed within this report. Experience with similar projects indicated that it is both possible and practical to treat all mechanical equipment such that the relevant noise levels are achieved. Examples of the possible acoustic treatments to mechanical equipment includes the following:

- Supply and Exhaust Fans – location of fans within the building and treated using internally lined ductwork or acoustic silencers.

- General supply and exhaust fans – general exhaust and supply fans such as toilet, kitchen, lobby and other small mechanical fans can be acoustically treated using acoustic flex ducting or internally lined ducting.

- Residential Condensers – The project may include external residential condenser units which will be located within the basement, on balconies, or on the roof-top. Providing condenser equipment is selected using suitable noise level data, then acoustic treatments can be implemented such as screening and treatment to exhaust to ensure that the relevant noise emission criteria will be achieved.

Details of the required mechanical services equipment and acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the CC submission of the project.

Experience with similar projects indicates that the acoustic treatment of the proposed mechanical equipment to be installed on the project is both possible and practical.

4.3 Noise from Communal Roof Terrace Area

Noise associated with communal areas is not well addressed in NSW. The NSW EPA *Noise Policy for Industry* does not address noise from communal areas. As such, to ensure the acoustic amenity is reasonably maintained for the existing surrounding developments, PWNA believe that an RBL + 5dBA as a L_{Aeq} approach is considered acceptable. Adoption of a background + 5 approach is similar to the criteria typically adopted in the assessments of external areas of a licensed venue during the daytime period (noted: NSW Liquor and Gaming use a L_{10} rather a L_{Aeq}).

4.3.1 Assessment of Communal Areas

For the purpose of this assessment, we have assumed the following noise levels:

- Single person talking – 69dBA LAeq.

4.3.2 Communal Area Acoustic Treatments

Operation of the external communal space on third floor has been assessed at the nearest receivers against the criteria outlined above. To ensure compliance, the following treatments are recommended:

- Permitted use of the external communal area is between 7:00am-10:00pm Monday to Saturday and 8:00am-10:00pm on Sundays and Public Holidays.

- No playing of amplified music is to be undertaken within the external communal area. No external speakers should be included in the design and construction of the external area.

- The external communal terrace area will have no more than forty (40) people utilising the space at any one time with an assumption that one in two are speaking in conversation.

4.4 Noise from Additional Traffic

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

A peak hour increase proposed for the number vehicles associated with the development will not exceed a 2dBA increase at the nearest residential receivers. As summarised in the NSW EPA RNP, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person and is therefore considered acoustically acceptable.

5 CONCLUSION

Pulse White Noise Acoustics Pty Ltd (PWNA) has been engaged to undertake an acoustic assessment of the proposed mixed-use development to be located at 22-24 Raglan Street, Manly NSW 2095. As part of this assessment, we have undertaken a review of the building envelope, and noise emissions from the use of the site. From this assessment we note the following:

- Minimum acoustic performances and associated indicative constructions for the building envelope have been provided in Section 4.1 of this report. The recommended treatments have been provided to ensure compliance with the objectives presented in Section 3.1.
- To control noise impacts at external receivers, recommended indicative treatments for major engineering services have been provided in Section 4.1.3. From our review we have formulated the following opinion:
    - Details of the exact location and selection of all engineering services is not known at this stage of the project. A proof-of-concept assessment has been carried out based on our experience with similar types of developments and the typical plant items installed. Experience with similar projects indicates that the acoustic treatment of the proposed mechanical equipment to be installed on the project is both possible and practical. It is recommended that, prior to the issue of a Construction Certificate (CC), a detailed acoustic assessment is undertaken to ensure all cumulative noise from engineering services comply with the requirements as listed in Section 3.2.
    - Noise impacts from the external communal area has been reviewed. On the proviso that the management and building controls outlined in Section 4.3.2 are installed or adhered to, noise levels from the use of the communal space will achieve the established target levels.

As such, we believe that the proposal is acoustically acceptable and meets all the detailed acoustic criteria listed above.

Regards,

Alex Danon

Acoustic Engineer

PULSE WHITE NOISE ACOUSTICS PTY LTD

APPENDIX A: ACOUSTIC GLOSSARY

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

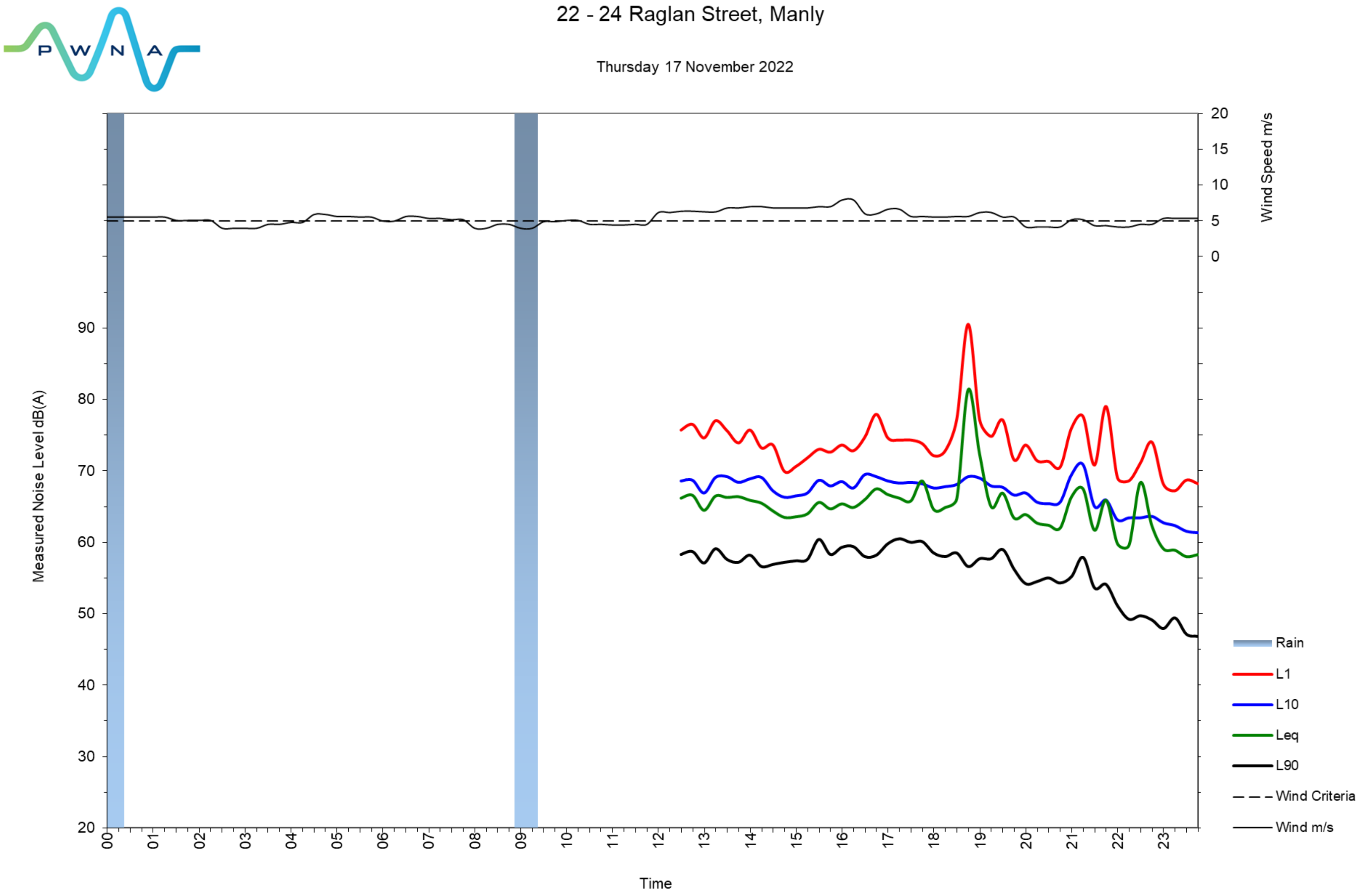
Ambient Sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Audible Range	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 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_{max}	The maximum sound pressure level measured over a given period.
L_{min}	The minimum sound pressure level measured over a given period.
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_{90}	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.
L_{eq}	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.

