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Fairfield Hospital Enabling Works - At Grade Car Parks

Review of Environmental Factors (REF) #1 Noise and Vibration Impact Assessment

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TABLE OF CONTENTS

1 INTRODUCTION

This acoustic report has been prepared by Acoustic Logic on behalf of Health Infrastructure (HI) to assess the potential environmental impacts that could arise from infrastructure works at Fairfield Hospital, Polding Street & Prairie Vale Road, Prairiewood (the site). The project is seeking approval for a Development Without Consent (REF) application under Part 5 of the EP&A Act.

This report has been prepared to assess potential noise and vibration impacts. This report accompanies a Review of Environmental Factors (REF). for the construction and operation of three new car parking facilities, including:

- A new, permanent 70-space car park to the north
- A new, permanent 44-space car park to the west; and
- A new, temporary 32-space car park north of the main Hospital building, upon the existing inactive helipad.

Alongside associated works including:

- Site establishment and preparation including earthworks and tree removal
- Inground building services works and utility adjustments, including fire hydrant pipework
- Civil works including new sediment basin, two (2) OSD tanks
- Landscaping including tree replacement planting; and
- Installation of ancillary works including, but not limited to; lighting and fencing.

Noise and vibration impacts assessed include:

- Construction noise and vibration emissions
- Operational 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 supplementing the review of environmental factors (REF) and should not be used or relied on for any other purpose.

1.1 STATEMENT OF SIGNIFICANCE

Based on the identification of potential issues, and an assessment of the nature and extent of impacts of the proposed development, it is determined that:

- The extent and nature of potential impacts are generally moderate and will not have significant adverse effects on the locality, community and the environment.
- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal effect on the locality.

2 REFERENCED DOCUMENTS

2.1.1 Background Information Used

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

- The architectural drawings prepared by Architectus for the proposal.
- The traffic report prepared by TTW for the proposal.

2.1.2 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
- NSW EPA – 'Road Noise Policy" ("**RNP**") March 2011
- NSW Department of Environment and Conservation Assessing Vibration: A Technical Guideline" (Feb 2006)
- German Standard DIN 4150-3 (2016) – '*Vibration in Buildings – Part 3: Effects on Structures*'

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)
Noise Management Level (NML)	Construction noise affected management level as per the quantitative method of the Interim Construction Noise Guideline (ICNG) EPA
Highly Noise Affected Management Level (HNAML)	Construction "highly" noise affected management level as per the quantitative method of the Interim Construction Noise Guideline (ICNG) EPA

* Unless nominated otherwise.

4 SITE DESCRIPTION AND THE PROPOSAL

The site is located at the Fairfield Hospital Campus on the corner of Polding Street & Prairie Vale Road, Prairiewood, within the Fairfield Local Government Area (LGA). The project is located within the development parcel, legally described as Lot 101 DP 1032949, as identified in Figure 1 below.

4.1 REF DELIVERABLE REQUIREMENT REPORTING

Table 1 – REF Deliverable

REF Requirement	Description	Relevant Section of Report
Noise and Vibration Report	• Noise and Vibration Report (including baseline noise model, noise criteria and construction and operational impact assessment and recommended mitigations • If any changes to an existing helipad, including location, noise and vibration assessment to also consider impacts of this.	Section 5 & Section 6

4.2 THE PROPOSAL

The proposal is for the enabling works associated with the Fairfield Hospital redevelopment. The enabling works include the construction and operation of three new car parking facilities, including:

- A new, permanent 70-space car park to the north
- A new, permanent 44-space car park to the west; and
- A new, temporary 32-space car park north of the main Hospital building, upon the existing inactive helipad.

Alongside associated works including:

- Site establishment and preparation including earthworks and tree removal
- Inground building services works and utility adjustments, including fire hydrant pipework
- Civil works including new sediment basin, two (2) OSD tanks
- Landscaping including tree replacement planting; and
- Installation of ancillary works including, but not limited to; lighting and fencing.

4.3 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)	Receiver Type	Comment
NCA1	Residential	Multi-level residential dwellings located east and west of Lily Street, Wetherill Park.
NCA2	Residential	Multi-level residential dwellings located along McKeown Street, Power Street, Pierce Close and Lemon Close, Prairiewood
NCA3	Residential	Multi-level residential dwellings located along Eccles Place, Belair Place, Kaputar Place and Bogong Place, Prairiewood
NCA4	Residential	Multi-level residential dwellings located along Power Street, Corio Road, Sherritt Place, Bradshaw Place and Byrne Place, Prairiewood
NCA5	Hospital	Hammondcare Braeside Hospital
NCA6	Commercial	Wetherill Park Police Station
NCA7	Residential	Multi-level residential dwellings located along Prairie Vale Road, Christie Street and Donahue Close, Prairiewood
NCA8	Residential	Residential flat building along Calabria Lane and Italia Avenue, Prairiewood
NCA9	Commercial/Retail	Stockland Wetherill Park Shopping Centre
NCA10	Educational Establishment	Prairiewood High School

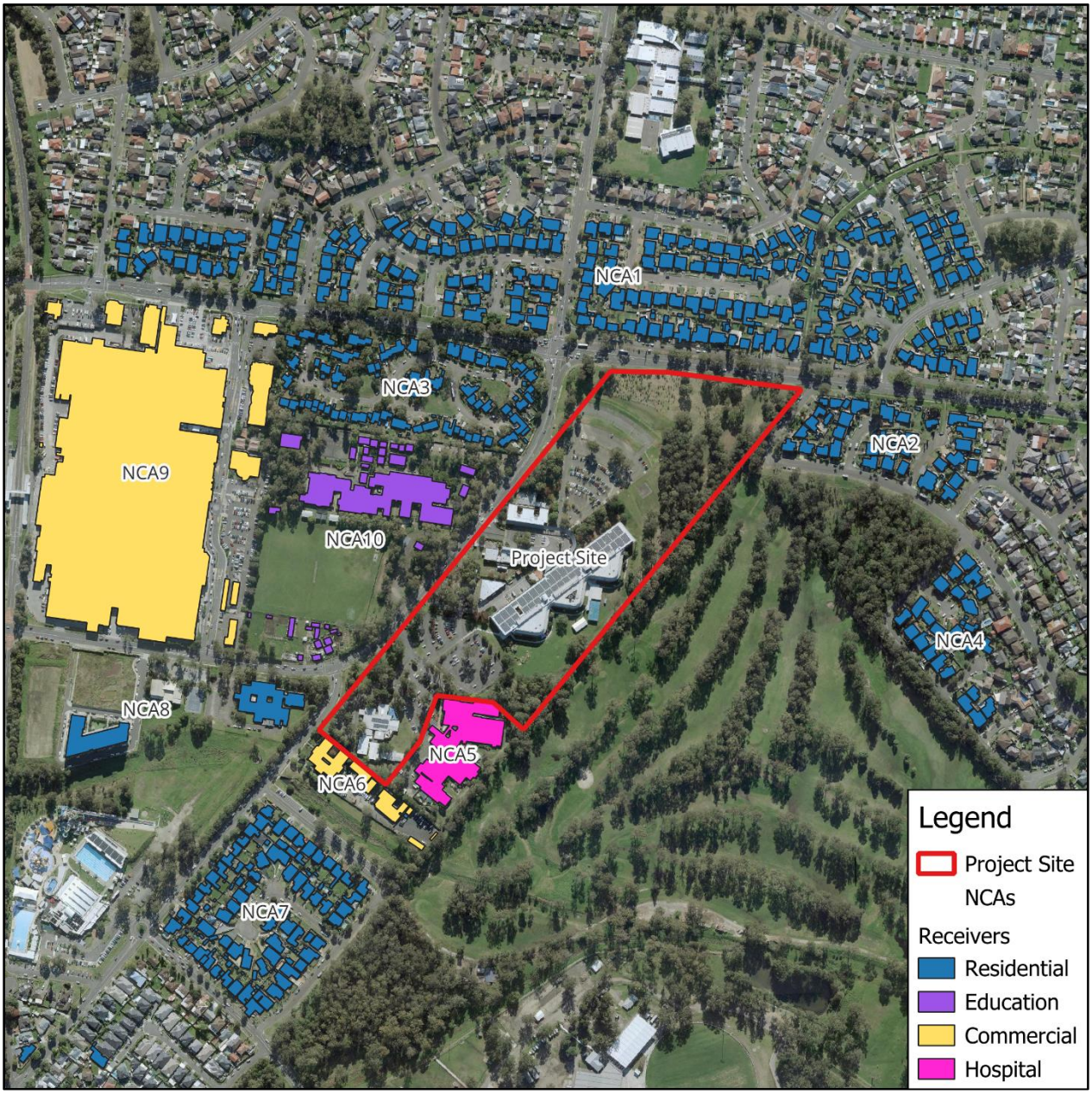


Figure 1 – Site Map and Local Context

5 SITE OPERATIONAL NOISE EMISSIONS ASSESSMENT

5.1 ENVIRONMENTAL NOISE AND VIBRATION SOURCES

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

- Onsite carparking noise
- Vehicle movements on local roads

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

Table 3 – Project Specific Trigger Levels

Location/Receiver Type	Time	Trigger Noise Level (dB(A) $L_{eq,15min}$)
NCA1, NCA2 & NCA4 (Residential)	Day	53
	Evening	43
	Night	38
NCA3 (Residential)	Day	58
	Evening	48
	Night	43
NCA5 (Hospital)	Noisiest 1-hour	35 (Internal) 50 (External)
NCA6 (Commercial)	When in Use	65
NCA7 & NCA8 (Residential)	Day	48
	Evening	43
	Night	38
NCA9 (Commercial)	When in Use	65
NCA10 (Educational Establishment)	Noisiest 1-hour period when in use	35

5.3 EVALUATION OF ON SITE NOISE EMISSIONS

5.3.1 On-grade Carpark Noise Emissions

From review of the traffic report prepared by TTW, we note that the proposed carpark works will result in a net increase of 137 on-site parking spaces.

The proposal does not result in any changes to the existing hospital operations. As the proposed carpark works are in addition to existing car parking spaces, it is likely there will be a minor shift in carpark noise (<2dB) however it is unlikely to result in a perceptible noise increase to the existing carpark operations.

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 night time traffic movements are proposed, the impact on sleep from maximum noise events generated by these movements should also be considered for residential receivers.

We note that the traffic report prepared by TTW, dated 26th September 2025, concludes that whilst the proposal will result in a net increase of 137 on-site carparking spaces, and the proposal will not result in any changes to the existing hospital operations, the proposed works will not generate additional traffic generation and there will be insignificant impacts to the local road network.

On this basis, we do not expect there to be a perceptible increase (<2dB) in traffic noise on local roads.

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.

7.1 CONSTRUCTION NOISE MANAGEMENT LEVELS

7.1.1 Residential Receivers

Residential noise management levels are based on the "rating background noise level" ("**RBL**") applicable to the receivers. RBL's are typically determined by measuring the ambient noise environment using the methodology in the EPA NPfI. The measurements, analysis and RBL's determined for this project are summarised in APPENDIX B.

The ICNG construction noise management levels are summarised in the following table, along with how they should be used to manage impacts.

Table 4 – Construction Noise Management Levels

Management Level $L_{Aeq,(15min)}$*	**How to Apply**
Noise affected Management Level ("**NML**") RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur.

*** Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.**

The ICNG recommended standard hours are:

Table 5 – EPA ICNG Recommended Standard Hours of Construction Work

Construction Activity	**EPA ICNG Recommended Standard Hours**
Normal construction	Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays
Blasting	Monday to Friday 9 am to 5 pm Saturday 9 am to 1 pm No blasting on Sundays or public holidays
Construction Activities with impulsive or tonal noise emissions (CNVG & CNVS guideline)	Monday to Friday 8 am to 5 pm[1] Saturday 9 am to 1 pm[1] No work on Sundays or public holidays

(1) Works may be carried out in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block. *Continuous* includes any period during which there is less than a one-hour respite between ceasing and recommencing any of the work the subject of this condition.

7.1.2 Other Land Uses

For other land uses, the management levels are absolute noise levels, independent of the prevailing noise environment, so monitoring of the prevailing environment is not generally required for these uses. The ICNG construction noise management levels for uses other than residential dwellings are summarised in the following table.

Table 6 – Construction Noise Management Levels – Non Residential Uses

Land Use	Management Level, $L_{Aeq\ (15min)}$ (applies for times when properties are being used)
Commercial and Retail Outlets	70 (external)*
Classrooms at schools and other educational institutions	45 (Internal noise level)
Hospital wards and operating theatres	45 (Internal noise level)
Other Businesses	Project by project basis, consider maximum noise level recommended in AS 2107 for similar occupancies.*

*** Noise levels apply at the most affected occupied point of the premises. For other occupancies, noise levels are applied at the most affected point within 50m of the area boundary. Internal noise levels are assessed at the centre of an occupied room. Where internal noise levels cannot be measured, external noise levels may be used, with the equivalent external noise level determined using an appropriate external to internal noise reduction.**

The project specific NML's for the most impacted receivers are summarised in the following table using the objectives tabled above and the adopted RBL's.

Table 7 – Noise Management Levels for Most Impacted Receivers

Noise Catchment Area	RBL – dB(A)L_{90}	NML – dB(A)L_{eq}	HANML – dB(A)L_{eq}
NCA1	48	58	75
NCA2	48	58	75
NCA3	53	63	75
NCA4	48	58	75
NCA5	-	65	
NCA6	-	65 (external noise level) 45 (internal noise level)	
NCA7	43	53	75
NCA8	43	53	75
NCA9	-	65	
NCA10	-	65 (external noise level) 45 (internal noise level)	

* An external noise level of 65 dB(A) would result in an internal noise level of 45 dB(A) assuming a typical 20 dB(A) reduction for a standard façade. Therefore, compliance with the external NML will also result in compliance with the internal NML.

7.2 CONSTRUCTION VIBRATION MANAGEMENT LEVELS

7.2.1 Amenity Management

Vibration goals for the amenity of nearby land users are those recommended by the EPA document *Assessing Vibration: A technical guideline*. These levels (extracted from Tables 2.2 and 2.4 of the guideline) are presented in the following table for various types of vibration:

Table 8 -(Table 2.2 Assessing Vibration: A Technical Guideline) – Preferred and Maximum Weighted RMS Values for Continuous and Impulsive Vibration Acceleration (m/s2) 1-80Hz

Location	Assessment Period [1]	Preferred values		Maximum Values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous Vibration					
Critical areas[2]	Day or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.02	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058
Impulsive Vibration					
Critical areas[2]	Day or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

1 Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am.

2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate task require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS6472-1992.

Table 9 -(Table 2.4 Assessing Vibration: A technical guideline) – Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum Value	Preferred value	Maximum Value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am.
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas. Source: BS6472-1992.

7.2.2 Structure Damage Risk Criteria

7.2.2.1 Generally

German Standard DIN 4150-3 (2016) provides a guideline for acceptable levels of vibration velocity in building foundations, to assess the effects of vibration on structures. The table give guidance on the maximum accepted values of velocity at the foundation and in the plane of the highest floor of various types of buildings, to prevent any structural damage.

The table following lists the peak particle velocity, which is the maximum absolute value of the velocity signals for the three orthogonal components. This is measured as a maximum value of any of the three orthogonal component particle velocities when measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

It is noted that if measured vibration levels do not exceed the guidelines listed in the following table, damage that will reduce the serviceability of the building will not occur, and if damage to the building does occur, it is assumed that the damage is related to other causes. Furthermore, the DIN4150-3 guideline states the following regarding the limits presented in Table 1 of the standard:

"Exceeding the guideline values does not necessarily lead to damage. Should they be exceeded, however, further investigations may be necessary, such as determining and evaluating the stresses as detailed in 4.3 and 4.4.".

Table 10 -(Table 1 – DIN 4150-3 (2016)) – Guideline Values for Vibration Velocity, $v_{i,max}$, for Evaluating the Effects of Short-Term Vibration on Structures

	TYPE OF STRUCTURE	Guideline values for $v_{i,max}$ in mm/s				
		Foundation, all directions, i = x, y, z, at a frequency of			Topmost floor, horizontal direction, i = x, y	Floor slabs, vertical direction, i = z
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz [a]	All Frequencies	All Frequencies
L/C	1	2	3	4	5	6
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 **and** are of great intrinsic value (e.g. listed buildings) buildings that are under a preservation order)	3	3 to 8	8 to 10	8	20[b]

NOTE Even if guideline values as in line 1, columns 2 to 5, are complied with, minor damage cannot be excluded.

a At frequencies above 100 Hz, the guideline values for 100 Hz can be applied as minimum values.

b It may be necessary to lower the guideline value markedly to prevent minor damage

7.2.3 Hospital Specific Vibration Limits

The ASHRAE Handbook specifies vibration levels associated with potential disruption to the use of sensitive equipment within a building. The maximum vibration velocities [$mm.s^{-1}$] recommended from 1-100Hz is given in Figure 37 of the ASHRAE used in conjunction with recommended equipment requirements curves given in table 46. Figure 37 and table 46 from the 2007 ASHRAE document is presented below in Figure 2 and Table 11 respectively.

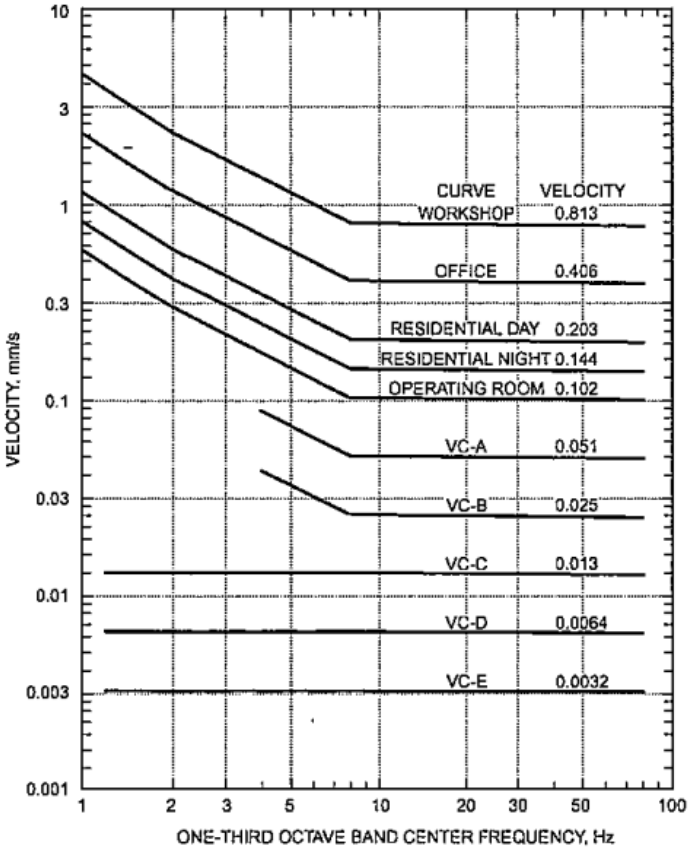


Fig. 37 Building Vibration Criteria for Vibration Measured on Building Structure

Figure 2 – Fig. 37 from 2007 ASHRAE Handbook: Vibration Criteria Curves

Table 11 – Tab. 46 from 2007 ASHRAE Handbook: Equipment Vibration Criteria

Equipment Requirements	Curve
Adequate for computer equipment, probe test equipment, and microscopes less than 40x magnification	0.203 (Residential – day)
Bench Microscopes up to 100x magnification; laboratory robots	0.102 (Operating Room)
Bench microscopes up to 400x magnification; optical and other precision balances; coordinate measuring machines; metrology laboratories; optical comparators; microelectronics manufacturing equipment; proximity and projection aligners, etc.	0.051 (VC – A)
Microsurgery, eye surgery, neurosurgery; bench microscopes at magnification greater than 400x magnification; optical equipment on isolation tables; microelectronic manufacturing equipment, such as inspection and lithography equipment (including steppers) to 3mm line widths	0.025 (VC – B)
Electron microscopes up to 30,000x magnification; microtomes; magnetic resonance imagers; microelectronics manufacturing equipment, such as lithography and inspection equipment to 1mm detail size	0.013 (VC – C)
Electron microscopes at magnification greater than 30,000x magnification; mass spectrometers; cell implant equipment; microelectronic manufacturing equipment such as, aligners, steppers and other critical equipment for photolithography with line widths of 1/2µm; includes electron beam systems	0.0064 (VC – D)
Un-isolated laser and optical research systems; microelectronics manufacturing equipment, such as aligners, steppers and other critical equipment for photolithography with line widths of 1/4µm; includes electron beam systems	0.0032 (VC – E)

a. See Figure 2 for corresponding vibration curve.

7.3 PRELIMINARY CONSTRUCTION NOISE ASSESSMENT

Construction noise emissions to nearby development depend on the activities being undertaken at the time, and where on the site the activities occur.

Construction noise levels at the surrounding receivers have been predicted using the SoundPLAN computer model based on the following inputs.

- ISO 9613-2:2024 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors" noise propagation standard.
- Meteorological Conditions – 20°C , 70% RH, neutral wind conditions.
- The plant sound power levels indicated in Table 12. These have been corrected for estimated typical operation duty indicated in the table using 10 x log(% duty/100).
- Elevation data for the site and surrounds was obtained from the project architectural drawings and obtained from Geoscape database.
- Source heights – 1.5m above the ground/building level of the noise source location, unless noted otherwise.
- Ground absorption of 0.6.

