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Warringah Recreation Centre

DA Acoustic Assessment

New Squash Building

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1 INTRODUCTION

This report has been prepared to assess noise impacts associated with the proposed redevelopment of Warringah Recreation Centre located at 433 Pittwater Road, North Manly. In particular, noise impacts associated with the new squash building.

Impacts assessed include:

- Operational noise emissions.
- Construction noise and vibration emissions.
- Noise impacts from additional traffic on nearby public roads generated by the development.

The subject site and local context are indicated in Figure 1.

The report has been prepared for the sole purpose of a development application assessment and should not be used or relied on for any other purpose.

2 REFERENCED DOCUMENTS

2.1 BACKGROUND INFORMATION USED

The assessment is based on the following drawings, reports and other information:

- Webber Architects General Performance Specification Return Brief (Rev. G, dated 26.02.2024).
- Webber Architects Architectural drawing (Rev. A, dated 10.05.2024).
- Acoustic Logic Warringah Golf Clubhouse DA Acoustic Assessment (Ref: *20221047.1/2908A/R2/PF*, dated 29/08/2023).
- Traffic Impact Assessment prepared by PDC Consultants (Ref: 0979r01v01, dated 29/05/2024).

2.2 GUIDELINES

The following planning instruments and guidelines have been used in the assessment:

- NSW EPA *Noise Policy for Industry* (**NPfI**) October 2017.
- NSW EPA *Interim Construction Noise Guideline* (**IGNG**) July 2009.
- North Beaches Council *Warringah Development Control Plan* (**DCP**) 2011.
- NSW EPA *Noise Guide for Local Government* (**NGLG**) 2013 (as amended).
- NSW EPA *Road Noise Policy* (**RNP**) March 2011.

3 ABBREVIATIONS AND DEFINITIONS

The following Abbreviations and definitions are used in this noise impact assessment.

dB	Decibels - unit for the measurement of sound
dB(A)	A-weighted decibels. Unit of measurement for broadband sound with the A-frequency weighting applied to approximate human loudness perception to sounds of different pitch.
L_{eq}	Energy, time averaged sound level
L_{max}	Maximum sound pressure level, fast response
L_{90}	Sound level exceeded for 90% of the measurement period
R_w	Frequency weighted sound reduction index.
NRC	Average absorption co-efficient for the octave bands with centre frequencies of 250Hz to 2 kHz inclusive.
Day*	The period from 7 am to 6 pm (Monday to Saturday) and 8 am to 6 pm(Sundays and public holidays).
Evening*	Refers to the period from 6 pm to 10 pm.
Night*	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am(Sundays and public holidays).
Project Trigger Level	Target noise levels for a particular noise-generating facility.
Assessment Background Level (ABL)	Background noise level representative of a single period.
Rating Background Level (RBL)	The overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. (Calculated in accordance with NPfI unless noted otherwise)

* Unless nominated otherwise.

4 SITE DESCRIPTION AND THE PROPOSAL

The proposal seeks the redevelopment of Warringah Recreation Centre currently located at the southeast corner of 433 Pittwater Road, North Manly. This development application includes the relocation of indoor squash courts to the new indoor squash building.

The following table provides a comparison between the existing operational uses and the proposal:

Table 1 – Warringah Recreation Centre Uses and Operating Times

Current Use	Proposed Use	Time	Comments
Indoor Squash Courts Currently 3 indoor squash courts	No change in use, 3 new courts relocated to the new indoor squash building	Monday to Saturday 7:00am – 10:00pm Sunday 8:00am – 7:00pm	Minor change to location/orientation of the building

4.1 HOURS OF OPERATION

The proposed hours of operation for the squash building are:

- 7am to 10pm, Monday to Saturday.
- 8am to 7pm, Sunday

4.2 SENSITIVE RECEIVERS

The following table lists the nearest/potentially most impacted sensitive receivers surrounding the site. An aerial photo of the site indicating nearby noise sensitive receivers and measurement locations is presented in Figure 1.

Table 2 – Sensitive Receivers

Receiver (Refer Figure 1)	Comment
Residential – R1	Residential houses to the north east of the site at 518-528 Pittwater Road, North Manly.
Residential – R2	Residential houses to the south east of the site at 518-528 Pittwater Road, North Manly.
Commercial – C1	Mixed use buildings to the east of the project site at 490-500 Pittwater Road, North Manly.

Figure 1 – Site Plan Showing Local Context

5 SITE OPERATIONAL NOISE EMISSIONS ASSESSMENT

5.1 ENVIRONMENTAL NOISE SOURCES

The following significant noise sources have been identified as requiring assessment:

- Internal activities and process equipment and plant for squash building.
- Air conditioning and ventilation plant.

With respect to typical operation, the centre already generates a level of noise emissions, primarily from external facilities such as sports courts. With respect to acoustic impacts from new development, we propose to assess the change in noise level between the existing and future use of the site, i.e. a comparative analysis.

Noting the above, the control of noise from new internal areas is an element which is both feasible and reasonable to control. It is proposed that noise emission goals be applied to new internal areas of the development (i.e. squash courts) to minimise impacts on surrounding development. Noise emission criteria relevant for the assessment of internal sporting noise, use of internal noise generating spaces will be assessed against the EPA NPI 2017.

An outline of relevant acoustic criteria is presented below.

5.2 NOISE ASSESSMENT CRITERIA FOR ON-SITE NOISE SOURCES

Criteria to assess noise emissions from the operation of the proposed development have been developed using the NPfI. This policy was primarily developed to assess noise impacts from industrial development but can also be adapted to assess other types of development such as commercial buildings and air conditioning plant.

For each receiver type:

- Receivers have been grouped into "catchments". These are receivers that have been assessed as having similar characteristics (receiver type and ambient noise level). These are shown in Figure 1.
- For each catchment, representative noise assessment trigger levels have been determined based on NPfI guidelines. The trigger levels have been adopted in this assessment as criteria. These will be used to indicate whether additional mitigation is needed to manage noise emissions.
- For each catchment, noise emissions have been assessed to the most impacted receiver. This means that impacts at all other receivers within that catchment will be less. Compliance at the most impacted receiver will therefore also result in compliance at all other receivers within the catchment.

For residential receivers, three criteria are assessed:

- Intrusive assessment– that is, how audible is the emitted noise compared to ambient, background noise). Criteria are determined relative to the measured rating background noise level.
- Amenity assessment – that is, how loud is the absolute level of industrial noise, including cumulative noise from other industrial sources. The NPfI nominates appropriate amenity noise levels depending on the receiver type and prevailing noise environment/zoning.
- Maximum Noise assessment – will high level, short term noise events cause adversely impact sleep at night? Trigger levels are determined relative to the measured night rating background, and assessed outside rooms where sleep is likely to occur.

For residential receivers, noise emissions are assessed against the trigger levels to determine the likely extent of impacts. The lower of the relevant intrusiveness and amenity trigger levels are adopted. Noise emissions lower than the trigger levels indicate there is no adverse impact. A maximum noise level assessment is separately undertaken if night time emissions occur.

For other receiver types, only an "amenity" assessment is required.

Appendix A summarises the results of ambient noise monitoring. Appendix B provides the derivation of NPfI trigger levels for each of the receivers. These are summarised in the following table.

Table 3 – Project Triger Levels

Location/Receiver Type	**Time**	**RBL dB(A) L_{90}**	**Trigger Noise Level (dB(A) $L_{eq,15min}$)**		
			Intrusiveness	Amenity	Max Event
R1, R2 - Residential	Day	51	56	**53**	n/a
	Evening	46	51	**43**	n/a
	Night	34	39	**38**	**L_{max} 52 dB(A)**
C1 - Commercial	Day	n/a	n/a	63	n/a

5.3 NOISE EMISSION ASSESSMENT

Noise emissions from the proposed Squash building will be primarily dominated by usage of the indoor squash courts.

- The proposed indoor courts are located away from the residents with admin area to the east.
- The proposed indoor courts are fully closed.
- An analysis has been conducted with an indicative sound pressure level of 60dB(A) measured at 10m away from the court.
- It is recommended that any glazing along the eastern façade (facing residents) is to be minimum 10mm thick with acoustic seals. (R_w 33).
- Based on the above, noise levels from the use of the internal sport courts at the closest residential receiver would be less than 43 dB(A) $L_{eq(15min)}$ (evening) and meet the NSW NPI noise emission requirements for all proposed time periods.

5.3.1 Noise from Mechanical plant

Detailed plant selection and location has not been undertaken at this stage. Satisfactory levels will be achievable through appropriate plant selection, location and if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services to the closest residential receiver should comply with the requirements of Section 0.

Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels.

