

Central Barangaroo

Construction Noise and Vibration Management Sub Plan

SYDNEY

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1 INTRODUCTION

Acoustic Logic have been engaged to provide a project construction noise and vibration management plan ("CNVMP" or the "Plan") that will be used to manage noise and vibration emissions associated with the proposed works.

The Plan:

- Identifies sensitive receivers that are likely to be potentially impacted by the proposed works.
- Develops project specific noise and vibration management levels. These will be used to indicate whether additional impact mitigation, beyond normal "good practice", is indicated.
- Identifies the major noise and vibration sources that will be present on the construction site, and additional construction-related traffic generated by the development.
- Predicts the likely noise and vibration levels during the phases of construction and assesses these against the established management levels. Where the predicted impacts exceed the management levels, the Plan identifies and assesses potential measures to minimise these impacts.
- Provides specific and general recommendations for the ongoing monitoring, assessment and management of noise and vibration emissions as the works progress in response to additional information and site conditions, and the updating of the Plan to reflect additional information obtained during the construction period.

The subject site and local context are indicated in Figure 1 and **Figure 2**.

Where the term "construction" is used in this Plan, it includes demolition, excavation and any other site activity related to the construction of the development being assessed.

This Plan has been prepared for the sole purpose as stated above and should not be used or relied on for any other purpose.

2 DEVELOPMENT CONSENT CONDITIONS

The plan addresses the following consent conditions for SSD-46922214, repeated below:

"CONSTRUCTION NOISE AND VIBRATION MANAGEMENT SUB-PLAN

C10. *Prior to the commencement of work, the Applicant must submit to the Certifier a Construction Noise and Vibration Management Sub-Plan (CNVMP) for the development prepared by a Professional Engineer who possesses the qualifications to join the Australian Acoustic Society, Institute of Engineers Australia (grade of member or the Association of Australasian Acoustic Consultants (grade of member firm) that nominates measures to minimise environmental impacts and harm during construction of the development arising from construction noise and vibration, including but not limited to, the following information:*

- (a) Identification of noise sources and Sensitive Receivers;*
- (b) Quantification of rating background noise level ($L_{A90, 15}$ minute) for Sensitive Receivers, measured in accordance with AS 1055:1.2.1997.*
- (c) Describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009) (ICNG) (as may be updated or replaced from time to time) and the noise criteria in the City of Sydney Construction Hours/Noise Code of Practice 1992*
- (d) Prediction and assessment of potential noise, ground-borne noise and vibration levels from the proposed construction methods expected at Sensitive Receiver premises against the objectives identified in the ICNG, EPA's Assessing Vibration: Technical Guideline and relevant standards;*
- (e) Comply with the State Environmental Planning Policy (Transport and Infrastructure) 2021 and 'Development Near Rail Corridors and Busy Roads – Interim Guideline' (2008) and the Sydney Metro Underground Corridor Protection Guidelines.*
- (f) Have appropriate measures in place to ensure the construction process would not damage or interfere with the rail corridor during construction from air-borne noise, ground-borne noise and vibration effects, including vibration monitoring within 25m of the rail corridor.*
- (g) Noise mitigation measures that can be implemented to reduce construction noise and vibration impacts, and describe the measures to be implemented to manage high noise generating works (such as piling and rock breaking) or activities that may be particularly annoying (as defined in the ICNG), in close proximity to Sensitive Receivers;*
- (h) Measures to identify non-conformances with the requirements of the CNVMP, and procedures to implement corrective and preventative action and to respond to complaints;*
- (i) Procedures for notifying sensitive receivers of construction activities that are likely to affect their noise and vibration amenity, including nearby heritage items;*
- (j) Include strategies that have been developed in consultation with the directly adjoining properties for managing vibration such as any alternative construction methods with lower source vibration levels and provision for respite periods;*
- (k) Confirmation of noise monitoring methodology to be undertaken;*
- (l) Include a complaints management system that would be implemented for the duration of the development.*

The CNVMP must be prepared in consultation with Council and Sydney Metro and demonstrate how Council and Sydney Metro's comments have been addressed. A copy of the final CNVMP must be submitted to the Planning Secretary for information.

3 REFERENCED DOCUMENTS

3.1 BACKGROUND INFORMATION USED

The assessment is based on the following information:

- Aqualand Early Works Staging Diagrams dated 18th December 2025
- The DA Noise and Vibration Impact Assessment prepared by this office (ref: 20220262.2/0311A/R11/AZ, dated 3rd November 2025).

3.2 GUIDELINES

The primary guideline that will be used to formulate the Plan is the NSW EPA – 'Interim Construction Noise Guideline' ("**ICNG**") July 2009.

The ICNG recognises that development occurs close to sensitive receivers and the nature of construction means that it is not possible to prevent noise impacts. The ICNG is focused *"on applying a range of work practices most suited to minimise construction noise impacts, rather than focusing only on achieving numeric noise levels. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time."*

The ICNG requires the identification of activities likely to exceed the noise/vibration management levels, and the implementation of feasible and reasonable mitigation strategies to minimise emissions. Strategies include physical and management controls, liaising with the public and stakeholders, monitoring, etc. The ICNG recognises that each site will have a particular set of circumstances to be addressed, and that it is typically not possible to fully mitigate impacts. The guideline is intended as a pathway to determining a realistic compromise between construction sites and the surrounding receivers.

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

- NSW Department of Environment and Conservation Assessing Vibration: A Technical Guideline" (Feb, 2006)
- City of Sydney - Code of Practice: Construction Hours/Noise within the CBD (1992) ("CoS COP")
- Sydney Metro Underground Corridor Protection Guidelines

3.2.1 City of Sydney Code of Practice Construction Hours/Noise 1992

The COP provides different categories of working hours with the respective noise criteria, as follows:

Table 1 – City of Sydney Code of Practice Categories of Working Hours and Noise Criteria

Day	Time Zone	Category	Noise Criteria
Monday to Friday	00.00 – 07.00	4	Background + 0 dBA
	07.00 – 08.00	1	Background + 5 dBA
	08.00 – 19.00	1	Background + 5 dBA + 5 dBA to be determined on a site basis
	19.00 – 23.00	2	Background + 3 dBA
	23.00 – 24.00	4	Background + 0 dBA
Saturday	00.00 – 07.00	4	Background + 0 dBA
	07.00 – 08.00	1	Background + 5 dBA
	08.00 – 17.00	1	Background + 5 dBA + 5 dBA to be determined on a site basis
	17.00 – 23.00	2	Background + 3 dBA
	23.00 – 24.00	4	Background + 0 dBA
Sunday and Public Holidays	00.00 – 07.00	4	Background + 0 dBA
	07.00 – 17.00	3	Background + 3 dBA
	17.00 – 24.00	4	Background + 0 dBA

4 PROPOSAL AND LOCATION

4.1 PROJECT SUMMARY

Approval has been determined for early works associated with the future mixed-use development of Central Barangaroo (set out under MP06_0162). The approval seeks to undertake bulk excavation and site establishment works for the installation of the perimeter retention wall, and conduct remediation and archaeological investigations within the site.

These works will facilitate the provision of future basements, consistent with the parameters set out under the approved Concept Plan for Barangaroo under MP06_0162.

The works subject of the Early Works approval includes the following:

- Establish the site and installation of temporary plant and machinery, including dewatering and bentonite slurry plant and ancillary services,
- Construction of perimeter retention wall, including any required excavation, associated rock anchors and PRW capping beam construction,
- Associated remediation and Archaeological investigations in the area of excavation and works;
- Provision for future services,
- Associated "tie-in" works to Metro Interface Wall and the secant pile wall proposed by the applicant under SSD-39587022,
- De-stressing and removal of existing anchors supporting Sydney Metro pile wall,
- Bulk excavation for the provision of a future basement and associated rock anchors (including anchors to support the secant pile wall approved in SSD-39587022 ,
- Construction of foundation piling,
- Installation of waterproofing membrane,
- Construction of hydrostatic slab, and
- Structure and waterproofing for the Barangaroo Metro station southern entrance interface next to the existing Sydney Metro pile wall.

4.2 THE SITE

The site is located in Central Barangaroo, which forms part of the wider Barangaroo Precinct comprising a total area of 22ha. It is located in the north-western edge of Sydney CBD and falls within City of Sydney Local Government Area (LGA). Barangaroo Precinct interfaces with Hickson Road in the east, the foreshore in the west, Walsh Bay to the north and Darling Harbour in the south.

The Precinct is divided into three distinct development areas, including:

- Barangaroo South (approx. 7.5ha) – Located at the southernmost end of Barangaroo Precinct. Progressively built over the last six years and includes mixed-use neighbourhood comprising commercial office buildings, mixed use buildings, shops, cafes, hotel and community uses.
- Central Barangaroo (approx. 5.2ha and area subject of SSDA) – Located between Barangaroo South and Barangaroo Reserve. Currently vacant and undergoing site preparation works to facilitate a mixed-use area with a focus on retail activation, residential and community uses.
- Barangaroo Reserve (approx. 6.1ha) – Located in the northern end of the Precinct featuring Barangaroo Reserve. Featuring open space and lookout points to Sydney Harbour, Nawi Cove and Marrinawi Cove. Barangaroo Reserve features the Cutaway – a future arts and cultural entertainment space.

The above results in a total area of 18.8ha. The residual 3.2ha is represented by the reshaping of the former industrial headland into Barangaroo Reserve and the creation of Nawi Cove as a substantial water body within the Barangaroo site, forming the original 22ha.

Central Barangaroo is occupied by temporary structures for construction purposes and a vehicle storage and construction site. The temporary structures support the construction of Barangaroo Metro Station, located within the north-eastern boundary of the site.

The area currently features a large concrete hardstand area/construction site that is occupied by temporary structures for site preparation works, machinery, materials and vehicle parking for site workers. Hoarding is currently erected around the Central Barangaroo site.

The site is also subject to current improvements such as remediation works, works to facilitate the Barangaroo Metro Station and a temporary road which runs off Hickson Road around the southern portion of the site. Tunnelling and excavation activities for the Barangaroo Metro Station have been completed and the Barangaroo Metro Station is operational.

4.3 BACKGROUND AND RELATED APPLICATIONS

4.3.1 Concept Application MP06_0162

The Barangaroo Concept Plan was approved on 9 February 2007 under Part 3A of the EP&A Act 1979. It has been modified several times since 2007.

The original Concept Plan was facilitated through an amendment to Schedule 3 of *State Environmental Planning Policy (Major Development) 2005* now consolidated into *State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021 (PEHC SEPP)*. The SEPP establishes the land use, height, GFA and other provisions relating to the planning and development of Barangaroo.

4.3.2 The Approved Concept Plan

Following several modifications up to MOD 11, the approved Concept Plan that applies to Barangaroo currently is described in Condition A1 of the Instrument of Approval and is generally summarised to include the following key elements:

- A mixed use development with a maximum of 655,864m² of GFA comprised of:
 - o A maximum 237,031m² of residential GFA of which a maximum 162,031m² will be in Barangaroo South,
 - o A maximum 76,000m² of GFA for tourist uses of which a maximum 59,000m² will be in Barangaroo outh,
 - o A maximum 44,766m² of GFA for retail uses of which a maximum 30,000m² will be in Barangaroo South,
 - o A maximum 5,000m² of GFA for active uses in the Public Recreation zone of which a maximum 3,500m² will be in Barangaroo South, and
 - o A minimum of 14,800m² of GFA for community uses.
- Approximately 11 hectares of new public open space/public domain, with a range of formal and informal open spaces serving separate recreational functions and including an approximate 2.2km foreshore promenade.

4.3.3 Central Barangaroo Early Works Phase 1 SSDA-39587022

SSDA-39587022 was approved by the Independent Planning Commission on 29 January 2025 and includes:

- Partial demolition of an existing shoring wall capping beam along Hickson Road,
- Construction of a new secant pile retention wall (approx. 150m long),
- Excavation of land related to construction of the secant pile retention wall,
- Localised remediation related to the secant pile retention wall,
- Associated Archaeological Investigations in the area of excavation and works,
- Sydney Metro / Hickson Road interfaces – perimeter retention wall interface works, and Hickson Road public domain interface works, and
- Relocation of stormwater and other services to enable the permanent works outlined above.

4.3.4 Central Barangaroo Early Works RTS

SSD-46922214 was publicly exhibited from 9 July 2025 until 9 August 2025. The DPHI provided a key issues letter, dated 28 August 2025, and the following submissions were received from government agencies and Council:

- Ausgrid
- DCCEEW (CPHR)
- DCCEEW (Water)
- EPA
- Heritage NSW (Aboriginal and European History)
- SES
- Sydney Metro
- Sydney Water Corporation
- Transport for NSW
- City of Sydney

Three submissions and two objections were received from the public.

The agency responses and submissions primarily raised issues relating to stormwater and flooding, construction traffic and access, heritage impacts, utilities coordination and provision of deep soil.

In response to matters raised during the exhibition the design has been amended as follows:

- A reduction in the footprint of the future basement therefore approximately 62,000m³ less bulk excavation: the western perimeter retention wall has been relocated further east to be parallel to the eastern perimeter retention wall, and the entire depth has been reduced by approximately 2 metres from RL -11.2 to RL -9.05m (excavation adjacent to Sydney Metro remains unchanged at RL-14.3m).
- Construction traffic access and works zones, particularly along Hickson Road have been rationalised and reorganised.

Further technical information and clarifications have also been prepared to address the full range of issues raised in submissions, including heritage, flooding and stormwater and utilities coordination.

Approval for this SSD has been determined since 23rd December 2025.

4.4 EXISTING SENSITIVE RECEIVERS

The precinct is surrounded by the following uses:

- Metro Station site, public domain, and Barangaroo Reserve to the north, with a hotel and commercial and residential properties further to the north
- To the south-west, Crown Sydney Hotel Resort (including Casino Resort, hotel and residential receivers)
- To the west Darling Harbour and Balmain
- To the south:
 - o Hickson Park, passive recreational public domain.
 - o One Sydney Harbour residential development.
 - o Commercial towers beyond.
- To the east:
 - o Residential dwellings on Hickson Road and High Street.
 - o Child Care Centre on the Corner of High Street and Argyle Lane.
 - o Commercial and hotel development along Hickson Road and Kent Street beyond.
 - o Residential dwellings and serviced apartments on Kent Street.

There is a Sydney Water pumping station located to the south of the site on Hickson Road.

4.5 APPROVED CONSTRUCTION WORK HOURS

Construction work is approved to occur:

- Monday to Friday 7 am to 6 pm
- Saturday 7 am to 5pm.
- No work on Sundays or public holidays will occur other than emergency operations.

Activities may be undertaken outside of these hours if required:

- By the Police or public authority for the delivery of vehicles, plant or materials to and from the site;
or
- In an emergency to avoid the loss of life, damage to property or to prevent environmental harm.

Notification of activities undertaken in the above circumstances must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

Rock breaking, rock hammering, sheet piling, pile driving, similar activities and the operation of high noise emission appliances, plant and/or machinery such as pile – drivers, rock breakers and hydraulic hammers and those that are not listed in Groups B, C, D, E or F of Schedule 1 of the City of Sydney Code of Practice for Construction Hours/Noise 1992 and Australian Standard 2436-2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites may only be carried out between the following hours:

- 9am to 12pm, Monday to Friday;
- 2pm to 5pm Monday to Friday; and

- 9am to 12pm, Saturday.

4.6 PROPOSED WORKS

4.6.1 Preliminary Works

The preliminary works will be divided into three main phases:

- Site Establishment
- Archaeological Testing Pits
- Demolition and Stormwater Diversion

4.6.1.1 Site Establishment

During this phase of work, new A-class hoarding will be constructed along the north and east perimeters of the subject site, with the existing A-class hoarding to the west and south-west and the existing chain-link fencing along the south to remain. A temporary site compound will be built with site parking towards the south-east of the site.

4.6.1.2 Archaeological Testing Pits & Salvage Excavation

Archaeological testing pits will be formed around the perimeter of the subject site with three stockpile bays. Any identified archaeological artefacts will be salvaged and excavated. Potential areas have been identified as shown:



4.6.1.3 Demolition and Stormwater Diversion

Existing stormwater infrastructure will be diverted to the eastern perimeter of the site. Demolition of the capping beam along the north east perimeter of the site will also occur.

4.6.2 Perimeter Retention Wall

The primary works proposed involve the construction of a reinforced concrete perimeter retention wall with supporting capping beams. The width of the wall is approximately 1.2m and will extend from the existing ground (approx. RL 2.5m) to a maximum depth of approximately RL-25m within the rock bed.

The junction of the capping beam and the wall will be constructed over the sea water line (at the 'king' tide level) which sits at approximately RL1.1m. The wall will extend around the northern, western and southern perimeter boundaries of the extent of excavation.

The wall will continue below the level of bulk excavation subject to the existing rock profile to satisfy the design requirements.

The junction between the northern extent of the proposed wall and the existing Sydney Metro pile wall will be coordinated with Sydney Metro, structural engineering, geotechnical engineering and water-proofing consultant. Similarly, the junction between the southern extent of the proposed wall and the secant pile wall (proposed by the applicant, refer SSD-39587022) will be coordinated to ensure alignment.

4.6.3 Bulk Excavation

The proposed works seek consent for the bulk excavation required to accommodate the proposed perimeter wall and provision for a future basement associated with the approved Concept Plan MP06_0162.

It is estimated that approximately 215,400m³ of material will be excavated from the site within the perimeter wall. Excavation will reach a maximum depth of approximately RL -9.0m, and approximately RL -14m at the Sydney Metro interface, subject to design and Sydney Metro interface requirements.

Consent for the construction of the basement structure and future uses is not sought in this application and will be subject to a separate future detailed SSDA.

4.6.4 Staging

It is envisaged that the proposed early works will largely be carried out in the five following stages:

Stage 1:

- Carry out archaeological investigation works,
- Site establishment works (including installation of site sheds, etc), and
- Installation of temporary construction pads and initial construction of approximately a 339m length of the perimeter retention wall.

Stage 2:

- Progress site establishment works as needed on site, particularly the bentonite pump
- Continue wall construction through use of D-wall trench cutters and ground anchor rock drilling equipment.
- Carry out associated remediation as required during construction of the wall,
- De-mobilise PRW plant and equipment,
- Mobilise de-watering and water treatment plant, and

- Construct capping beam.

Stage 3:

- Full extent of bulk excavation and remediation works (approximately 215,400m³) and install temporary rock anchors,
- Tie in-works, including establishing waterproof connection, with Sydney Metro interface wall and proposed Central Barangaroo secant pile wall (refer SSD-39587022), and
- Removal of de-stressed Sydney Metro rock anchors.

Stage 4:

- Foundation piling.

Stage 5:

- Installation of the waterproofing membrane and construction of the hydrostatic slab (approximately 1200mm thick).

Construction and excavation are anticipated to be undertaken over an approximated 28-month program.

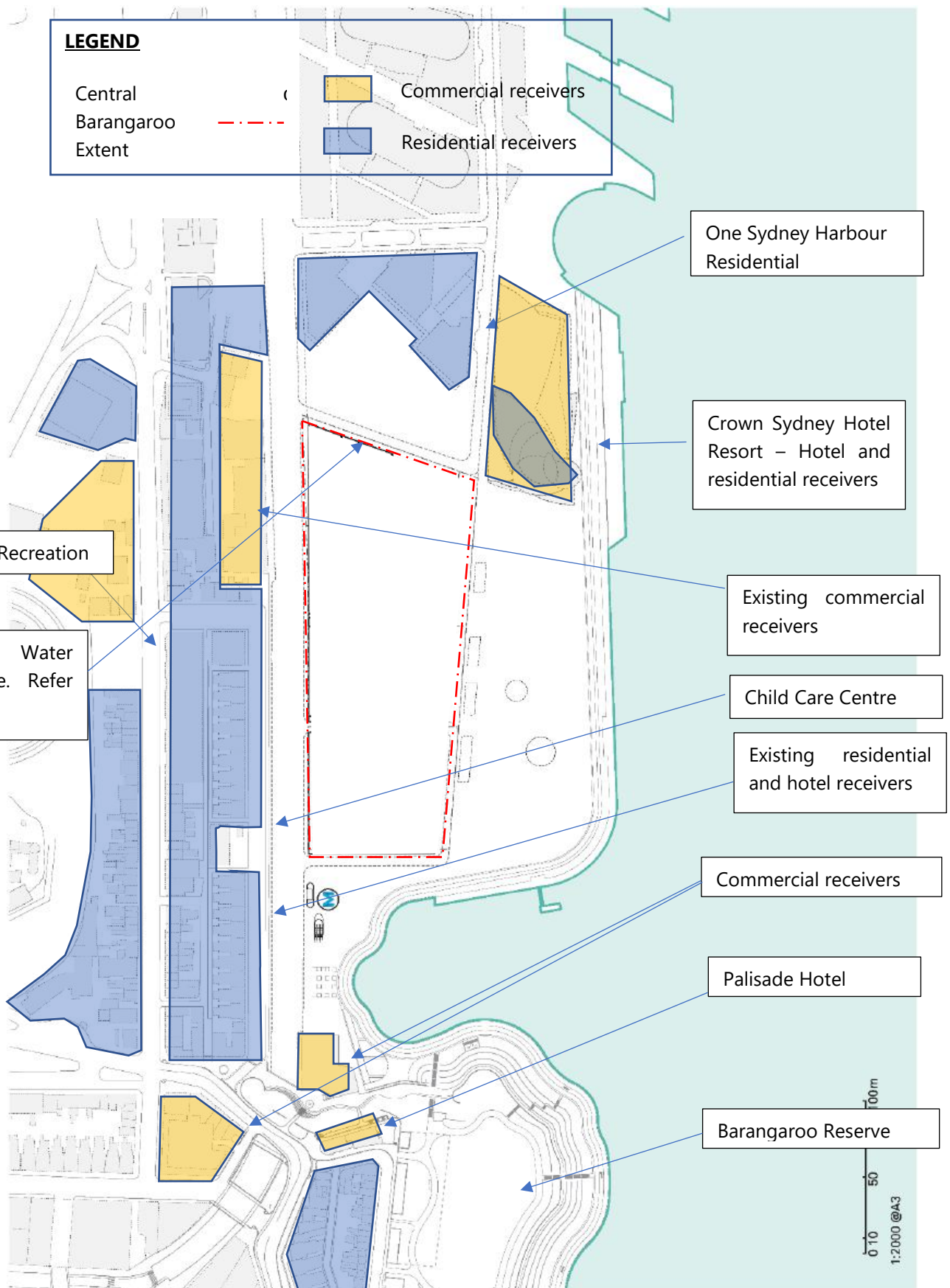


Figure 1: Site and Surrounds

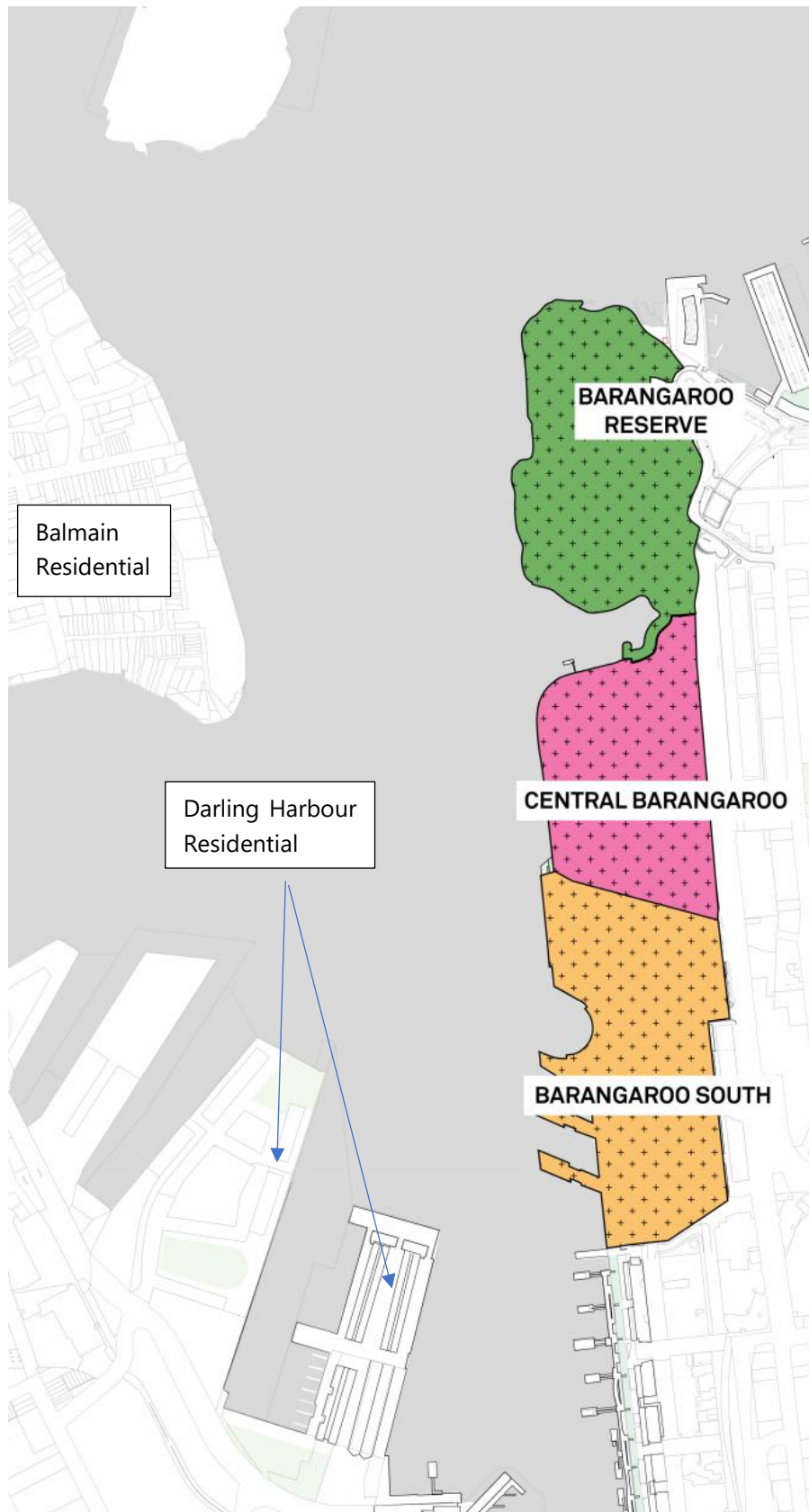
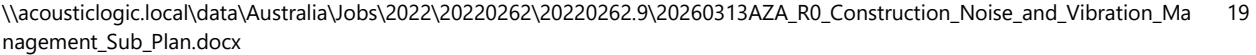
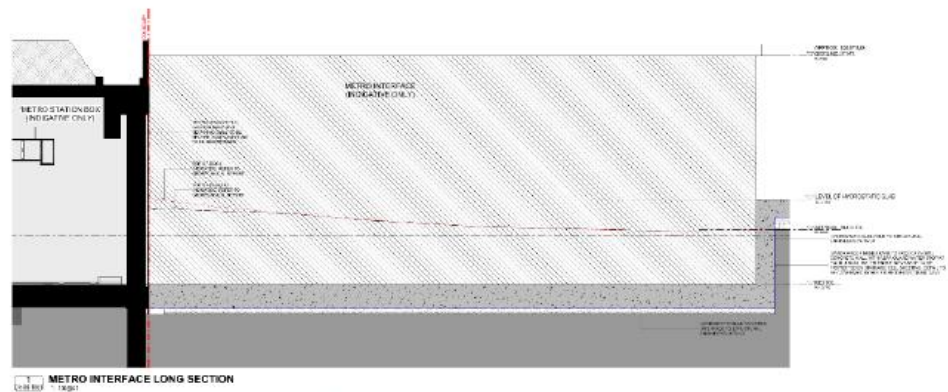
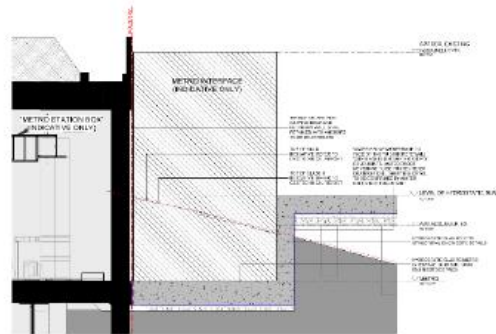


Figure 2: Site and Sensitive Receivers to West





1 METRO INTERFACE LONG SECTION
1:100



2 METRO INTERFACE CROSS SECTION
1:100

FOR APPROVAL

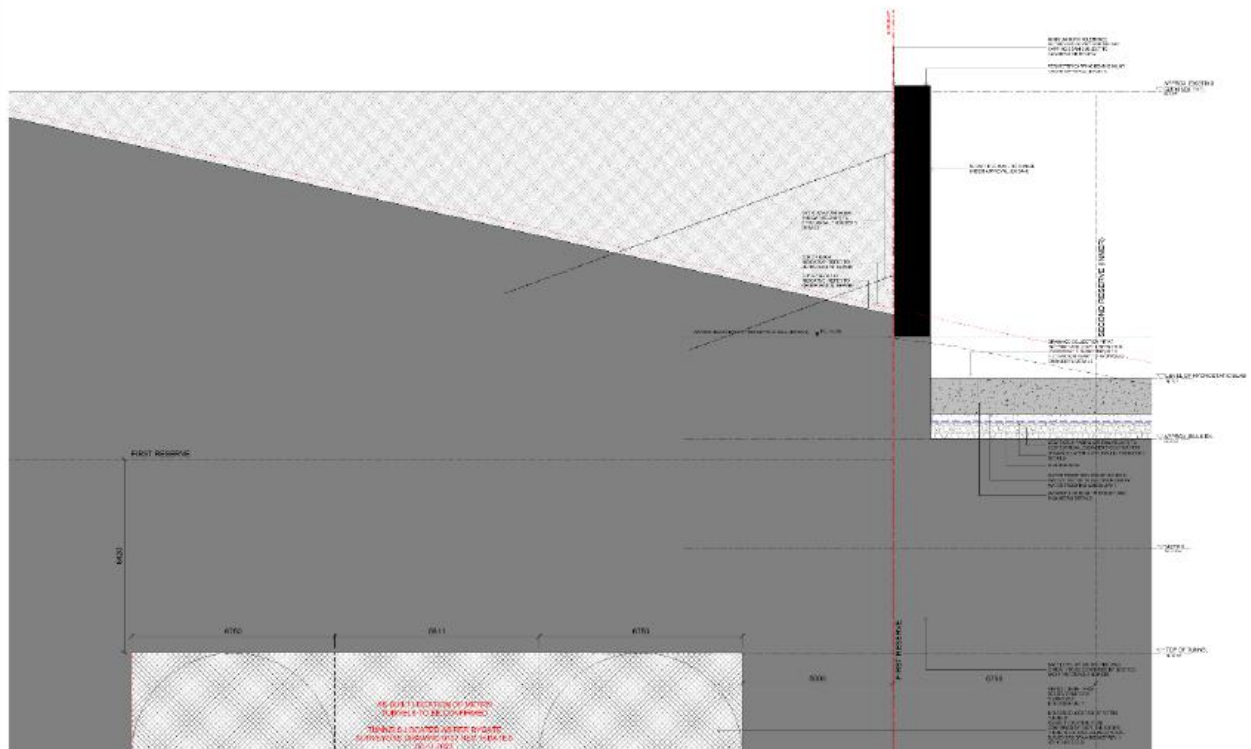
NO.	REVISION	DATE
1	ISSUED FOR APPROVAL	10/10/2021
2	ISSUED FOR APPROVAL	10/10/2021
3	ISSUED FOR APPROVAL	10/10/2021
4	ISSUED FOR APPROVAL	10/10/2021
5	ISSUED FOR APPROVAL	10/10/2021
6	ISSUED FOR APPROVAL	10/10/2021
7	ISSUED FOR APPROVAL	10/10/2021
8	ISSUED FOR APPROVAL	10/10/2021
9	ISSUED FOR APPROVAL	10/10/2021
10	ISSUED FOR APPROVAL	10/10/2021



Client: Queensland
Project: Rock Road, Rockhampton QLD
Country: Queensland
Metro Sections

DA-00-1551
1:100
1/7

NOT FOR CONSTRUCTION



1 DETAIL 2 - EASTERN BOUNDARY TO EWD-1
1:100

FOR APPROVAL

NO.	REVISION	DATE
1	ISSUED FOR APPROVAL	10/10/2021
2	ISSUED FOR APPROVAL	10/10/2021
3	ISSUED FOR APPROVAL	10/10/2021
4	ISSUED FOR APPROVAL	10/10/2021
5	ISSUED FOR APPROVAL	10/10/2021
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8	ISSUED FOR APPROVAL	10/10/2021
9	ISSUED FOR APPROVAL	10/10/2021
10	ISSUED FOR APPROVAL	10/10/2021

EAST BOUNDARY TO EWD-1



Client: Queensland
Project: Rock Road, Rockhampton QLD
Country: Queensland
Detail Wall Sections - Sheet 3 (East)

DA-00-1703
1:100
1/4

NOT FOR CONSTRUCTION



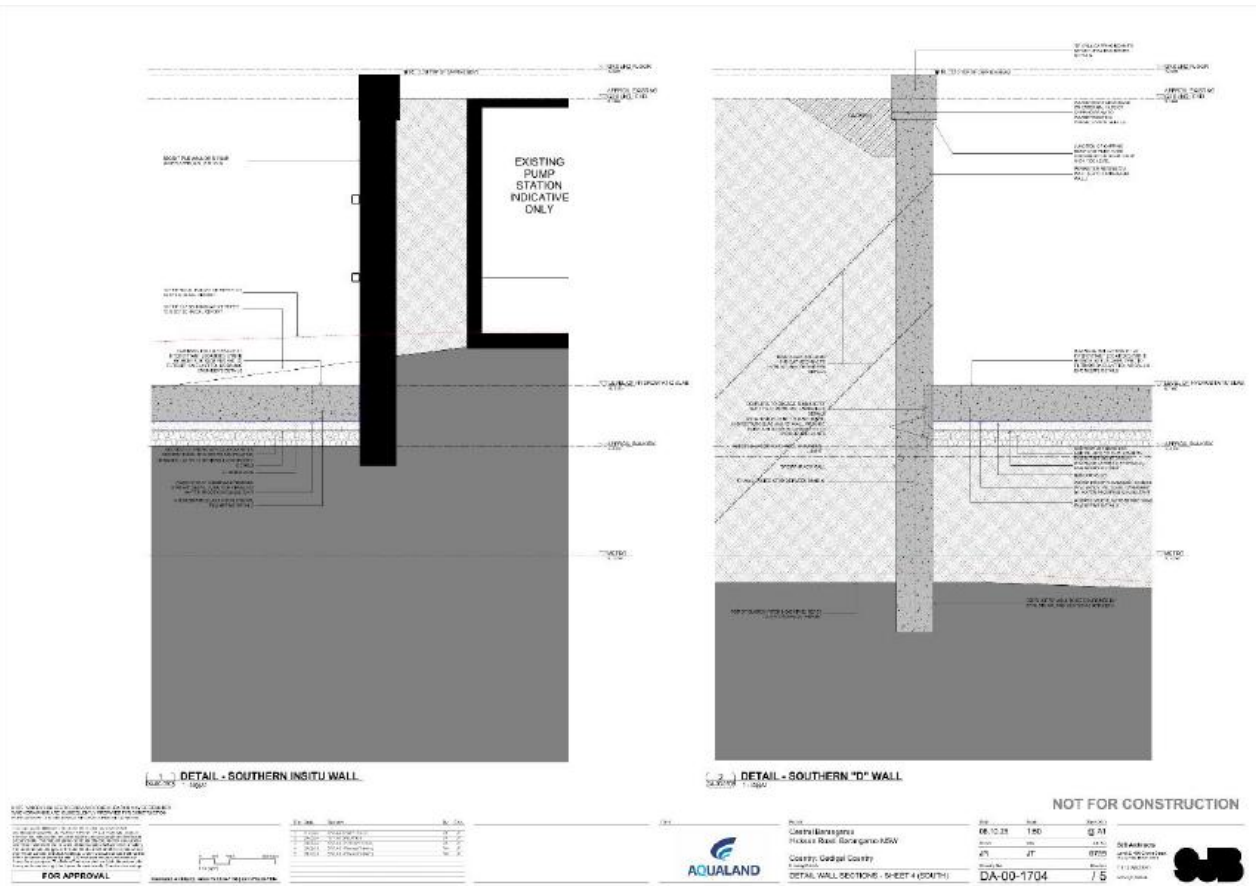


Figure 3: Proposed Site Works

- The main noise producing plant for Stage 1 & Stage 2 is:
 - o Excavator, and truck for off-site removal of spoil.
 - o Material delivery trucks.
 - o Mobile and fixed cranes
 - o CFA Rig
 - o Concrete truck.
 - o Concrete agitator.
 - o D-wall trench cutters
 - o Ground anchor rock drilling equipment
 - o Water treatment plant
- The main noise producing plant for Stages 3, 4, 5 and 6 is:
 - o Excavators (with/without hydraulic hammers), and truck for off-site removal of spoil.
 - o Jackhammers,
 - o Dozers/Loaders
 - o Material delivery trucks.

5 EXISTING ACOUSTIC ENVIRONMENT

5.1 ENVIRONMENTAL 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 continuously during this period, and then statistical and integrating techniques are used to characterise the noise being measured.

For the assessment of construction noise, the principal measurement parameters obtained from the data 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 time-varying noise sources (such as traffic noise).

L₉₀ – This is commonly used as a measure of the background noise level as it represents the noise level heard in the typical, quiet periods during the measurement interval. The L₉₀ 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 L₉₀ level.

5.2 UPDATED NOISE MONITORING

Updated noise monitoring has been conducted in and around the subject site to reflect on the changing environment of the Barangaroo Precinct. Detailed monitoring graphs have been provided in Appendix

5.2.1 Equipment Used

Unattended noise monitoring took place utilising Rion NL-42 type noise monitors.

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.

5.2.2 Locations Monitored

The locations monitored are indicated in Figure 4. Photographs of the monitoring locations have been provided in Appendix D.



Figure 4: Monitoring Locations

5.2.3 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 Observatory Hill and Fort Denison 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.

Monitoring periods excluded include:

- Sunday, 11th May 2025 – Night-time period
- Thursday, 15th May 2025 – Night-time and Evening periods
- Friday, 16th May 2025 – Night-time period at Munn Reserve location
- Saturday, 17th May 2025 – Night-time period
- Sunday, 18th May 2025 – All time periods
- Monday, 19th May 2025 – All time periods
- Tuesday, 20th May 2025 – Night-time period
- Wednesday, 21st May 2025 – Night-time period
- Thursday, 22nd May 2025 – All time periods
- Friday, 23rd May 2025 – Day-time period and evening periods
- Saturday, 24th May 2025 – Evening period
- Sunday, 25th May 2025 – Evening period
- Monday, 26th May 2025 – Evening period. Night-time period removed at Munn Reserve location
- Tuesday, 27th May 2025 – Day-time and evening periods
- Wednesday, 4th June 2025 – Day-time period

5.2.4 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.

5.2.4.1 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.

The day, evening and night periods are as defined in the NPfI, as follows:

- Day - 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

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 2 – Assessment Background Noise Levels – Monitor Location 1

Location	Date	ABL – dB(A) L ₉₀		
		Day	Evening	Night
Central Barangaroo Site South (in close proximity to One Sydney Harbour Tower)	Tuesday, 3 rd June 2025	51	49	43
	Wednesday, 4 th June 2025	-	49	43
	Thursday, 5 th June 2025	50	52	44
	Friday, 6 th June 2025	50	52	44
	Saturday, 7 th June 2025	49	53	44
	Sunday, 8 th June 2025	48	54	44
	Monday, 9 th June 2025	48	50	44
	Tuesday, 10 th June 2025	-	-	-
	Calculated RBL	49	52	44
	Adopted RBL	49	49¹	44

Note:

1. The evening RBL cannot be higher than the day-time RBL.

Table 3 – Assessment Background Noise Levels – Monitor Location 2

Location	Date	ABL – dB(A) L ₉₀		
		Day	Evening	Night
KU Lance Childcare, High Street, Millers Point	Friday, 9 th May 2025	-	-	40
	Saturday, 10 th May 2025	46	46	42
	Sunday, 11 th May 2025	44	43	-
	Monday, 12 th May 2025	47	43	39
	Tuesday, 13 th May 2025	46	44	39
	Wednesday, 14 th May 2025	46	44	40
	Thursday, 15 th May 2025	46	-	-
	Friday, 16 th May 2025	47	46	41
	Saturday, 17 th May 2025	47	46	-
	Sunday, 18 th May 2025	-	-	-
	Monday, 19 th May 2025	-	-	-
	Tuesday, 20 th May 2025	46	43	-
	Wednesday, 21 st May 2025	46	45	-
	Thursday, 22 nd May 2025	-	-	-
	Friday 23 rd May 2025	-	-	42
	Saturday, 24 th May 2025	47	-	40
	Sunday, 25 th May 2025	44	-	40
	Monday, 26 th May 2025	47	-	39
	Tuesday, 27 th May 2025	-	-	45
	Wednesday, 28 th May 2025	-	-	-
	Calculated RBL	46	43	40
	Adopted RBL	44¹	41¹	38¹

Note:

2. Corrected for façade reflections.

Table 4 – Assessment Background Noise Levels – Monitor Location 3

Location	Date	ABL – dB(A) L ₉₀		
		Day	Evening	Night
Munn Reserve, Millers Point	Friday, 9 th May 2025	-	-	40
	Saturday, 10 th May 2025	48	53	-
	Sunday, 11 th May 2025	44	43	-
	Monday, 12 th May 2025	50	44	40
	Tuesday, 13 th May 2025	49	47	40
	Wednesday, 14 th May 2025	49	52	40
	Thursday, 15 th May 2025	52	-	-
	Friday, 16 th May 2025	53	53	-
	Saturday, 17 th May 2025	53	54	-
	Sunday, 18 th May 2025	-	-	-
	Monday, 19 th May 2025	-	-	-
	Tuesday, 20 th May 2025	52	48	-
	Wednesday, 21 st May 2025	51	53	-
	Thursday, 22 nd May 2025	-	-	-
	Friday 23 rd May 2025	-	-	41
	Saturday, 24 th May 2025	48	-	40
	Sunday, 25 th May 2025	45	50	40
	Monday, 26 th May 2025	50	-	-
	Tuesday, 27 th May 2025	-	-	45
	Wednesday, 28 th May 2025	-	-	-
	Calculated RBL	50	47	40
	Adopted RBL	50	47	40

Table 5 – Assessment Background Noise Levels – Monitor Location 4

Location	Date	ABL – dB(A) L ₉₀		
		Day	Evening	Night
Barangaroo Reserve, Towns Place, Millers Point	Friday, 9 th May 2025	-	-	38
	Saturday, 10 th May 2025	50	49	38
	Sunday, 11 th May 2025	45	42	-
	Monday, 12 th May 2025	51	45	38
	Tuesday, 13 th May 2025	51	47	38
	Wednesday, 14 th May 2025	51	44	38
	Thursday, 15 th May 2025	50	-	-
	Friday, 16 th May 2025	51	45	38
	Saturday, 17 th May 2025	50	48	-
	Sunday, 18 th May 2025	-	-	-
	Monday, 19 th May 2025	-	-	-
	Tuesday, 20 th May 2025	53	50	-
	Wednesday, 21 st May 2025	53	50	-
	Thursday, 22 nd May 2025	-	-	-
	Friday 23 rd May 2025	-	-	40
	Saturday, 24 th May 2025	48	-	40
	Sunday, 25 th May 2025	45	-	38
	Monday, 26 th May 2025	50	-	39
	Tuesday, 27 th May 2025	-	-	39
	Wednesday, 28 th May 2025	-	-	-
	Calculated RBL	50	46	38
	Adopted RBL	50	46	38

Table 6 – Assessment Background Noise Levels – Monitor Location 5

Location	Date	ABL – dB(A) L ₉₀		
		Day	Evening	Night
Ballaarat Park, Darling Island Road, Pyrmont	Friday, 9 th May 2025	-	-	41
	Saturday, 10 th May 2025	45	47	41
	Sunday, 11 th May 2025	44	43	-
	Monday, 12 th May 2025	46	45	41
	Tuesday, 13 th May 2025	46	46	41
	Wednesday, 14 th May 2025	46	45	41
	Thursday, 15 th May 2025	46	-	-
	Friday, 16 th May 2025	46	46	41
	Saturday, 17 th May 2025	45	48	-
	Sunday, 18 th May 2025	-	-	-
	Monday, 19 th May 2025	-	-	-
	Tuesday, 20 th May 2025	48	45	-
	Wednesday, 21 st May 2025	47	47	-
	Thursday, 22 nd May 2025	-	-	-
	Friday 23 rd May 2025	-	-	42
	Saturday, 24 th May 2025	46	-	41
	Sunday, 25 th May 2025	45	-	41
	Monday, 26 th May 2025	48	-	42
	Tuesday, 27 th May 2025	-	-	42
	Wednesday, 28 th May 2025	-	-	-
	Calculated RBL	46	46	41
	Adopted RBL	50	46	38

Table 7 – Assessment Background Noise Levels – Monitor Location 6

Location	Date	ABL – dB(A) L ₉₀		
		Day	Evening	Night
Edward Street, Balmain	Friday, 9 th May 2025	-	-	36
	Saturday, 10 th May 2025	45	46	37
	Sunday, 11 th May 2025	43	41	-
	Monday, 12 th May 2025	45	42	36
	Tuesday, 13 th May 2025	45	46	36
	Wednesday, 14 th May 2025	44	43	37
	Thursday, 15 th May 2025	45	-	-
	Friday, 16 th May 2025	45	42	37
	Saturday, 17 th May 2025	43	46	-
	Sunday, 18 th May 2025	-	-	-
	Monday, 19 th May 2025	-	-	-
	Tuesday, 20 th May 2025	47	45	-
	Wednesday, 21 st May 2025	48	46	-
	Thursday, 22 nd May 2025	-	-	-
	Friday 23 rd May 2025	-	-	-
	Saturday, 24 th May 2025	-	-	-
	Calculated RBL	45	45	36
	Adopted RBL	45	45	36

6 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

6.1 GENERAL

The principal objective of this study is to undertake an evaluation of works to be performed during the operation of the various activities during construction and develop a management plan to ensure noise and vibration:

1. Does not excessively impact on the sensitive receivers.
2. Is monitored when potentially high noise and vibration generating activities are being used.

This assessment will formulate/present the relevant noise and vibration management levels which will be used to manage impacts from construction activities. Mitigation measures have been recommended that are used to control noise and vibration impacts.

The principal issues to be addressed in this section are:

- Identification of the noise and vibration guidelines which will be applicable to this project.
- Formulation of a strategy for construction activities to comply with the guidelines identified.
- Development of construction methods which will minimise the impact on surrounding uses in accordance with the guidelines.

The expected activities are described in Section 4.5.

6.2 CONSTRUCTION NOISE MANAGEMENT LEVELS

Noise emanating from the construction site has been assessed with reference to the recommendations of the EPA ICNG and CoS COP 1992.

6.2.1 EPA Interim Construction Noise Guideline (ICNG)

The ICNG reflects on feasible and reasonable mitigation strategies, management controls and public liaising in the effort to reach realistic compromises between construction sites and potential noise affected receivers.

Table 8 - Construction Noise Management Levels

Management Level L_{Aeq}(15min)	How to Apply
Noise affected 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.

Management Level L_{Aeq}(15min)	How to Apply
	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

Approved work hours for Saturdays are until 5pm, of which are considered outside of "normal hours" approved by NSW EPA. Therefore, an assessment of works during these hours is undertaken, following is typically adopted.

Table 9 – Construction Noise Management Levels- Out of Normal Hours

Management Level L_{Aeq}(15min)	How to Apply
Noise affected RBL + 5dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community

The ICNG provides guidance on construction noise management levels for sensitive uses other than residential dwellings. These uses as detailed in the following table.

Table 10 – Construction Noise Management Levels – Non Residential Uses

Land Use	Management Level, L_{Aeq} (15min) (applies when properties are being used)
Commercial and Retail Outlets	70dB(A)

A summary of noise emission management levels for both standard hours of construction and outside standard hours is presented.

Table 11 – Construction Noise Emission Objectives

Location	Time of Day	“Noise Affected” Level dB(A) L_{eq} (15min)	“Highly Noise Affected” Level dB(A) L_{eq} (15min)
Residences	Standard construction hours	RBL + 10	75
	Outside recommended standard hours	RBL + 5	-
Active Recreation	Day	65	-
Passive Recreation	Day	60	-
Classrooms at Schools (Child Care Centre)	Day	45 (internal)	-
Commercial Development	When in use	70	N/A

6.2.2 City of Sydney Code of Practice 1992

Residential noise management levels are based on the City of Sydney Council Code of Practice which provides different categories of working hours with the respective noise criteria, as follows:

Table 12 – City of Sydney Code of Practice Categories of Working Hours and Noise Criteria

Day	Time Zone	Category	Noise Criteria
Monday to Friday	00.00 – 07.00	4	Background + 0 dBA
	07.00 – 08.00	1	Background + 5 dBA
	08.00 – 19.00	1	Background + 5 dBA + 5 dBA to be determined on a site basis
	19.00 – 23.00	2	Background + 3 dBA
	23.00 – 24.00	4	Background + 0 dBA
Saturday	00.00 – 07.00	4	Background + 0 dBA
	07.00 – 08.00	1	Background + 5 dBA
	08.00 – 17.00	1	Background + 5 dBA + 5 dBA to be determined on a site basis
	17.00 – 23.00	2	Background + 3 dBA
	23.00 – 24.00	4	Background + 0 dBA

6.2.3 Summary of Management Levels

The NML's for the most impacted receivers are summarised in the following table using the objectives tabled above and the adopted background noise levels.

Table 13 – Noise Management Levels for Most Impacted Receivers

Location/Receiver	Adopted Background dB(A) L ₉₀	Time Period	CoS COP dB(A) L _{eq}	ICNG NML dB(A) L _{eq}	ICNG HANML dB(A) L _{eq}
Balmain	45	Standard construction hours	55	55	75
		Outside recommended standard hours	50	50	-
Darling Harbour	46	Standard construction hours	56	56	75
		Outside recommended standard hours	51	51	-
Casino Resort Podium/Hotel	-	Standard construction hours/Outside standard hours	-	70	-
Casino Resort Residential	49	Standard construction hours	59	59	75
		Outside recommended standard hours	54	54	-
One Sydney Harbour Residential	49	Standard construction hours	59	59	75
		Outside recommended standard hours	54	54	-
Barangaroo Commercial	-			70	-
Hickson Road Commercial	-			70	-

High Street Residences	44	Standard construction hours	54	54	75
		Outside recommended standard hours	49	49	-
Hickson Road Residences	50	Standard construction hours	60	60	75
		Outside recommended standard hours	55	55	-
High Street Child Care Centre	-			45 internal* 65 external in play area	-
Kent Street Residences	50	Standard construction hours	60	60	75
		Outside recommended standard hours	55	55	-
Barangaroo Reserve	-			60	-
Commercial Receivers to North	-			70	-
Residential Receivers to North	50	Standard construction hours	60	60	75
		Outside recommended standard hours	55	55	-

* 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.

6.3 CONSTRUCTION VIBRATION MANAGEMENT LEVELS

6.3.1 Amenity Management Generally

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 the guideline) are presented below for various types of vibration:

Table 2.2 Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration (m/s²) 1–80 Hz

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	0.020	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 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am

² Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks 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: BS 6472–1992

Table 2.4 Acceptable vibration dose values for intermittent vibration (m/s^{1.75})

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 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.

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: BS 6472–1992

6.3.2 Infrastructure Assets

Nearby infrastructure includes Sydney Water and Sydney Metro assets.

6.3.2.1 Sydney Metro

Construction activities will occur near Sydney Metro assets, and management of activities may be required in order to protect these assets.

Section 5.4 of the Sydney Metro Underground Corridor Protection Technical Guideline, provides the following considerations:

5.4 Noise and vibration

Noise and vibration assessments for proposed Development must include noise and vibration generated by construction and rail operations. Sydney Metro does not accept liability for the generation of noise and vibration from railway operations (including track maintenance), or for its transmission into Development above, below or adjacent to Metro Infrastructure.

When designing Development, consideration must be given to existing and future, operational and construction vibration; as well as ground or structure-borne noise emissions in accordance with Developments Near Rail Corridor and Busy Roads – Interim Guideline, Department of Planning, NSW Government 2008 and TS 01717 Development Near Rail Tunnels.

Consideration should be given to whether Section 2.100 of the Transport and Infrastructure SEPP is triggered for impacts of rail noise or vibration on non-rail Development. If triggered, measures to achieve consistency with the requirements of the SEPP should be detailed.

More stringent limits may apply if rail equipment, that is sensitive to vibration, has the potential to be affected by the Development and its construction.

If predicted or actual vibration levels exceed tolerable limits, then the Applicant or public authority must modify the construction methodology in such a way that the vibration limits are satisfied.

5.4.1 Considerations during construction of Development

During construction of Development, and in accordance with TS 01717 Development Near Rail Tunnels, vibration impacts on Sydney Metro structures must be minimised. The maximum peak particle velocity (PPV) at 4 Hz and above at the tunnel lining is:

- 20 mm/s measured at the tunnel lining for segment lined tunnels
- 15 mm/s measured at the tunnel lining for mass concrete lined tunnels (e.g. Epping to Chatswood, mined station caverns, crossover caverns etc.).

Sources of vibration that are to be considered include: demolition, piling, ground treatments (e.g. compaction), construction equipment, tunnelling and industrial machinery.

Continuous rock breaking/hammering and sheet piling, vibratory rollers, excavators and the like can give rise to dynamic magnification due to resonance.

Sydney Metro may request construction vibration monitoring. In these instances, the Applicant or public authority should nominate an Alert level for monitoring and management purposes to advise when vibration levels are approaching these limits to ensure that the limits are not exceeded.

Atypical construction methods are to be assessed on a case-by-case basis with reference to relevant standards.

To assess the likelihood of cosmetic damage due to vibration, Australian Standard AS 2187: Part 2-2006 Explosives – Storage and Use – Part 2: Use of Explosives specifies that the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) are to be compared with the guidance vibration velocity limits.

6.3.2.2 Sydney Water

There is an existing sewer pump station located immediately to the south of the site. The location is indicated in Appendix C. Aqualand are consulting regularly with SW and INSW regarding the Pump Station. Vibration considerations will be made during the detailed design of the piling wall and selection of equipment. In the absence of any vibration level criteria from Sydney Water, a limit of 20 mm/s peak particle velocity will be used, corresponding to the lower end of the range for commercial and industrial buildings (refer below).

6.3.3 Other Structures

In addition to amenity management levels, higher vibration limits are imposed to generally protect nearby structures. German Standard DIN 4150-3 (2016) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (2016) are presented in the following table. The peak velocity is the value of the maximum of any of the three orthogonal component particle velocities as 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.

Table 14 -(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

It is noted that these vibration levels are significantly higher than the corresponding amenity management levels. Therefore, compliance with the amenity levels will result in vibration that is significantly below structure damage risk levels.

6.4 ASSESSMENT OF CONSTRUCTION NOISE

With respect to general construction noise, the impacts on nearby development will be dependent on the activity in question and where on the site the activity is undertaken.

6.4.1 Construction Noise Predictions

Noise from construction activities at the surrounding receivers has been predicted using the SoundPLAN computer model based on the following inputs.

- ISO 9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation" noise propagation standard.
- Meteorological Conditions – 20°C , 70% RH, neutral weather conditions.
- The following plant sound power levels (dB(A) (sourced from AS 2436 and AL database):
 - o Truck – 106 at 15 km/hr driving around site, 95 idling (continuous). (up to 3 truck movements per 15 minutes assumed worst case). We note the traffic assessment undertaken by Stantec, anticipates that there will be an average of 15 trucks per hour.
 - o CFA Rig – 107 (continuous)
 - o Concrete truck discharging – 103 (continuous)
 - o Concrete Vibrator – 102 (continuous)
 - o Tracked Excavator 103 (continuous)
 - o Water treatment plant pump – 90 (continuous)
 - o Diesel Crane – 104 operating, idling – 94. Assumed 50% of time lifting and 50% of time idling.
 - o Bentonite pump (diesel) – 108 (continuous)
- Elevation data for the site and surrounding areas was obtained from NSW Spatial Services via the ELVIS – Elevation and Depth – Foundation Spatial Data website.
- Source heights – 2m above ground level.

6.4.2 Scenarios Modelled

A worst-case assumption was made for the modelling: all operations occur on the site simultaneously. Movable plant was modelled at two locations along length of the wall to indicate the highest and range of noise levels expected. The modelled noise sources are described below.

6.4.2.1 Stage 1

The plant modelled for Stage 1 to represent noise levels from site establishment works, with the following plant included at each location:

- o Concrete/Delivery Truck idling
- o Four concrete/delivery trucks entering and leaving site
- o CFA Rig
- o Tracked Excavator
- o 3 Cranes
- o Concrete truck discharging
- o Concrete Vibrator

- o Water treatment plant pump

6.4.2.2 Stage 2

The scenarios modelled for Stage 2 are that similar of Stage 1 however include associated processes for the construction of the perimeter retention wall and the operation of the water treatment plant. The plant was modelled in two locations. The following plant is included at each location:

- o Same as Stage 1
- o D-wall trench cutters
- o Ground anchor rock drilling equipment

6.4.2.3 Stage 3, 4, 5 and 6

The plant modelled for Stages 3-6 are to represent noise levels from operation relative to bulk excavation works. The following plant is included:

- o Delivery Truck idling
- o Four delivery trucks entering and leaving site
- o 3 Tracked Excavators
- o Dozer/Loader
- o 3 Cranes

6.4.3 Stage 3 (Hydraulic Hammering)

Hydraulic hammering as part of Stage 3 works has been modelled in isolation. The following plant is included:

- o 3 Tracked Excavators with hydraulic hammer attachment. These are modelled 5m below ground level.
- o Jackhammer

6.4.4 Predicted Noise Levels

The output of the SoundPLAN modelling is provided in Appendix B. The predicted noise levels are summarised in the following tables.

6.4.4.1 Stage 1

Table 15 – Predicted Noise Impacts – Stage 1

Location/Receiver	Highest Predicted Level dB(A) L_{eq}	NML dB(A) L_{eq}	HANML dB(A) L_{eq}	Requires Assessment of Additional Management
Balmain	50	55/50	75	No
Darling Harbour	40	56/51	75	No
Casino Resort Podium/Hotel	60	70	-	No
Casino Resort Residential	65	59/54	75	Yes
One Sydney Harbour Residential	60	59/54	75	No
Barangaroo Commercial	50	70	-	No
Hickson Road Commercial	65	70	-	No
High Street Residences	65	54/49	75	Yes
Hickson Road Residences	45	60/55	75	No
High Street Child Care*	60	65	-	No
Kent Street Residences	60	60/55	75	No
Barangaroo Reserve*	55	60	-	No
Hickson Park*	65	70	-	Yes
Commercial Receivers to North	50	60	-	No
Residential Receivers to North	45	60/55	75	No

* Assessed at 1.5m above ground level.

6.4.4.2 Stage 2

Table 16 – Predicted Noise Impacts – Stage 2 – Scenarios 1-4

Location/Receiver	Highest Predicted Level dB(A) L_{eq}	NML dB(A) L_{eq}	HANML dB(A) L_{eq}	Requires Assessment of Additional Management
Balmain	45	55/50	75	No
Darling Harbour	40	56/51	75	No
Casino Resort Podium/Hotel	55	70	-	No
Casino Resort Residential	60	59/54	75	No
One Sydney Harbour Residential	55	59/54	75	No
Barangaroo Commercial	40	70	-	No
Hickson Road Commercial	65	70	-	No
High Street Residences	65	54/49	75	Yes
Hickson Road Residences	50	60/55	75	No
High Street Child Care*	65	65	-	No
Kent Street Residences	60	60/55	75	No
Barangaroo Reserve*	50	60	-	No
Hickson Park*	60	70	-	No
Commercial Receivers to North	55	60	-	No
Residential Receivers to North	50	60/55	75	No

* Assessed at 1.5m above ground level.

6.4.4.3 Stages 3-6

Table 17 – Predicted Noise Impacts – Stage 3-6

Location/Receiver	Highest Predicted Level dB(A) L_{eq}	NML dB(A) L_{eq}	HANML dB(A) L_{eq}	Requires Assessment of Additional Management
Balmain	50	55/50	75	No
Darling Harbour	45	56/51	75	No
Casino Resort Podium/Hotel	65	70	-	No
Casino Resort Residential	65	59/54	75	Yes
One Sydney Harbour Residential	60	59/54	75	No
Barangaroo Commercial	55	70	-	No
Hickson Road Commercial	55	70	-	No
High Street Residences	60	54/49	75	Yes
Hickson Road Residences	50	60/55	75	No
High Street Child Care*	65	65	-	No
Kent Street Residences	55	60/55	75	No
Barangaroo Reserve*	50	60	-	No
Hickson Park*	60	70	-	No
Commercial Receivers to North	60	60	-	No
Residential Receivers to North	50	60/55	75	No

* Assessed at 1.5m above ground level.

6.4.4.4 Stage 3 (Hydraulic Hammering/HH)

Table 18 – Predicted Noise Impacts – Stage 3 (HH)

Location/Receiver	Highest Predicted Level dB(A) L_{eq}	NML dB(A) L_{eq}	HANML dB(A) L_{eq}	Requires Assessment of Additional Management
Balmain	50	55/50	75	No
Darling Harbour	45	56/51	75	No
Casino Resort Podium/Hotel	55	70	-	No
Casino Resort Residential	55	59/54	75	No
One Sydney Harbour Residential	60	59/54	75	No
Barangaroo Commercial	65	70	-	No
Hickson Road Commercial	70	70	-	No
High Street Residences	70	54/49	75	Yes
Hickson Road Residences	55	60/55	75	No
High Street Child Care*	75	65	-	Yes
Kent Street Residences	50	60/55	75	No
Barangaroo Reserve*	60	60	-	No
Hickson Park*	55	70	-	No
Commercial Receivers to North	65	60	-	No
Residential Receivers to North	55	60/55	75	No

* Assessed at 1.5m above ground level.

6.4.4.5 Summary of Predicted Impacts

The analysis indicates that:

- No receiver will be subject to noise exceeding the HANML.
- With the exception of the nearest receivers on Hickson Road, no commercial receiver will be subject to noise exceeding the NML.
- During EPA standard work hours, there are 2 residential receivers that will be subject to noise exceeding the NML. These being:
 - o the closest residents in the One Sydney Harbour Tower and Crown for which a marginal exceedance of up to 8 dB(A) is predicted during construction.
 - o Approximately 25 residences in High Street south of Argyle Place. An NML exceedance of up to 15 dB(A) (54 dB(A) NML) is predicted during hydraulic hammering works (Stage 3). For the general excavation works (excluding hammering) the largest exceedance is 11 dB(A), and lower exceedances would generally occur on the location of the plant on the site.
- Outside of EPA standard work hours (Saturdays from 1pm to 5pm), residents along Kent Street will be subject to noise exceeding the outside of normal hours NML.
- Noise to the Barangaroo Reserve would not exceed the NMLs. Noise levels in Hickson Park will exceed the NML's by up to 5 dB(A) when piling and hydraulic hammering close to the southern boundary.

The predicted exceedances at the Crown and One Sydney Harbour Towers are 8 dB(A) or less. To assess whether mitigation of these exceedances is feasible or reasonable" the IGNG indicates the following should be considered:

- The levels of impact including noise levels and the number of people affected.
- The benefits of noise mitigation and the number of people protected.
- Cost effectiveness of mitigation.
- Community views.

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 NML exceedances. We note hydraulic hammering expected to occur during Stage 3 is the loudest activity expected to occur and resulting in exceedances of the NMLs.
- If any residual exceedances, investigate the use of additional barriers to screen the affected receivers. It is noted that there is an existing approximately 2.4m high hoarding on the boundary of the site.
- If any remaining residual significant exceedances, investigate time restrictions (e.g. avoiding loud early morning works at the residences and Saturday afternoon works to limit construction noise to "background + 5 dB(A)) and notification of affected receivers when works likely to exceed the NML's is likely to occur. This is likely the case for residences along High Street and across Hickson Park given the elevated height.

For the High Street residences, this preliminary assessment indicates that feasible and reasonable noise mitigation would need to be investigated to by the contractor to minimise noise impacts, based on the procedures and methods in Section 7 and the ICNG.

Regarding impacts on the High Street child care centre, for Stages 1 and 2, noise levels are expected to be within the acceptable management levels. This is also the case for Stage 3 (excluding hydraulic hammering works). When hydraulic hammering works do occur, the largest exceedance is 5 dB(A) depending on the location of the plant on site.

Regarding impacts are Hickson Park it is noted that:

- There is already a hoarding that separates the subject site from the park that provides a noise barrier.
- The exceedances only occur when the piling rig and hydraulic hammer is being used close to the southern boundary, and even these exceedances are minor. For other operations and times, noise levels are predicted to be compliant.

For the reasons outlined above, additional mitigation for this receiver is not indicated.

6.4.5 Water Treatment Plant

The water treatment plant may be required to operate 24/7. Accordingly it will be assessed using the out of normal hours criterion, using the night time background as a basis. The most affected receiver would be the residences in the One Sydney Harbour towers to the south of the site, which are approximately 70m from the plant.

The background noise measurement location most appropriate to these residents is Location 2, where a night time RBL of 45 dB(A) was established. Therefore, noise from the water treatment plant should not exceed 50 dB(A) L_{eq} .

The most likely noise source will be water pumps and the maximum sound power level emitted by the plant to comply with the receiver criterion is 95 dB(A). If the proposed plant sound level exceeds this, enclosure or other treatment should be installed to control emissions and comply with the criterion.

6.5 CONSTRUCTION VIBRATION

The available literature indicates that vibration produced by the proposed CFA piling and is negligible, and is the preferred method when working near vibration sensitive structures. The proposed activities would not generate significant ground vibration and it expected that ground vibration from the proposed activities will be well below the recommended vibration limits and management levels at all receivers.

Excavation close to the Metro infrastructure may produce vibration levels exceeding the applicable guideline criteria. Impacts on the Metro will be dependent on whether it is in operation when the works are carried out, and the excavation activities undertaken. If the Metro is in operation, then amenity impacts for staff and patrons would need to be considered in addition to structure impacts. As a minimum vibration monitoring of the Metro structure should be undertaken when excavation works are within 25m of the Metro infrastructure. Additional noise or vibration monitoring requirements should be assessed when developing the project Construction Noise and Vibration Management Plan as recommended in this assessment depending on the intensity of excavation activities and whether the Metro is in operation.

A precise assessment of vibration emissions from the proposed works, particularly the construction of a diaphragm wall is not possible due to the large number of unknowns including the actual equipment employed, how it is operated, site conditions, etc.

In the absence of any specific equipment the generic minimum safe working distances presented in Table 14 – Recommended Base Minimum Working Distances for Vibration Intensive Plant From Sensitive Receivers should be used with caution for guidance.

6.6 TRAFFIC GENERATION ON EXISTING ROADS

Based on the traffic assessment undertaken by Stantec, the proposed works will generate an average of 15 trucks per hour. Compared to existing traffic volumes on Hickson Road, this is a relatively small volume of traffic that would not cause a noticeable change in traffic noise experienced at properties along Hickson Road.

6.7 CONSTRUCTION OUTSIDE OF EPA NORMAL HOURS

The predictions indicate that the main noise producing activities (CFA piling and concrete pours) will generate noise levels exceeding the afterhours NML's for Saturday afternoon (and other afterhours periods). The IGNG guidelines would not normally permit these activities to occur after normal hours without justification.

The City of Sydney Construction Noise Code regards Saturday morning between 7am and 8am and Saturday afternoon as a "normal" construction period, with a criterion of "background + 5 dB(A)". Construction on sites outside of Barangaroo surrounding the residences would be governed by this code. On this basis, consideration should be given to including Saturday afternoon as part of "normal construction" for the subject site, given the predicted impacts are moderate, Saturday afternoons represents a more benign period for the nearby commercial buildings, and will and there is a corresponding benefit to all surrounding properties of a reduction in the overall construction period.

Time of use restrictions for high noise impact activities apply to Saturday works outside the normal EPA construction hours, and other activities not producing significant noise (e.g. maintenance) could occur on Saturday afternoons until 6pm without impacting the surrounding properties. (Refer Section 9.1.8).

Noise from the water treatment plant (which may operate at night) is assessed in Section 6.4.5.

7 NOISE AND VIBRATION MANAGEMENT PLAN

The project specific noise and vibration management plan should be implemented to manage noise and vibration impacts. The Plan should be revised as the works proceed in response to changing or latent conditions and to incorporate the results of additional analysis, monitoring or modified work practices implemented to minimise impacts.

The management plan has been prepared in accordance with ICNG guideline and includes:

- Identification of sensitive receivers and applicable noise and vibration management levels
- A description of the main noise or vibration producing activities, processes and equipment that will be employed and an indicative construction programme.
- Proposed construction hours.
- A prediction of likely noise/vibration levels at the most impacted receivers.
- The assessment and recommendation of mitigation methods to be applied where the predicted levels exceed the management levels, as indicated below.
- A monitoring plan including the type and extent of monitoring, reporting procedures.
- Recommended management procedures including complaints handling, response to monitoring exceedances, reporting, site training, etc.
- Community liaison.

8 NOISE AND VIBRATION MONITORING, REPORTING AND RESPONSE PROCEDURES

Noise and vibration monitoring may either consist of manned and/or unmanned measurements. Active monitoring may be undertaken during the construction work phase of the project if required in the event complaints are received from neighbours.

In the event that complaints are received from neighbours the following process should be considered:

1. Assessing impacts and determining the offending plant/equipment/process and.
2. Locating the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implementing additional acoustic treatment in the form of localised barriers, silencers etc.
4. Selecting alternative equipment/processes

Where monitoring is required and indicates exceedances of the predicted noise impacts immediate action should be taken to identify any further controls as required to reduce noise emissions so that the noise limits are complied with. Monitoring of the activities following the implementation of these additional controls will be undertaken to confirm compliance.

8.1 REPORTING REQUIREMENTS

The following is an example of reporting which may be kept on site;

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed below.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedances occurring including, the actions taken and results of follow up monitoring.
4. A report detailing complaints received and actions taken shall be presented.
5. All monitoring and reporting shall be conducted in conjunction with the conditions of consent.

8.2 RESPONSE PROCEDURES

Complaints associated with noise and vibration generated by site activities shall be recorded on a Noise Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager and the general public and their contact telephone number

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form may list:

- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Indicate what operations were occurring on site at the time of the complaint.
- Required remedial action, if required
- Validation of the remedial action.
- Summary of feedback to the complainant.

9 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 well as the ongoing investigation into noise during the construction period.

9.1 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.

9.1.1 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.

9.1.2 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 affected. 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.

9.1.3 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.

9.1.4 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.

9.1.5 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes investigating the possibility of locating fixed plant items as far as possible from residents as well as rotating plant and activities to provide respite to receivers.

9.1.6 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. Vary locations/equipment/techniques used as determined by the simulation testing. The following table provides an initial guide to working distances that should be confirmed by site measurement.