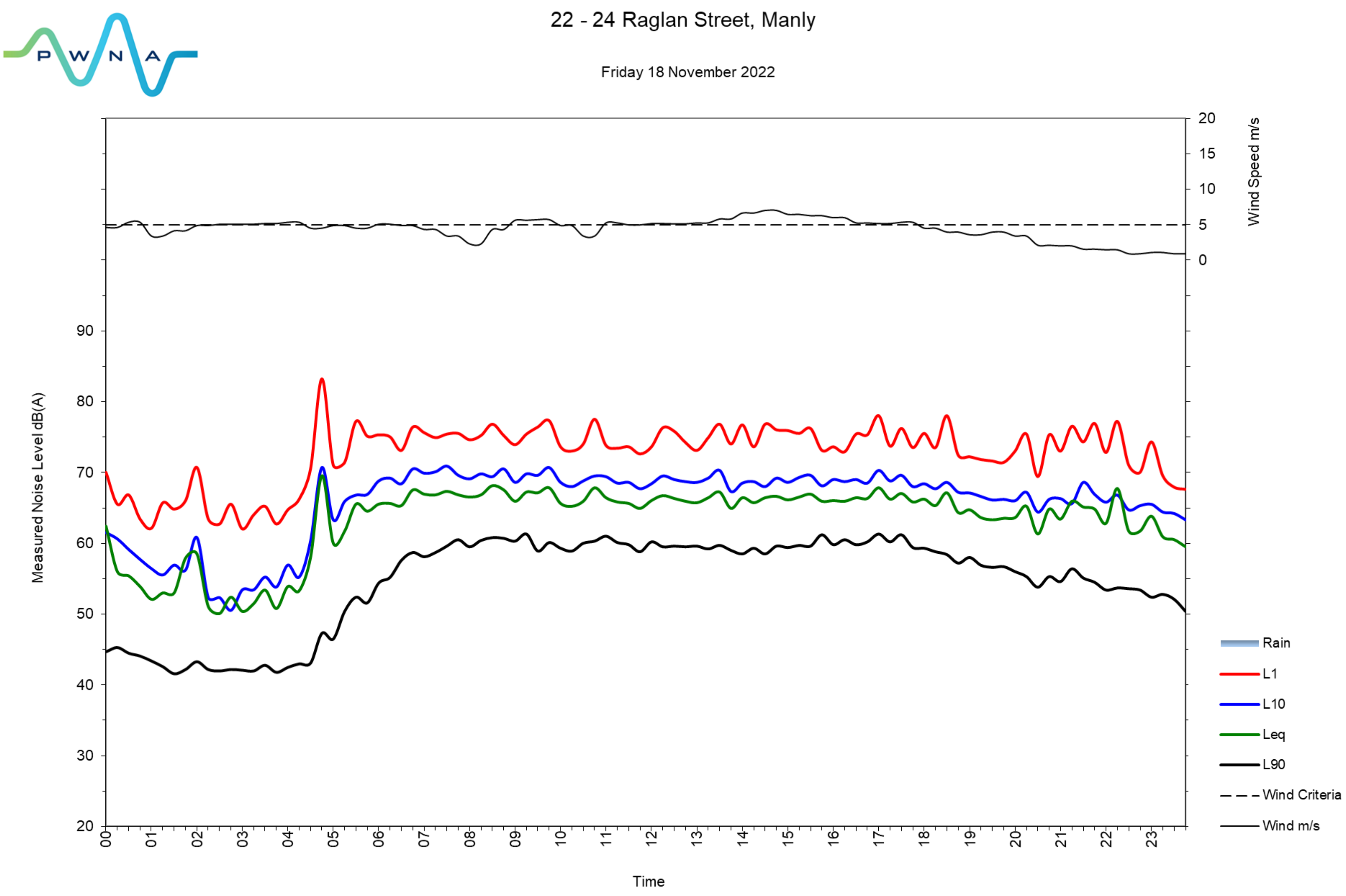
APPENDIX B: UNATTENDED NOISE MONITORING RESULTS – 22-24 RAGLAN STREET, MANLY

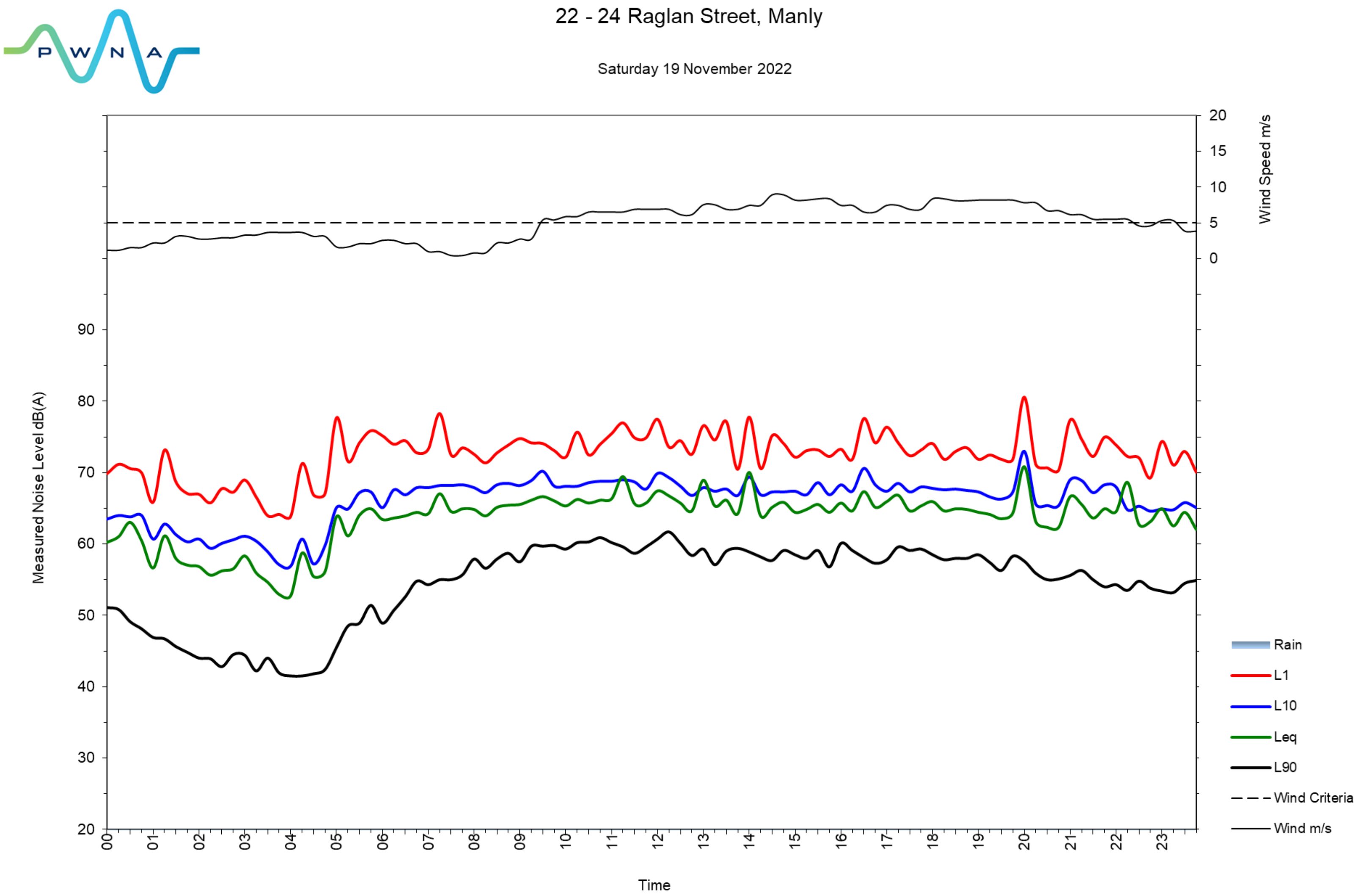
Weather Station: Observatory Hill