6 ROAD TRAFFIC NOISE GENERATED BY THE PROPOSED DEVELOPMENT

The impact of additional traffic generated by the proposed development has been assessed using the EPA RNP, which states the following:

- Section 2.3 of the RNP provides noise assessment criteria at residential (Table 3) and non-residential receivers (Table 4), and for different road classifications.
- Where existing traffic noise is already close to or exceeds the criteria in Tables 3 or 4, the RNP indicates the increase in noise should be assessed instead of the absolute level. For sensitive land uses affected by additional traffic on existing roads, any increase in the total traffic noise level should be limited to 2dB above that of the corresponding 'no build option'. The RNP indicates that an increase of up to 2dB(A) represents a minor impact that is considered barely perceptible to the average person.
- Where nighttime traffic movements are proposed, the impact on sleep from maximum noise events generated by these movements should also be considered for residential receivers.

Traffic noise data obtained from the traffic report indicates the proposed development will generate less traffic movements compare to the existing. Hence, there will be no additional traffic noise generation on the public road from the proposed development.

7 CONSTRUCTION NOISE AND VIBRATION

Noise and vibration during the demolition, excavation and construction phases of the project should be assessed prior to commencement of "noisy" works on site using the quantitative method in accordance with the EPA Interim Construction Noise Guideline.

The assessment should:

- Establish the potentially impacted receivers for noise or vibration. In particular the residential dwellings in the adjacent sites.
- Establish the noise and vibration management levels in accordance with the ICNG.
- Predict noise and vibration impacts.
- Where noise or vibration levels would exceed the management levels recommend reasonable and feasible mitigation.
- Where noise or vibration would exceed highly affected management levels apply additional mitigation such as respite periods. This would typically apply to hammering using excavator mounted hammers and similar highly intrusive activities.
- Recommend appropriate noise and vibration monitoring to be undertaken during the more intensive phases of the project.

A project specific Construction Noise and Vibration Management Plan should be developed using the results of the assessment that will be used to manage construction noise and vibration impacts, which may include monitoring, community liaison and complaints handling, noise mitigation to be adopted, training and management, etc.

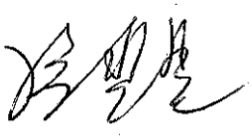
8 CONCLUSION

This report summarises the potential noise impact assessment undertaken for the proposed development. Construction and operational impacts have been assessed, as well as noise from traffic generated by the proposal.

- An assessment of operational noise emissions has been undertaken using Noise Policy for Industry guidelines. Site noise emissions from the development have been predicted and assessed against criteria adopted from the trigger levels determined using the Policy.
- It is concluded that with the implementation of the mitigation in Section 5.3 operational noise emissions from the proposed development will comply with noise criteria established for the site.
- Additional road traffic noise generated by the proposed development has been assessed using the EPA *Road Noise Policy* guideline and found to be compliant.
- Noise and vibration emissions during construction should be assessed and managed in accordance with the EPA *Interim Construction Noise Guideline*, as indicated in Section 7 of this report.

Please contact us should you have any further queries.

Yours faithfully,



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APPENDIX A AMBIENT NOISE MONITORING

This appendix summarises the ambient noise data measured near the subject site, and the calculated noise level descriptors adopted to characterise the existing noise environment.

Monitoring has been undertaken to provide the following ambient data:

- Background noise levels at the surrounding residential properties.
- Traffic noise levels.

A.1 NOISE DESCRIPTORS

Ambient noise constantly varies in level from moment to moment, so it is not possible to accurately determine prevailing noise conditions by measuring a single, instantaneous noise level.

To quantify ambient noise, a 15 minute measurement interval is typically utilised. Noise levels are monitored on a continuous basis over this period, and statistical and integrating techniques are used to characterise the noise being measured.

The principal measurement parameters are:

L_{eq} - represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of noise impact as it closely corresponds with how humans perceive the loudness of steady state and quasi-steady state noise sources (such as traffic noise).

L_{90} – This is commonly used as a measure of the background noise level as it represents the noise level heard in the quieter periods during the measurement interval. The L_{90} parameter is used to set noise emission criteria for potentially intrusive noise sources since the disturbance caused by a noise source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

L_{10} is used in some guidelines to measure noise produced by an intrusive noise source since it represents the average of the loudest noise levels produced at the source. Typically, this is used to assess noise from licenced venues.

L_{max} is the highest noise level produced during a noise event, and is typically used to assess sleep arousal impacts from short term noise events during the night. It is also used to assess internal noise levels resulting from aircraft noise and ground vibration induced noise from railways.

L_1 is sometimes used in place of L_{max} to represent a typical noise level from a number of high level, short term noise events.

A.2 UNATTENDED LONG TERM NOISE MONITORING

A.2.1 Equipment Used

Unattended noise monitoring was conducted using the following equipment:

- Rion NL-42 (Type 2)
- Rion Sound Level calibrator Type NC 74

Monitoring was continuous, with statistical noise levels recorded at 15-minute intervals throughout the monitoring period. Measurements were taken on "A" frequency weighting and fast time response, unless noted otherwise.

All monitoring equipment used retains current calibration - either manufacturers' calibration or NATA certified calibration. The monitors were field calibrated at the beginning and the end of the measurement with no significant drift in calibration noted.

A.2.2 Locations Monitored

The locations monitored are indicated in Figure 1.

A.2.3 Weather Affected and Extraneous/Outlying Data

Periods affected by adverse weather conditions (as defined by Fact Sheet B) are indicated on the following data graphs, and have been excluded from the assessment. Weather data was obtained from records provided by the Bureau of Meteorology for the Sydney harbour (wedding cake west) station.

As the Bureau of Meteorology wind data is typically obtained at an exposed location at 10m above ground level, and the monitoring locations were at approximately 1.5m above ground in more sheltered locations a wind multiplying factor of 0.6 has been applied to the BOM data to estimate the wind speed at the microphone location.

The following additional periods have been identified as likely to contain significant periods of non-representative data and have been excluded from the assessment:

- 2/9/2022 and 3/9/2022 Day Evening and night
- 4/9/2022 Day
- 5/9/2022 Day and Evening

A.3 CALCULATION OF REPRESENTATIVE AMBIENT NOISE LEVELS

The ambient, assessment and rating background levels have been determined from the unattended, long-term noise monitoring data based on the methodology in the Noise Policy for Industry Fact Sheet B.

A.4 RATING BACKGROUND NOISE LEVELS

The following table summarises the assessment background noise levels (ABL) for each location. Note that where no ABL is indicated, this is because that period was significantly affected by adverse weather or other extraneous noise.

In accordance with the NPfI:

- If the calculated evening rating background noise level is higher than the day level, the day rating background noise level has been adopted for the evening period.
- If the calculated night rating background noise level is higher than the evening level, the evening rating background noise level has been adopted for the evening period.
- If the calculated day rating background noise level was less than 35 dB(A), a "default" background of 35 dB(A) has been adopted.
- If the calculated evening or night rating background noise level was less than 30 dB(A), a "default" background of 30 dB(A) has been adopted.
- Where monitoring was conducted within 3m of a significant sound reflecting surface, 2.5 dB(A) has been subtracted from the calculated rating background to account for an increase in noise from reflections.

Table 4 – Assessment Background Noise Levels

Date	ABL		
	Day	Evening	Night
Tuesday 1/9/2022	-	-	33.4
Wednesday 2/9/2022	-	-	-
Thursday 3/9/2022	-	-	-
Friday 4/9/2022	-	45.8	37.2
Saturday 5/9/2022	-	-	33.6
Sunday 6/9/2022	52.3	45.5	33.9
Monday 7/9/2022	50.5	-	-
Tuesday 8/9/2022	-	-	-
Wednesday 9/9/2022	51.4	49.5	40
Thursday 10/9/2022	51	46.2	-
Friday 11/9/2022	48.8	45.3	34.2
Calculated RBL	**51**	**46**	**34**

A.5 AMBIENT NOISE LEVELS – TISEPP/DNRCBR NOISE INTRUSION ASSESSMENT

The $L_{eq,15hr}$ (day period, 7am to 10pm) and $L_{eq,9hr}$ (night period, 10pm to 7am) ambient noise level descriptors adopted in the EPA "Development Near Rail Corridors and Busy Roads" and NSW "Road Noise Policy" guidelines have been calculated from the data, and are summarised in the following table.