A detailed construction programme and staging is yet to be defined, therefore a preliminary assessment has been undertaken based on likely stages of the early works component. These are:

- Site Clearing & Excavation
    - Involving large sized excavators (~20t) with bucket, heavy-rigid trucks, concrete saws and petrol chainsaws
- Paving and Concrete Works
    - Involving a vibratory roller, concrete pump trucks and heavy rigid trucks
- Asphalting Works
    - Involving a pavement laying machine

7.3.1 Modelled Construction Noise Sources

Table 12 – Modelled Noise Sources

Construction Noise Source	Modelled Sound Power Level – dB(A)
Medium Rigid Truck travelling at 10km/h	100
Medium Rigid Truck Idle	95
Large Excavator (~20t)	105
Concrete Saw	118
Concrete Pump	109
Vibratory Roller	114
Pavement Laying Machine	114

7.3.2 Predicted Noise Levels

Table 13 – Predicted Noise Impacts – Excavation

Location/Noise Catchment Area	Highest Predicted Level dB(A) L_{eq}	NAML dB(A) L_{eq}	HANML dB(A) L_{eq}	Requires Assessment of Additional Management
NCA1	65	58	75	Yes
NCA2	63	58	75	Yes
NCA3	69	63	75	Yes
NCA4	56	58	75	No
NCA5	67	65	-	Yes
NCA6	54	65 (external noise level) 45 (internal noise level)	-	No
NCA7	44	53	75	No
NCA8	60	53	75	Yes
NCA9	59	65	-	No
NCA10	70	65 (external noise level) 45 (internal noise level)	-	Yes

Table 14 – Predicted Noise Impacts – Paving and Concrete Works

Location/Noise Catchment Area	Highest Predicted Level dB(A) L_{eq}	NML dB(A) L_{eq}	HANML dB(A) L_{eq}	Requires Assessment of Additional Management
NCA1	48	58	75	No
NCA2	44	58	75	No
NCA3	48	63	75	No
NCA4	37	58	75	No
NCA5	46	65	-	No
NCA6	35	65 (external noise level) 45 (internal noise level)	-	No
NCA7	30	53	75	No
NCA8	40	53	75	No
NCA9	39	65	-	No
NCA10	50	65 (external noise level) 45 (internal noise level)	-	No

Table 15 – Predicted Noise Impacts – Asphalting Works

Location/Noise Catchment Area	Highest Predicted Level dB(A) L_{eq}	NAML dB(A) L_{eq}	HANML dB(A) L_{eq}	Requires Assessment of Additional Management
NCA1	52	58	75	No
NCA2	48	58	75	No
NCA3	52	63	75	No
NCA4	40	58	75	No
NCA5	50	65	-	No
NCA6	38	65 (external noise level) 45 (internal noise level)	-	No
NCA7	32	53	75	No
NCA8	44	53	75	No
NCA9	42	65	-	No
NCA10	54	65 (external noise level) 45 (internal noise level)	-	No

7.3.2.1 Discussion of Predicted Results

The analysis indicates:

- The excavation work is likely the phase of the project that will require an assessment of additional management. Most receivers are predicted to exceed the NML/HNAML levels.
- During the remaining works, it is unexpected that additional management is required for external receivers. Sensitive receivers within the Hospital campus will likely require additional assessment and further management.

Where exceedances occur, the most effective mitigation investigation strategy is likely to be:

- Select the quietest plant/activity available (or retrofit acoustic treatment to the plant such as residential class mufflers) to minimise any NAML exceedances.
- If any residual exceedances, investigate the use of additional barriers to screen the affected receivers.
- If any remaining residual significant exceedances, investigate time restrictions (e.g. avoiding loud early morning works at the residences) and notification of affected receivers when works likely to exceed the NAML's is likely to occur.

For further management and control of potential noise impacts, refer to Section 7.5.

7.4 PRELIMINARY VIBRATION IMPACT ASSESSMENT

Significant vibration generating equipment is likely to be used during the paving work of the project (vibratory roller). It is not expected that significant vibration generation equipment will be used during the remaining construction phases

A precise assessment of structure-borne emissions from the proposed works is not possible due to the large number of unknowns including the actual equipment employed, how it is operated, site conditions, etc.

Notwithstanding, vibration and structure-borne noise levels shall be carefully monitored and verified on site during works by the contractor to manage impacts to the surrounding external receivers and internal receivers within the existing hospital.

7.5 NOISE AND VIBRATION MANAGEMENT AND CONTROL

The flow chart that follows illustrate the process followed to assess construction activities prior to the start of work on site, and for the ongoing investigation of noise and vibration impacts during the construction period.

The ICNG recommends "feasible and reasonable" mitigation measures to be implemented where works generate noise levels above the out of normal hours NML but does not specify what mitigation measures or to what extent these measures should be applied.

Specific mitigation measures shall be developed during the preparation of the detailed construction noise and vibration management plan in consultation with the Hospital campus, the head contractor and other relevant representatives.

7.5.1 General Noise Control Methods

The determination of appropriate additional noise control measures will be dependent on the particular activities and the construction equipment and plant identified as requiring future acoustic treatments to those already identified in this report. This section provides an outline of available methods which have previously been used on similar construction sites and may be possible on this site.

7.5.1.1 Selection of Alternate Appliance or Process

Where a particular activity or plant and equipment is found to generate noise levels that exceed the management levels, it may be possible to select an alternative approach or plant and equipment. For example; the use of excavator mounted hydraulic hammers of the site may potentially generate high levels of noise. By carrying this activity by using concrete saws or smaller plant here practical, construction noise levels and/or length of exposure to construction noise levels may be reduced.

7.5.1.2 Acoustic Barriers

The placement of barriers at the source is generally only effective for static plant. Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

The degree of noise reduction provided by barriers is dependent on the amount by which the line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

Barriers are used to provide shielding and do not act as an enclosure. The material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier screening. In this case, the use of a material such as 15mm plywood (or equivalent material) would be acceptable for the barriers.

7.5.2 Silencing Devices

Where construction methodologies or plant and equipment permit, investigate the use of silencing devices. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts, for example.

7.5.3 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

7.5.4 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes, for example, investigating the possibility of locating fixed plant items as far as possible from residents, rotating plant and activities to provide respite to receivers, scheduling activities after the construction of buildings that will screen receivers, avoiding noise sensitive periods for receivers, identify “safe” working distances, etc.

7.5.5 Vibration Management

The following principles should be considered to manage adverse vibration impacts identified:

- Obtaining separate structural or specialist advice for critical or fragile structures as to the level of damage risk.
- Selection of processes that minimise structure and ground vibration – generally avoiding percussive methods.
- Use smallest plant that is able to efficiently undertake the work activity.
- Lay vibration absorbing mats to cushion impacts from falling debris.
- Application of vibration dampening pads to metal surfaces subject to impacts.
- When demolishing, cut control joints in structures to form vibration "breaks", or work away from sensitive receiver locations to form natural vibration breaks in propagation path.
- Monitoring of structures using attended and/or unattended monitors with alarms.
- Time scheduling works to minimise amenity impacts.
- Communicating with affected receivers.
- Identify "safe" working distances to sensitive receivers/structures for various activities by conducting site simulation tests and limiting activities within those distances to those that are not likely to exceed vibration goals. The outcome of the simulation testing is a table of minimum working distances for each operation likely to cause significant vibration. The table below indicates an estimate of typical minimum working distances for initial planning purposes, which should be confirmed by site testing.

Table 16 – Recommended Base Minimum Working Distances for Vibration Intensive Plant from Sensitive Receivers

Plant item	Rating / Description	Minimum Working Distance			
		Cosmetic Damage			Human Response
		Light-Framed Structure (BS 7385)	Residential Structures (DIN 4150)	Heritage and Other Sensitive Structures (DIN 4150)	NSW EPA's Vibration Guideline
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	18.5	14 m	15m
	< 100 kN (Typically 2-4 tonnes)	6 m	17.8	16 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	43	33 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	51.5	41 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	-	54 m	100 m
	> 300 kN (> 18 tonnes)	25 m	-	68 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	-	5 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	-	19 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	-	60 m	73 m
Vibratory Pile Driver	Sheet piles	20 m	-	50 m	100 m
Pile Boring	≤ 800 mm	2 m (nominal)	-	5 m	7 m
Jackhammer	Hand held	1 m (nominal)	-	2 m	3 m
Profiler	Wirtgen W210	4 m	-	-	-
Asphalt Paver	Vogele Super 1800-3	1 m	-	-	-
Steel Drum Roller	Hamm HD70 (Oscillating Mode)	2 m	-	-	-
Steel Drum Roller	Hamm HD70 (Static Mode)	1 m	-	-	-

8 SUMMARY OF COMPLYING MITIGATION

Initial modelling indicated that additional mitigation is needed to achieve compliance with the trigger levels. This additional mitigation is described below, along with other measures to minimise impacts.

8.1 CONSTRUCTION NOISE

- 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.

9 CONCLUSION

This report presents an acoustic assessment of potential noise and vibration associated with the redevelopment of Fairfield Hospital.

Operational noise and vibration have been assessed against the requirements noted in Section 5 and Section 6. Based on the proposal, operational noise and vibration impacts are expected to be minimal and have little impact on the surrounding amenity.

Preliminary noise and vibration emissions during construction have been identified and assessed. These are to be managed in accordance with the EPA "Interim Construction Noise Guideline", as indicated in Section 7 of this report. A Construction Noise and Vibration Management Plan shall be prepared by the engaged contractor for the management of noise and vibration impacts to both internal (within the Hospital campus) and external receivers during the construction works.

Mitigation measures and/or recommendations have been made in Section 7.5 and APPENDIX A.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Adrian Zappia
MAAS

APPENDIX A SUMMARY OF MITIGATION MEASURES

Table 17 – Summary of Mitigation Measures

Project Stage Design (D) Construction (C) Operation (O)	Mitigation Measure	Relevant Section of Report
C	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.	Section 7

APPENDIX B 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.
- Noise generated by adjacent land uses.

B.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.

B.2 UNATTENDED LONG TERM NOISE MONITORING

B.2.1 Equipment Used

Unattended noise monitoring was conducted using two Rion NL-42 (Type 2) noise monitors which were field calibrated before and after the monitoring period using a 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.

B.2.2 Locations Monitored

The locations monitored are indicated in Figure 3. Photographs of the monitoring locations are provided below in Figure 4 to Figure 6.

B.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 Horsley Park Equestrian Centre AWS.

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 0.5 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:

- Wednesday, 27th November 2024 – Day-time period (All Monitors)
- Thursday, 28th November 2024 – Evening Period (All Monitors)
- Friday, 29th November 2024 – All Periods (All Monitors)
- Saturday, 30th November 2024 – Daytime/Evening Period (All Monitors)
- Saturday, 30th November 2024 – Night-time Period (Monitor Location 2)

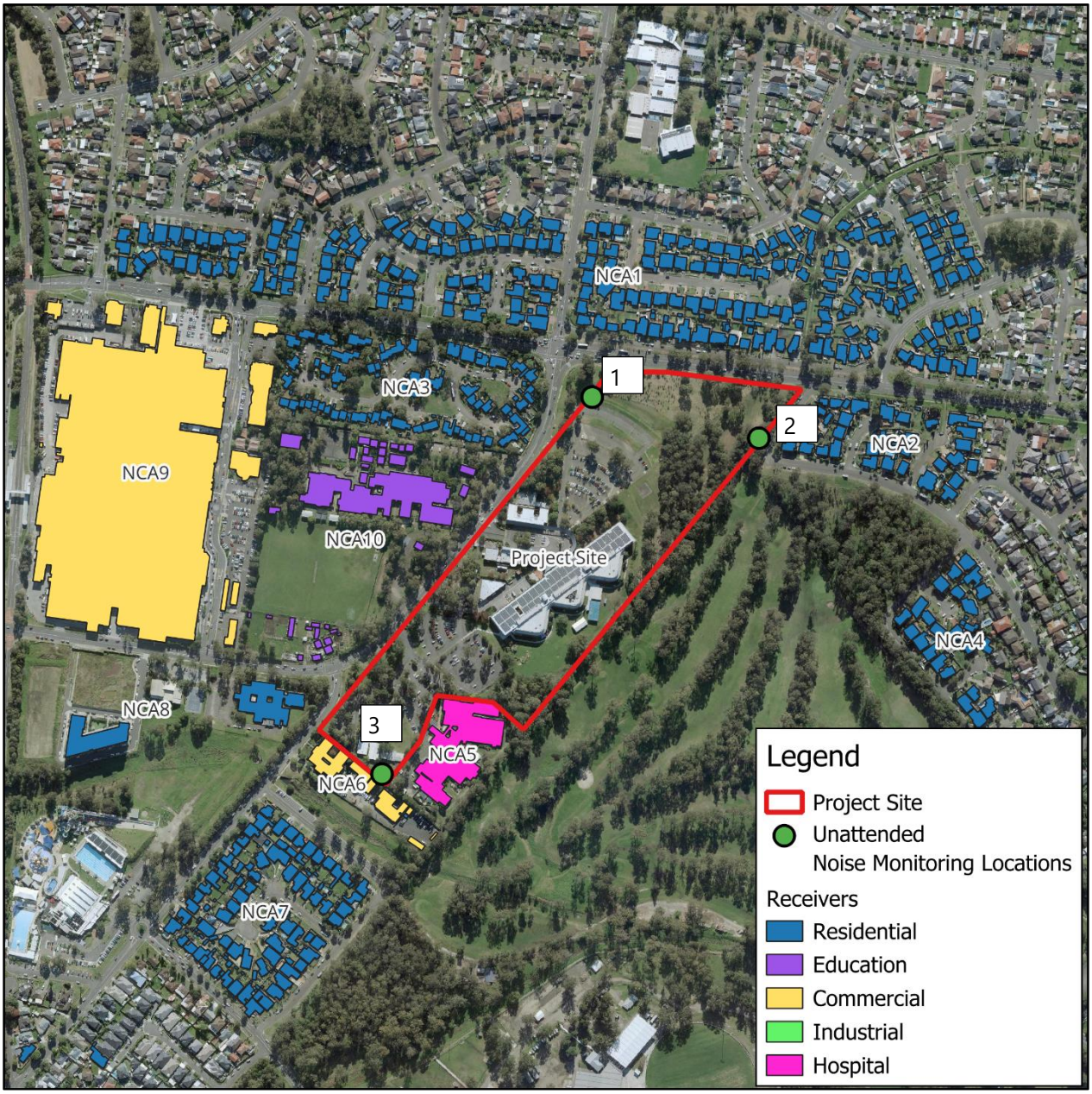


Figure 3 – Noise Monitoring Locations

Figure 4 – Noise Monitoring Location 1

Figure 5 – Noise Monitoring Location 2

Figure 6 – Noise Monitoring Location 3

B.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.

B.4 RATING BACKGROUND NOISE LEVELS

The following tables summarise 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 18 – Assessment Background Noise Levels – Location 1

Location	Date	Assessment Background Noise Level – dB(A)L_{90}		
		Day	**Evening**	**Night**
Cnr of Prairevale Road and Polding Street, Prairewood (Location 1)	Thursday, 21st November 2024	53	54	37
	Friday, 22nd November 2024	53	53	40
	Saturday, 23rd November 2024	52	51	38
	Sunday, 24th November 2024	51	52	37
	Monday, 25th November 2024	53	52	38
	Tuesday, 26th November 2024	52	51	40
	Wednesday, 27th November 2024	-	51	37
	Thursday, 28th November 2024	53	-	38
	Friday, 29th November 2024	-	-	-
	Saturday, 30th November 2024	-	-	39
	Sunday, 1st December 2024	52	52	40
	Monday, 2nd December 2024	-	-	-
	Calculated RBL	**53**	**52**	**38**
	Adopted RBL	**53**	**52**	**38**

Table 19 – Assessment Background Noise Levels – Location 2

Location	Date	Assessment Background Noise Level – dB(A)L_{90}		
		Day	**Evening**	**Night**
McKewon Street, Wetherill Park (Location 2)	Thursday, 21st November 2024	48	47	35
	Friday, 22nd November 2024	49	46	36
	Saturday, 23rd November 2024	48	46	36
	Sunday, 24th November 2024	46	46	34
	Monday, 25th November 2024	49	46	36
	Tuesday, 26th November 2024	49	45	37
	Wednesday, 27th November 2024	50	45	37
	Thursday, 28th November 2024	48	-	36
	Friday, 29th November 2024	-	-	-
	Saturday, 30th November 2024	-	-	-
	Sunday, 1st December 2024	46	47	38
	Monday, 2nd December 2024	-	-	-
	Calculated RBL	**48**	**46**	**36**
	Adopted RBL	**48**	**46**	**36**

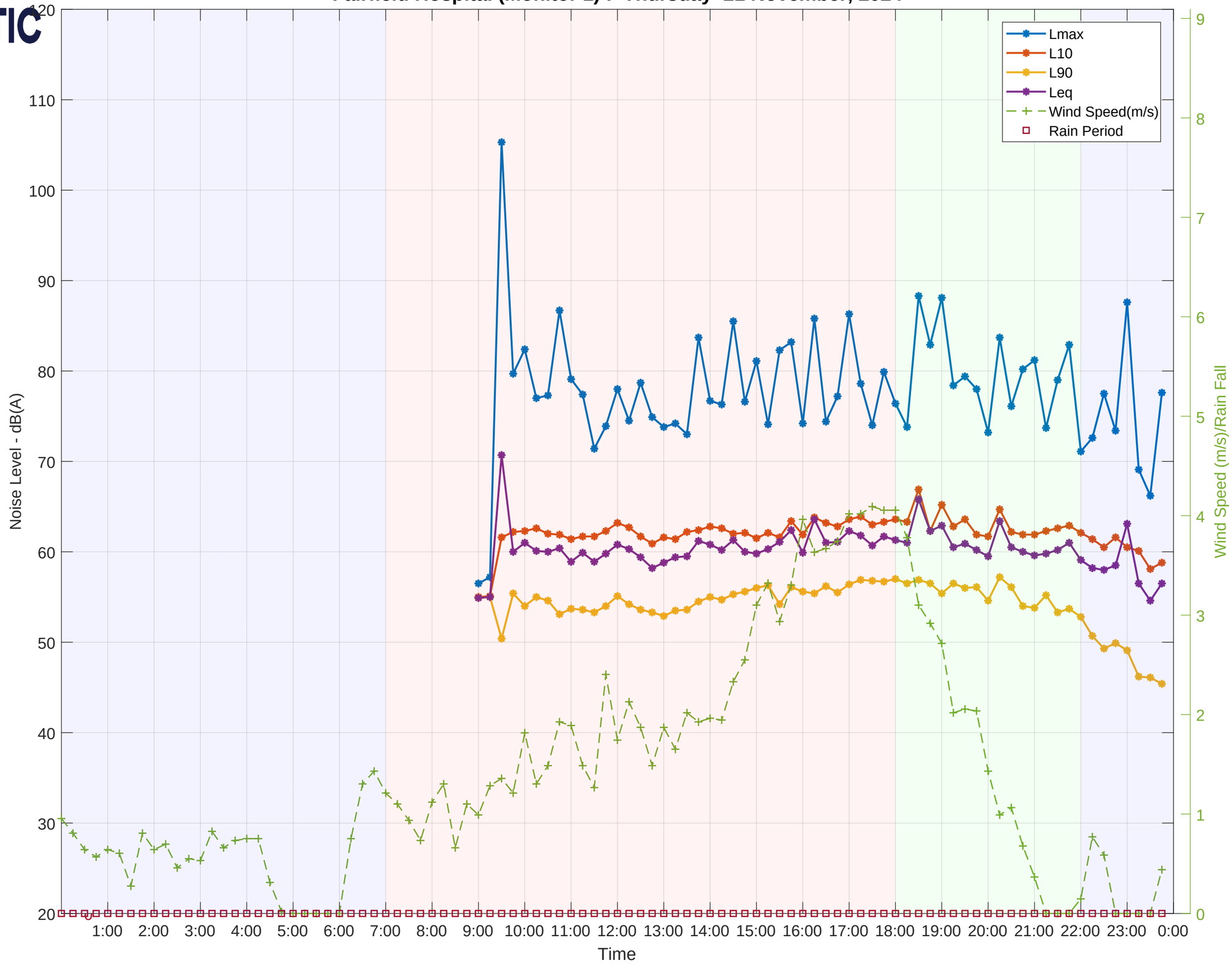
Table 20 – Assessment Background Noise Levels – Location 3

Location	Date	Assessment Background Noise Level – dB(A)L_{90}		
		Day	**Evening**	**Night**
Fairfield Drug Health Services/Rehabilitation Centre (Location 3)	Thursday, 21st November 2024	43	44	39
	Friday, 22nd November 2024	44	44	39
	Saturday, 23rd November 2024	42	43	40
	Sunday, 24th November 2024	41	42	39
	Monday, 25th November 2024	43	43	38
	Tuesday, 26th November 2024	44	43	40
	Wednesday, 27th November 2024	45	42	40
	Thursday, 28th November 2024	44	-	40
	Friday, 29th November 2024	-	-	-
	Saturday, 30th November 2024	-	-	42
	Sunday, 1st December 2024	42	43	-
	Monday, 2nd December 2024	-	-	-
	Calculated RBL	**43**	**43**	**40**
	Adopted RBL	**43**	**43**	**40**