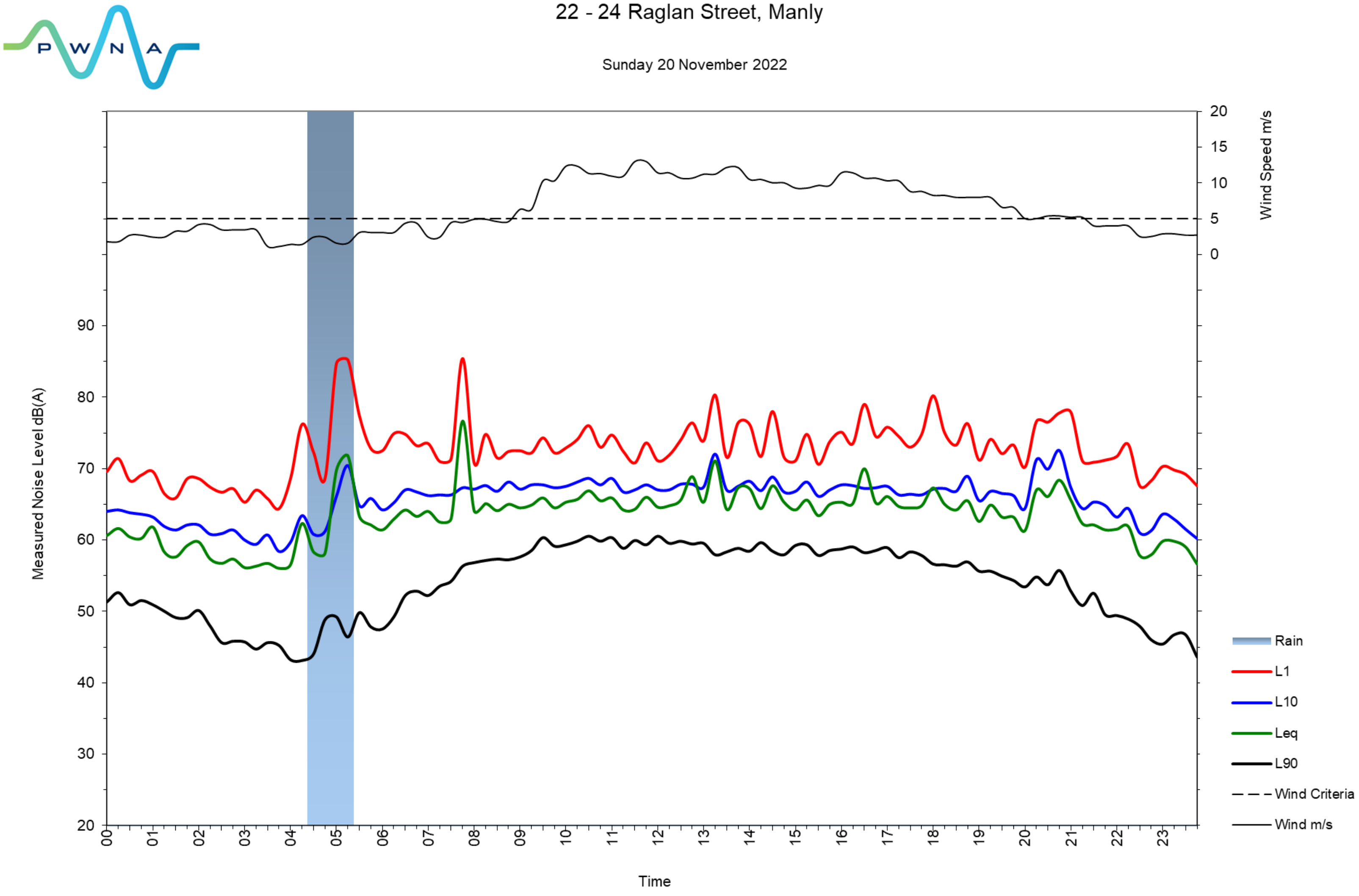
Weather Station ID: 066214

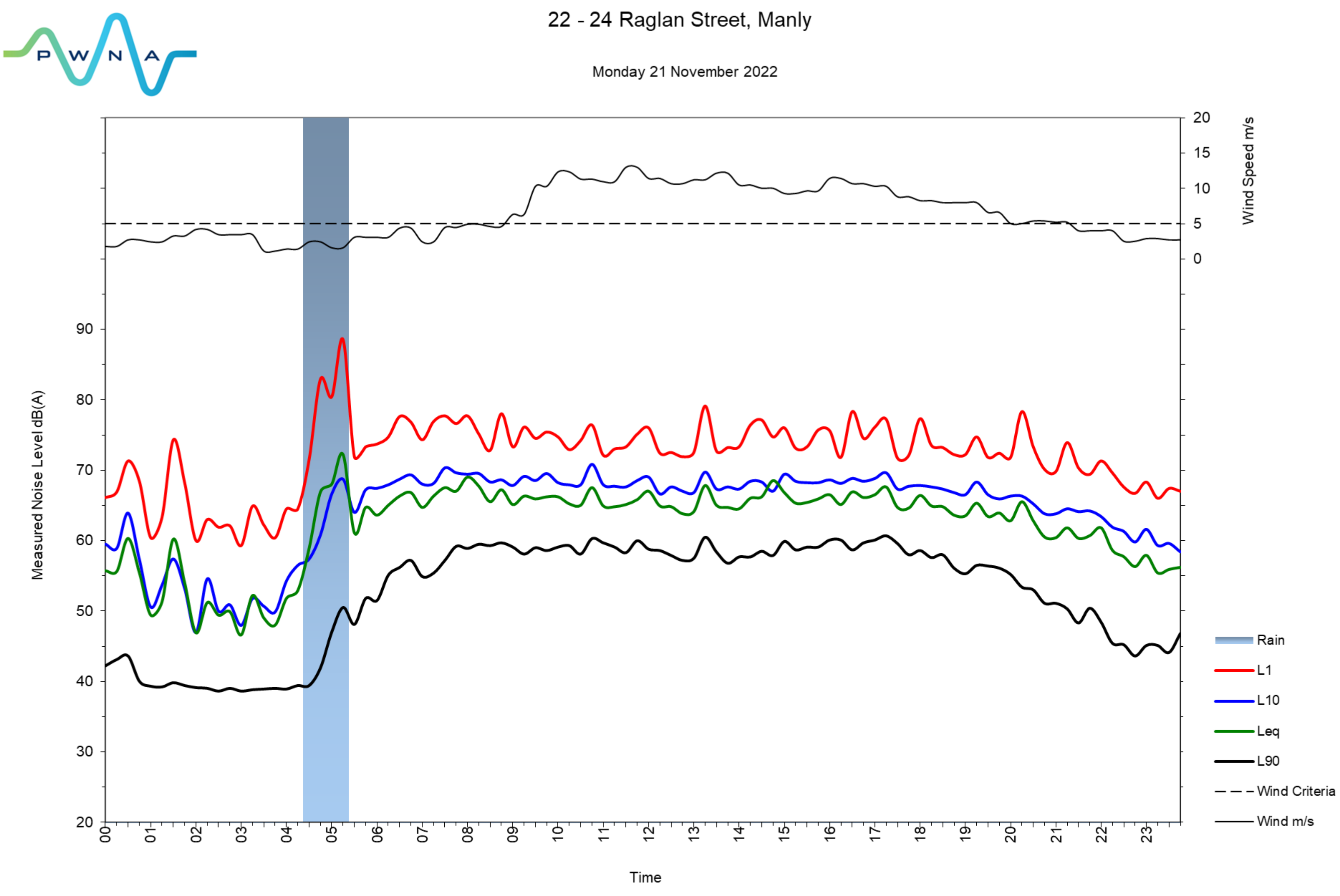
Coordinates: Lat: -33.86, Lon: 151.20, Height: 43.37 m