Table 5 – Ambient Noise

Location	Ambient Noise Level (dB(A) $L_{eq,period}$)*	
	Day (7am to 10pm)	Night (10pm to 7am)
Logger location	55	50

A.6 ATTENDED MONITORING

A.6.1 Equipment Used

Attended noise monitoring was conducted using:

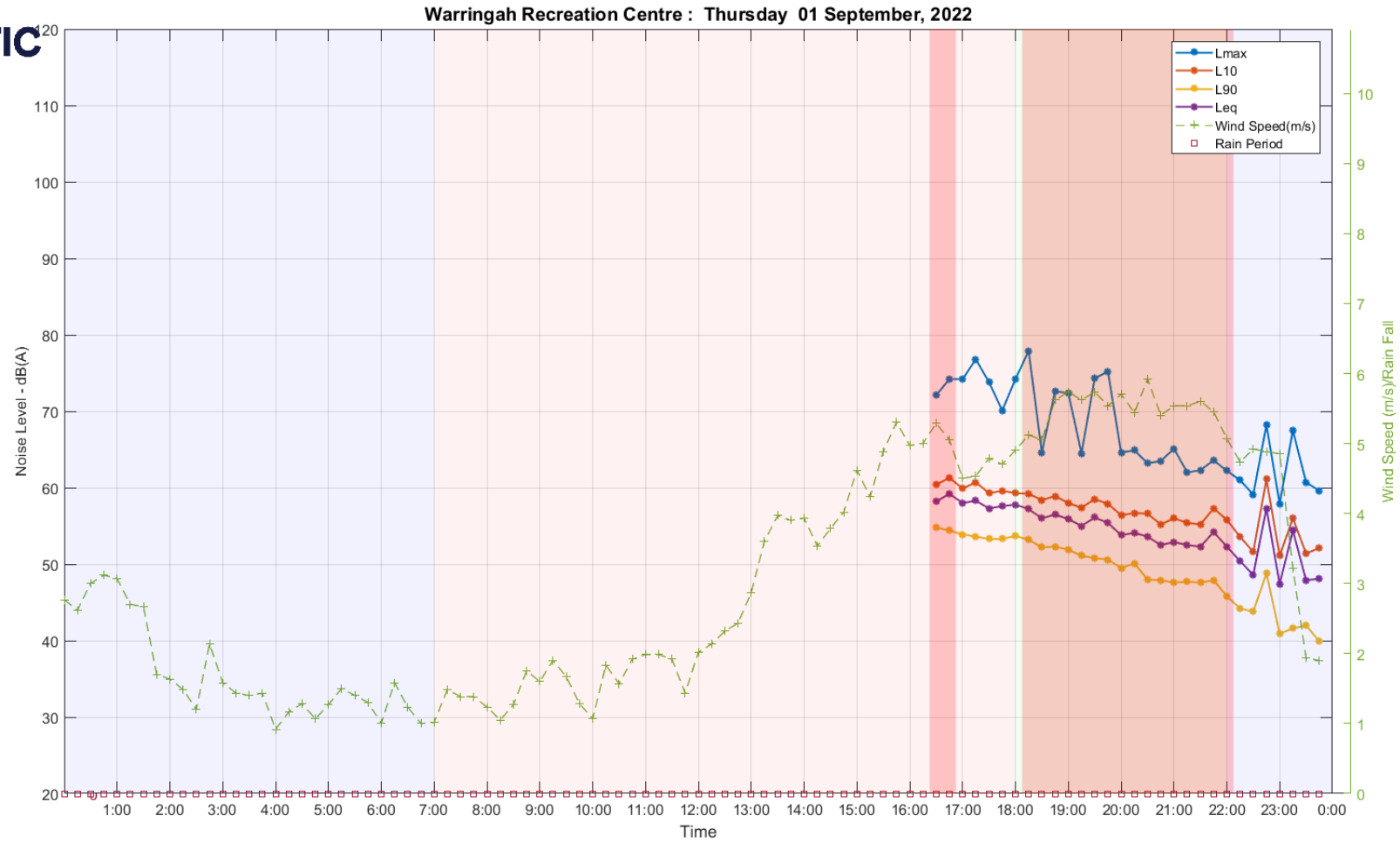
- Norsonics SA 140 (Type 1) sound analyser
- Rion NL-42 (Type 2) sound level meter

The sound level meter equipment used retain current calibration - either manufacturers' calibration or NATA certified calibration, and were field calibrated at the beginning and the end of the measurement with no significant drift in calibration noted.

A.6.2 Locations Monitored

The measurement location is indicated in Figure 1.