Table 19 – 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	-	-	-

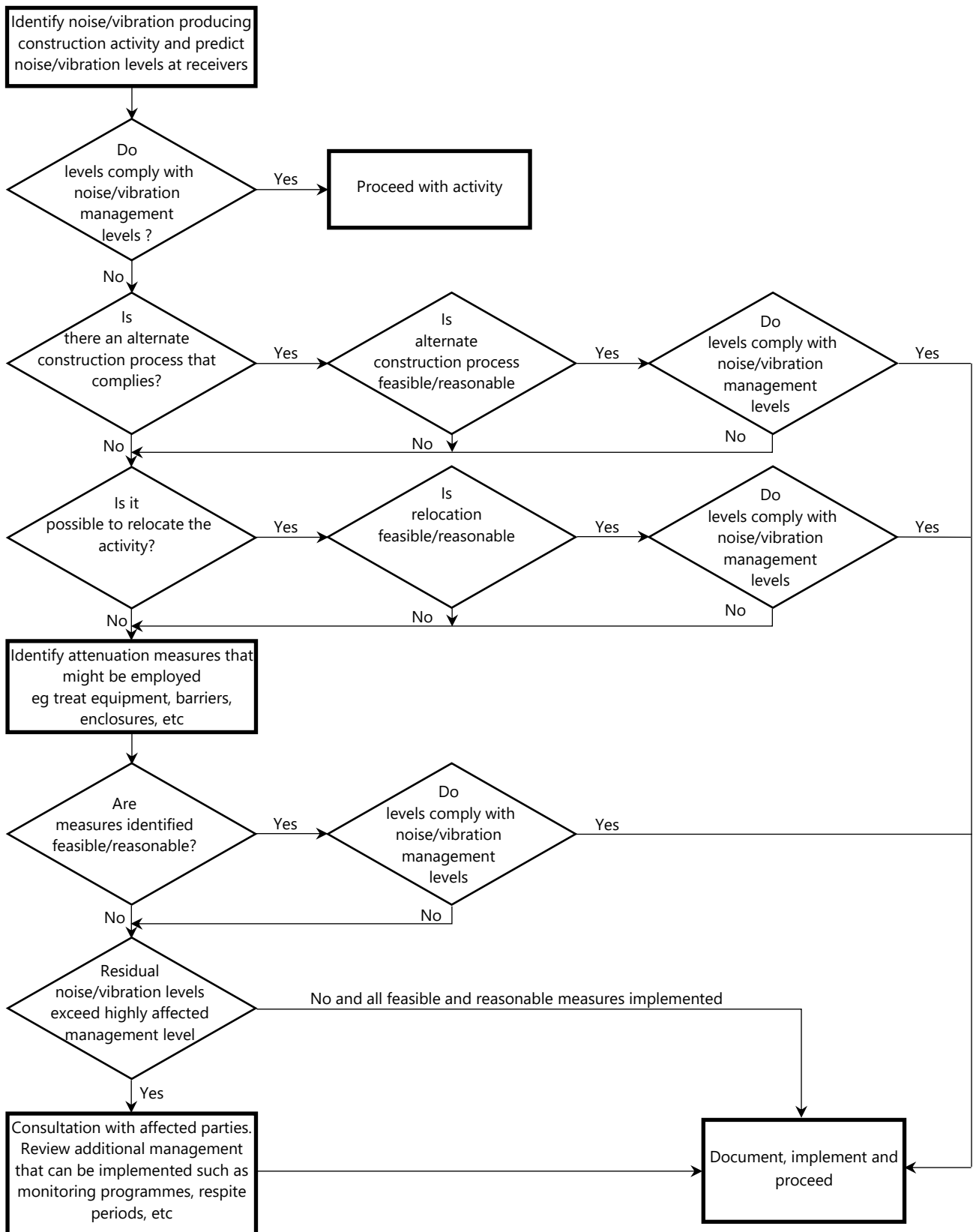


Figure 5: Process Flowchart

9.1.7 Notification

Notification of affected receivers of the progress of works, particularly when short-term activities likely to create higher noise levels occur, can in many cases minimise community reaction.

9.1.8 Time of Use

High noise level generating activities would be subject to additional time of use restrictions to:

- Restrict activities prior to 8am and after 1pm Saturdays to those generating noise levels complying with "background + 5 dB(A)"
- Provide respite for high noise impact activities. These activities will be limited to continuous blocks of no more than 3 hours, with at least one hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receivers.

9.2 SUMMARY OF MITIGATION

The project specific mitigation and management to be adopted is summarised in the following sections.

9.2.1 Management Controls

- Construction work hours are to be as per SSD-46922214.
- Excavation using hydraulic hammers will be required when excavating in rock. This should be minimised as much as practically possible.
- The scheduling of construction activities should be undertaken to reasonably minimise noise impacts to all surrounding residents.
- A respite period is to be implemented for high noise generating activities, such as rock breaking, hydraulic hammering and piling. The recommended hours of use are to be as per Condition D7:
 - o Monday to Friday: 9am to 12pm and 2pm to 5pm
 - o Saturday: 9am to 12pm
- Materials handling/vehicles:
 - o Trucks, skid steer/bobcats and other mobile plant to use non-tonal reversing beacons (subject to WHS requirements) to minimise potential disturbance of neighbours.
 - o Avoid careless dropping of construction materials into empty trucks.
 - o Trucks/trailers and delivery vehicles are to turn off engine when idling to reduce noise impacts (unless required for concrete pumping works or similar).
- Community consultation:
 - o Informing nearby receivers is typically a critical aspect in reducing the risk of complaint when it comes to construction noise. The objective in undertaking a consultation process is to:
 - Inform and educate the groups about the project and noise controls being implemented.

- Increase understanding of all acoustic issues related to the project and options available.
- Identify group concerns generated by the project, so they can be addressed
- Provide advice about the time and duration of potential high noise generating activities.
- Ensure that concerned individuals or groups are aware of and have access to a Site Complaints Register which will be used to address any construction noise related problems should they arise.

9.2.2 Physical Controls

Class A hoarding is to be used around the perimeter of the project site to provide low-level shielding of construction noise from at grade level sources.

9.2.3 Ongoing Construction Noise and Vibration Monitoring

The recommended minimum level of monitoring is recommended below. Additional monitoring may be required in response to complaints, site conditions, etc.

9.2.3.1 Noise and Vibration Monitoring Equipment

Noise monitoring will be conducted using real-time noise loggers with Class 1 microphones as per EPA requirements. All monitoring equipment used is to retain current calibration, either manufacturers' calibration or NATA certified calibration.

Vibration monitoring will be conducted using Texcel ETM type monitors (or approved equivalent) with externally mounted tri-axial geophones. The geophones will be located as close as practicably possible to the location of the sensitive structure. The monitors are to be set to send notification (SMS/email) when alert levels have been exceeded at the location of the geophone.

9.2.3.2 Noise and Vibration Monitoring Locations

A preliminary markup of noise and vibration monitoring locations is provided in Appendix E. Detailed locations will be subject to accessibility to private properties (vibration and noise levels are ideally measured at the affected receivers however this is not always possible) and feasibility and are to be determined in consultation with Aqualand and other representative parties.

9.2.3.3 Noise and Vibration Monitoring Results

Noise and vibration monitoring is to be downloaded either on site (typically during a monitoring service visit) or remotely to actively review all monitoring data recorded at each monitoring location. Relating to the vibration monitors, this will include any vibration events found to exceed the trigger levels nominated in Section 6.3.

If multiple vibration events exceeding the nominated trigger levels are recorded, all data recorded by the monitor is to be reviewed and forwarded to a nominated representative of Aqualand/site staff. From there, alternative methodologies and procedures can be explored to ensure such activity can be appropriately managed.

9.2.3.4 Noise and Vibration Monitoring Program and Reporting

Monitoring reports are to be provided on a monthly basis, as a minimum, documenting all recorded levels with exceedances highlighted that can be reviewed by the contractor and actioned accordingly. Monitoring reports will detail the location of all monitors within the vicinity of the site (inclusive of photos), general description of construction work carried during the monitoring period, recorded noise and/or vibration levels during the works carried out, a comparison of the recorded levels to the associated management criteria and a discussion of exceedances and how they can be appropriately controlled. In the event that attended monitoring has been carried out, a report will be prepared and issued after the monitoring visit has been completed.

9.2.3.5 Monitoring Alerts

If the nominated vibration/noise trigger level is exceeded, the following personnel will receive SMS alerts:

- Project acoustic consultant
- Site foreman
- Head contractor and any other representative nominated by the project's head contractor.

9.2.4 Response to Alerts

Where noise or vibration exceedances are measured (via alerts or reporting) the activities producing the exceedance should be immediately identified and the activity paused to determine an appropriate method of mitigation (refer typical methods noted above).

Measurements verifying the effectiveness of any mitigation should be undertaken immediately following implementation of mitigation. Any changes to site management/treatment should be reflected in site procedures and the noise and vibration management plan.

10 CONCLUSION

An assessment of noise and vibration impacts from the construction of the proposed works has been undertaken based on recommendations contained in the NSW Interim Construction Noise Guideline.

Sensitive receivers around the work site have been identified and noise and vibration management levels appropriate to the receiver have been determined based on recommendations contained in the Construction Noise Guideline.

Predictions of noise and vibration levels from the works at the sensitive receivers have been made for the proposed activities. The predictions indicate that most of the receivers around the site will not be exposed to noise or vibration levels above the management levels established for them.

There are a limited number of receivers where minor exceedances are predicted. For these receivers, normal good practice management to minimise noise emissions is recommended.

The High Street residences south of the child care centre will be exposed to noise levels up to 15 dB(A) above the applicable management levels, and the assessment of reasonable and feasible mitigation, as recommended in this report, is recommended. No residential receiver will be subject to noise exceeding the highly affected noise management level. Noise mitigation strategies have been identified and recommended for assessment prior to commencement.

Minor impacts are predicted at Hickson Park when the piling and hydraulic hammering plant is located close to the southern site boundary. However, given there is already an existing site hoarding, and the exceedances are minor and occur for a limited period additional mitigation beyond the implementation of normal good practice management is not indicated.

Noise from the water treatment plant may operate into the night-time period, falling under the NSW EPA's outside of standard hours management levels. An assessment has been carried out, determining reasonable and feasible mitigation to be incorporated so that noise associated with this plant is maintained in accordance with the NSW EPA guideline.

It is not expected that vibration generated by the proposed activities will produce adverse impact at any surrounding property. Vibration monitoring within 25m of the Sydney Metro tunnel is required to ensure that levels are managed to those stipulated by Sydney Metro standards. A monitoring markup is provided in Appendix E, demonstrating monitoring to be undertaken in this location.

It is concluded that with the implementation of the mitigation and ongoing assessment recommended in Section 9, construction noise and vibration emissions from the proposed development will be minimised in accordance with the ICNG.

Yours faithfully,

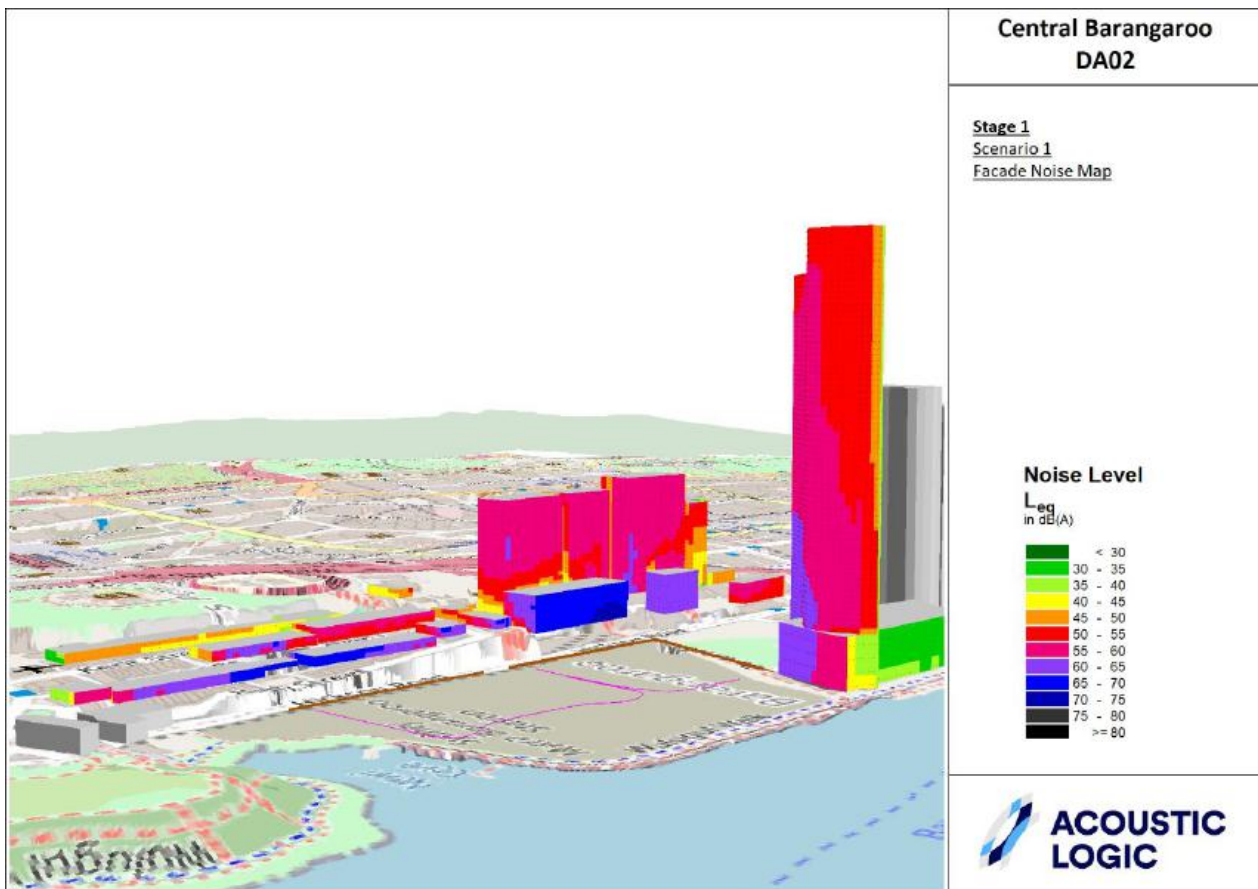
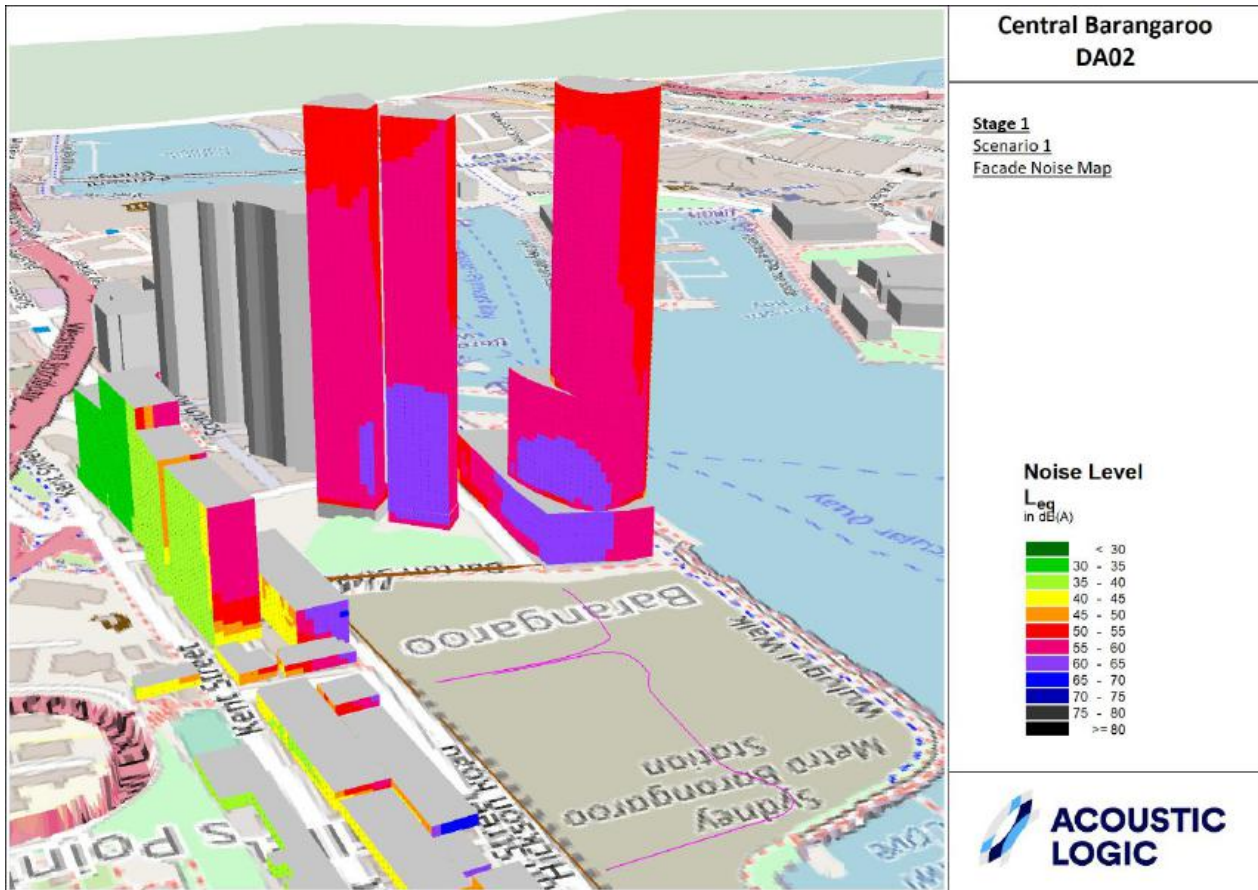


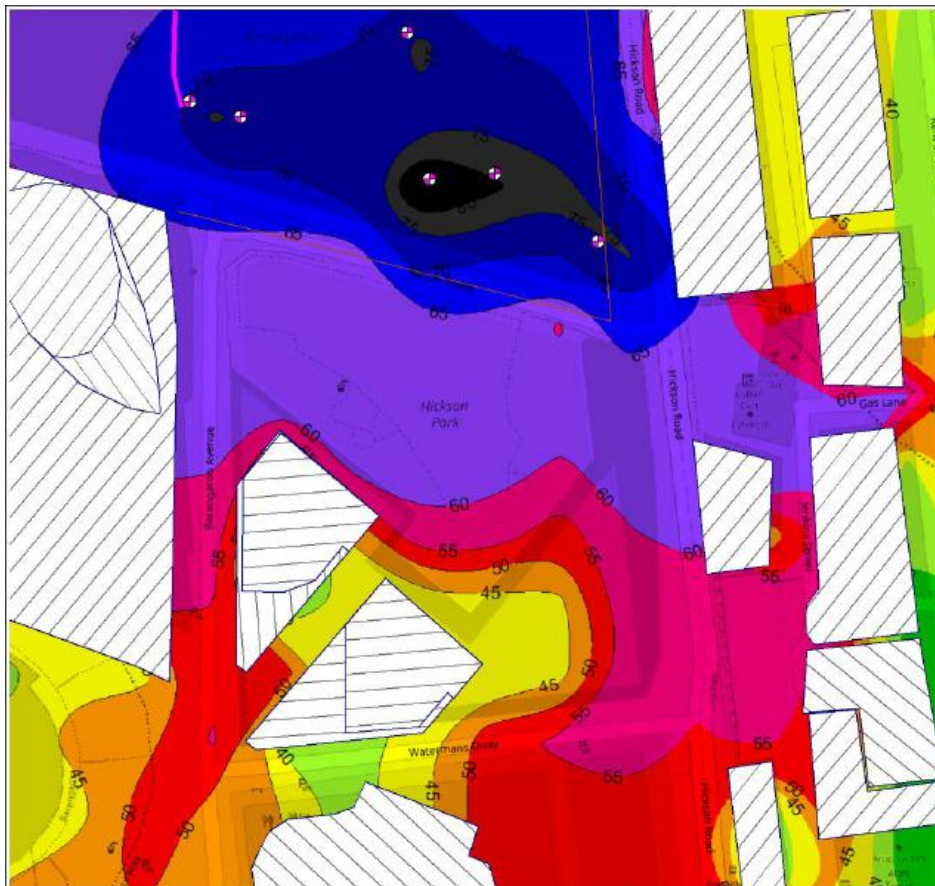
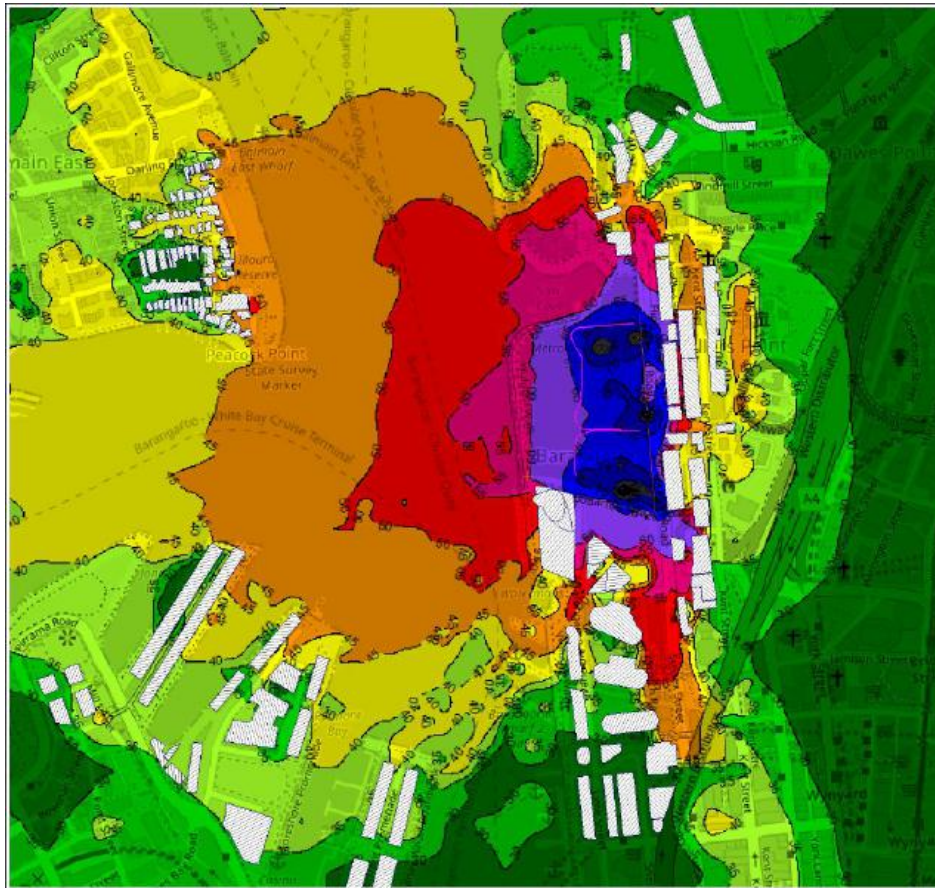
Acoustic Logic Pty Ltd
Adrian Zappia
MAAS

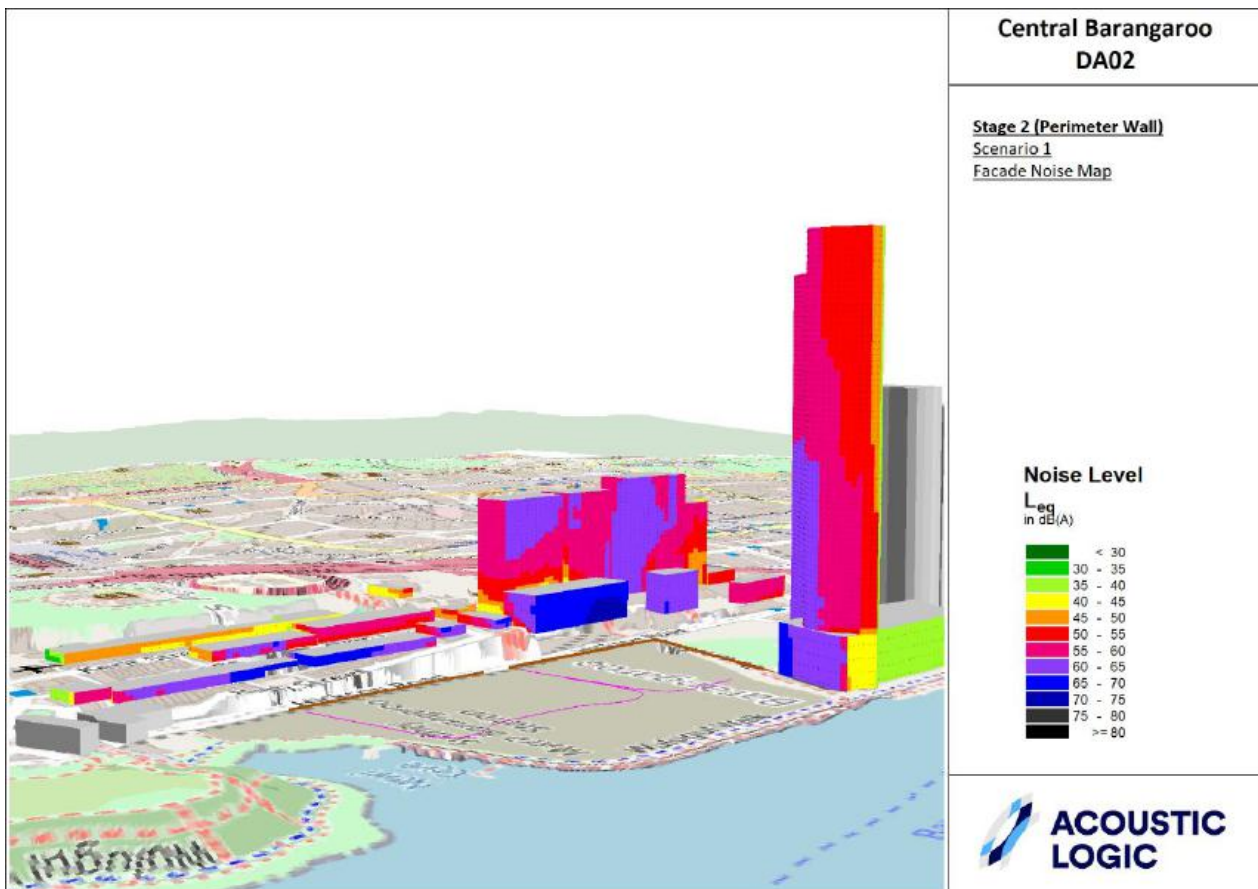
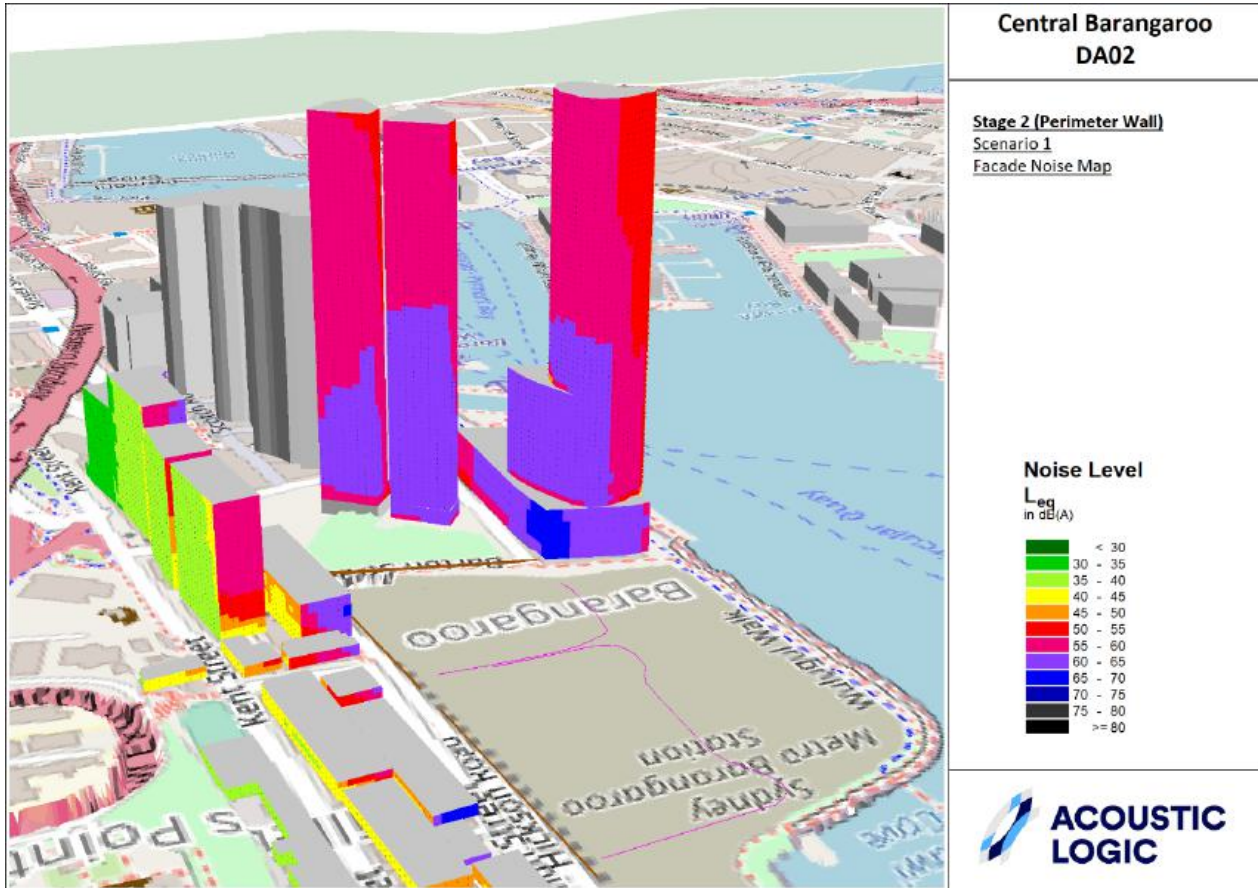
APPENDIX A - PLANT SOUND POWER LEVEL SPECTRA

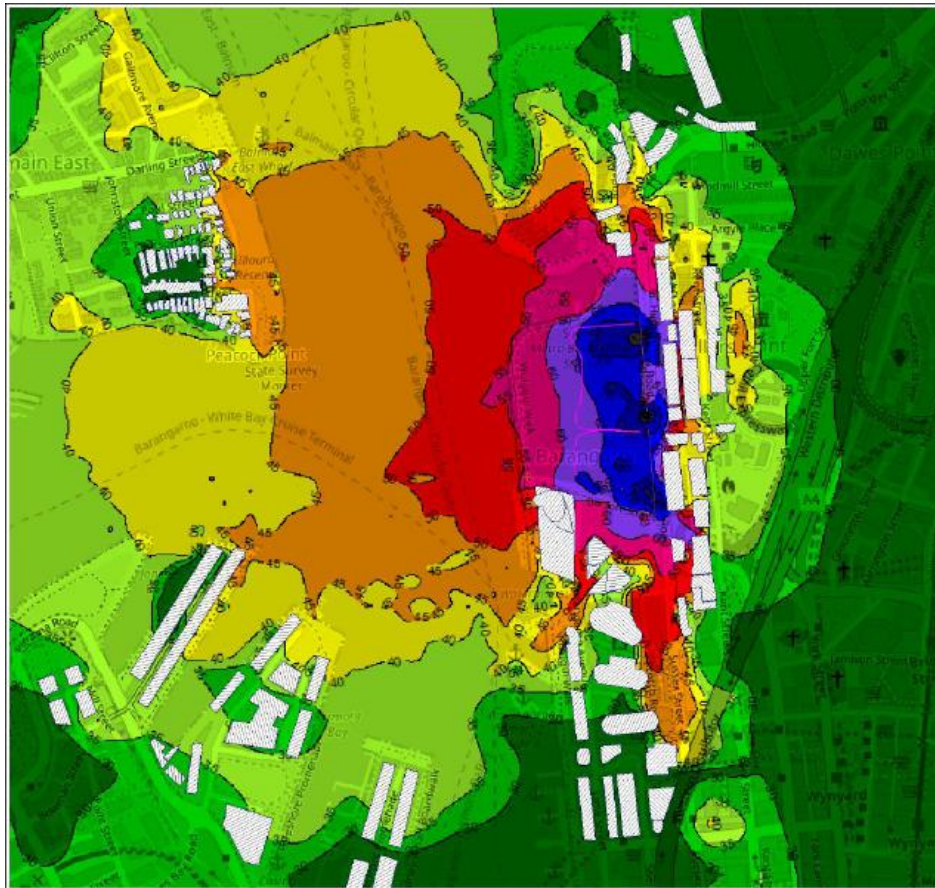
Plant	63	125	250	500	1000	2000	4000	8000	A-wt
CFA Rig	109	109	106	104	102	100	96	91	107
Concrete Vibrator	95	103	104	97	95	94	92	89	102
Tracked Excavator	102	108	103	101	97	94	88	79	103
Excavator + hydraulic hammer	124	124	121	116	118	116	114	109	118
D-wall Trench Cutters	107	111	108	105	106	111	106	101	114
Ground Anchor Rock Drilling Equipment	107	111	108	105	106	111	106	101	114
Dozer	112	116	114	114	111	108	102	94	116
Jack hammer	108	97	93	96	96	101	109	110	113
Angle Grinder Cutting Steel	84	78	79	87	97	104	100	100	108
Crane	110	98	92	96	97	94	88	81	101
Crane Idling	96	87	82	84	88	85	79	71	91
Bentonite Pump	107	100	101	106	103	101	96	93	108
Truck Idle	94	91	90	89	90	89	85	72	95
Truck at 15 km/h									106
Water treatment plant	91	86	87	85	85	84	77	67	90

APPENDIX B – SOUNDPLAN MODELLING OUTPUTS









Central Barangaroo DA02

Stage 2 (Perimeter Wall)

Scenario 1

Noise Contours

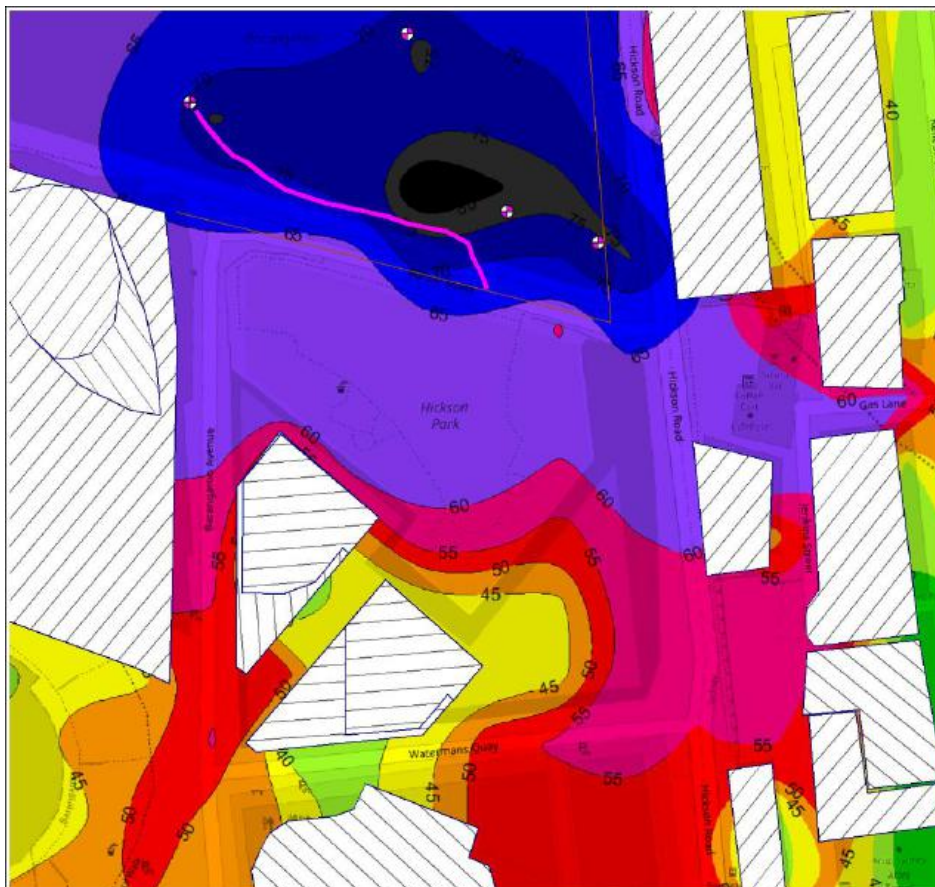
Height above ground: 1500mm

Noise Level

L_{eq}
in dB(A)



**ACOUSTIC
LOGIC**



Central Barangaroo DA02

Stage 2 (Perimeter Wall)

Scenario 1

Noise Contours

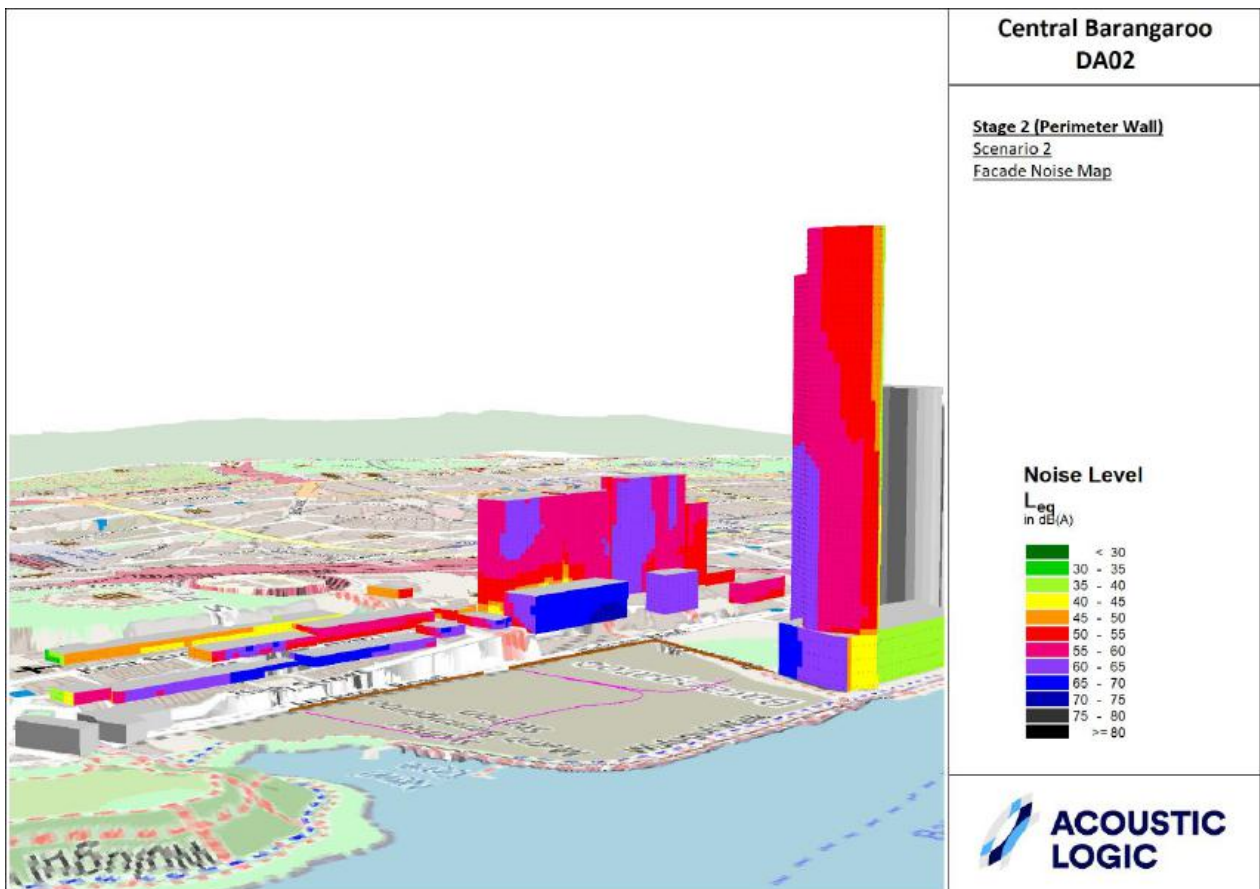
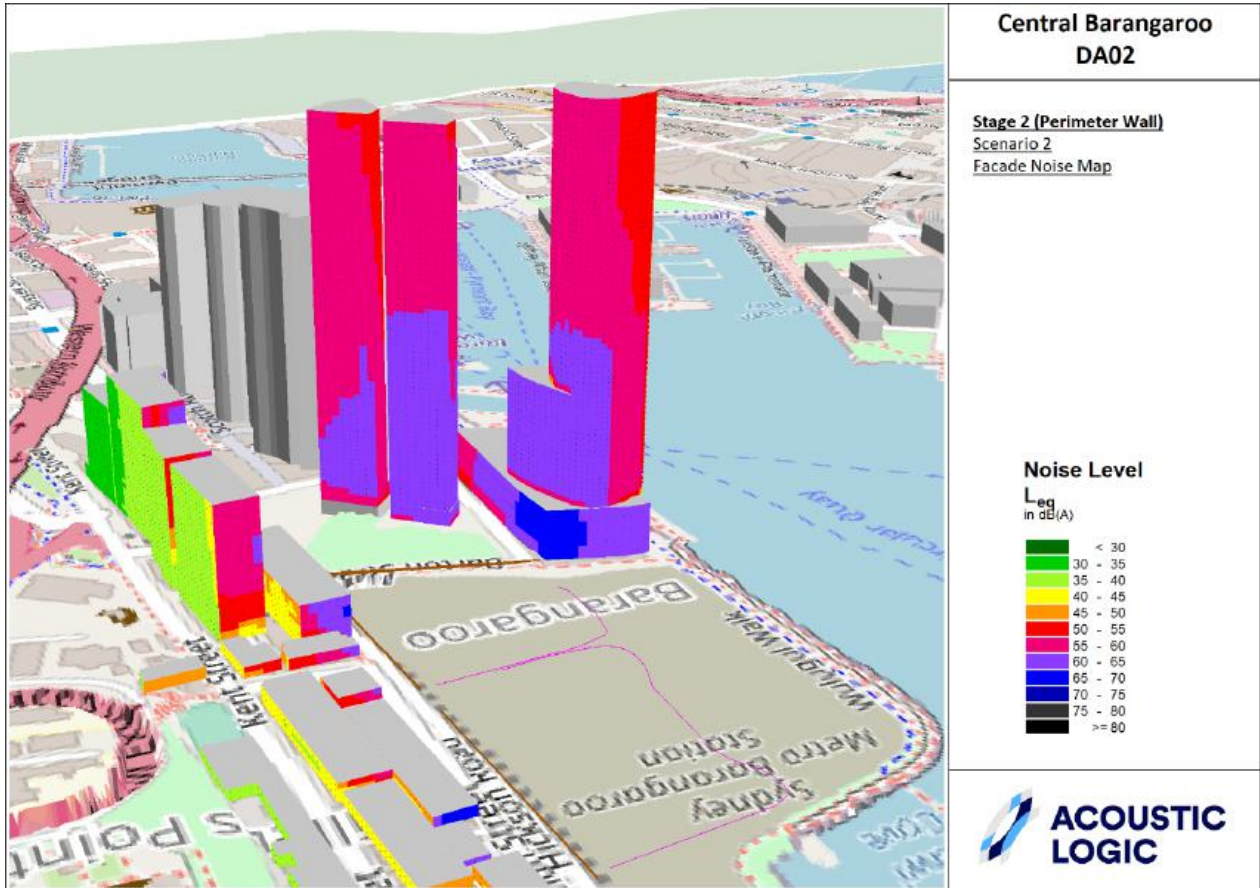
Height above ground: 1500mm

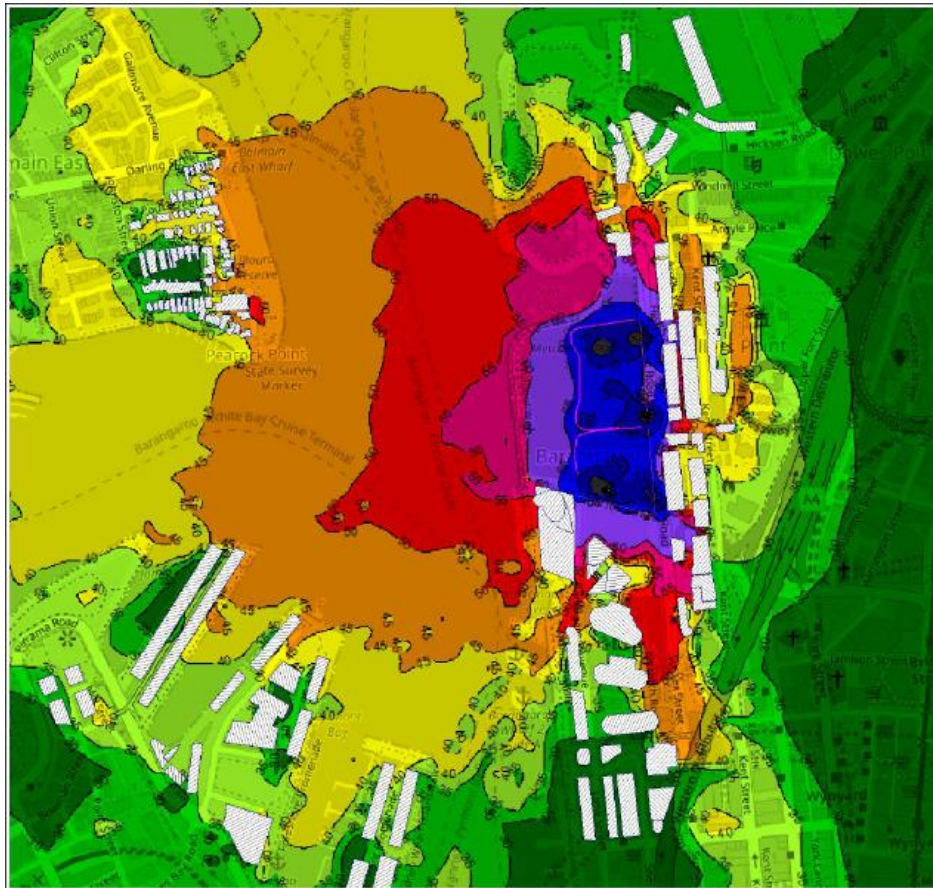
Noise Level

L_{eq}
in dB(A)



**ACOUSTIC
LOGIC**

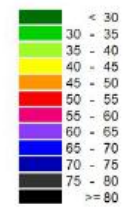




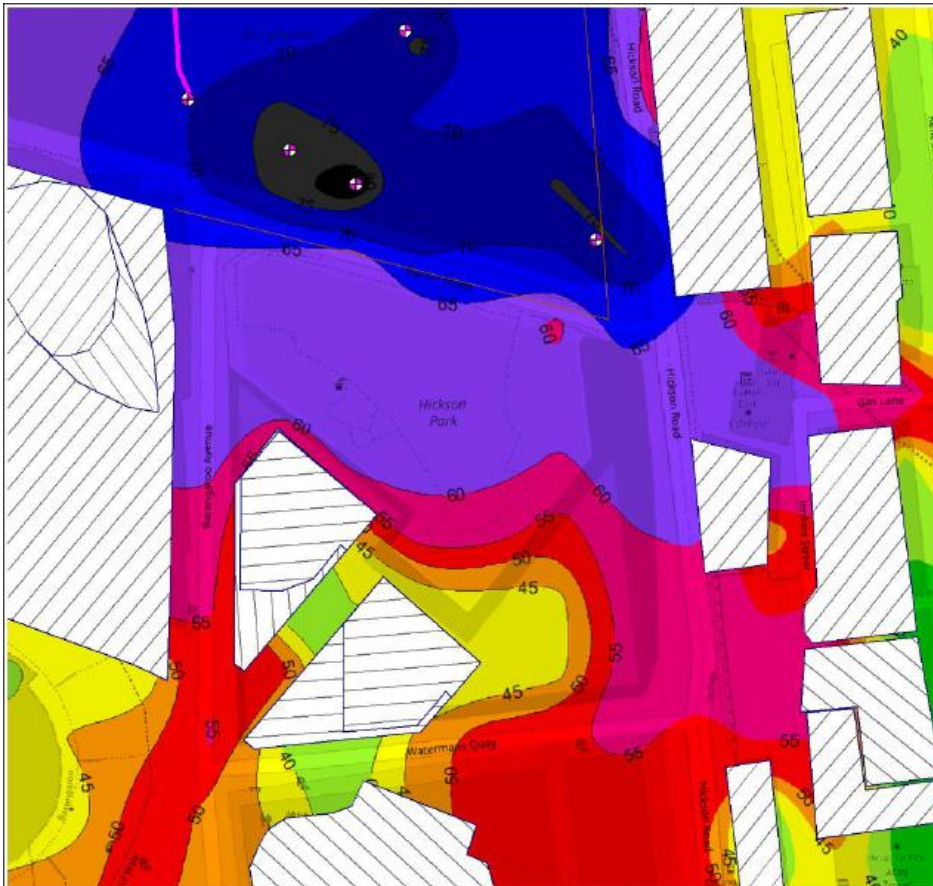
Central Barangaroo
DA02

Stage 2 (Perimeter Wall)
Scenario 2
Noise Contours
Height above ground: 1500mm

Noise Level

$$L_{eq} \text{ in dB(A)}$$


**ACOUSTIC
LOGIC**



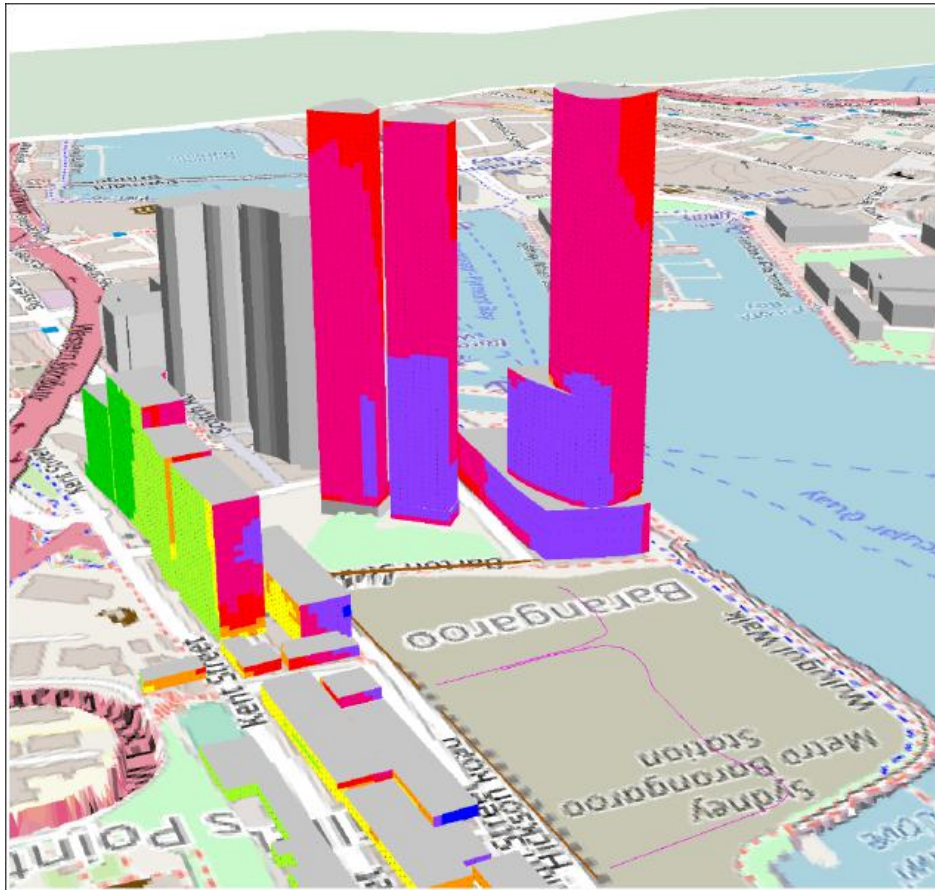
Central Barangaroo
DA02

Stage 2 (Perimeter Wall)
Scenario 2
Noise Contours
Height above ground: 1500mm

Noise Level

$$L_{eq} \text{ in dB(A)}$$

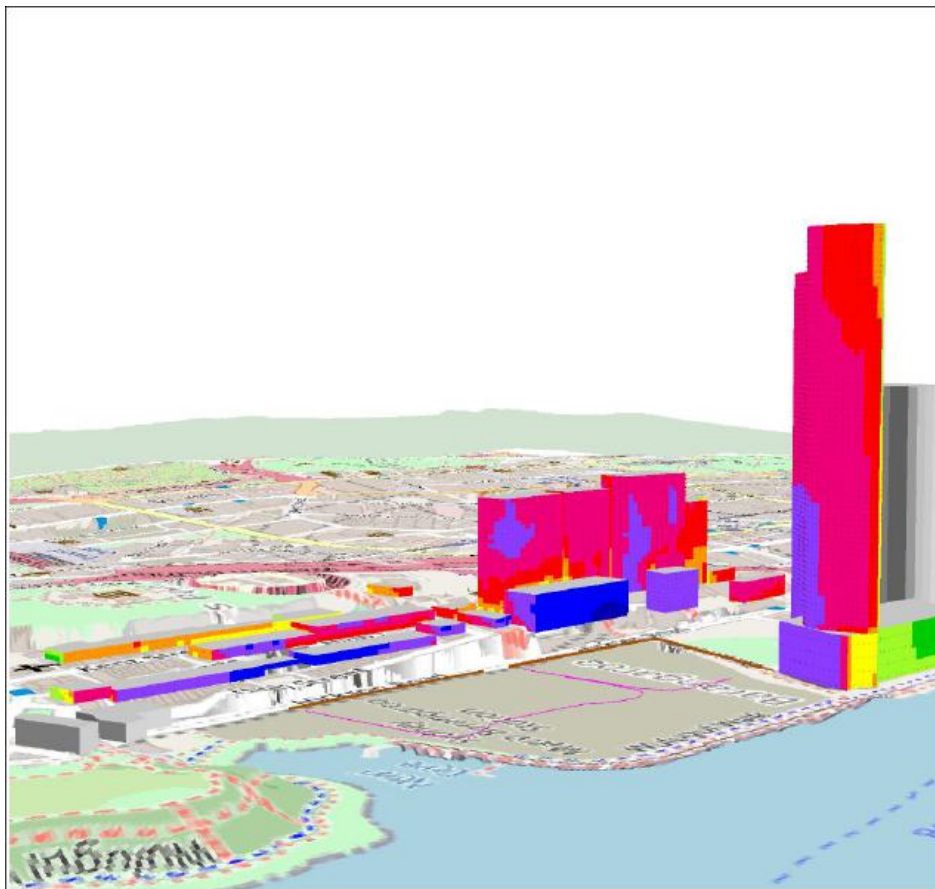

**ACOUSTIC
LOGIC**



Central Barangaroo DA02

Stage 2 (Perimeter Wall)
Scenario 3
Facade Noise Map

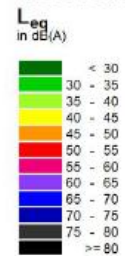
Noise Level

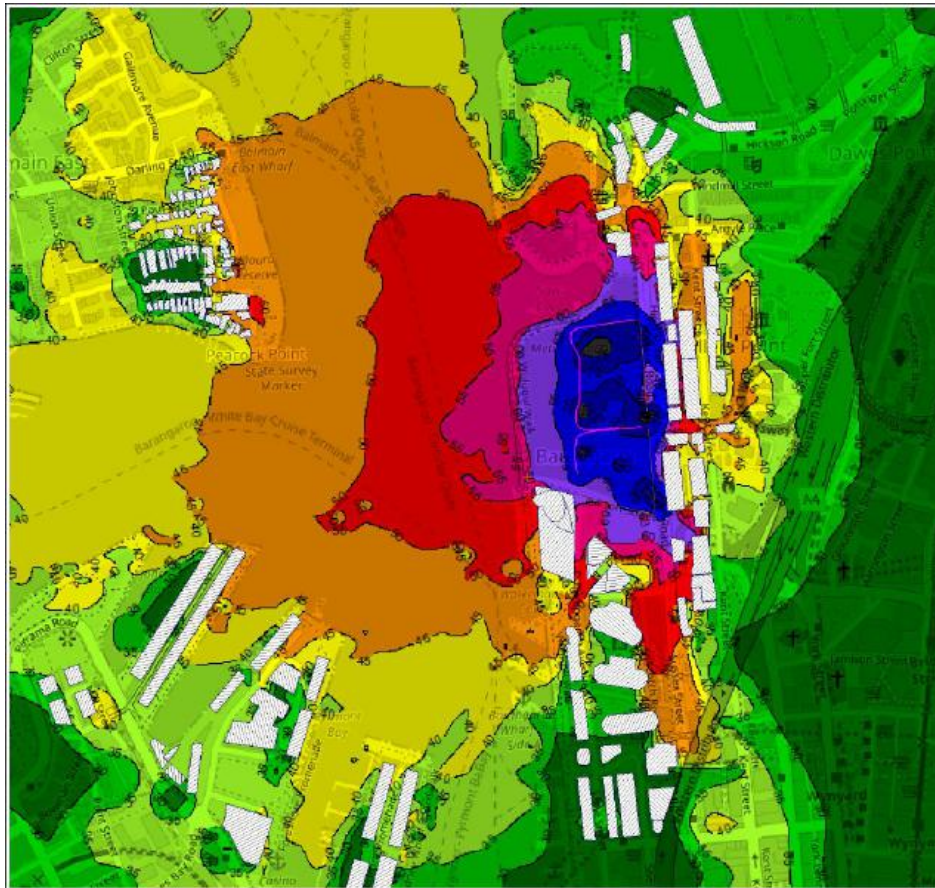


Central Barangaroo DA02

Stage 2 (Perimeter Wall)
Scenario 3
Facade Noise Map

Noise Level





Central Barangaroo DA02

Stage 2 (Perimeter Wall)

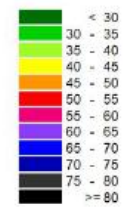
Scenario 3

Noise Contours

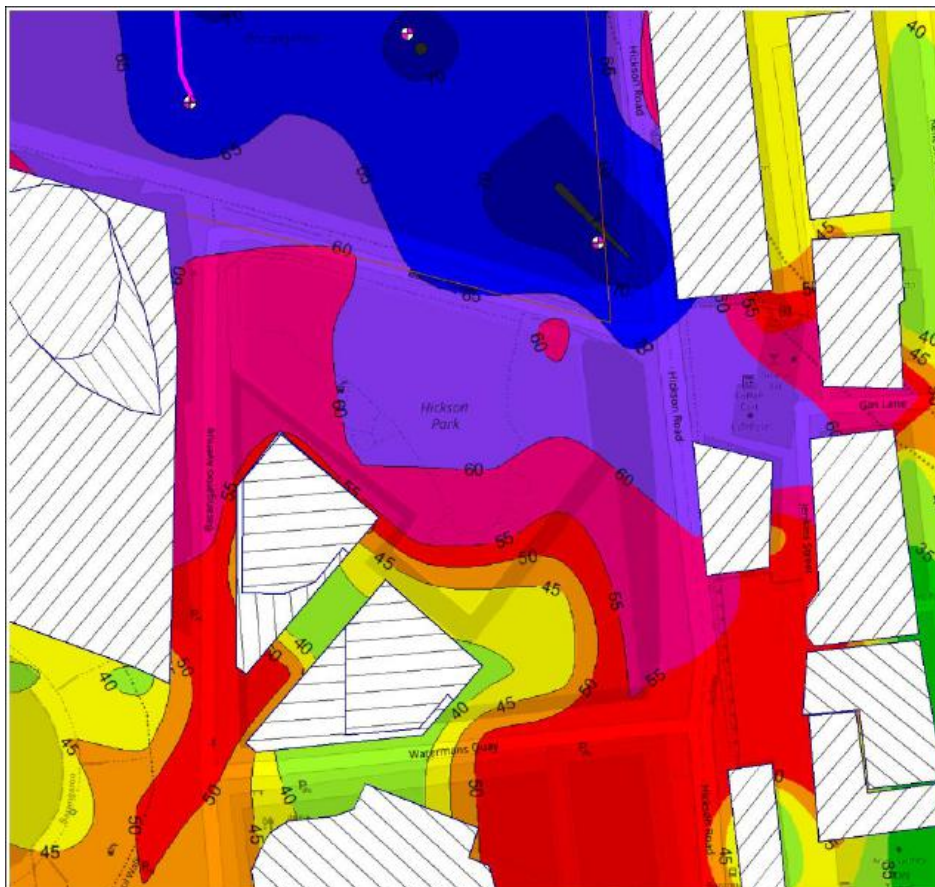
Height above ground: 1500mm

Noise Level

L_{eq}
in dB(A)



**ACOUSTIC
LOGIC**



Central Barangaroo DA02

Stage 2 (Perimeter Wall)

Scenario 3

Noise Contours

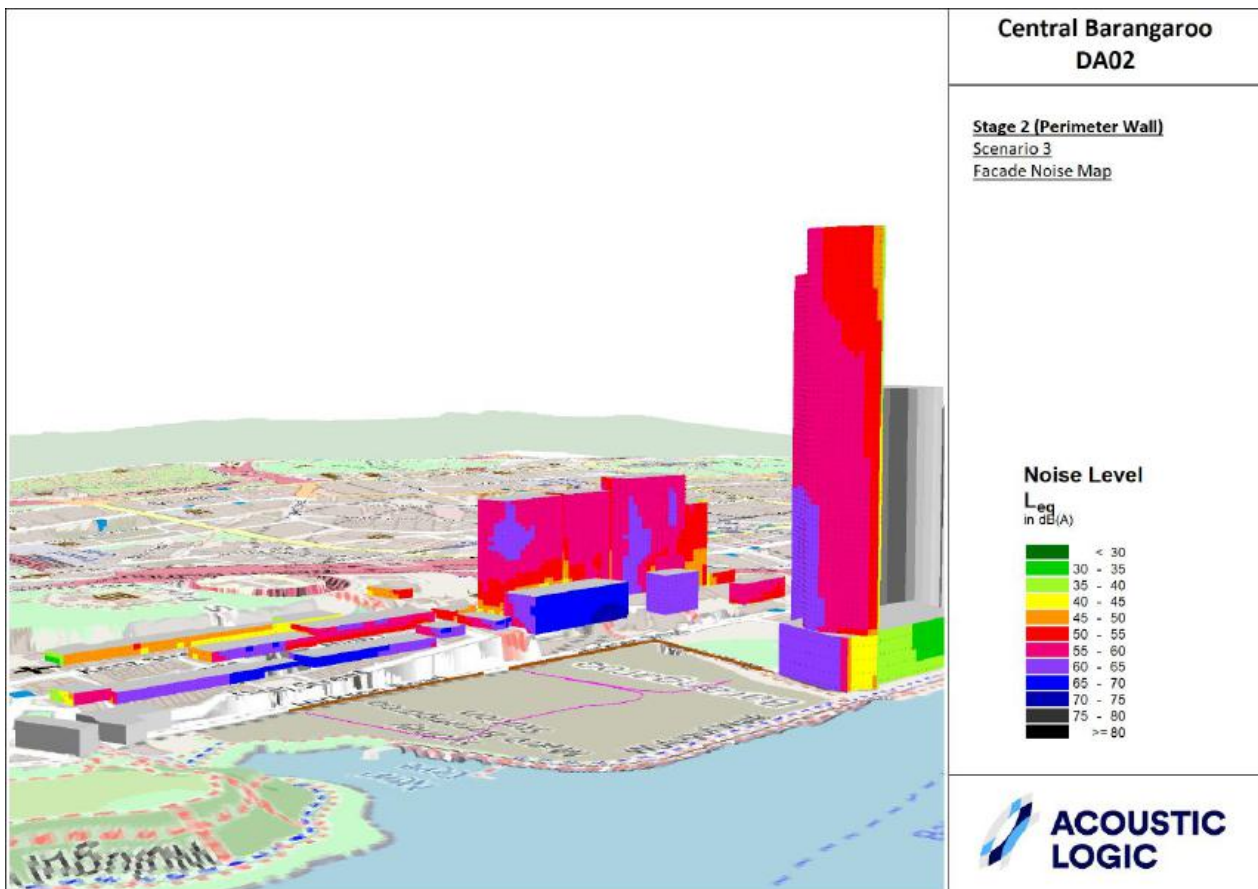
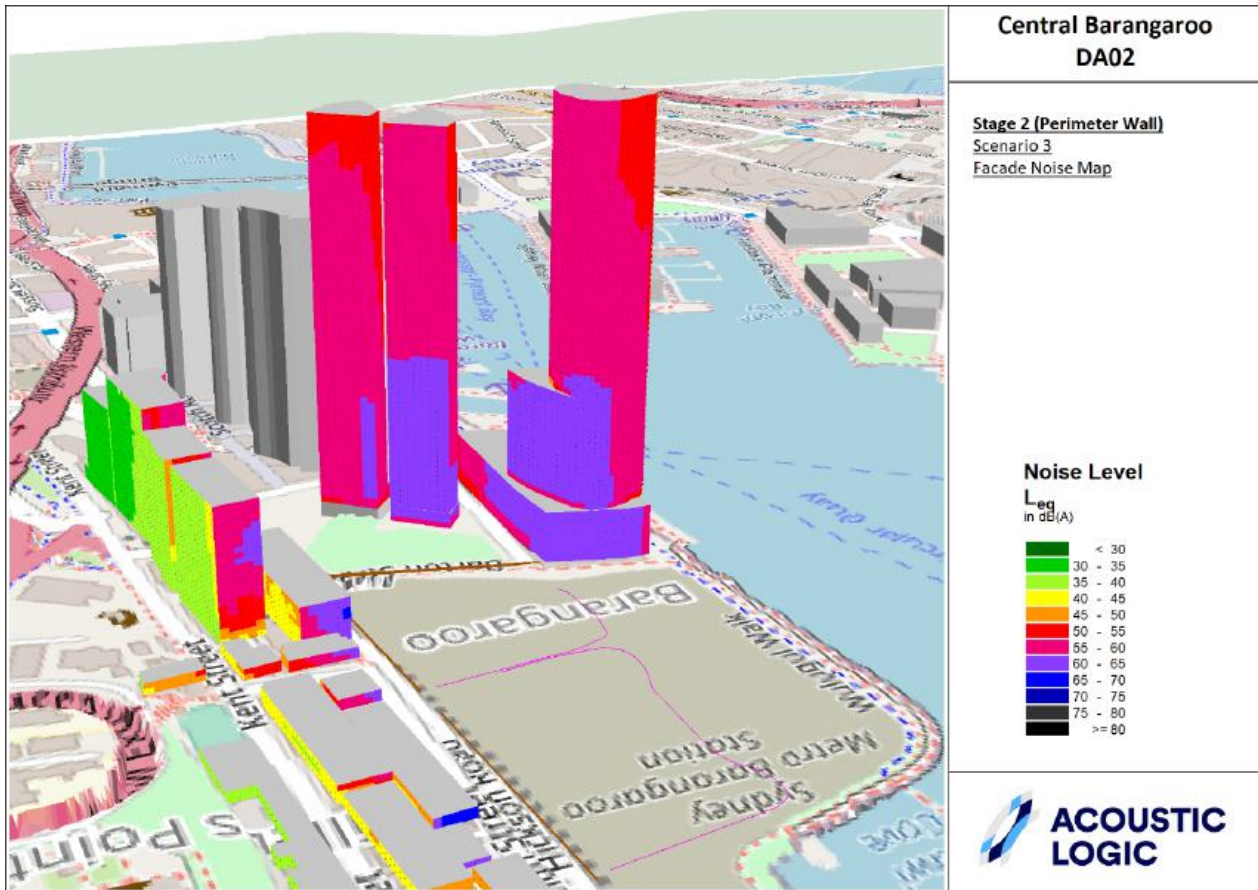
Height above ground: 1500mm

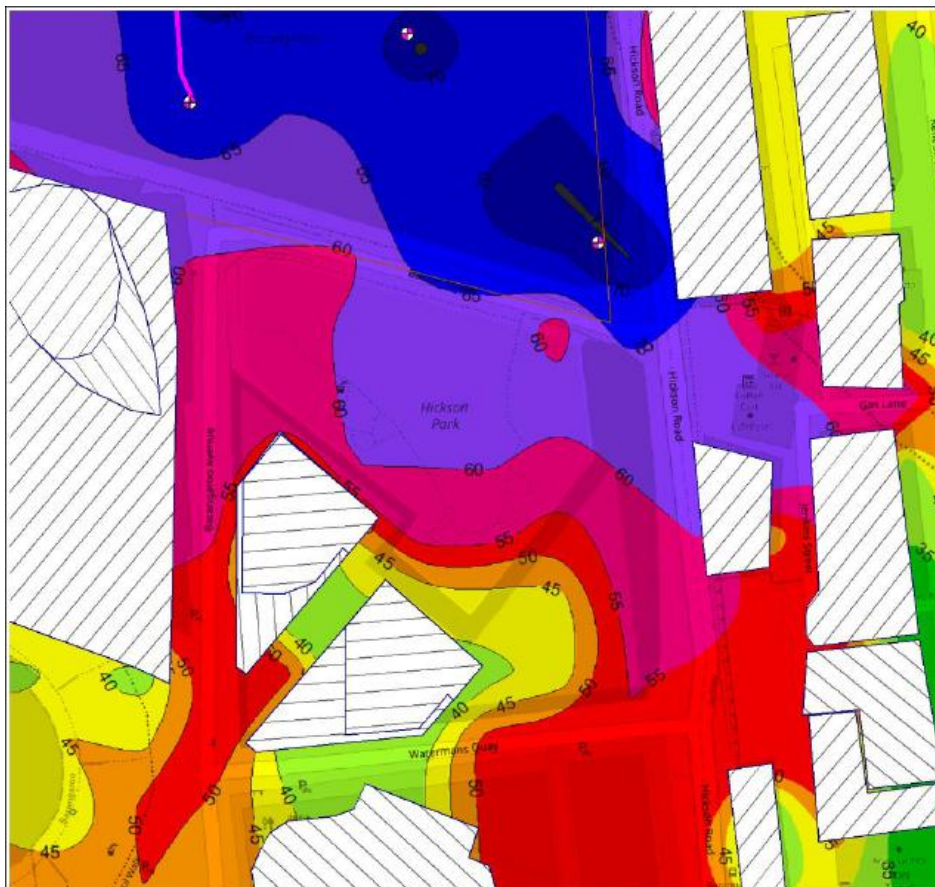
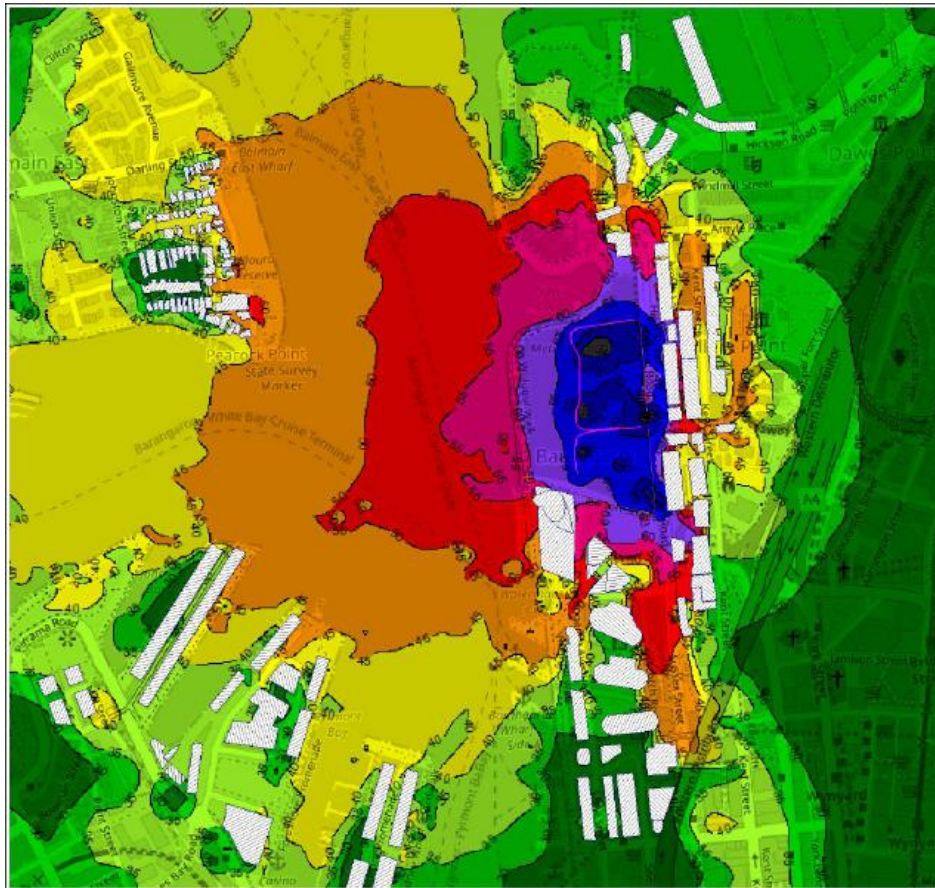
Noise Level