22 - 24 Raglan Street, Manly
Thursday 17 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
15
10
5
0
90
80
70
60
50
40
30
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

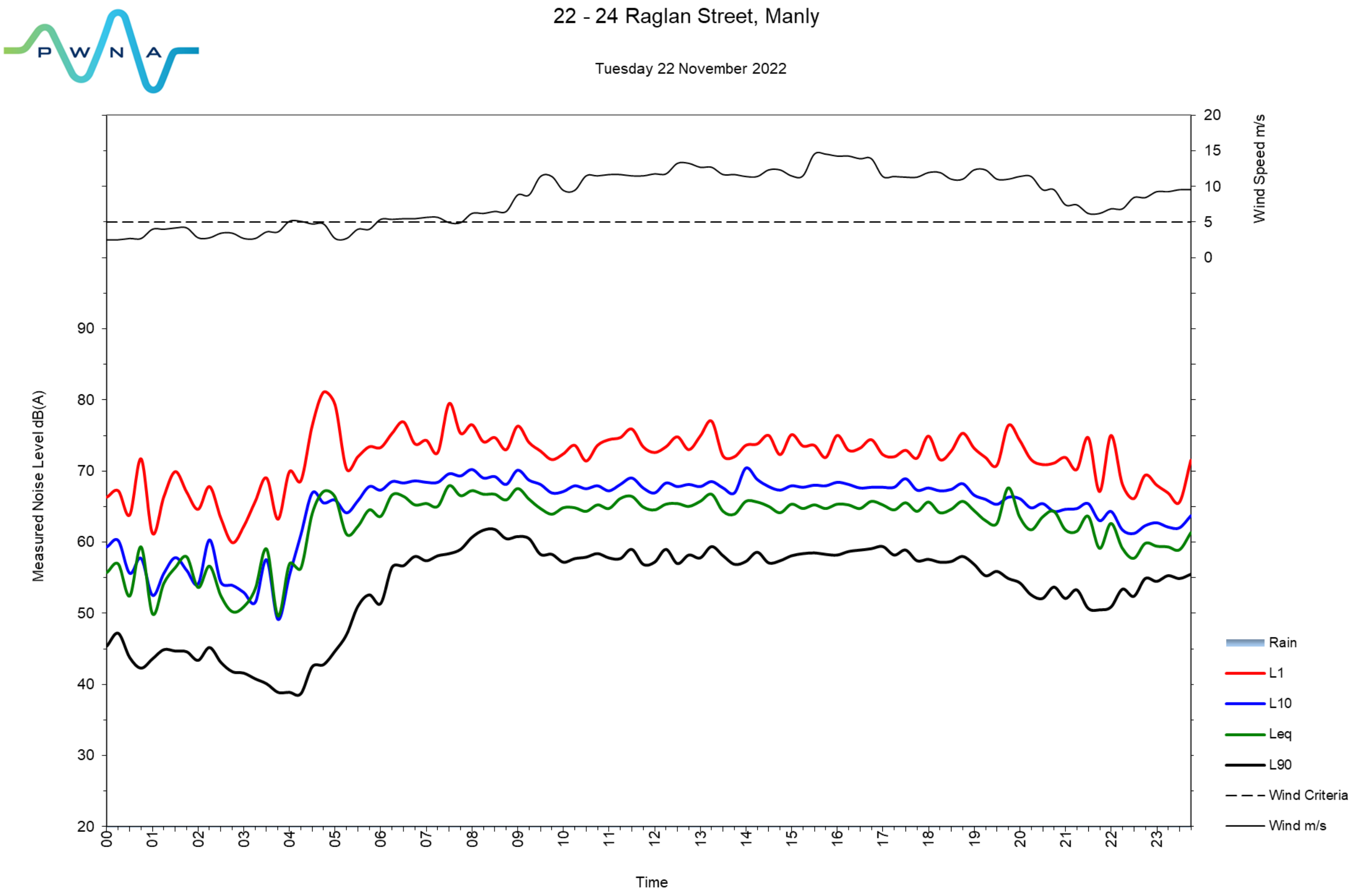

22 - 24 Raglan Street, Manly
Friday 18 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