A.7 UNATTENDED MONITORING DATA GRAPHS


Warringah Recreation Centre : Thursday 01 September, 2022
Lmax
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Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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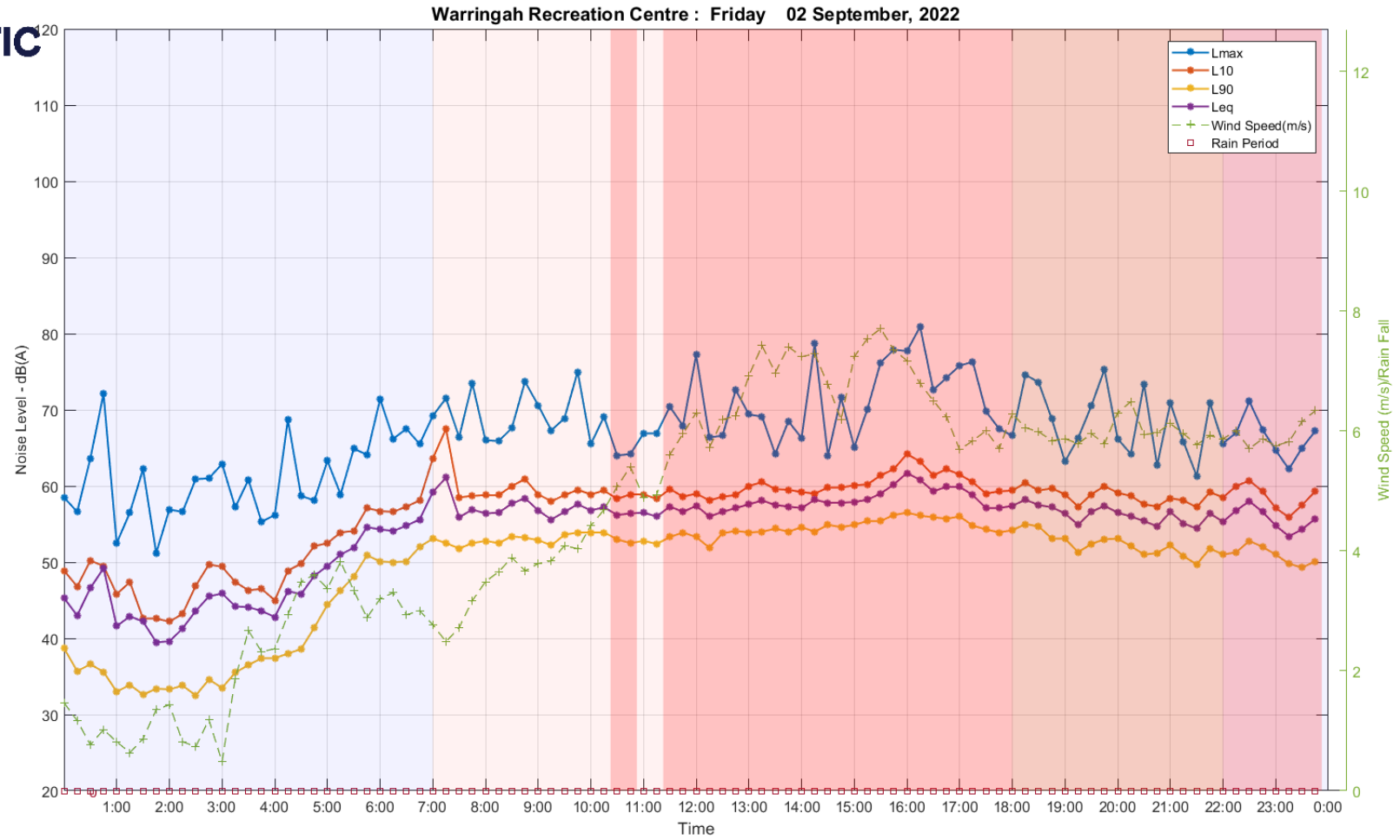
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Lmax
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Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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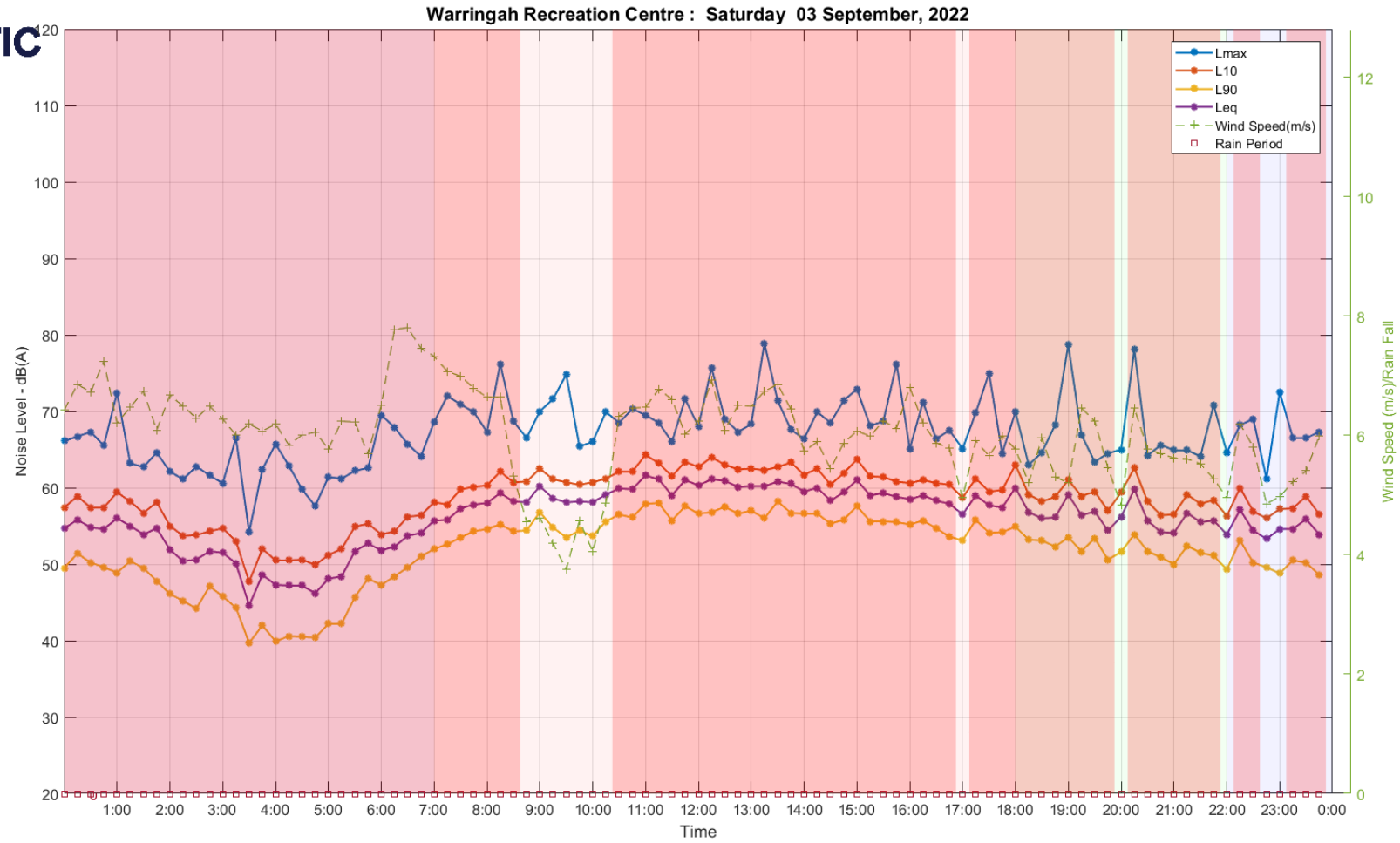
Warringah Recreation Centre : Saturday 03 September, 2022