B.5 UNATTENDED MONITORING DATA GRAPHS

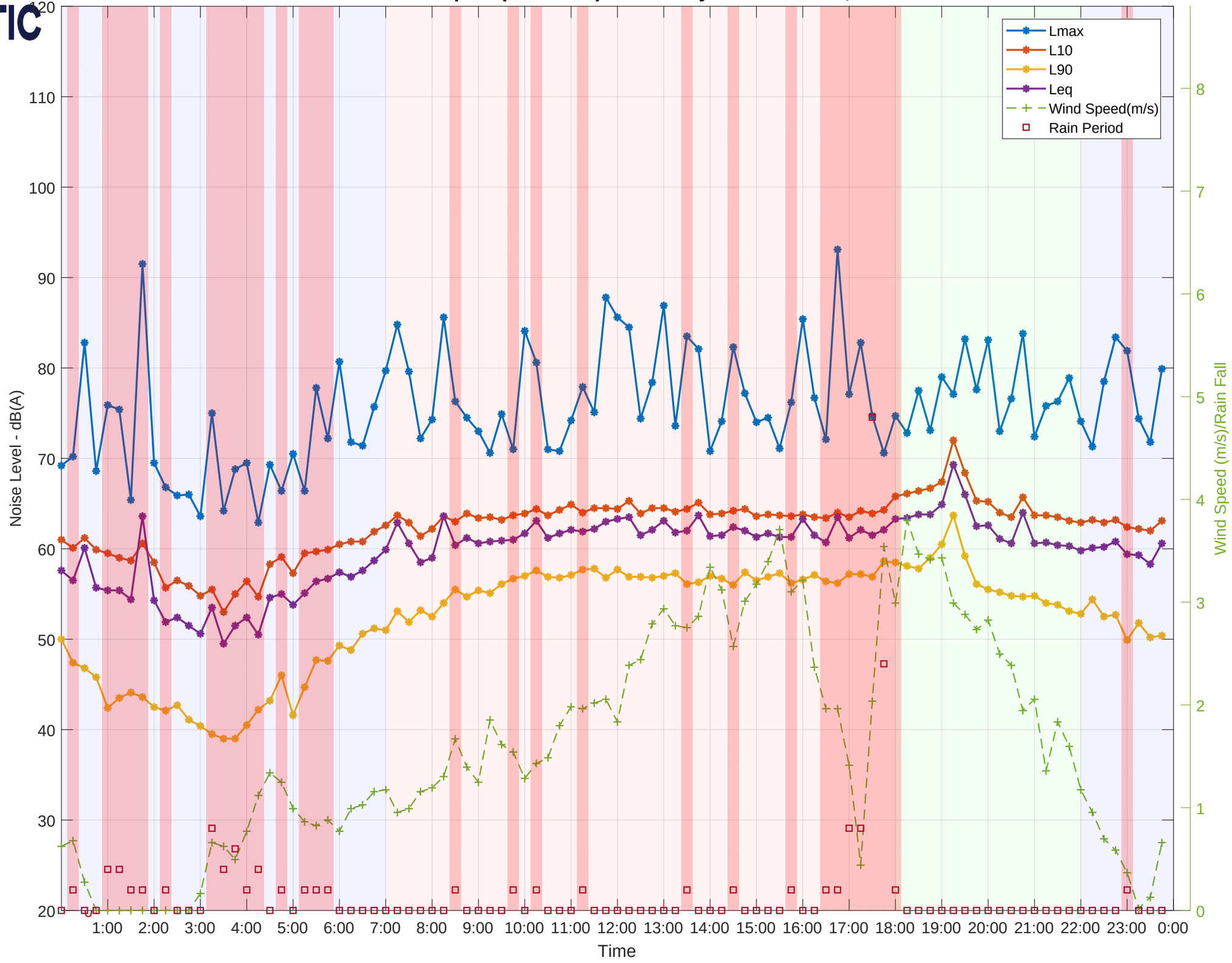
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Thursday 21 November, 2024



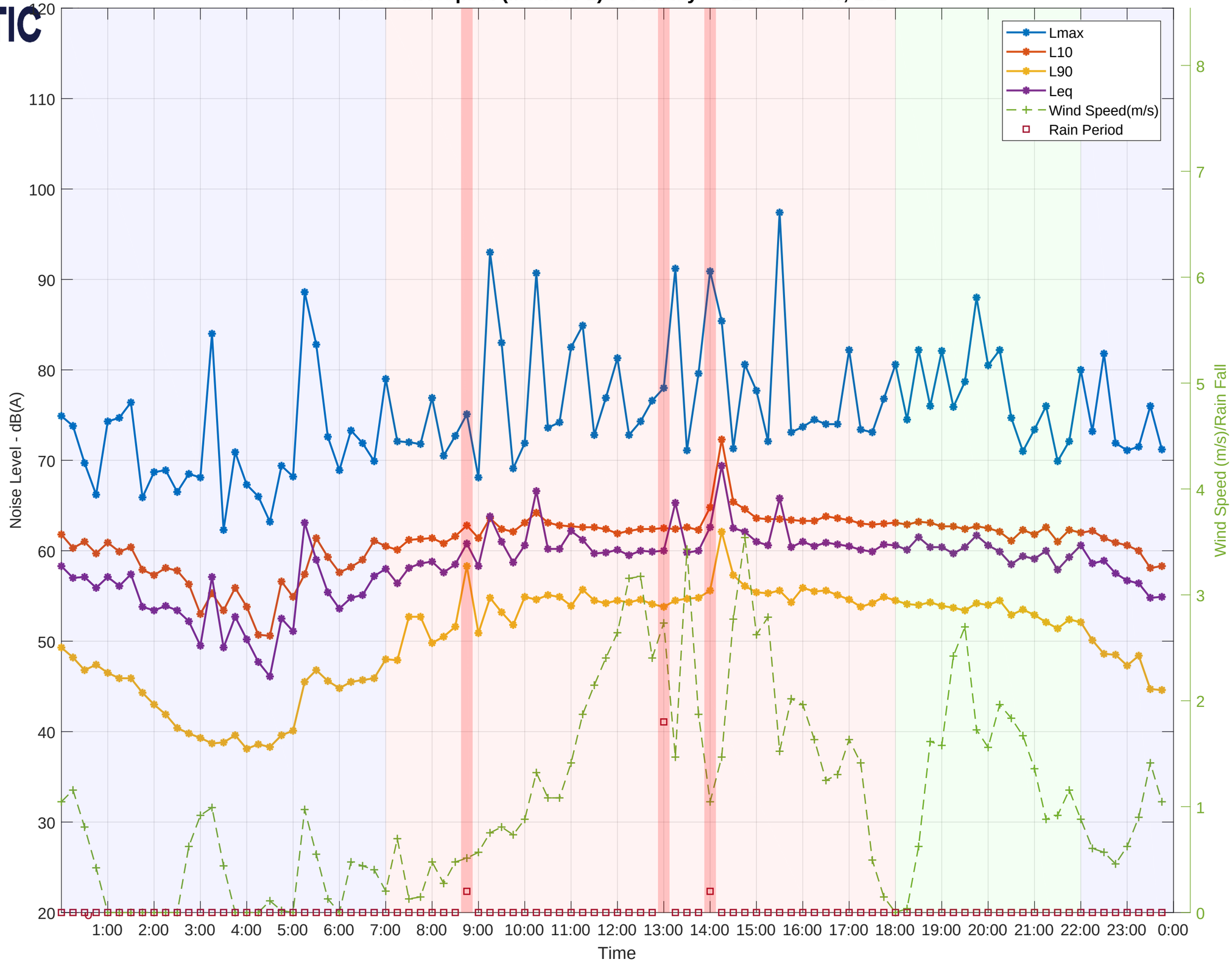
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Saturday 30 November, 2024

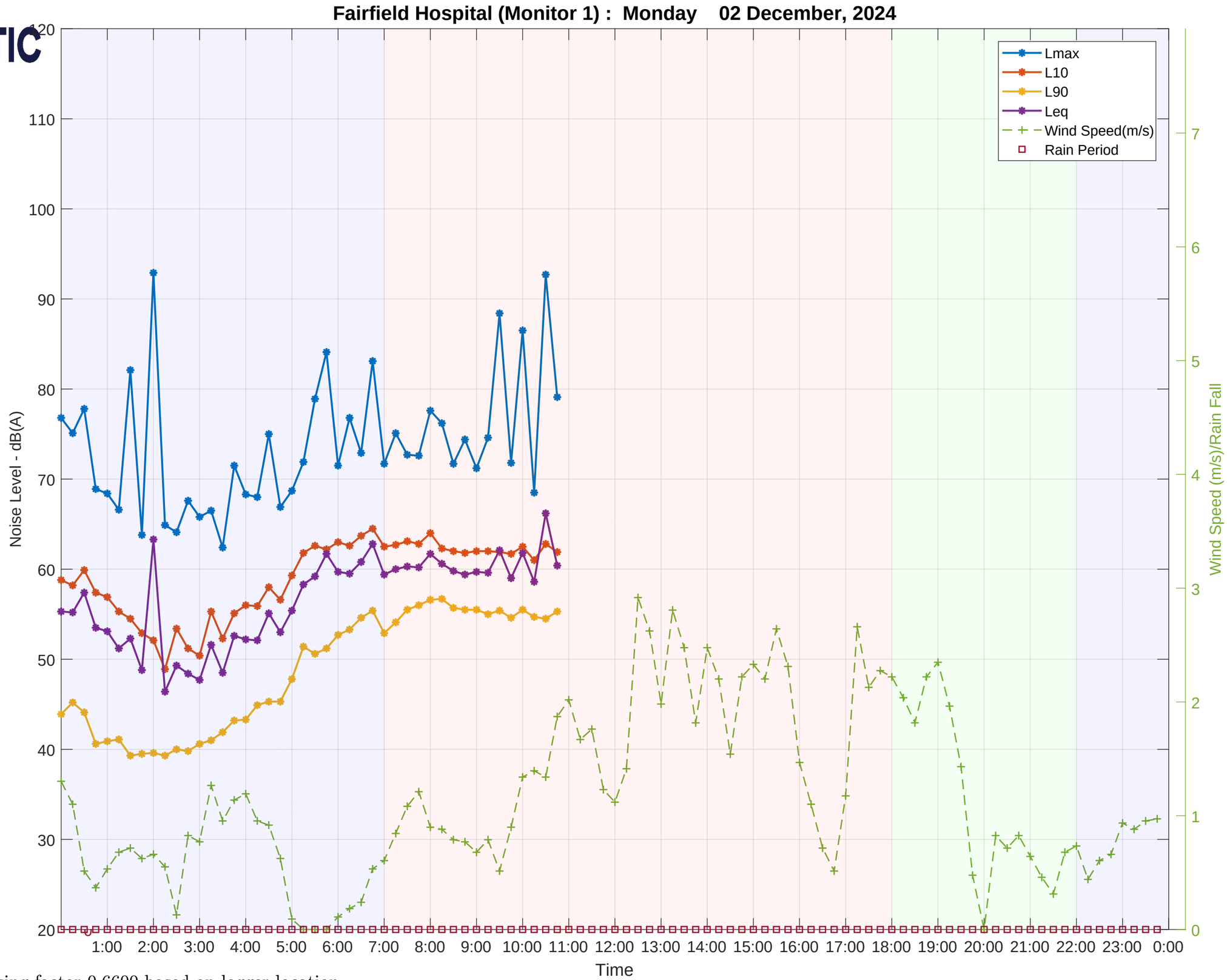


ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Sunday 01 December, 2024



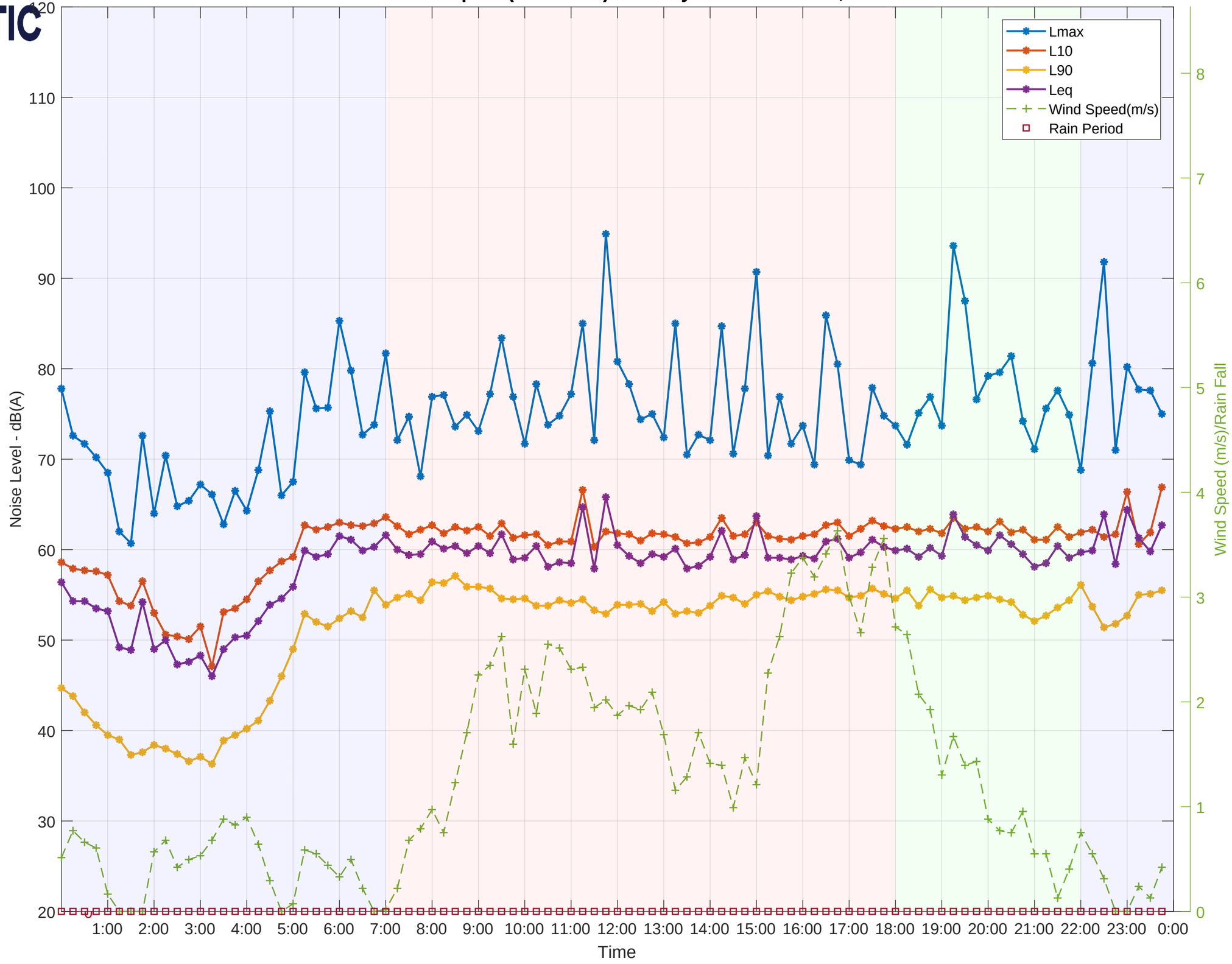
ACOUSTIC LOGIC



Wind Speed is corrected using factor 0.6600 based on logger location

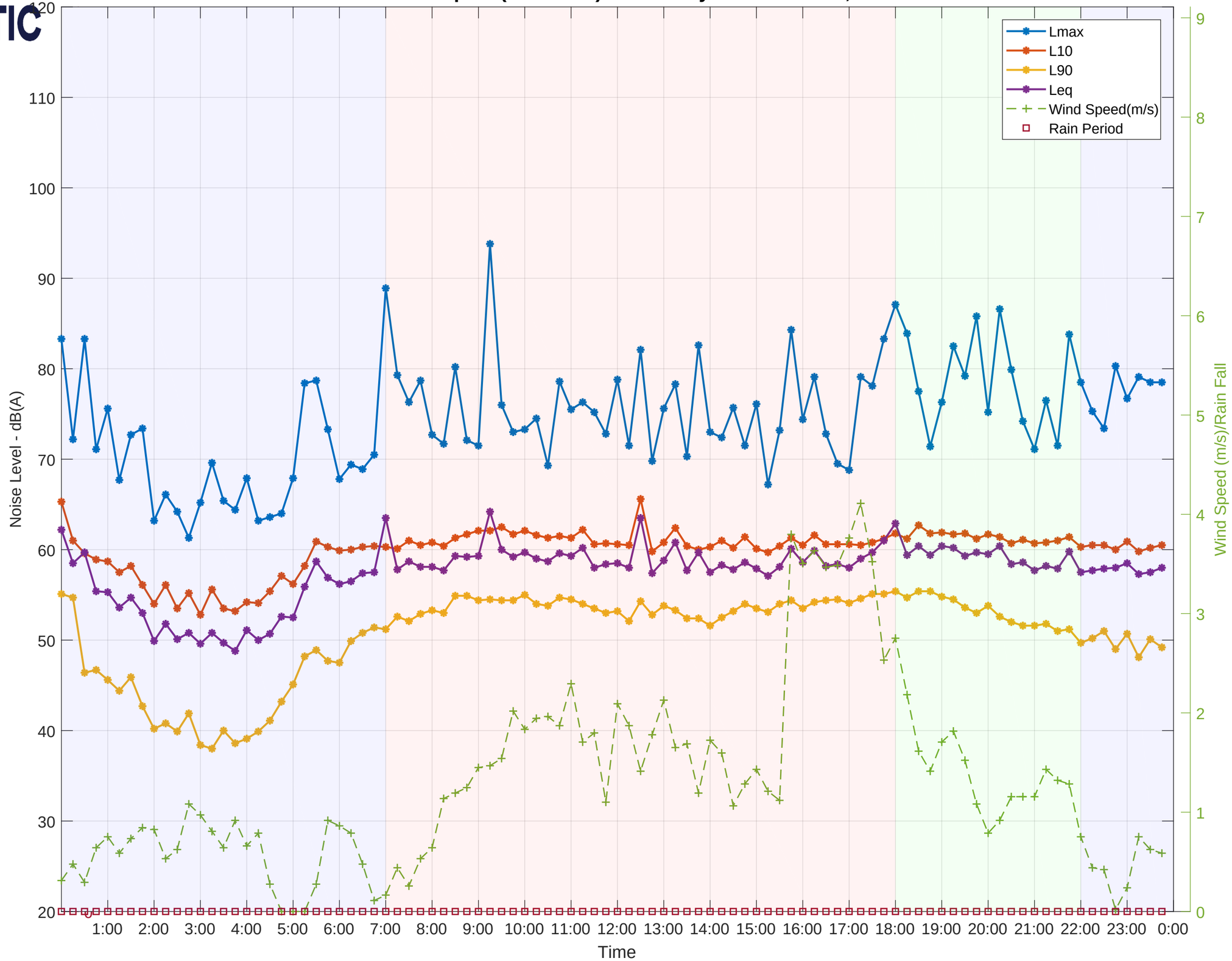
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Friday 22 November, 2024



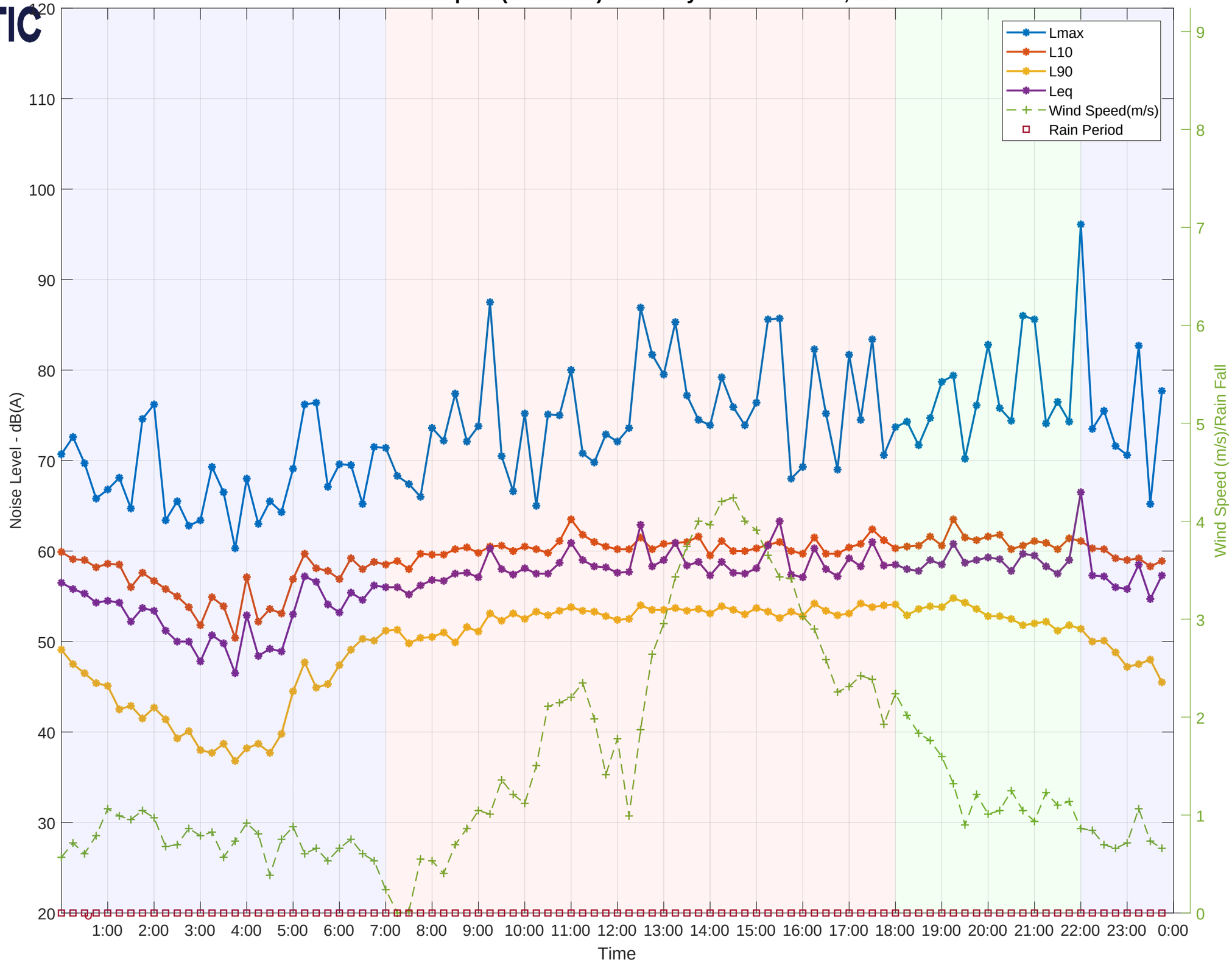
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Saturday 23 November, 2024