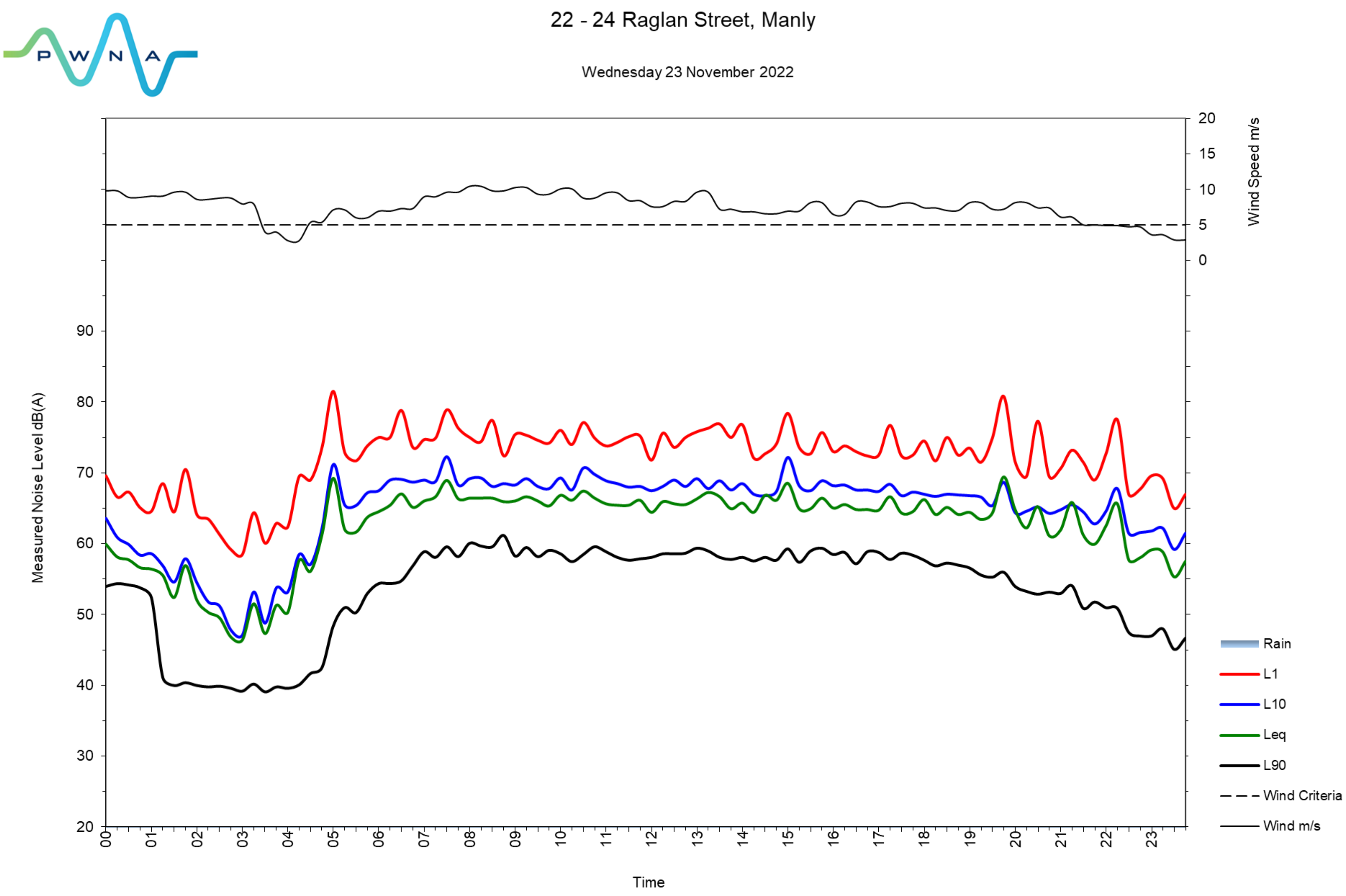

22 - 24 Raglan Street, Manly
Saturday 19 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

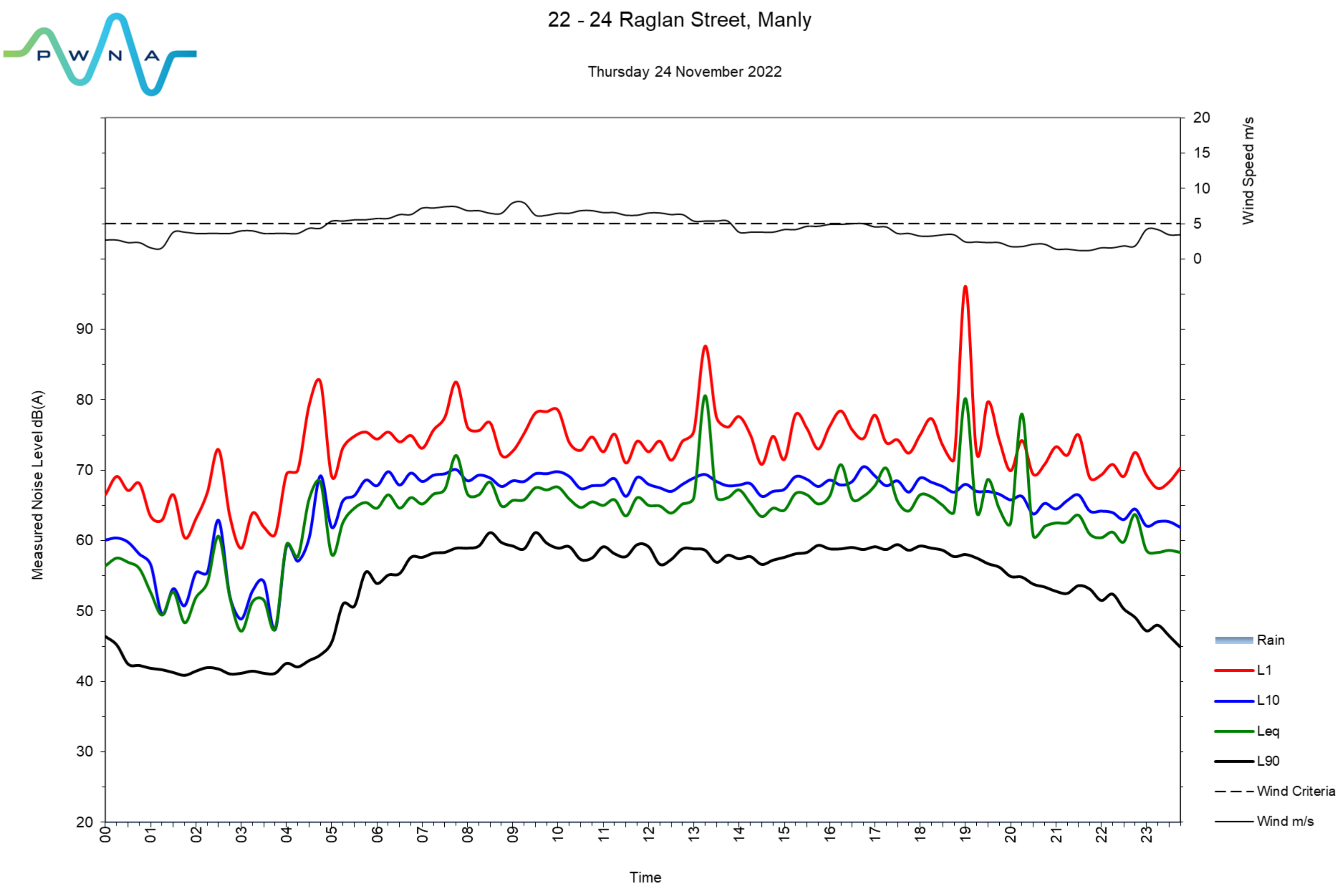

22 - 24 Raglan Street, Manly
Sunday 20 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
90
80
70
60
50
40
30
20
20
15
10
5
0
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