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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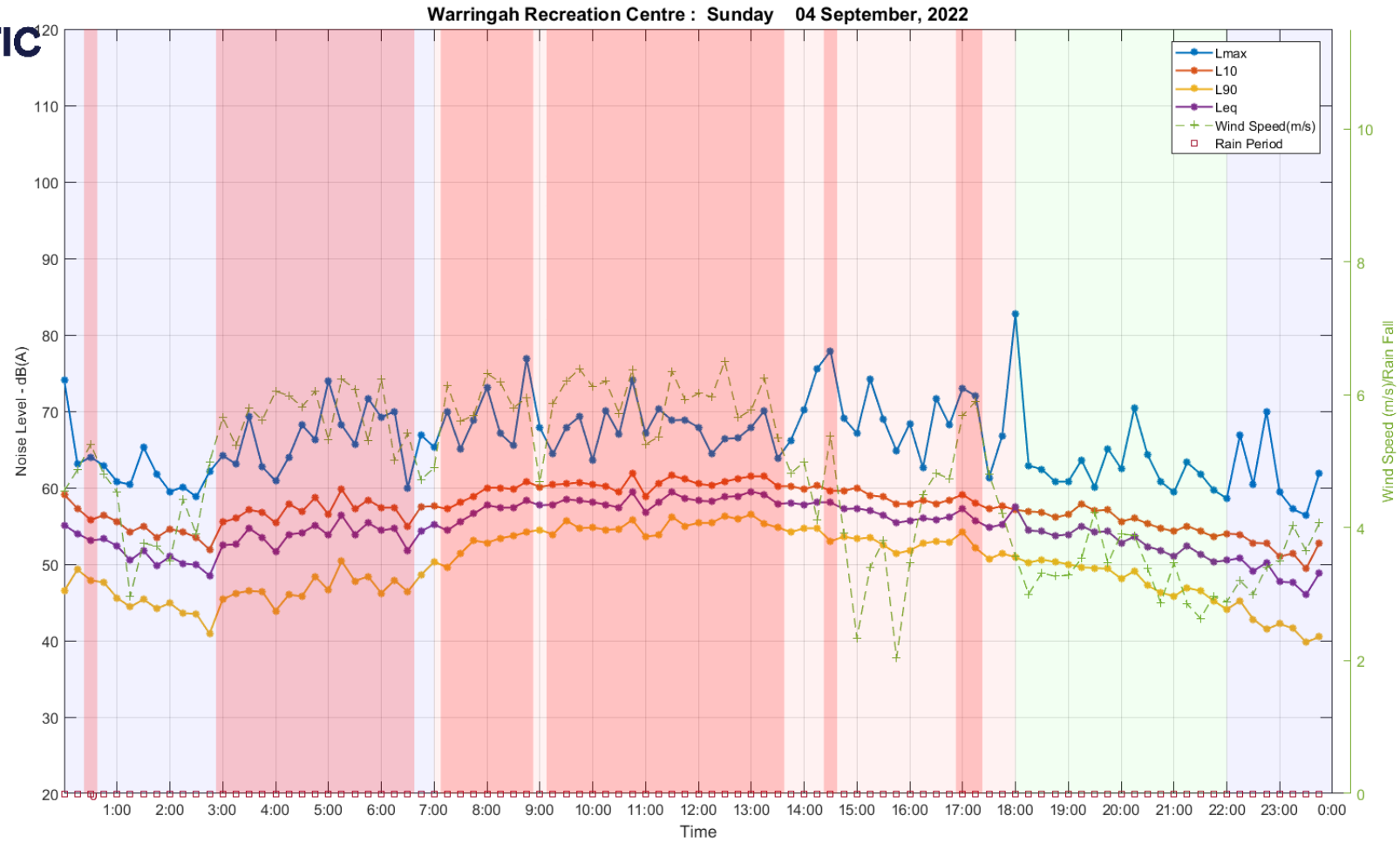
Warringah Recreation Centre : Sunday 04 September, 2022
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Wind Speed(m/s)
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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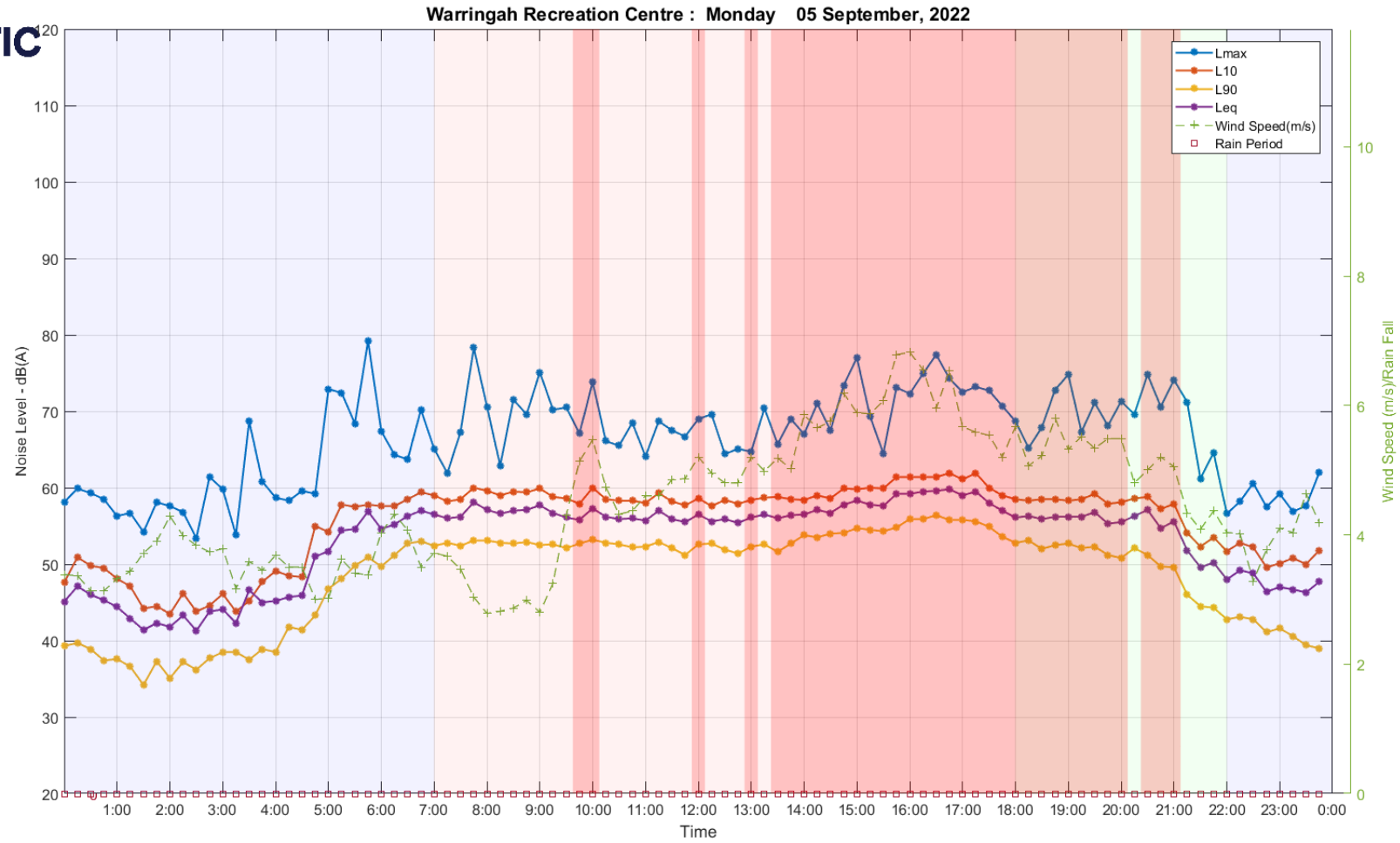
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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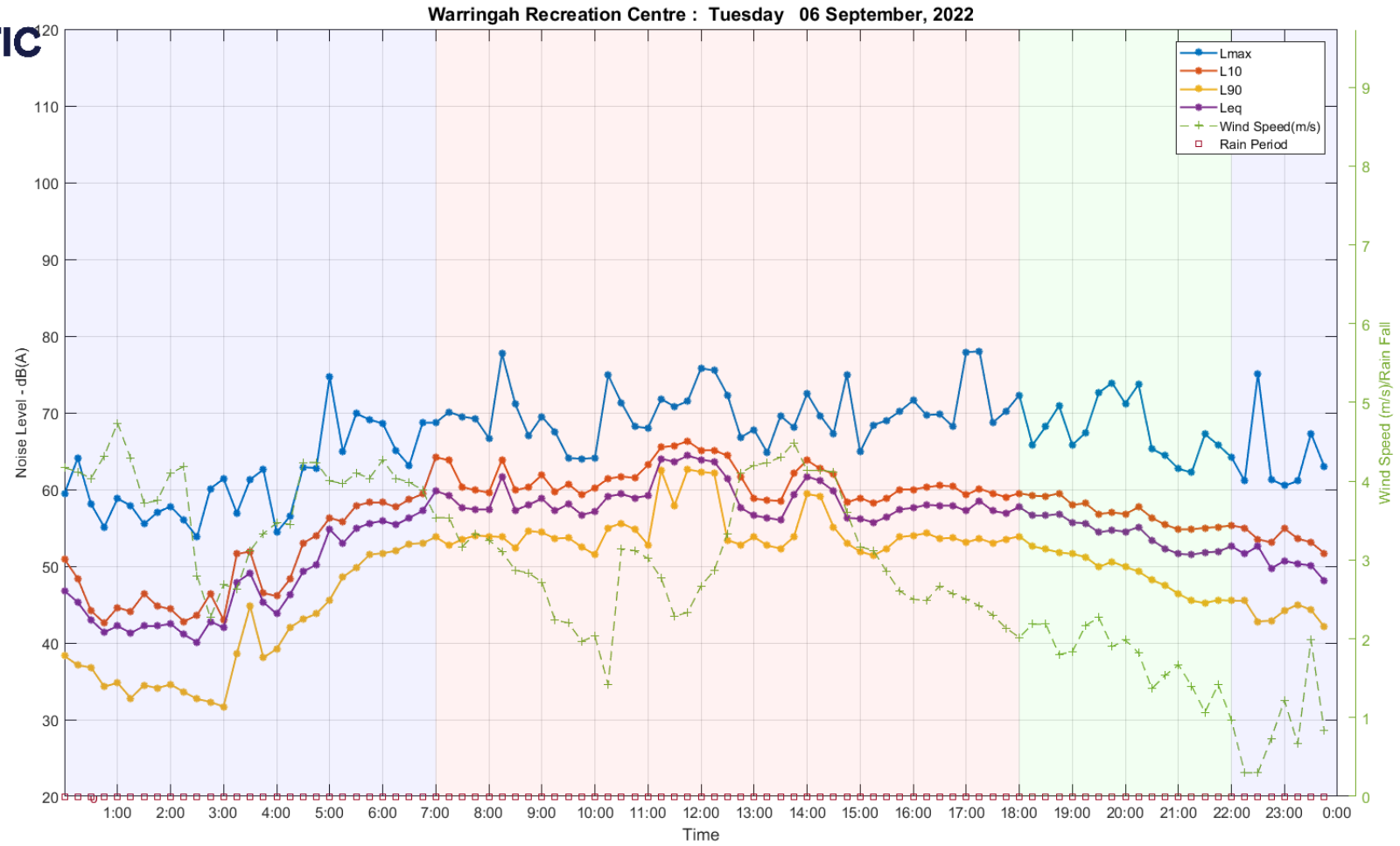