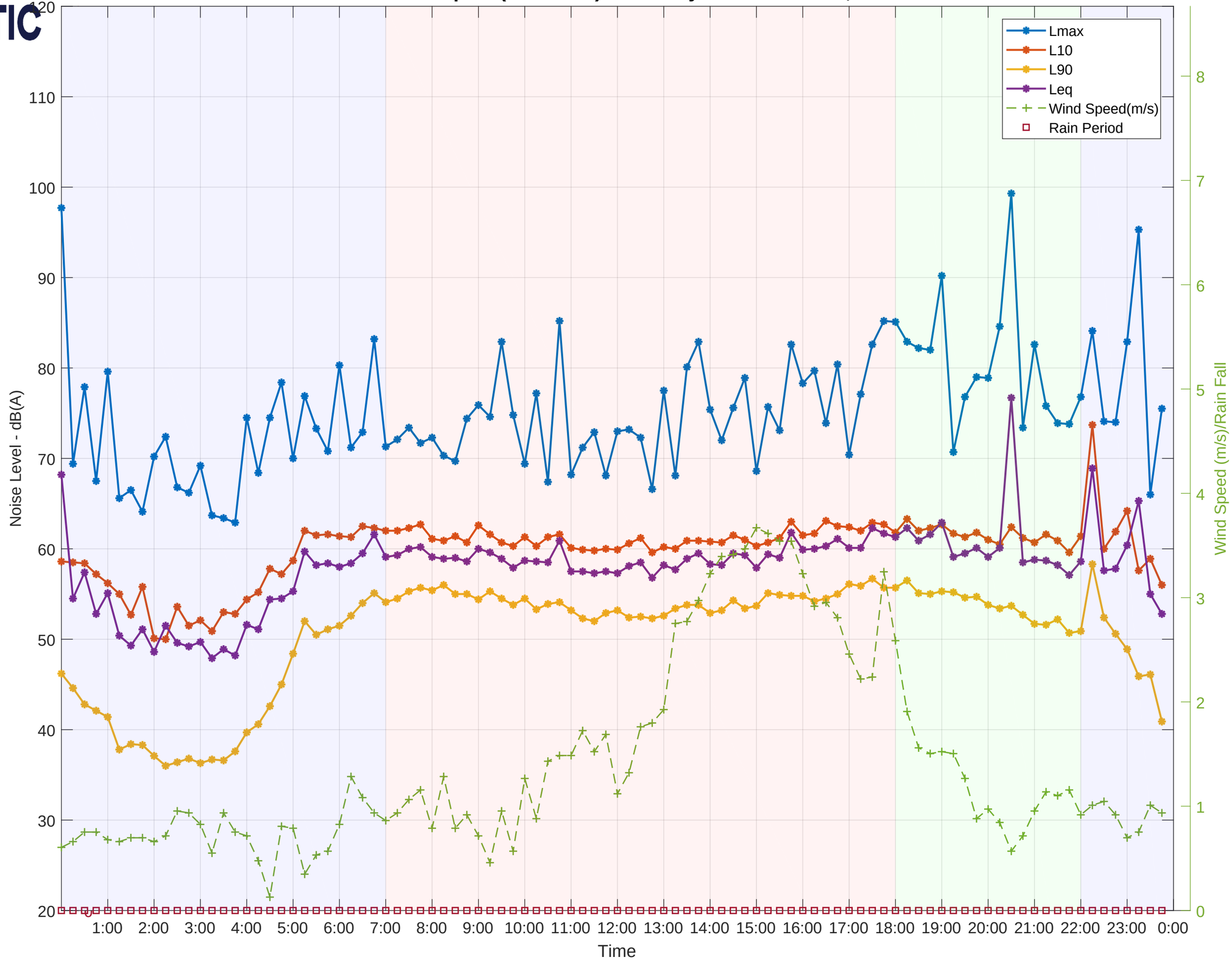
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Sunday 24 November, 2024



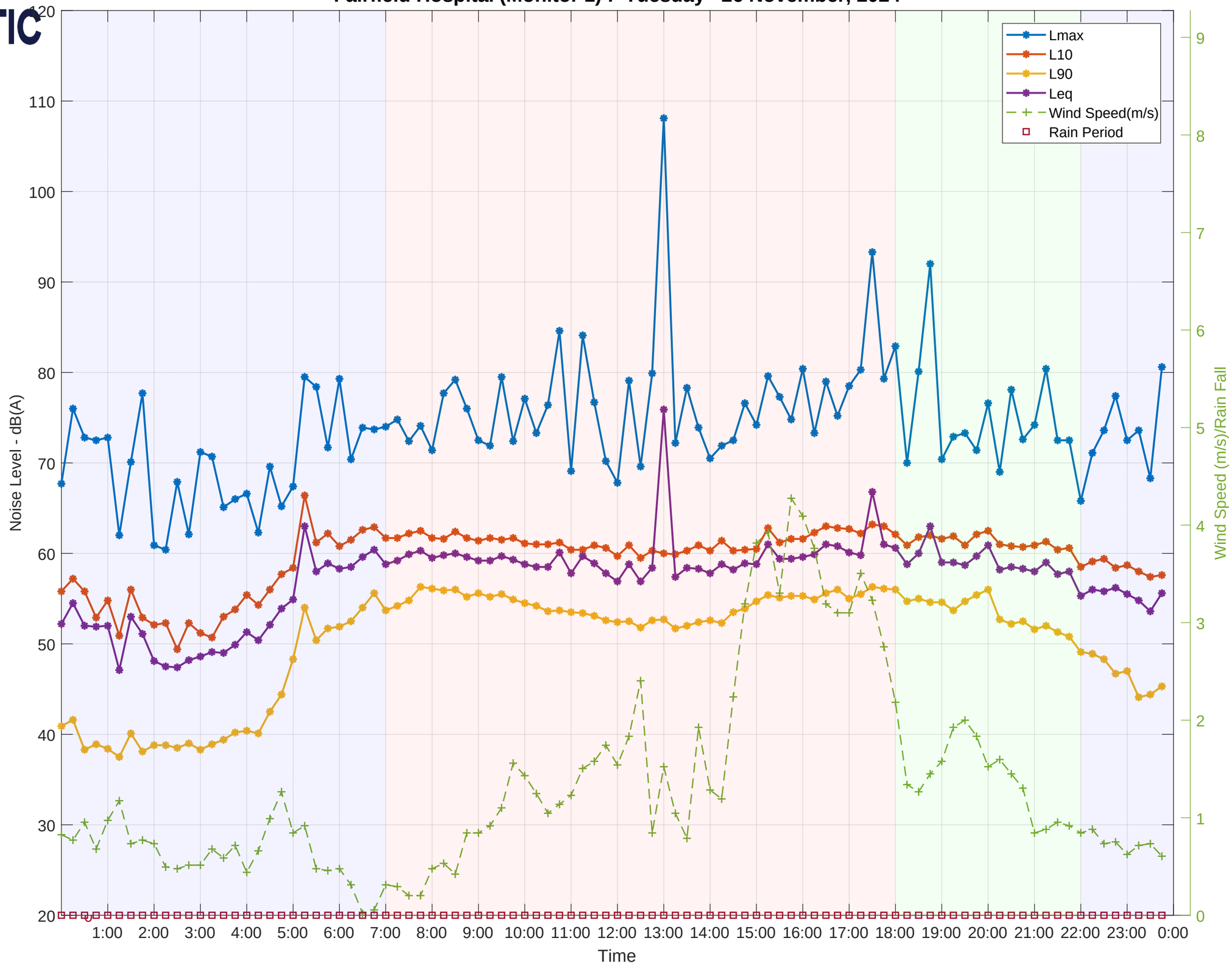
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Monday 25 November, 2024



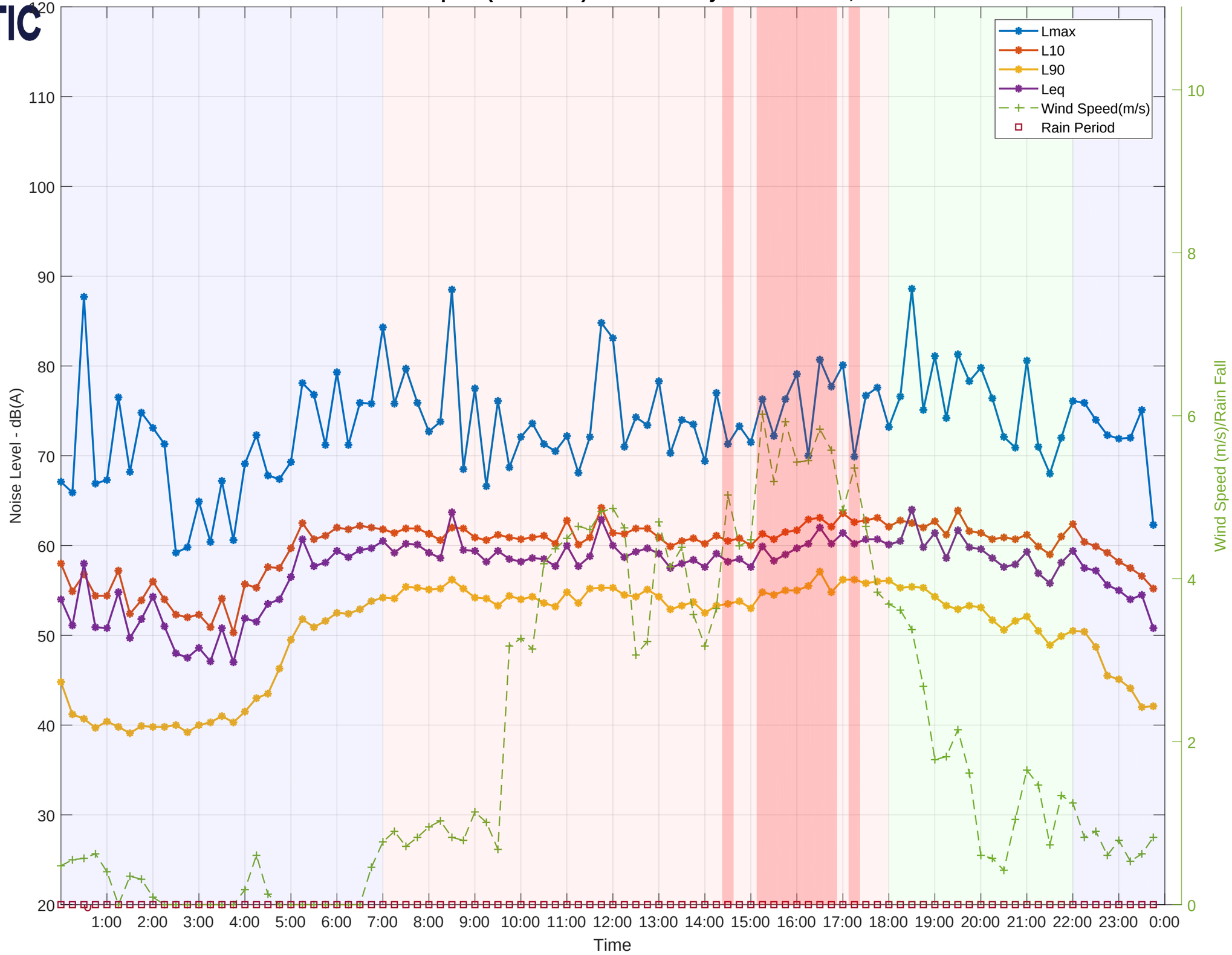
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Tuesday 26 November, 2024



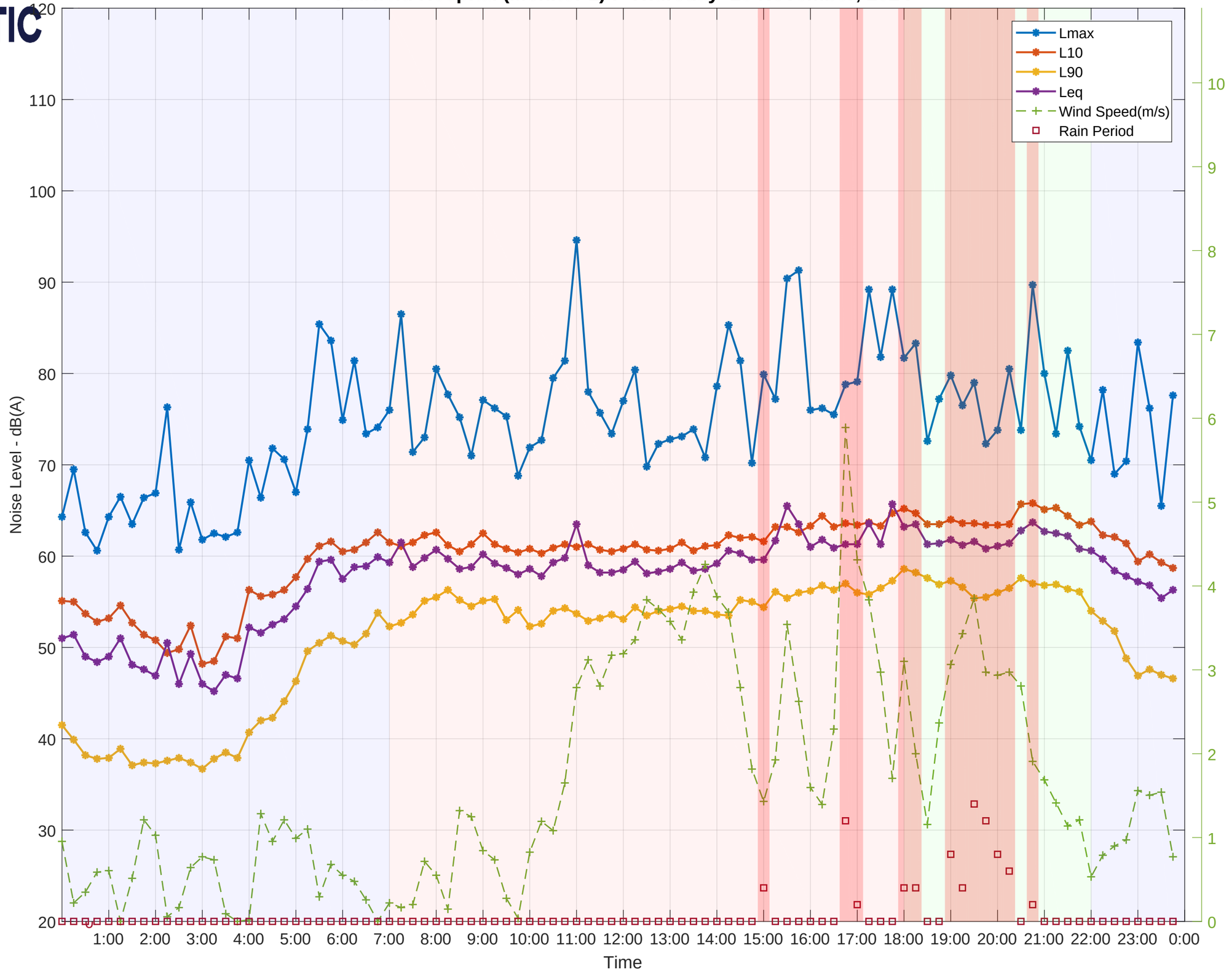
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Wednesday 27 November, 2024



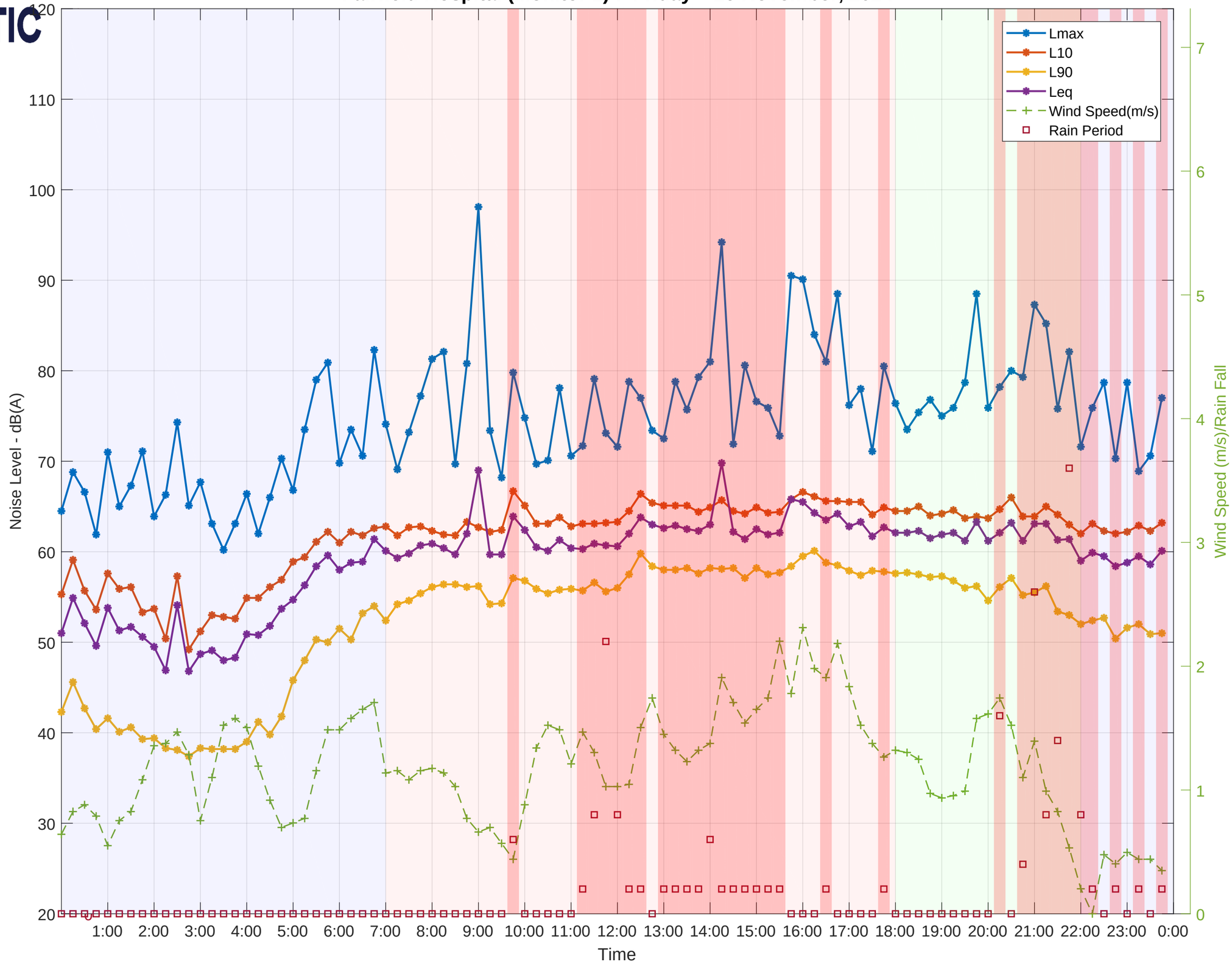
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Thursday 28 November, 2024



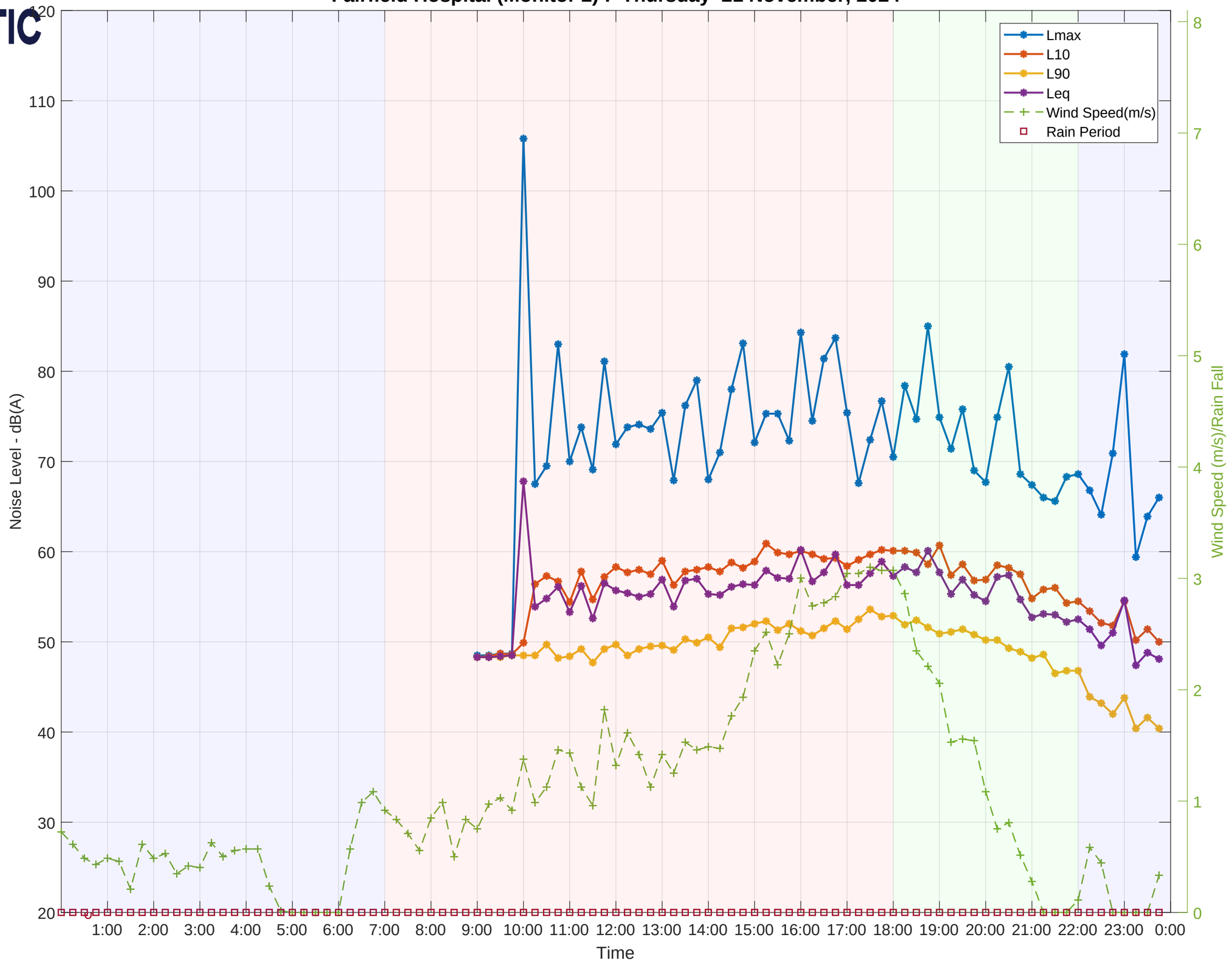
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 1) : Friday 29 November, 2024