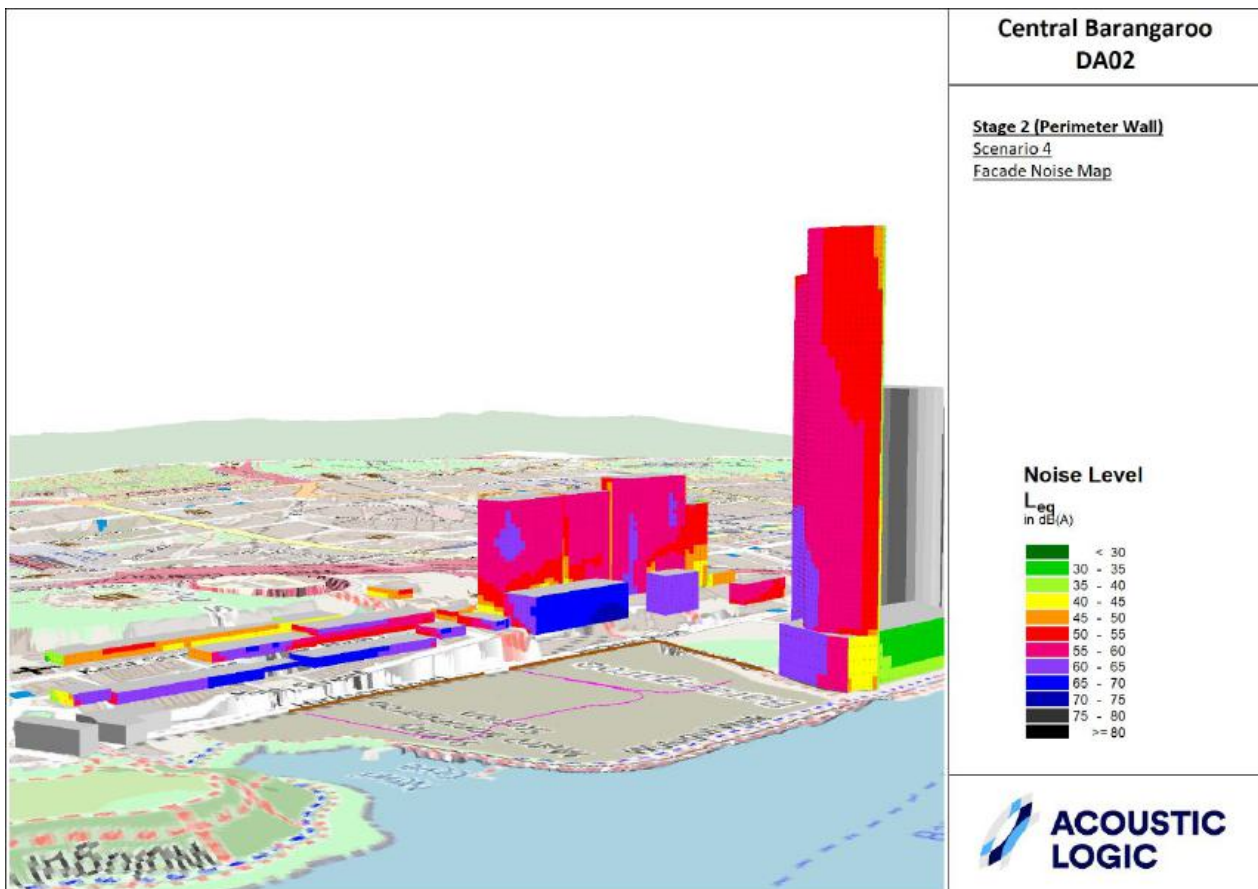
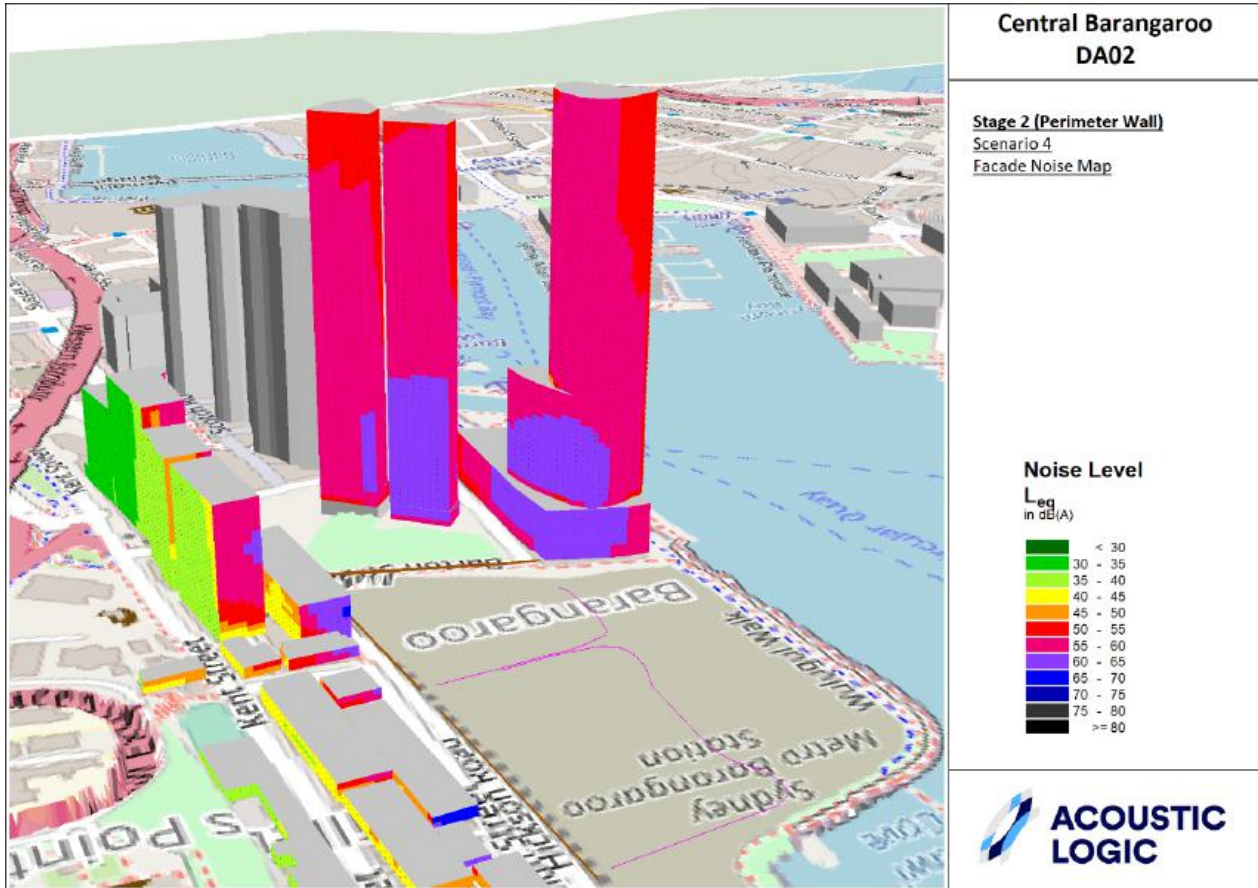
L_{eq}
in dB(A)

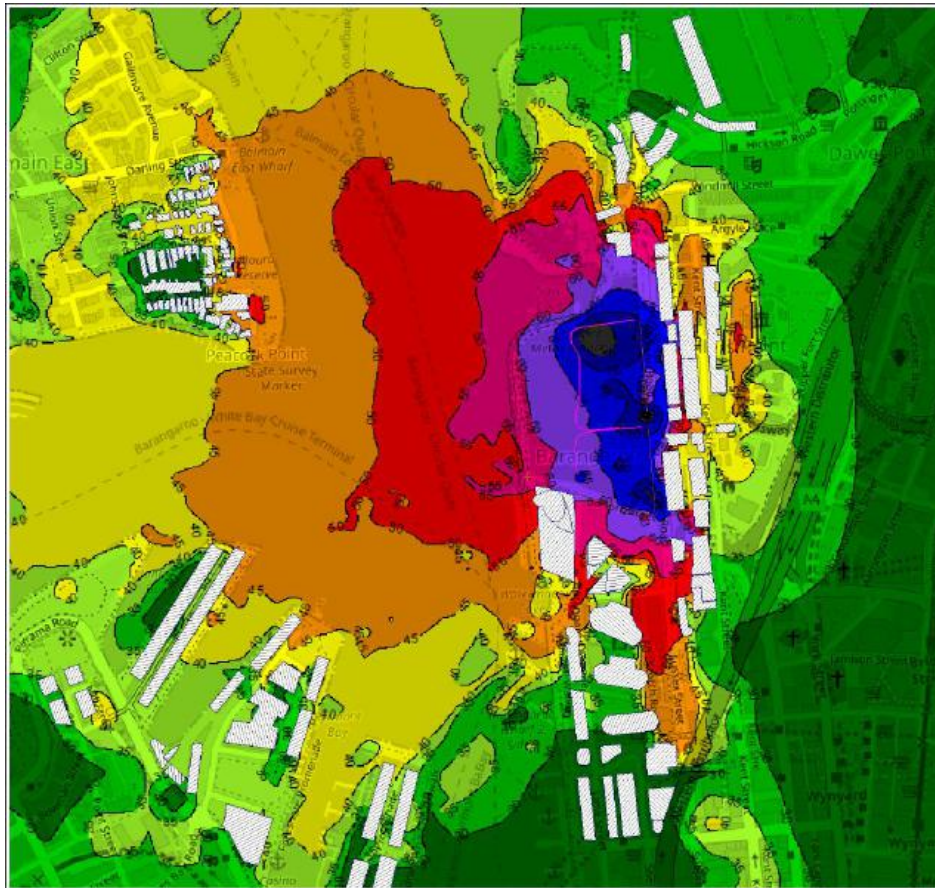


**ACOUSTIC
LOGIC**









Central Barangaroo DA02

Stage 2 (Perimeter Wall)

Scenario 4

Noise Contours

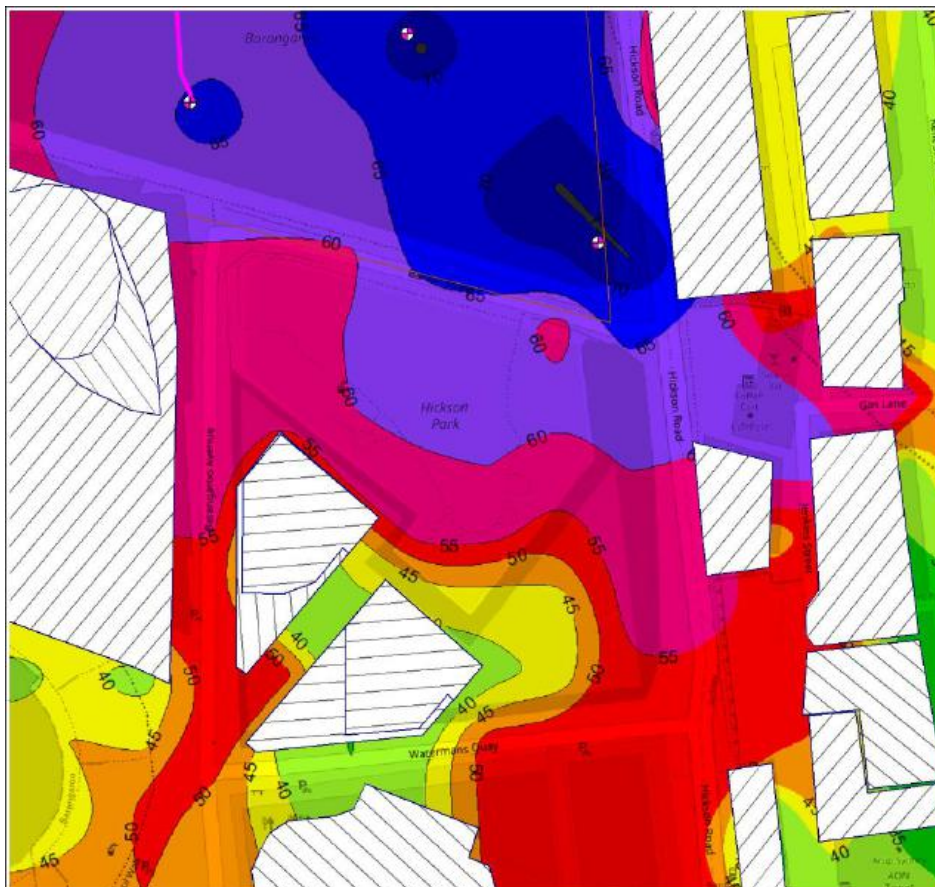
Height above ground: 1500mm

Noise Level

L_{eq}
in dB(A)



**ACOUSTIC
LOGIC**



Central Barangaroo DA02

Stage 2 (Perimeter Wall)

Scenario 4

Noise Contours

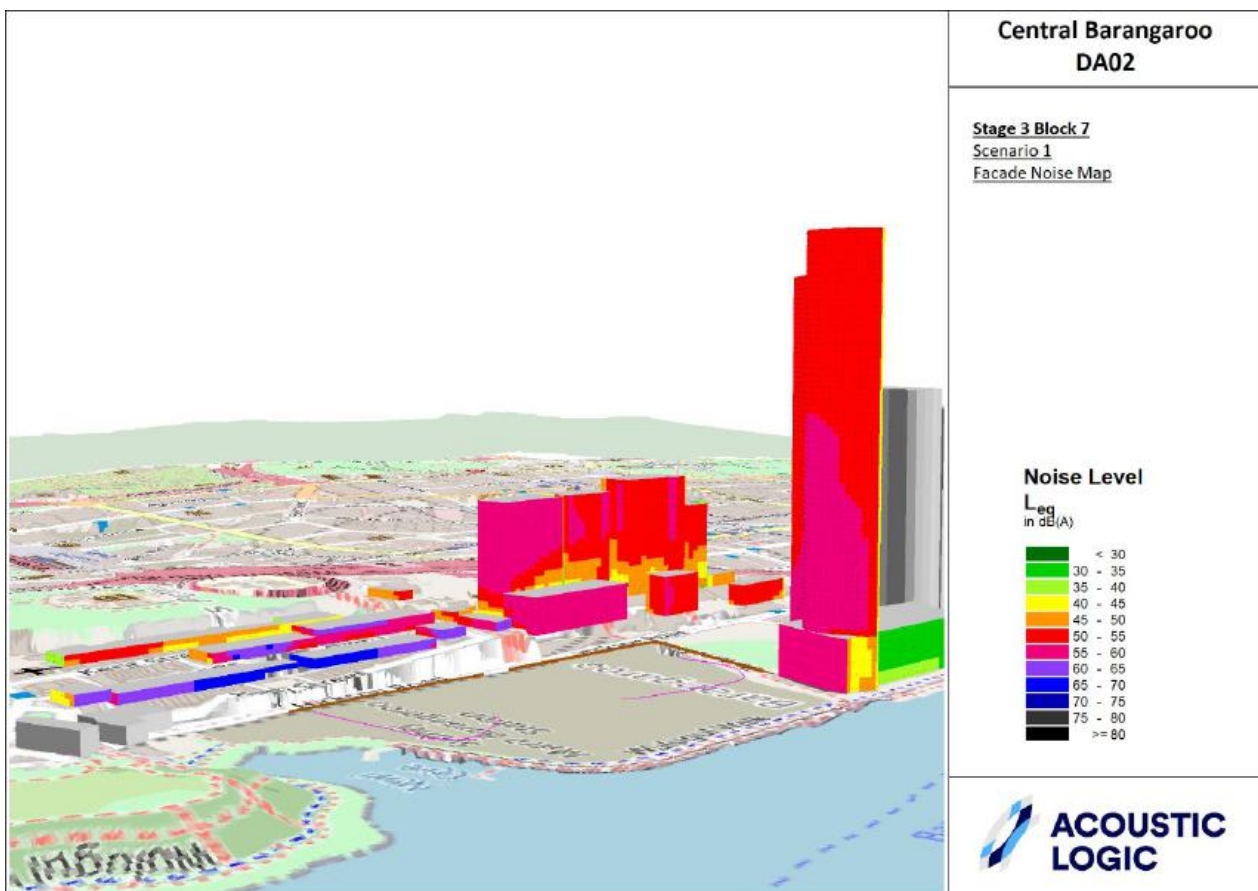
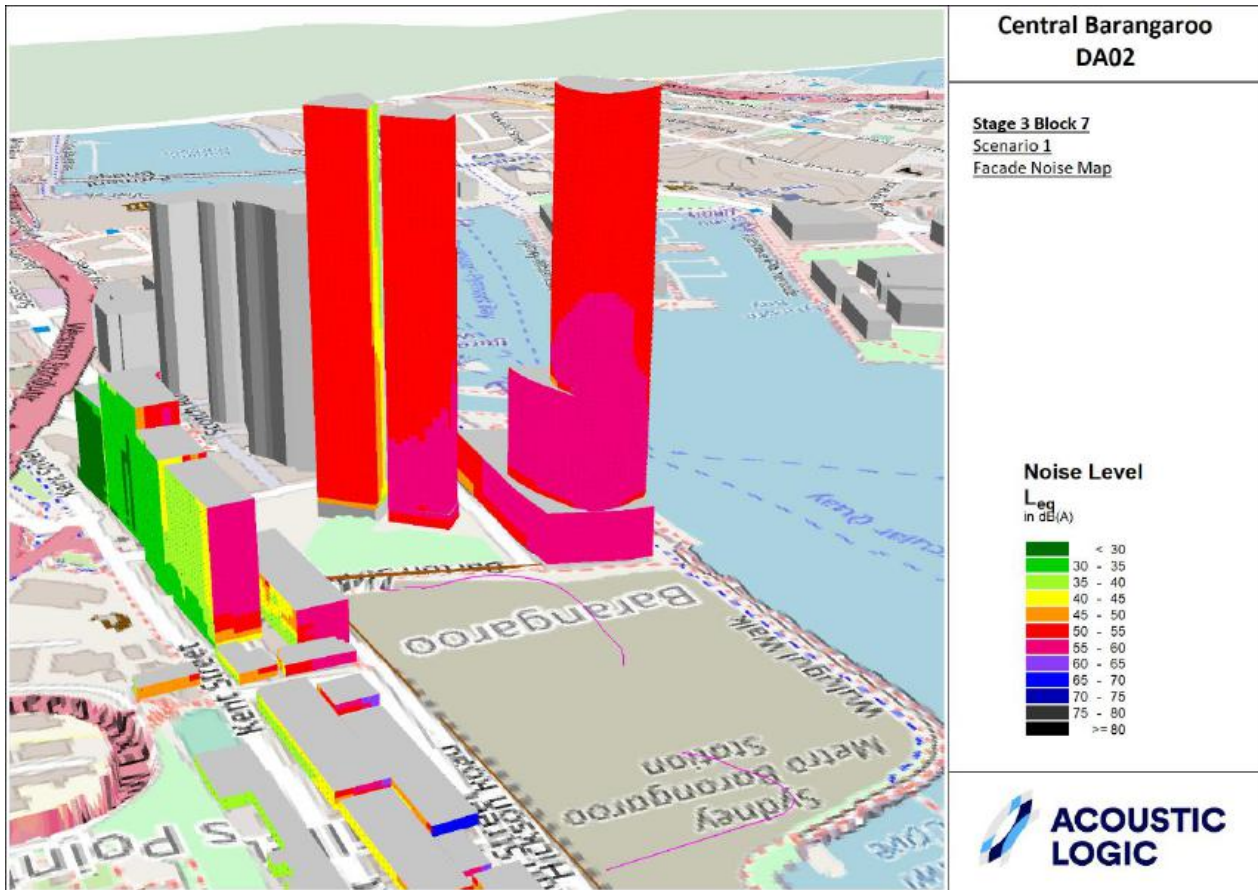
Height above ground: 1500mm

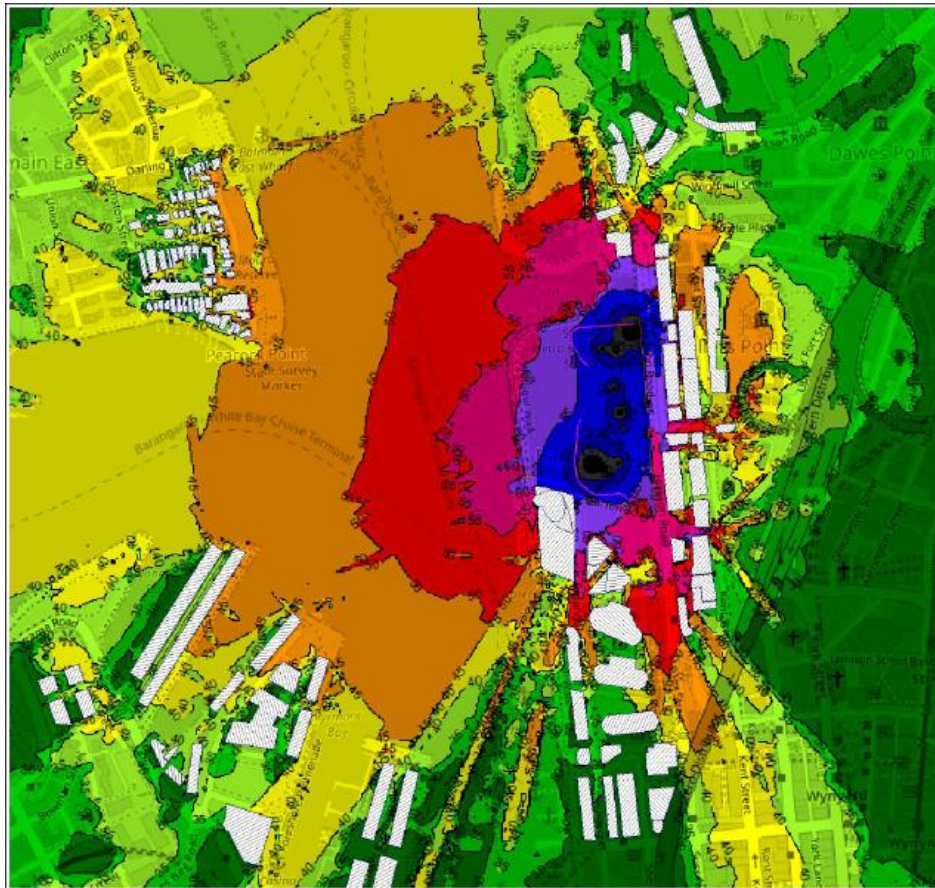
Noise Level

L_{eq}
in dB(A)



**ACOUSTIC
LOGIC**



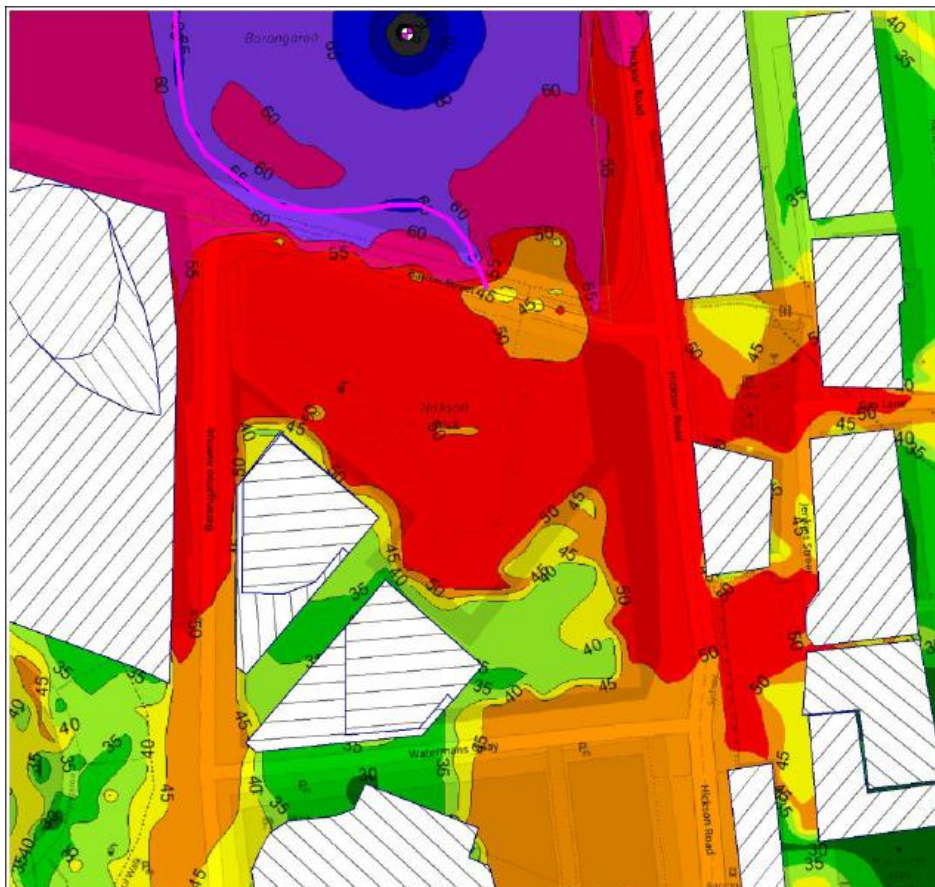


Central Barangaroo DA02

Stage 3 Block 7
Scenario 1
Noise Contours
Height above ground: 1500mm

Noise Level

L_{eq}
in dB(A)



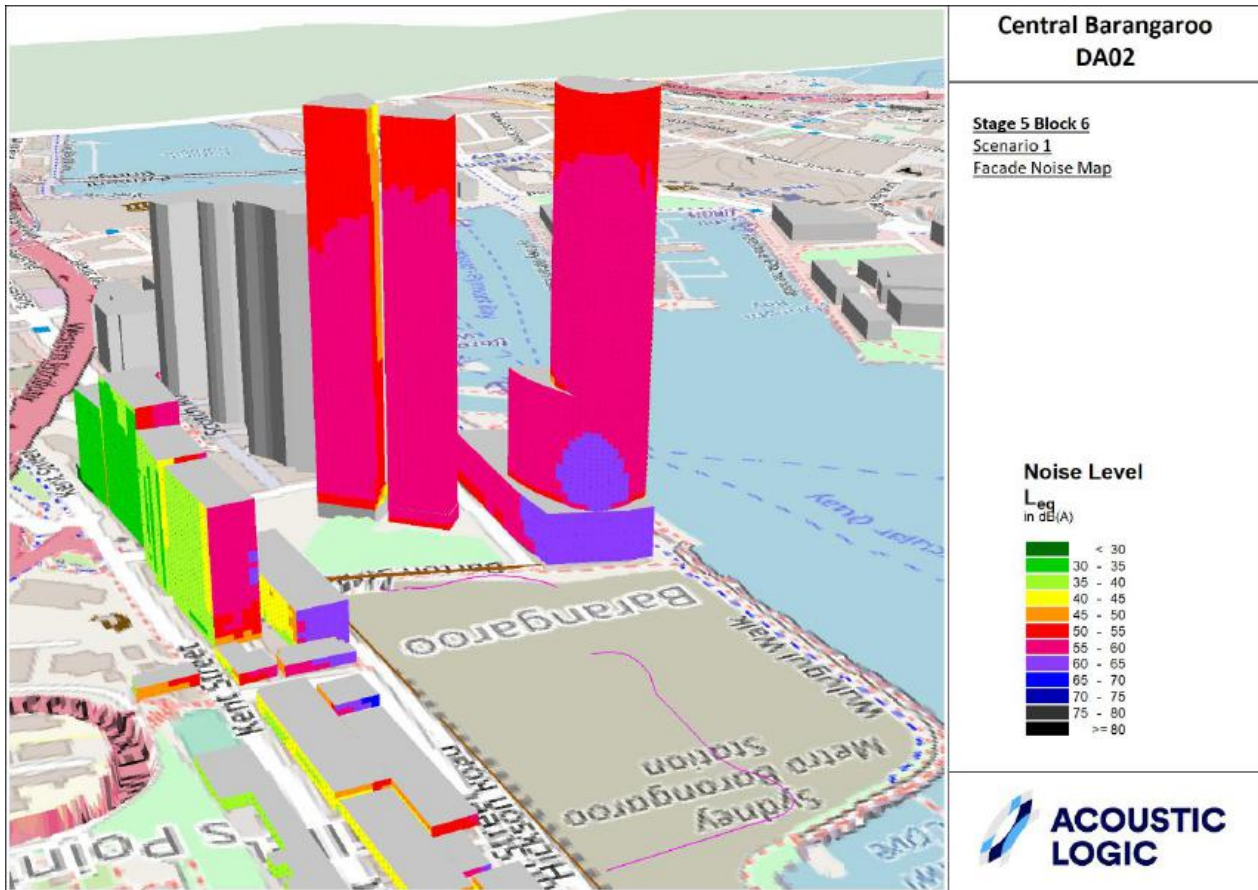
Central Barangaroo DA02

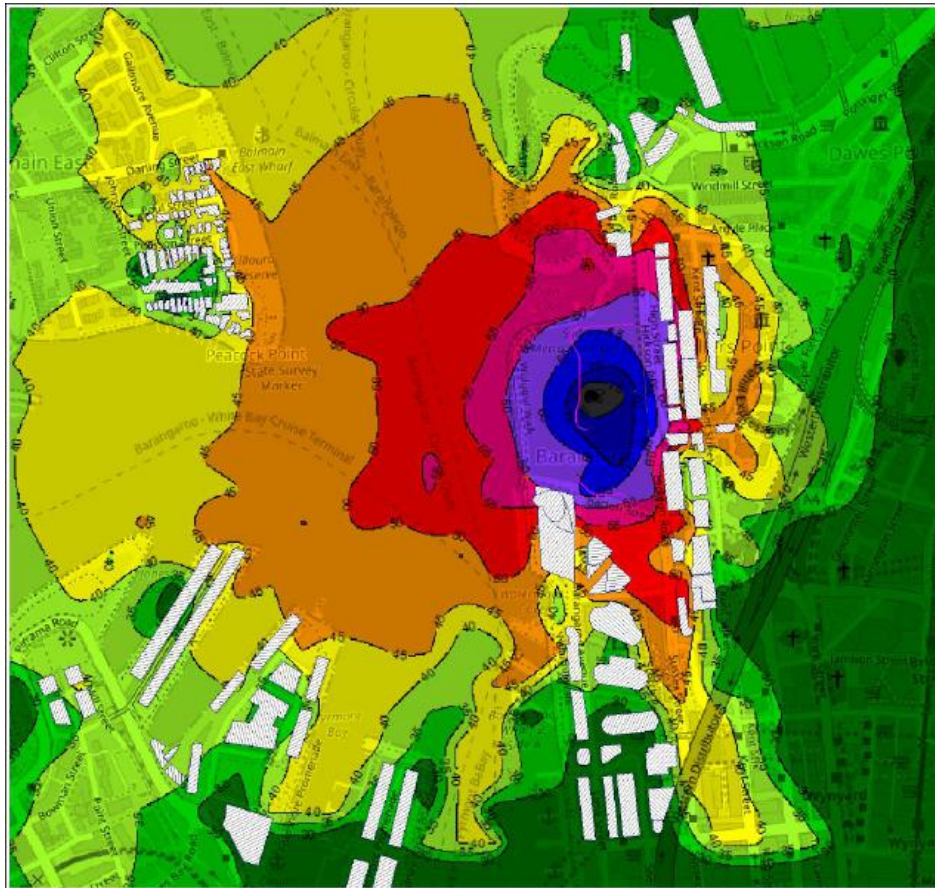
Stage 3 Block 7
Scenario 1
Noise Contours
Height above ground: 1500mm

Noise Level

L_{eq}
in dB(A)





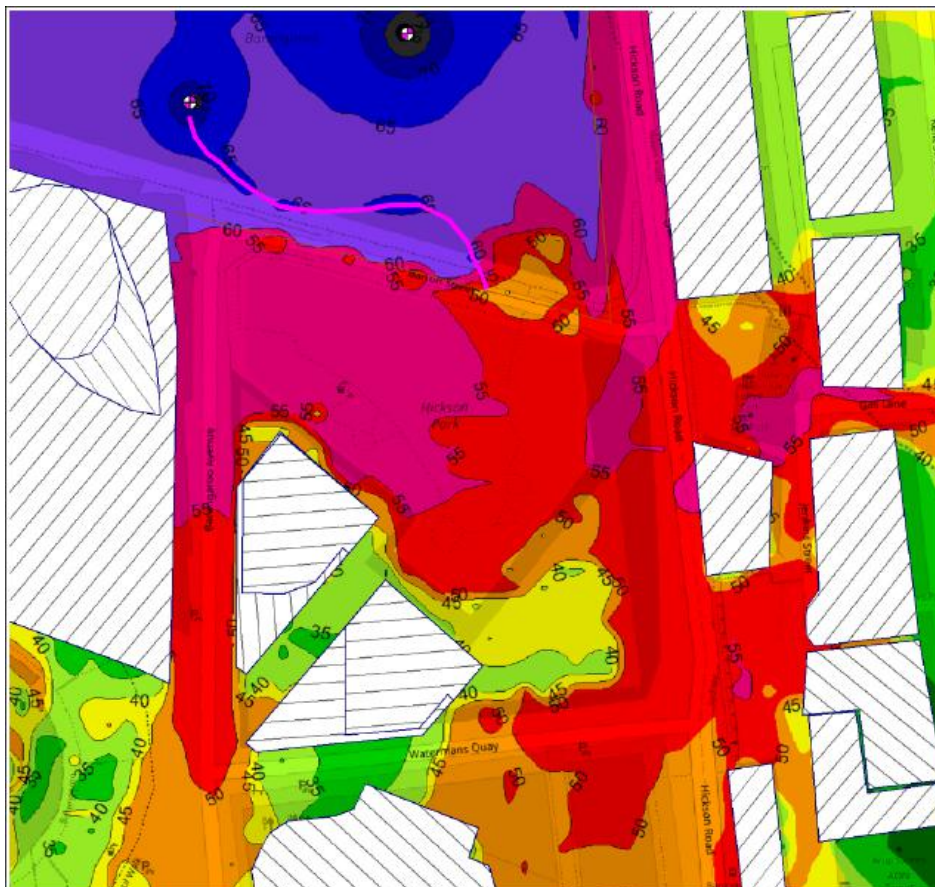


Central Barangaroo DA02

Stage 5 Block 6
Scenario 1
Noise Contours
Height above ground: 1500mm

Noise Level

L_{eq}
in dB(A)



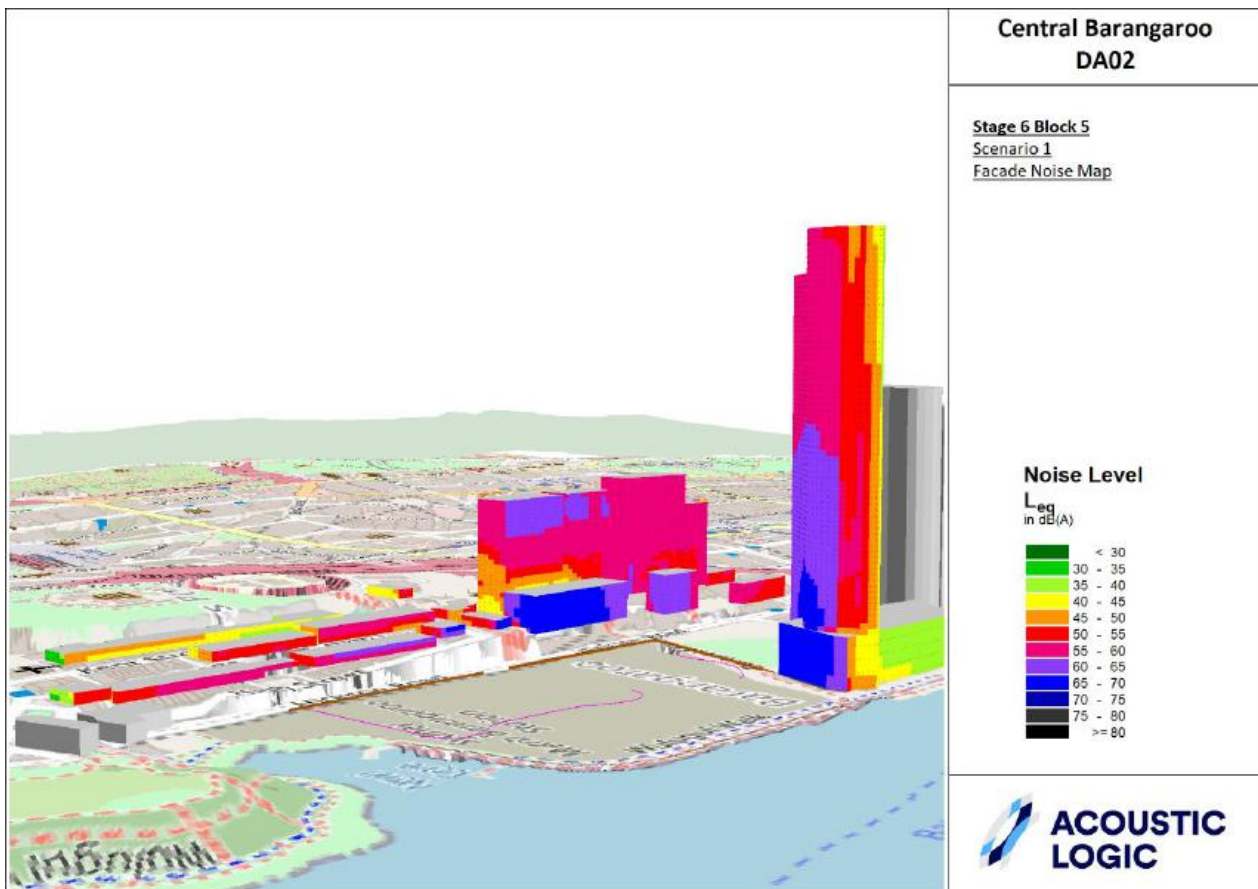
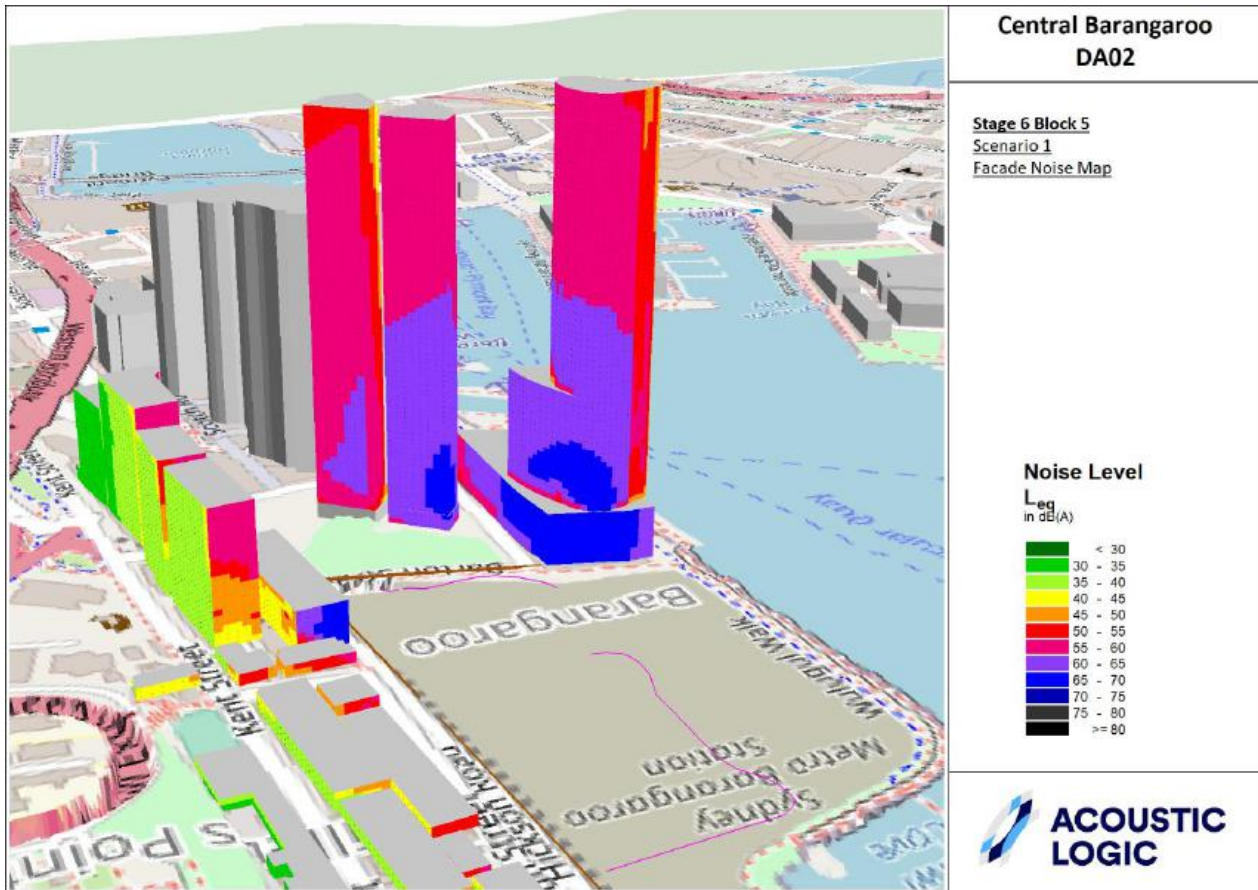
Central Barangaroo DA02

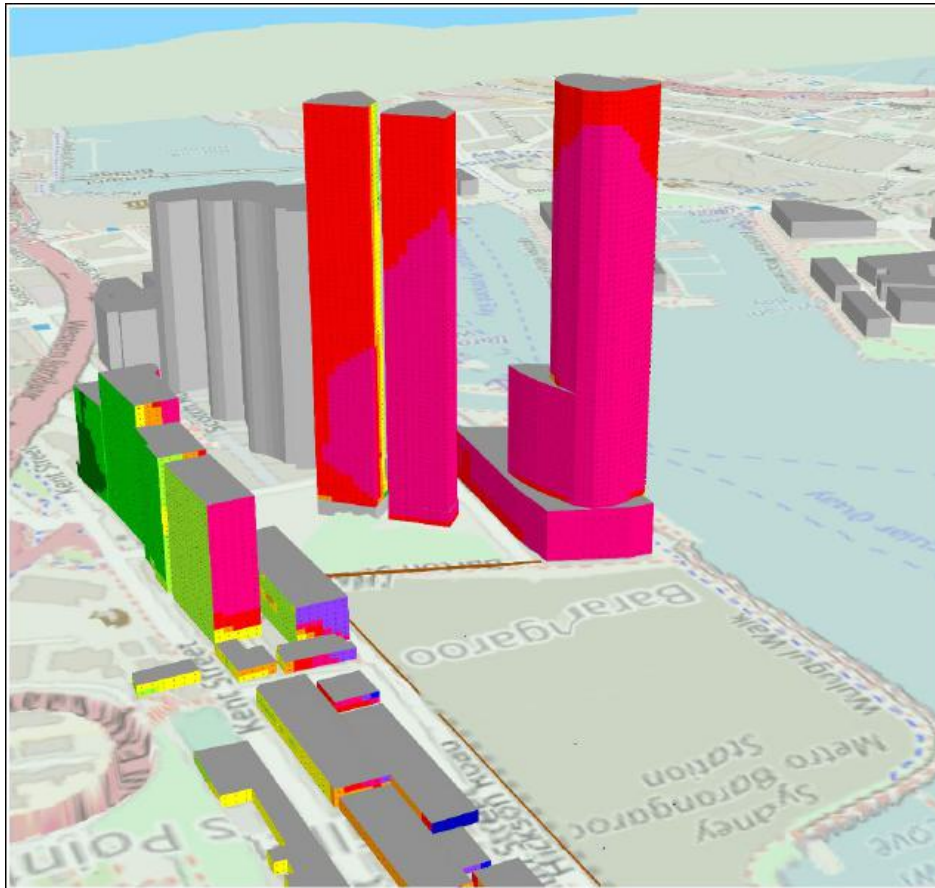
Stage 5 Block 6
Scenario 1
Noise Contours
Height above ground: 1500mm

Noise Level

L_{eq}
in dB(A)





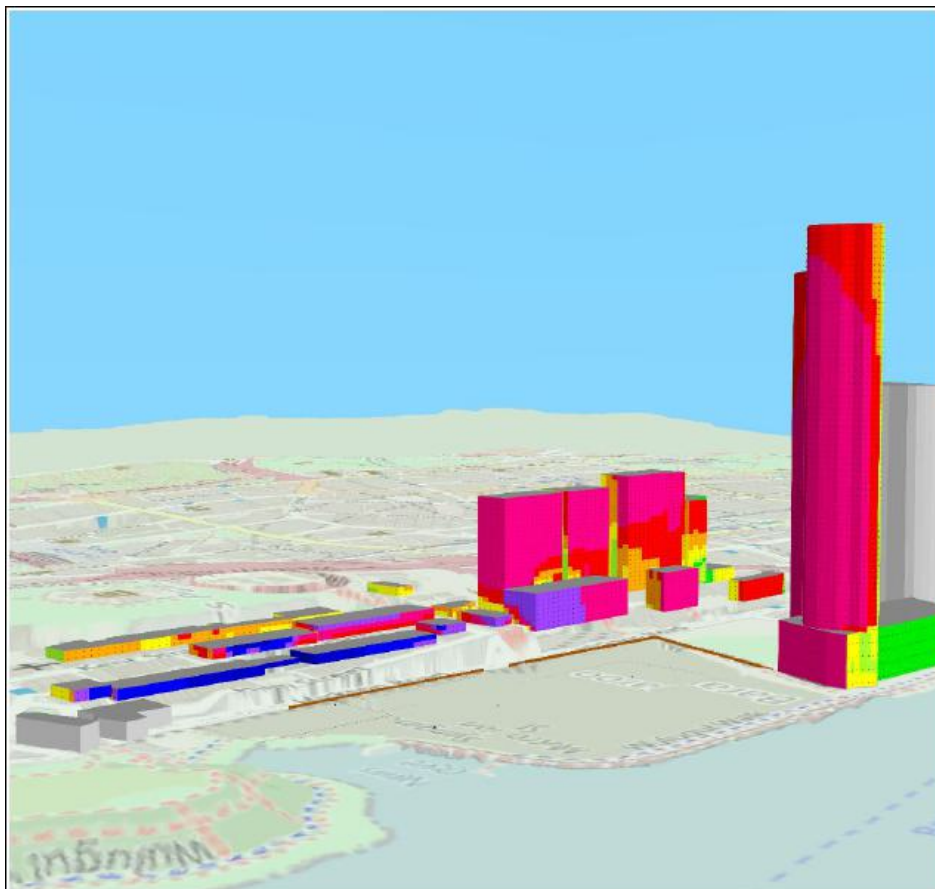
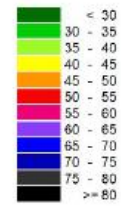


Central Barangaroo DA02

Stage 3
Hydraulic Hammering Scenario 1
Facade Noise Map

Noise Level

Leq
in dB(A)

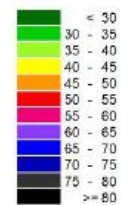


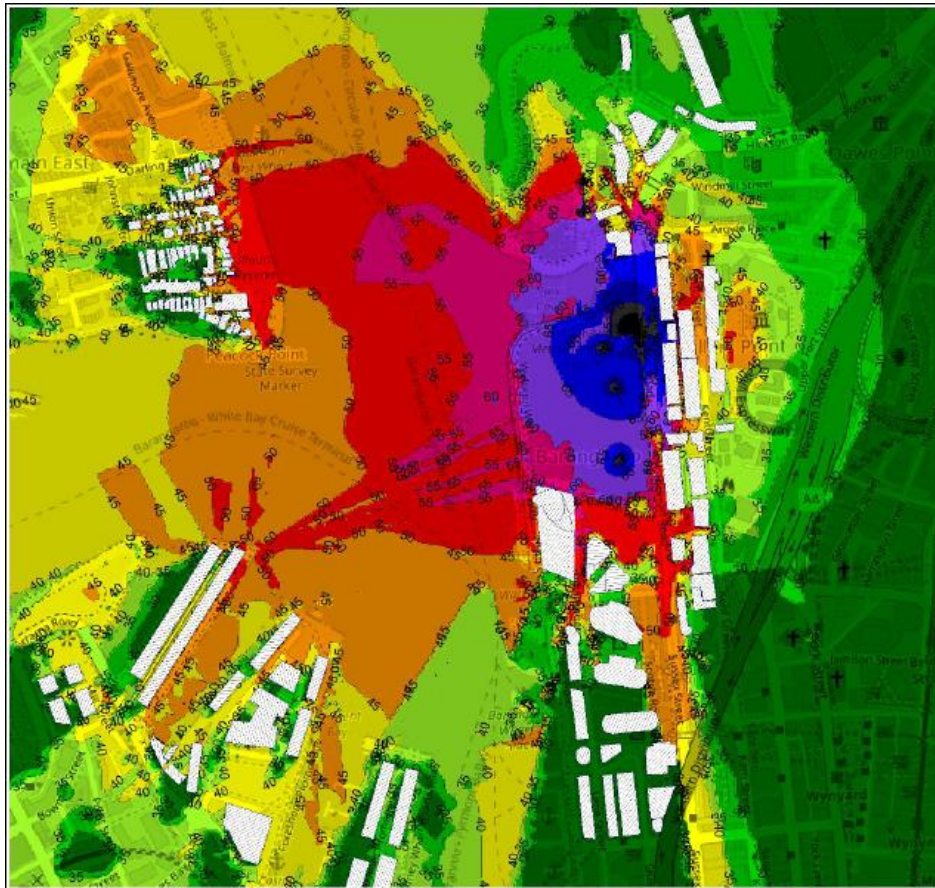
Central Barangaroo DA02

Stage 3
Hydraulic Hammering Scenario 1
Facade Noise Map

Noise Level

Leq
in dB(A)



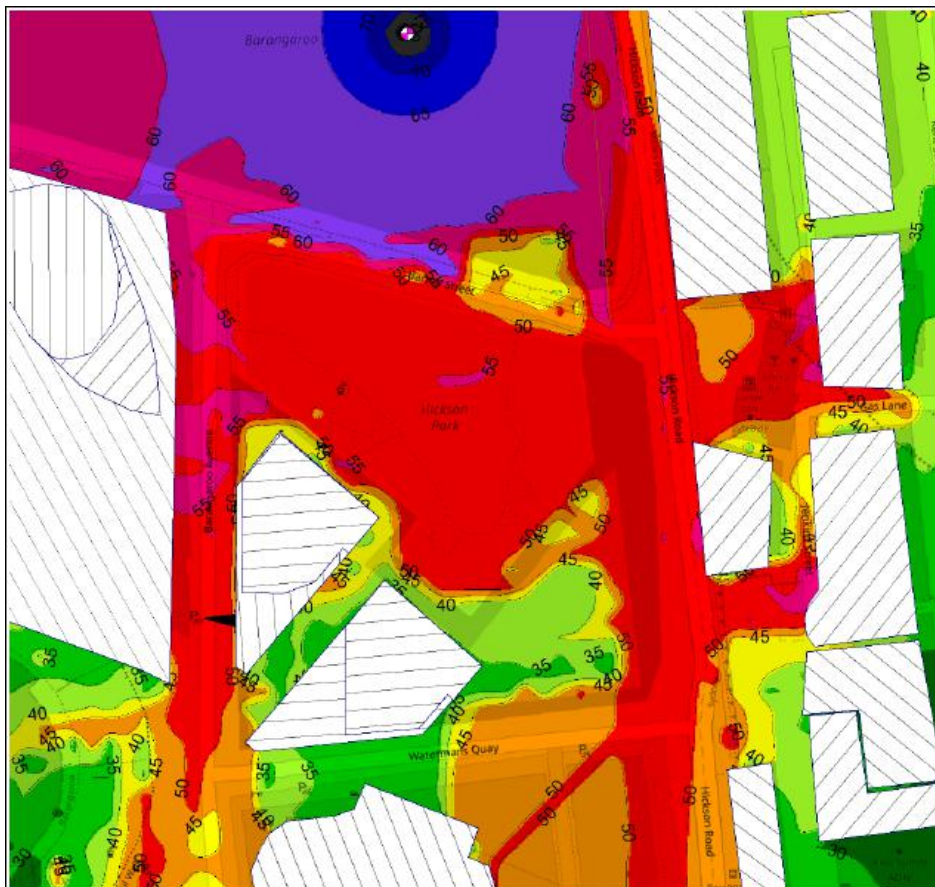
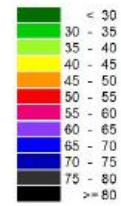


Central Barangaroo DA02

Stage 3
Hydraulic Hammering Scenario 1
Noise Contours
Height above ground: 1500mm

Noise Level

Leq
in dB(A)

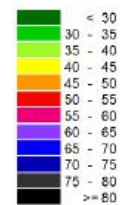


Central Barangaroo DA02

Stage 3
Hydraulic Hammering Scenario 1
Noise Contours
Height above ground: 1500mm

Noise Level

Leq
in dB(A)

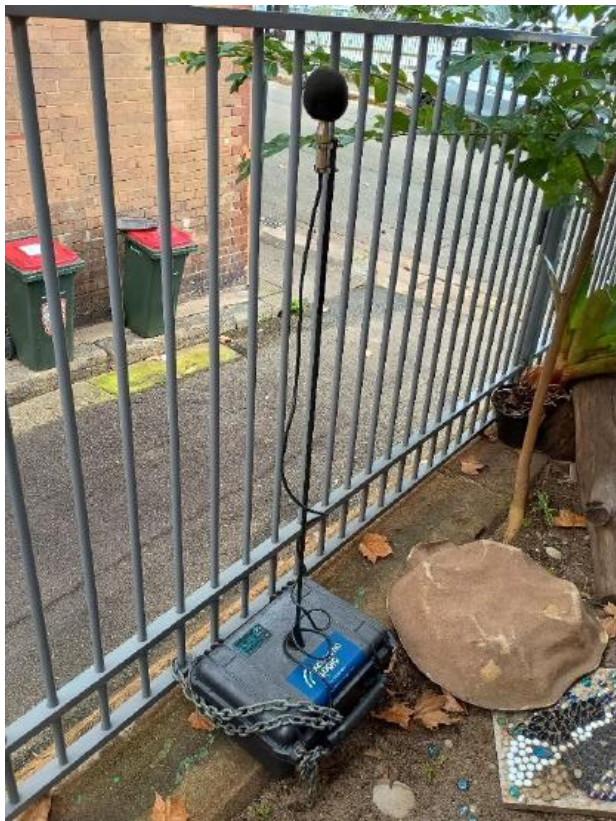


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APPENDIX D – MONITORING LOCATION PHOTOS



Central Barangaroo South site (in close proximity to One Sydney Harbour tower)



KU Lance Childcare



Barangaroo Reserve



Munn Reserve



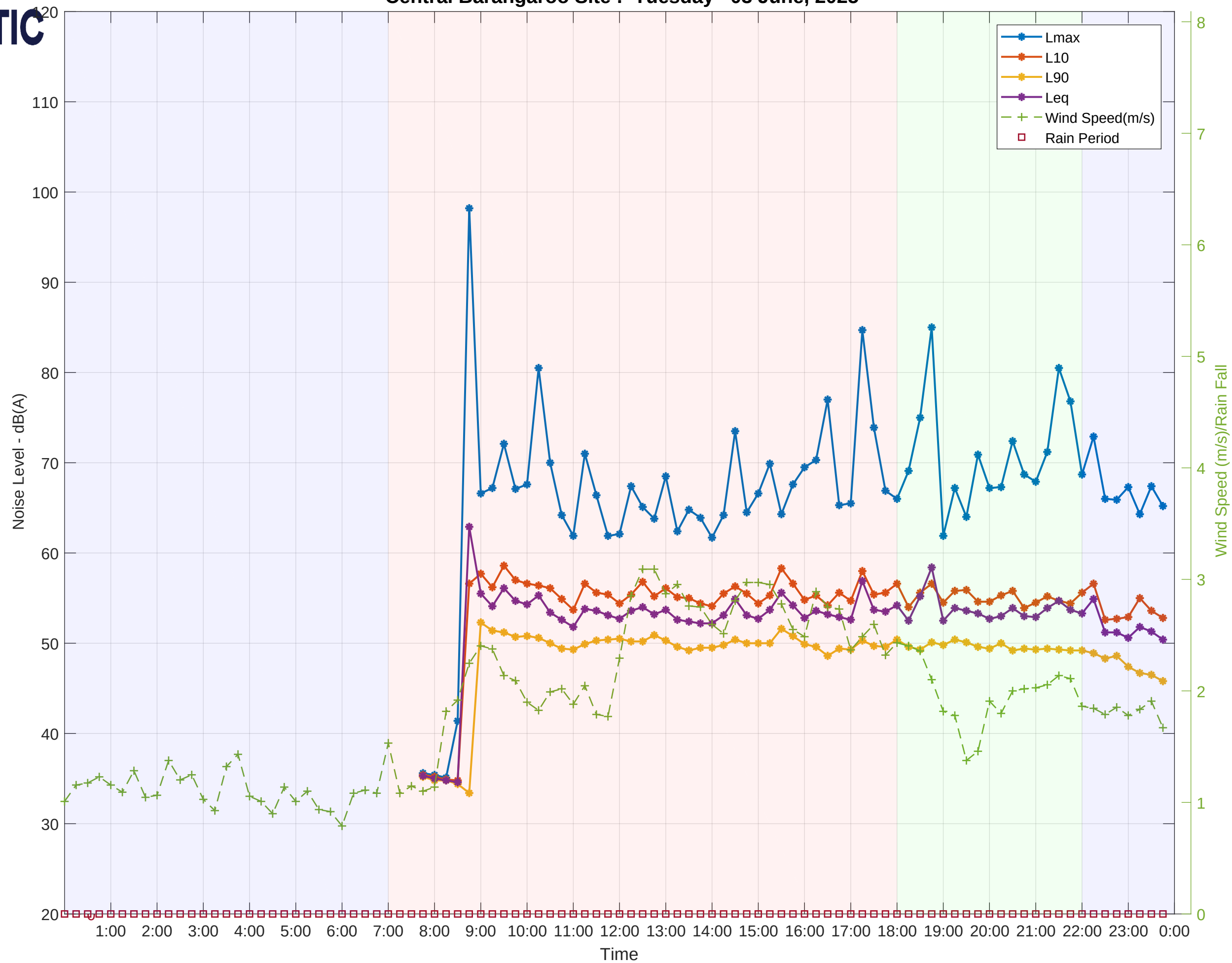
Ballaarat Park, Pyrmont



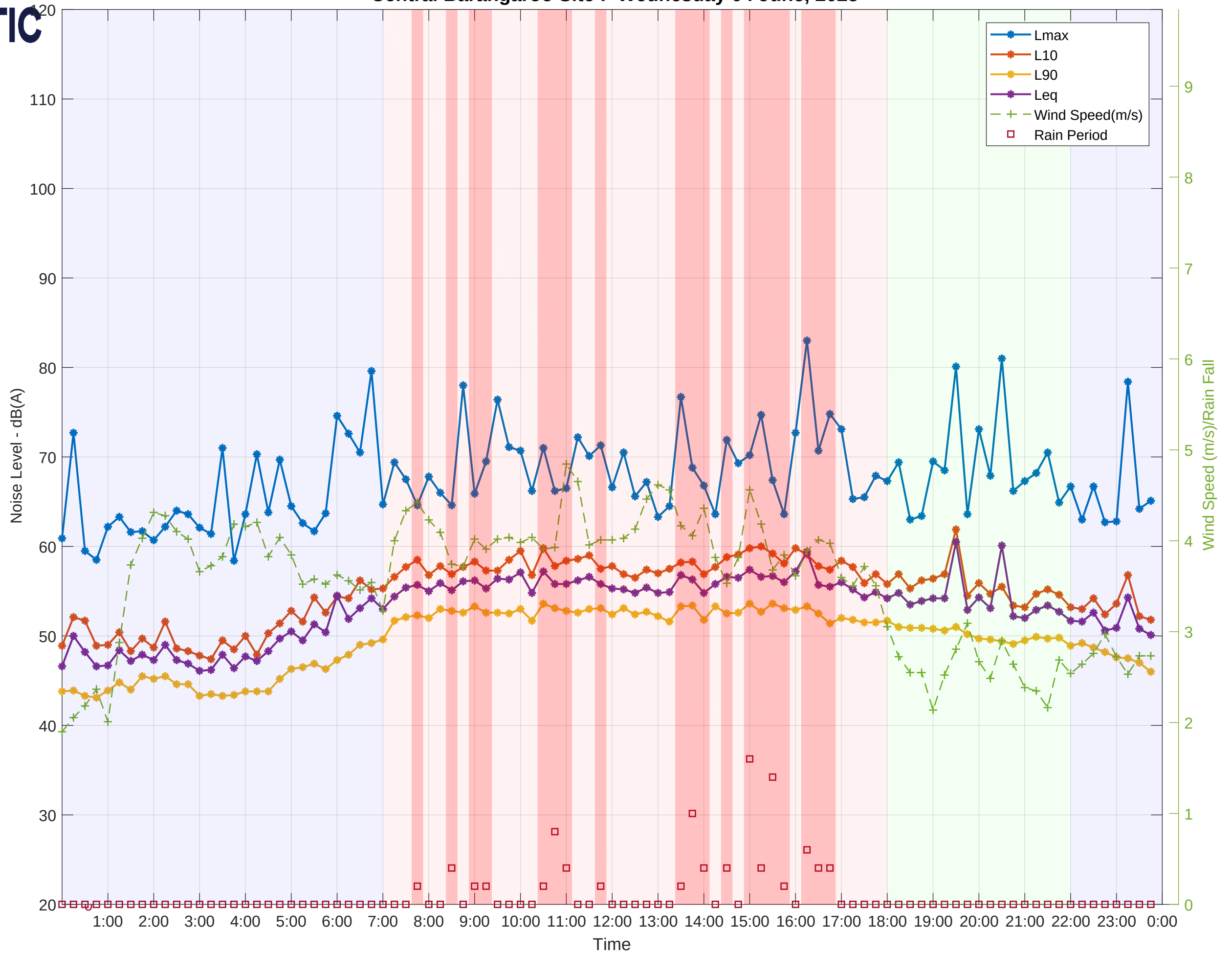
Edward Street, Balmain

APPENDIX E – UNATTENDED NOISE MONITORING GRAPHS

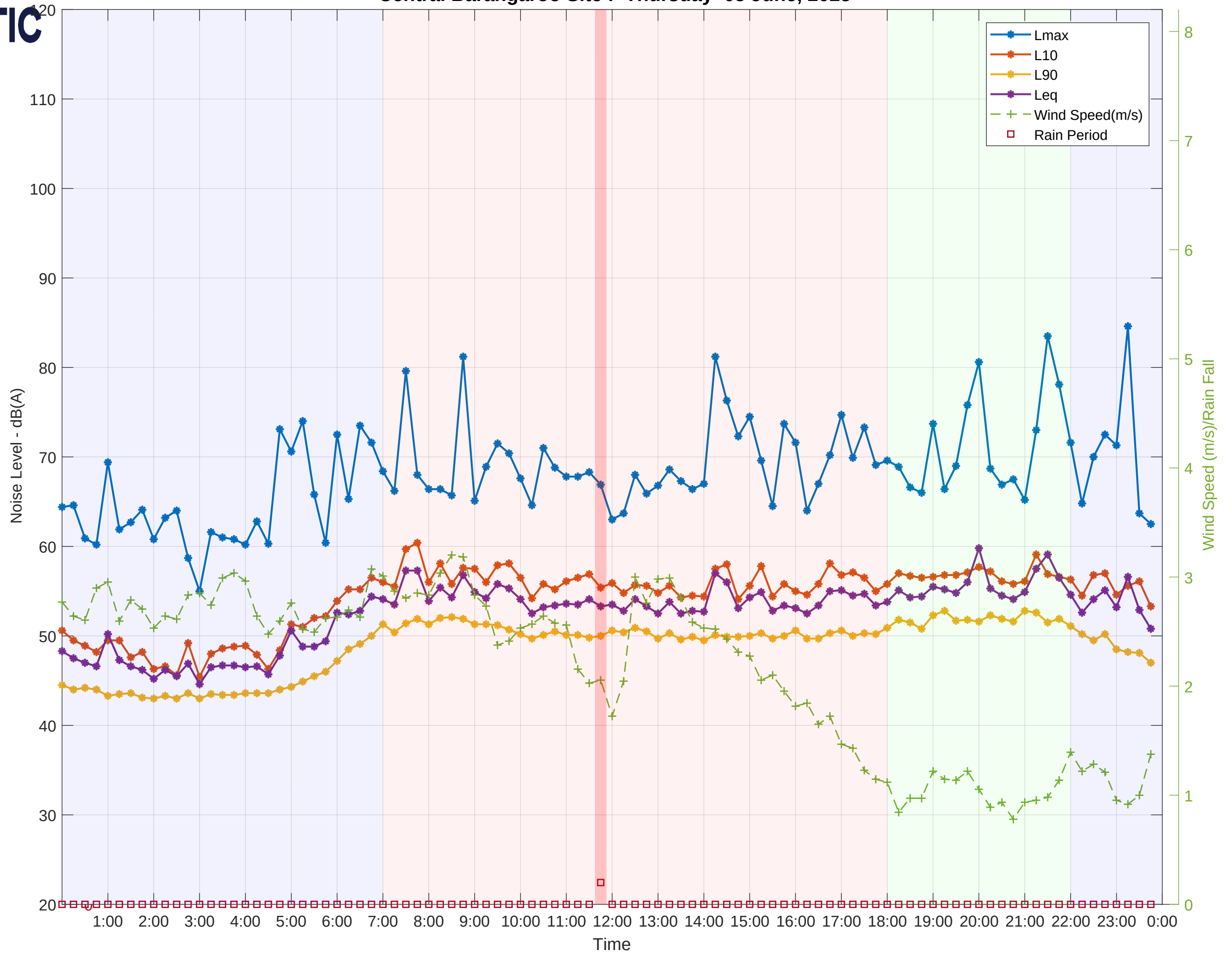
E.1 – MONITORING LOCATION #1

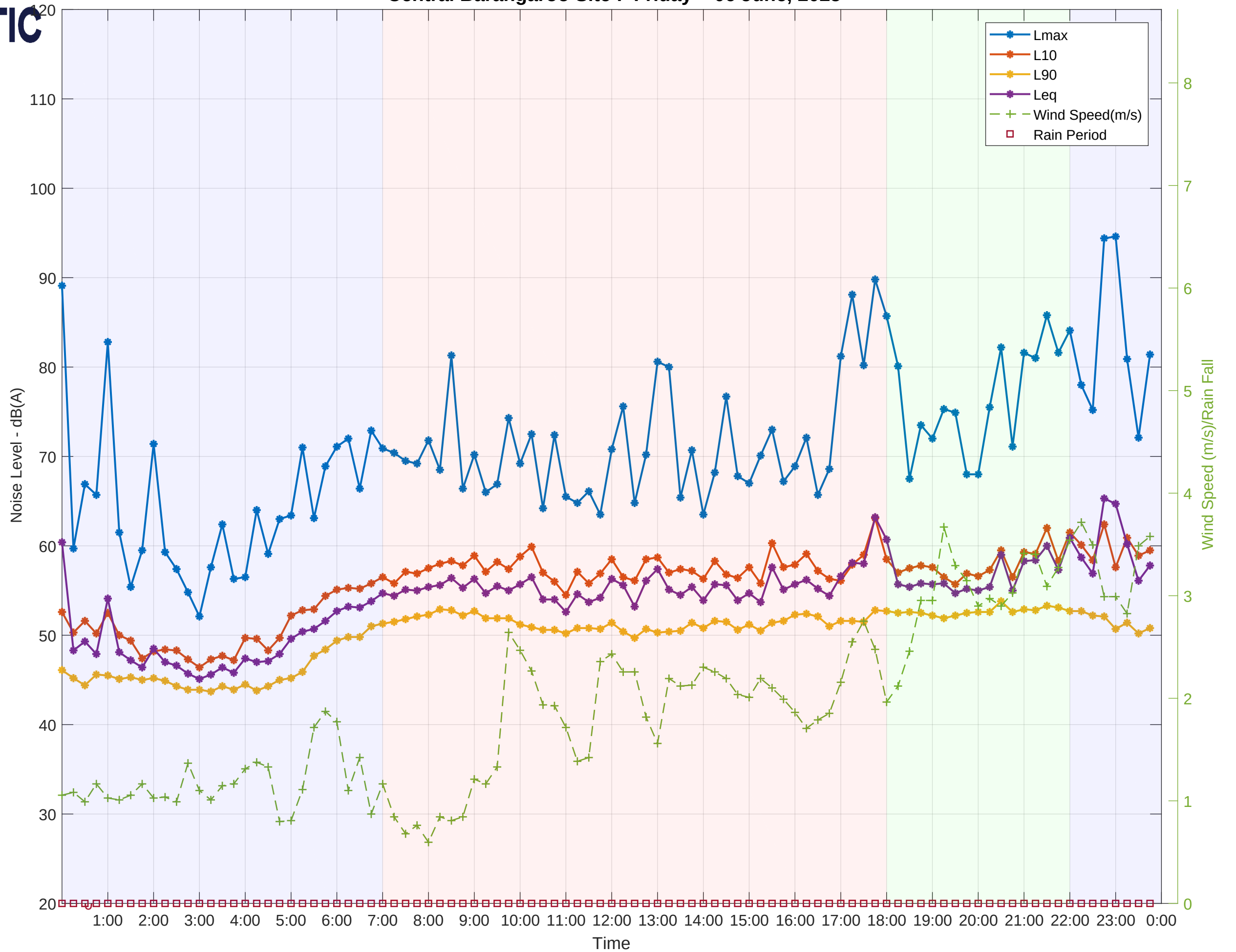


Central Barangaroo Site : Wednesday 04 June, 2025

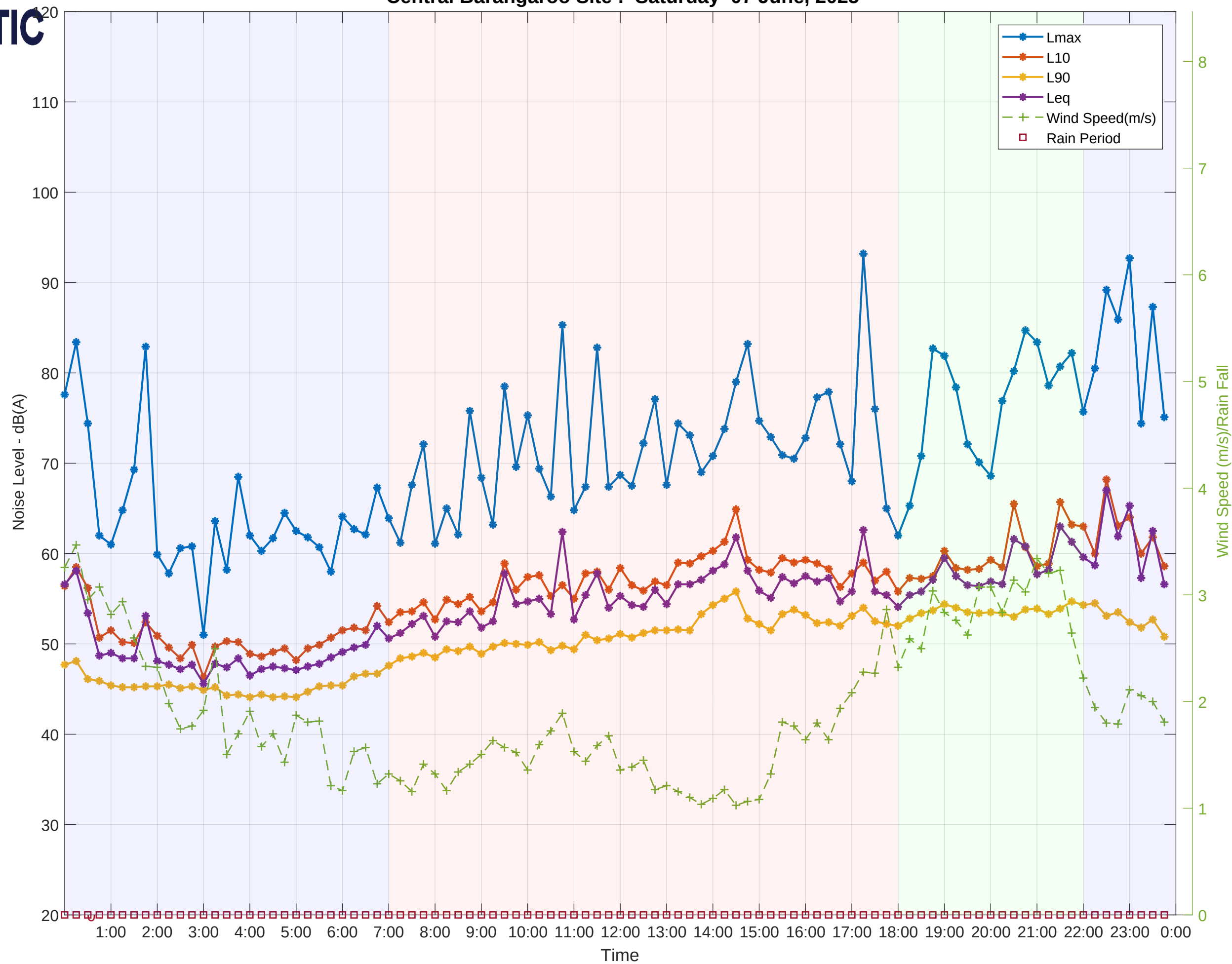


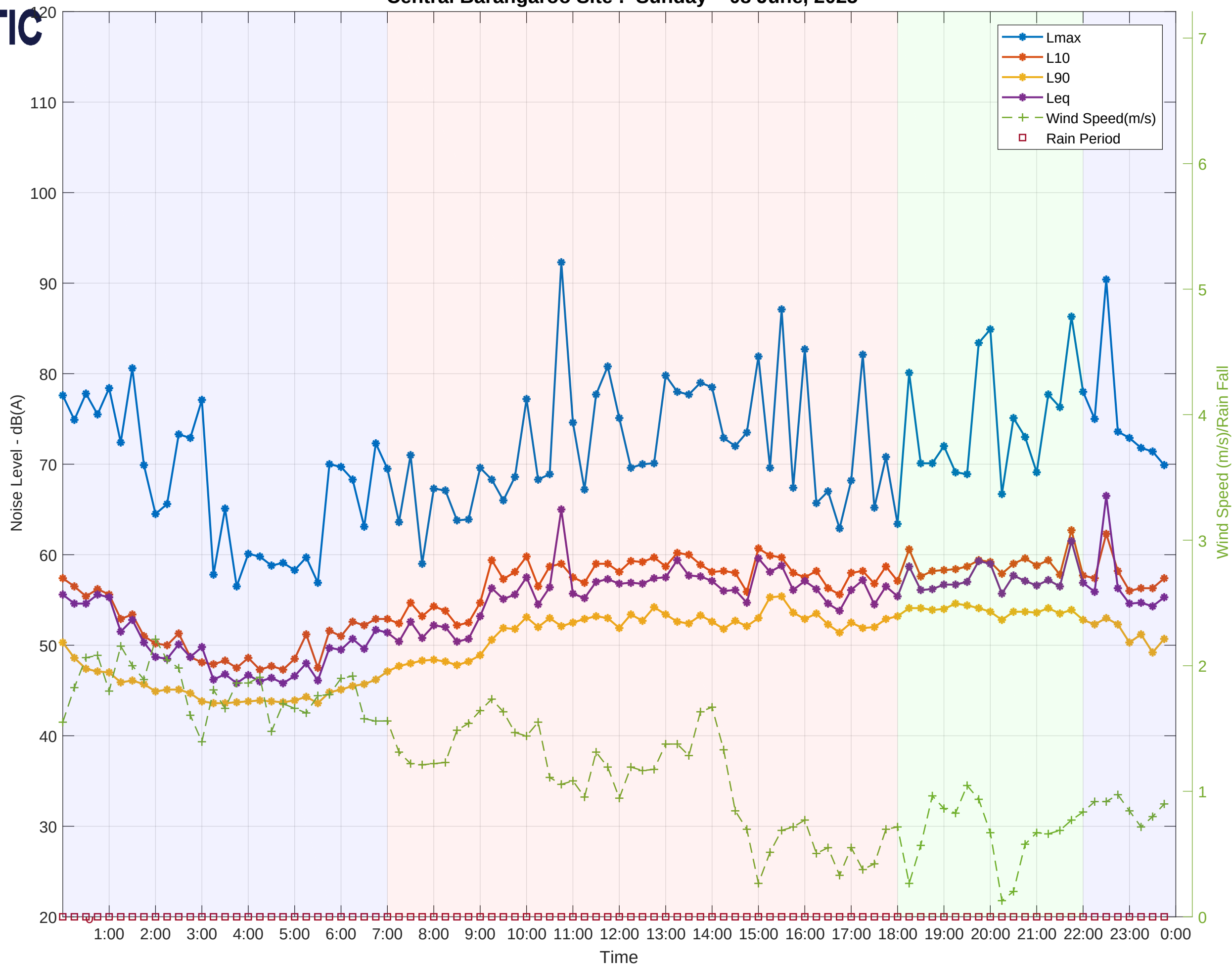
Central Barangaroo Site : Thursday 05 June, 2025