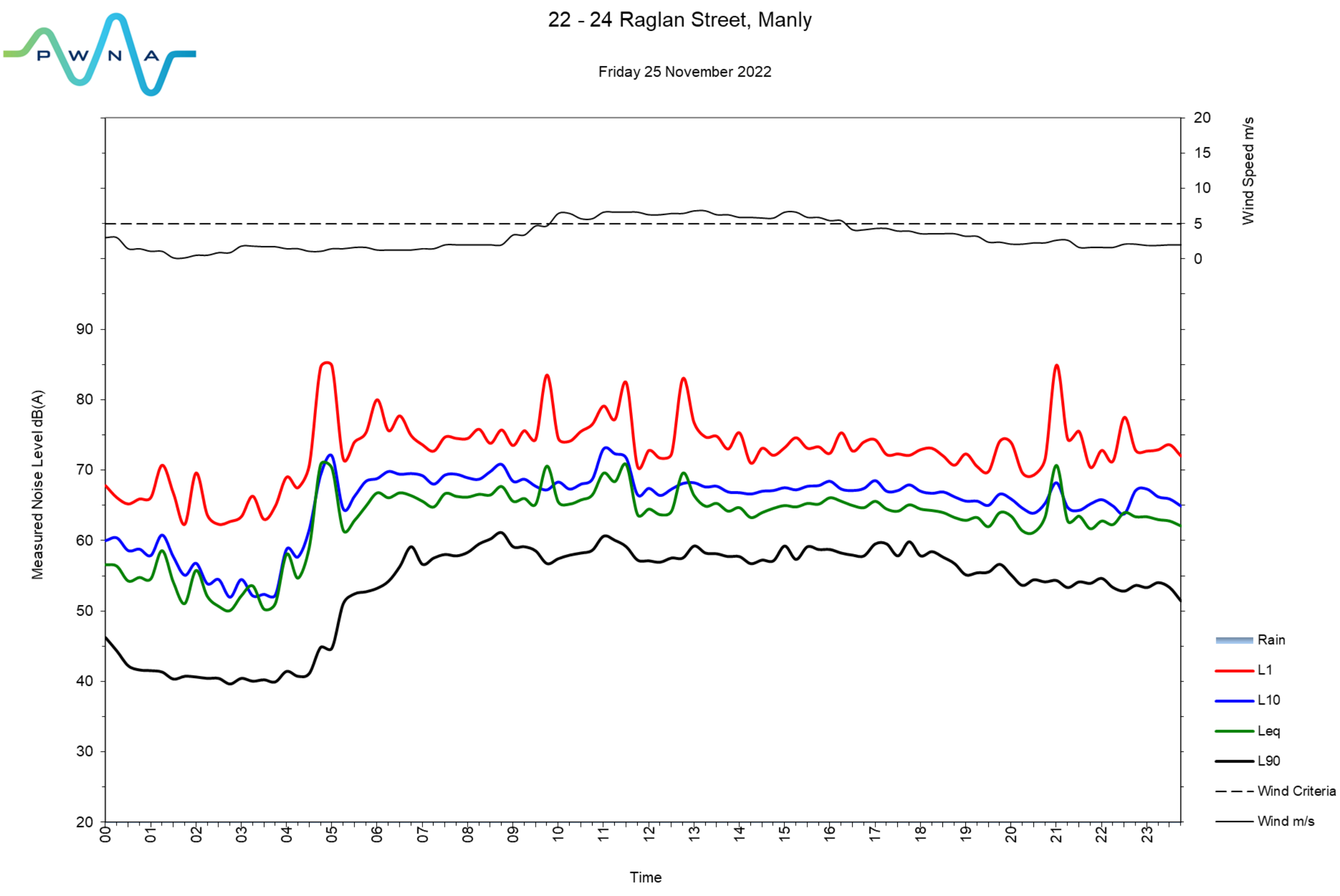


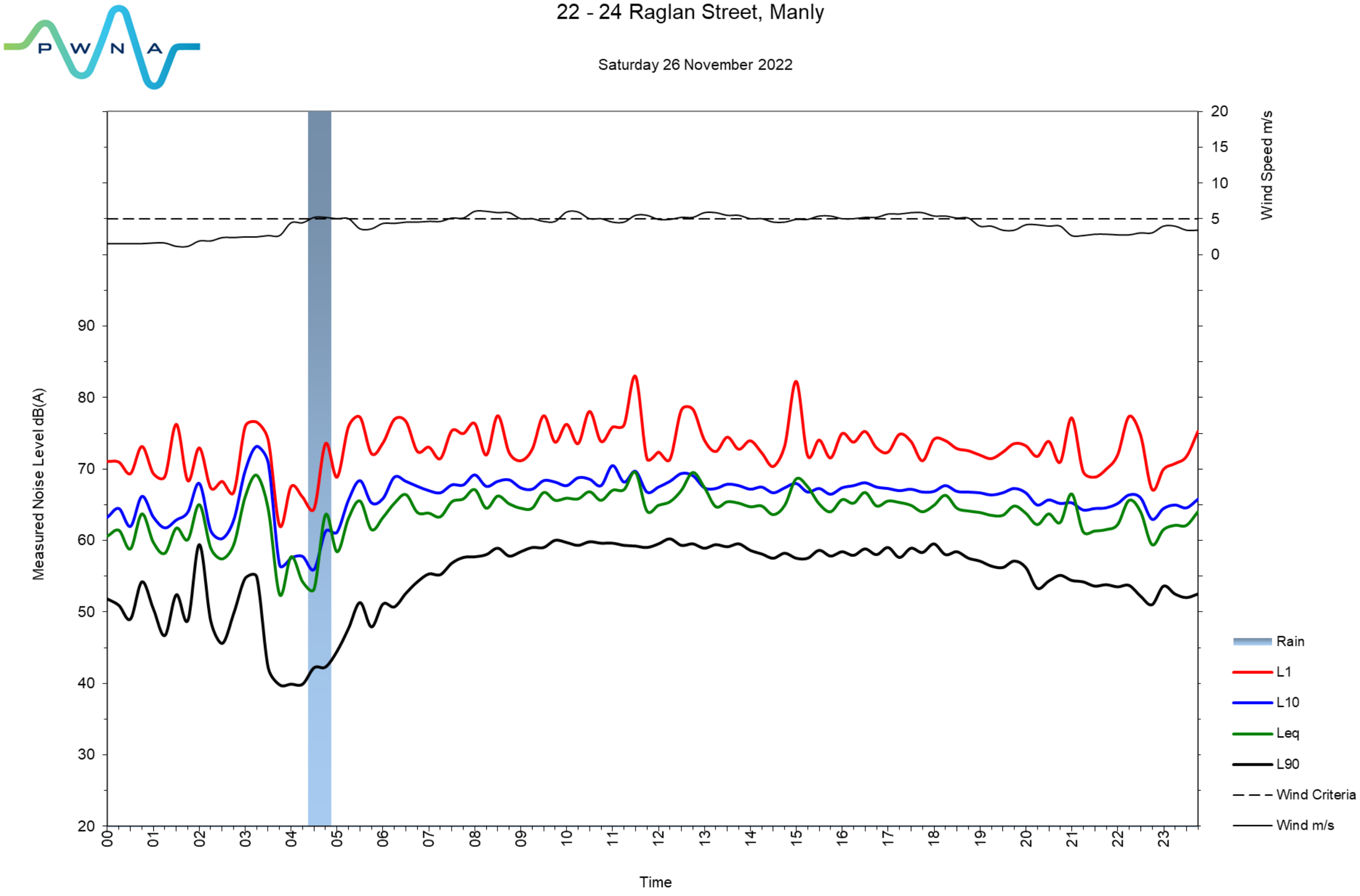
22 - 24 Raglan Street, Manly
Monday 21 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