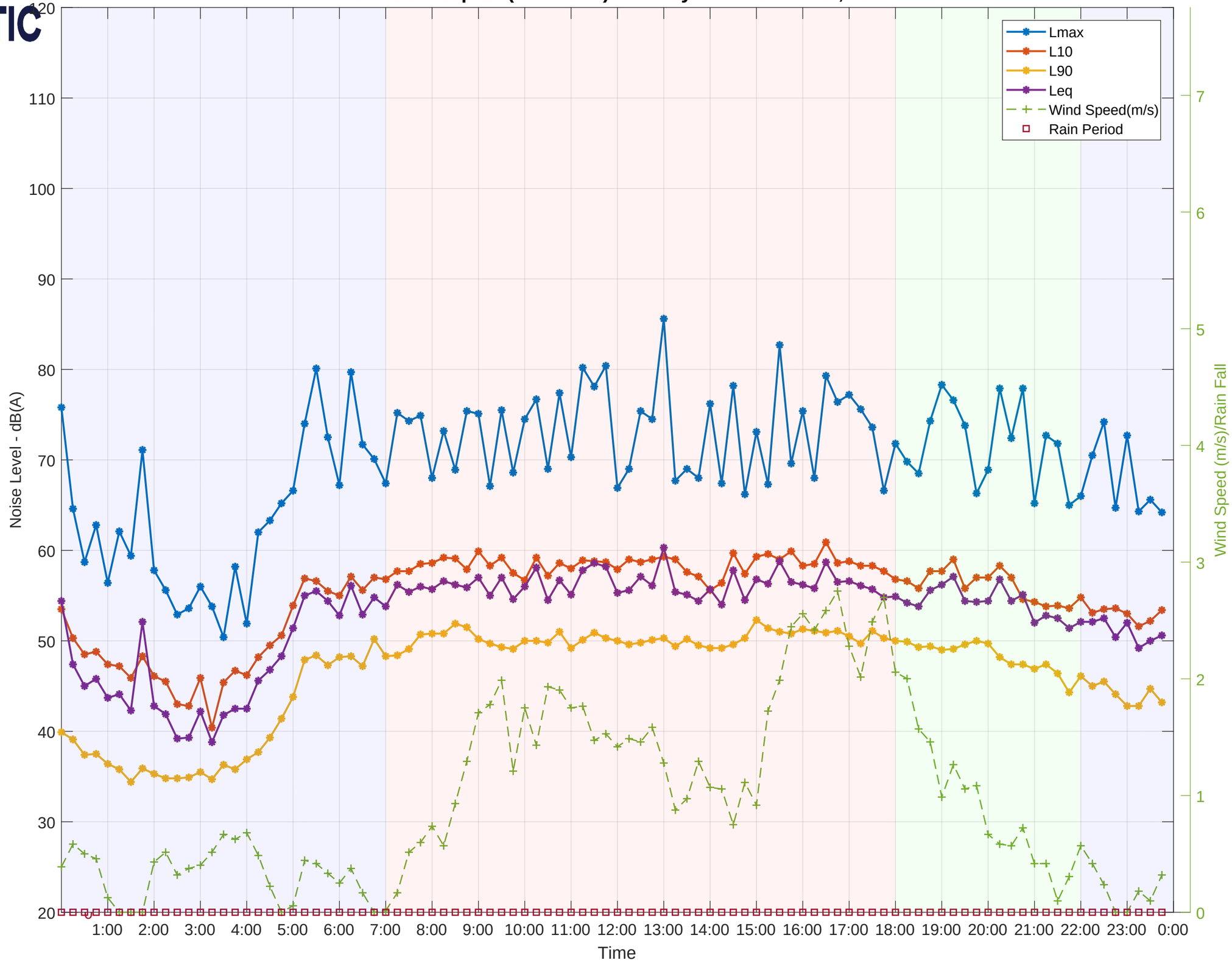
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Thursday 21 November, 2024



ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Friday 22 November, 2024



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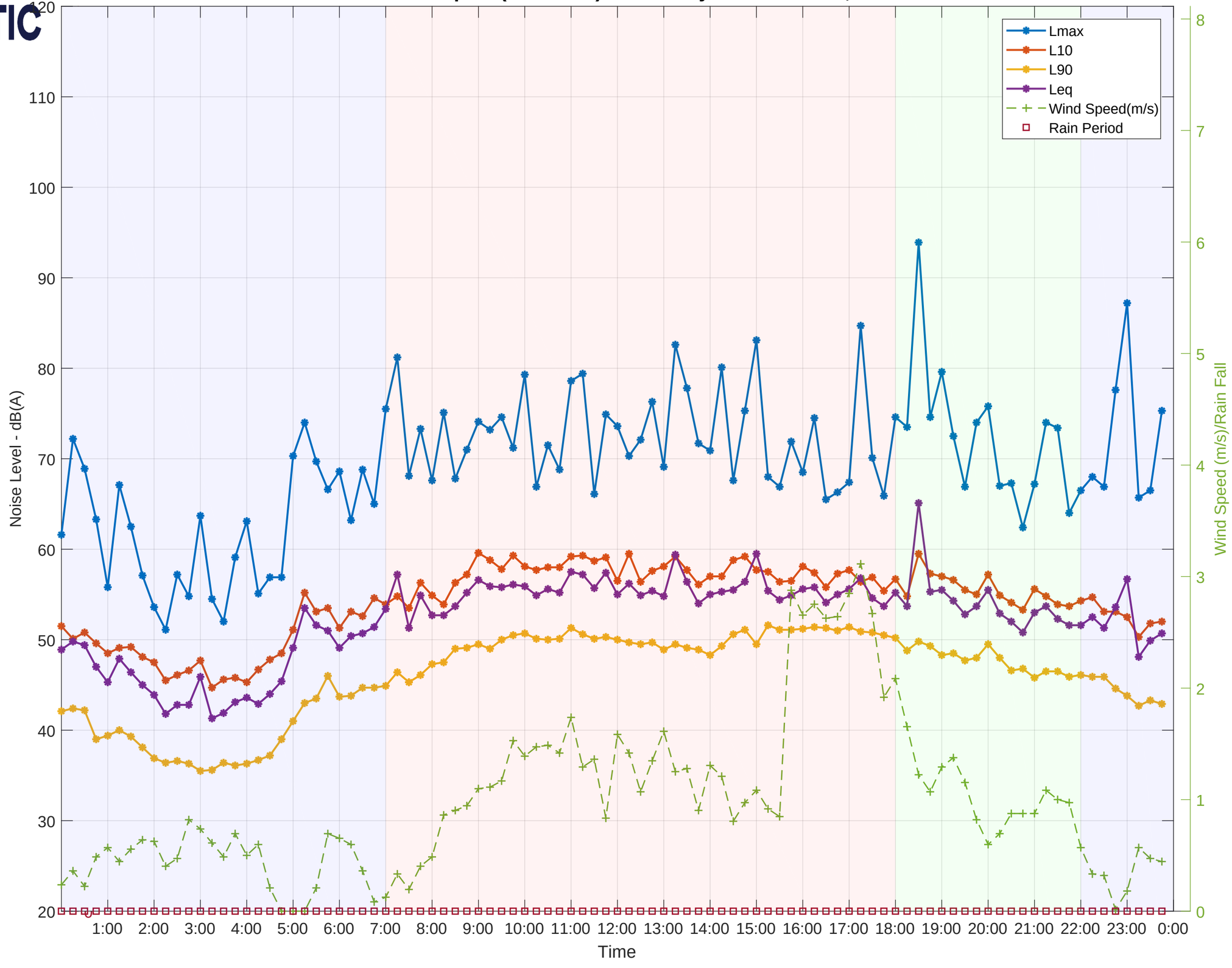
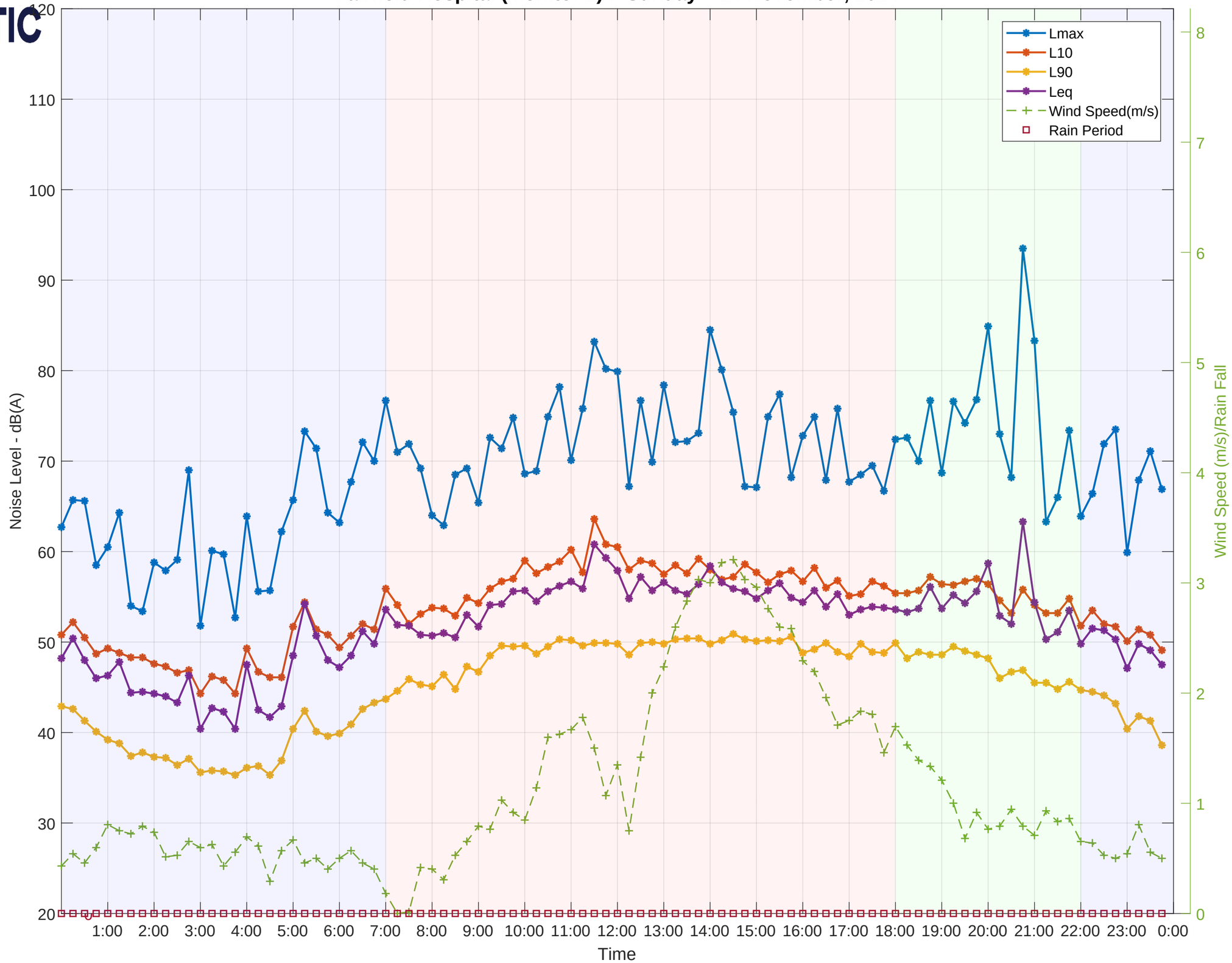
Fairfield Hospital (Monitor 2) : Saturday 23 November, 2024



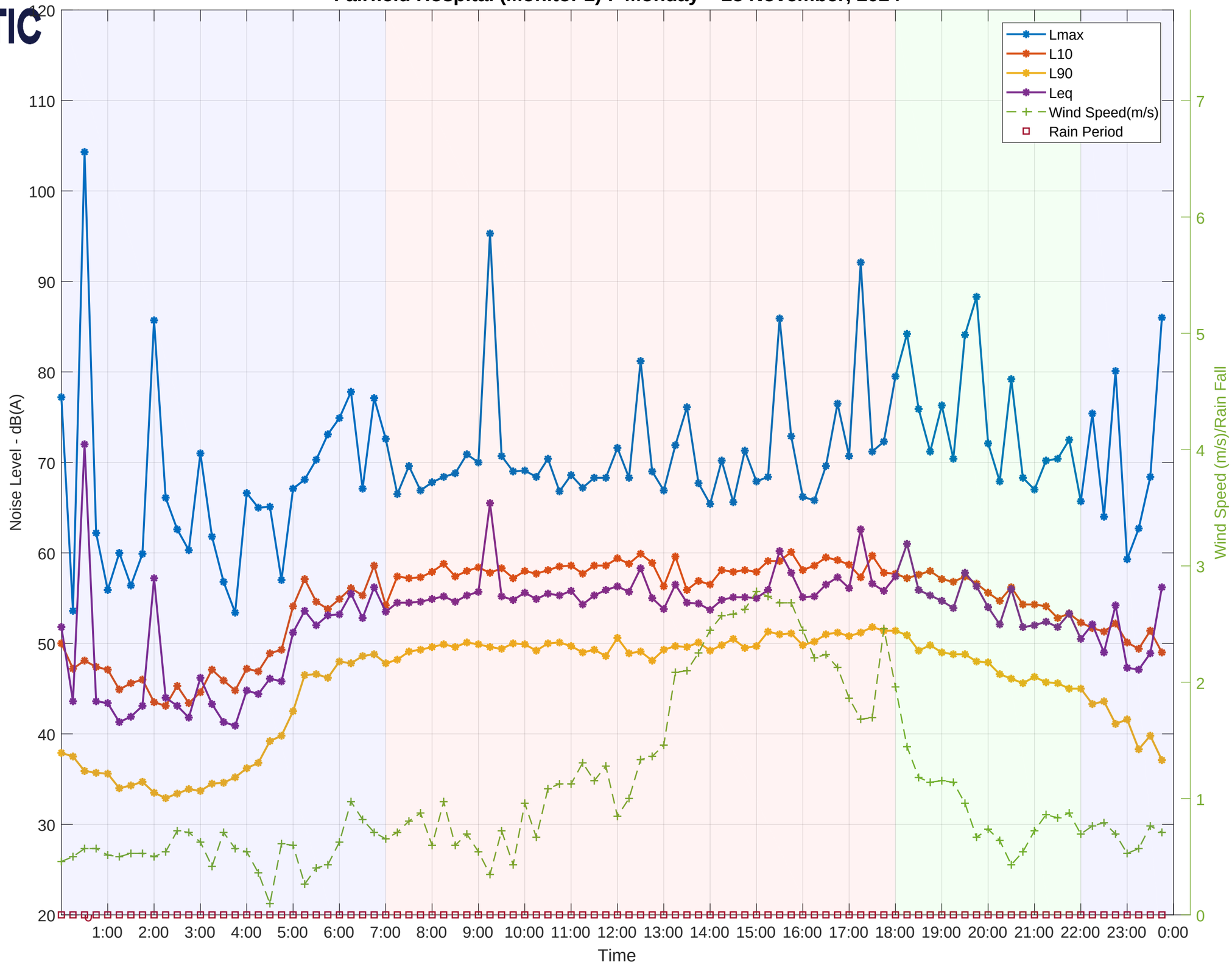
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Sunday 24 November, 2024



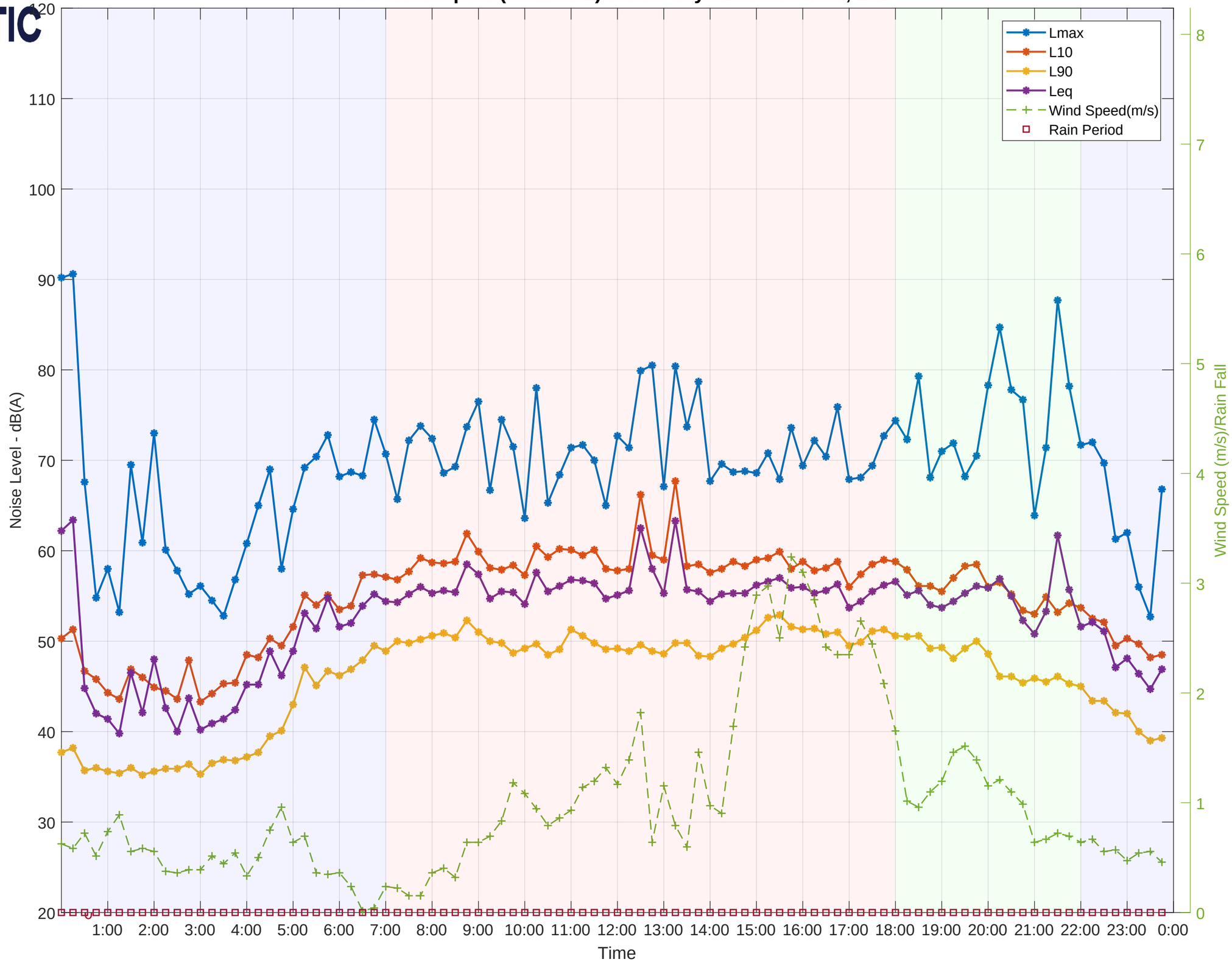
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Monday 25 November, 2024



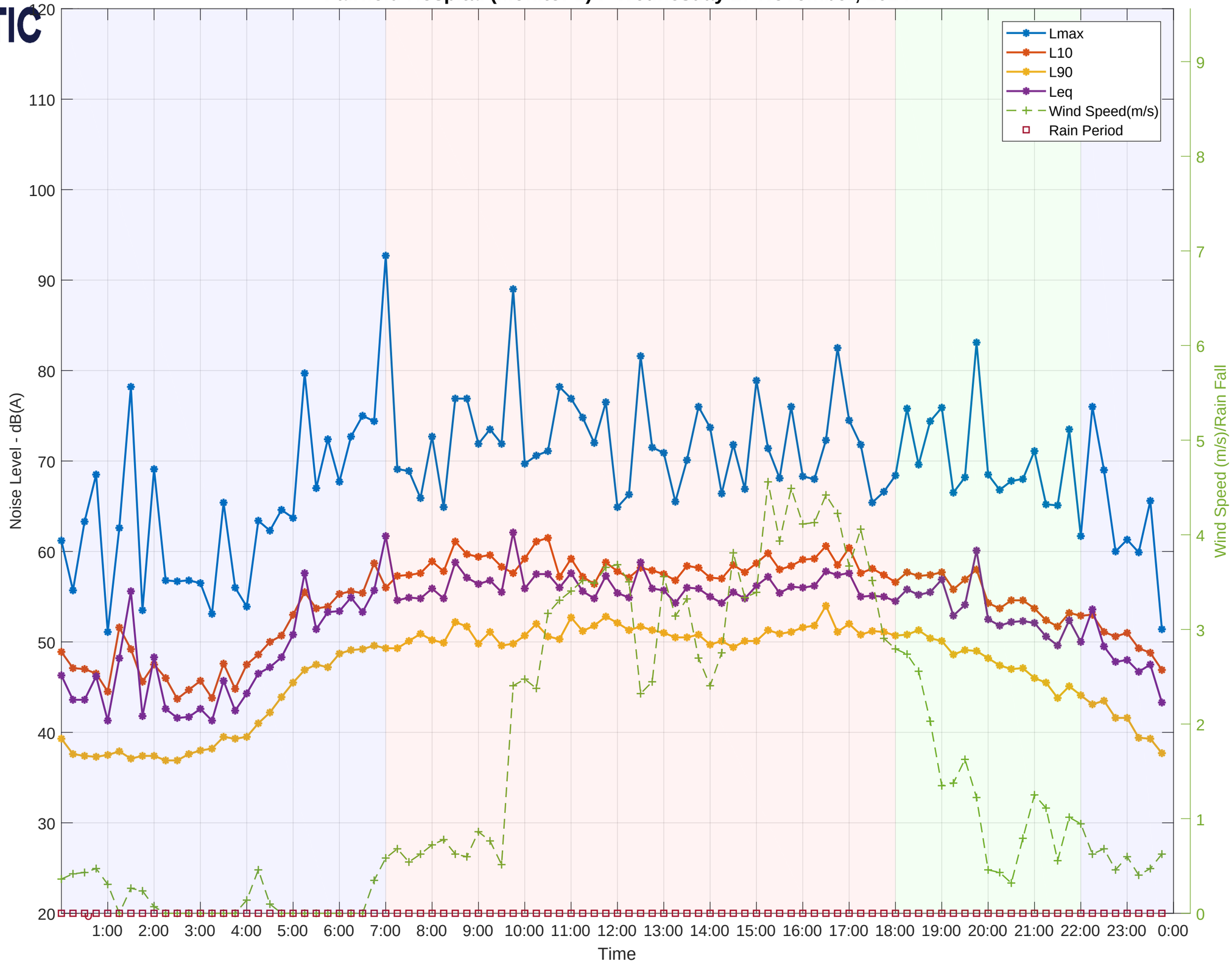
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Tuesday 26 November, 2024