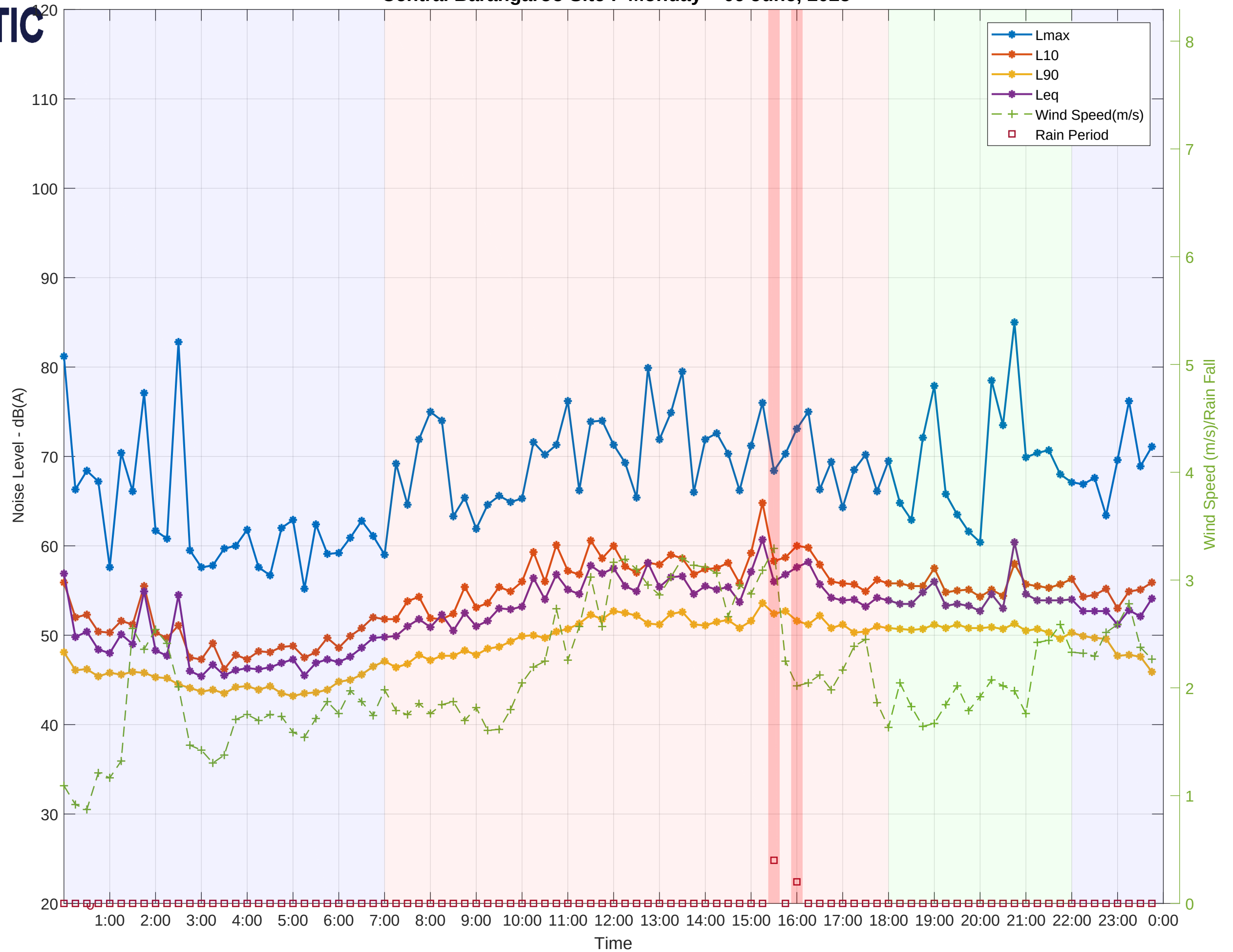


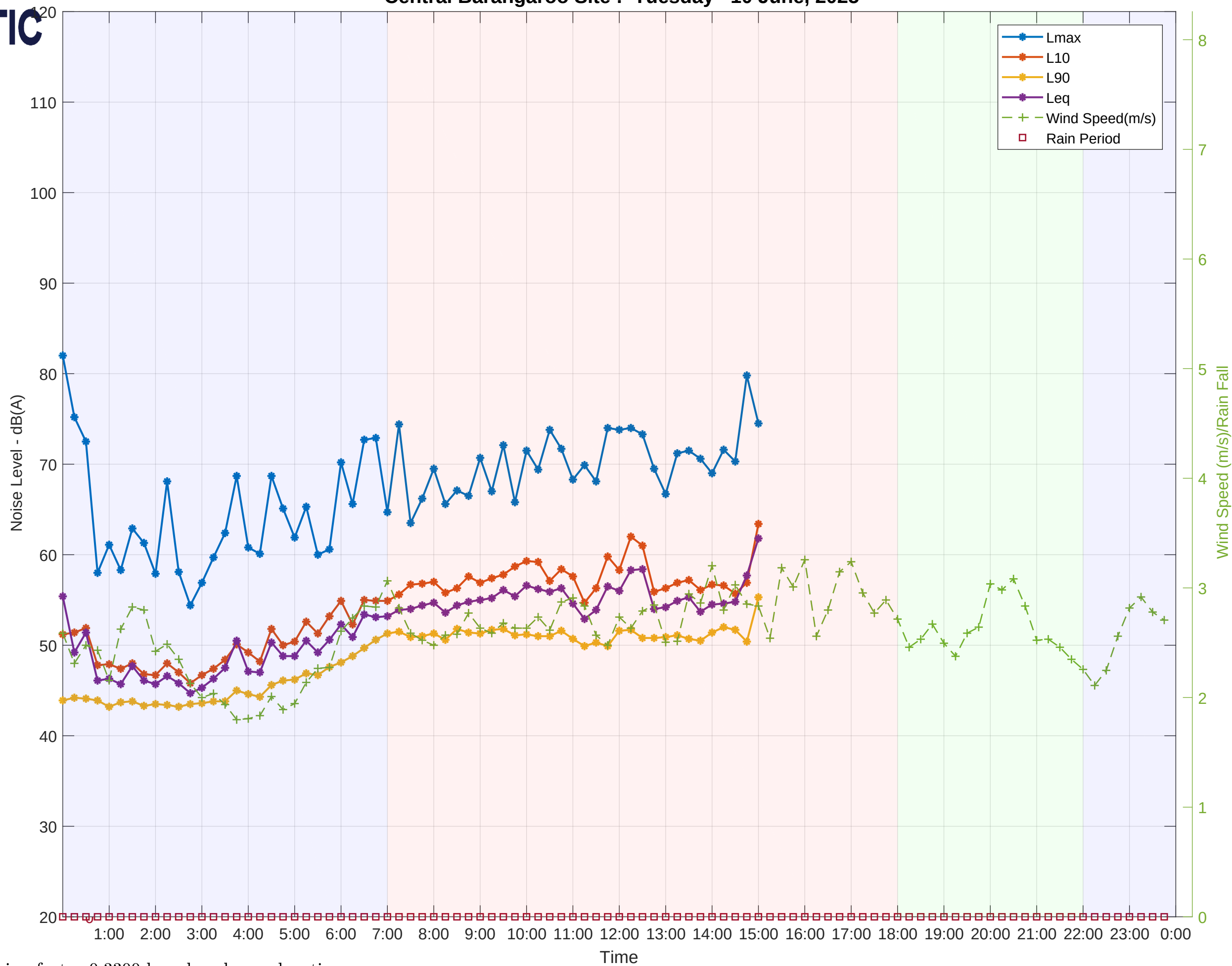


Central Barangaroo Site : Saturday 07 June, 2025



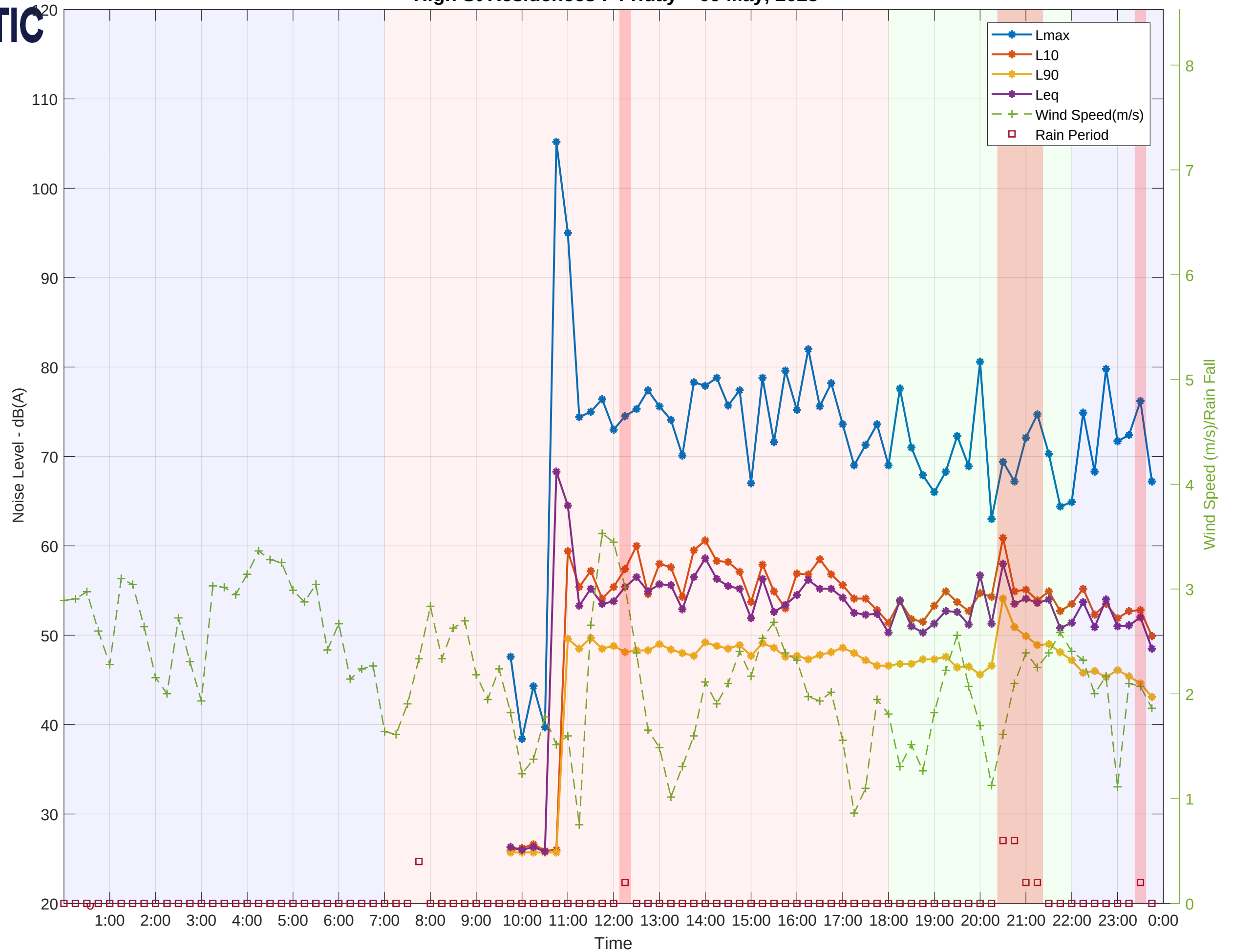


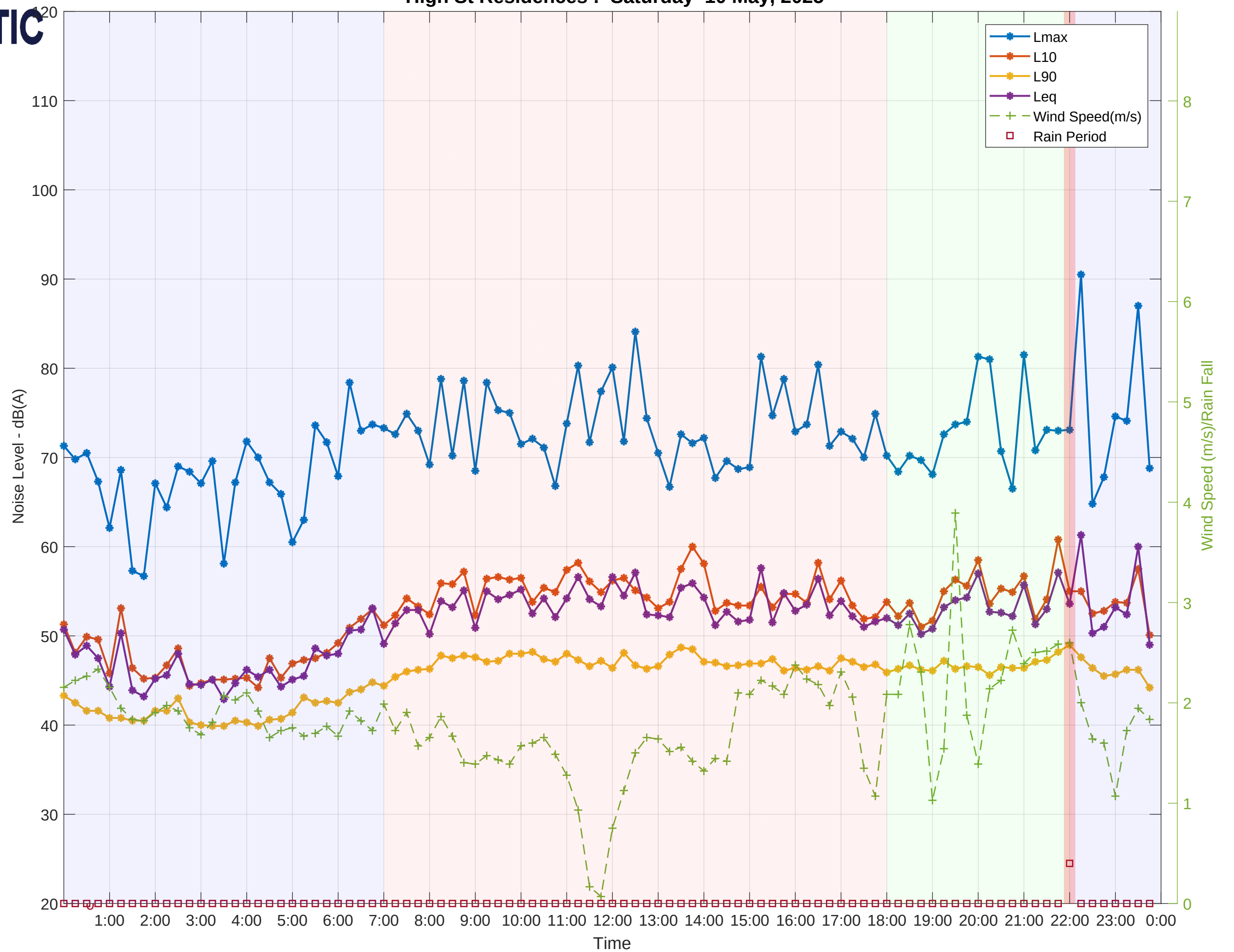


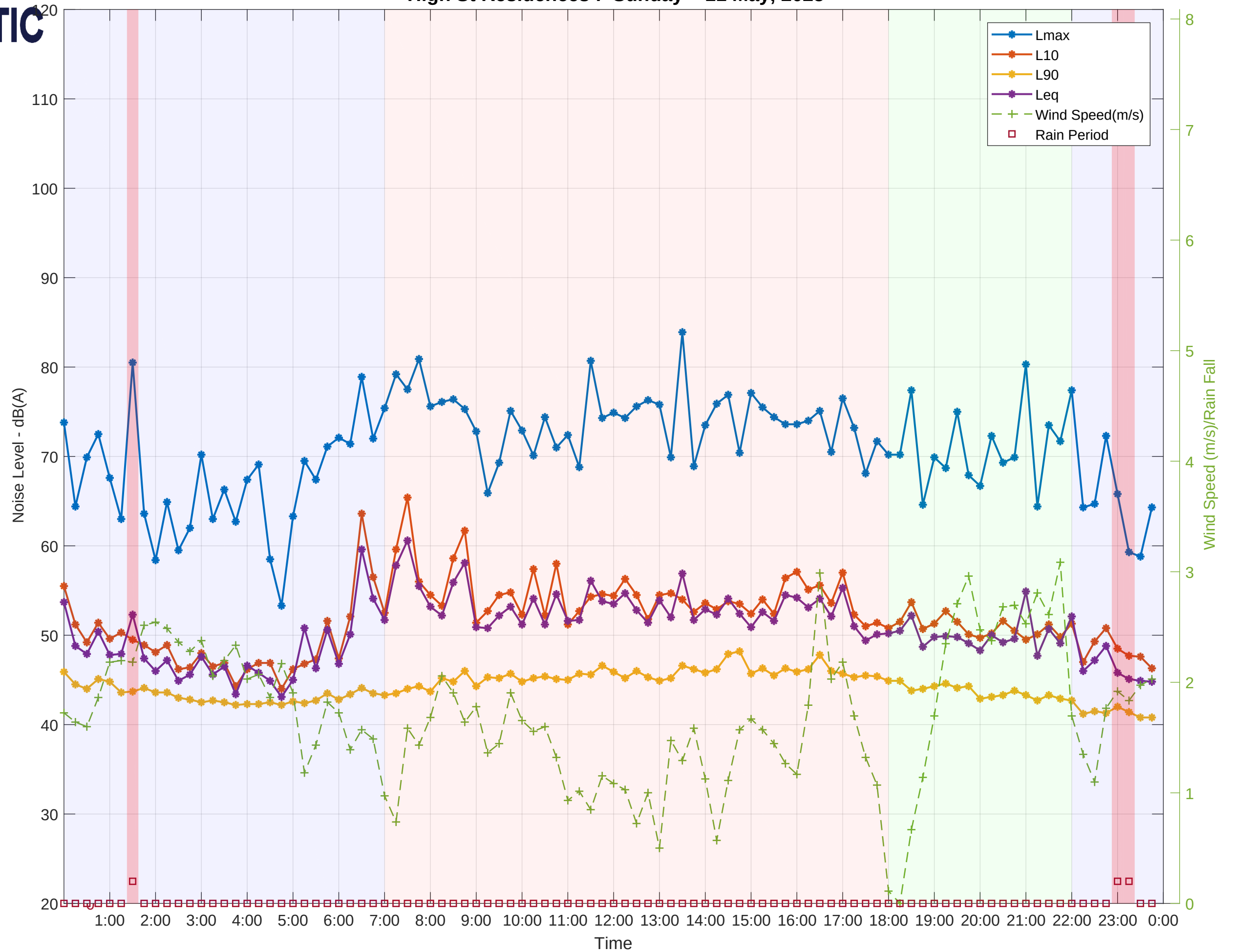


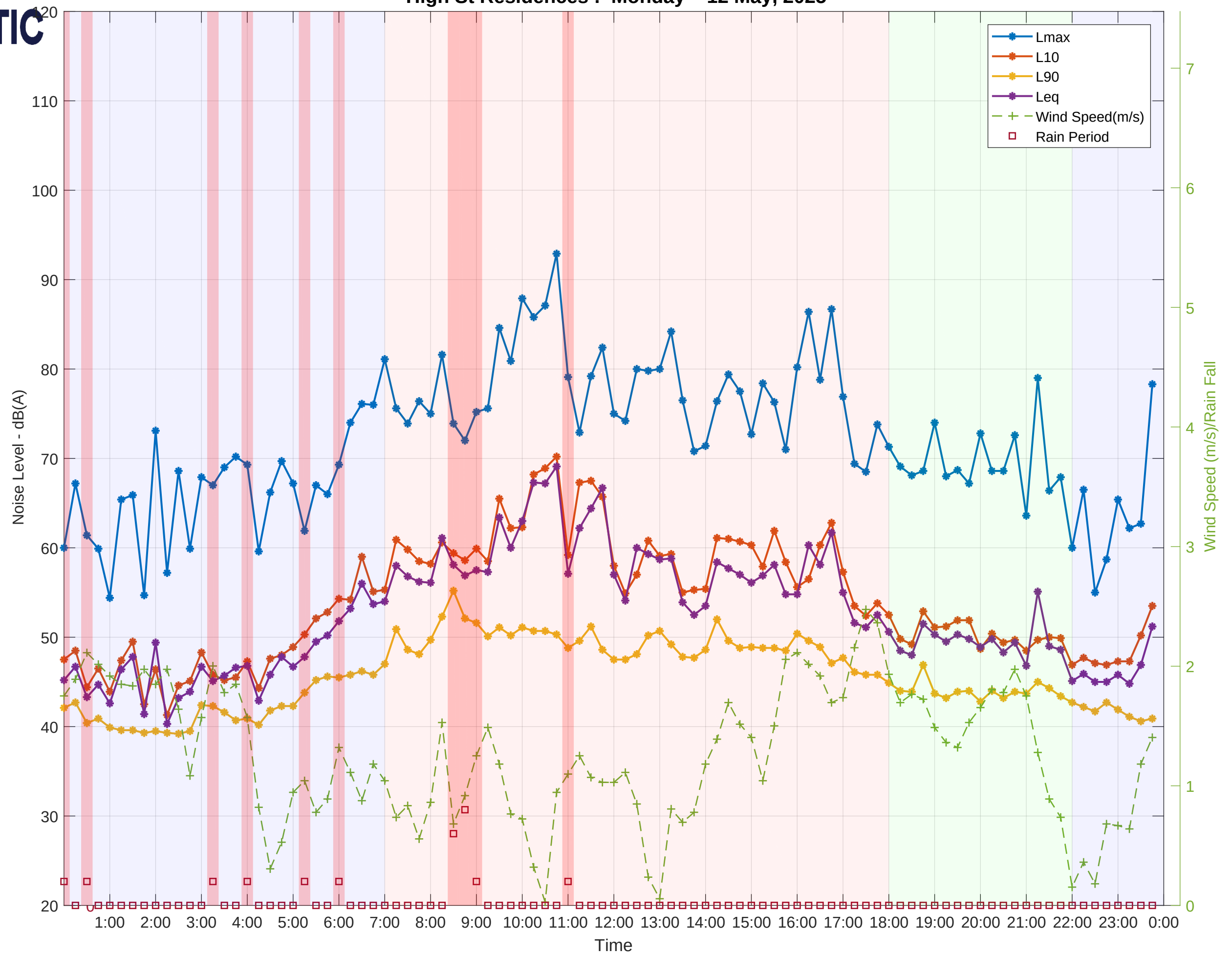
Wind Speed is corrected using factor 0.3300 based on logger location

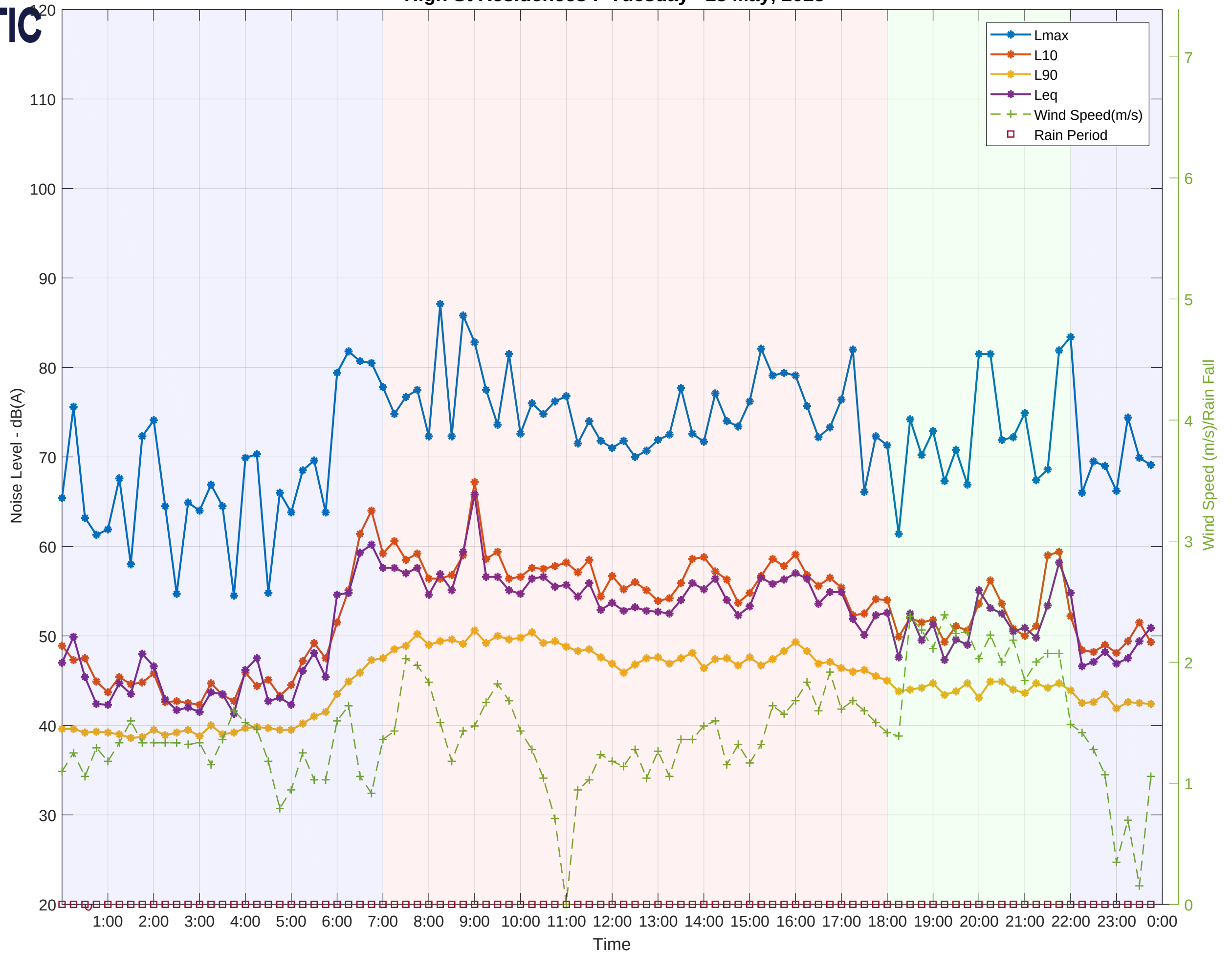
E.2 – MONITORING LOCATION #2

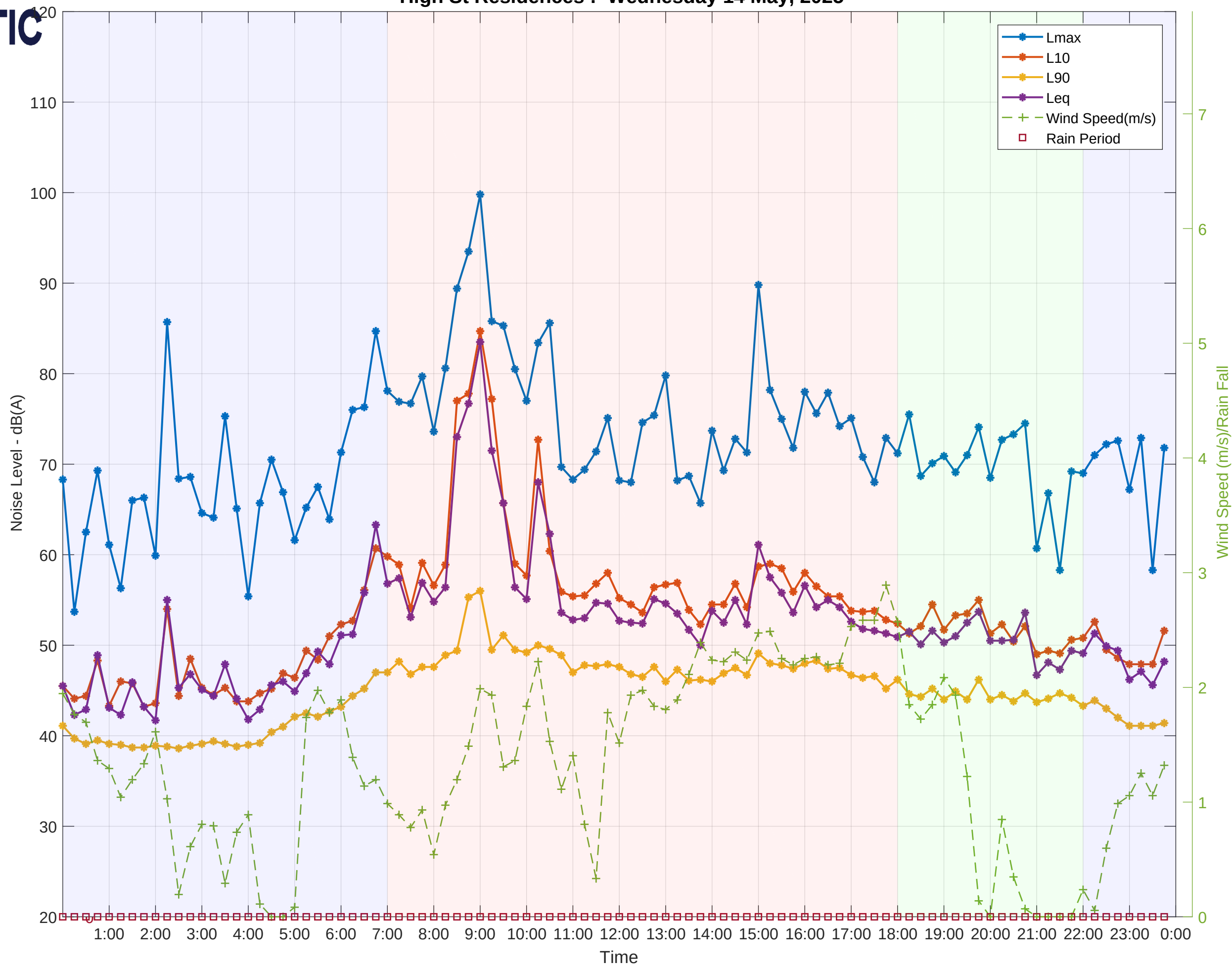


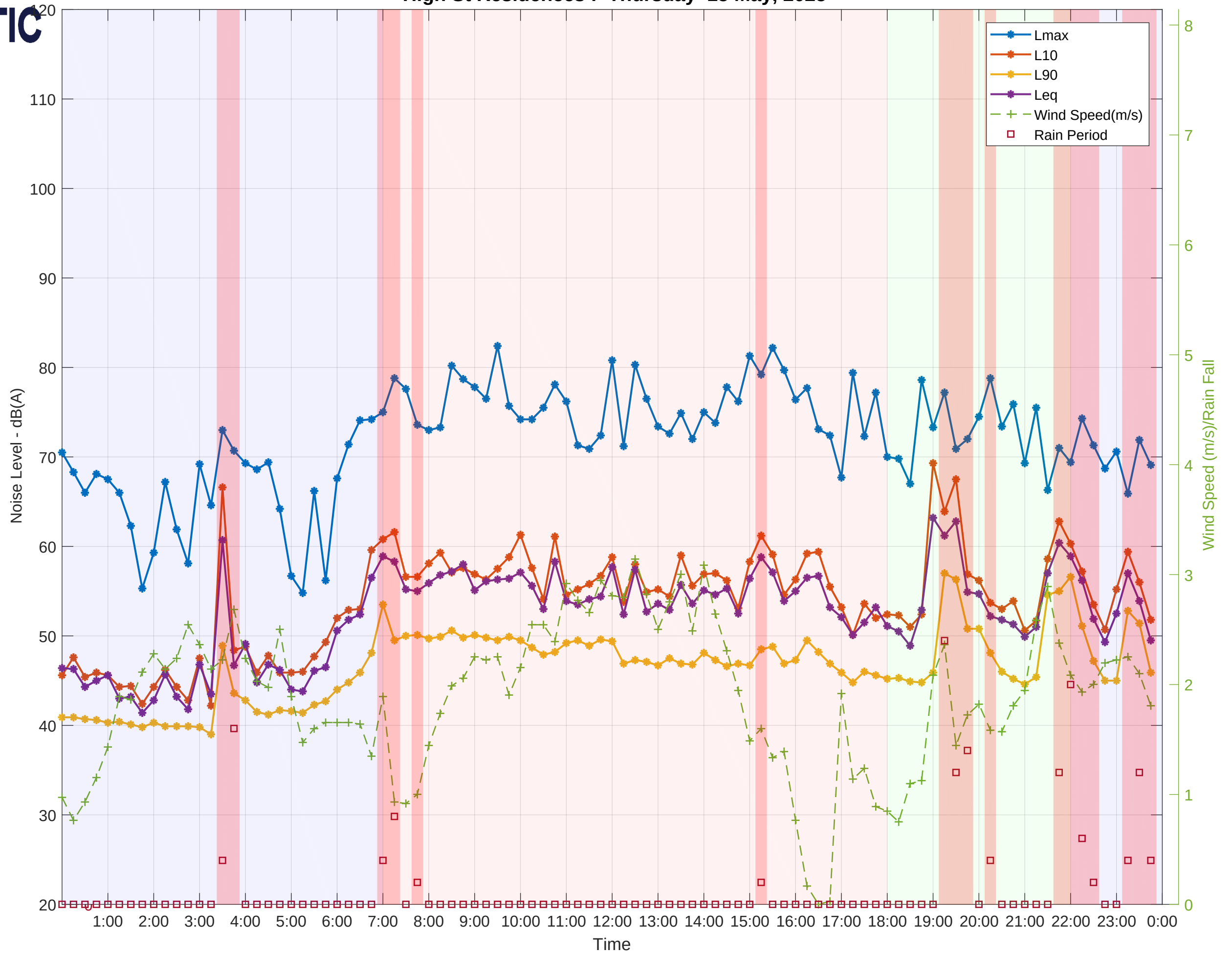


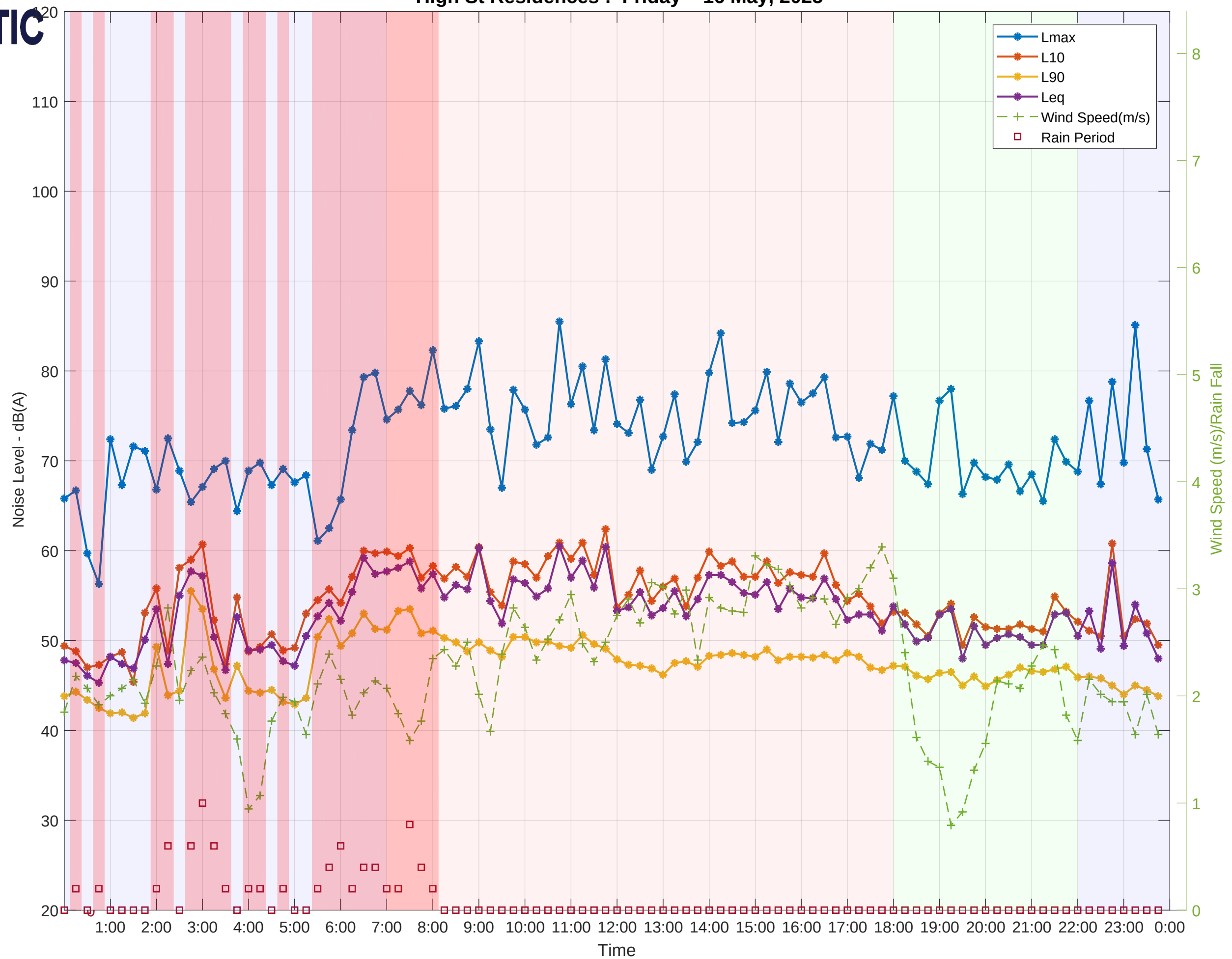




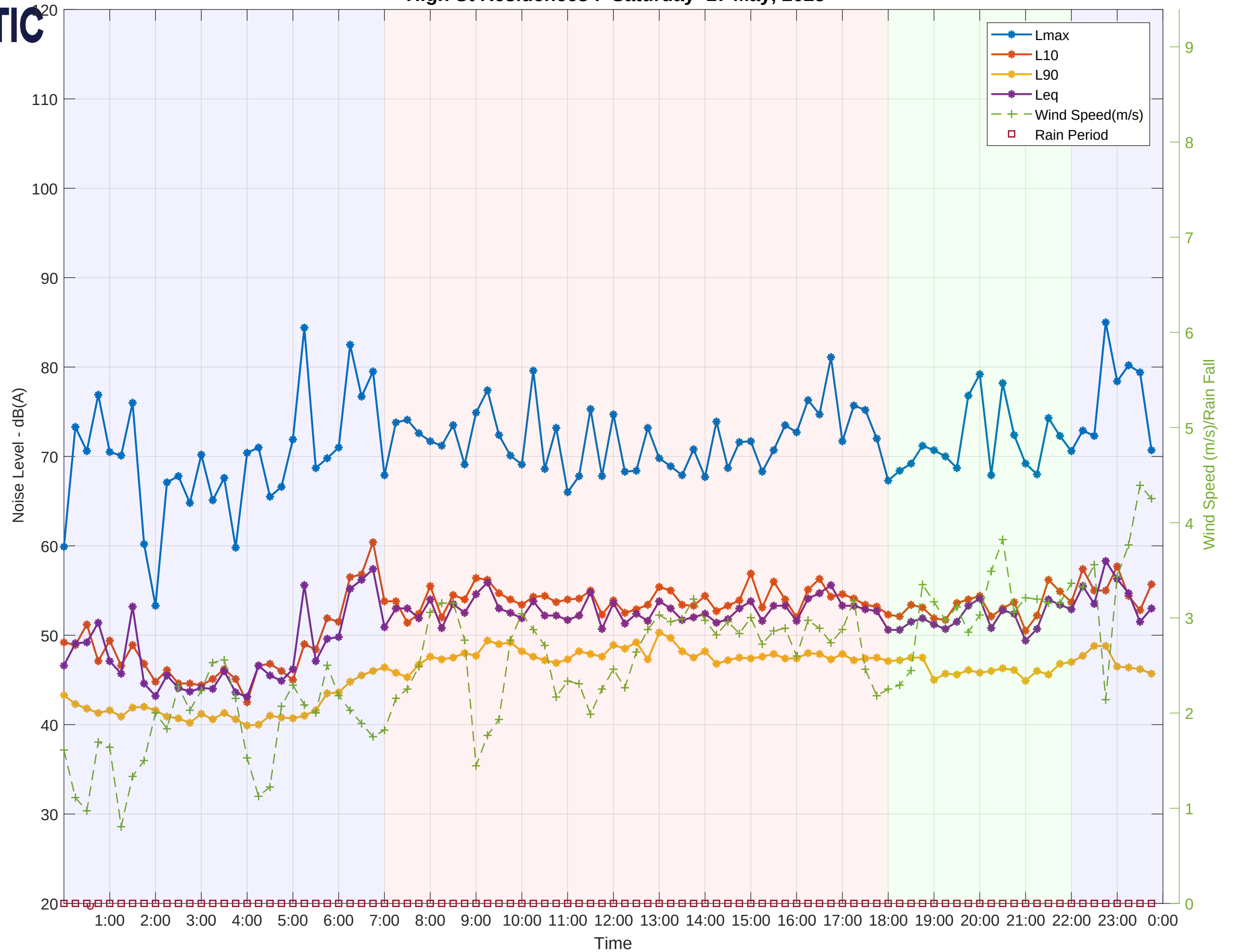


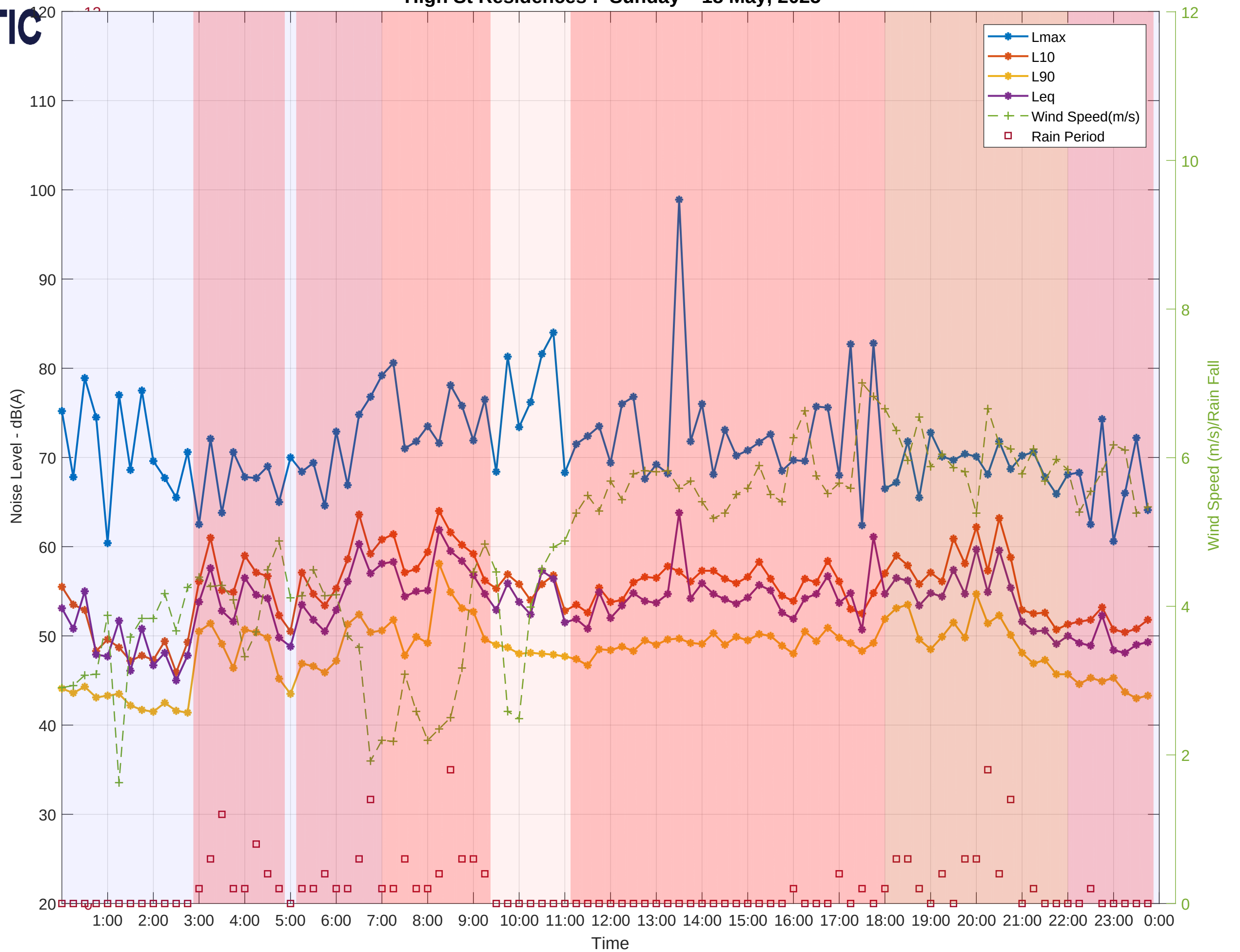


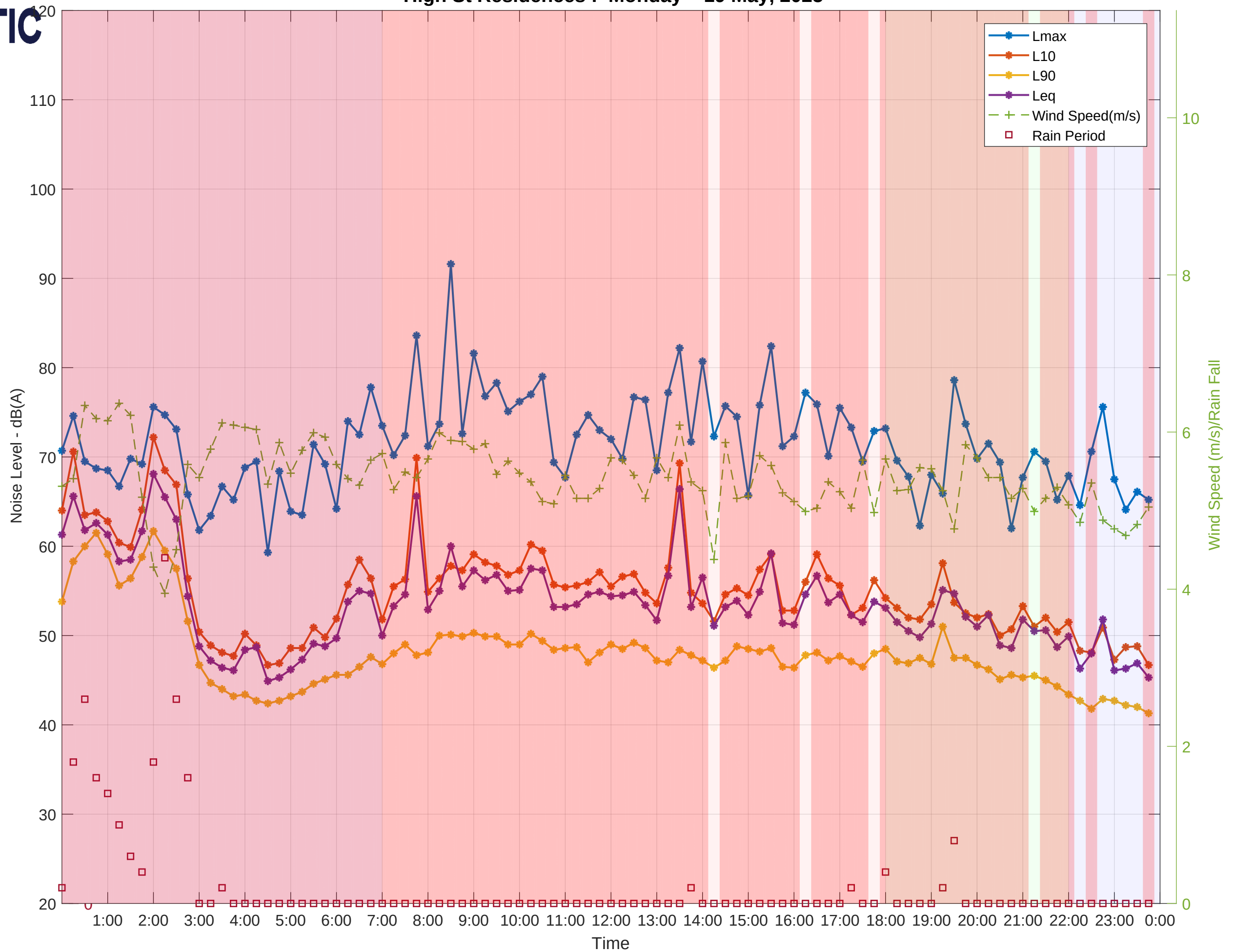


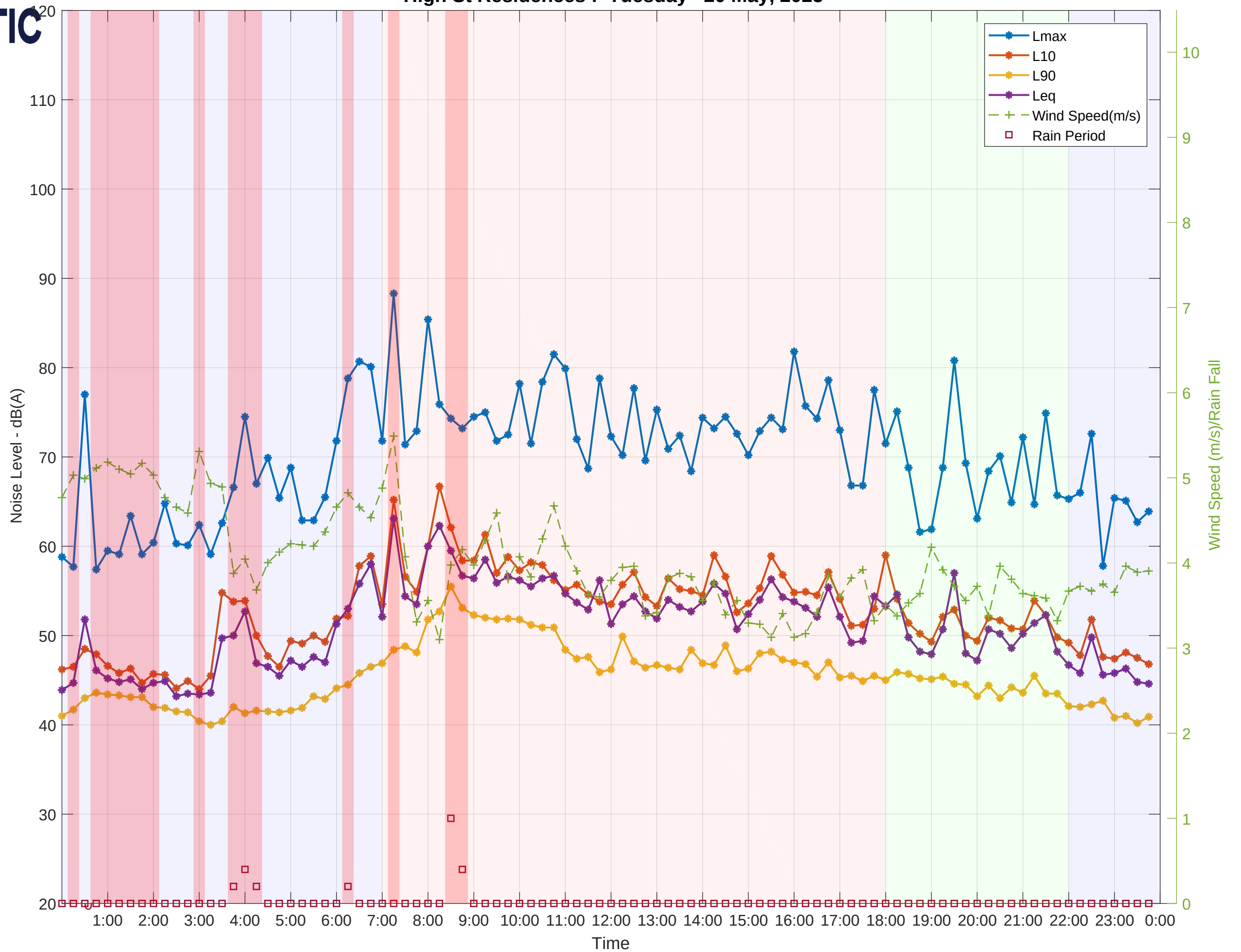


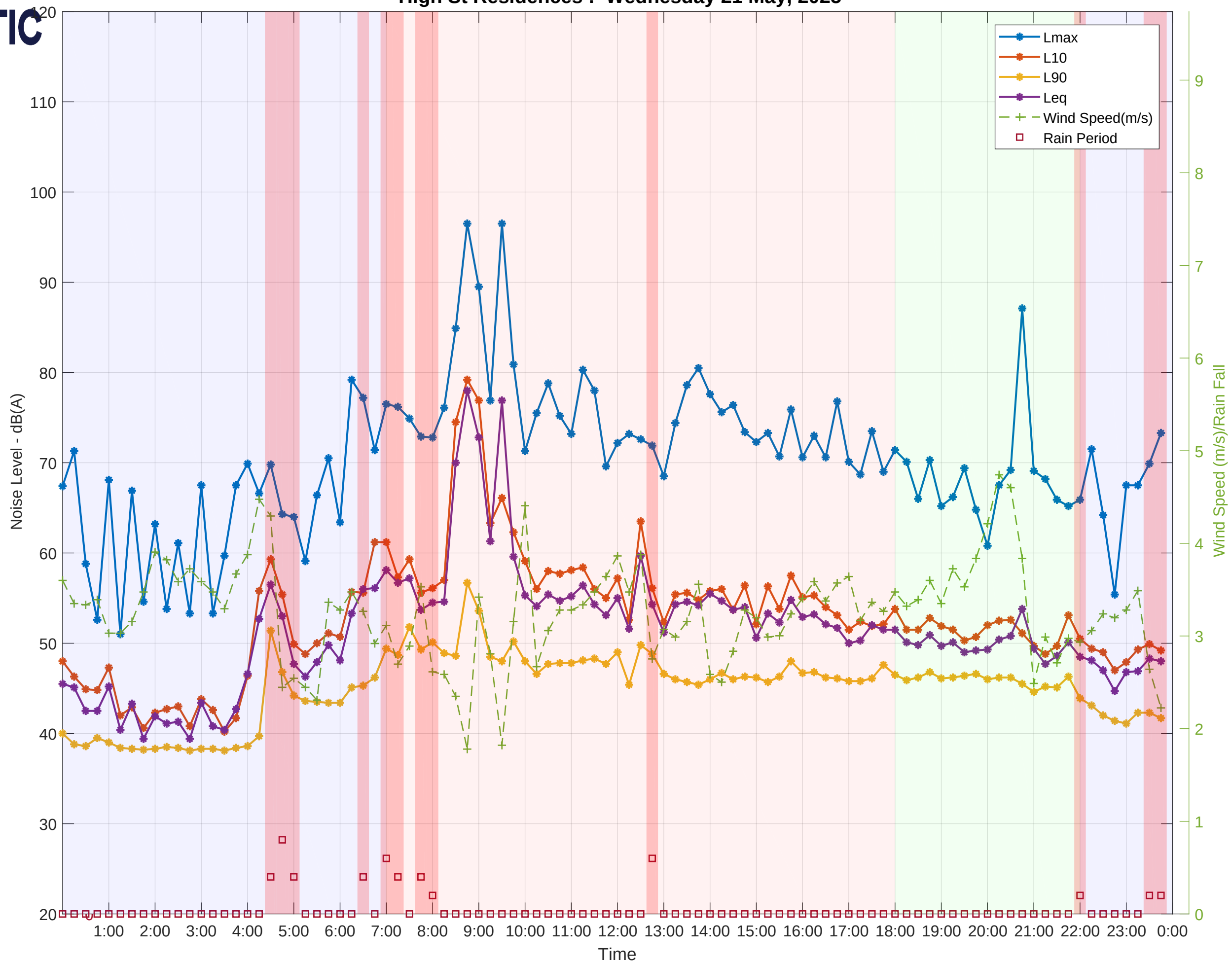
High St Residences : Saturday 17 May, 2025



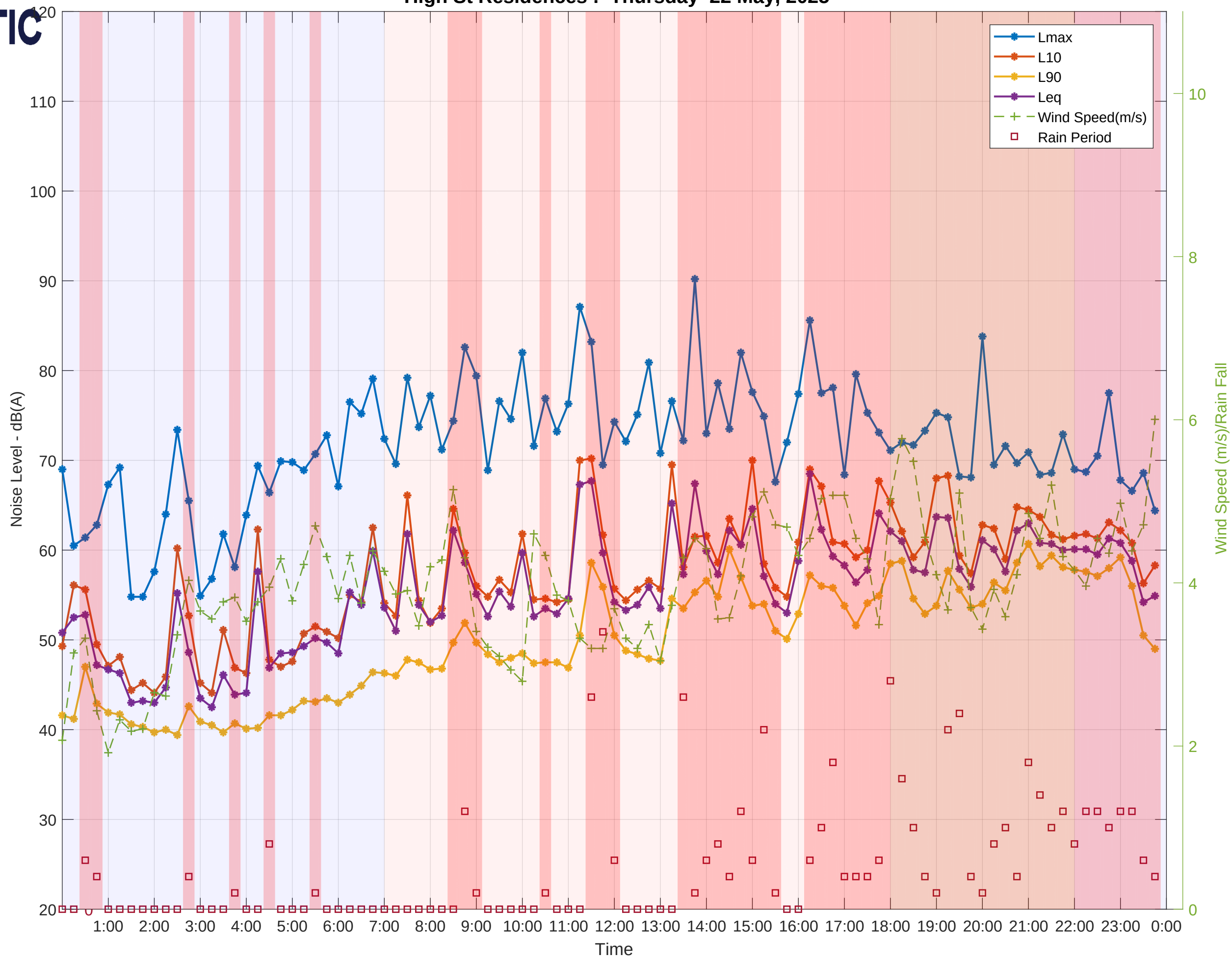


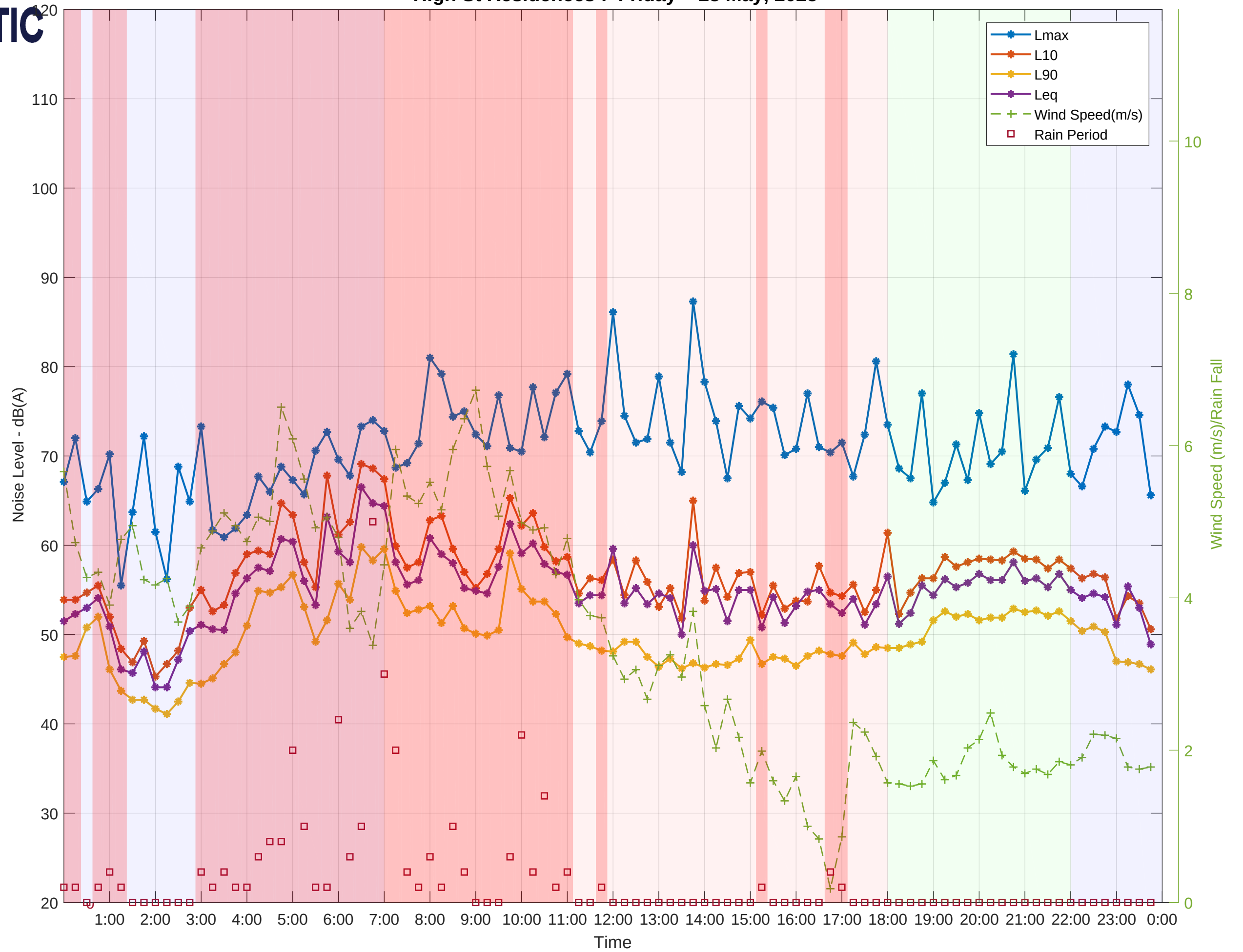


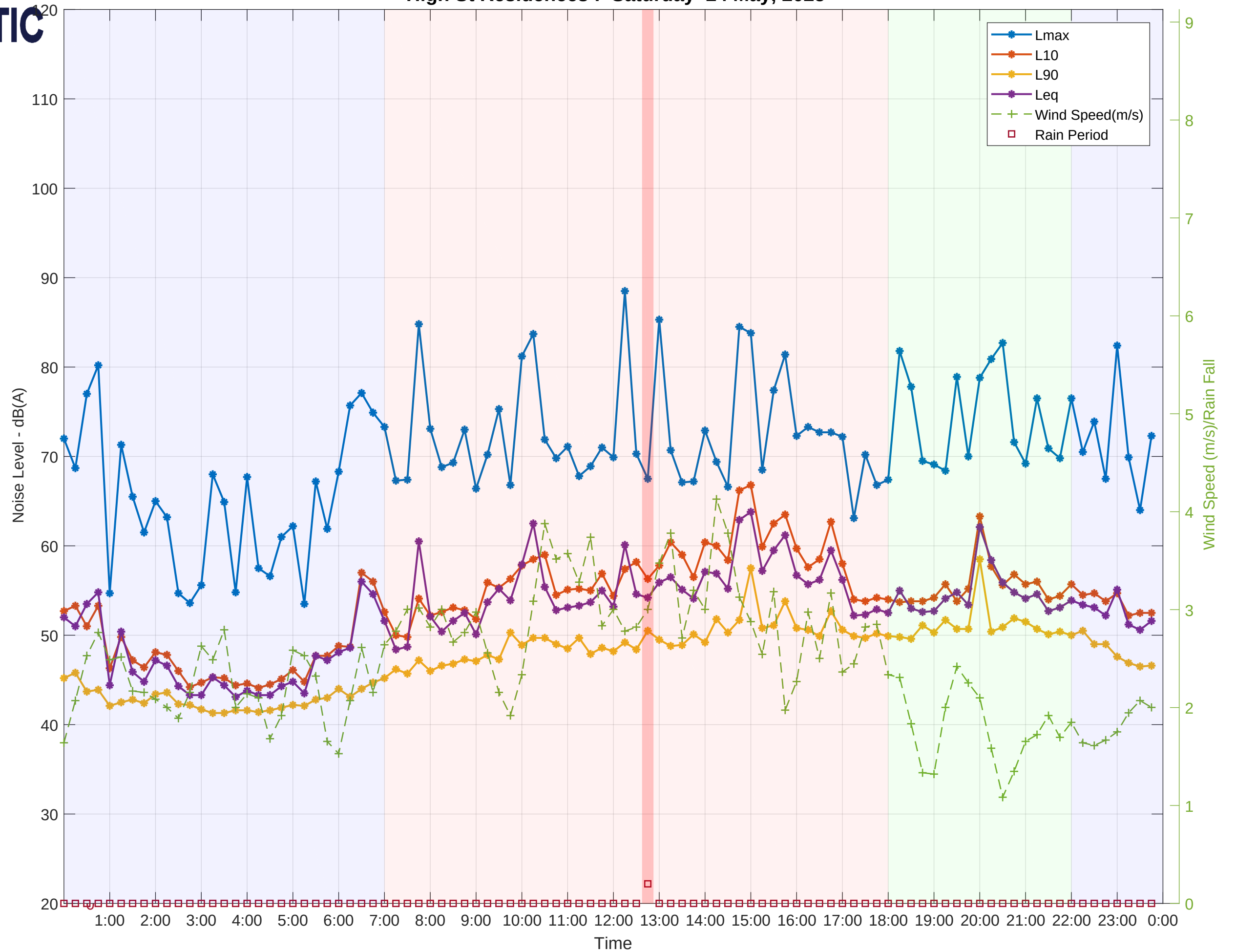


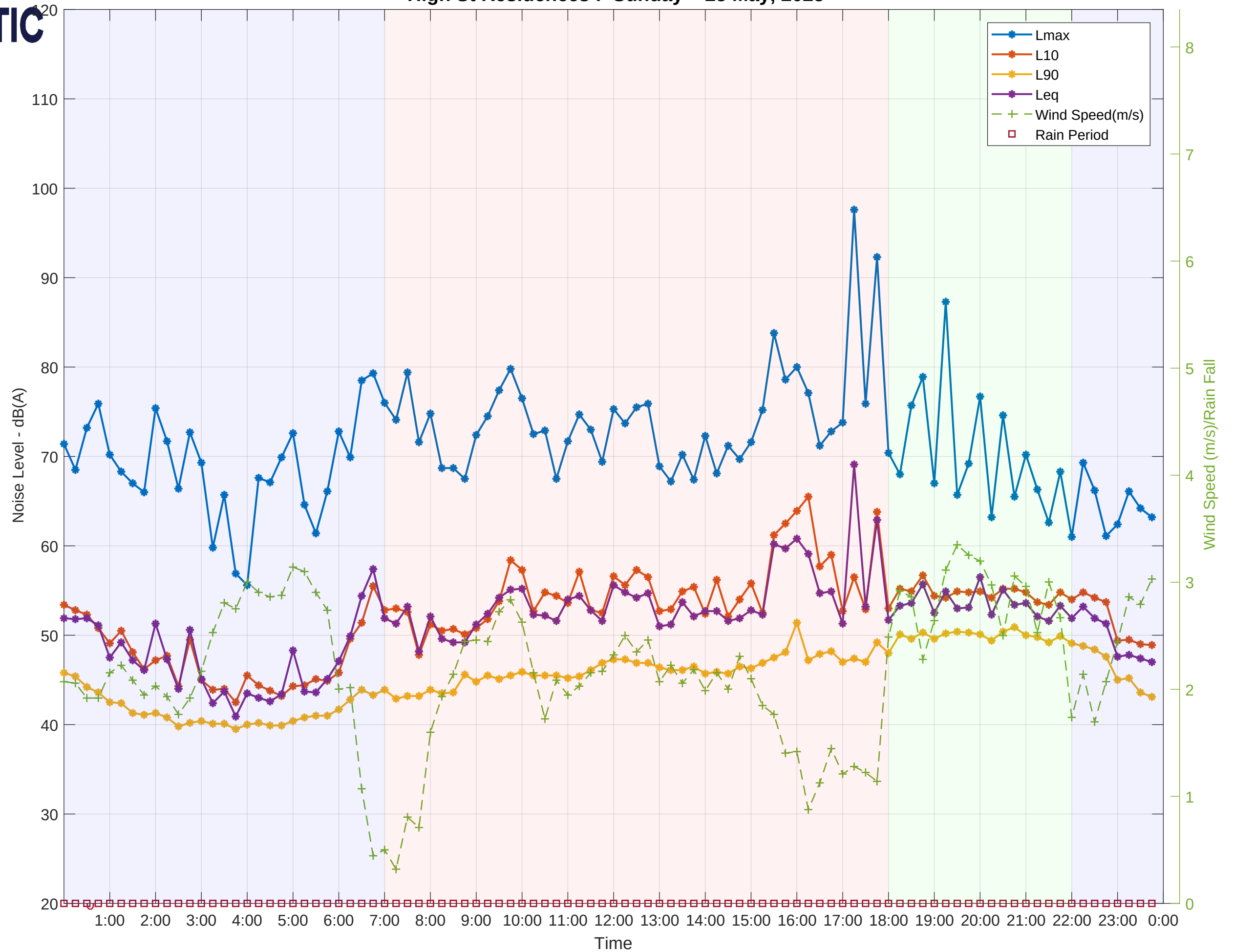


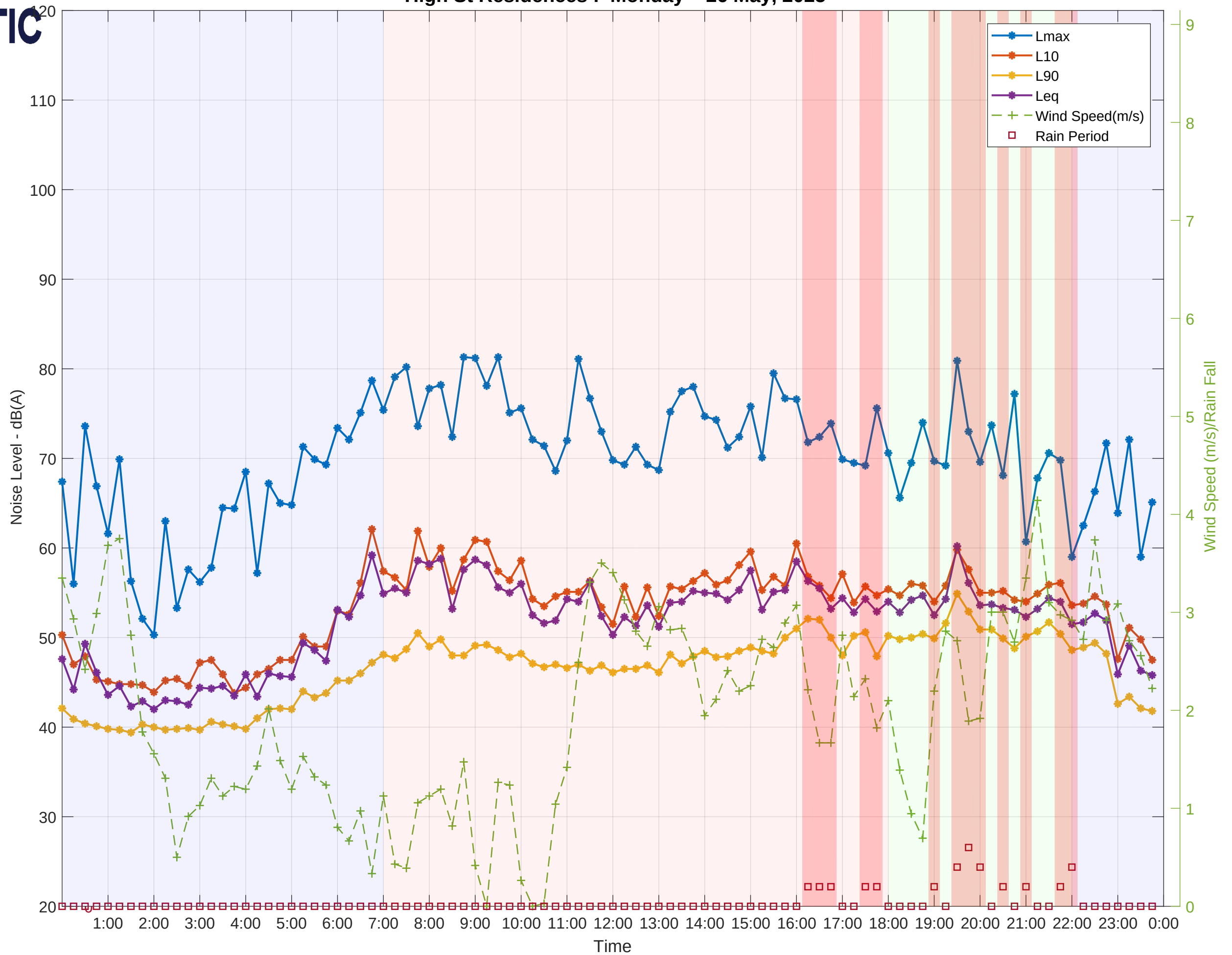
High St Residences : Thursday 22 May, 2025