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Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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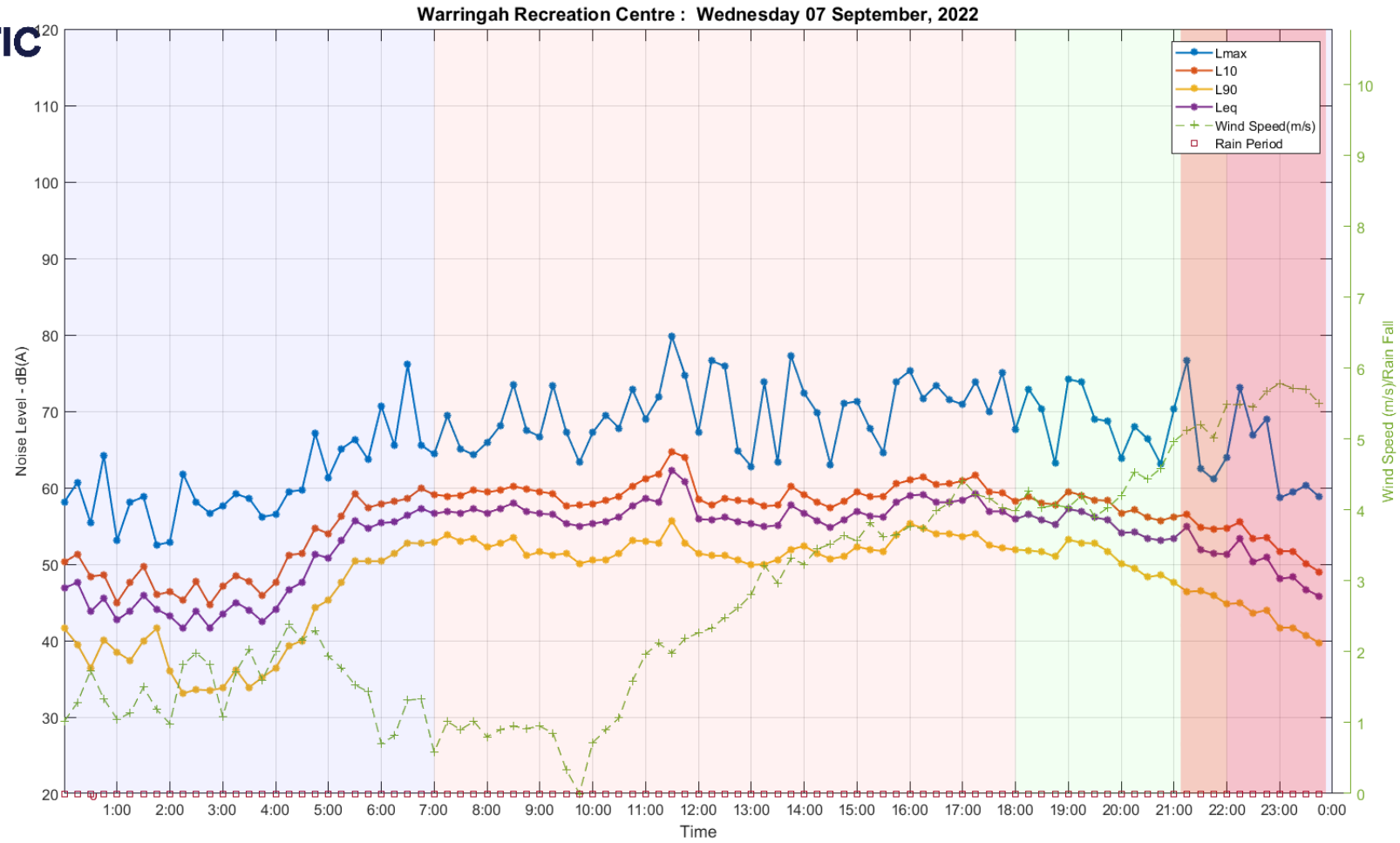
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Wind Speed (m/s)/Rain Fall
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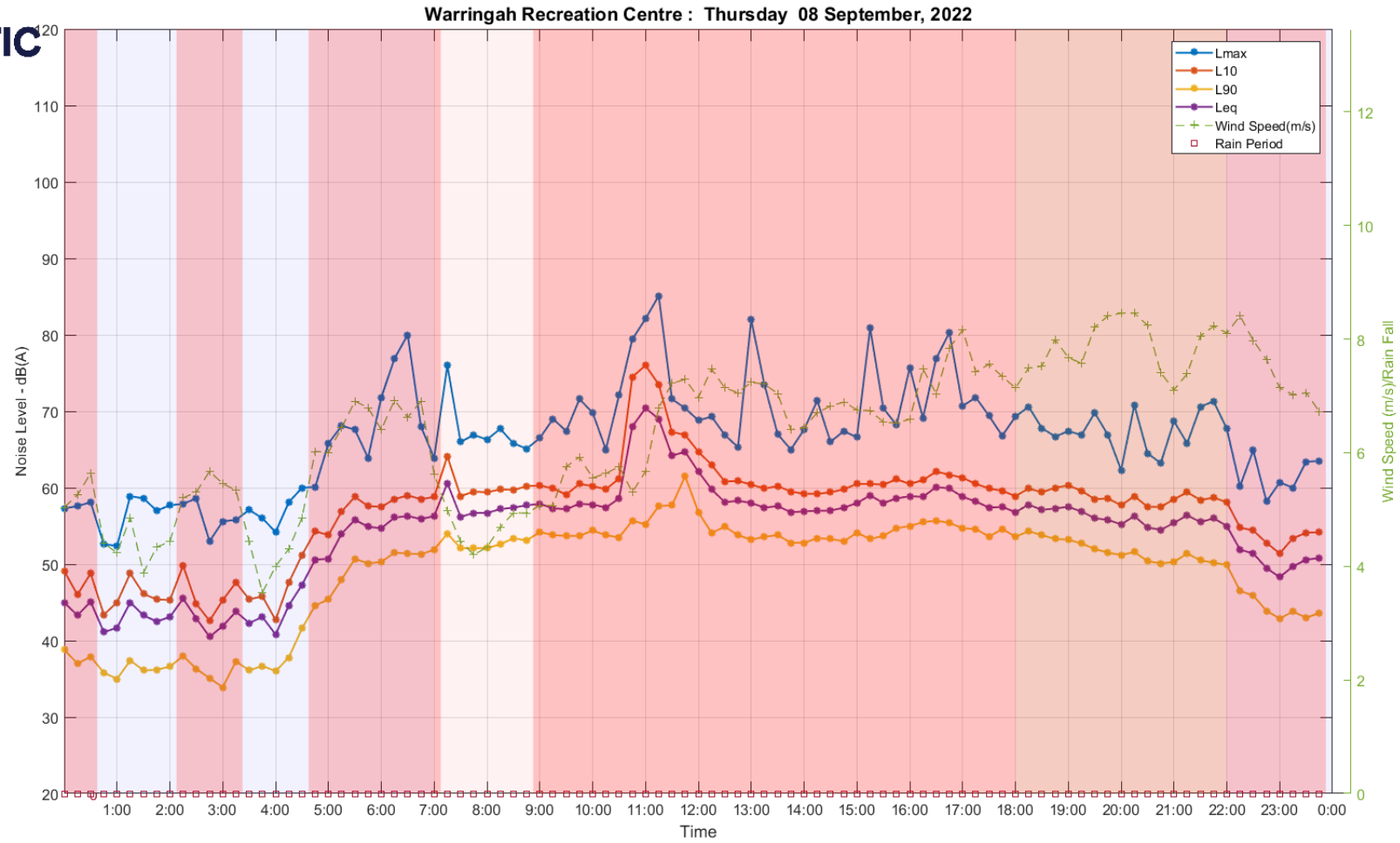
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Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
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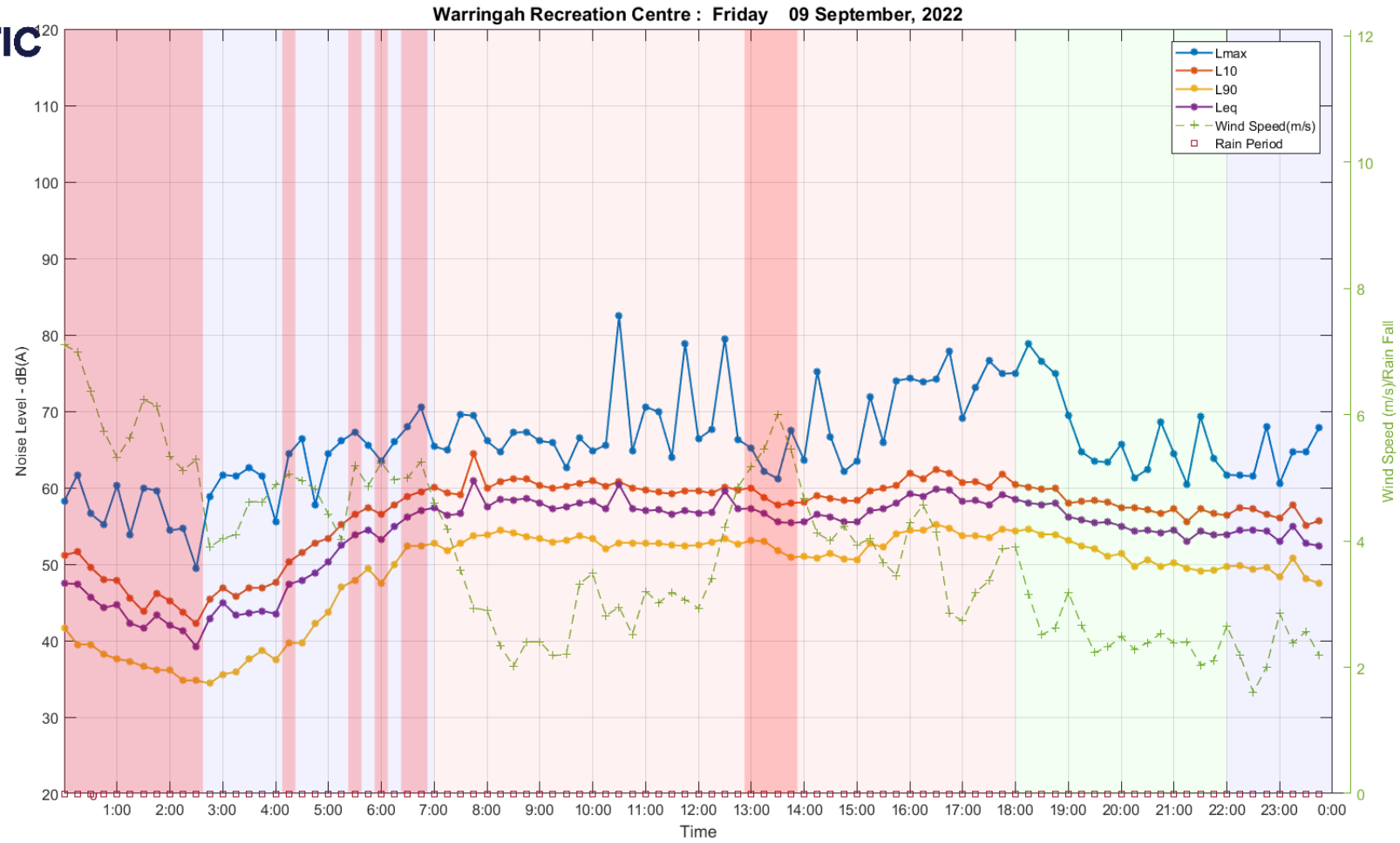
Warringah Recreation Centre : Friday 09 September, 2022
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
1:00
2:00