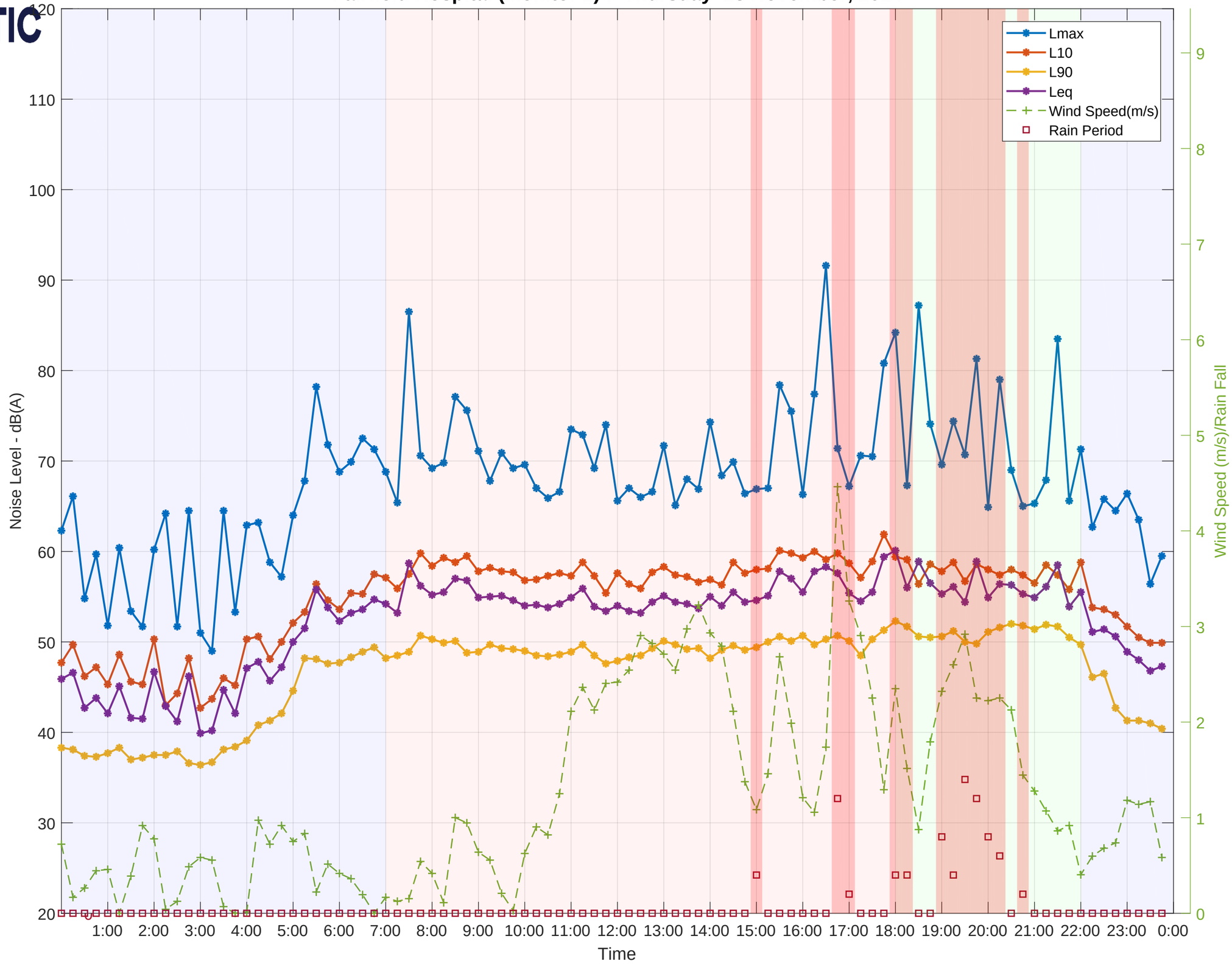
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Wednesday 27 November, 2024



ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Thursday 28 November, 2024



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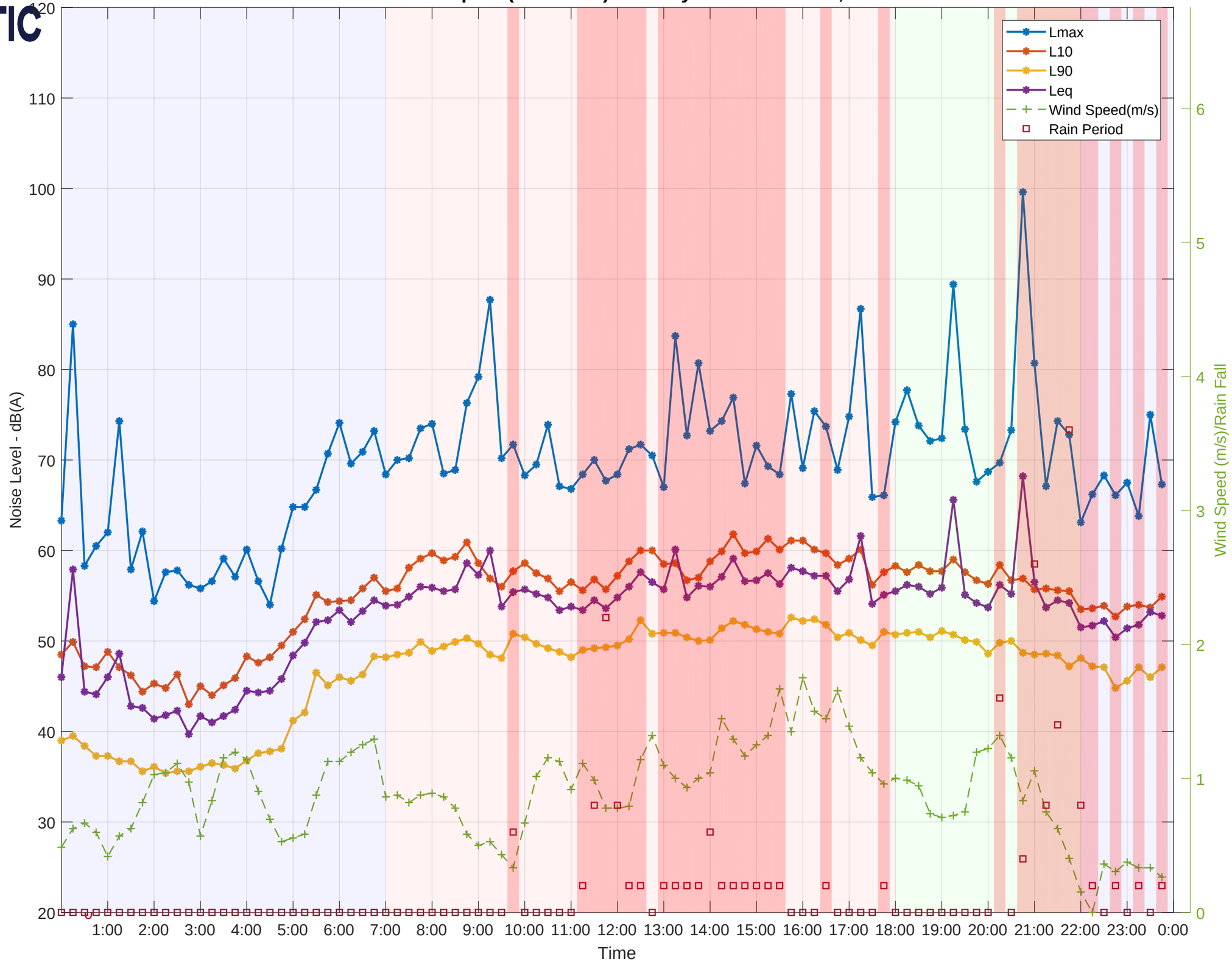
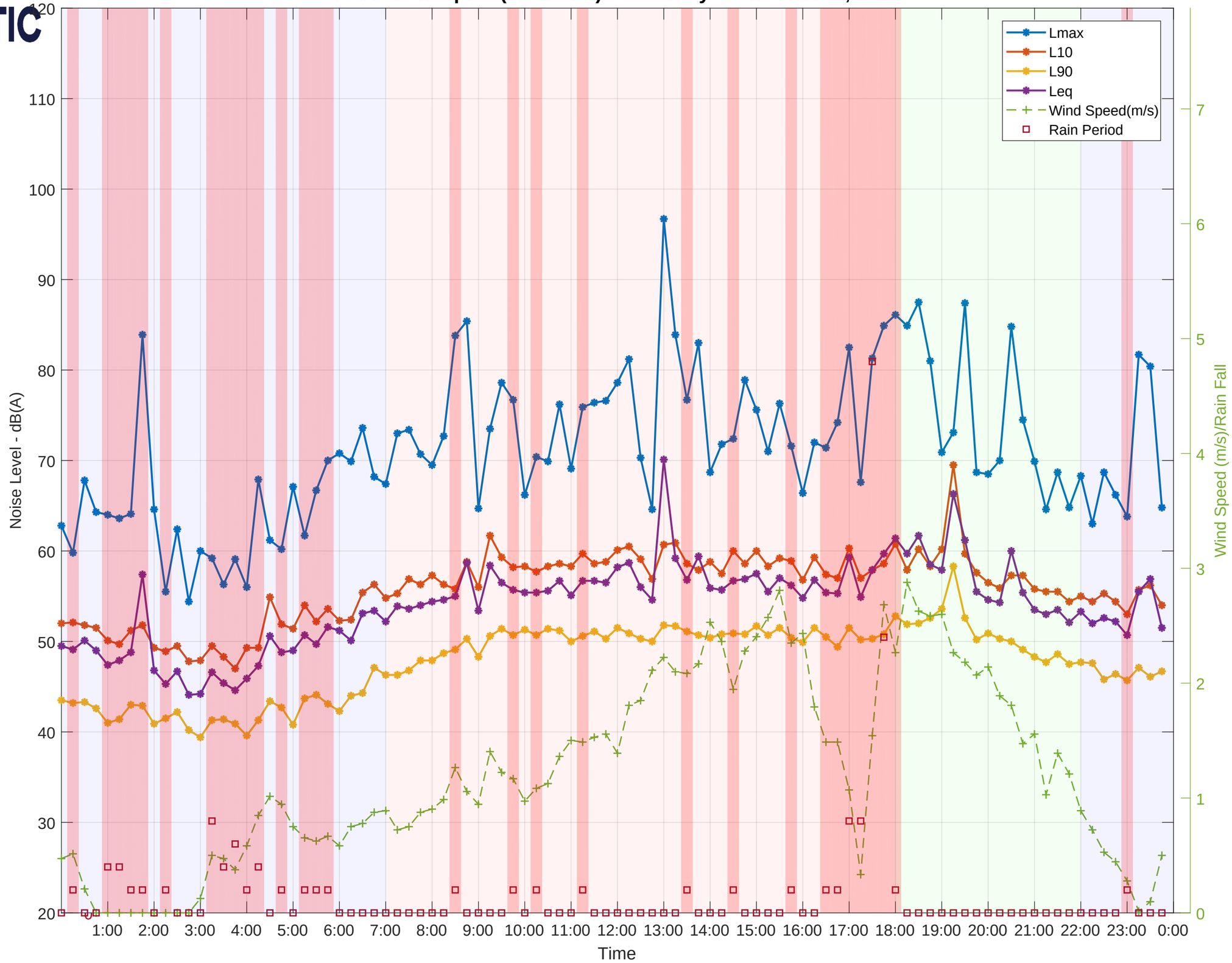
Fairfield Hospital (Monitor 2) : Friday 29 November, 2024



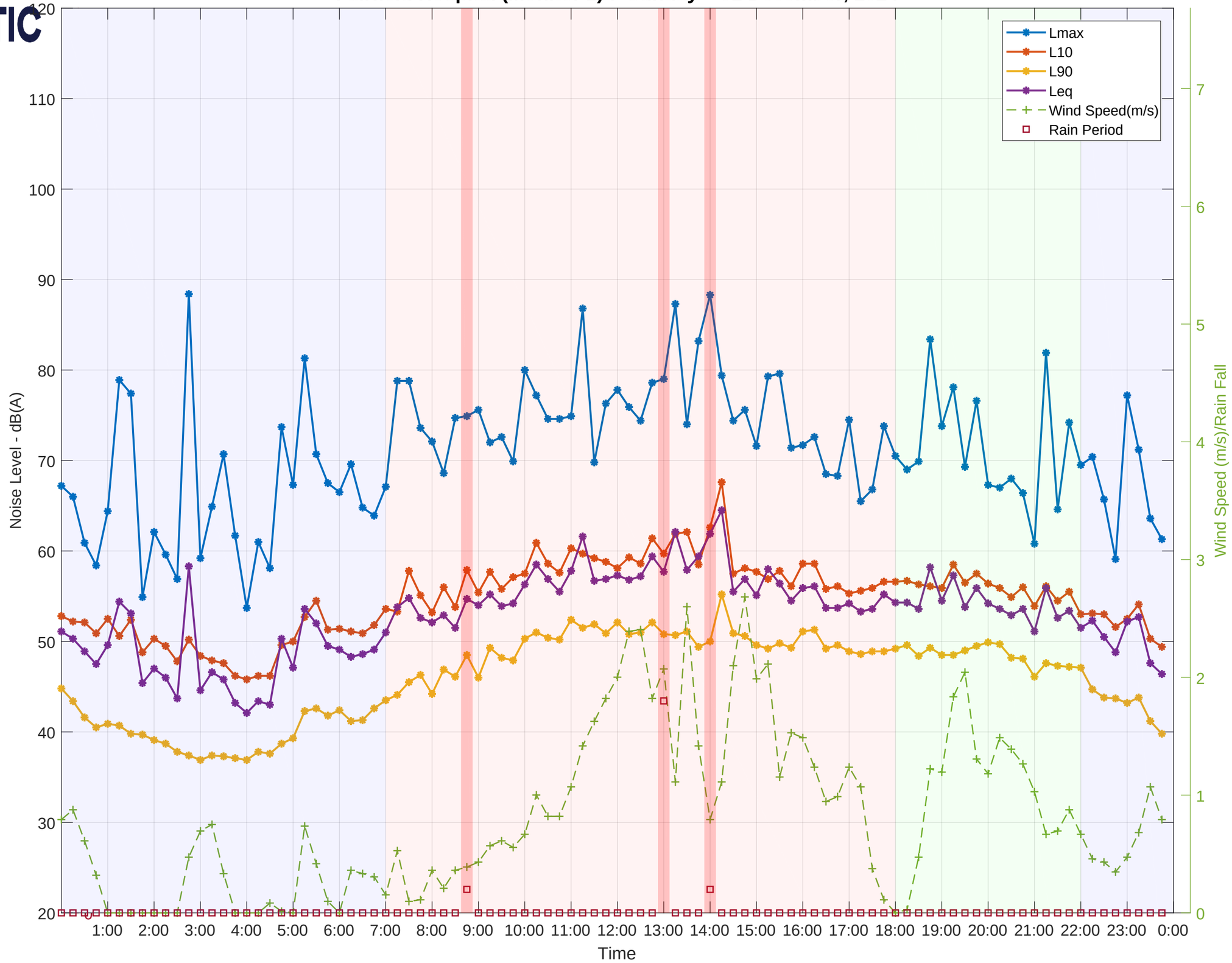
ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Saturday 30 November, 2024



ACOUSTIC LOGIC

Fairfield Hospital (Monitor 2) : Sunday 01 December, 2024



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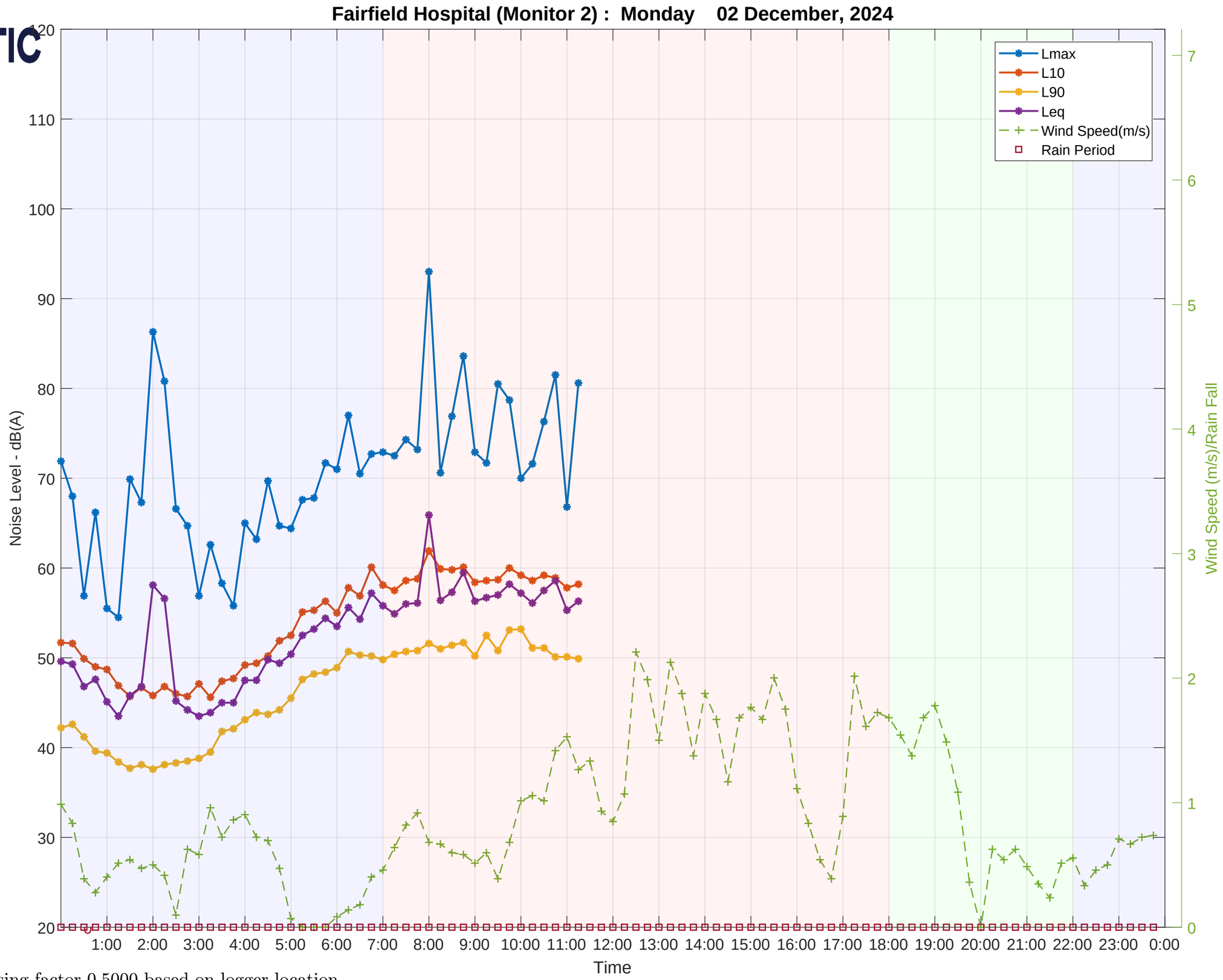
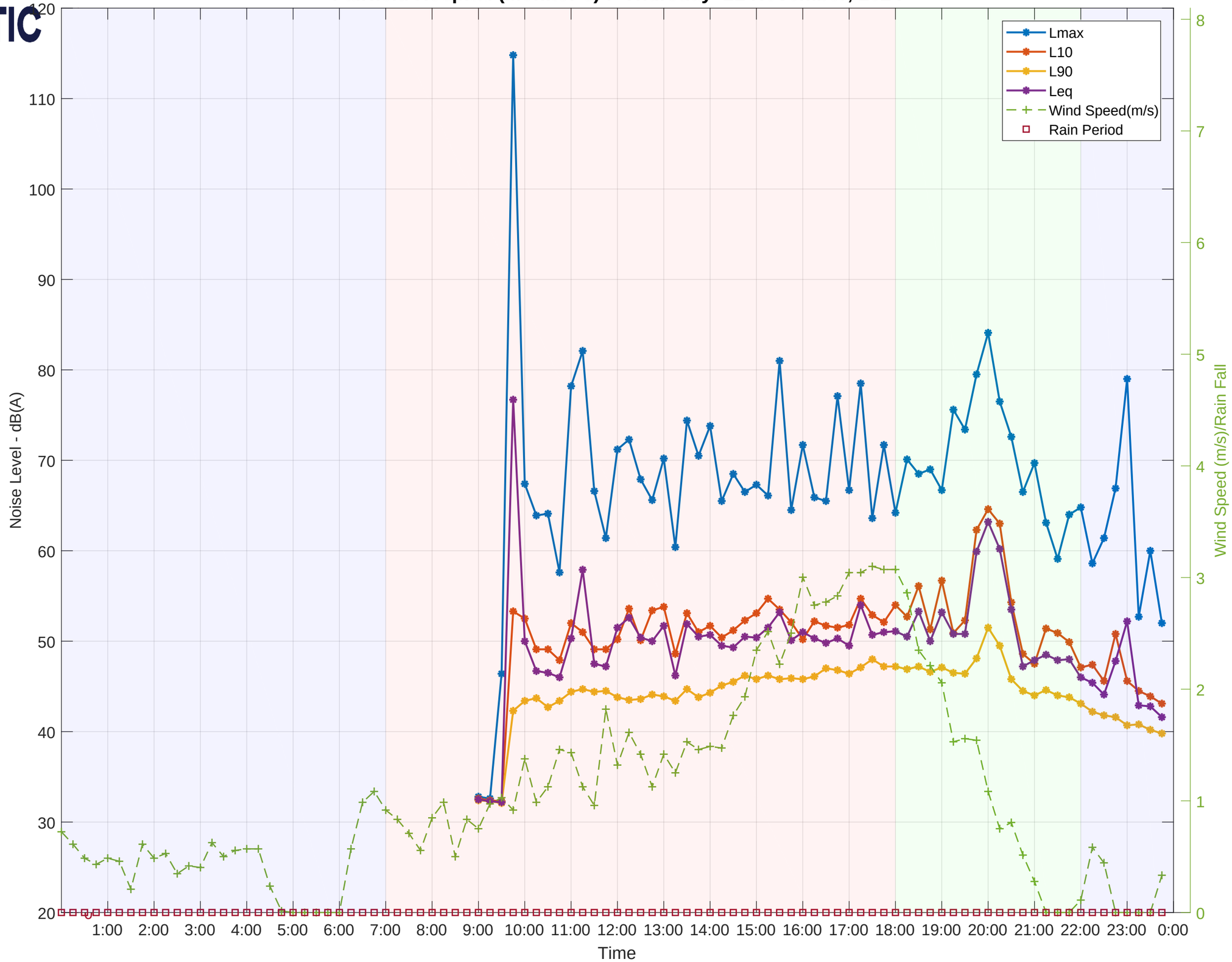