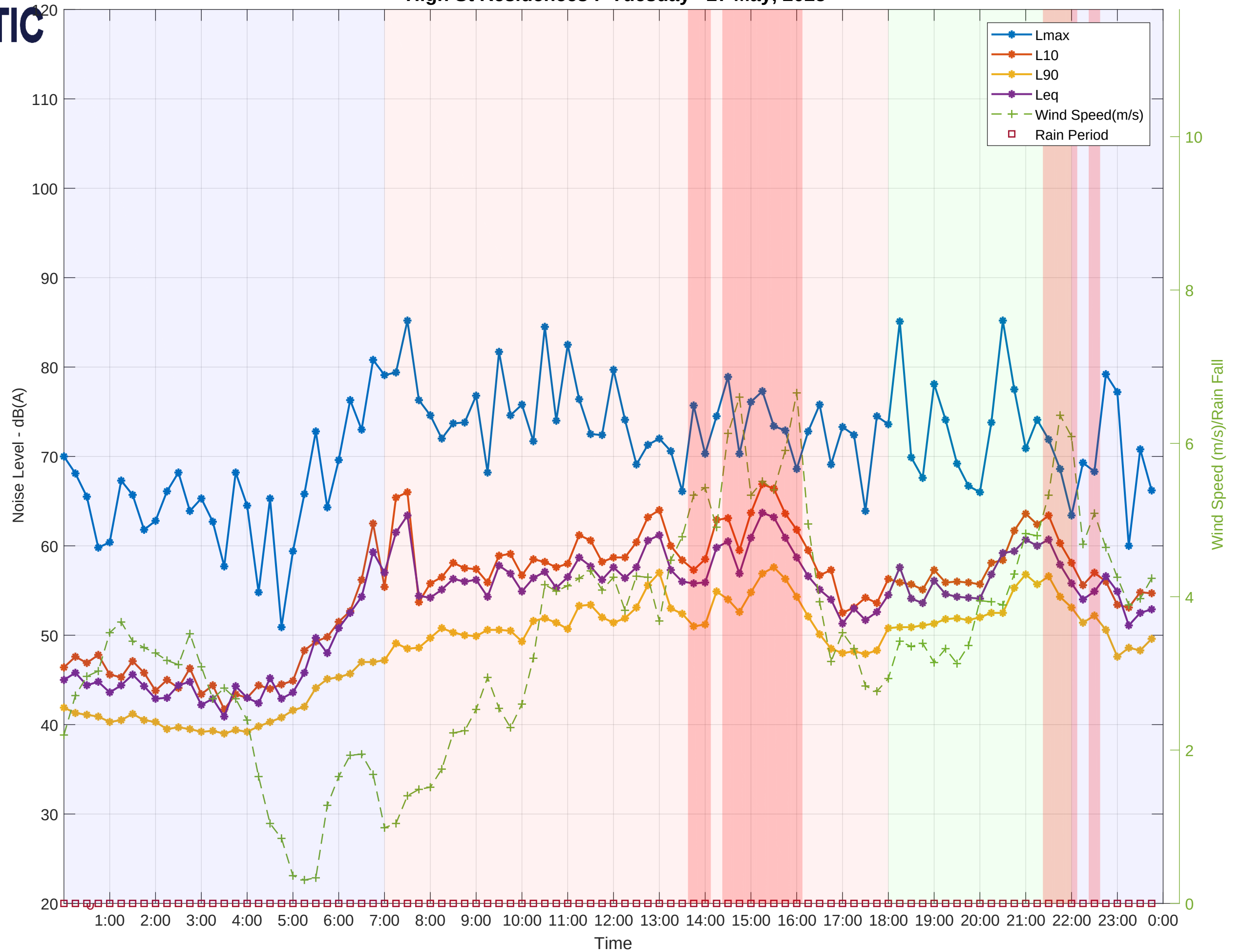




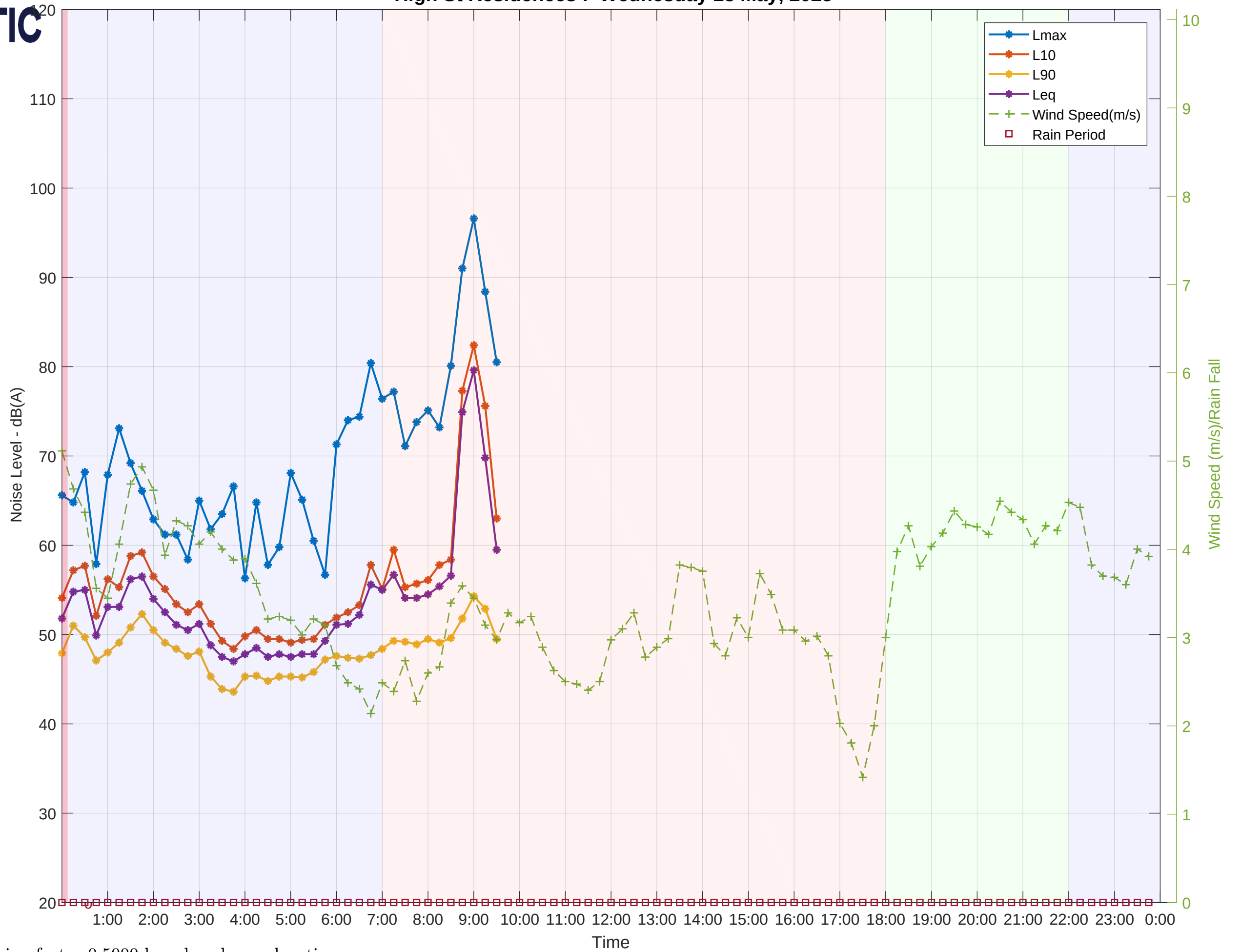






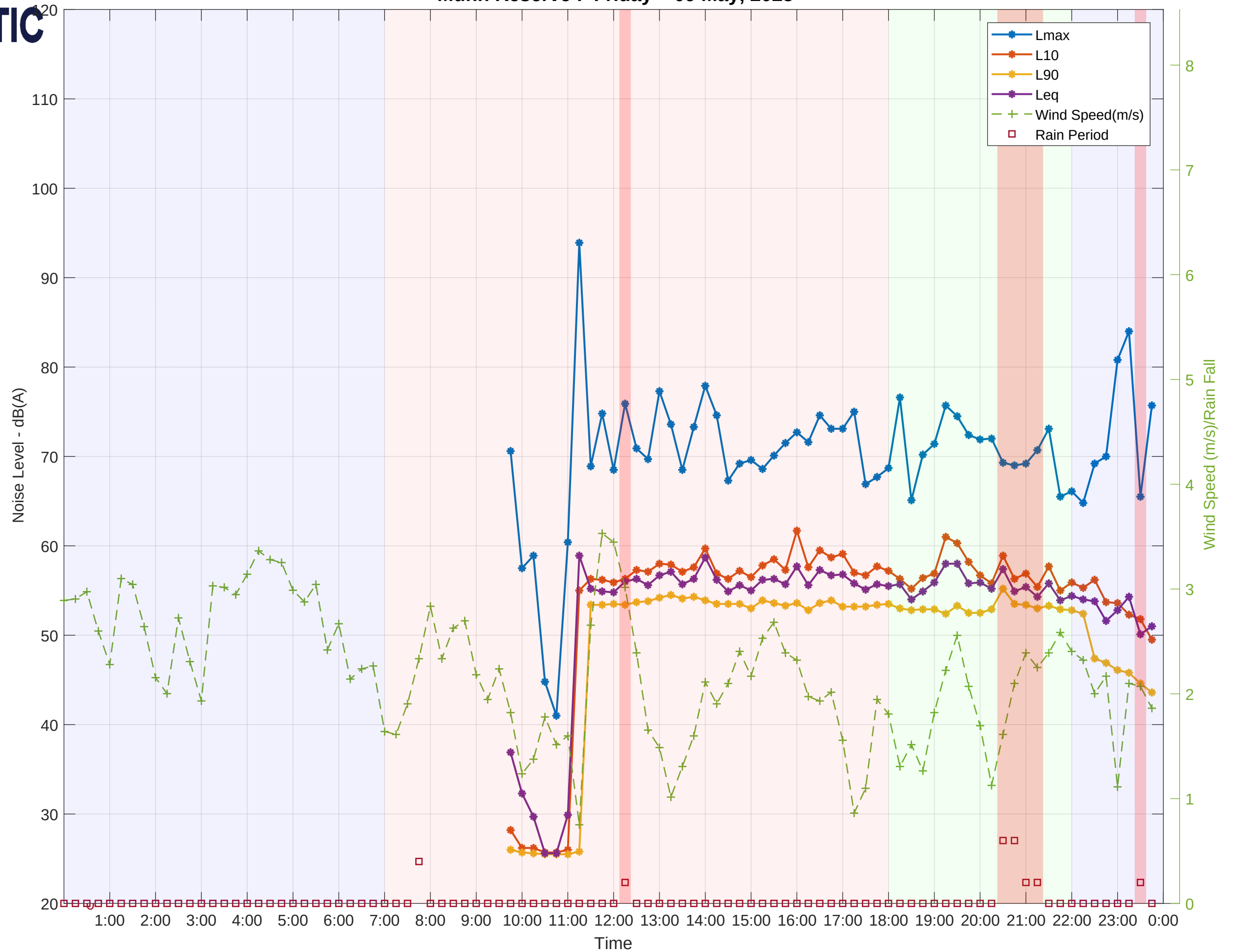


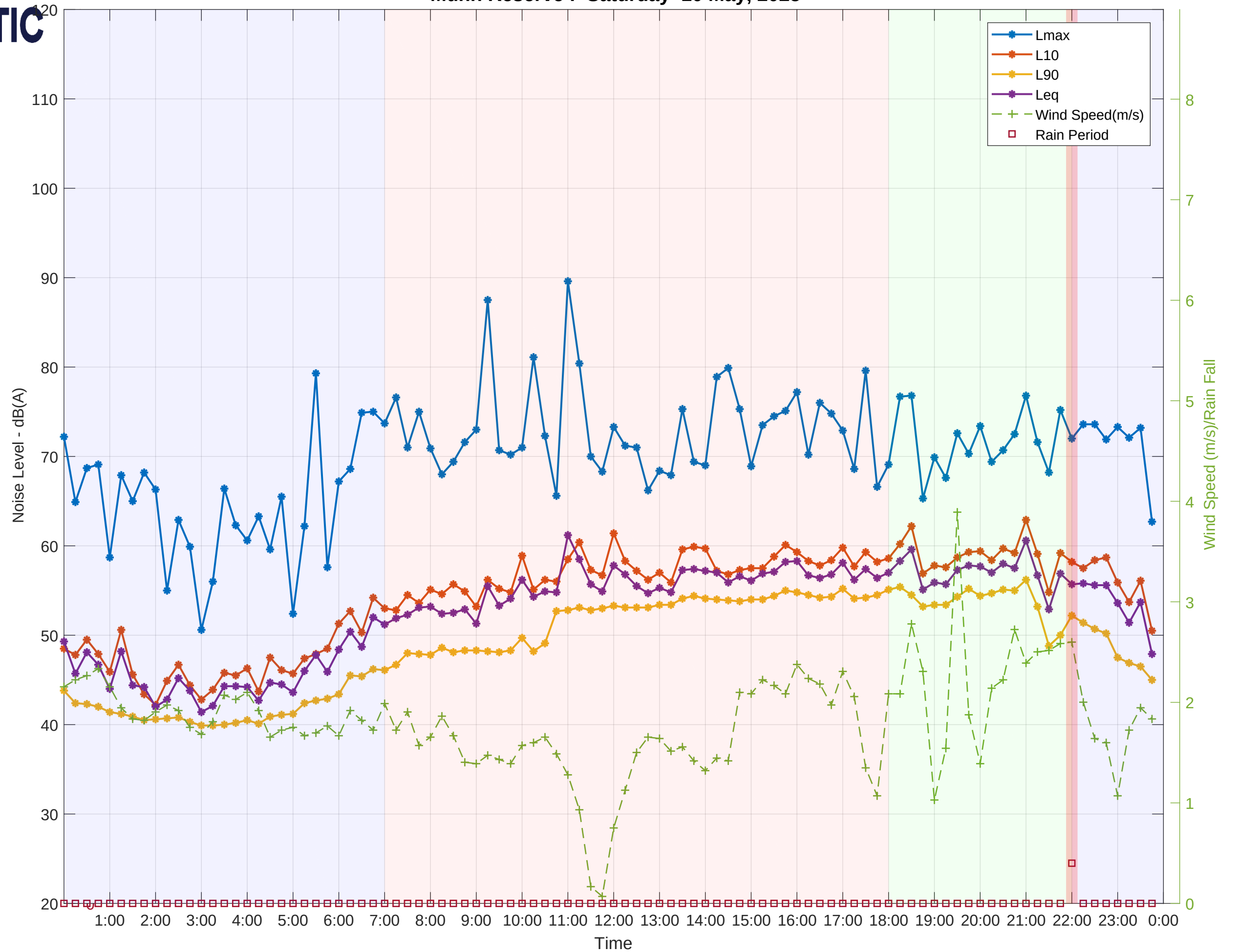
High St Residences : Wednesday 28 May, 2025

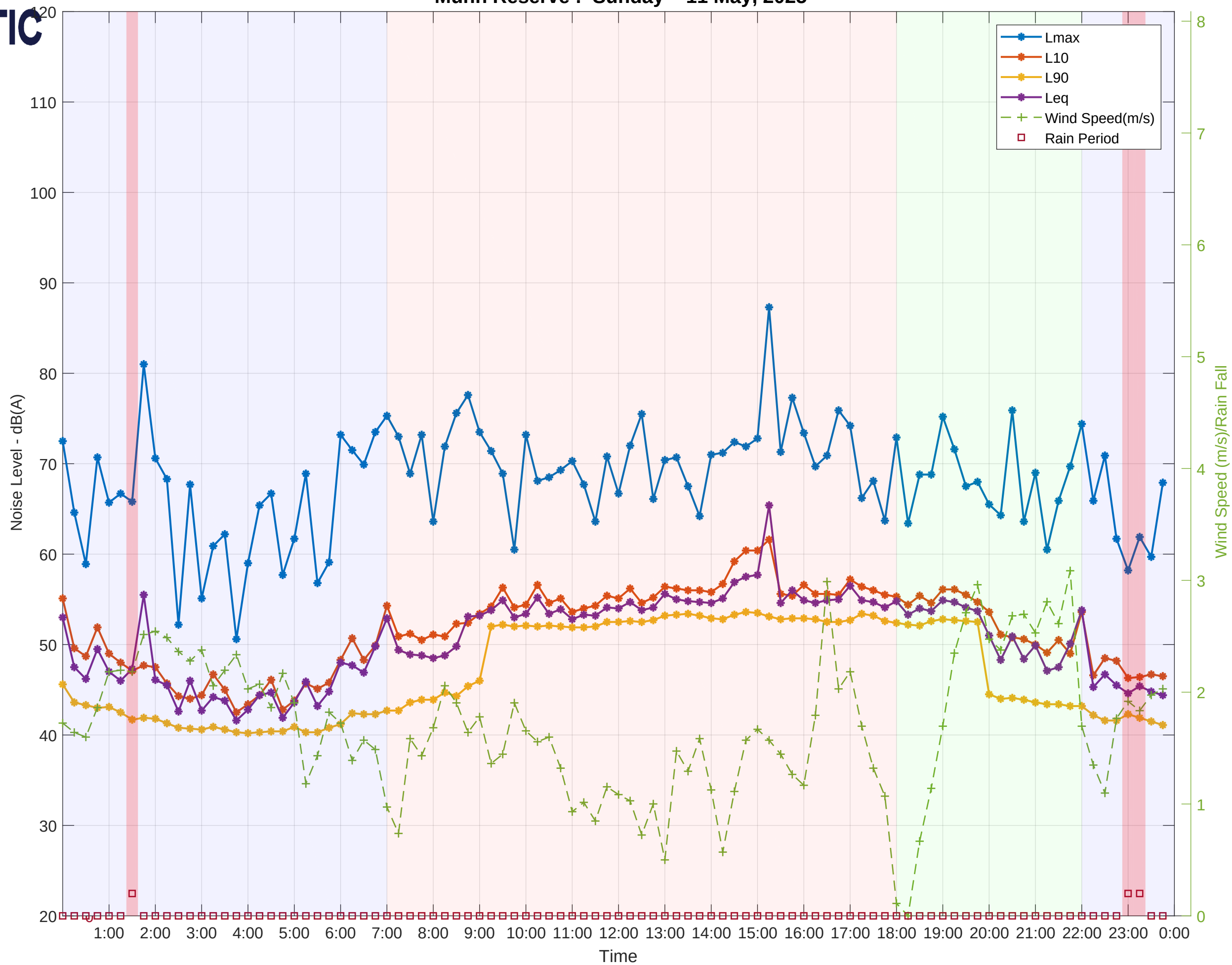


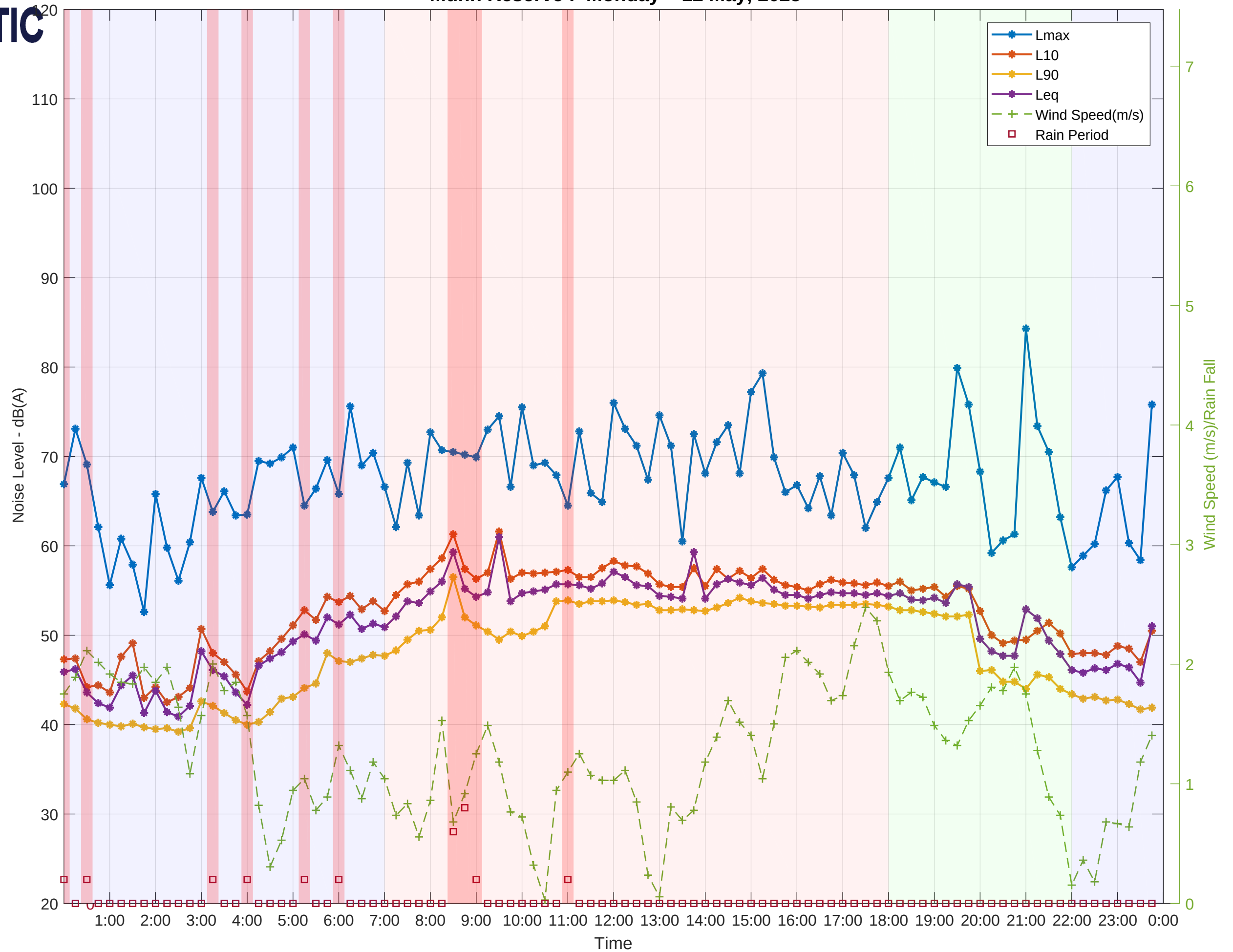
Wind Speed is corrected using factor 0.5000 based on logger location