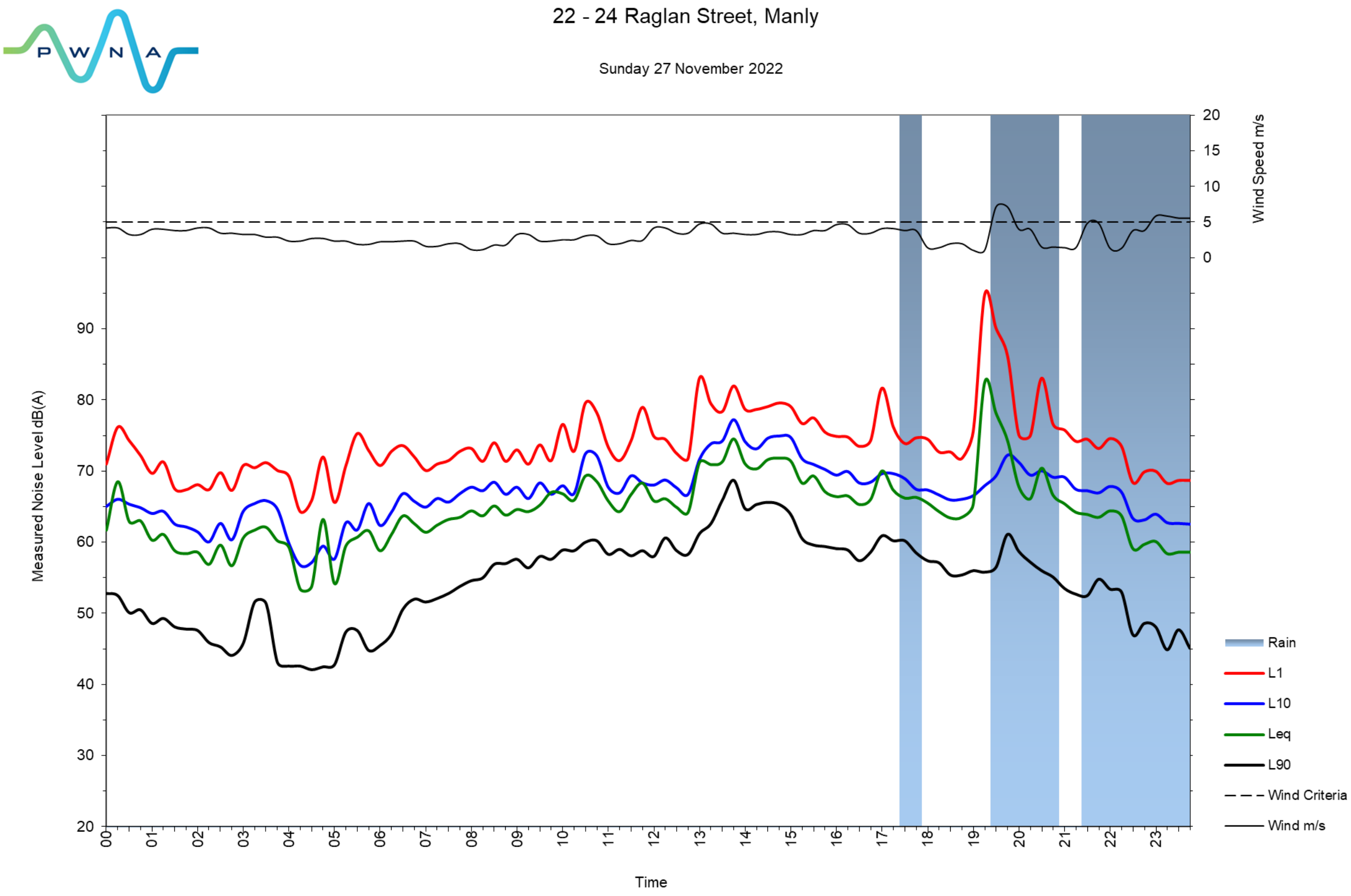

22 - 24 Raglan Street, Manly
Tuesday 22 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


22 - 24 Raglan Street, Manly
Wednesday 23 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

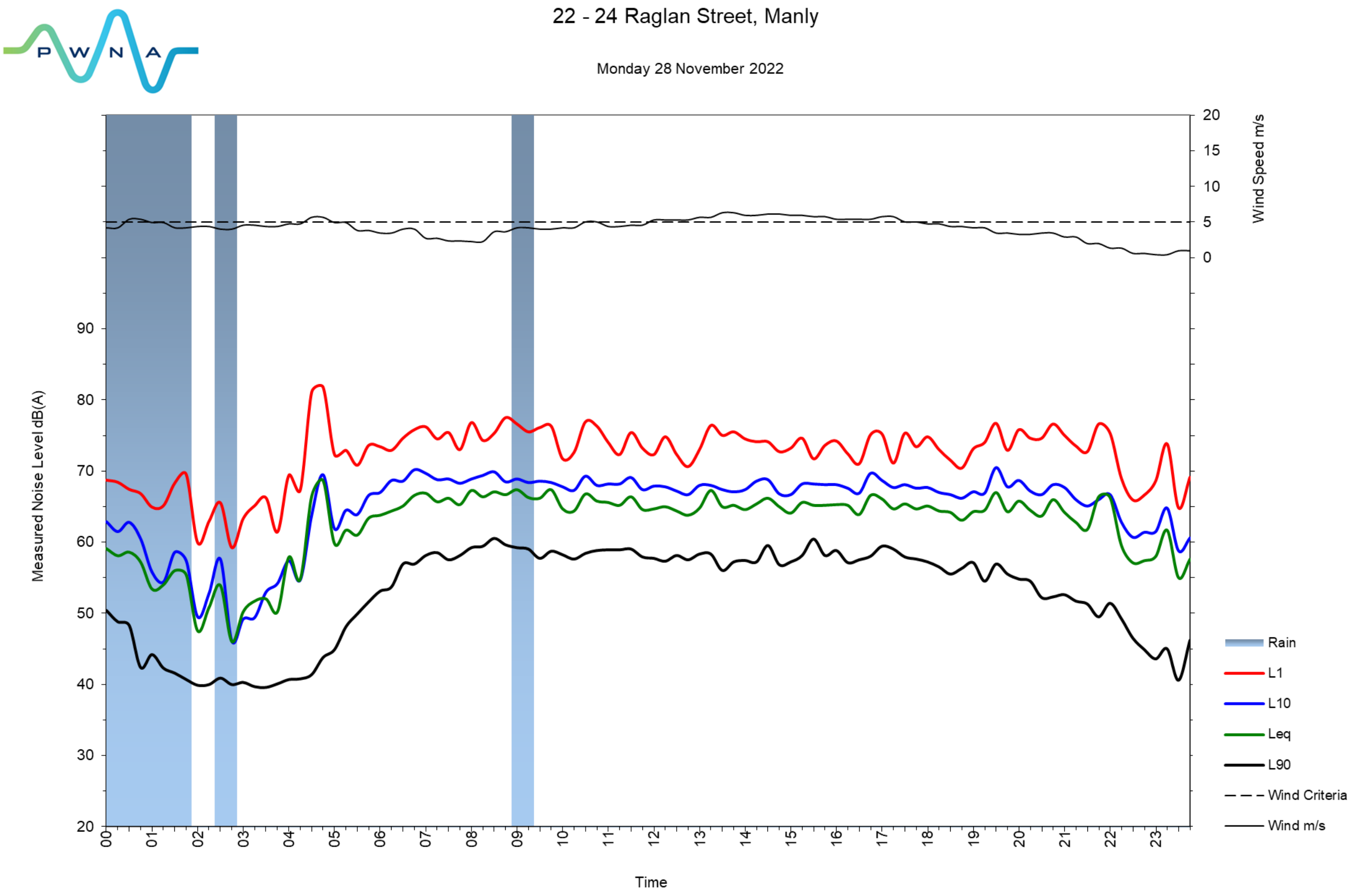

22 - 24 Raglan Street, Manly
Thursday 24 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
15
10
5
0
90
80
70
60
50
40
30
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