Wind Speed is corrected using factor 0.5000 based on logger location

ACOUSTIC LOGIC

Fairfield Hospital (Monitor 3) : Thursday 21 November, 2024



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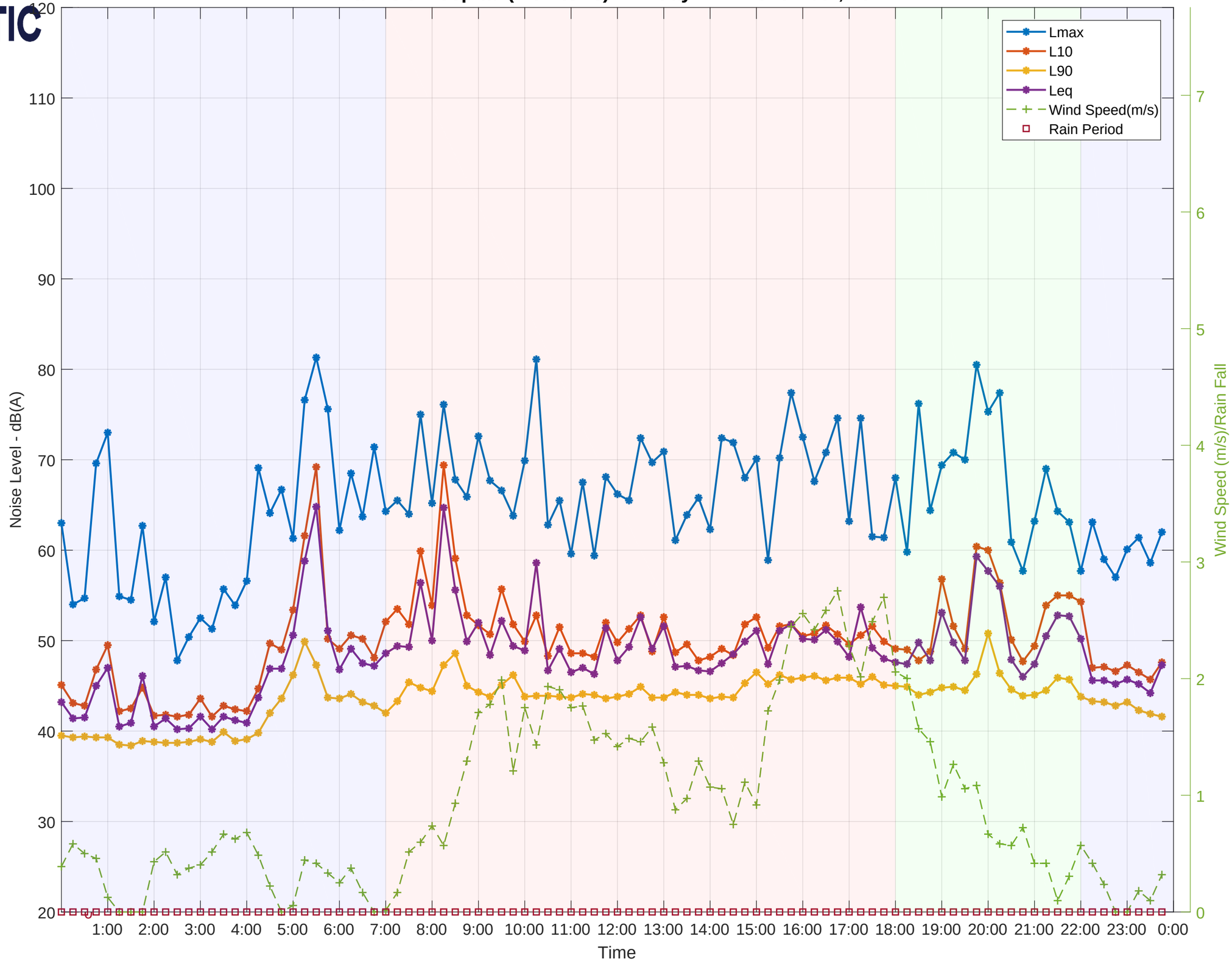

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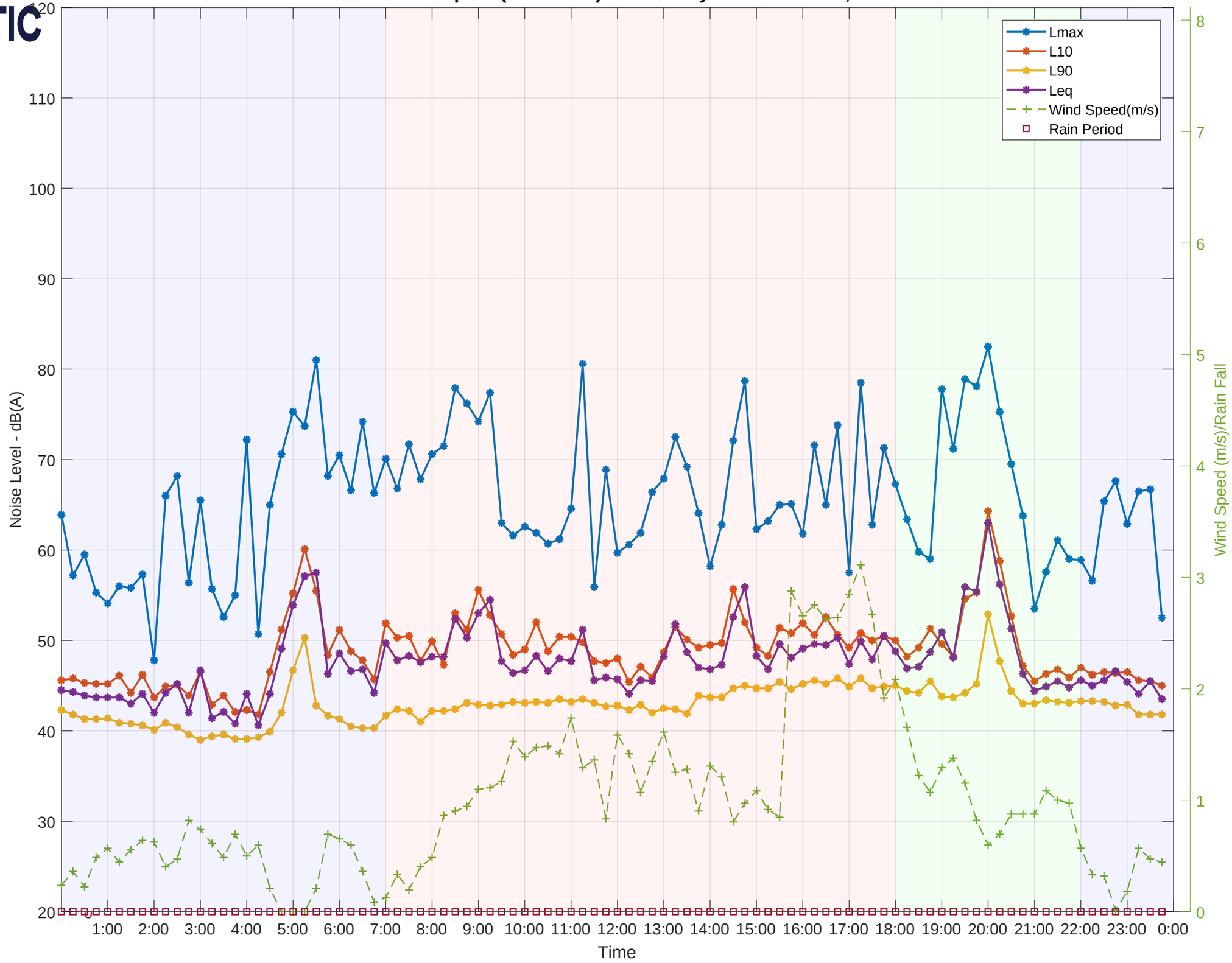
Fairfield Hospital (Monitor 3) : Saturday 23 November, 2024



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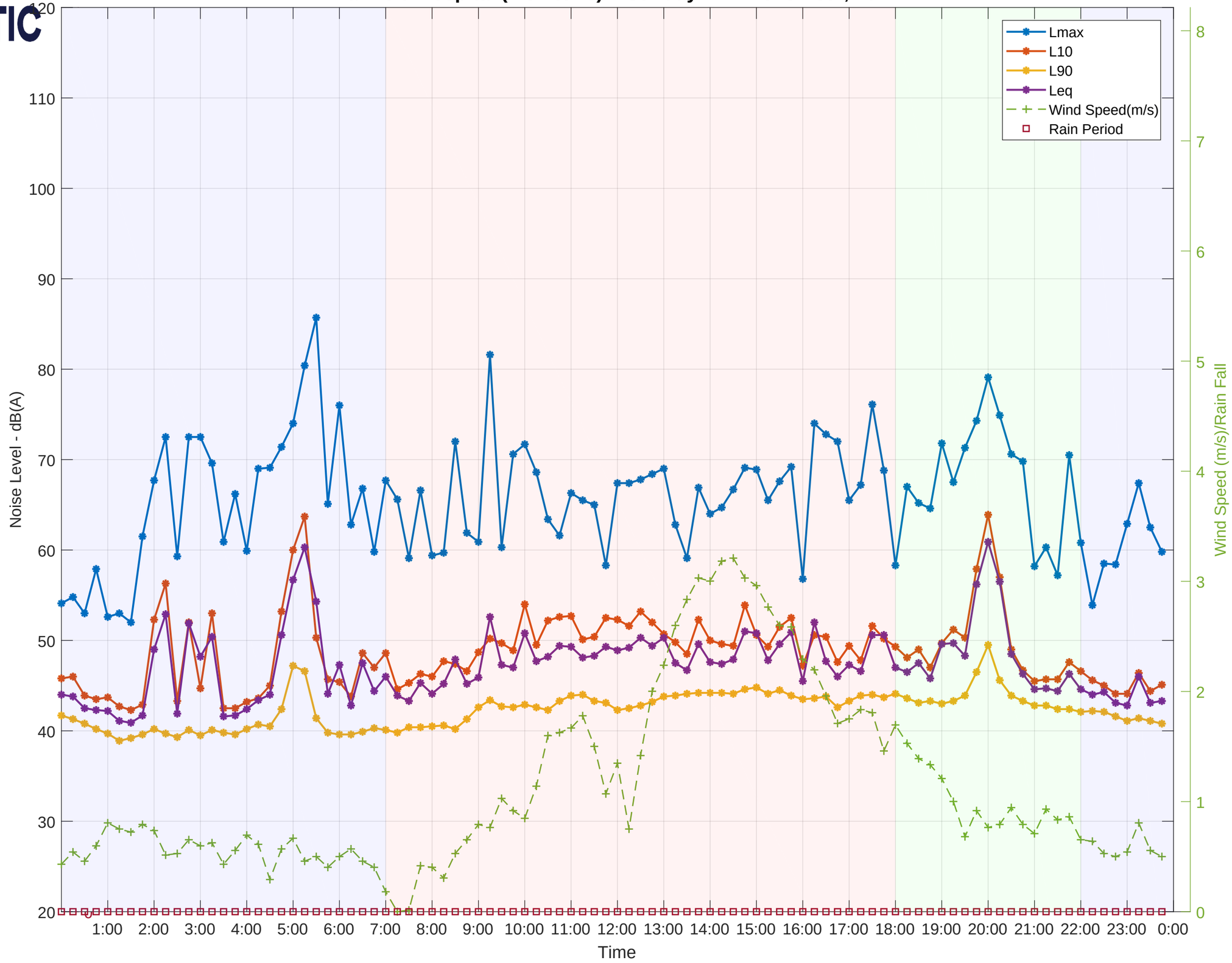

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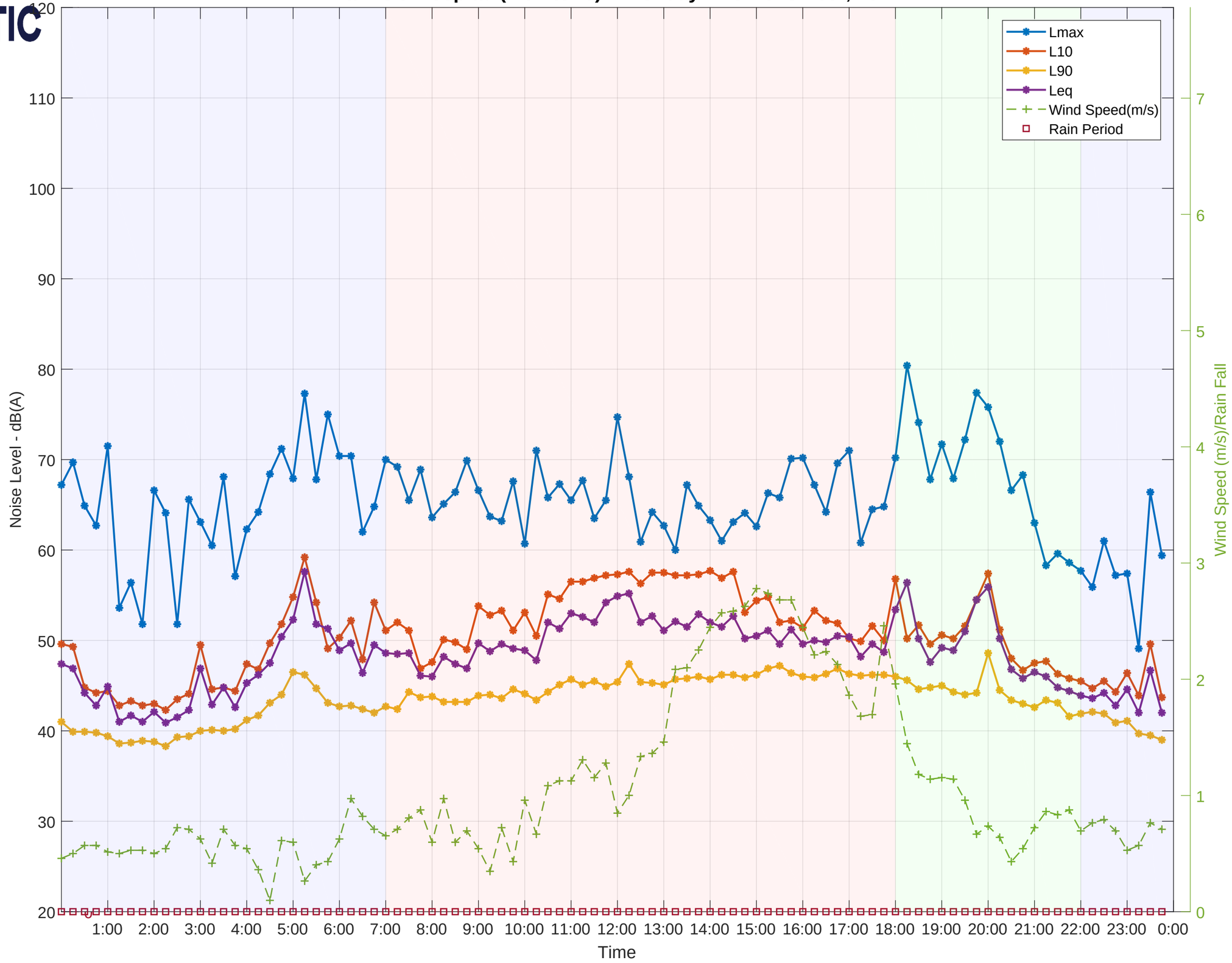

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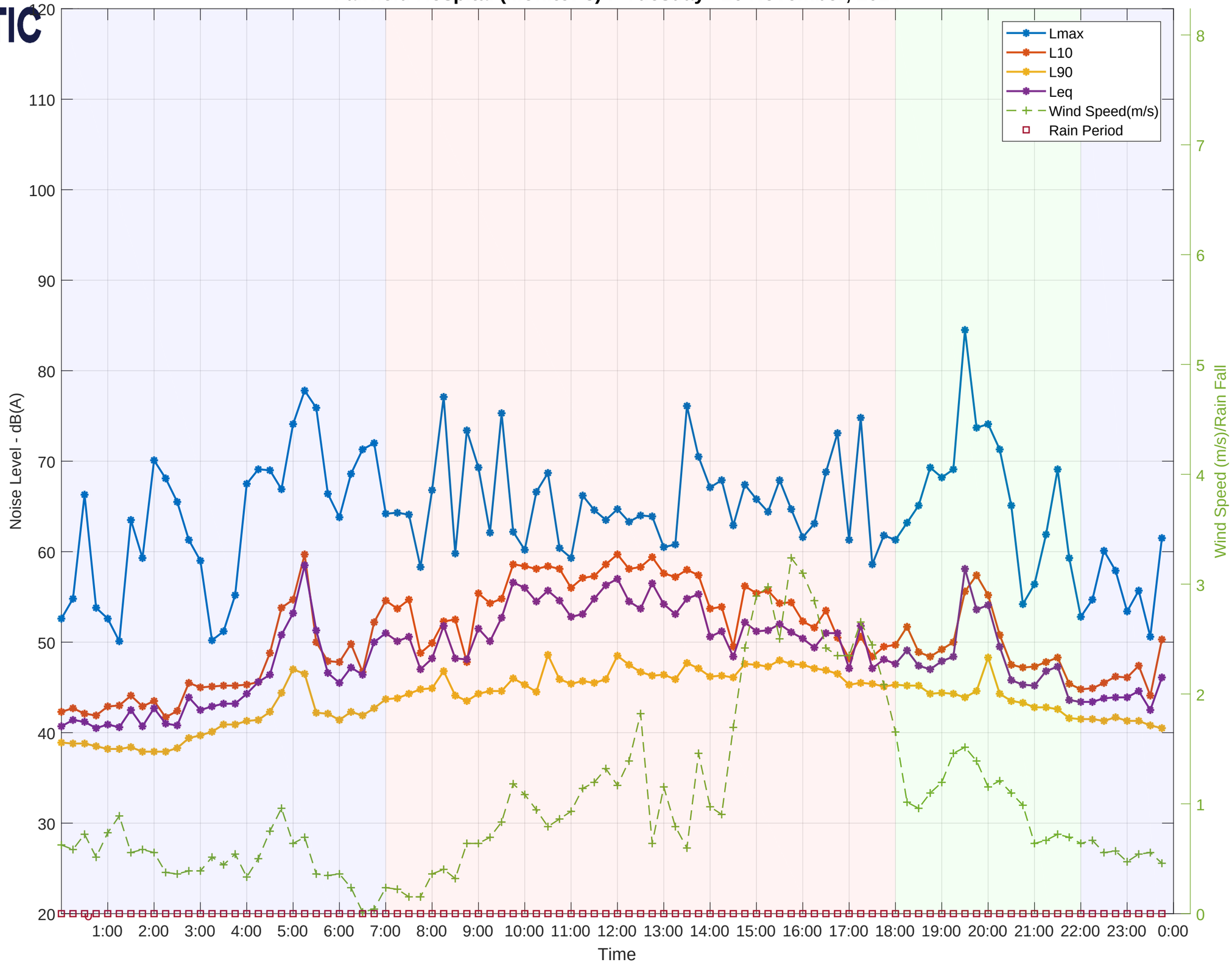