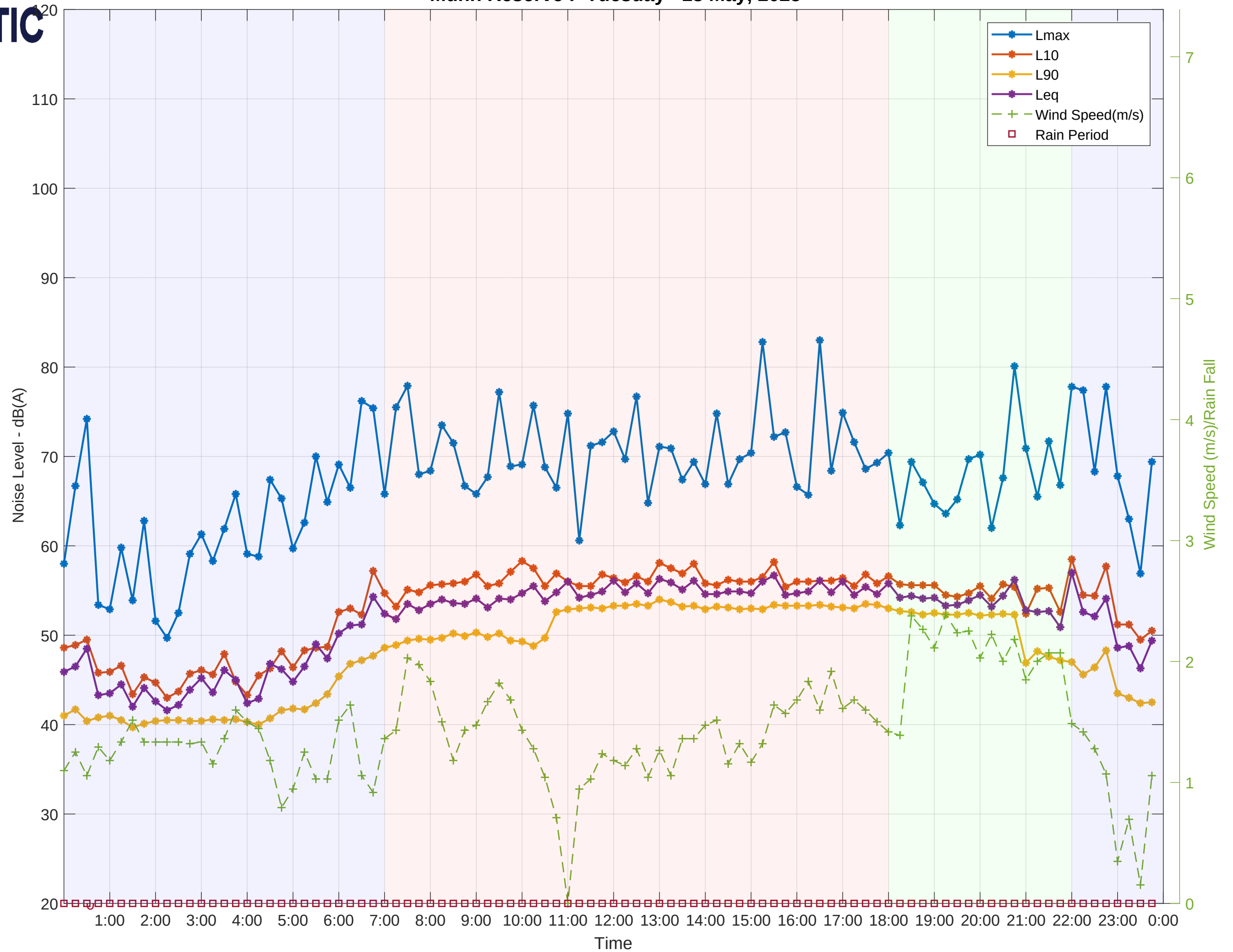
E.3 – MONITORING LOCATION #3

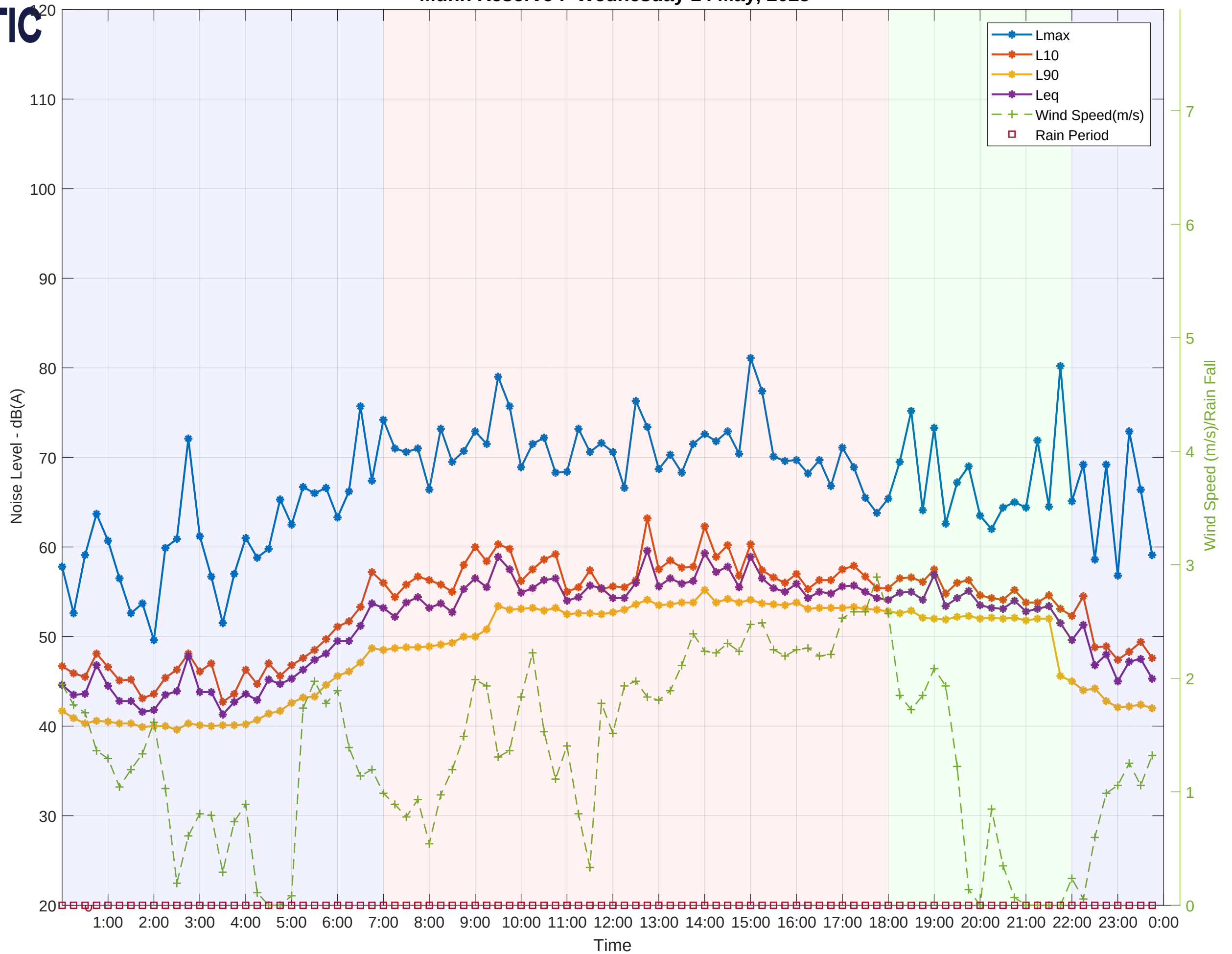


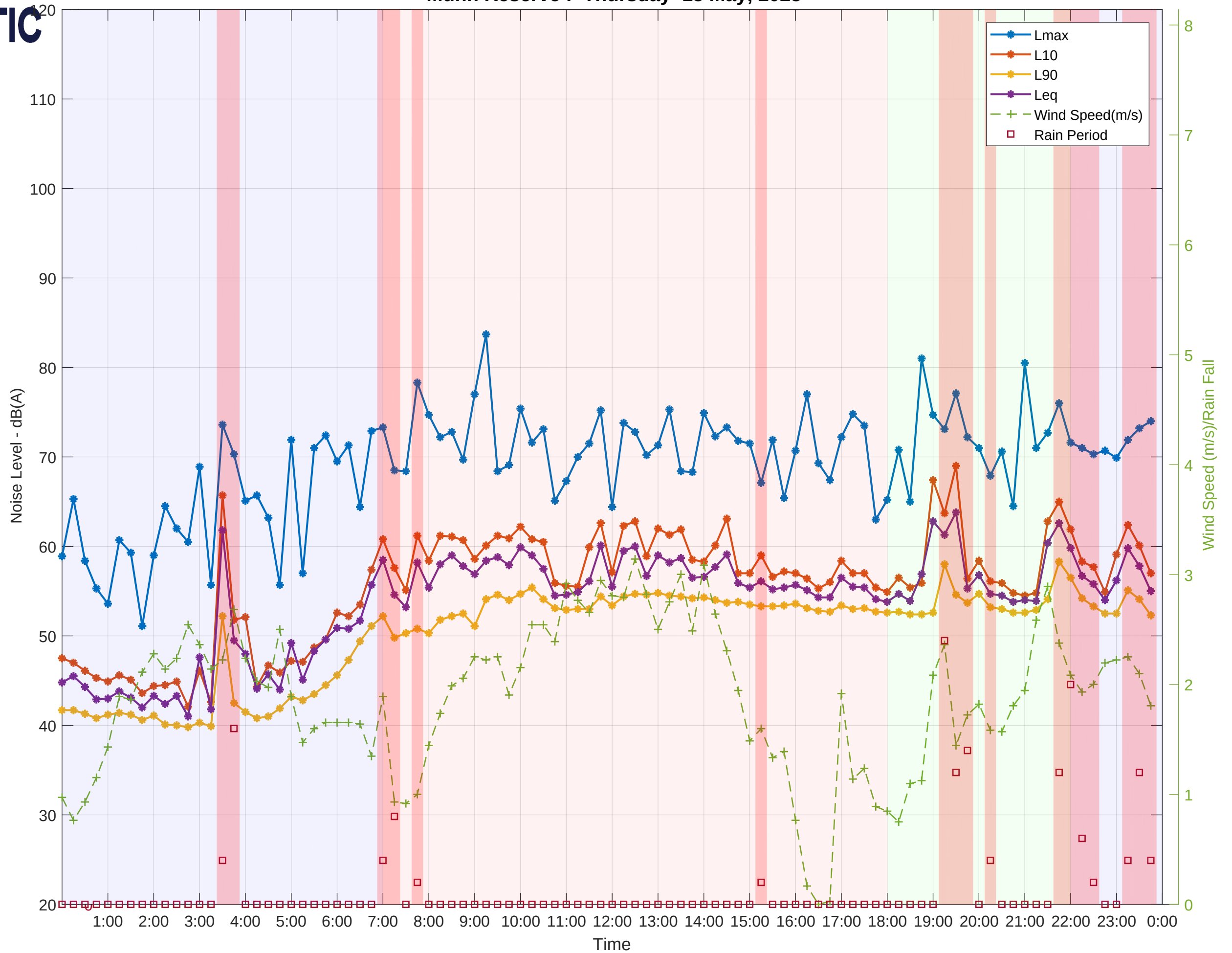


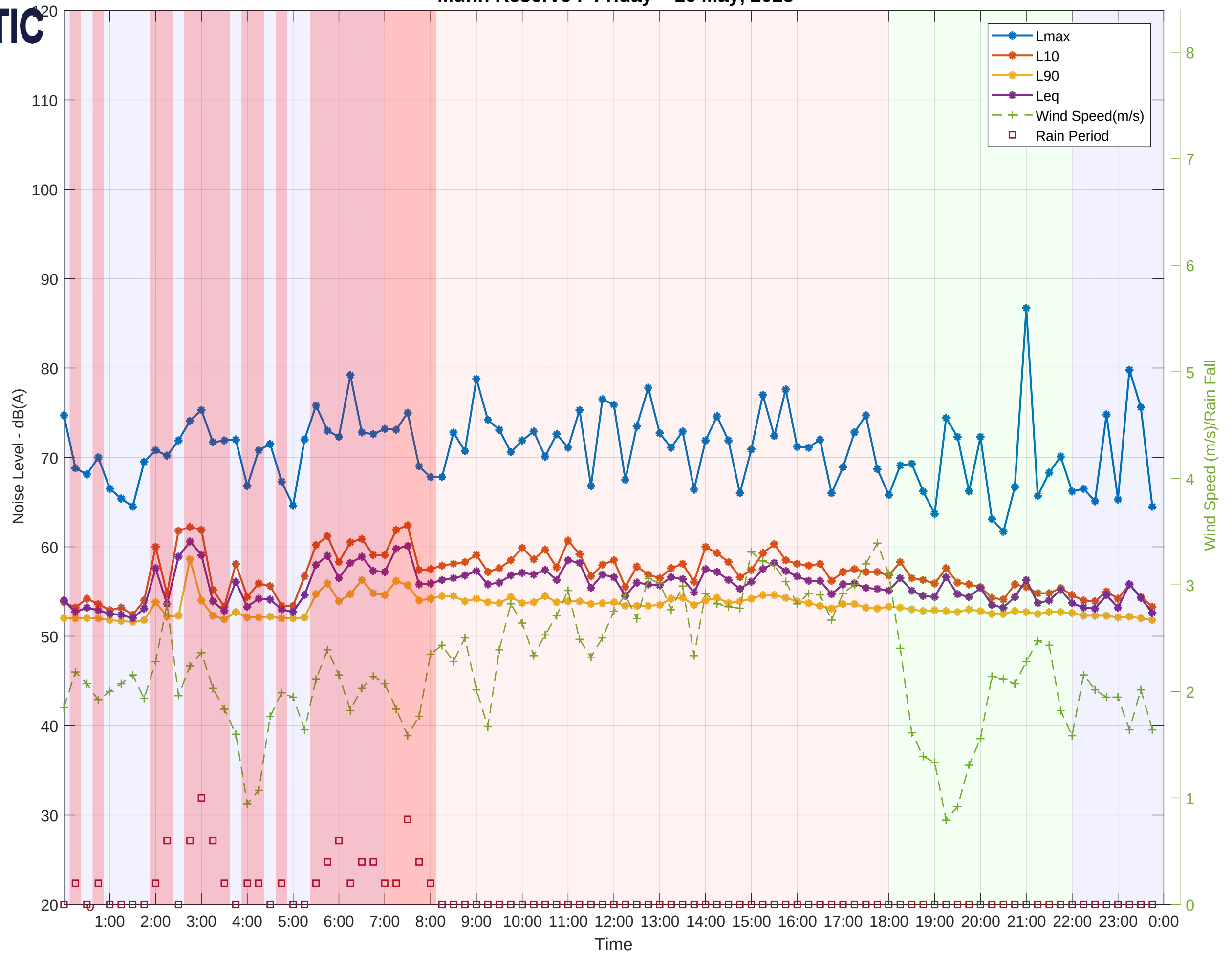




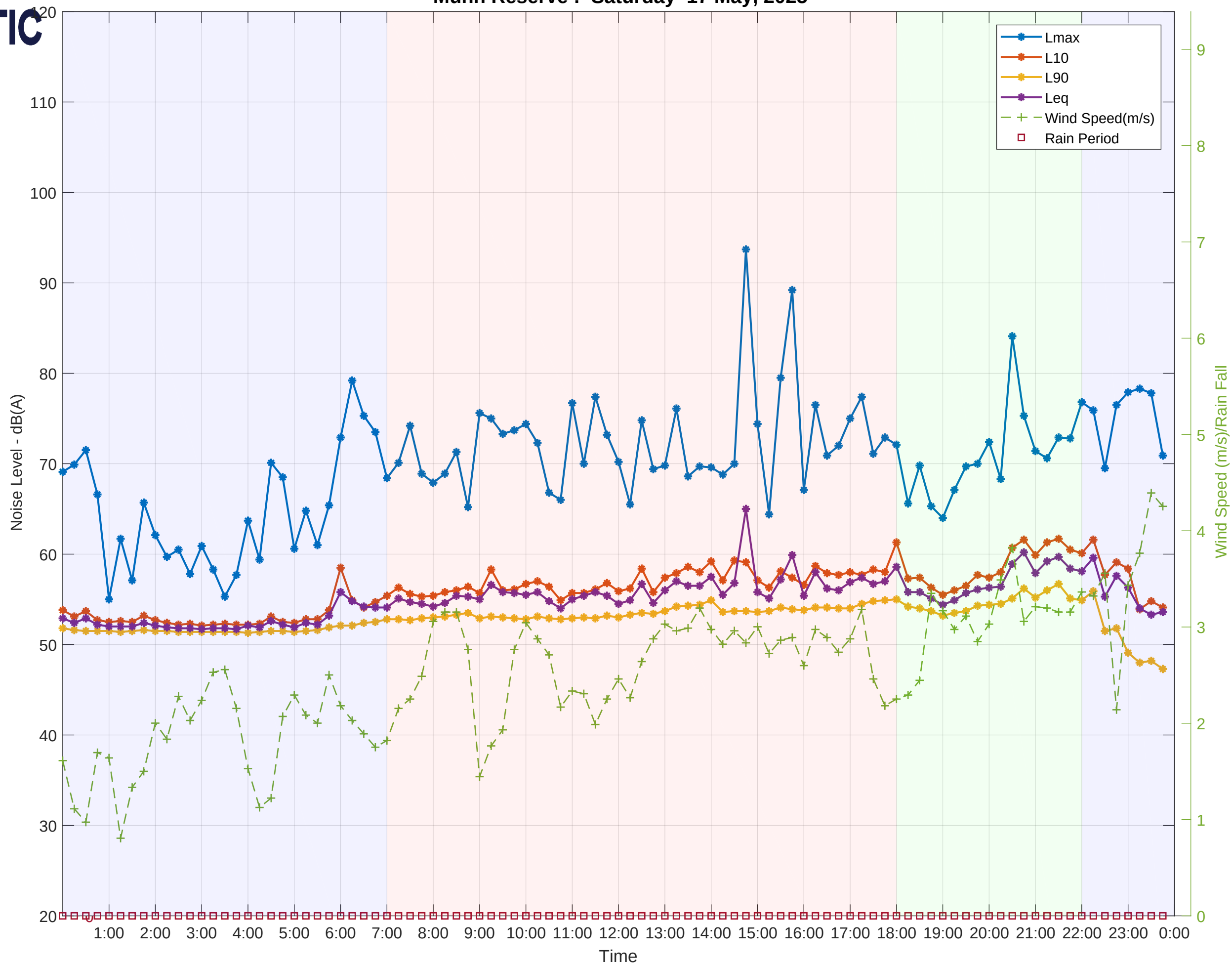


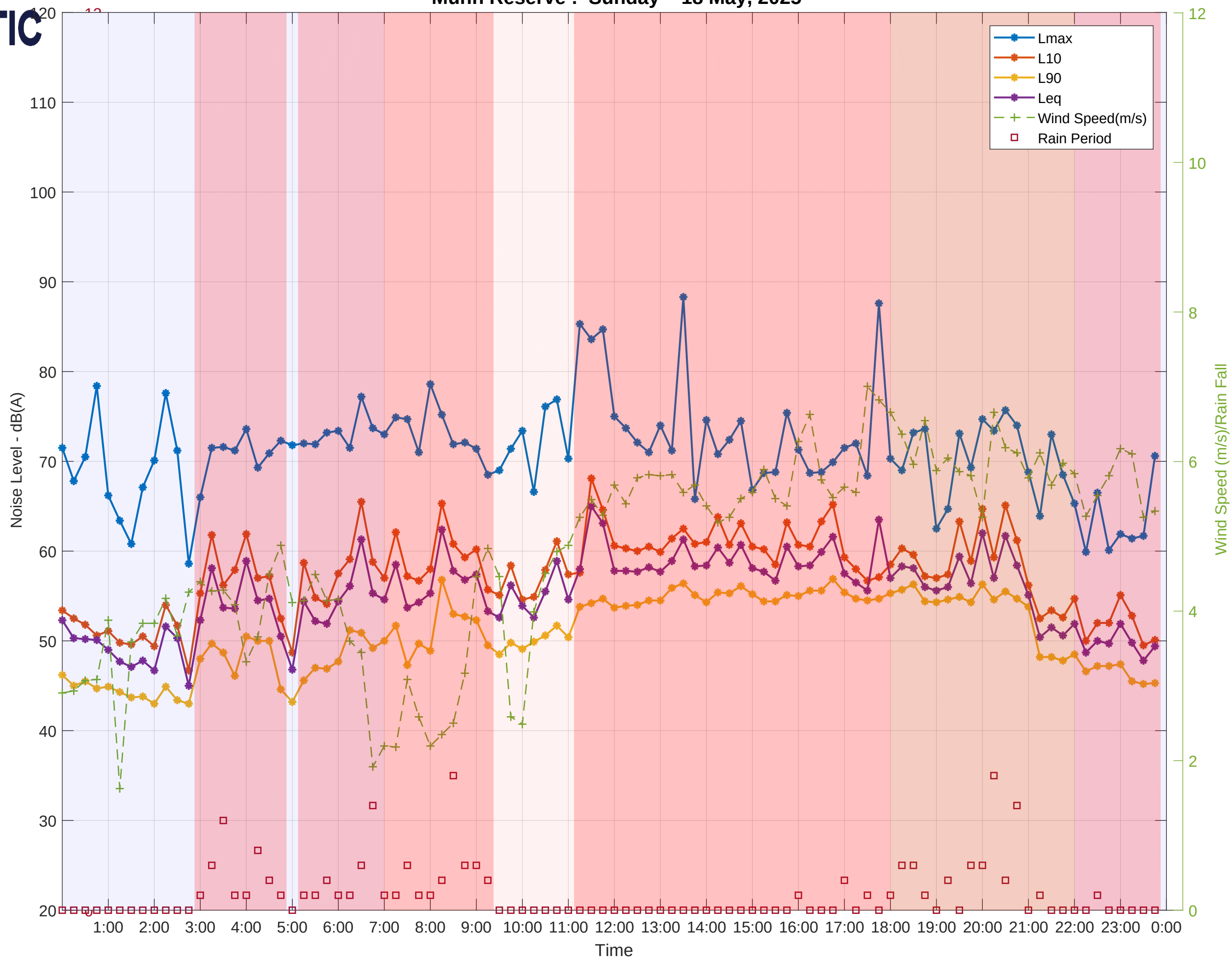


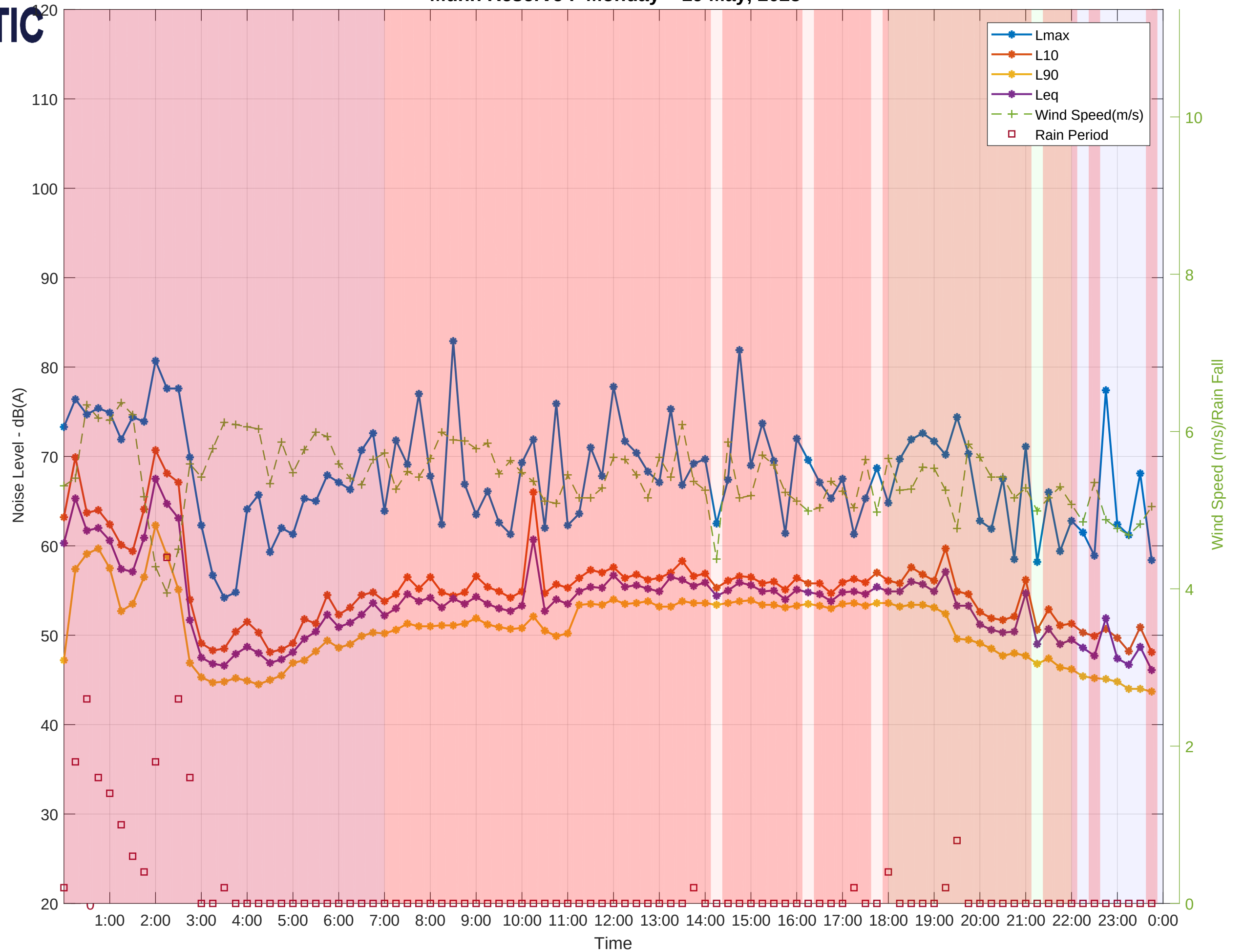


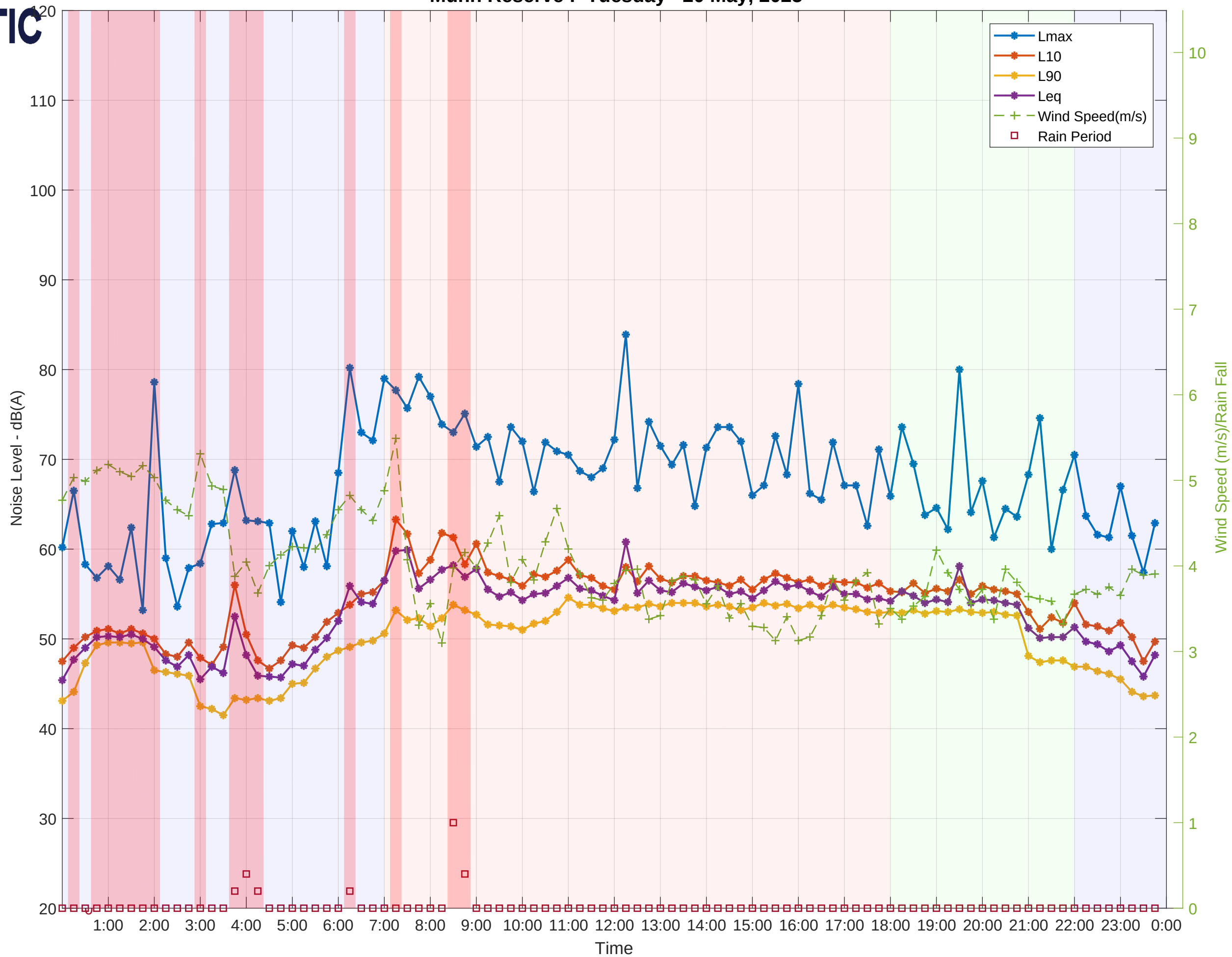


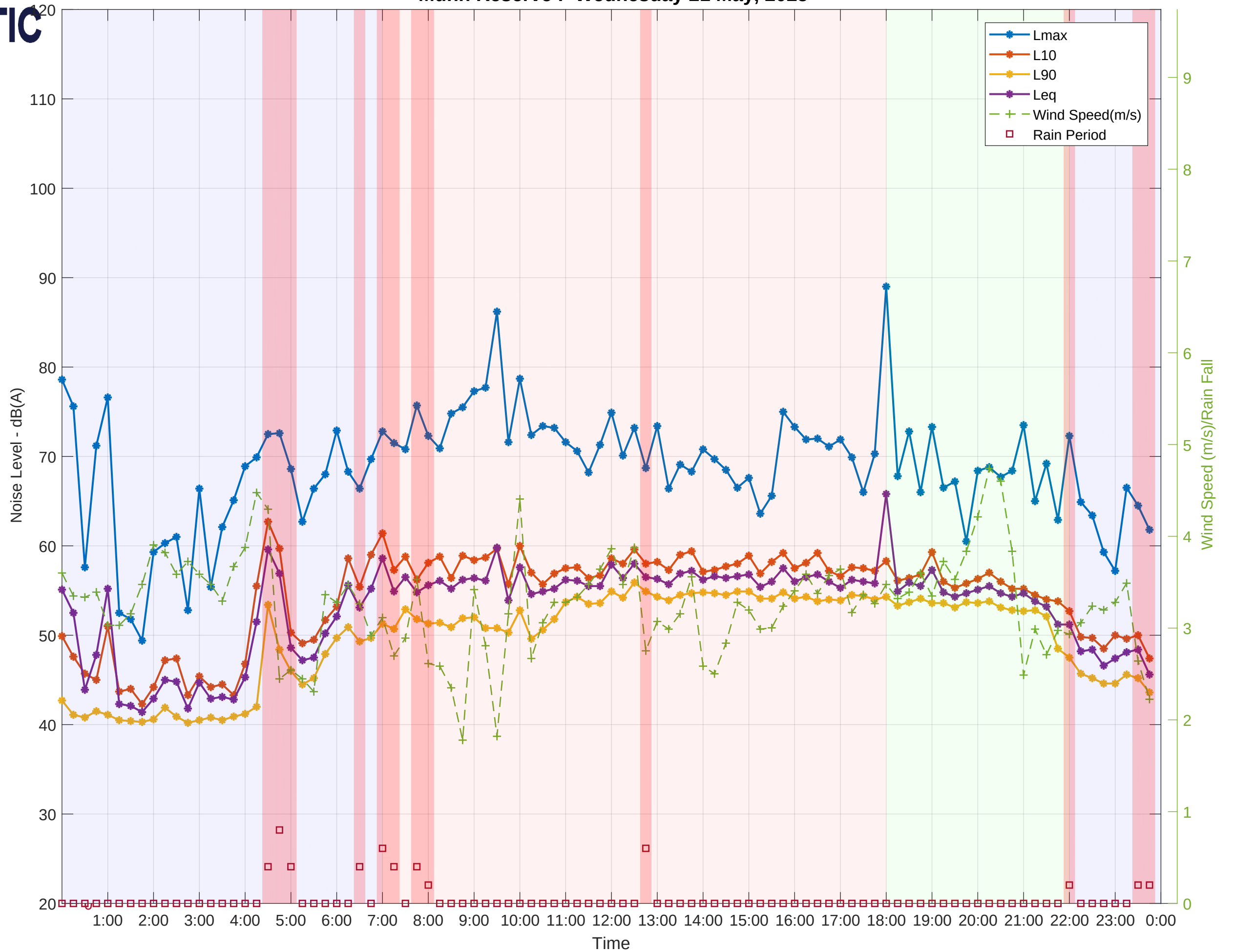
Munn Reserve : Saturday 17 May, 2025

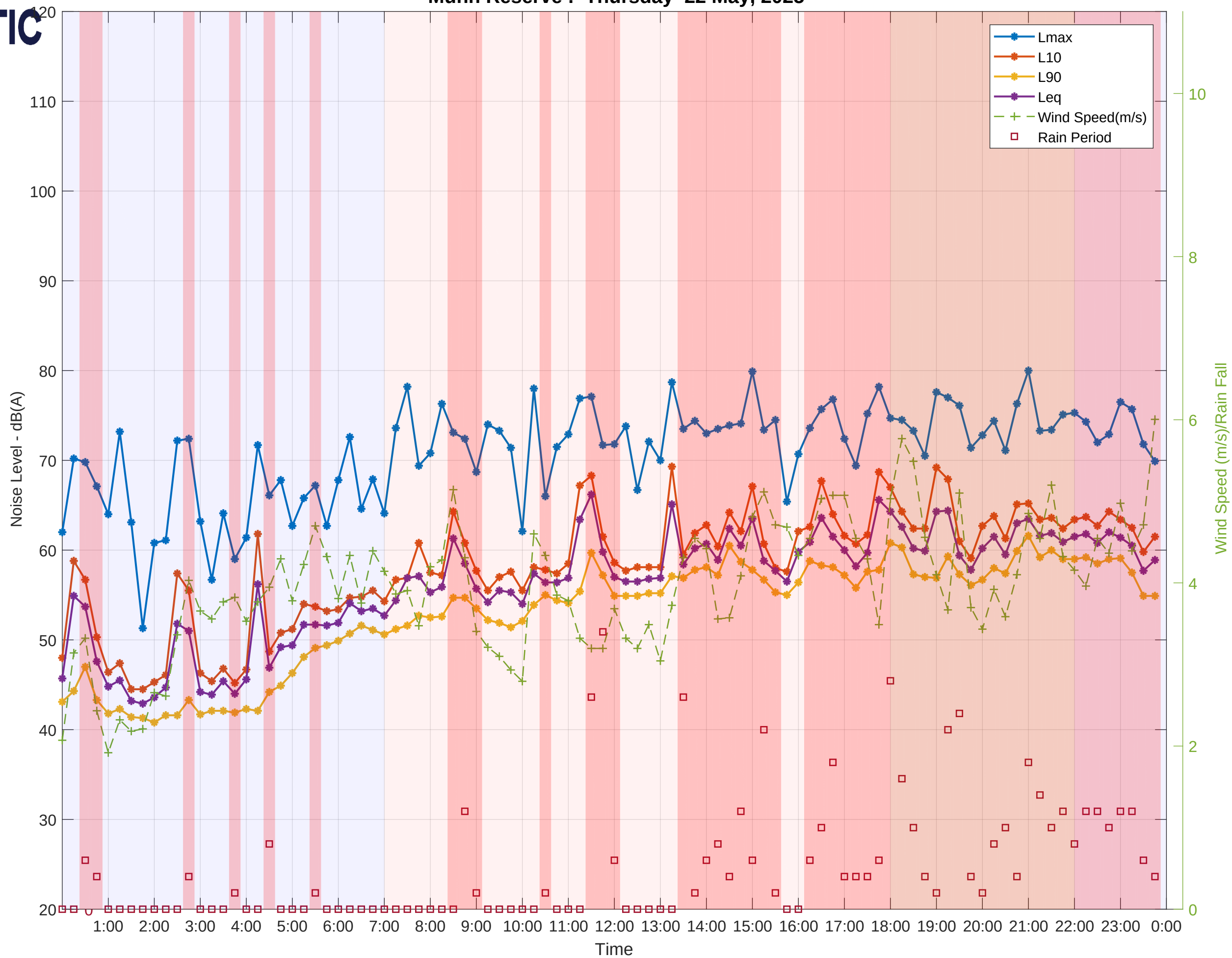


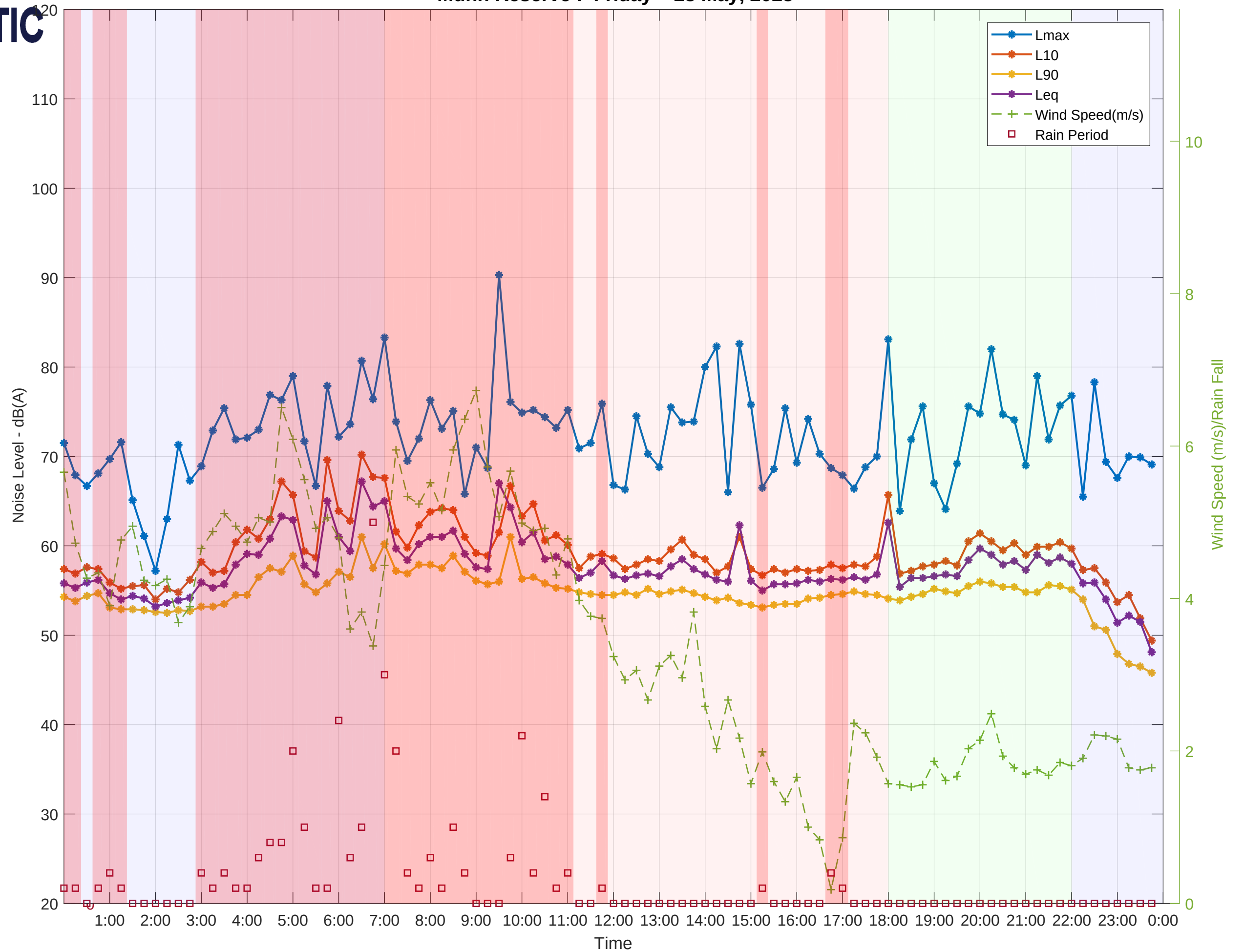


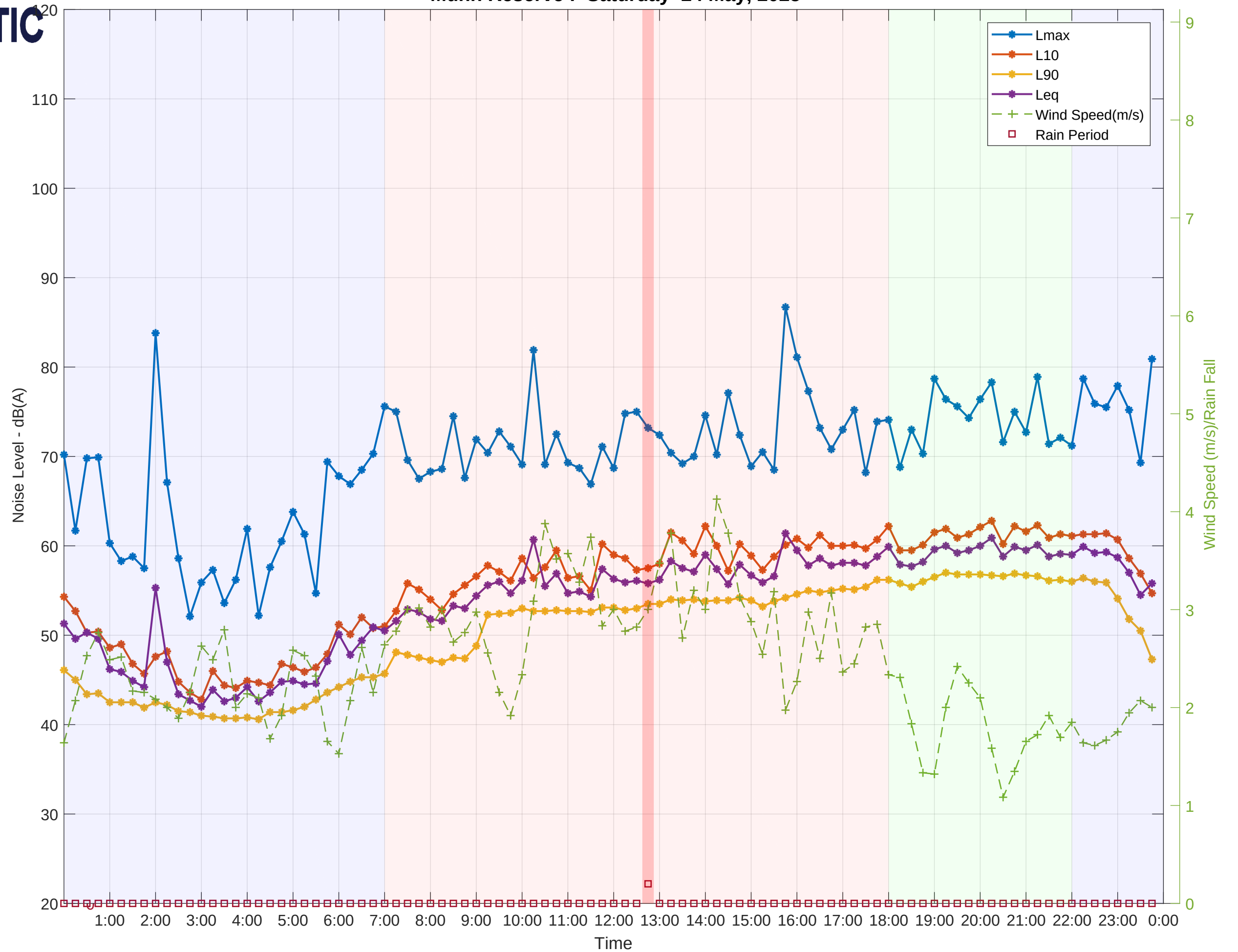


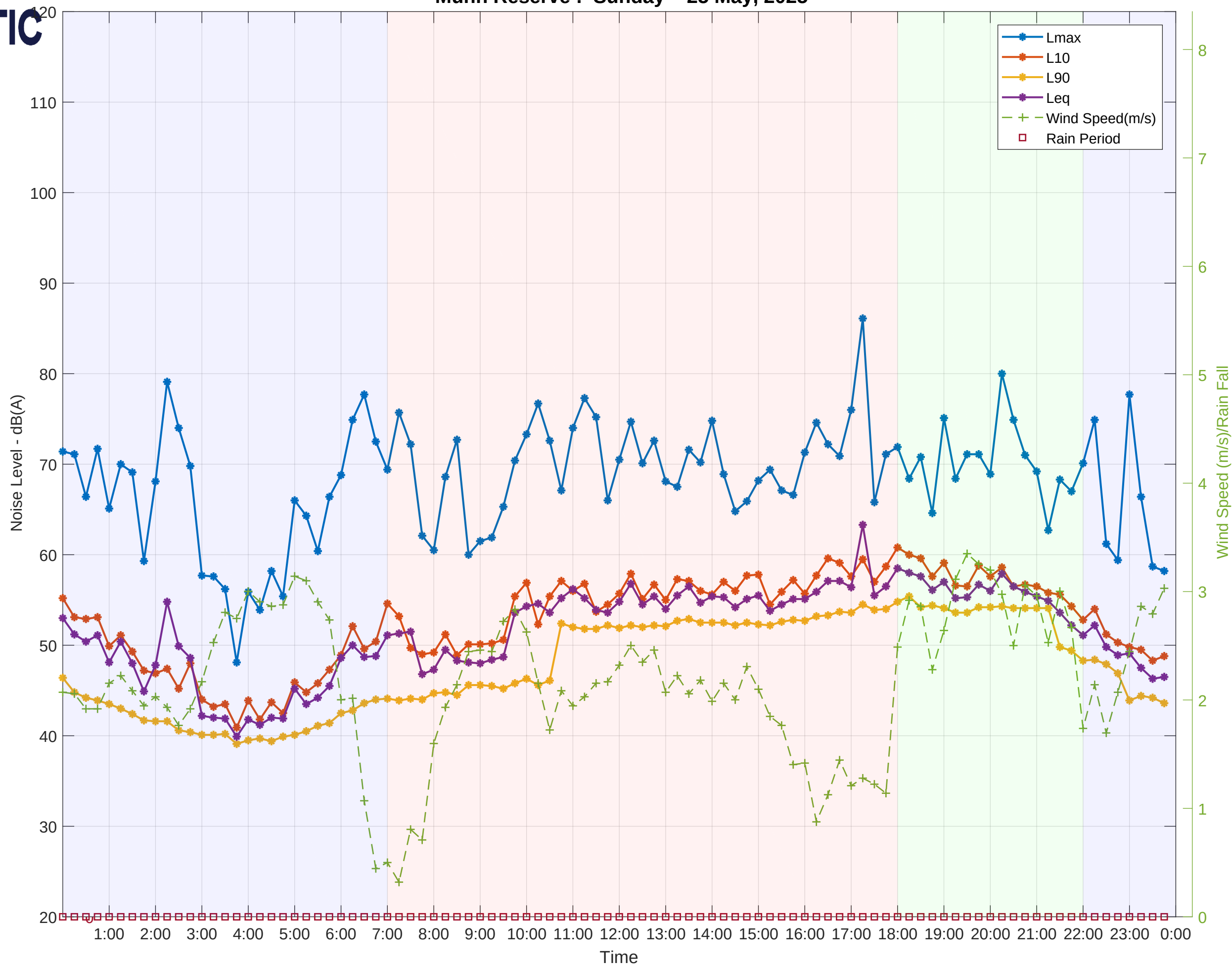


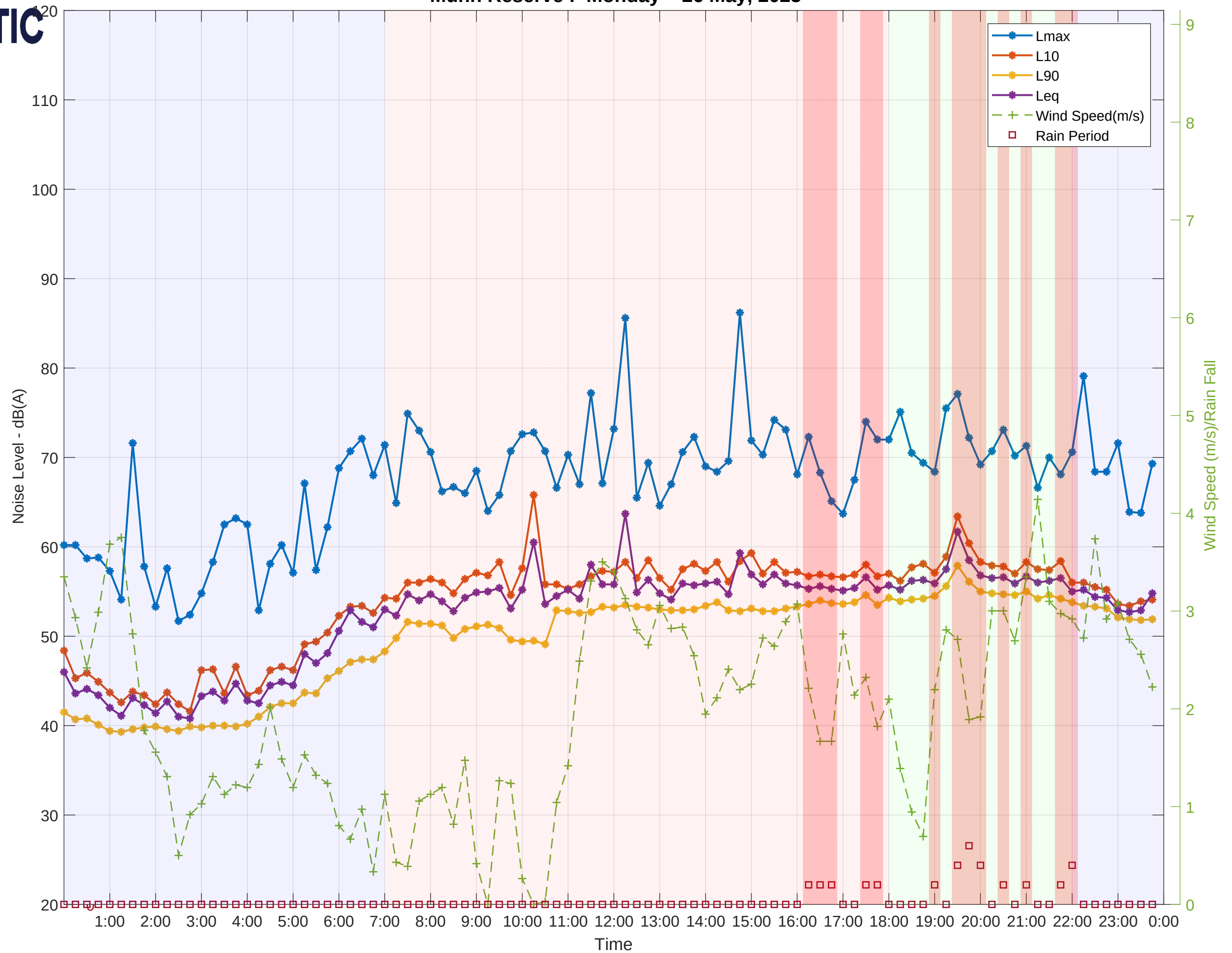


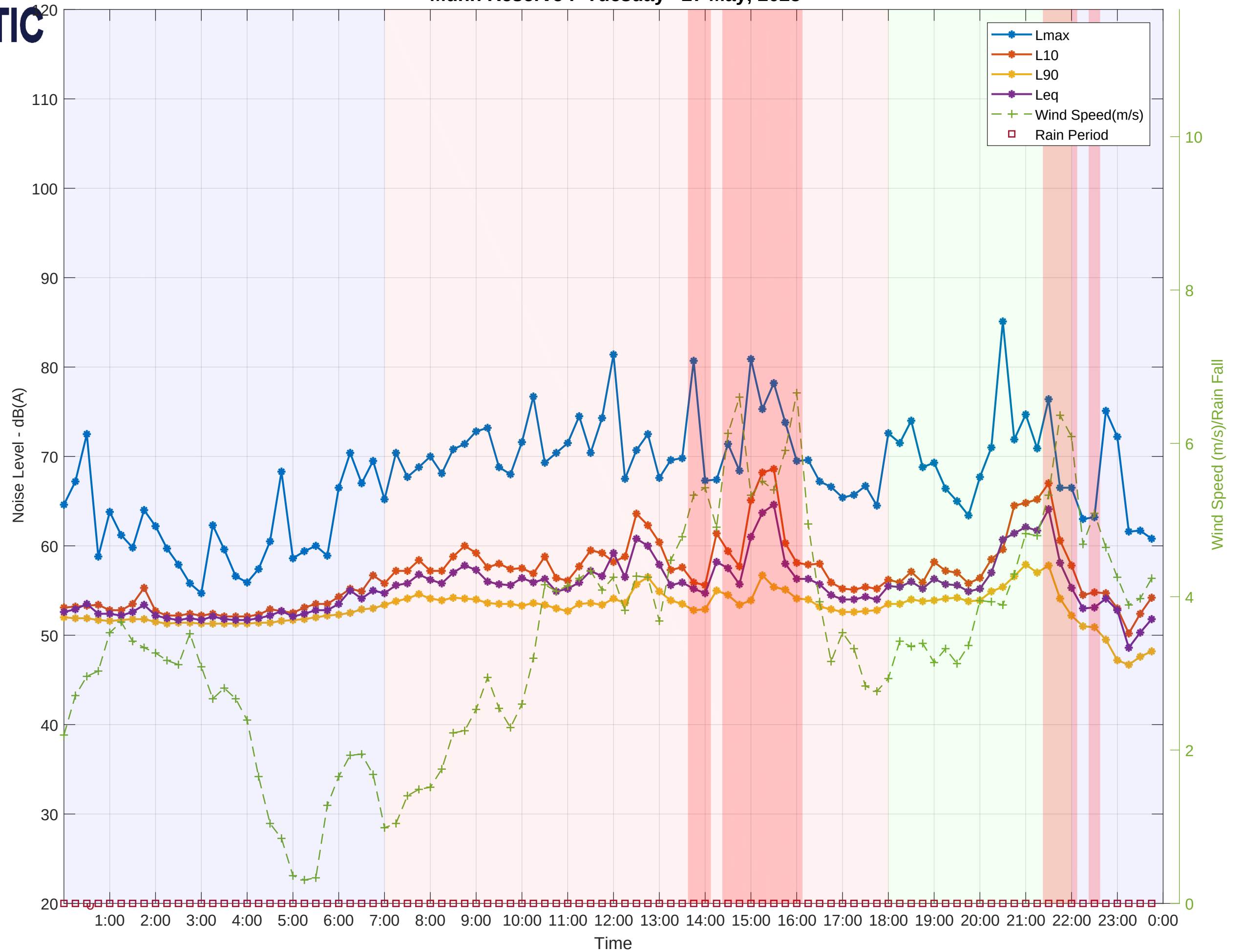


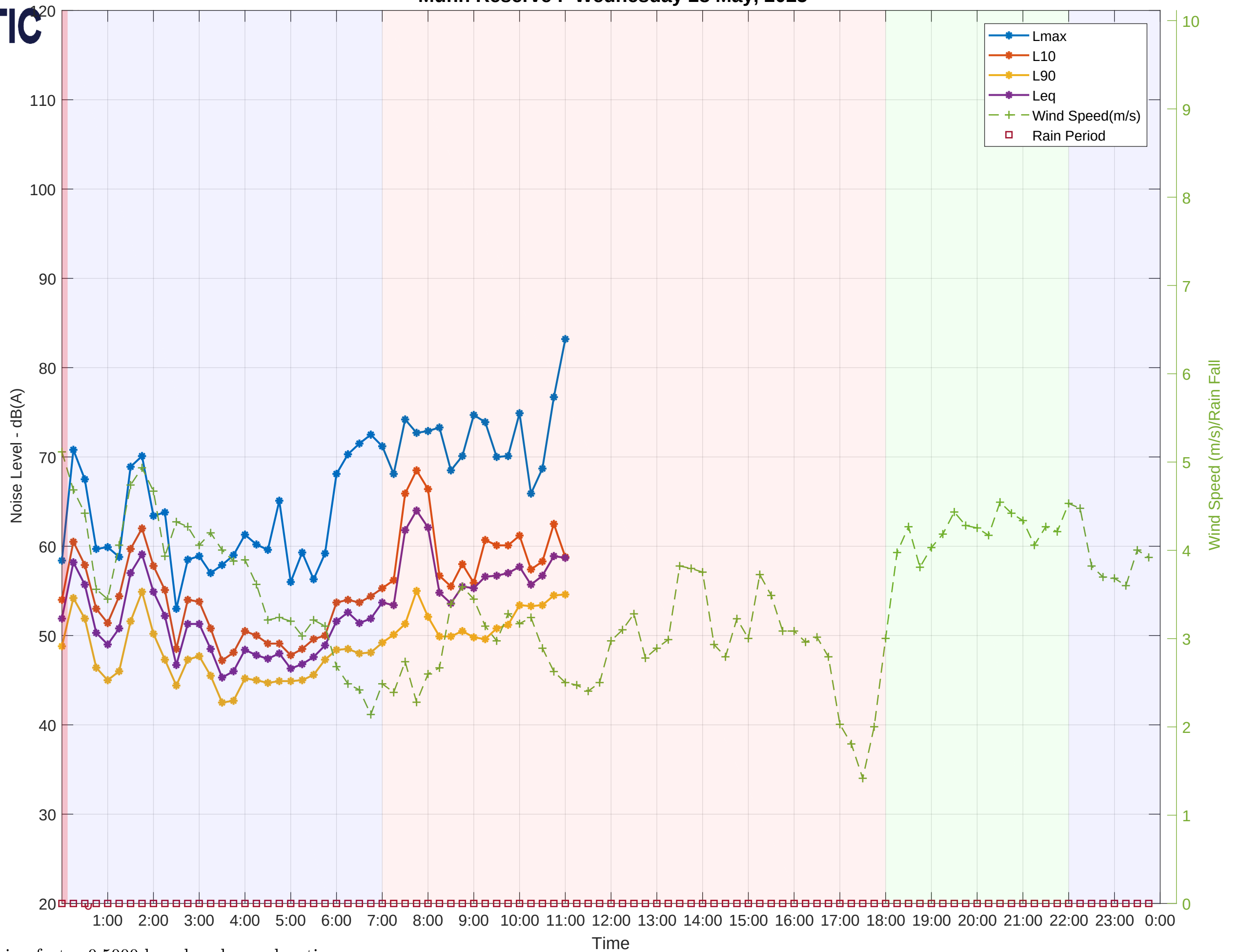






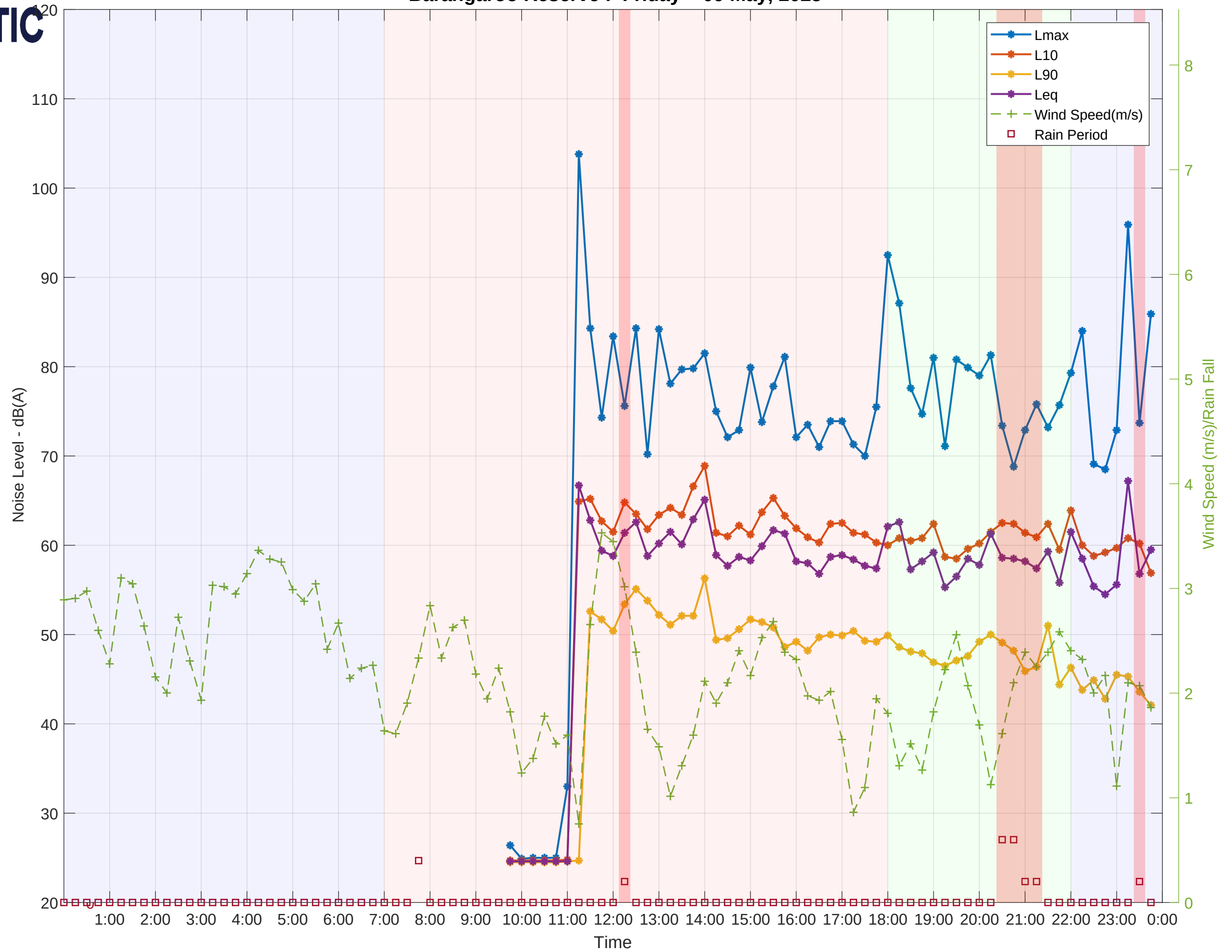


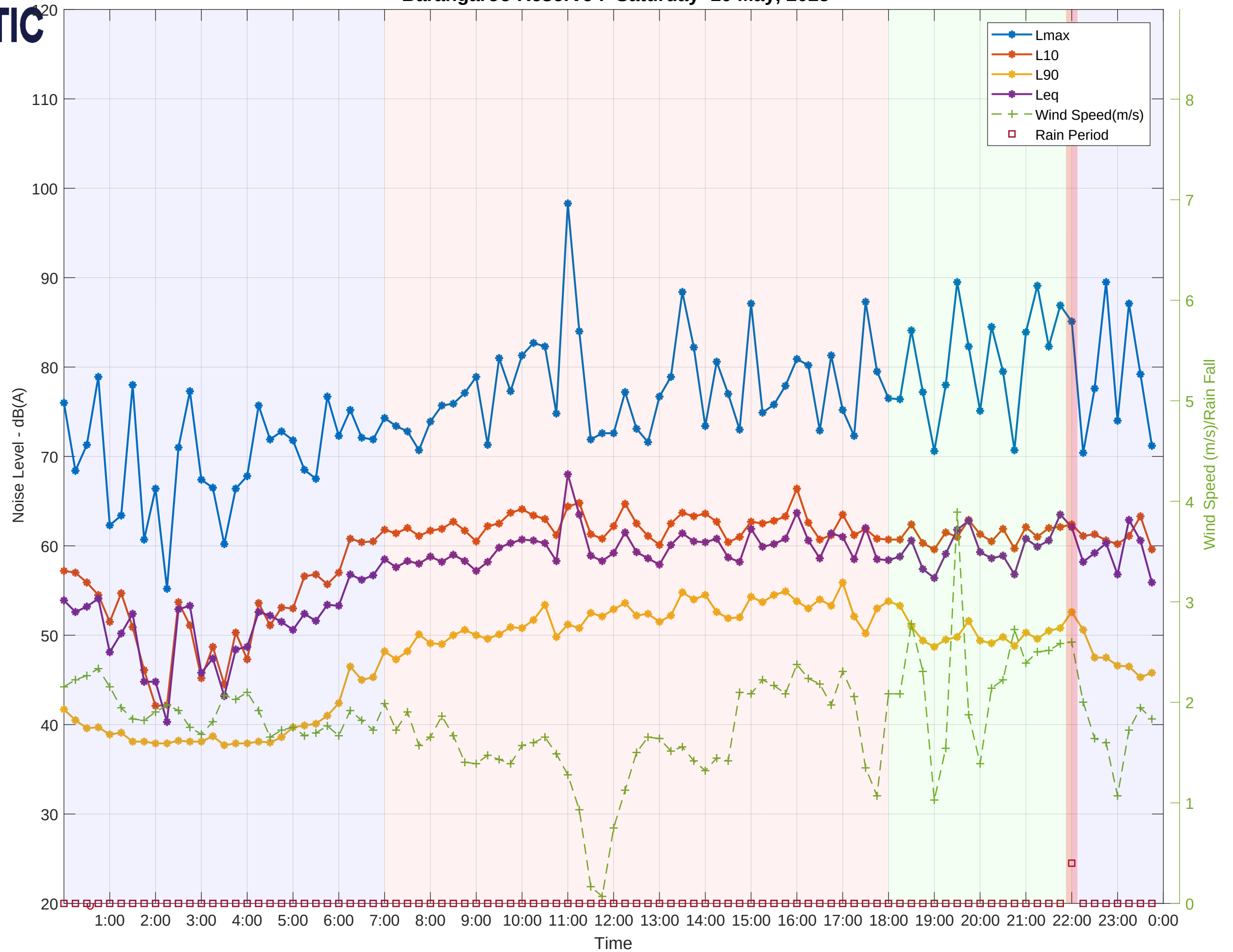


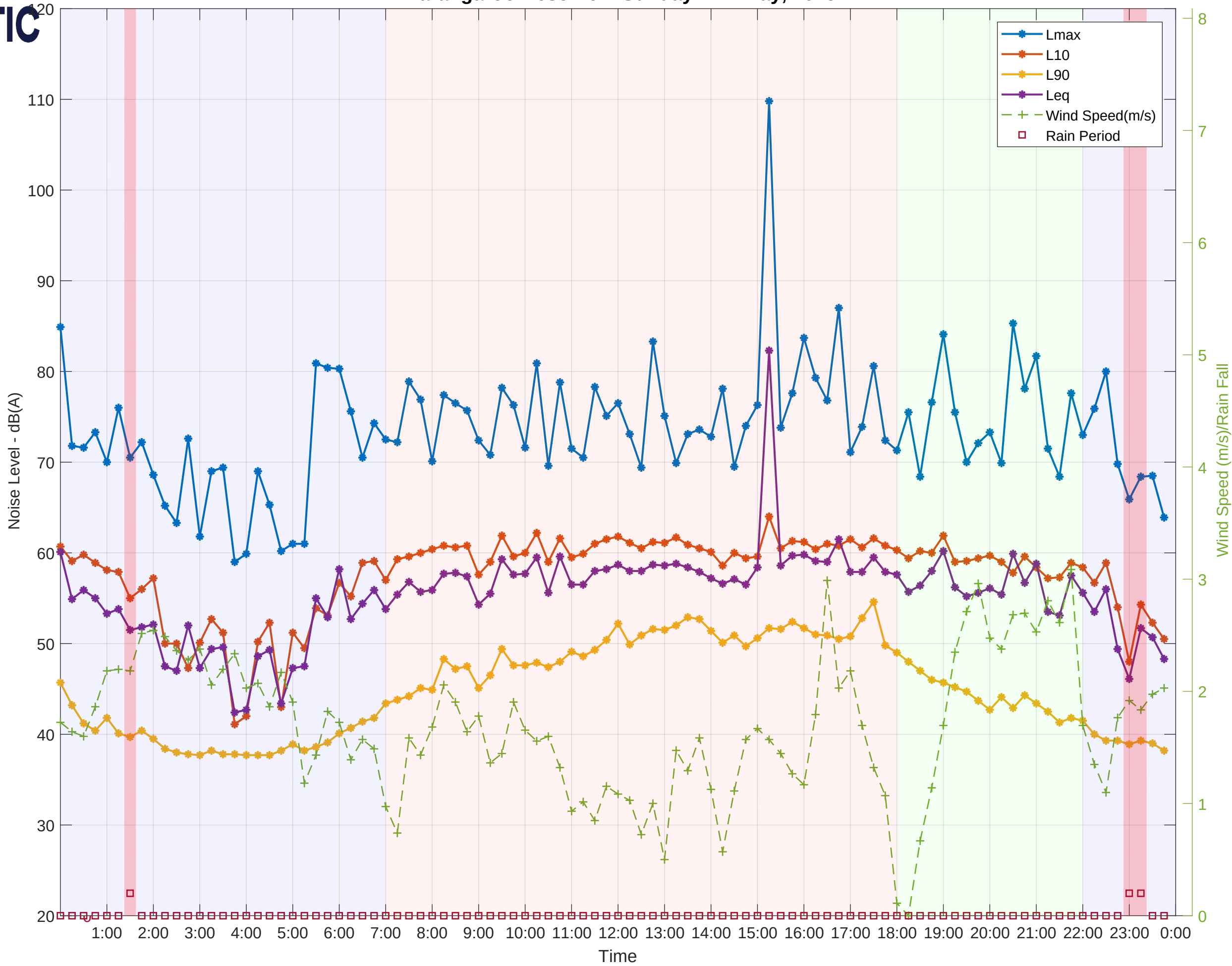


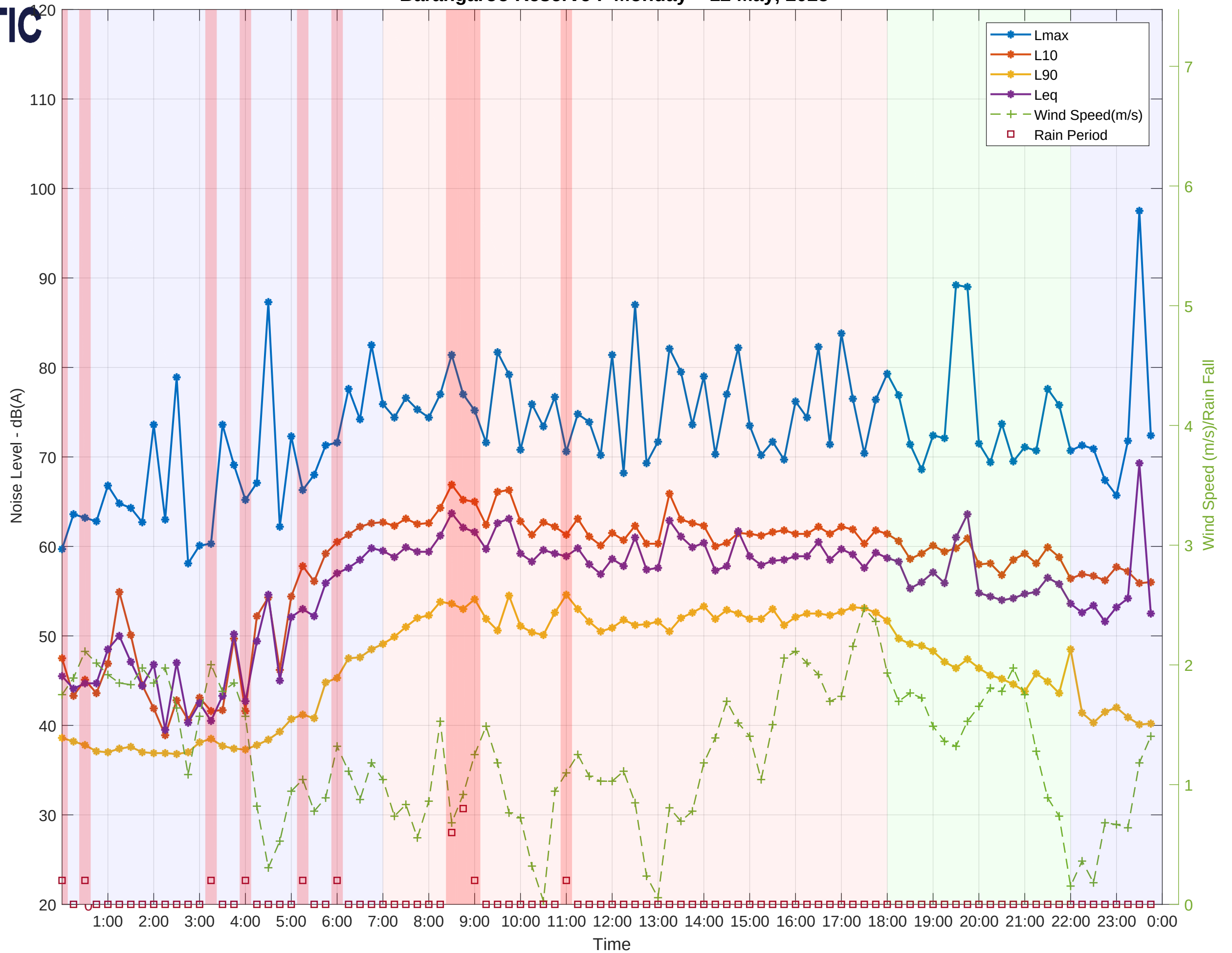
Wind Speed is corrected using factor 0.5000 based on logger location