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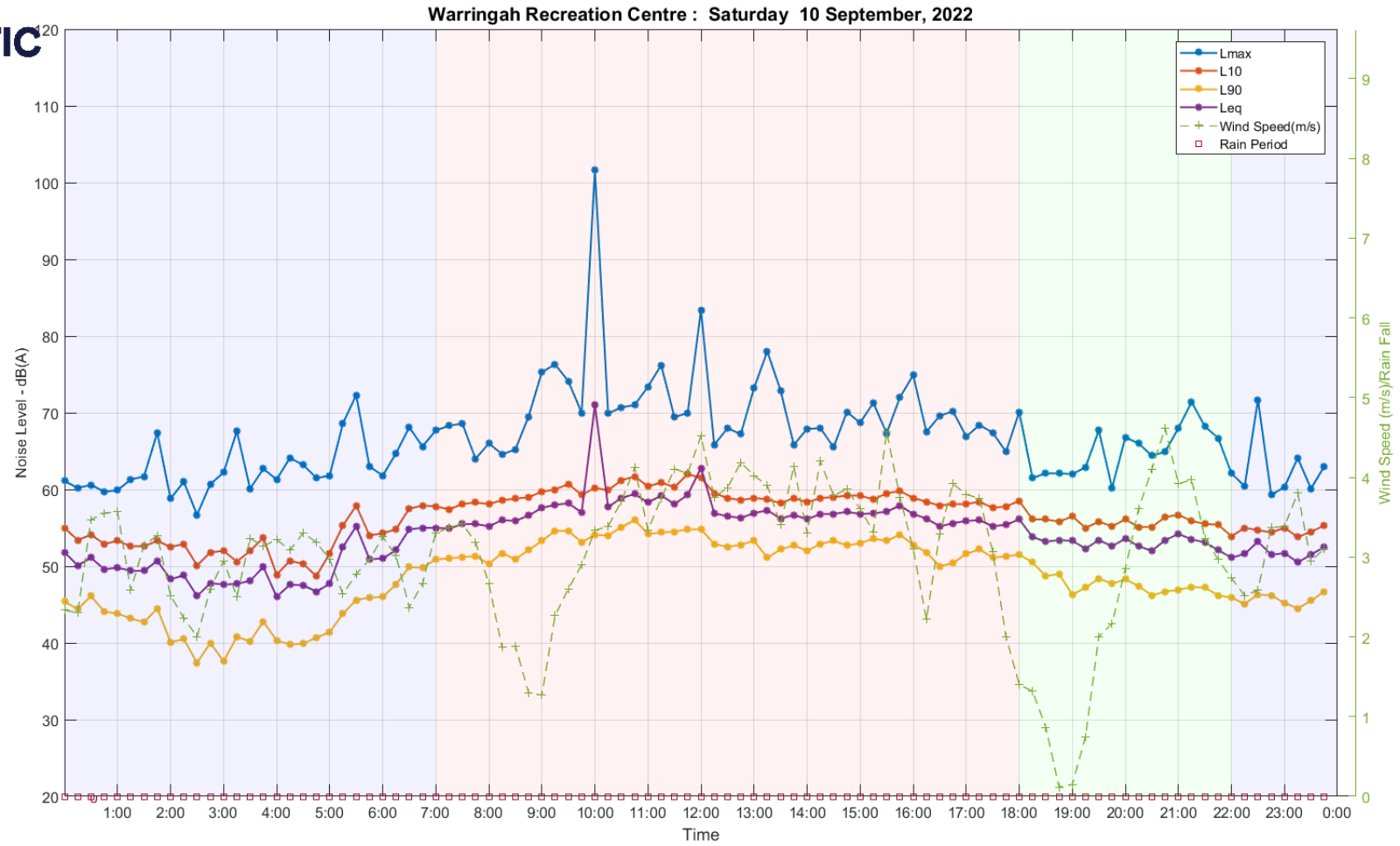
Warringah Recreation Centre : Saturday 10 September, 2022
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
120
110
100
90
80
70
60
50
40
30
20
9
8
7
6
5
4
3
2
1
0
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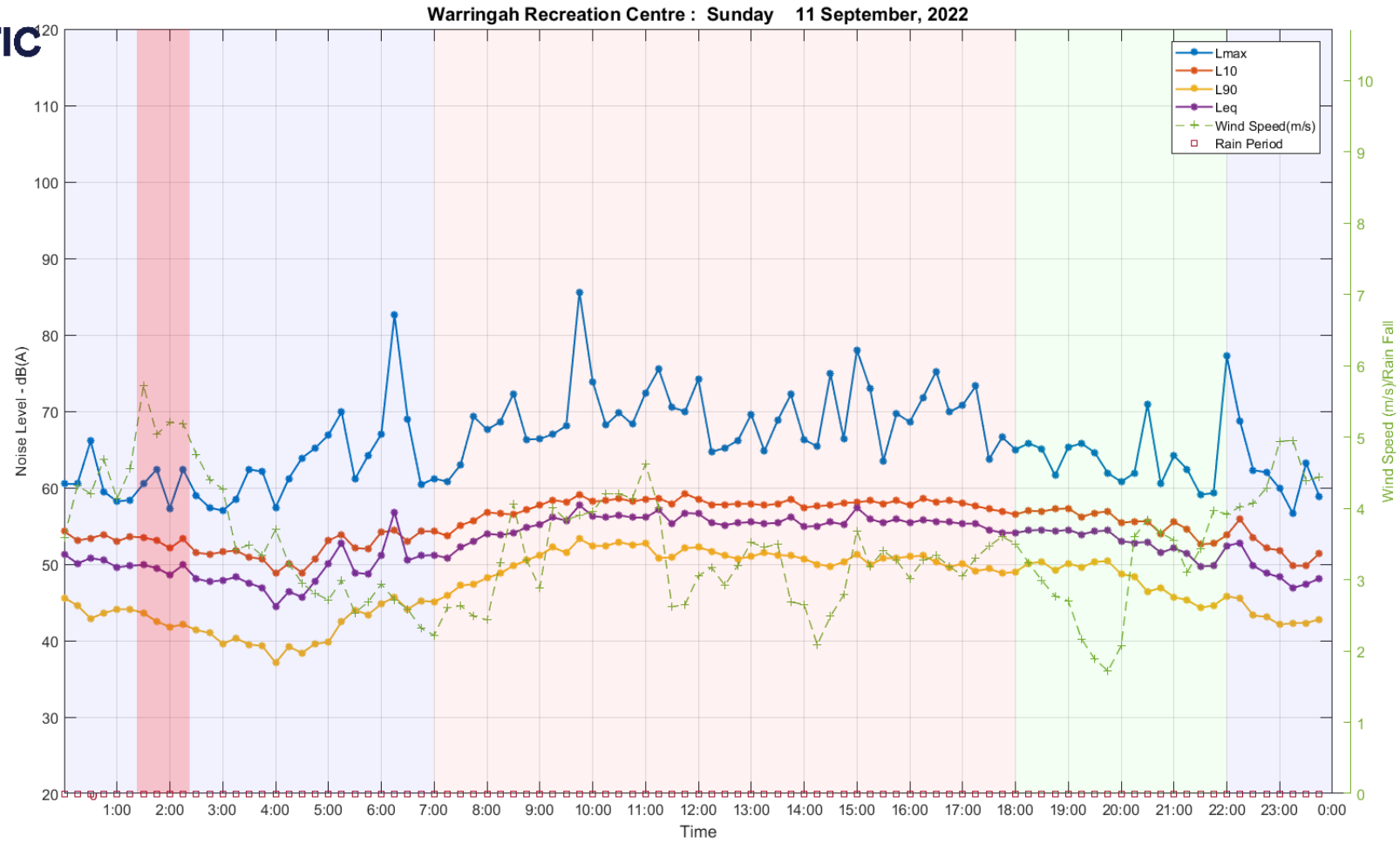
Warringah Recreation Centre : Sunday 11 September, 2022
Lmax
L10
L90
Leq
Wind Speed(m/s)
Rain Period
Noise Level - dB(A)
Wind Speed (m/s)/Rain Fall
Time
120
110
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
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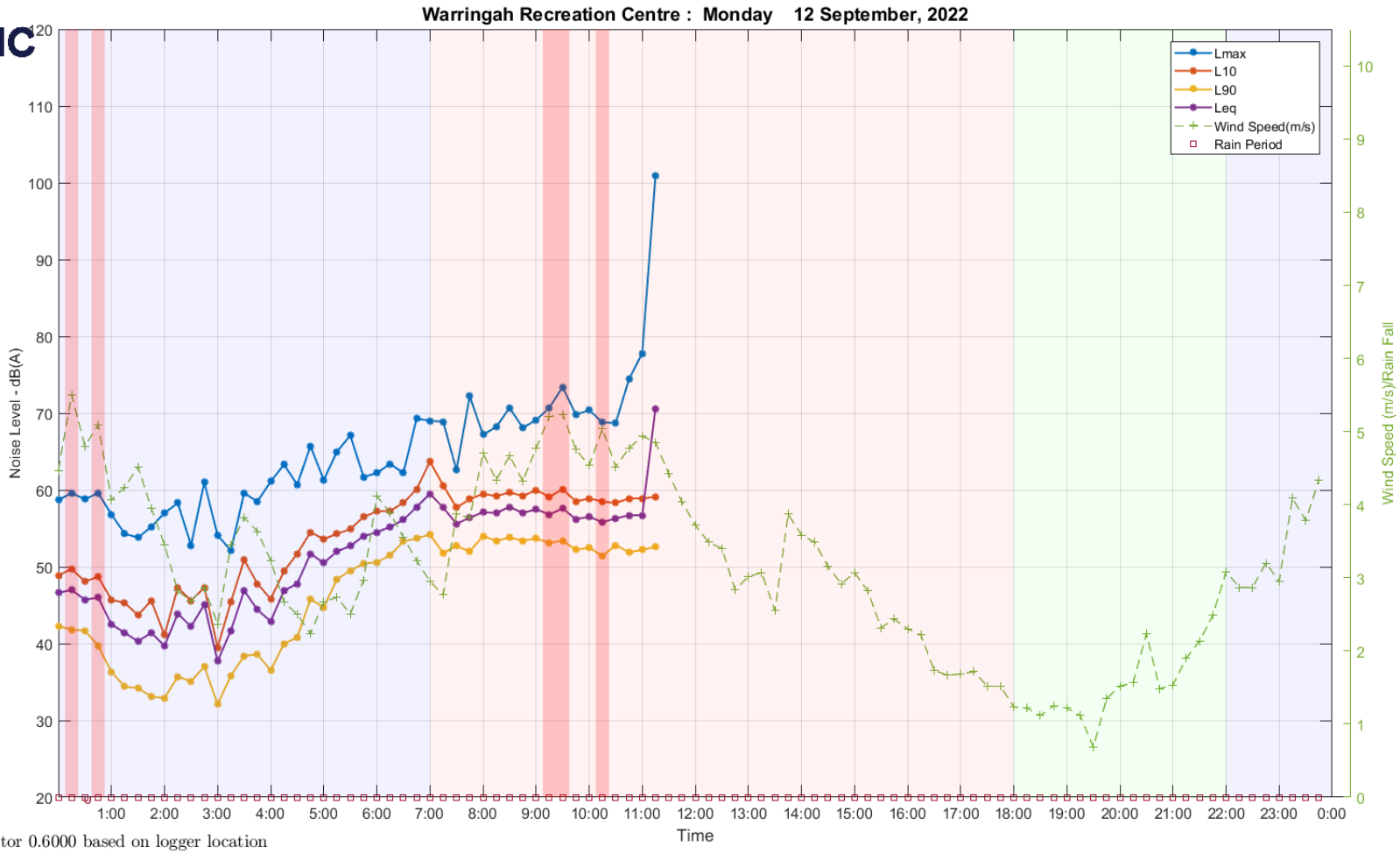