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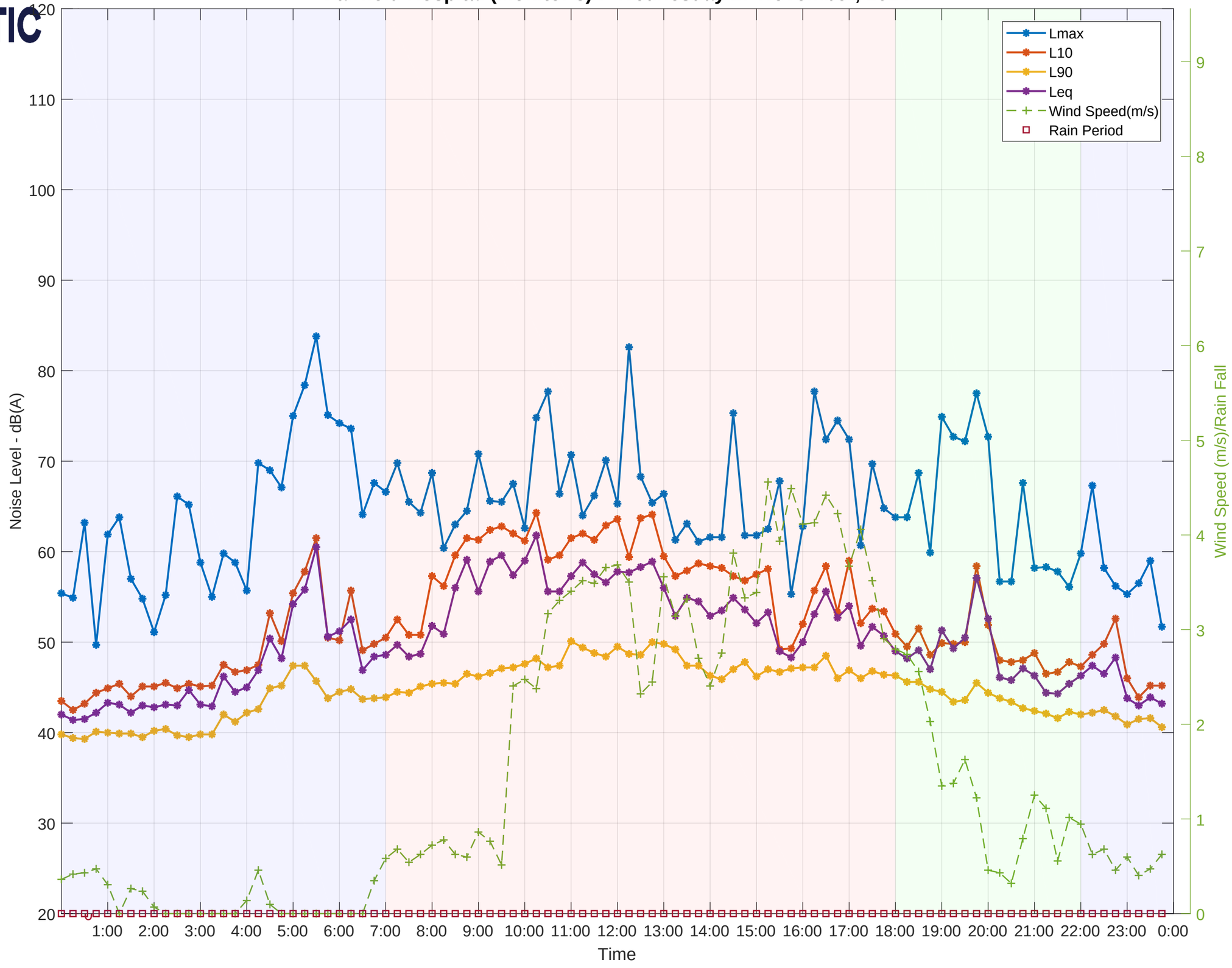
Fairfield Hospital (Monitor 3) : Wednesday 27 November, 2024



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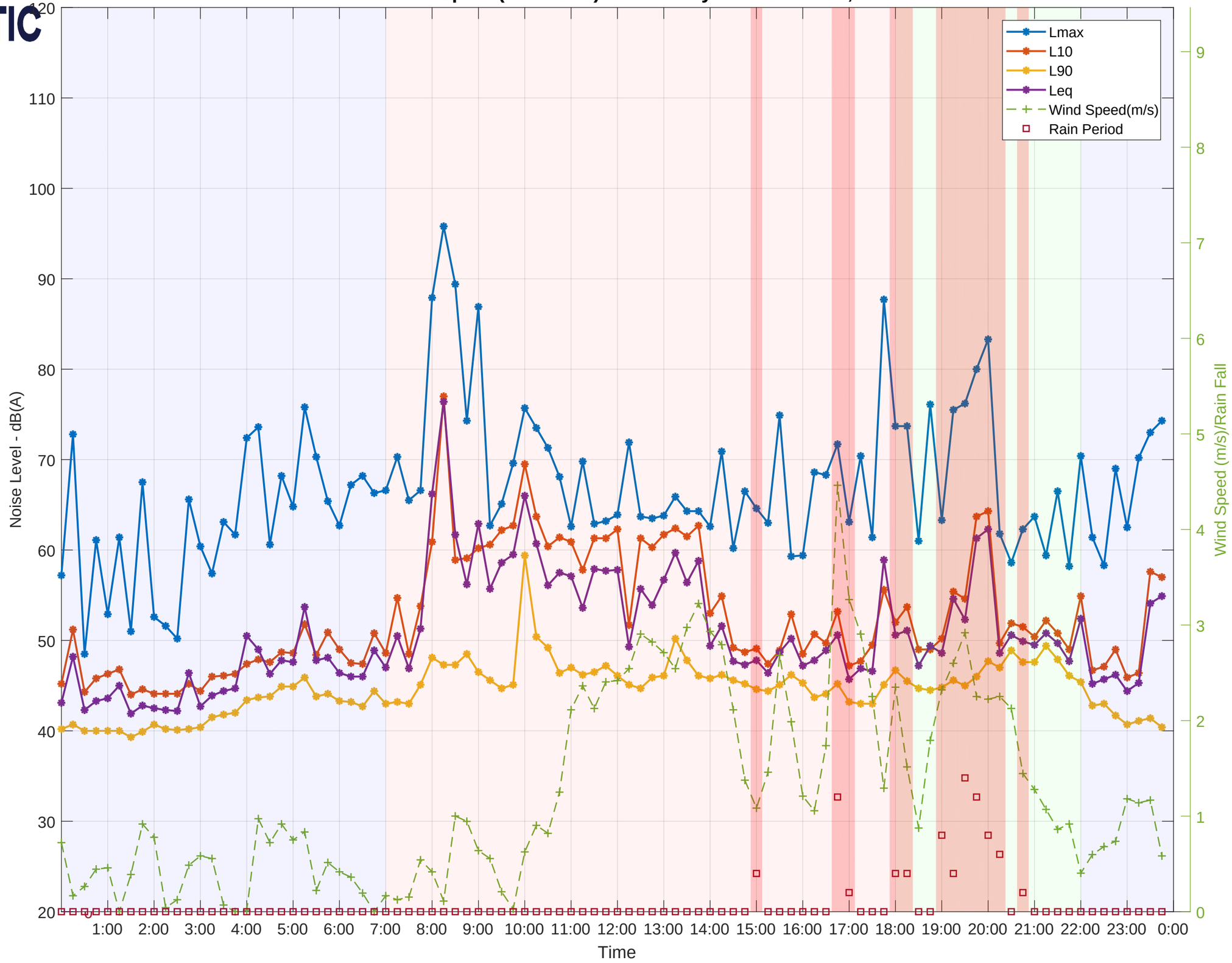

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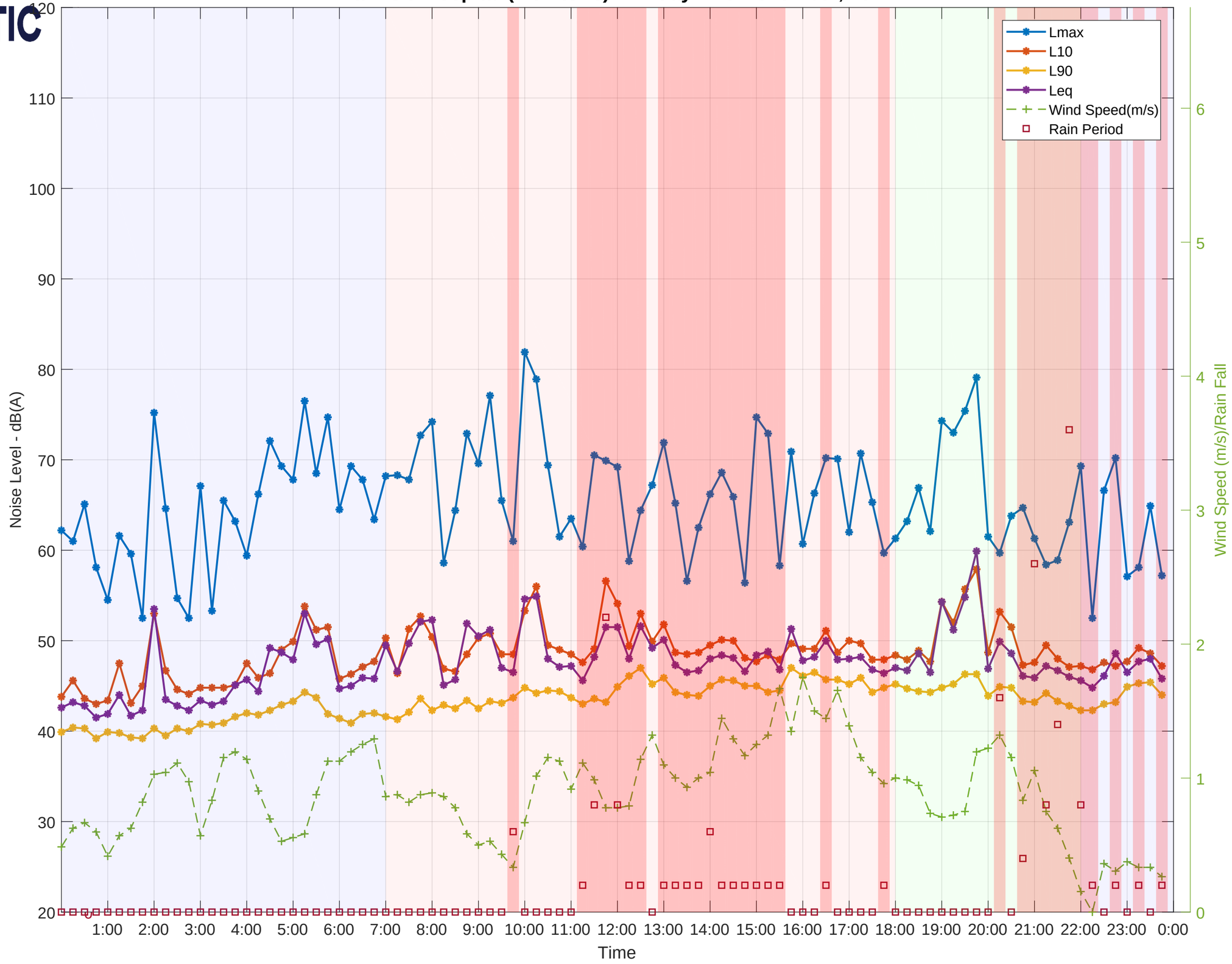

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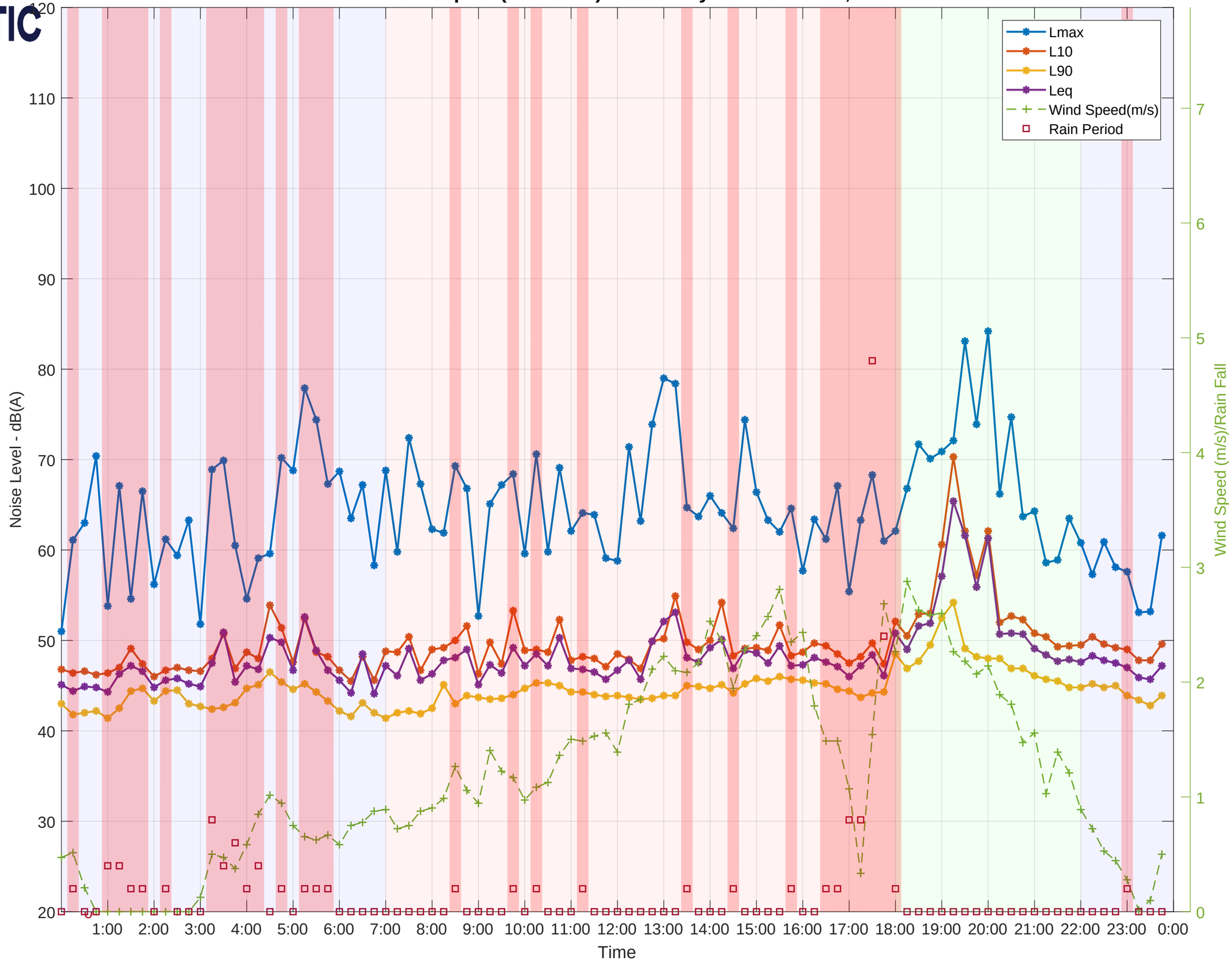

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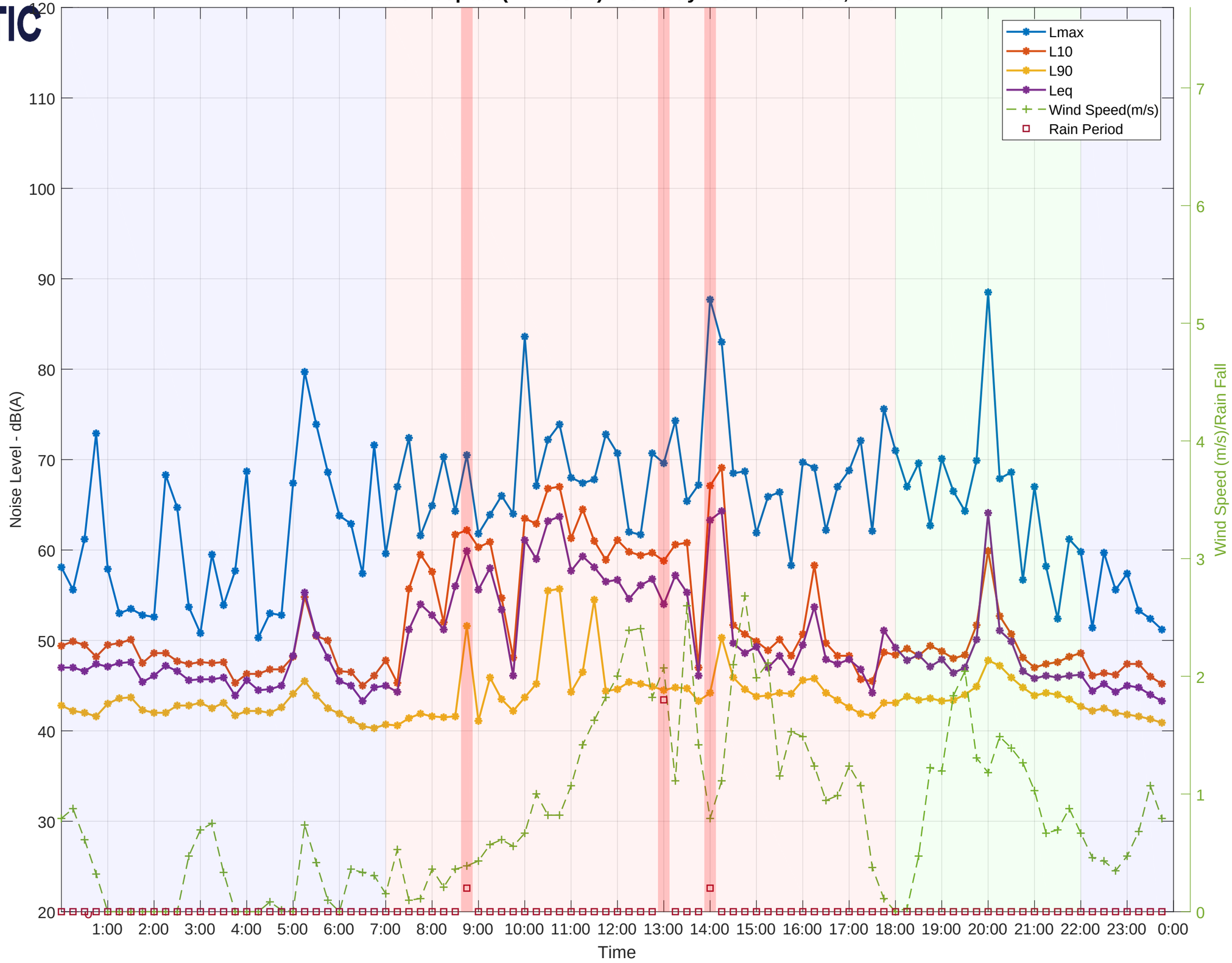
Fairfield Hospital (Monitor 3) : Sunday 01 December, 2024



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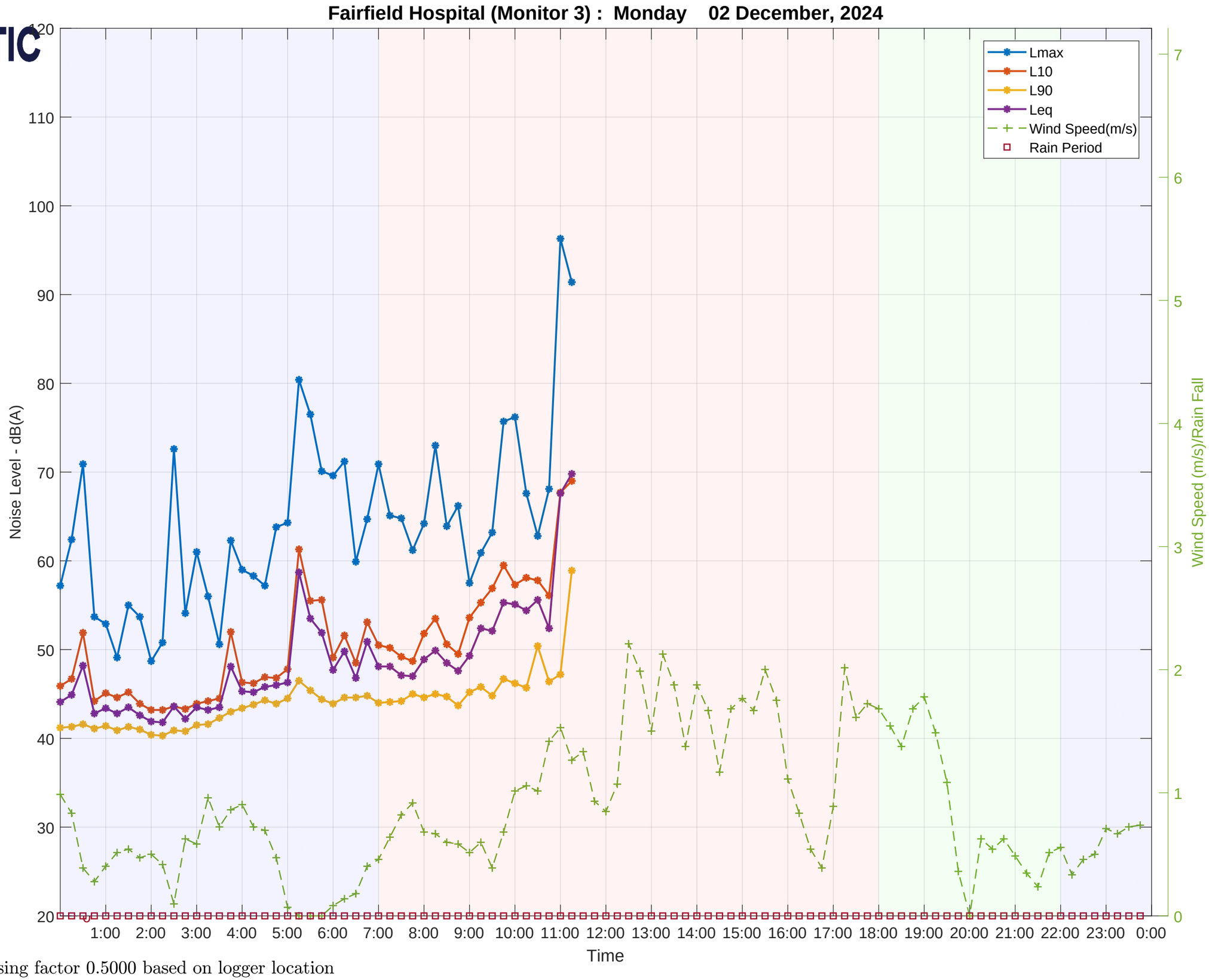

Wind Speed is corrected using factor 0.5000 based on logger location

APPENDIX C 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.

C.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.

C.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.

C.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" and "urban" 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

The NPfI 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 $L_{Aeq(1hr)}$.

C.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.

C.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.

C.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 21 – 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
NCA1, NCA2 & NCA4 (Residential)	Day	48	53	**53**	
	Evening	46	51	**43**	
	Night	36	41	**38**	41 L_{eq} 52 L_{max}
NCA3	Day	53	58	**58**	
	Evening	52	57	**48**	
	Night	38	43	**43**	41 L_{eq} 53 L_{max}
NCA5	Noisiest 1-hour	-	-	35 (Internal) 50 (External)	-
NCA6	When in Use	-	-	65	-
NCA7 & NCA8	Day	43	**48**	53	
	Evening	43	48	**43**	
	Night	40	45	**38**	45 L_{eq} 55 L_{max}
NCA9	When in Use	-	-	65	-
NCA10	Noisiest 1-hour period when in use	-	-	35	-