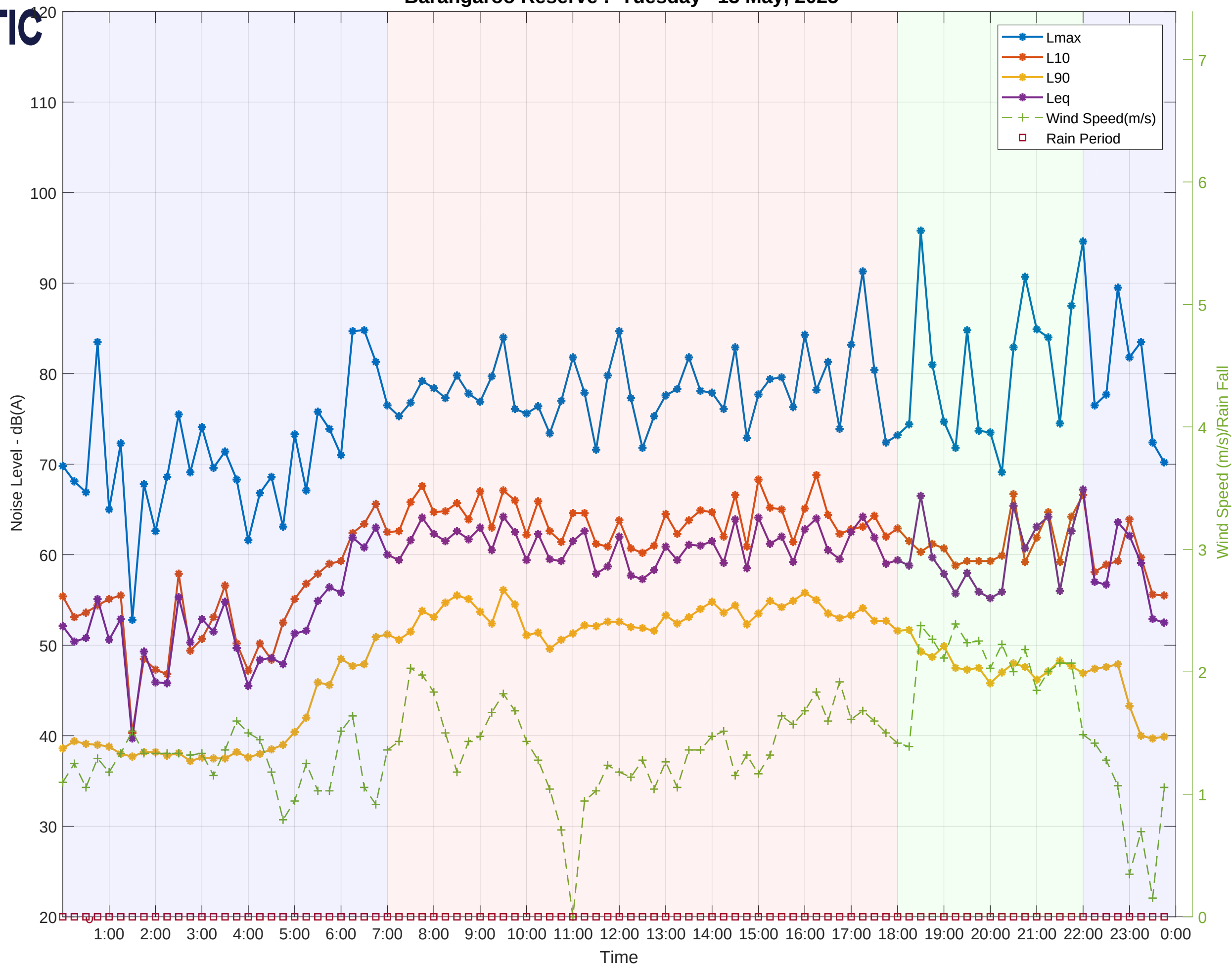
E.4 – MONITORING LOCATION #4

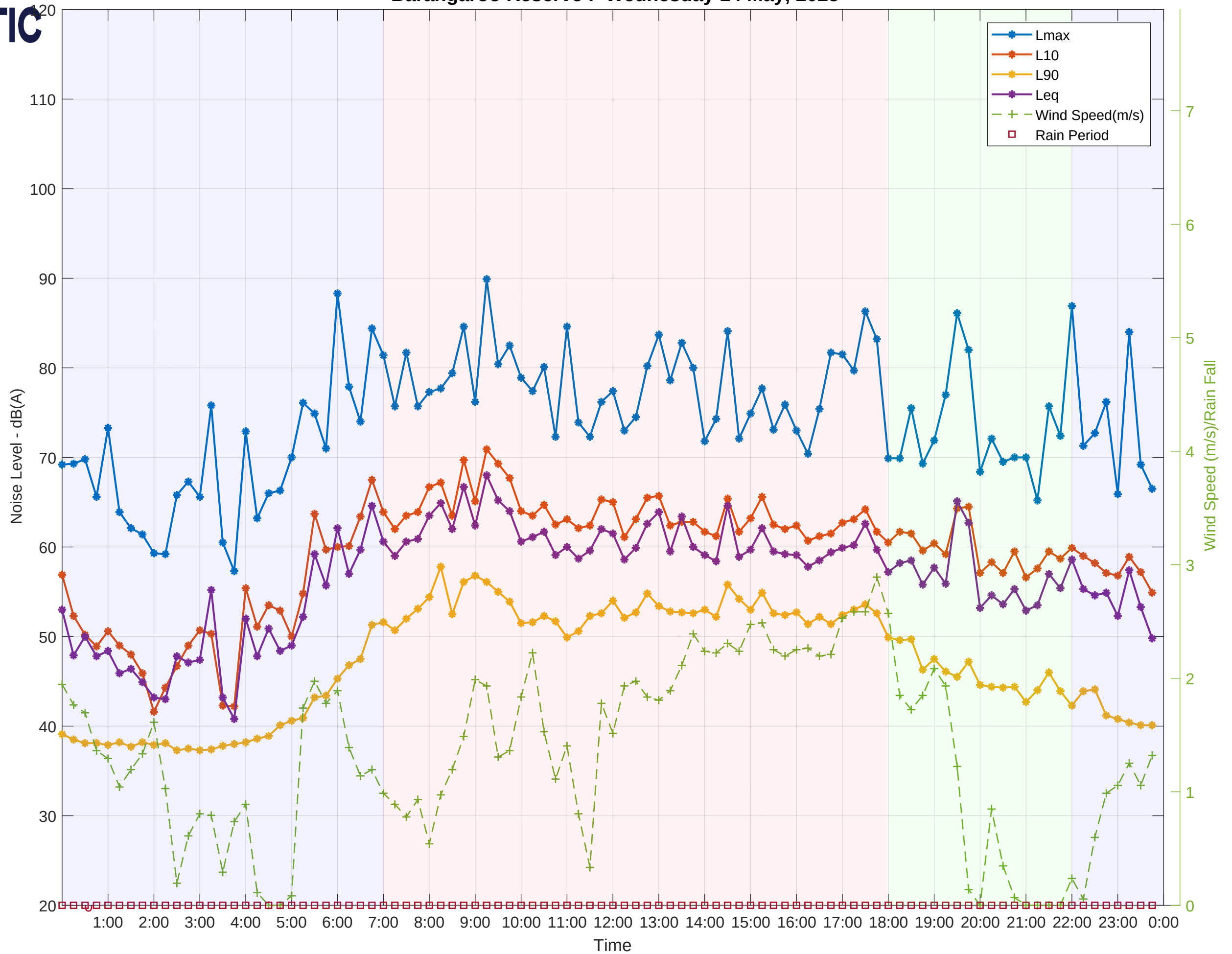


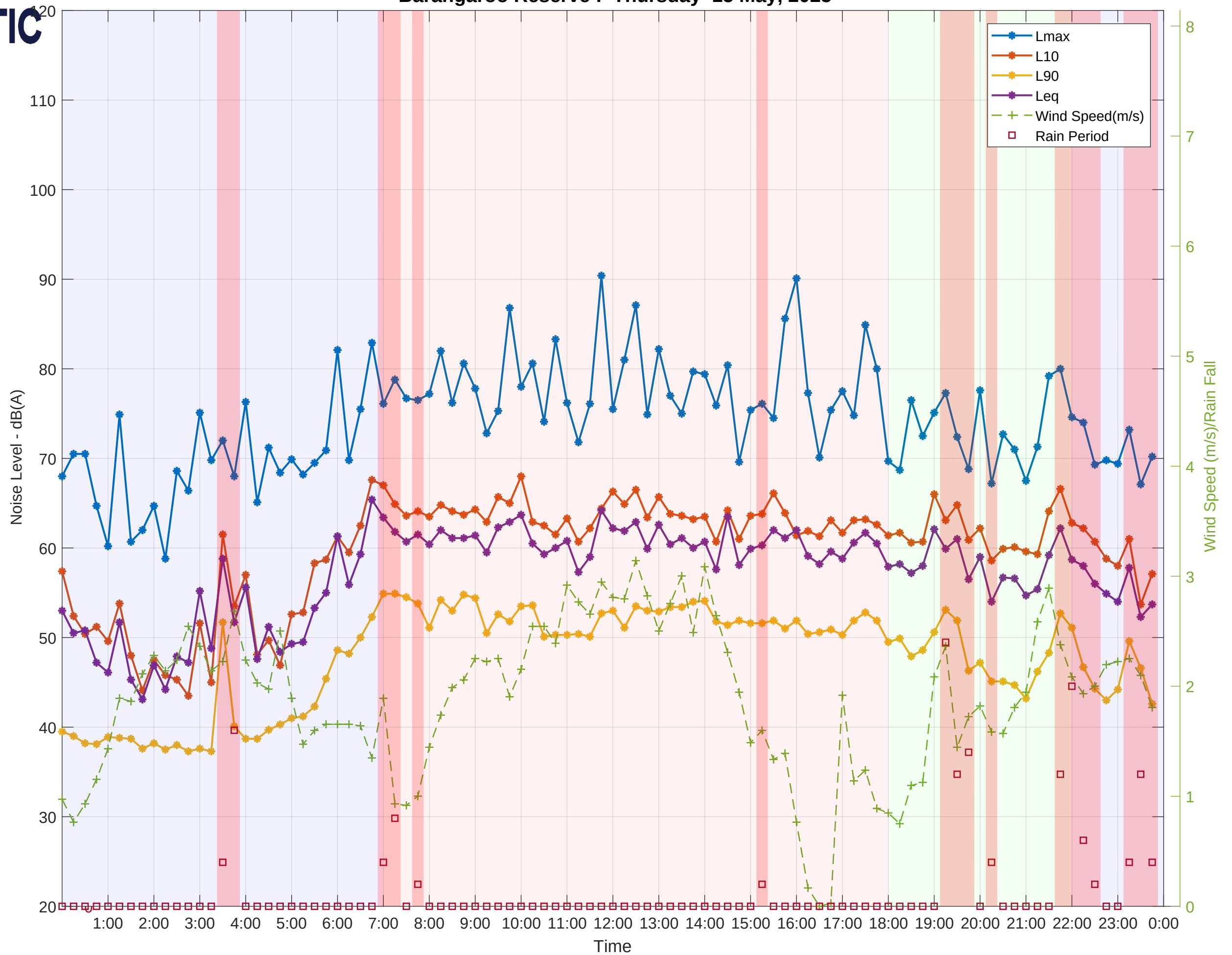


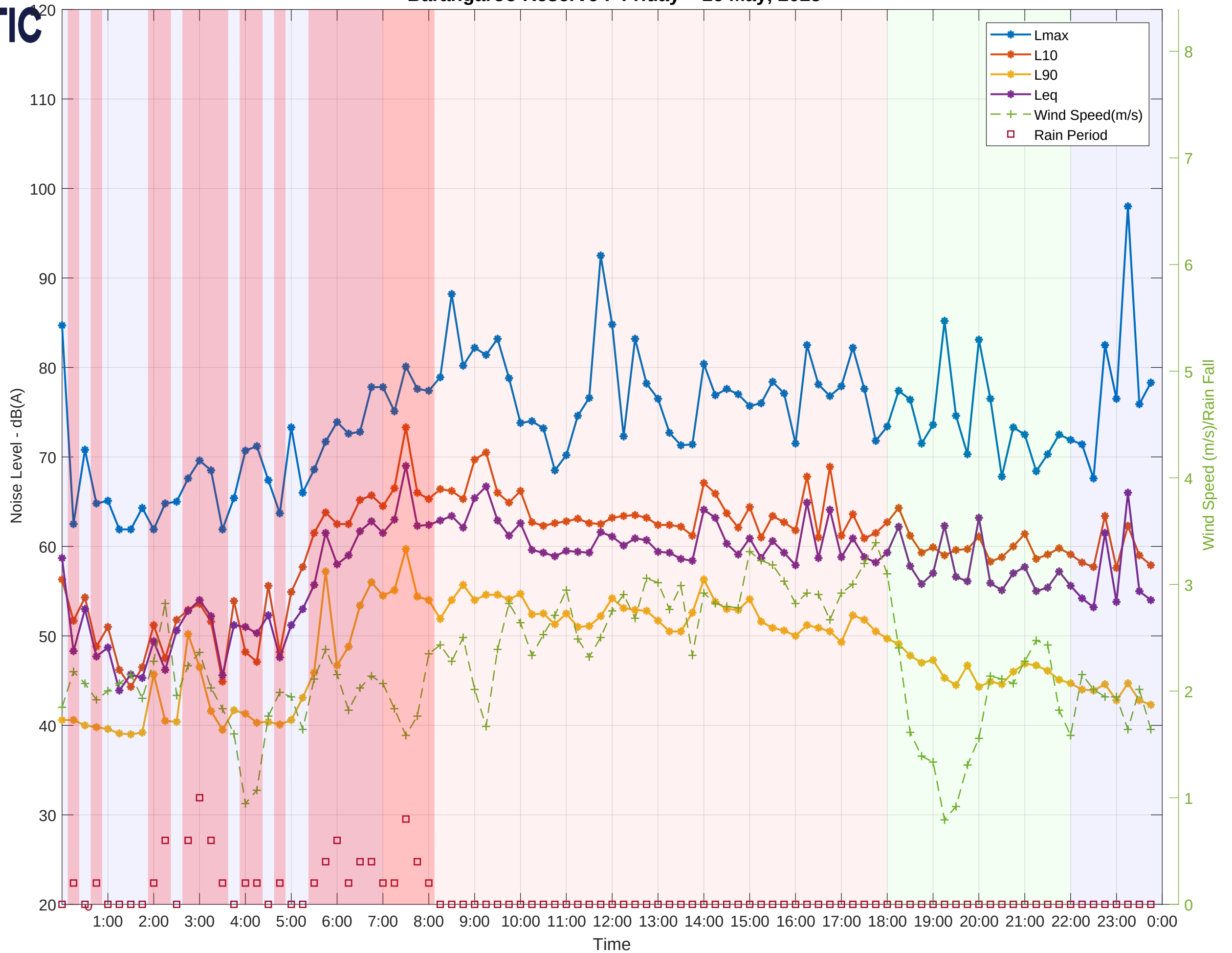


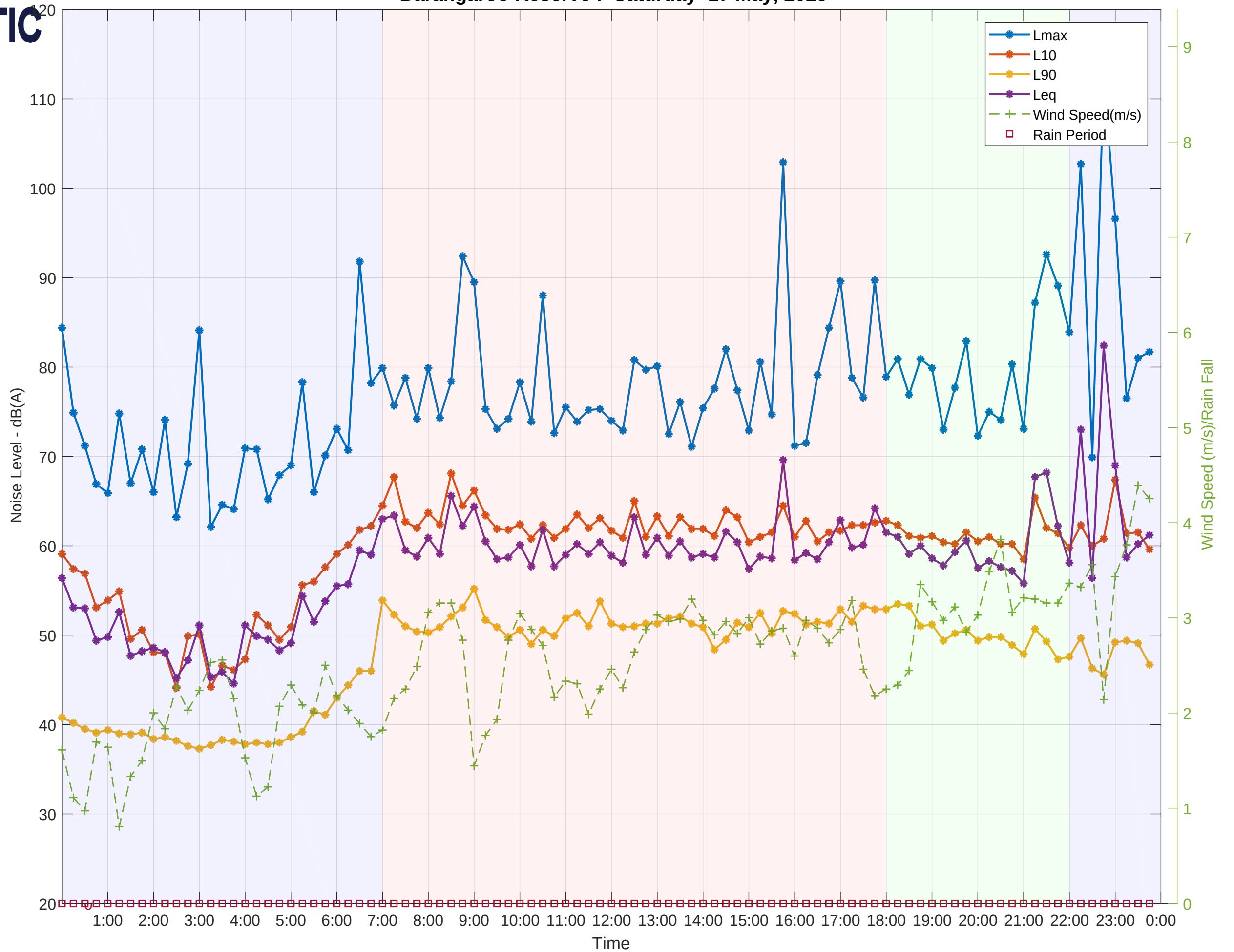


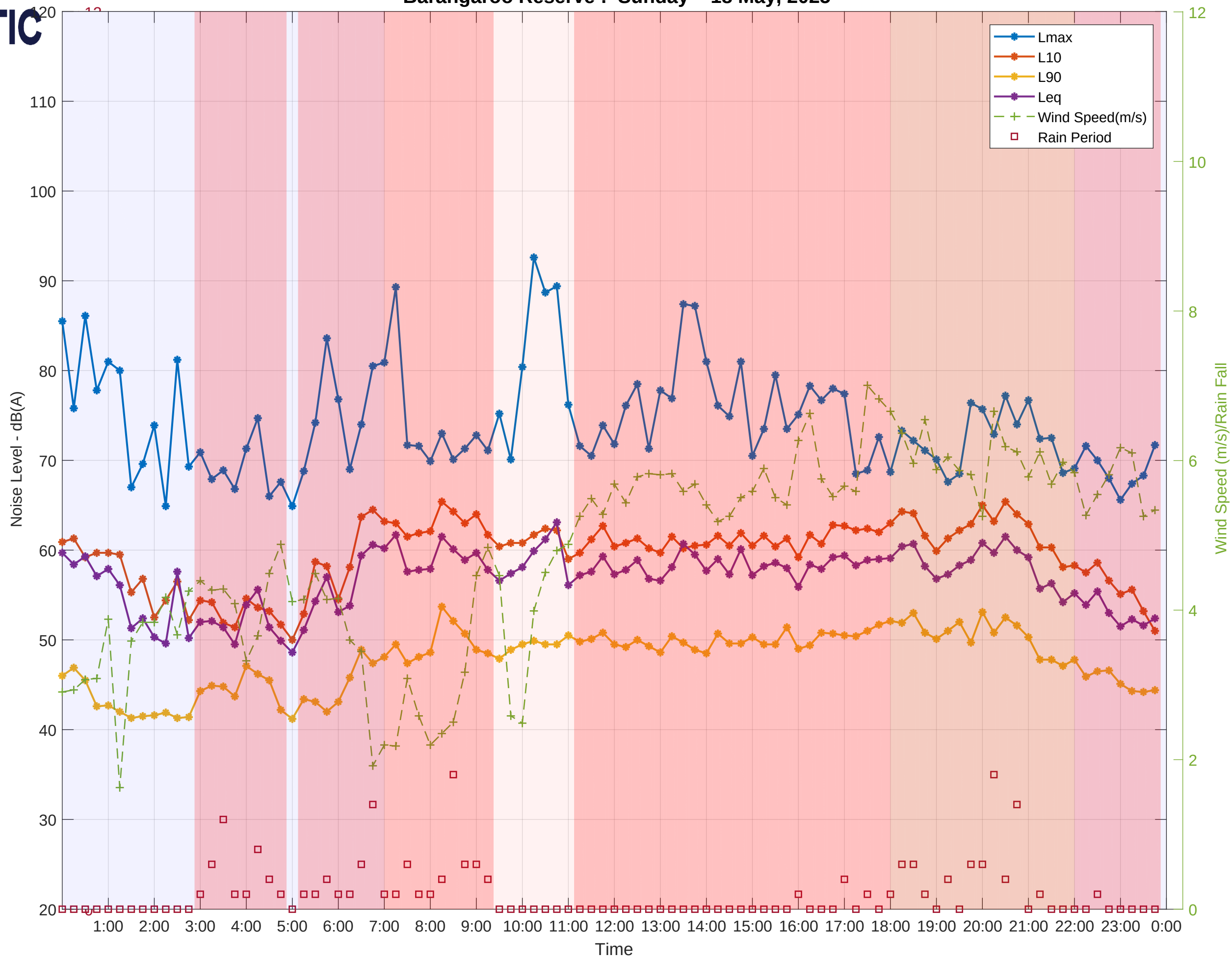


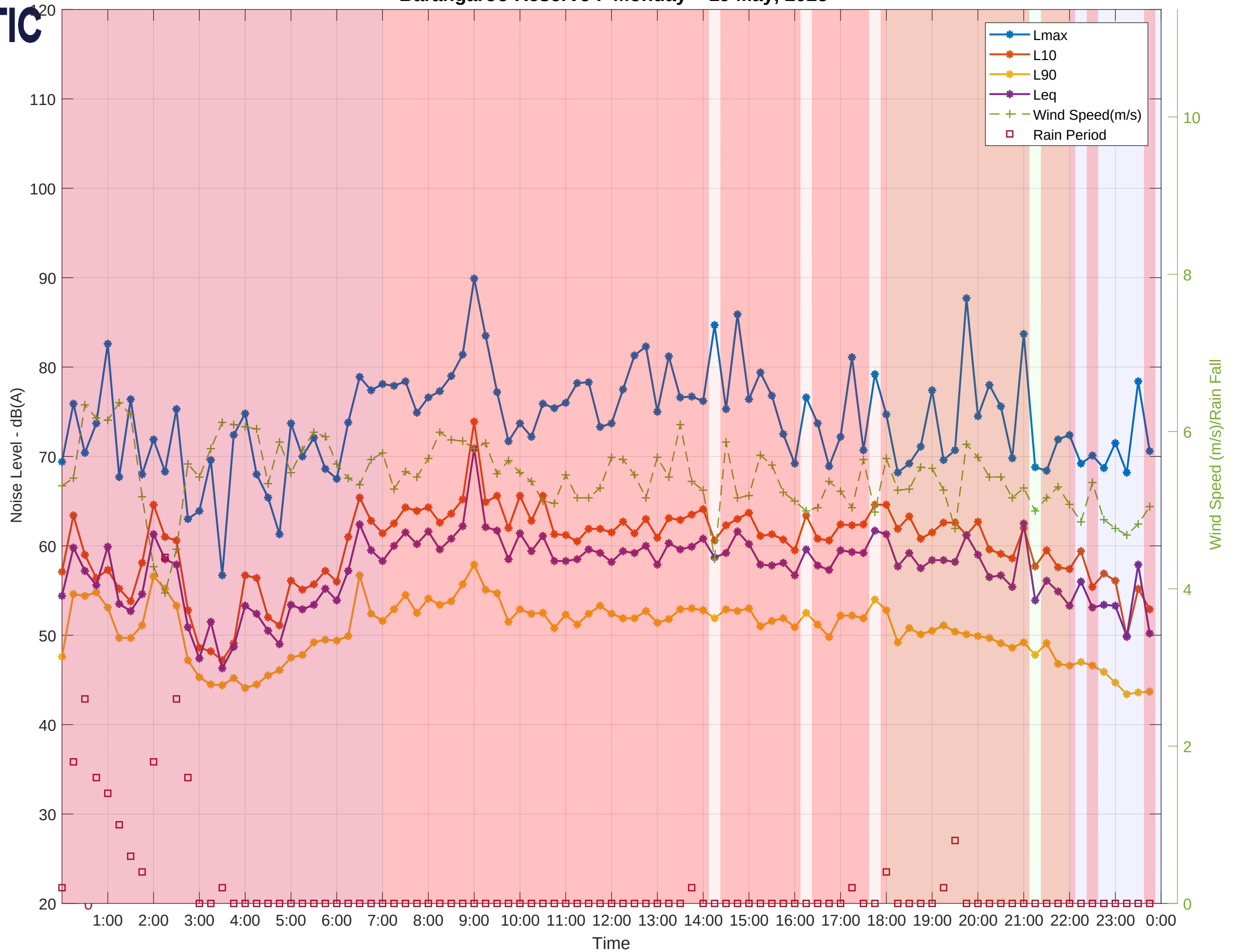


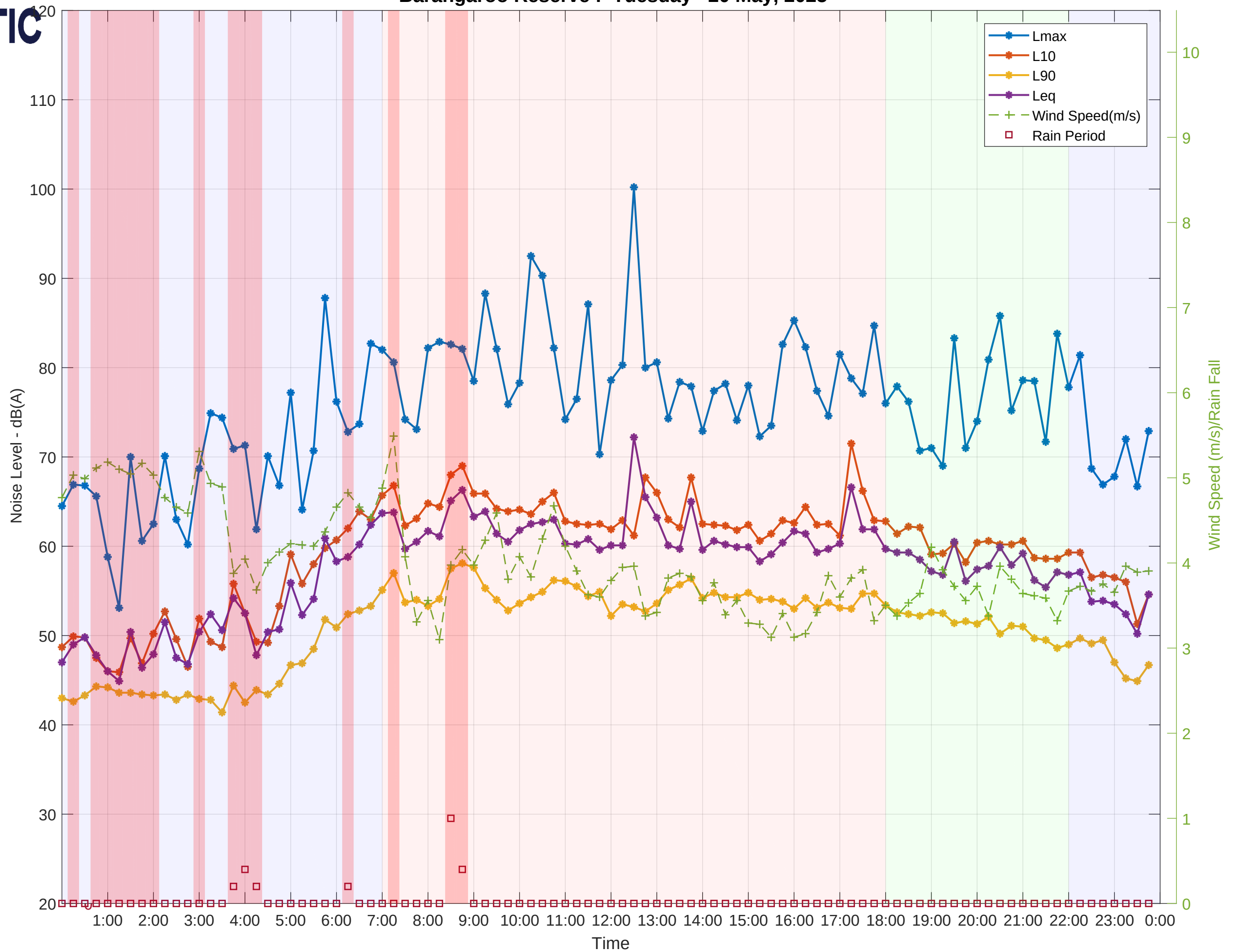


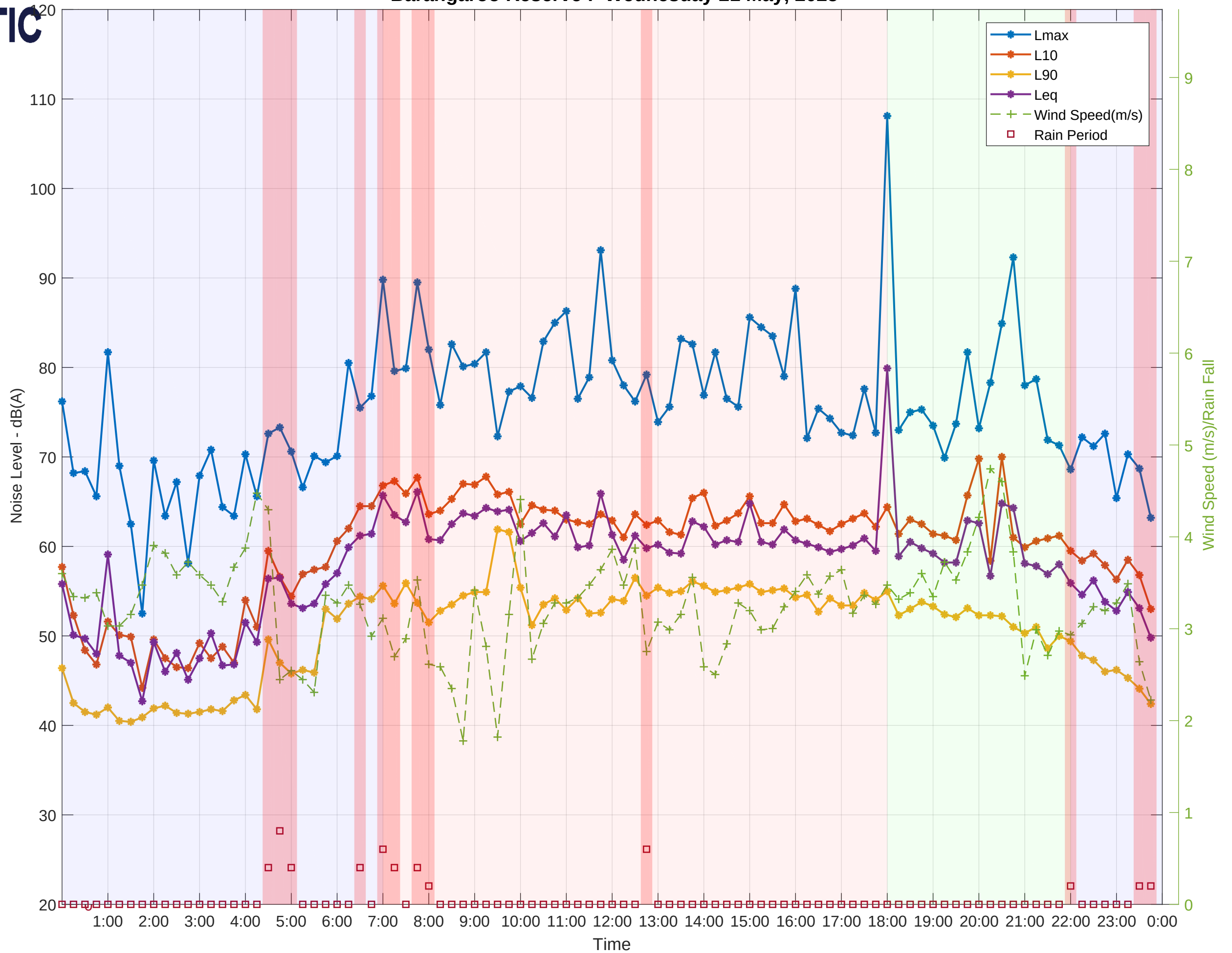


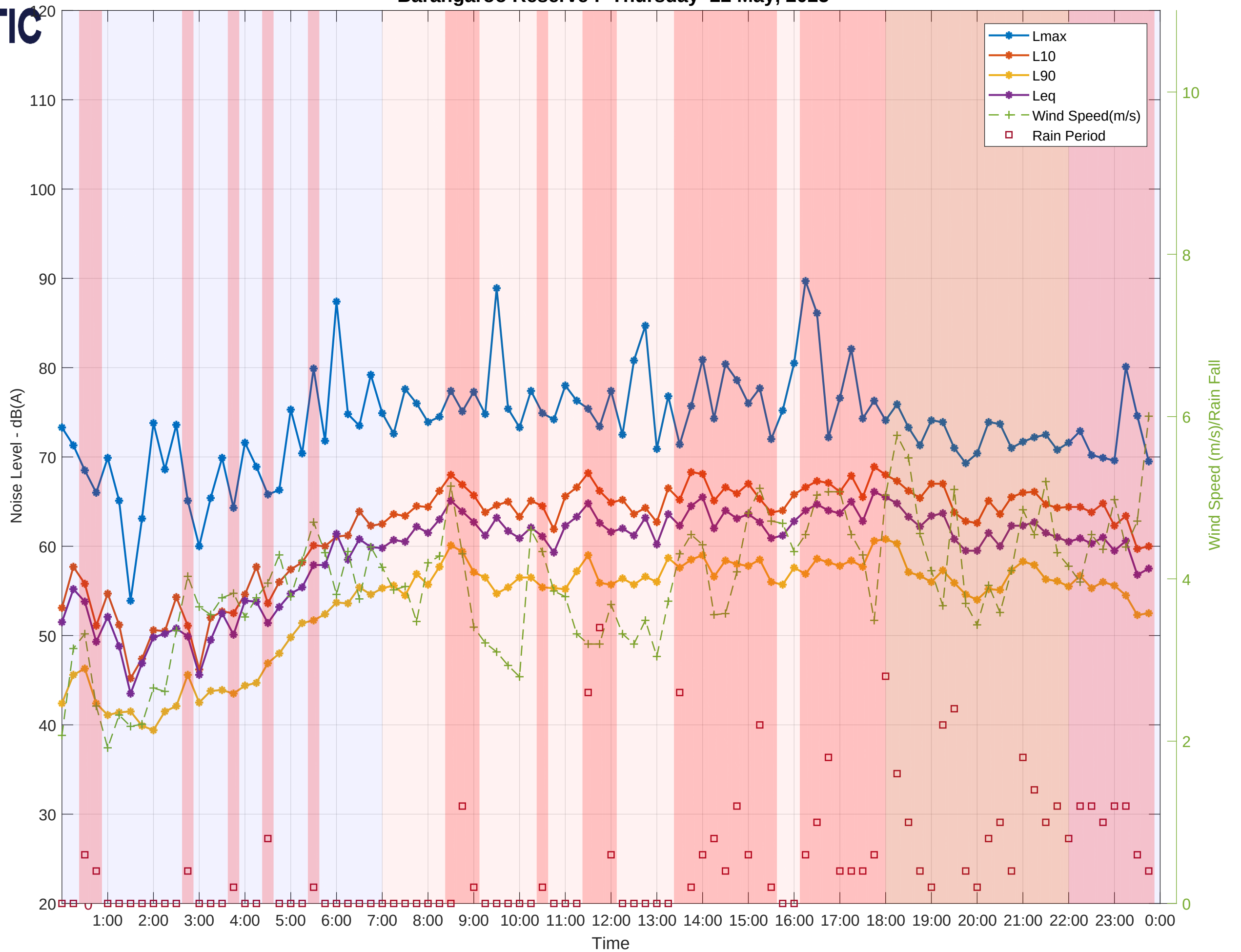


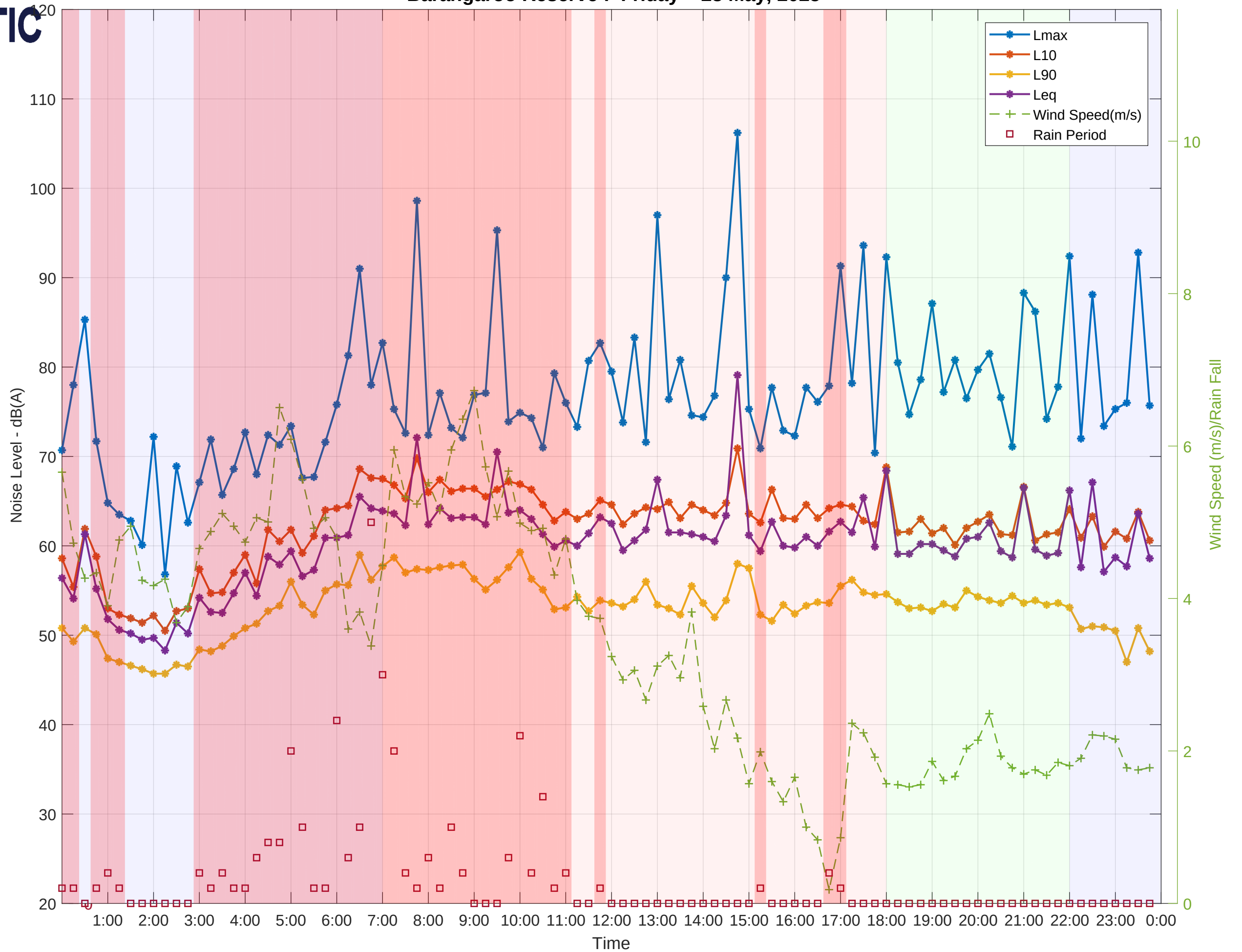


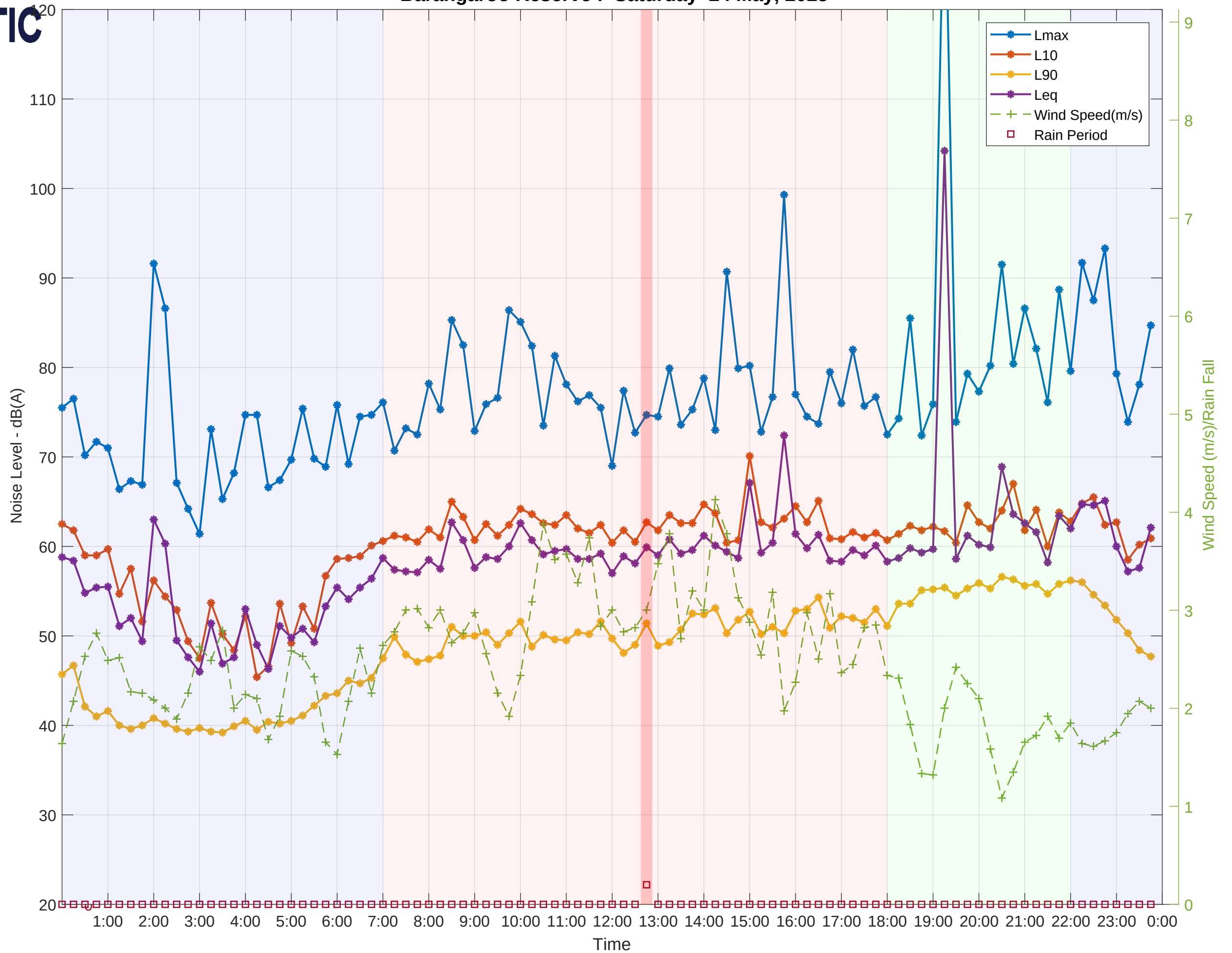


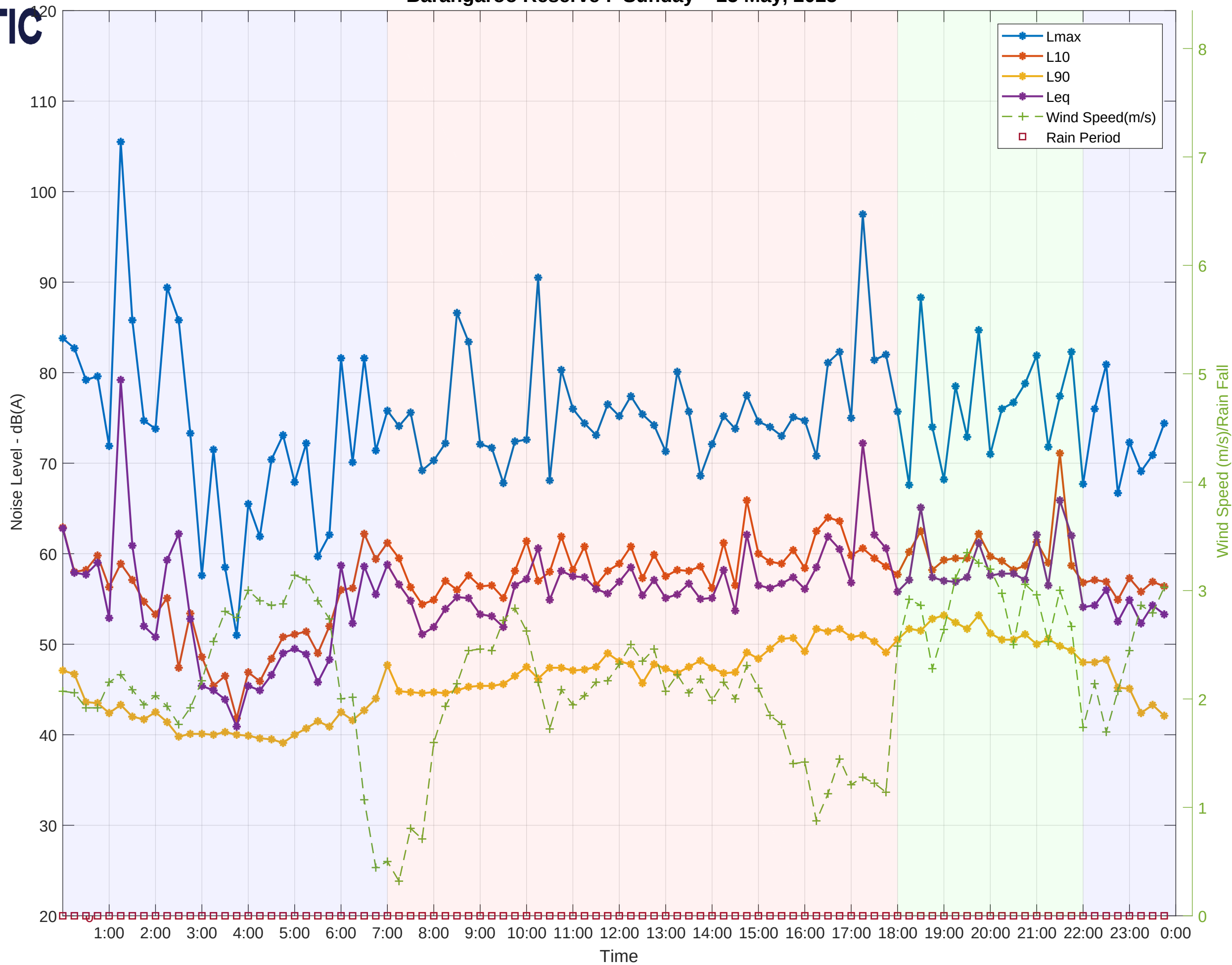


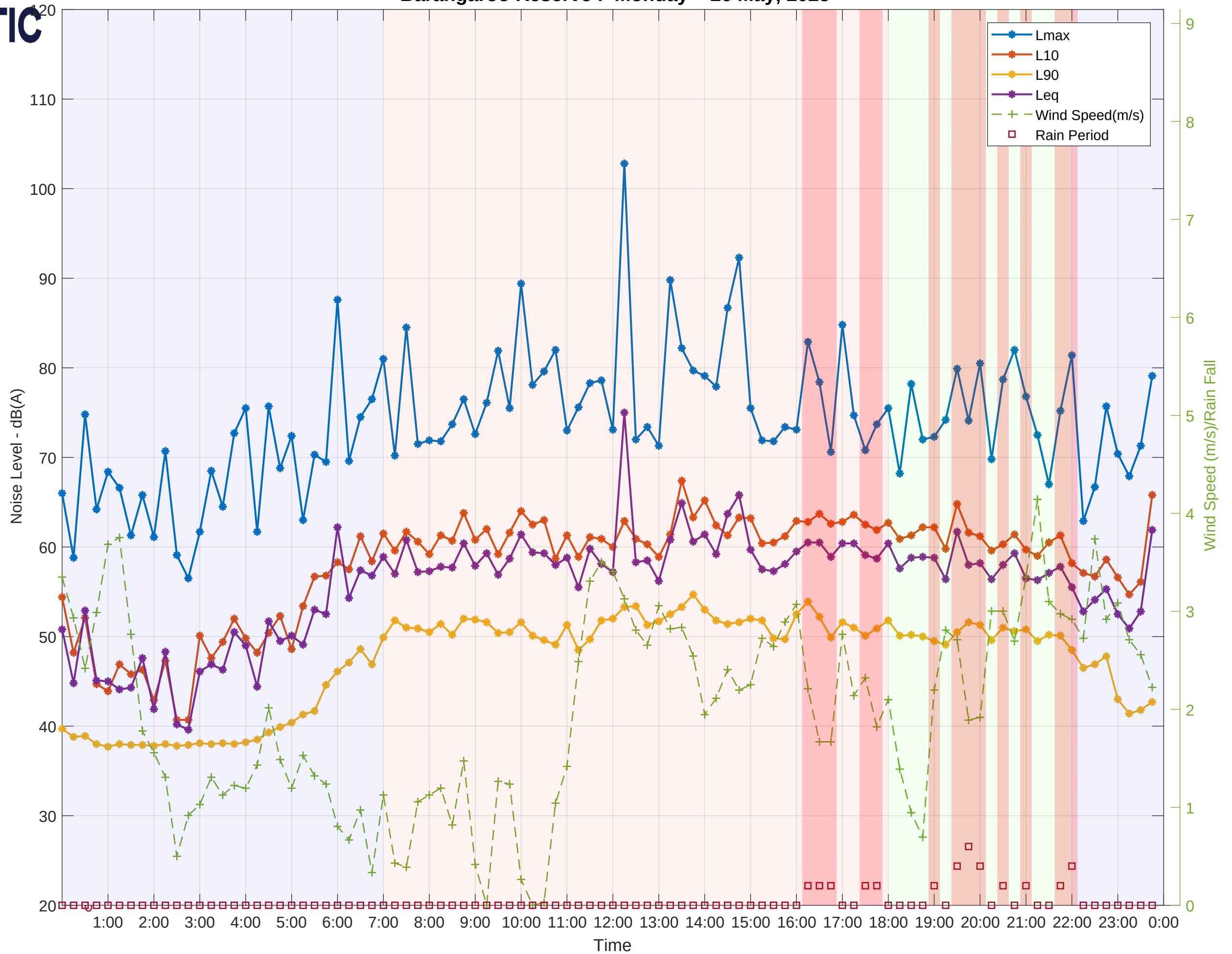


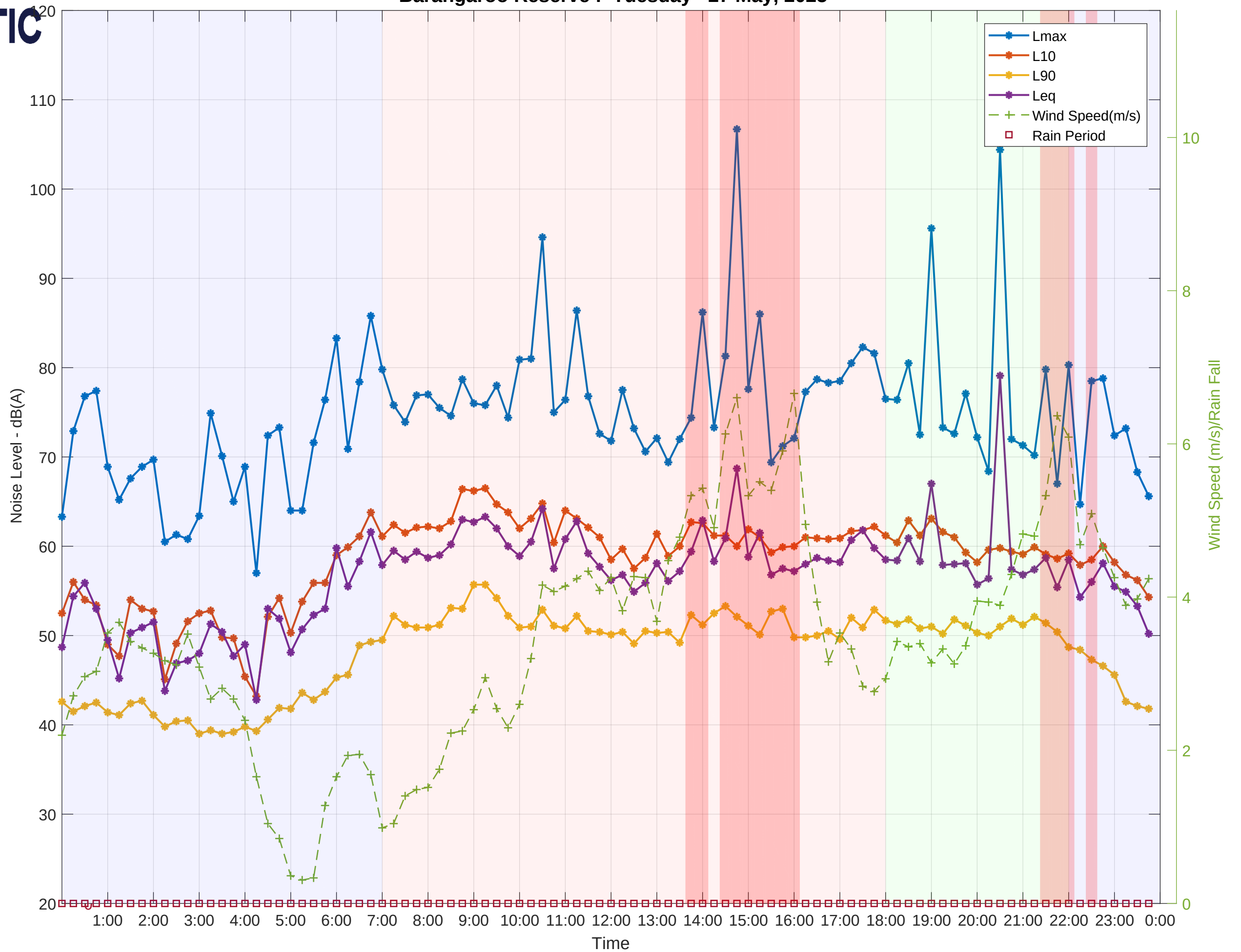


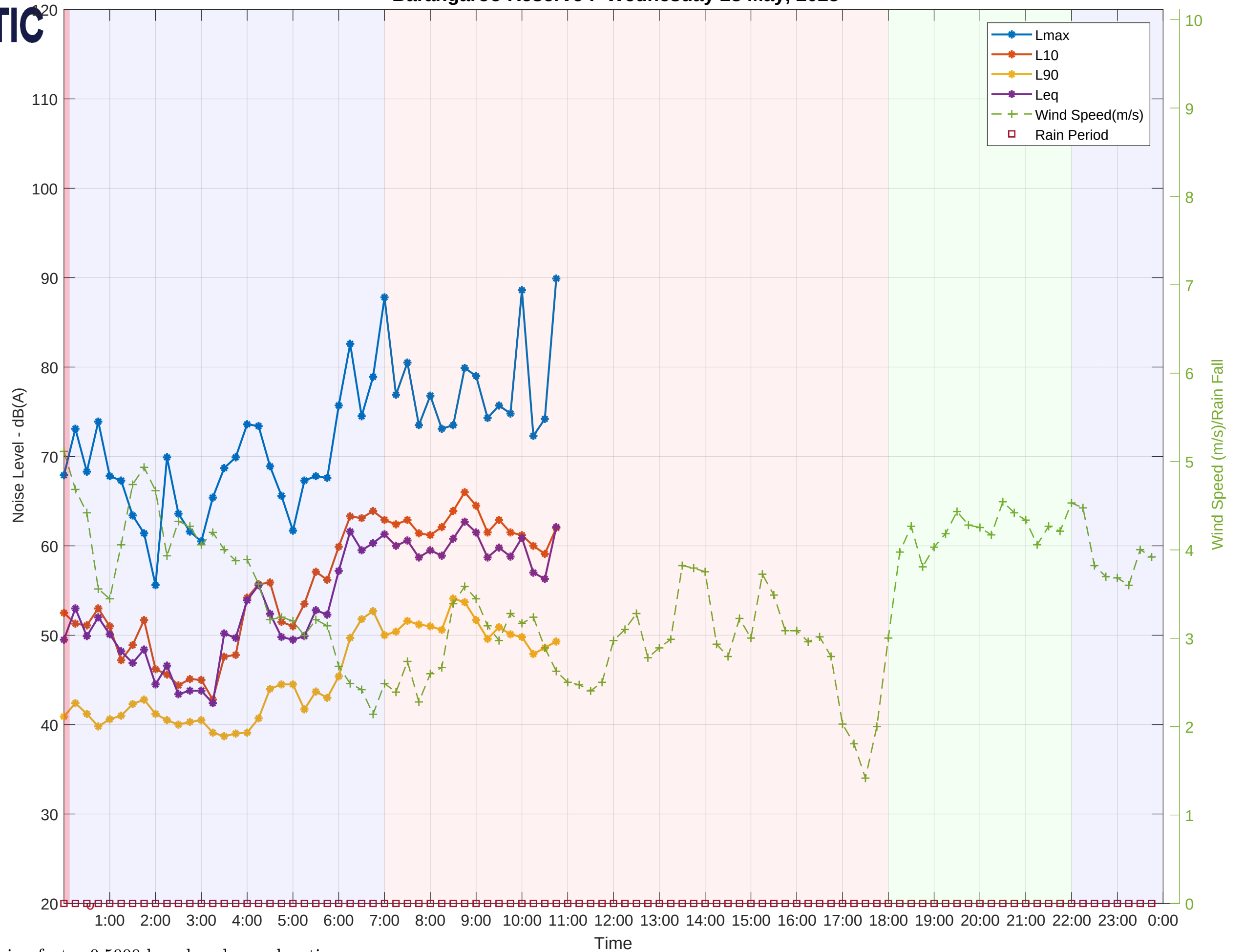






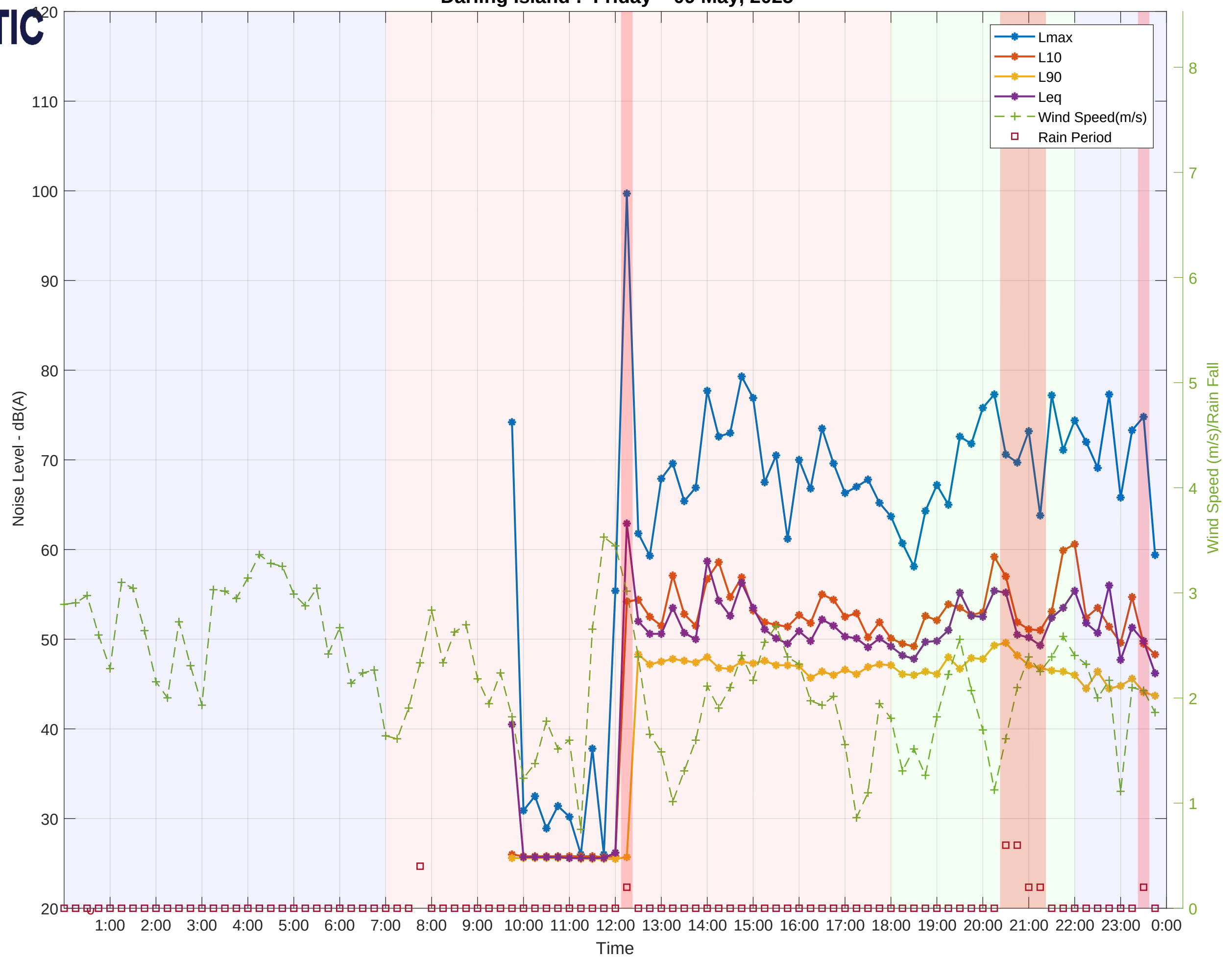


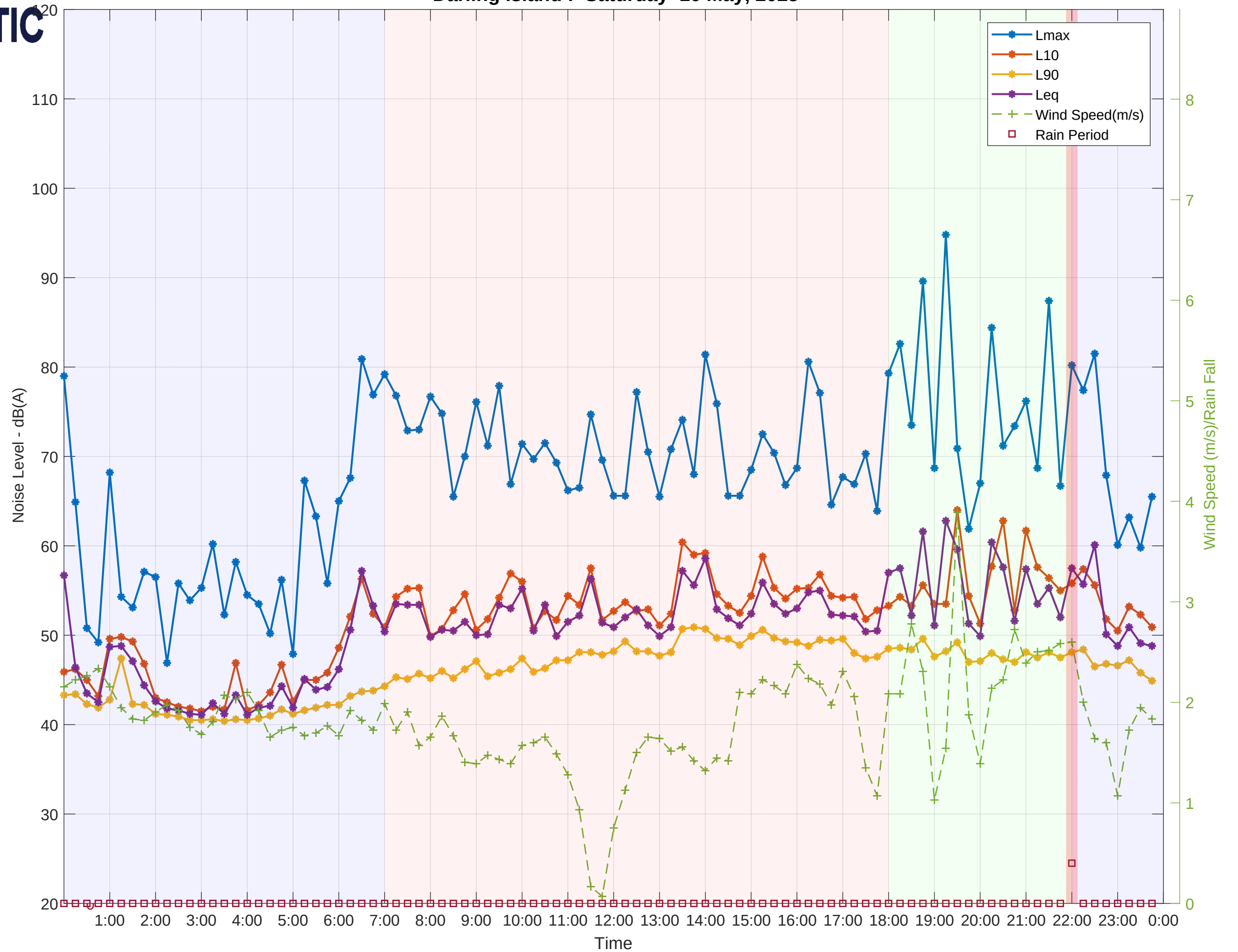


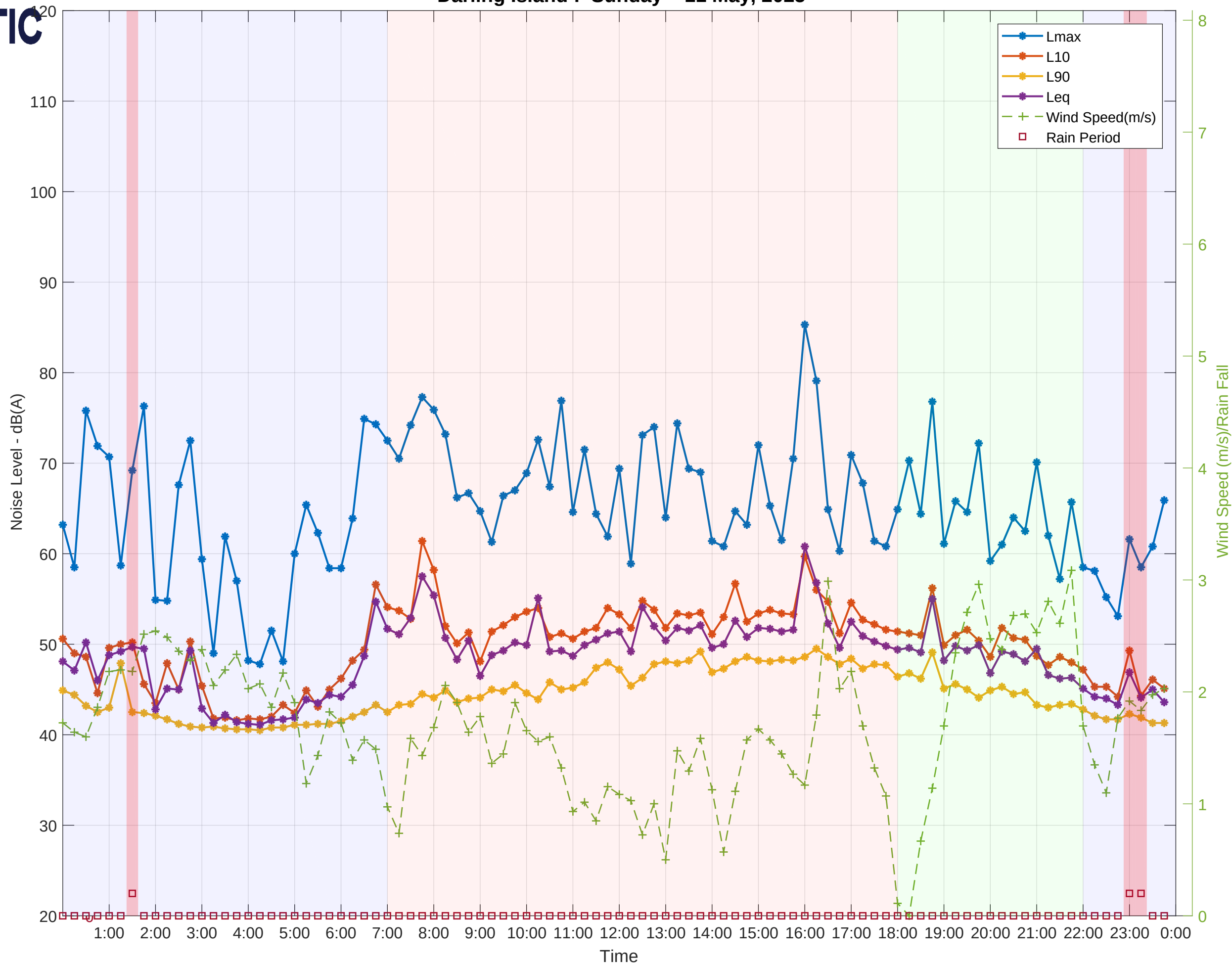


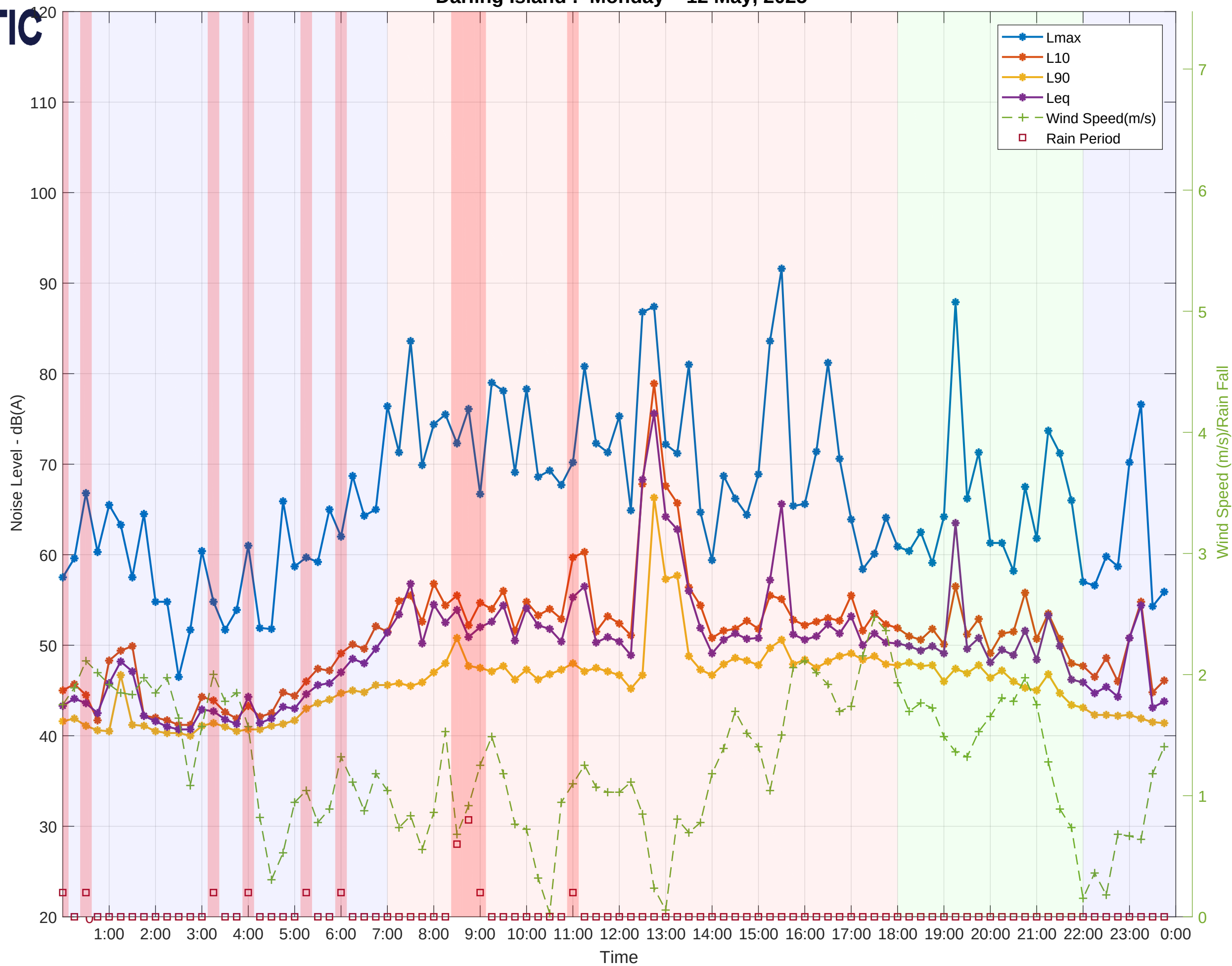
Wind Speed is corrected using factor 0.5000 based on logger location