Wind Speed is corrected using factor 0.6000 based on logger location

APPENDIX B EPA NOISE POLICY FOR INDUSTRY TRIGGER LEVELS

Project specific assessment trigger levels have been determined for each noise source applying at the identified potentially most impacted receivers.

B.1 NPFI TRIGGER LEVELS

The NPfI requires noise impacts at residential receivers to be assessed in 3 ways:

- Whether the emitted noise is unreasonably loud relative to ambient background noise. (which the EPA calls the "intrusiveness" trigger level).
- Whether the noise emitted is unreasonably loud in an absolute sense, and consistent with surrounding land use and environment. ("amenity" trigger level)
- For night noise emissions, whether discrete noise events are likely to adversely impact sleep ("maximum noise level" trigger levels).

For other receiver types only the amenity trigger level is relevant.

B.1.1 Intrusiveness

The $L_{eq,15min}$ descriptor is used for the intrusiveness trigger level, and is set at a level that is 5dB(A) above the rating background noise level.

B.1.2 Amenity

Table 2.2 of the NPfI (repeated below) sets out acceptable noise levels for various receiver types.

There are 3 categories of residential receivers - rural, suburban, urban. The nearest residential receivers to the subject site are categorised as "suburban" receivers. Categories for non-residential uses are also indicated in the table.

The NPI typically requires project amenity noise levels to be calculated in the following manner:

$$L_{Aeq,15min} = \textit{Recommended Amenity Noise Level} - 5\ dB(A) + 3\ dB(A)$$

Section 2.4 of the NPfI states:

Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development.

Given there are no other nearby "industrial" noise sources, and nor are any likely in the future, the applicable amenity $L_{Aeq,15min}$ trigger level can be calculated without the 5 dB(A) adjustment.

The NfPI permits the project specific amenity level to be increased in areas where ambient noise levels already significantly exceed the levels in Table 2.2 of the NPfI.

NPfI Table 2.2: Amenity Noise Levels			
Receiver	***Noise Amenity Area***	***Time of Day***	***Recommended Amenity Noise Level L_{Aeq}***
Residential	*Rural*	*Day*	*50*
		Evening	*45*
		Night	*40*
	Suburban	*Day*	*55*
		Evening	*45*
		Night	*40*
	Urban	*Day*	*60*
		Evening	*50*
		Night	*45*
Hotels motels caretakers' quarters holiday accommodation permanent resident caravan parks	*See column 4*	*See column 4*	*5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day*
School classroom – internal	*All*	*Noisiest 1-hour period when in use*	*35 (see notes for table)*
Hospital ward internal external	*All* *All*	*Noisiest 1-hour* *Noisiest 1-hour*	*35* *50*
Place of worship – internal	*All*	*When in use*	*40*
Area specifically reserved for passive recreation (e.g. national park)	*All*	*When in use*	*50*
Active recreation area (e.g. school playground golf course)	*All*	*When in use*	*55*
Commercial premises	*All*	*When in use*	*65*
Industrial premises	*All*	*When in use*	*70*
Industrial interface (applicable only to residential noise amenity areas)	*All*	*All*	*Add 5 dB(A) to recommended noise amenity area*

Notes: The recommended amenity noise levels refer only to noise from industrial sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as follows:

• rural residential – see Table 2.3

• suburban residential – see Table 2.3

• urban residential – see Table 2.3

• industrial interface – an area that is in close proximity to existing industrial premises and that extends out to a point where the existing industrial noise from the source has fallen by 5 dB or an area defined in a planning instrument. Beyond this region the amenity noise level for the applicable category applies. This category may be used only for existing situations (further explanation on how this category applies is outlined in Section 2.7)

• commercial – commercial activities being undertaken in a planning zone that allows commercial land uses

• industrial – an area defined as an industrial zone on a local environment plan; for isolated residences within an industrial zone the industrial amenity level would usually apply.

Time of day is defined as follows:

• day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays

• evening – the period from 6 pm to 10 pm

• night – the remaining periods.

(These periods may be varied where appropriate, for example, see A3 in Fact Sheet A.)

In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable L_{Aeq} noise level may be increased to 40 dB $L_{Aeq(1hr)}$.

B.1.3 Noise Characteristic Modifying Factors

Where applicable, the emitted intrusive noise level should be modified (increased or decreased) to account for characteristics such as tonality, low frequency, duration, etc according to NPfI Fact Sheet C.

B.1.4 Maximum Noise Level Assessment

The purpose of this assessment is to identify whether discrete, night time noise events have the potential to produce adverse sleep impacts.

Section 2.5 of NPfI recommends the following procedure to assess the potential for adverse sleep disturbance.

Where the subject development/ premises night -time noise levels at a residential location exceed:

- *$L_{eq(15min)}$ 40 dB(A) or the prevailing RBL (L_{90}) plus 5 dB, whichever is the greater, and/or*
- *L_{max} 52 dB(A) or the prevailing RBL (L_{90}) plus 15 dB, whichever is the greater,*

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy.

Other factors that may be important in assessing the extent of impacts on sleep include:

- *how often high noise events will occur*
- *the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development*
- *whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods)*
- *current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.*

Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under 'fast' time response. The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels.

B.2 PROJECT SPECIFIC TRIGGER LEVELS

The following table summarises the trigger levels applying at each of the identified "most impacted" receivers. These have been determined based on the NPfI methodology described above and the measured rating background noise levels.

The trigger levels in bold indicate the most stringent trigger level at each location.

Table 6 – Project Specific Trigger Levels

Location/Receiver Type	Time	RBL dB(A) L_{90}	Trigger Noise Level (dB(A) $L_{eq,15min}$)		
			Intrusiveness	Amenity	Max Event
R1, R2 - Residential	Day	51	56	**53**	N/A
	Evening	46	51	**43**	N/A
	Night	34	39	**38**	**L_{max} 52 dB(A)**
C1 - Commercial	Day	n/a	N/A	63	N/A

As the squash building does not operate during the night, a maximum noise level assessment is not required.