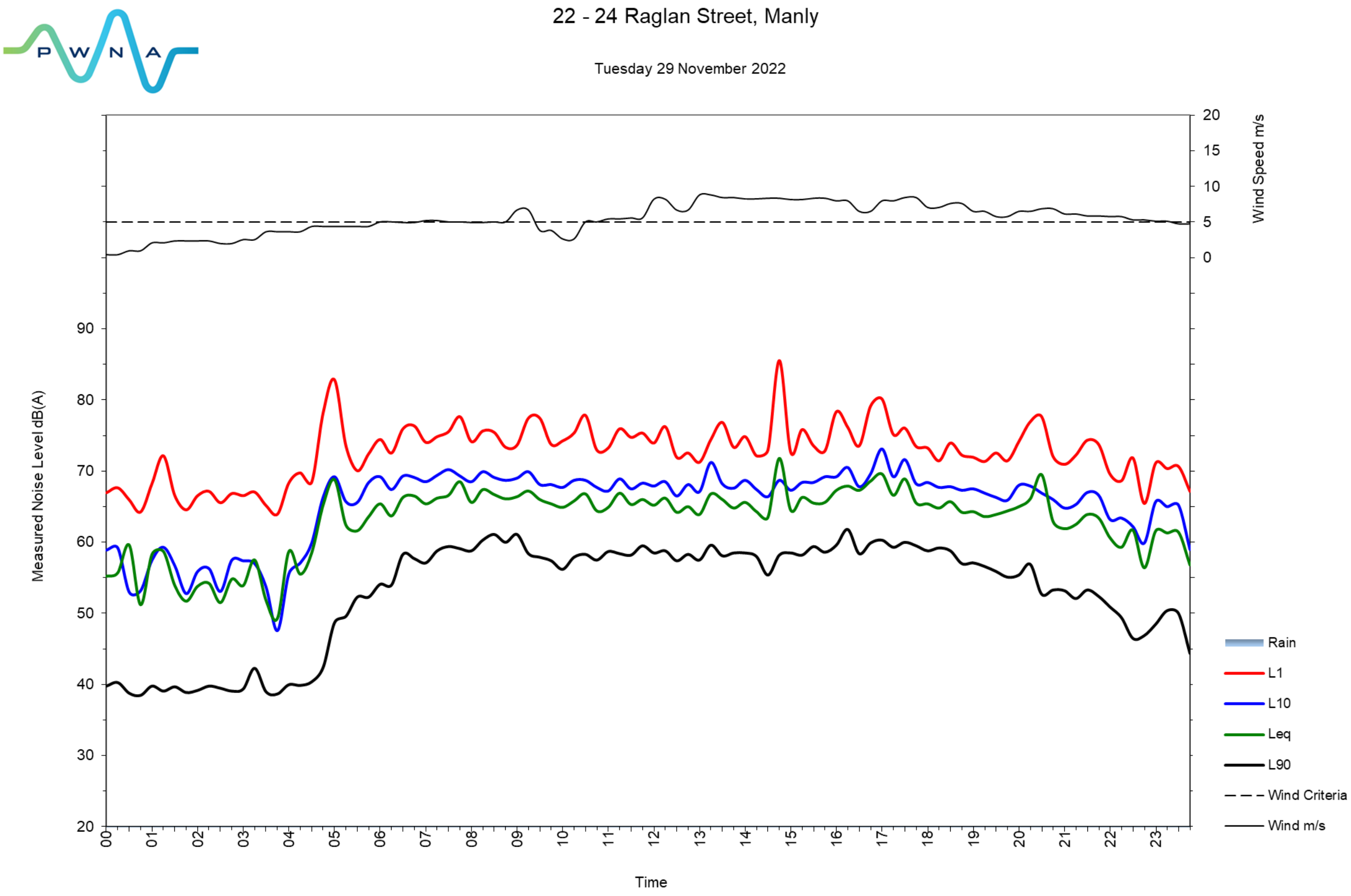

22 - 24 Raglan Street, Manly
Friday 25 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s

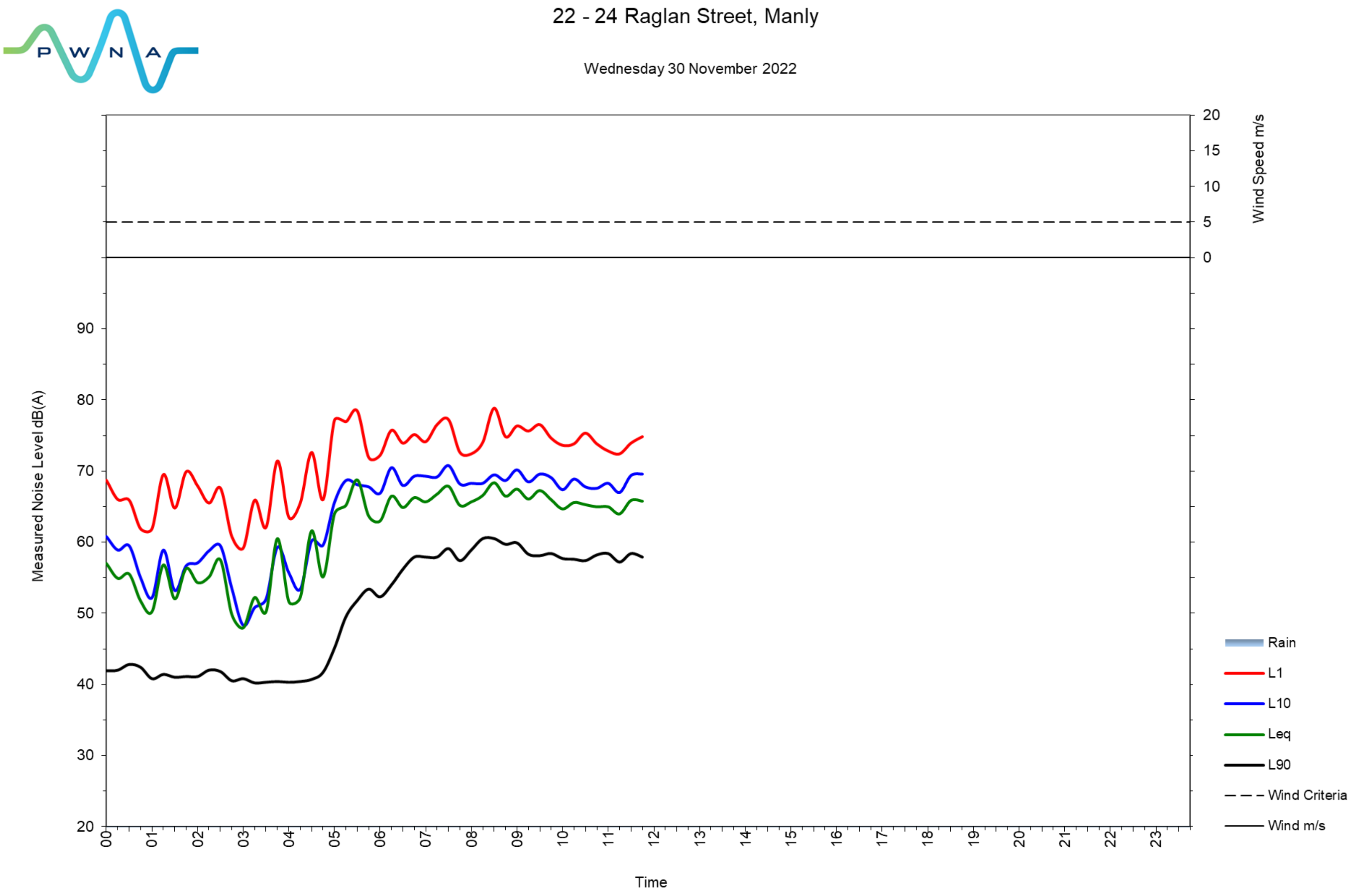

22 - 24 Raglan Street, Manly
Saturday 26 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s



22 - 24 Raglan Street, Manly
Sunday 27 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


22 - 24 Raglan Street, Manly
Monday 28 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


22 - 24 Raglan Street, Manly
Tuesday 29 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s


22 - 24 Raglan Street, Manly
Wednesday 30 November 2022
Measured Noise Level dB(A)
Wind Speed m/s
Time
20
30
40
50
60
70
80
90
0
5
10
15
20
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Rain
L1
L10
Leq
L90
Wind Criteria
Wind m/s