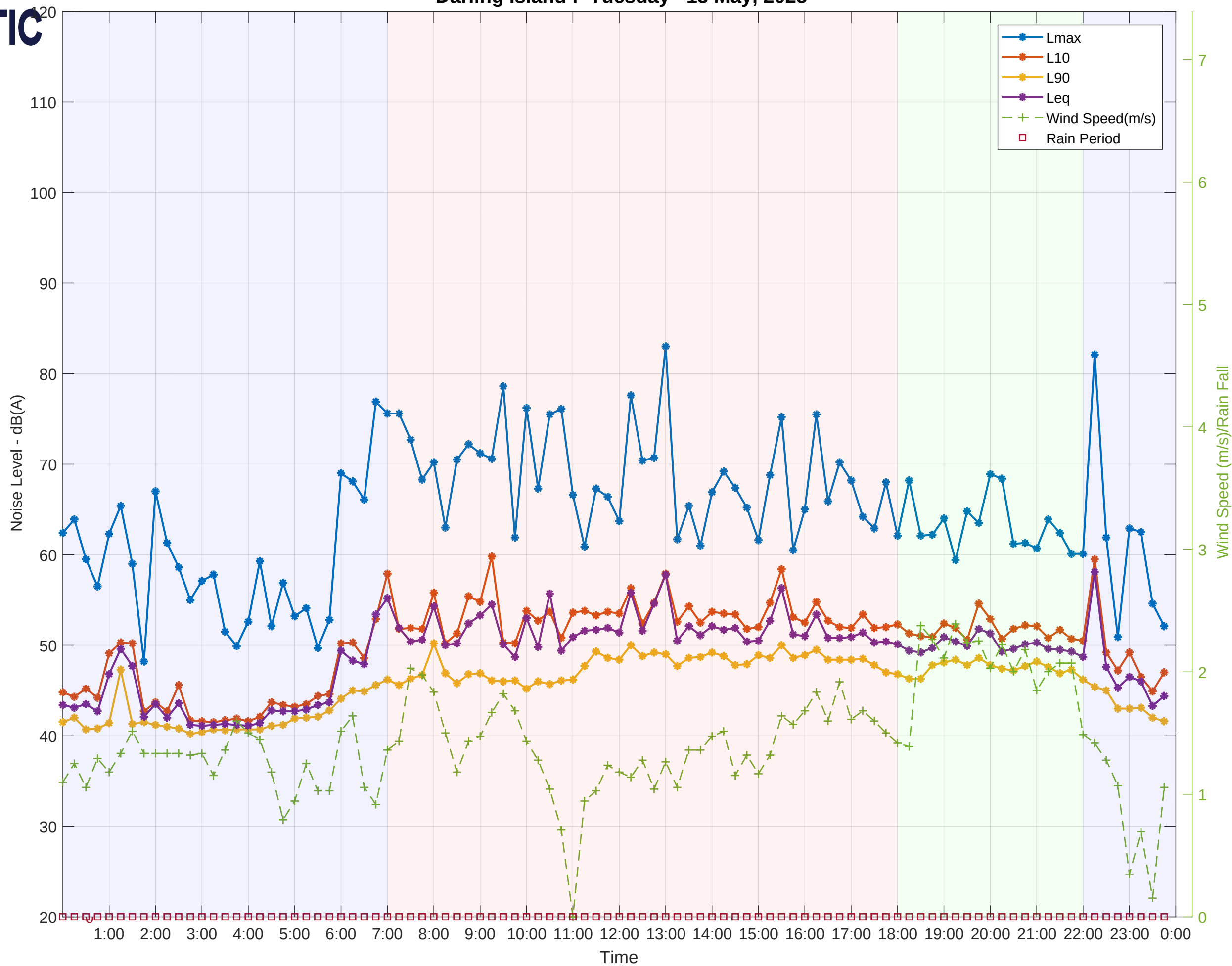
E.5 – MONITORING LOCATION #5

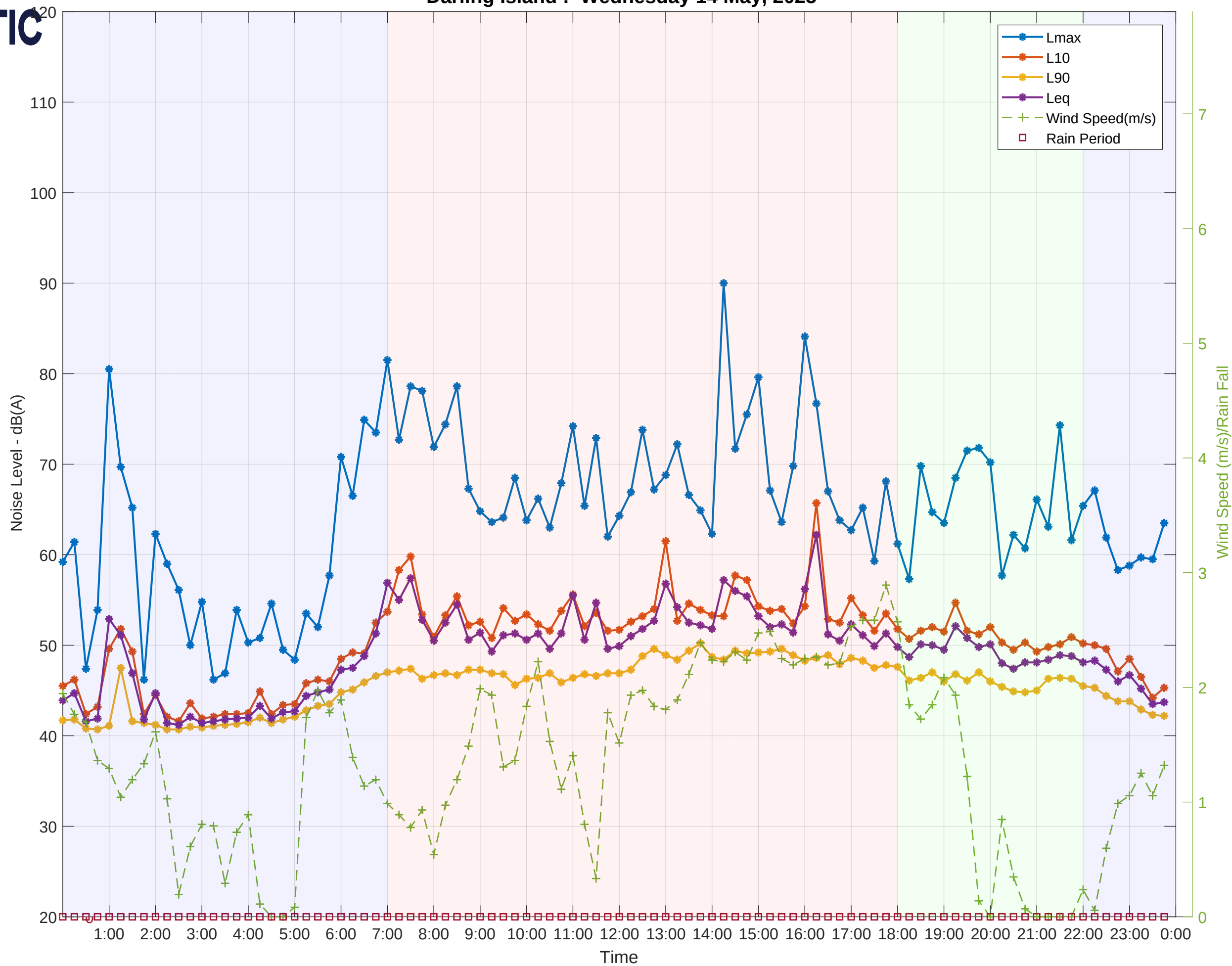


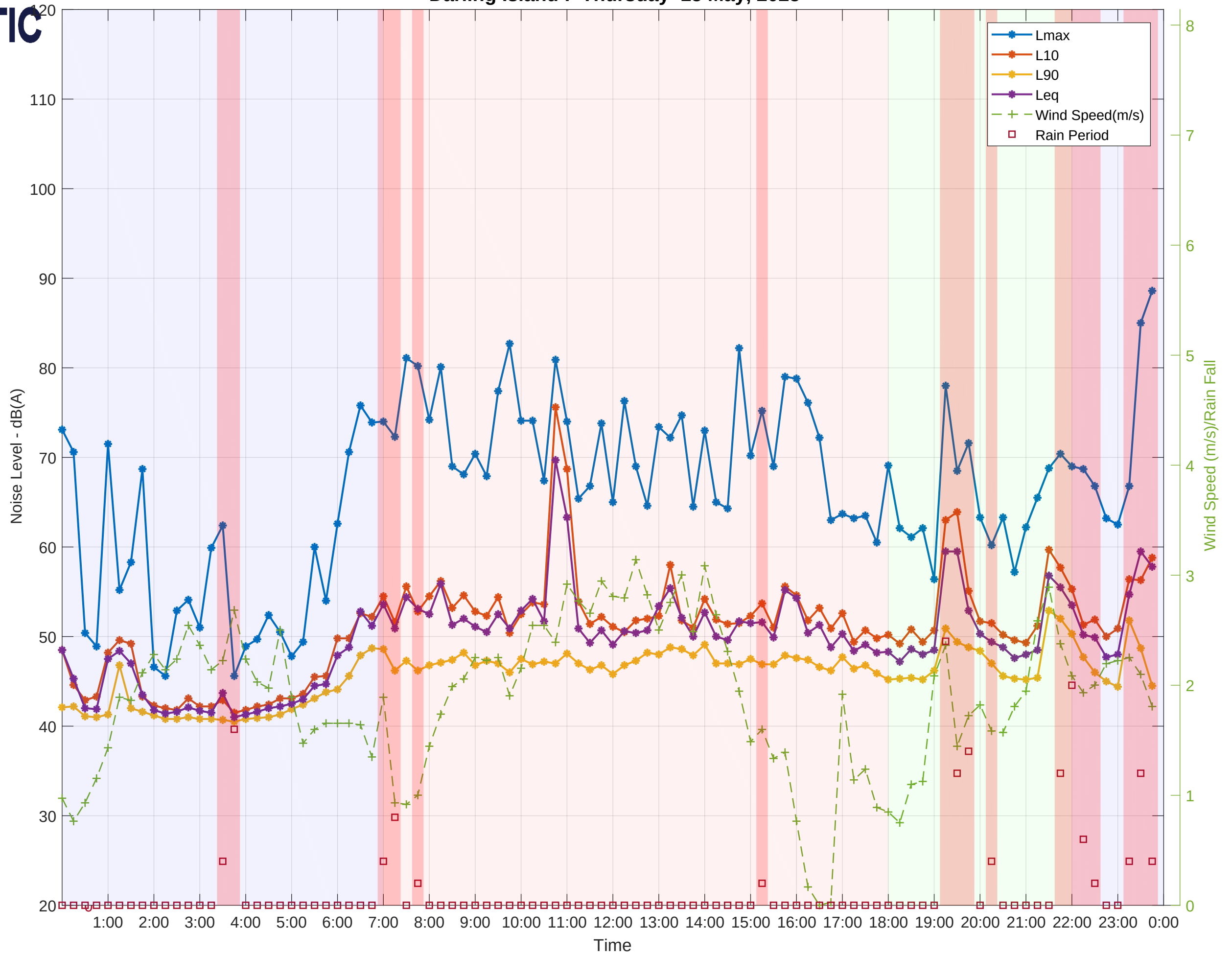


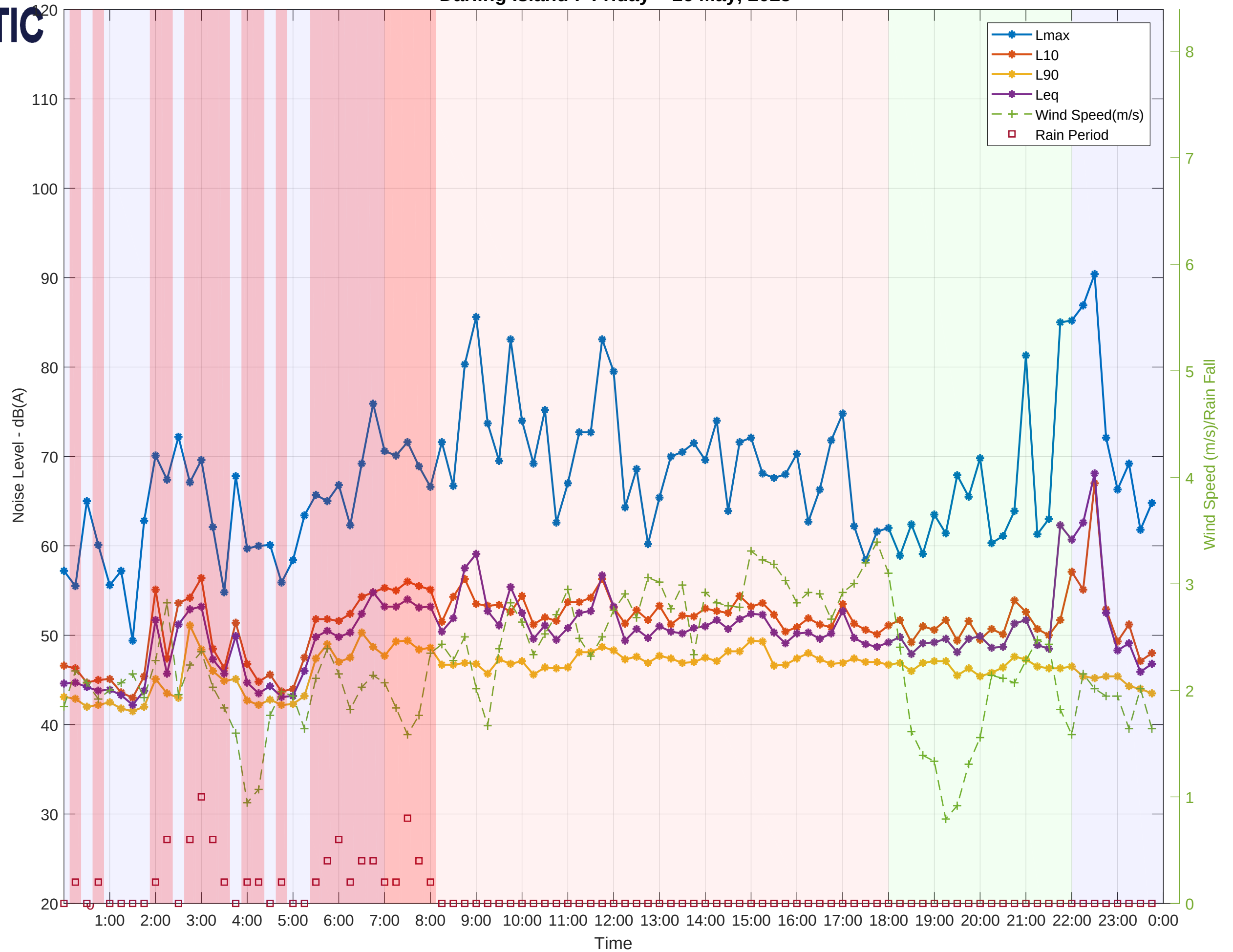


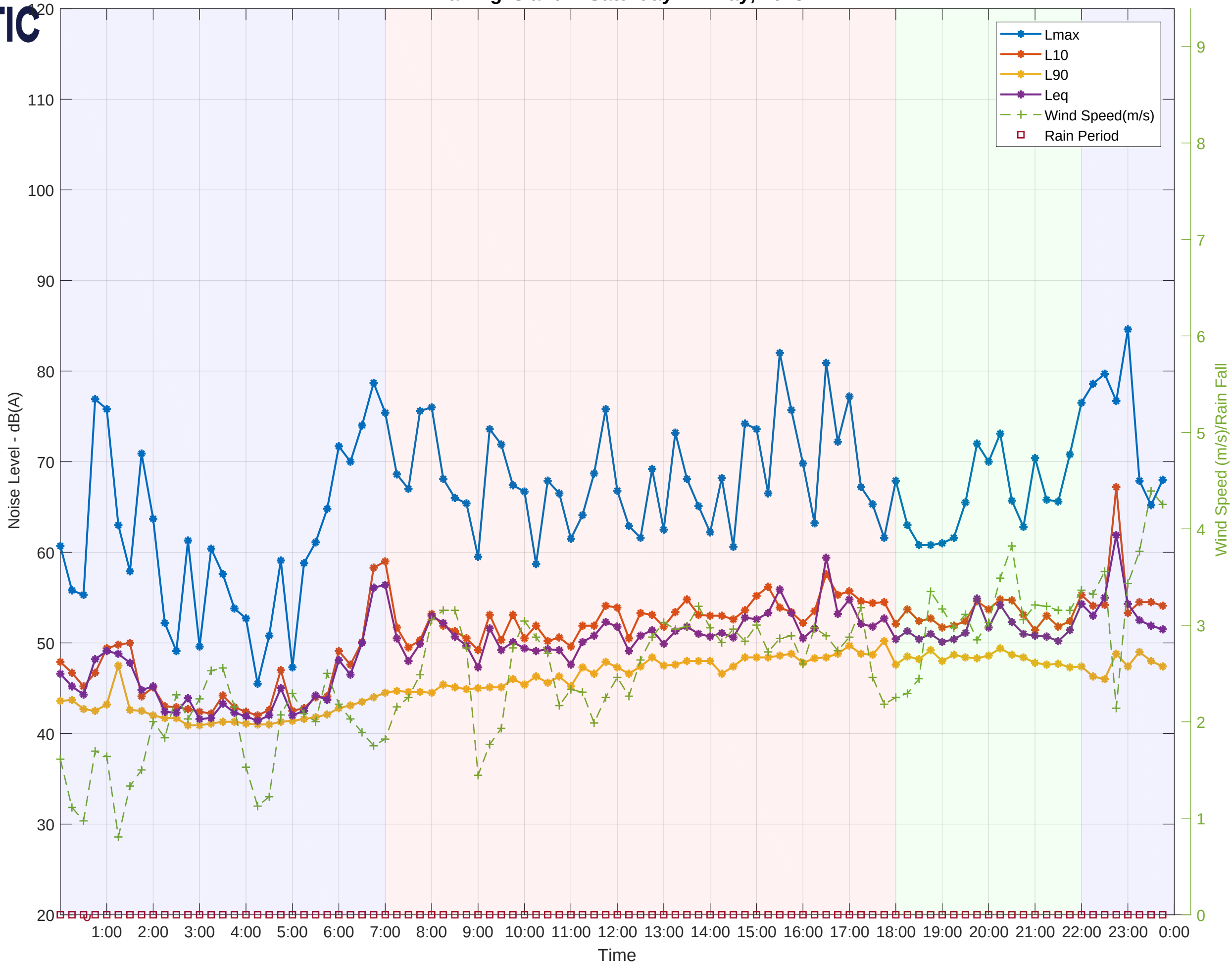


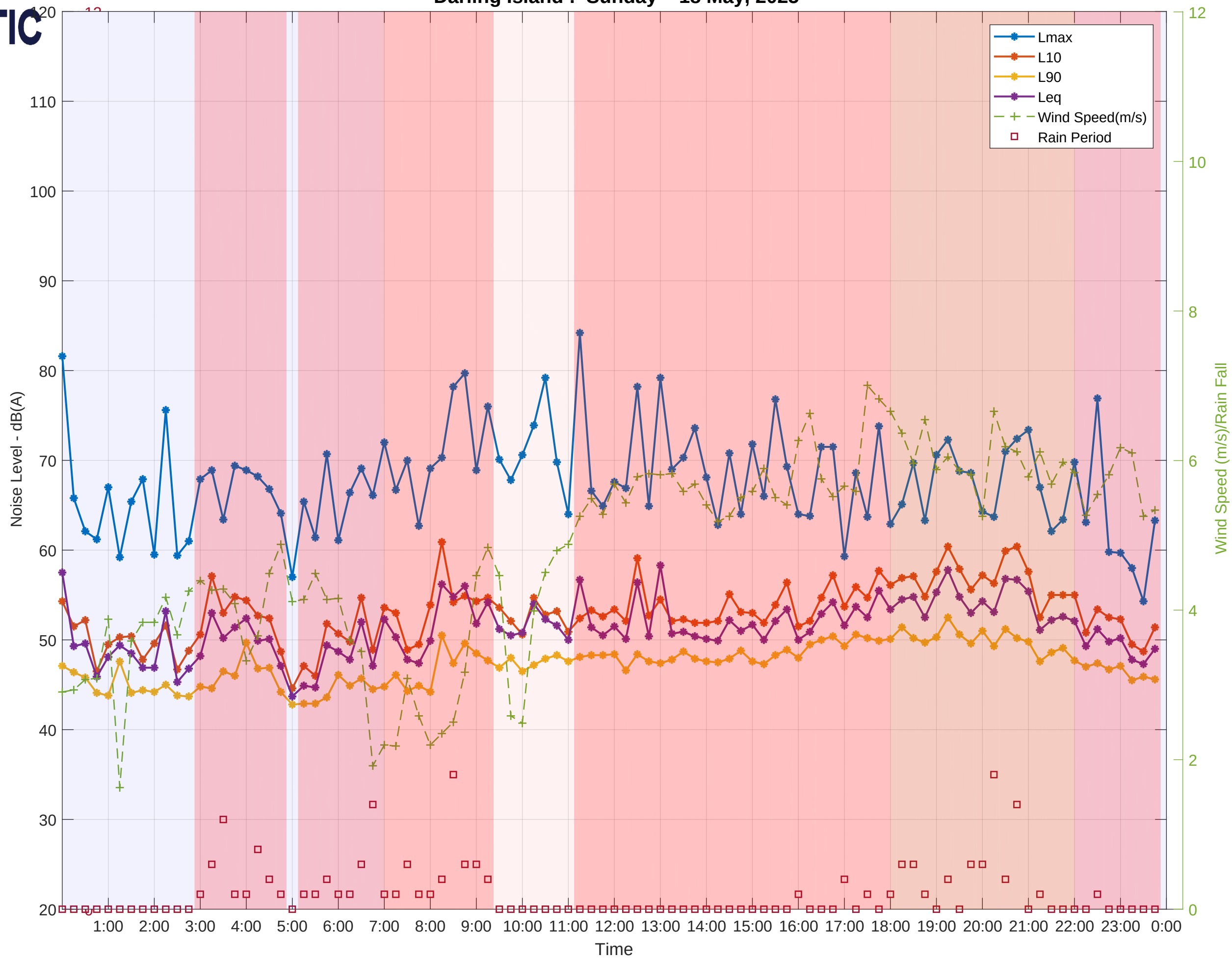


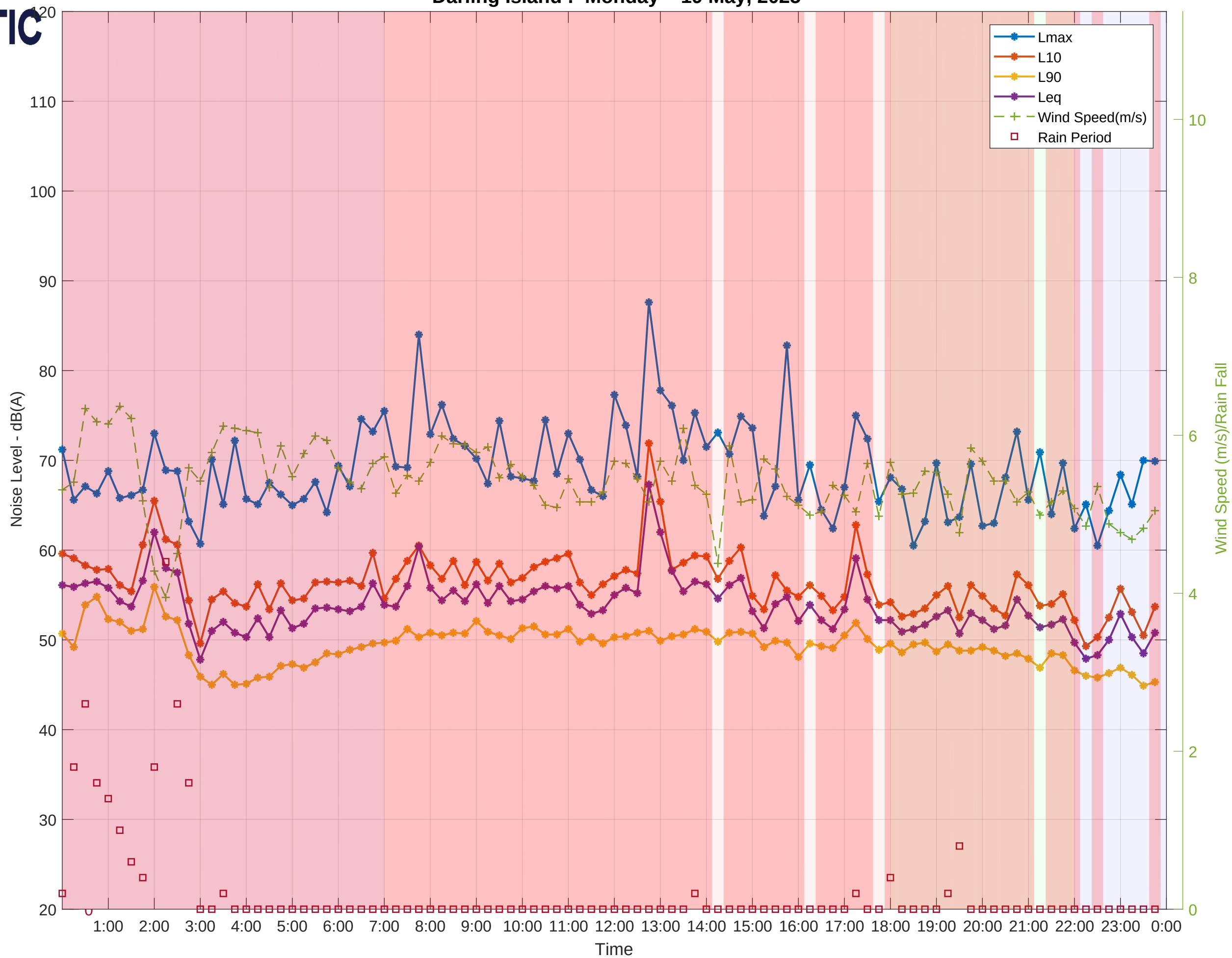


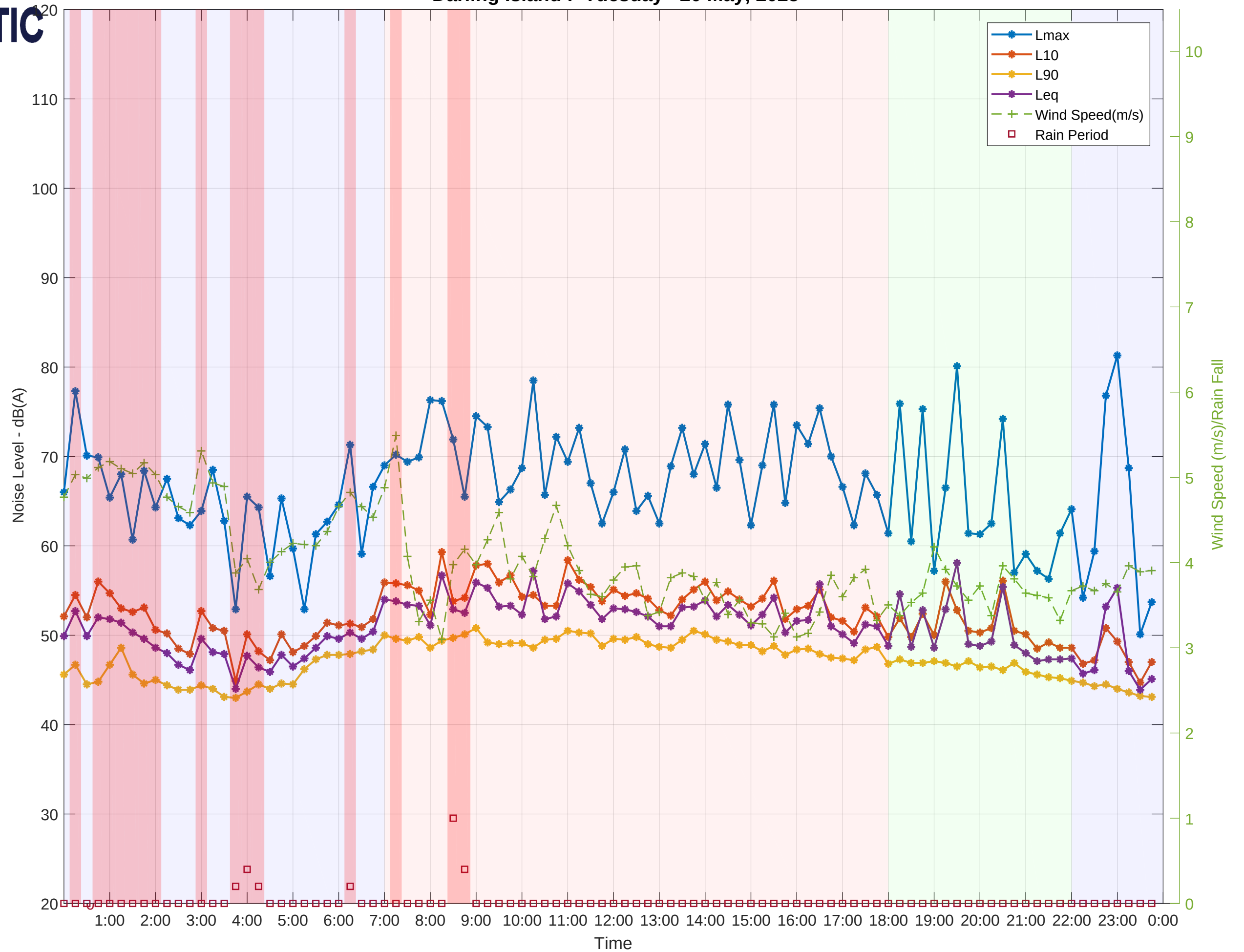


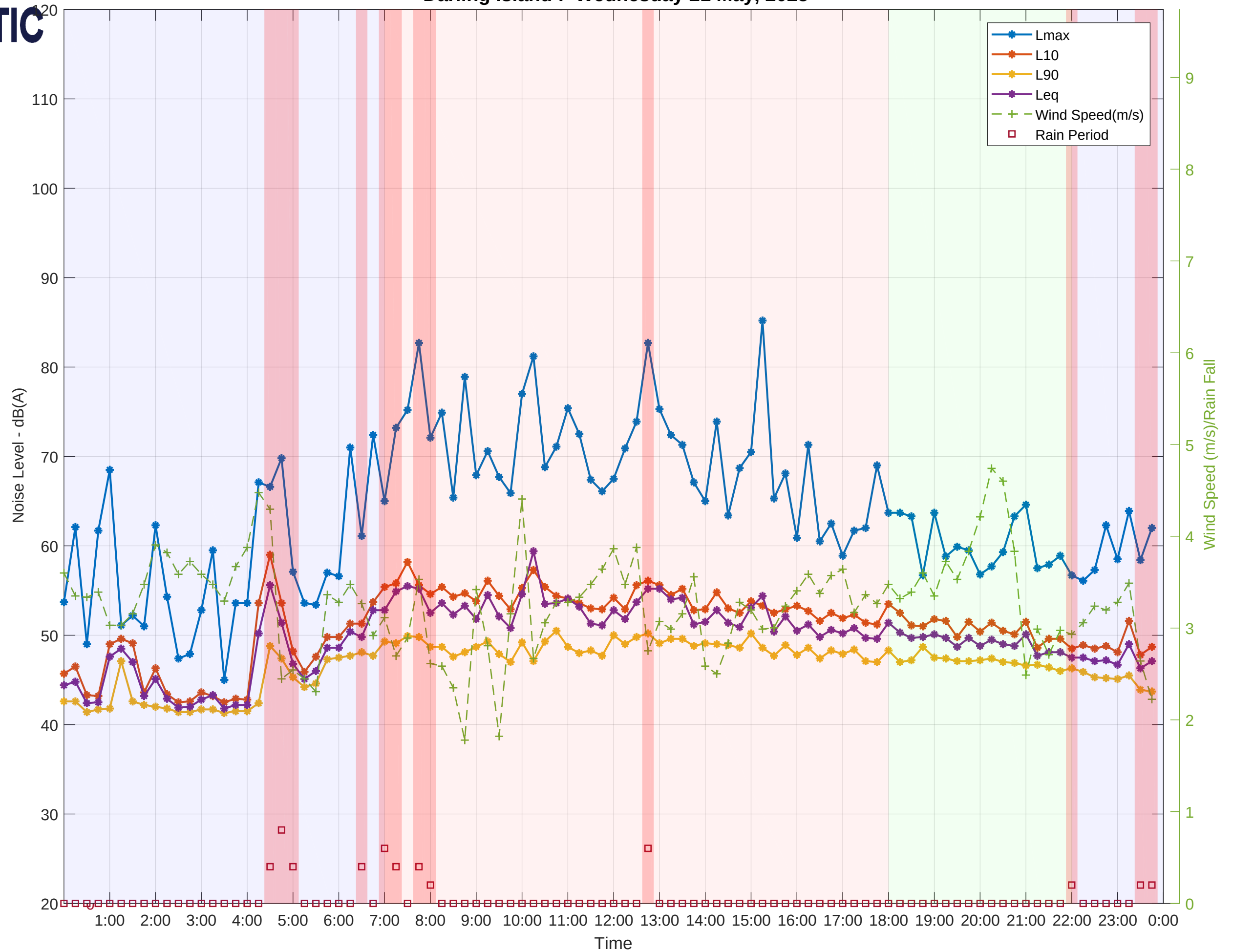


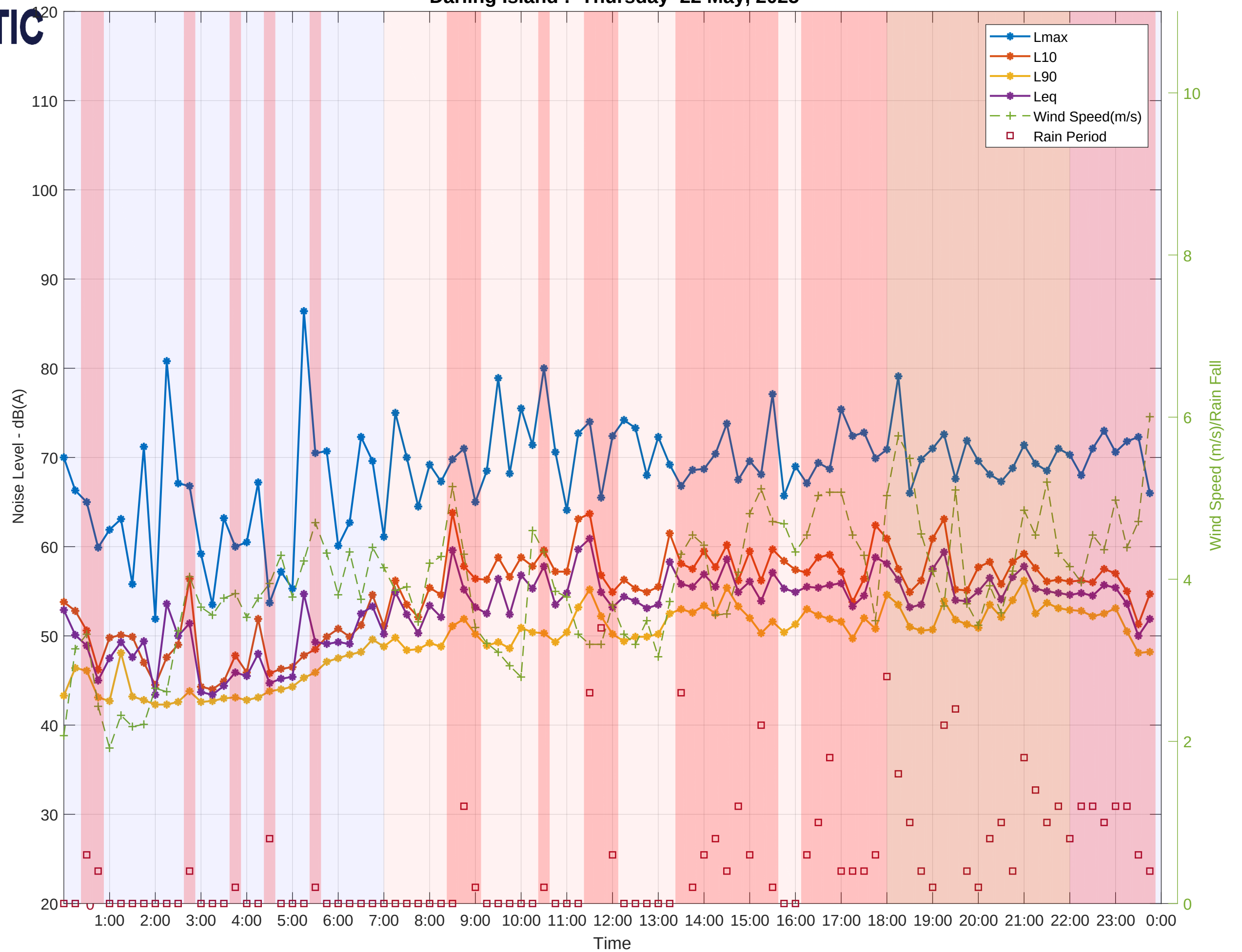


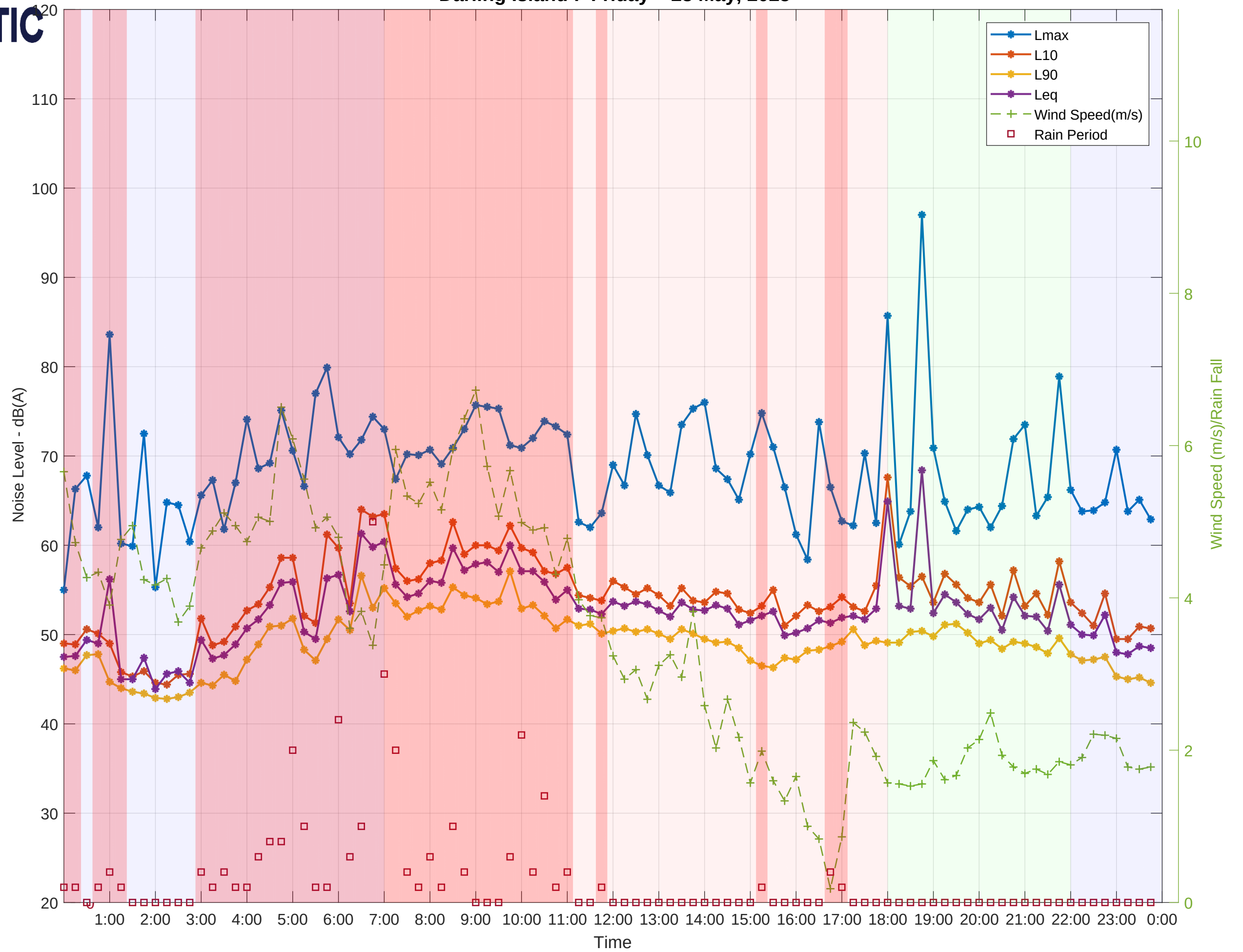


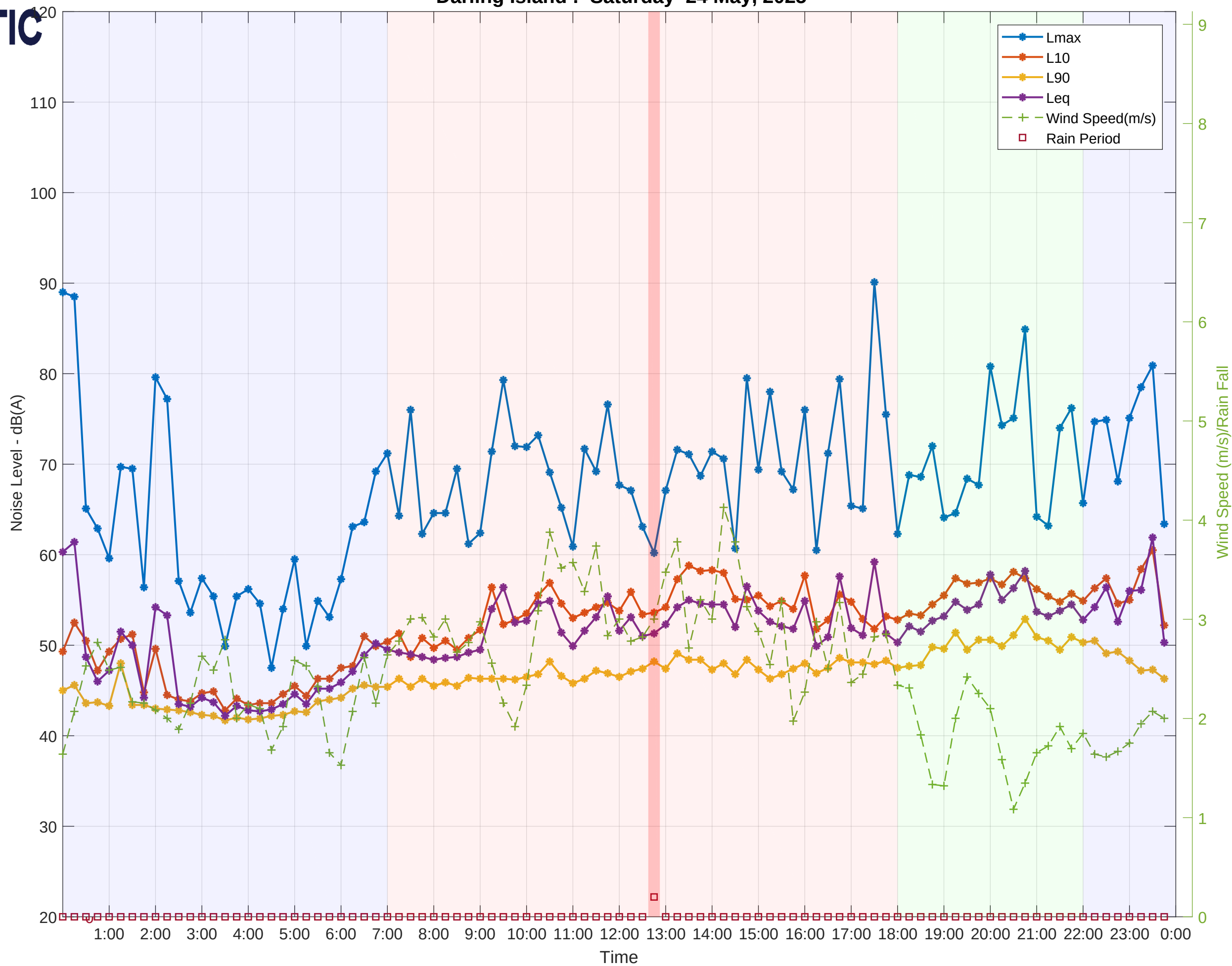


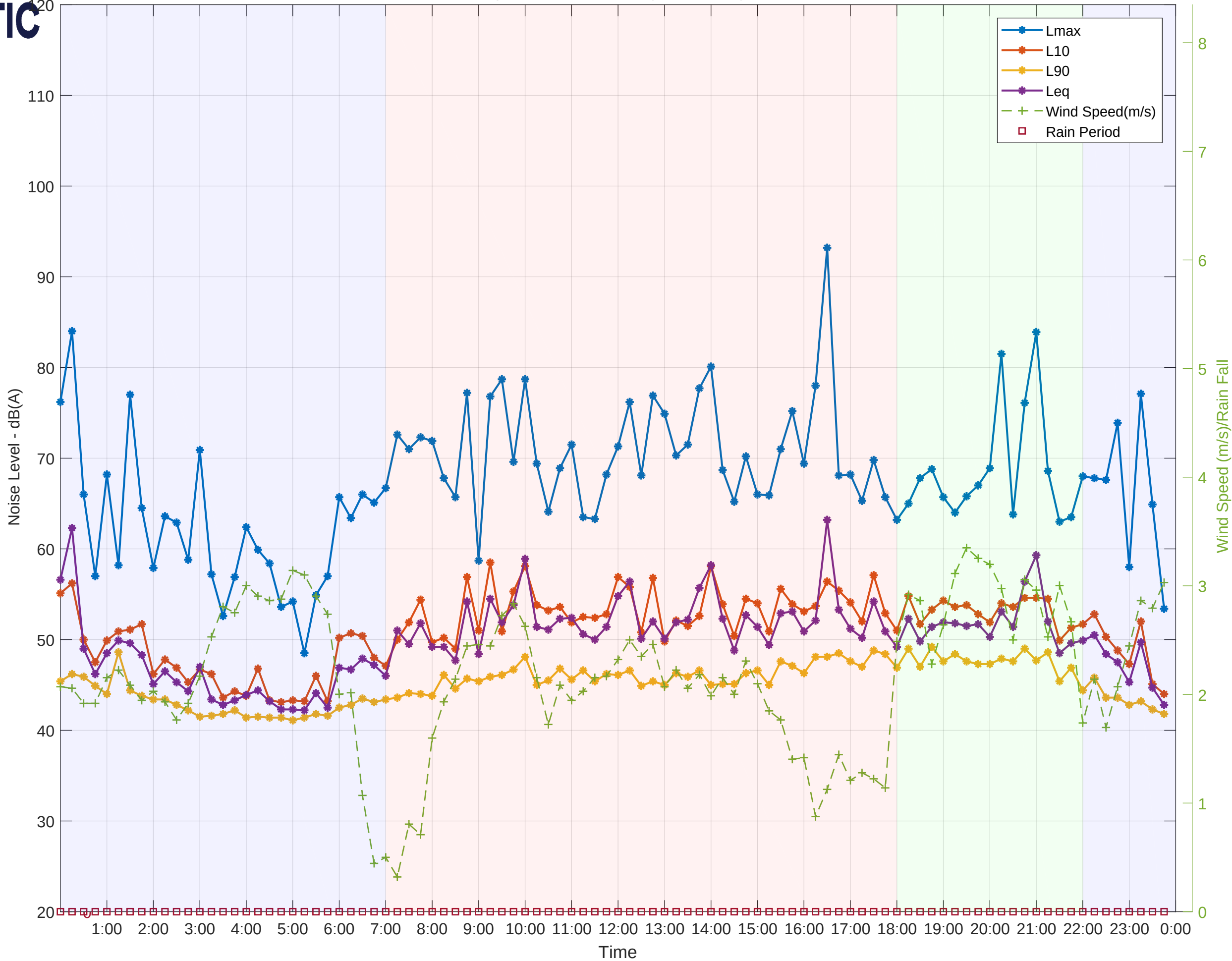


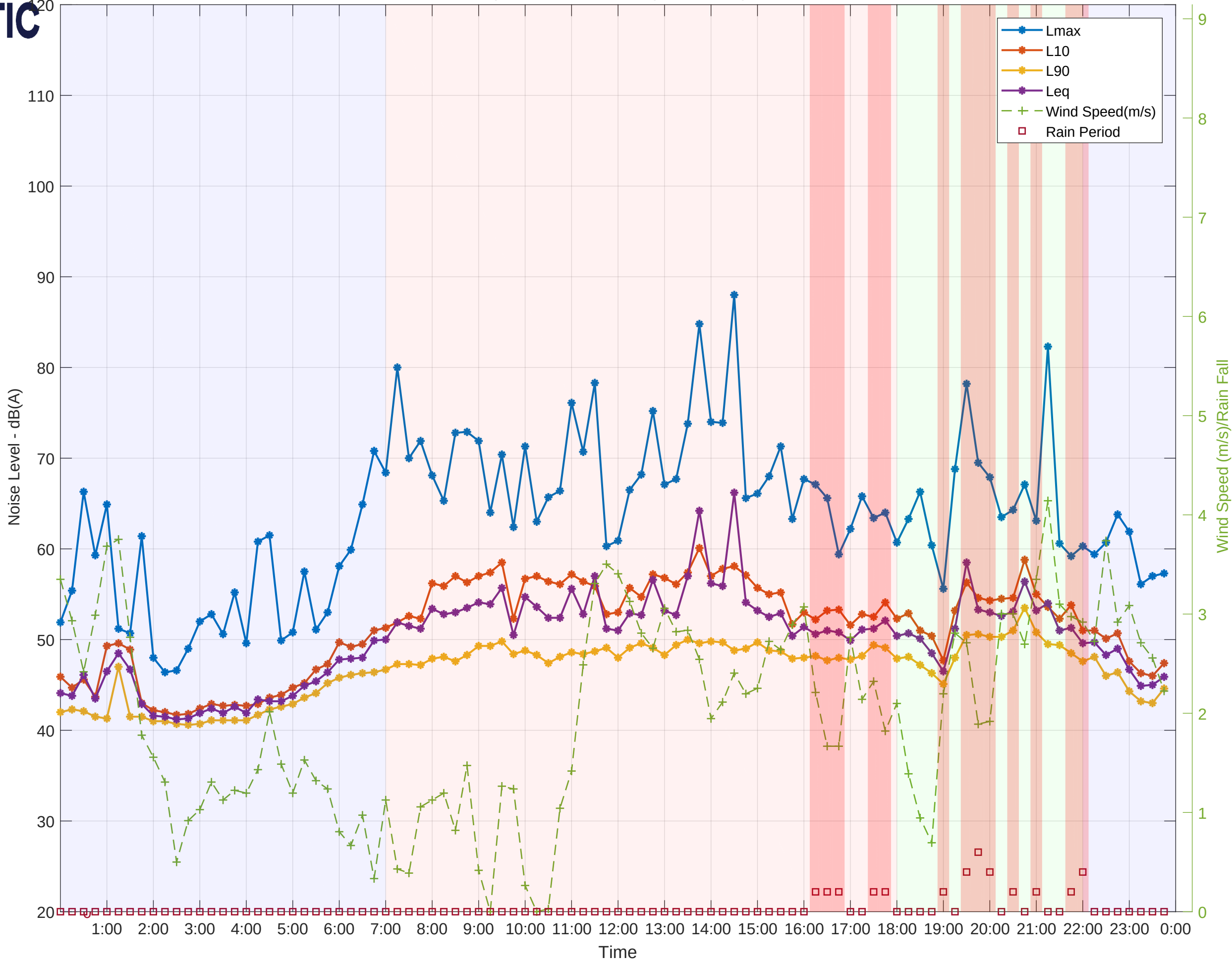


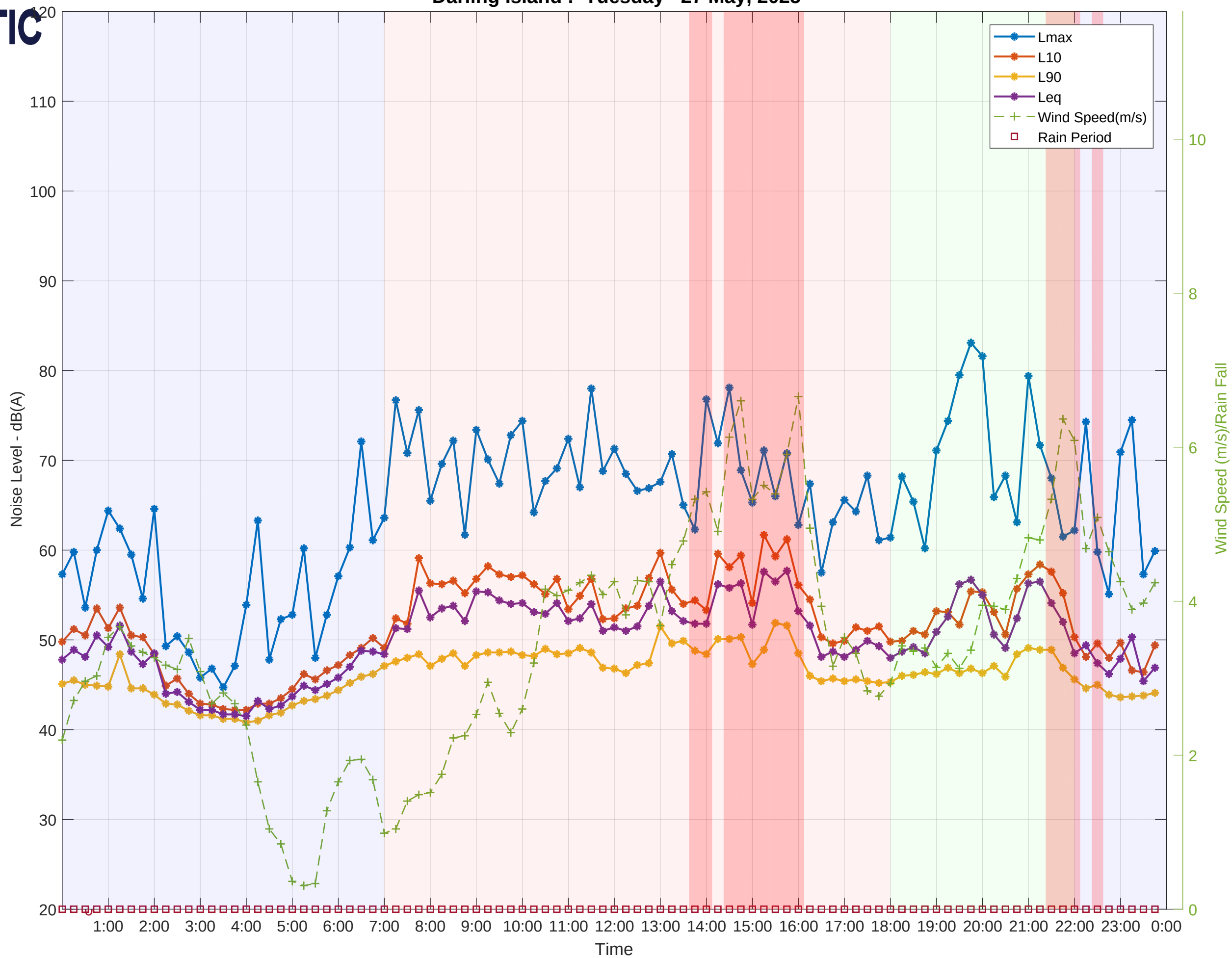


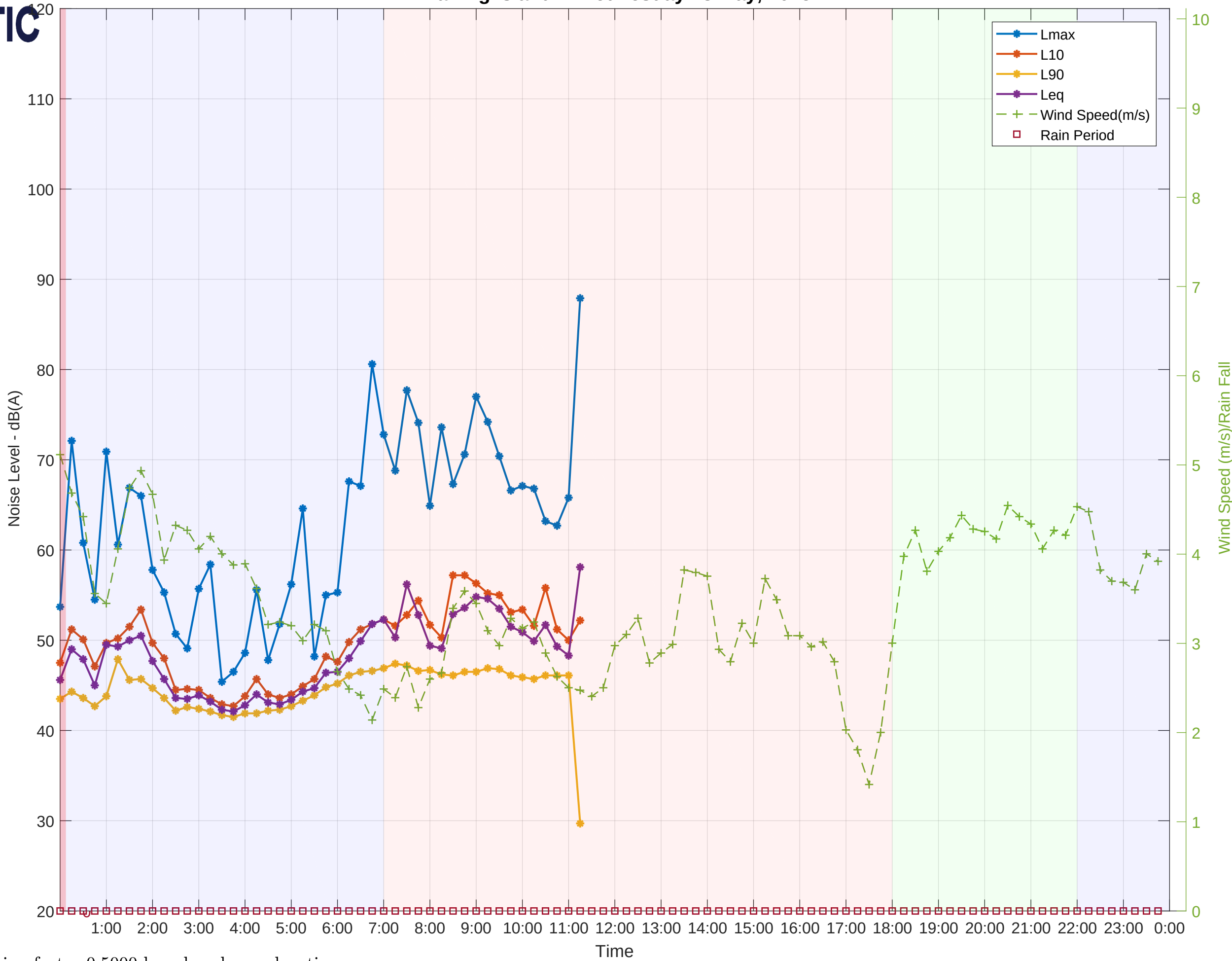






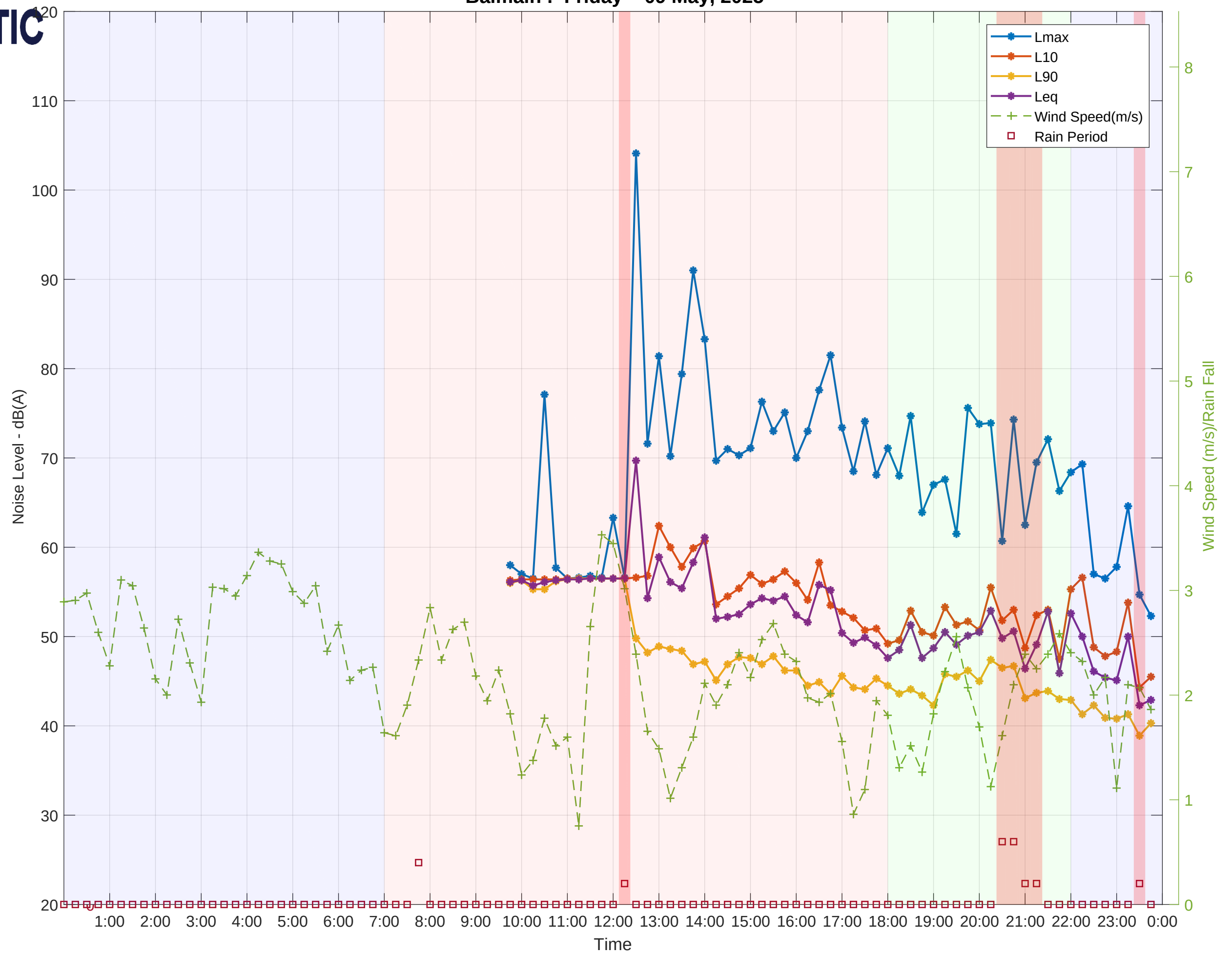


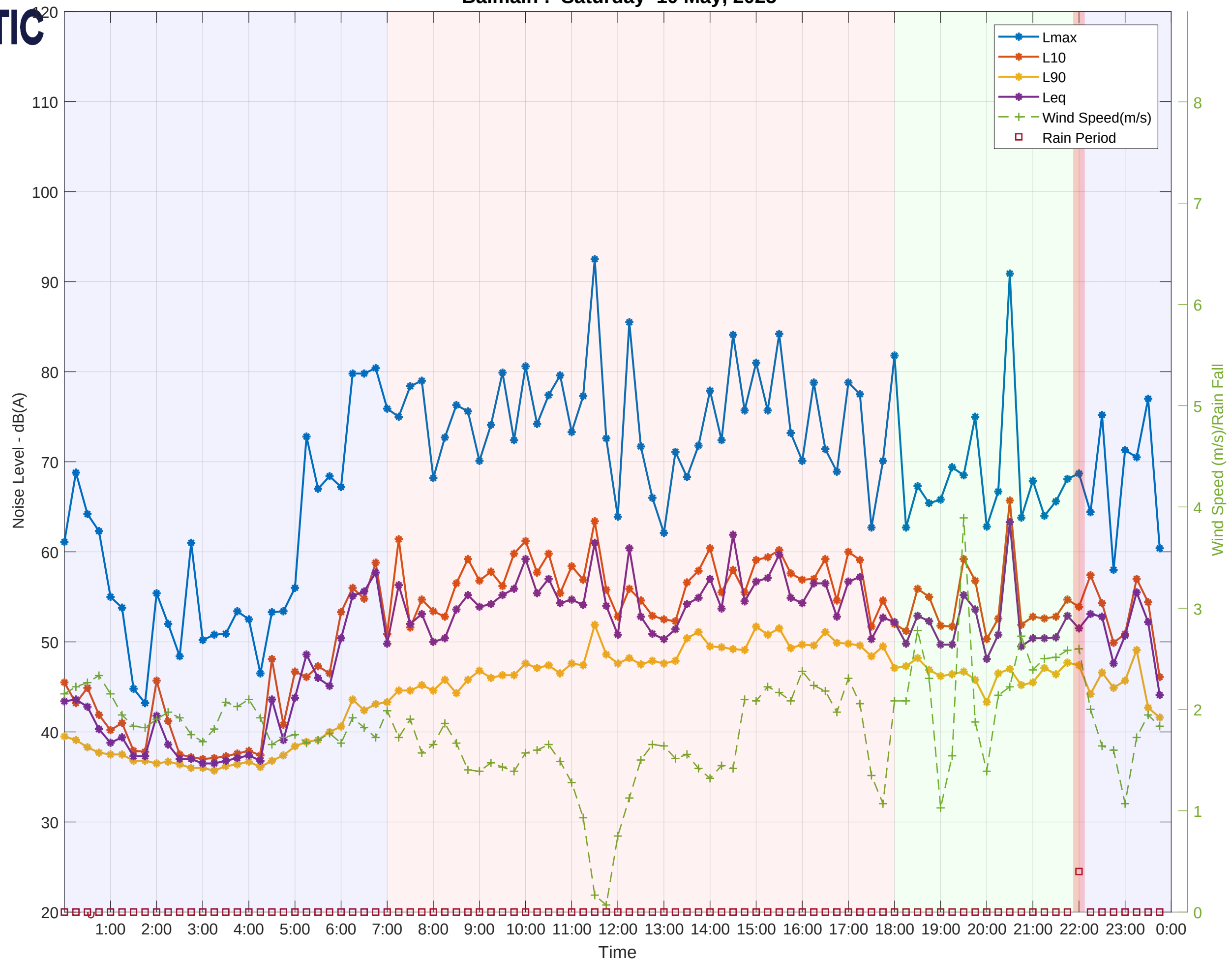


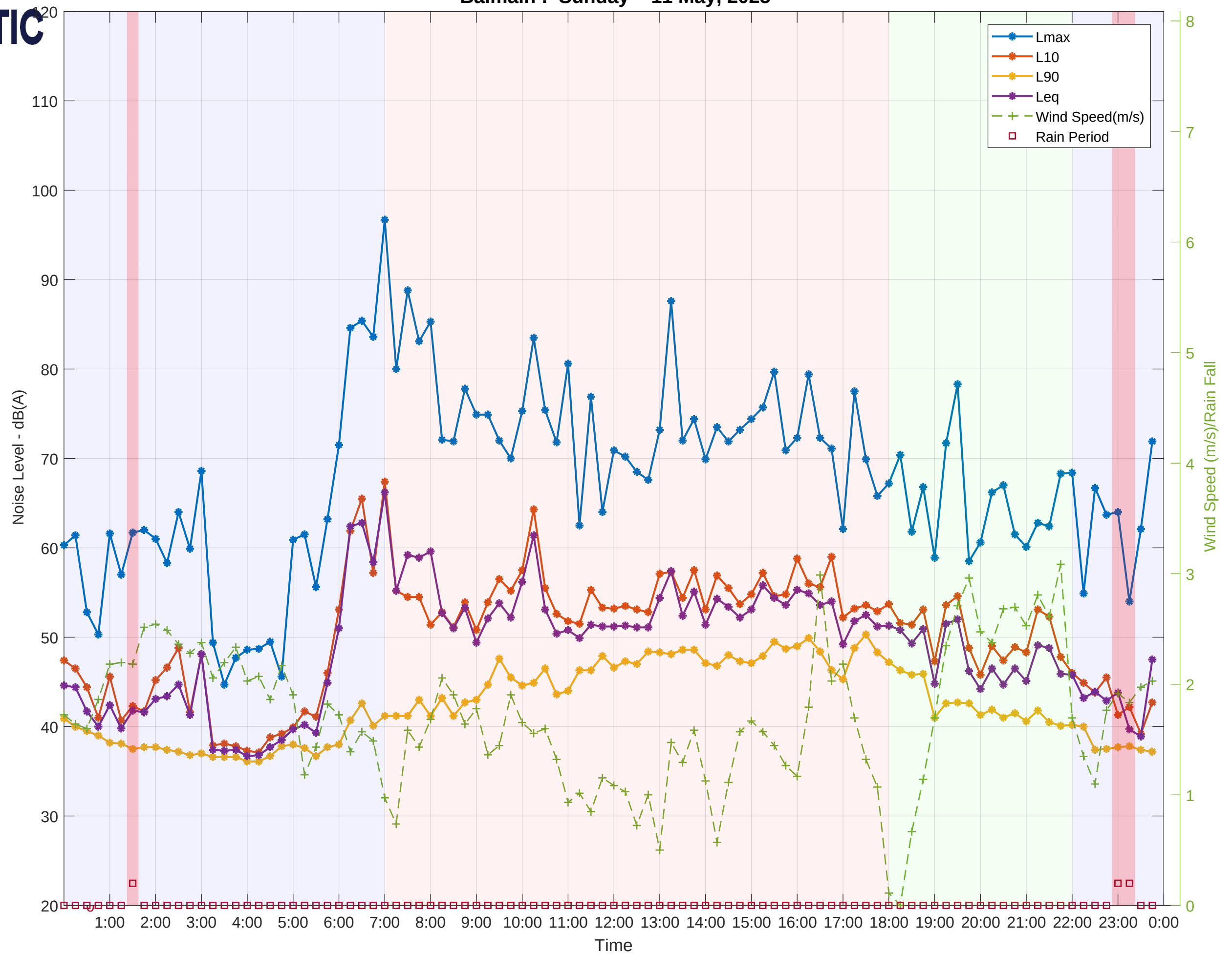


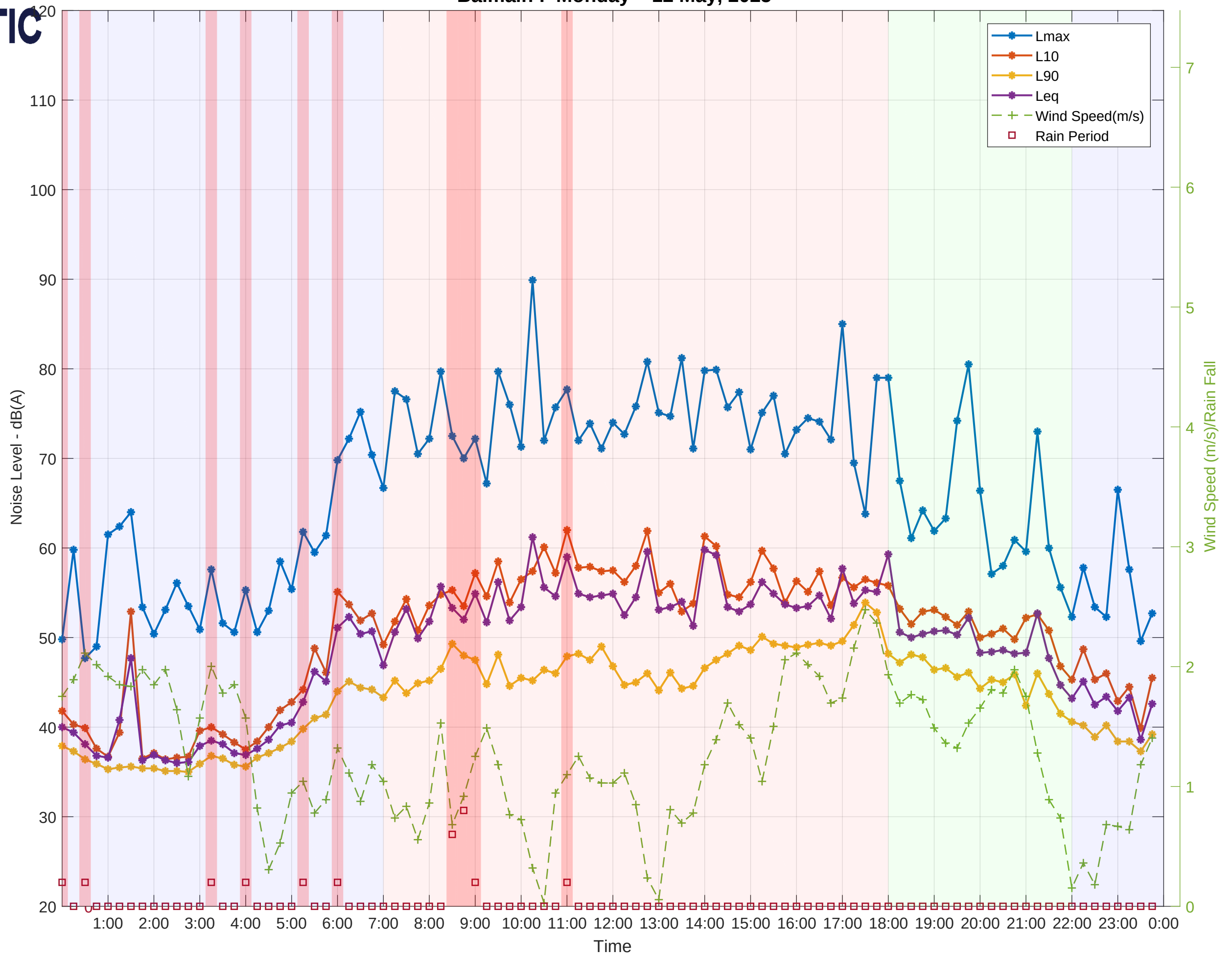
Wind Speed is corrected using factor 0.5000 based on logger location

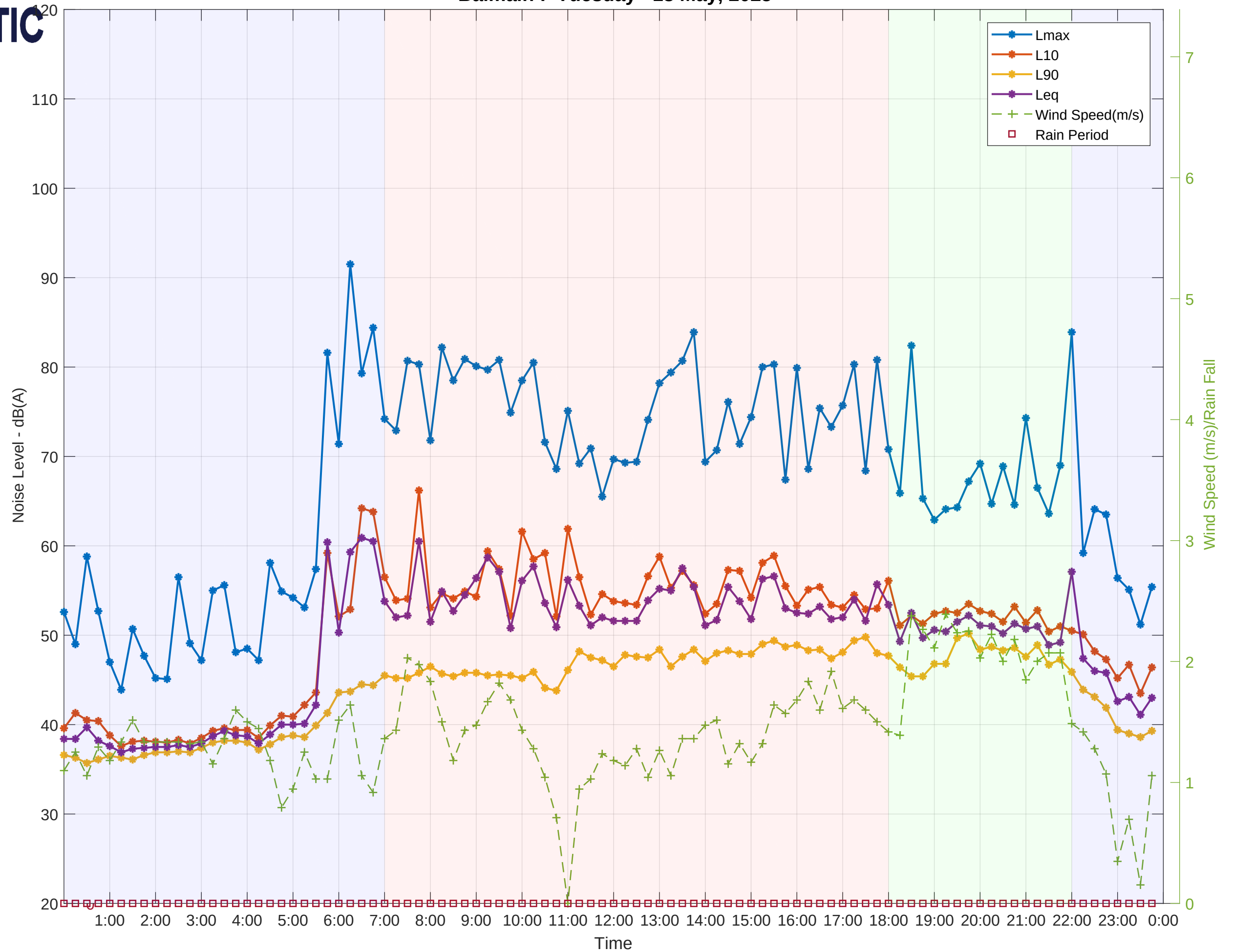
E.6 – MONITORING LOCATION #6

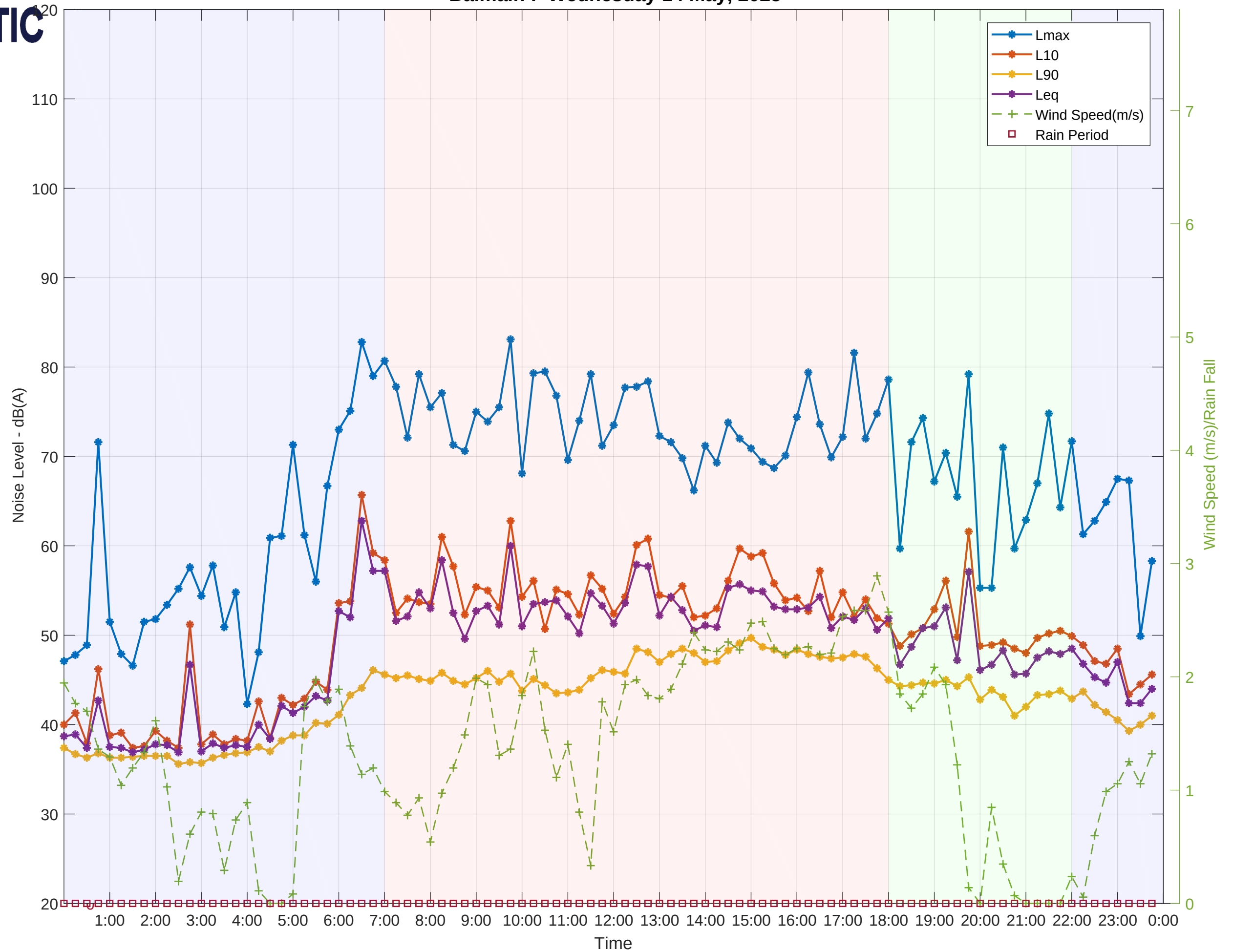


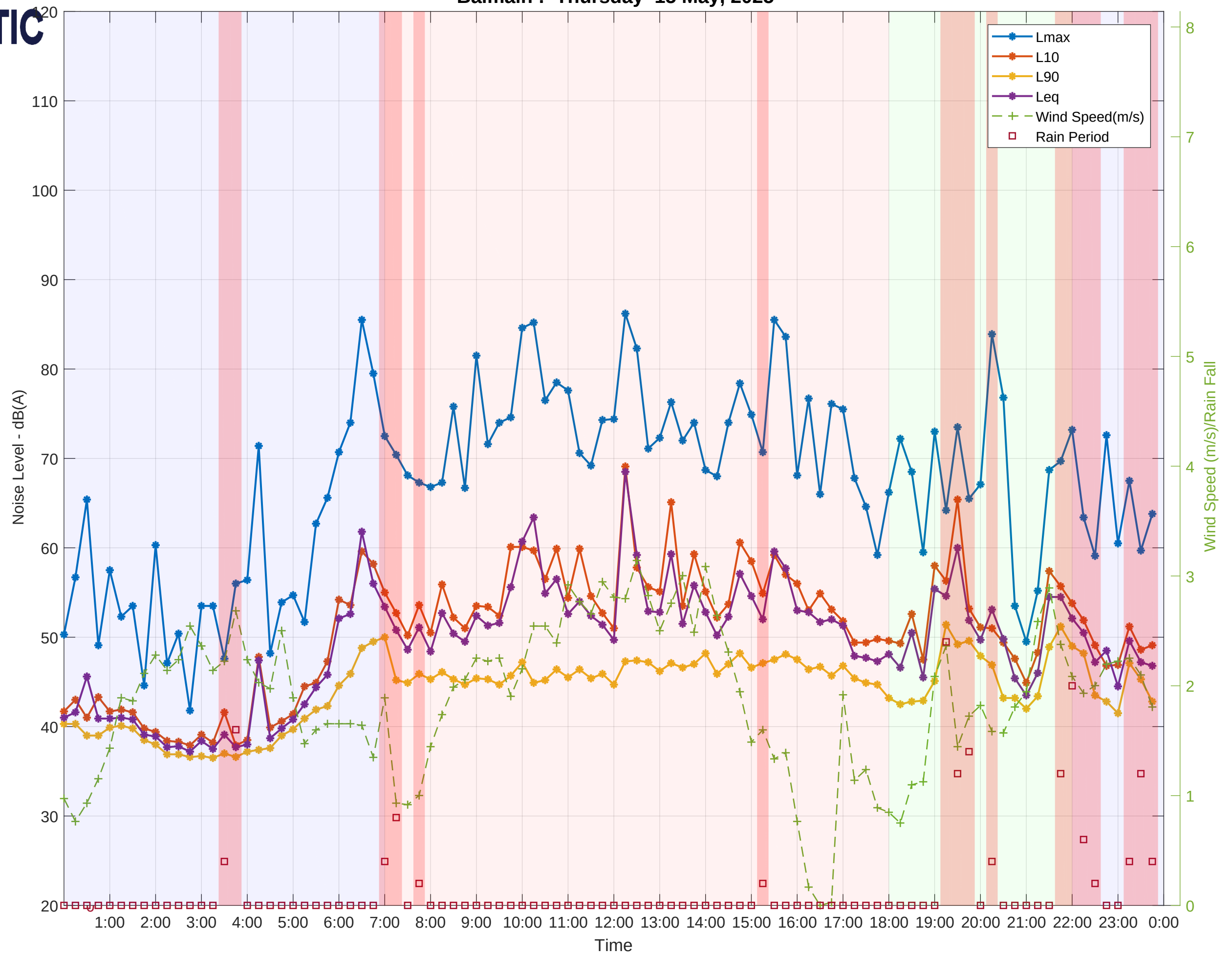


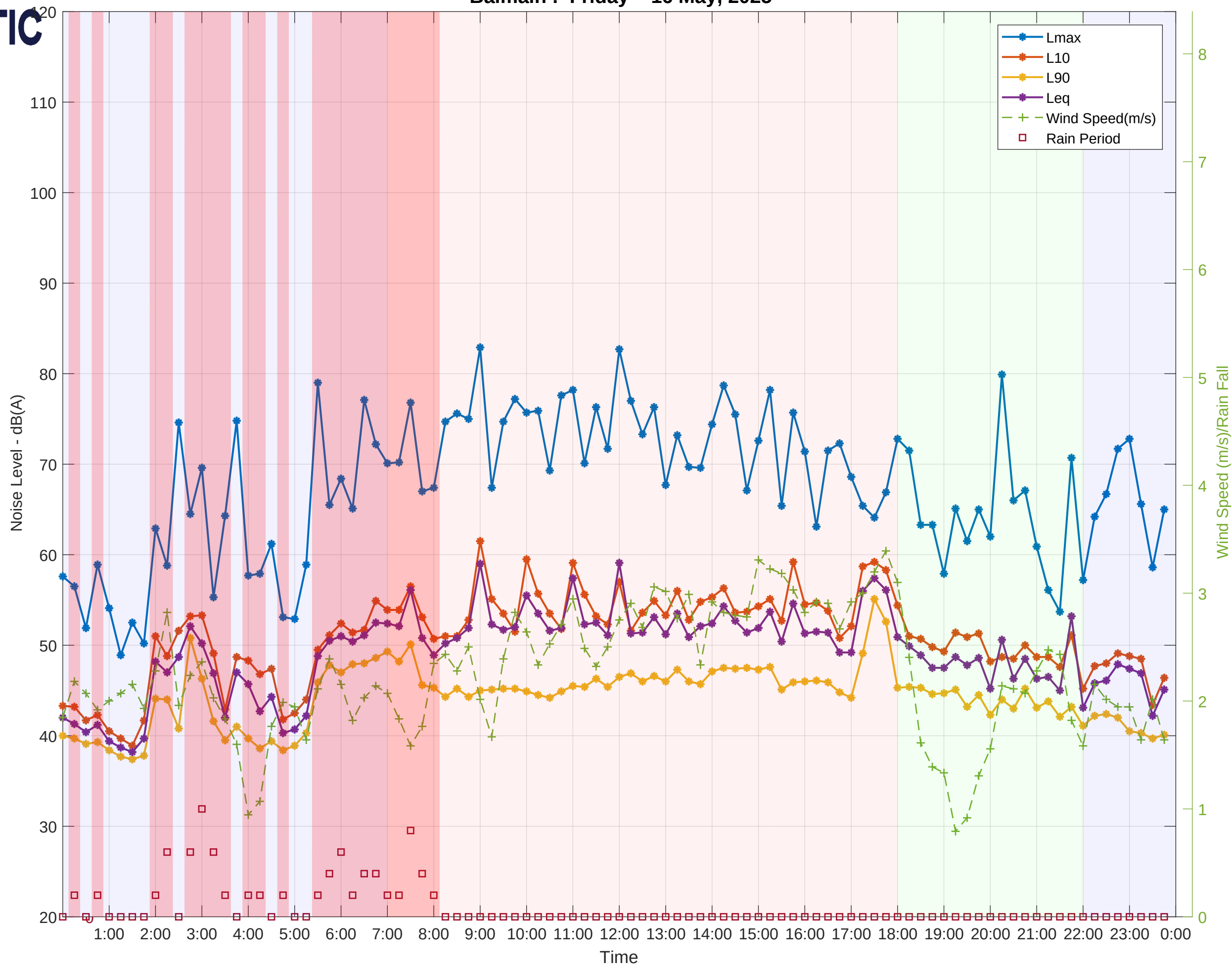


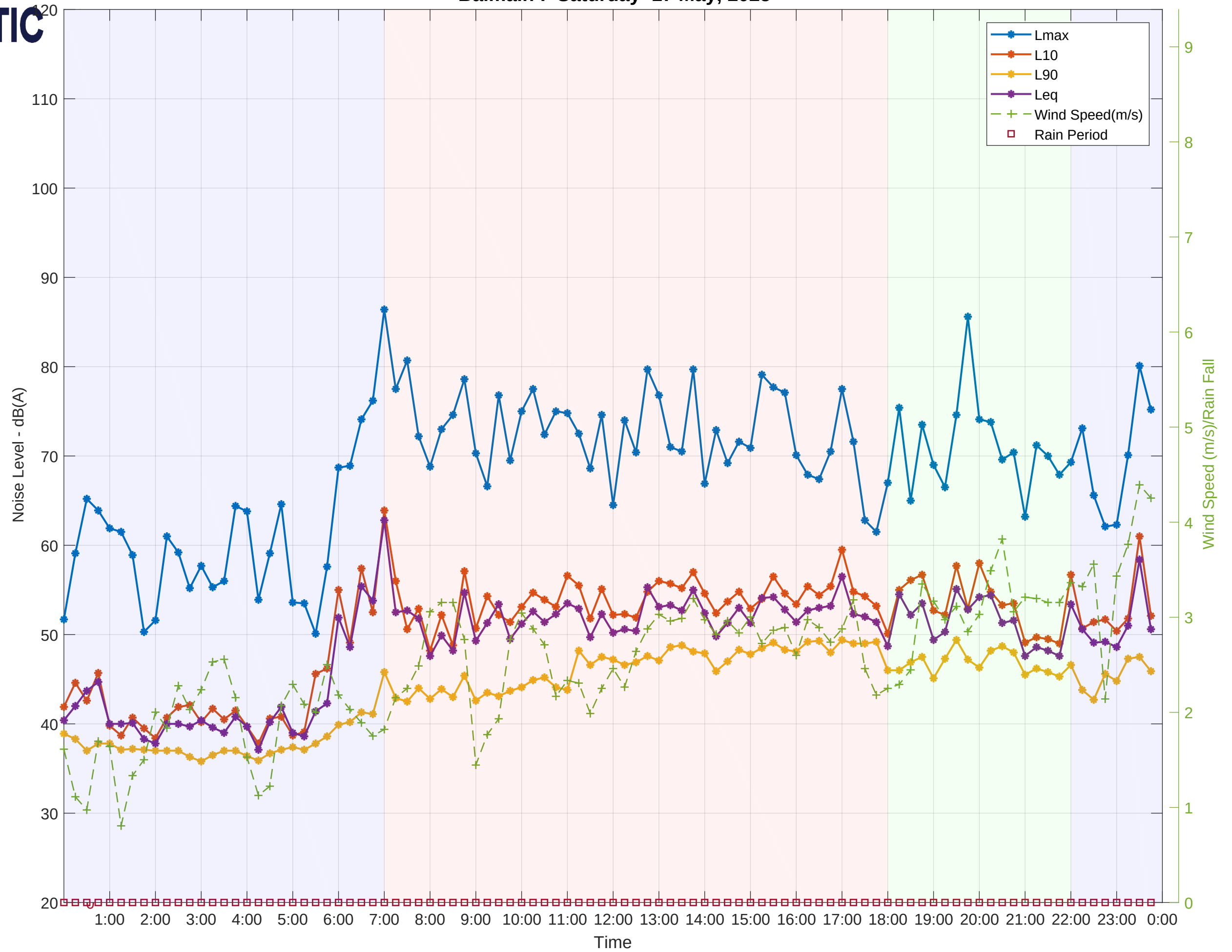


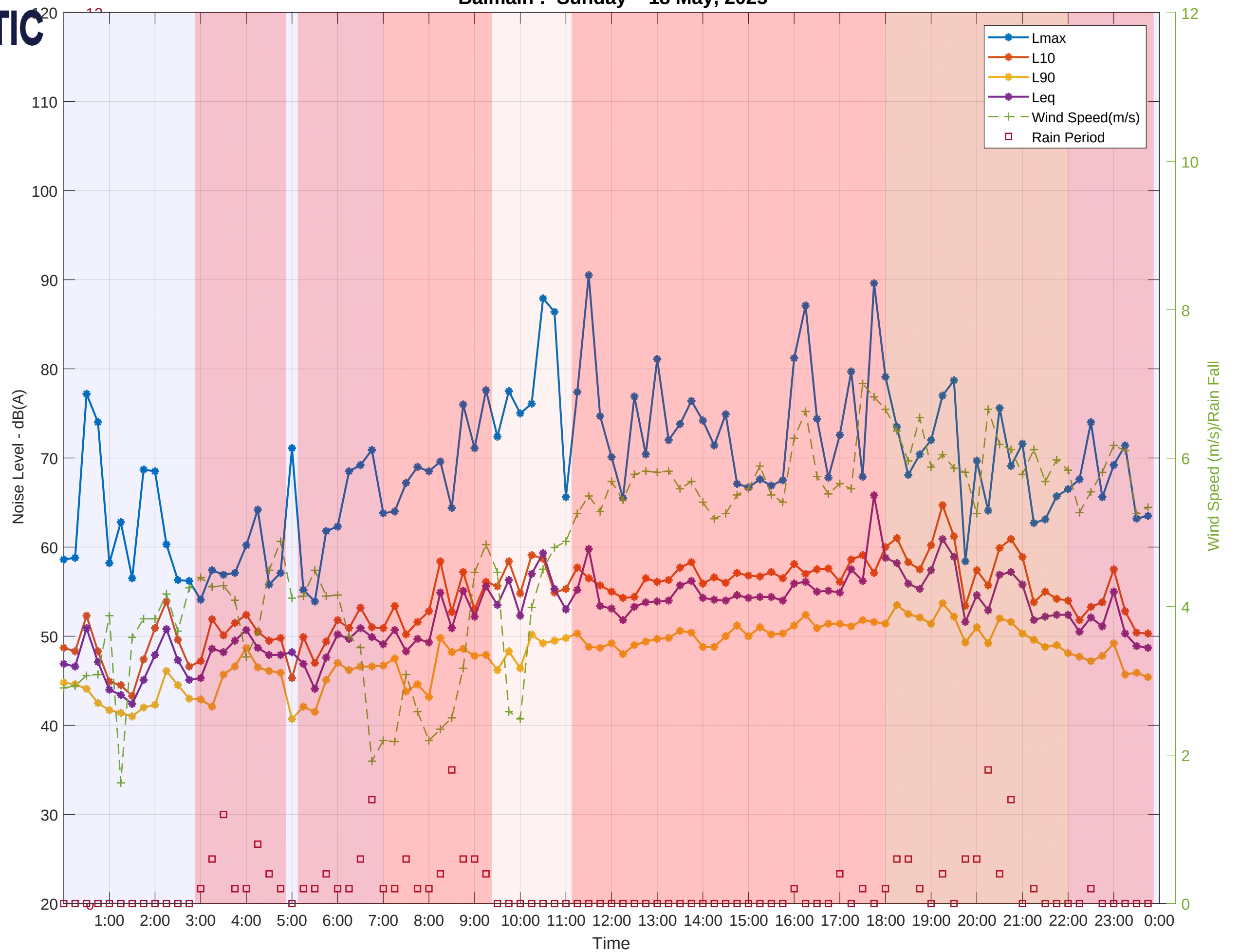


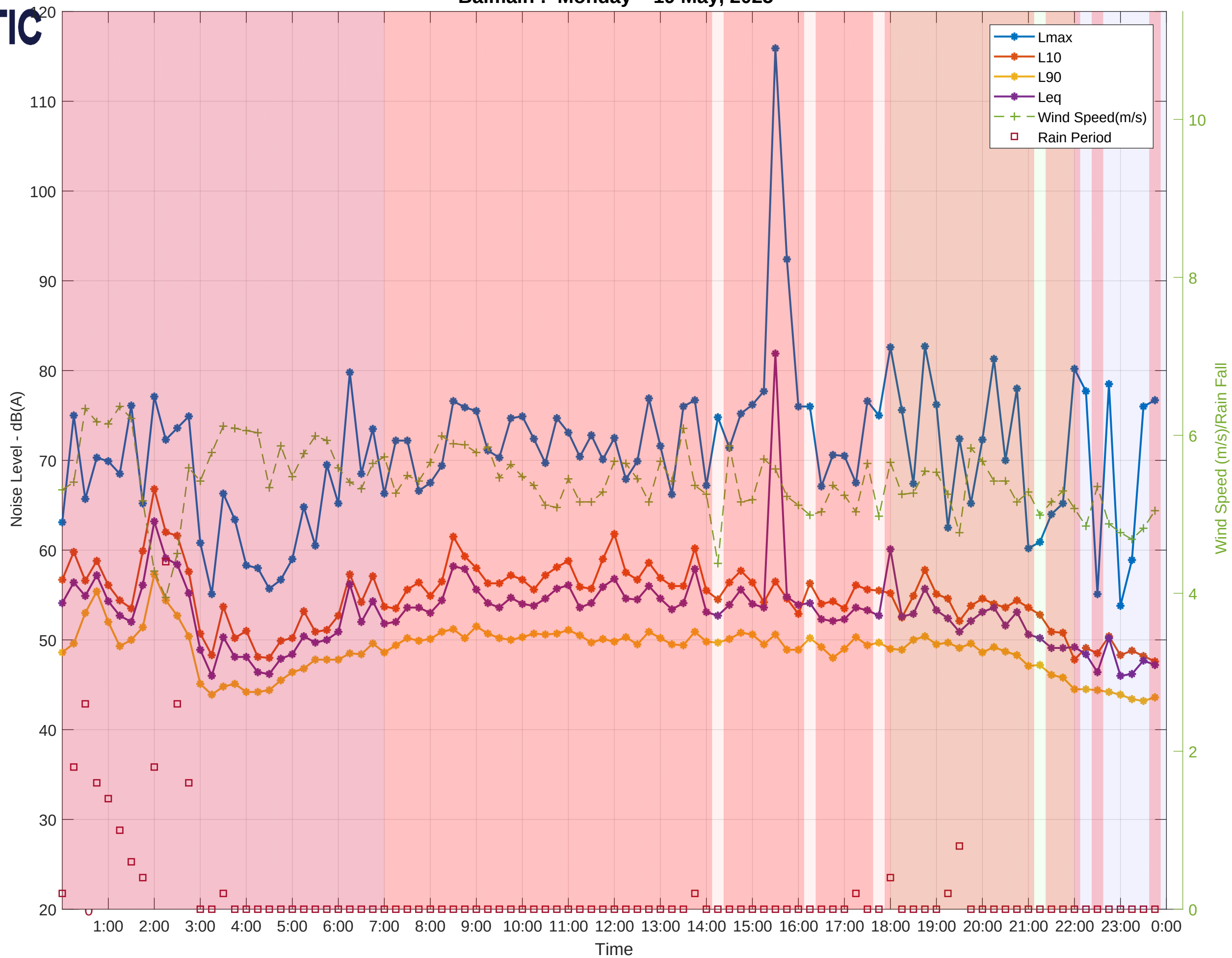


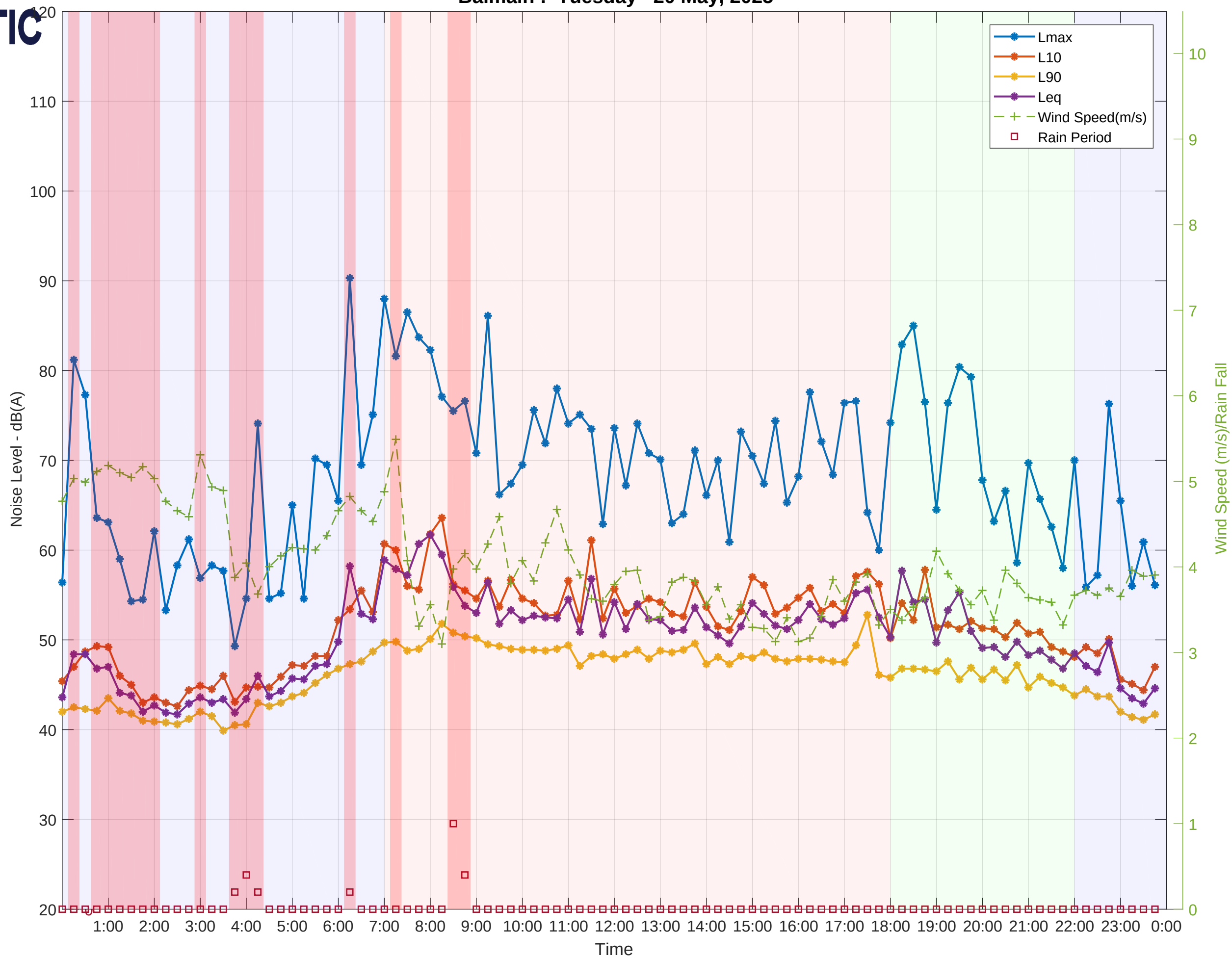


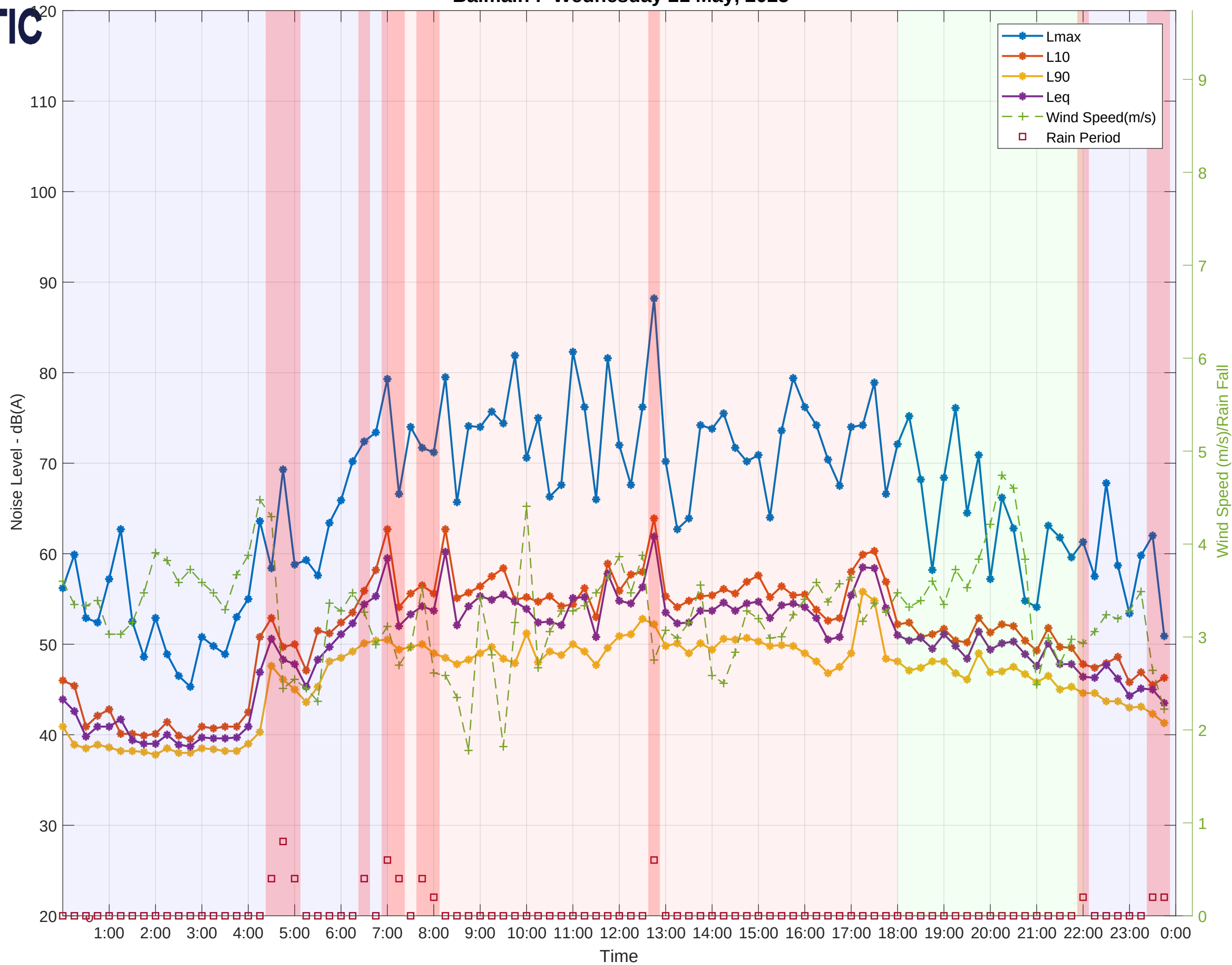




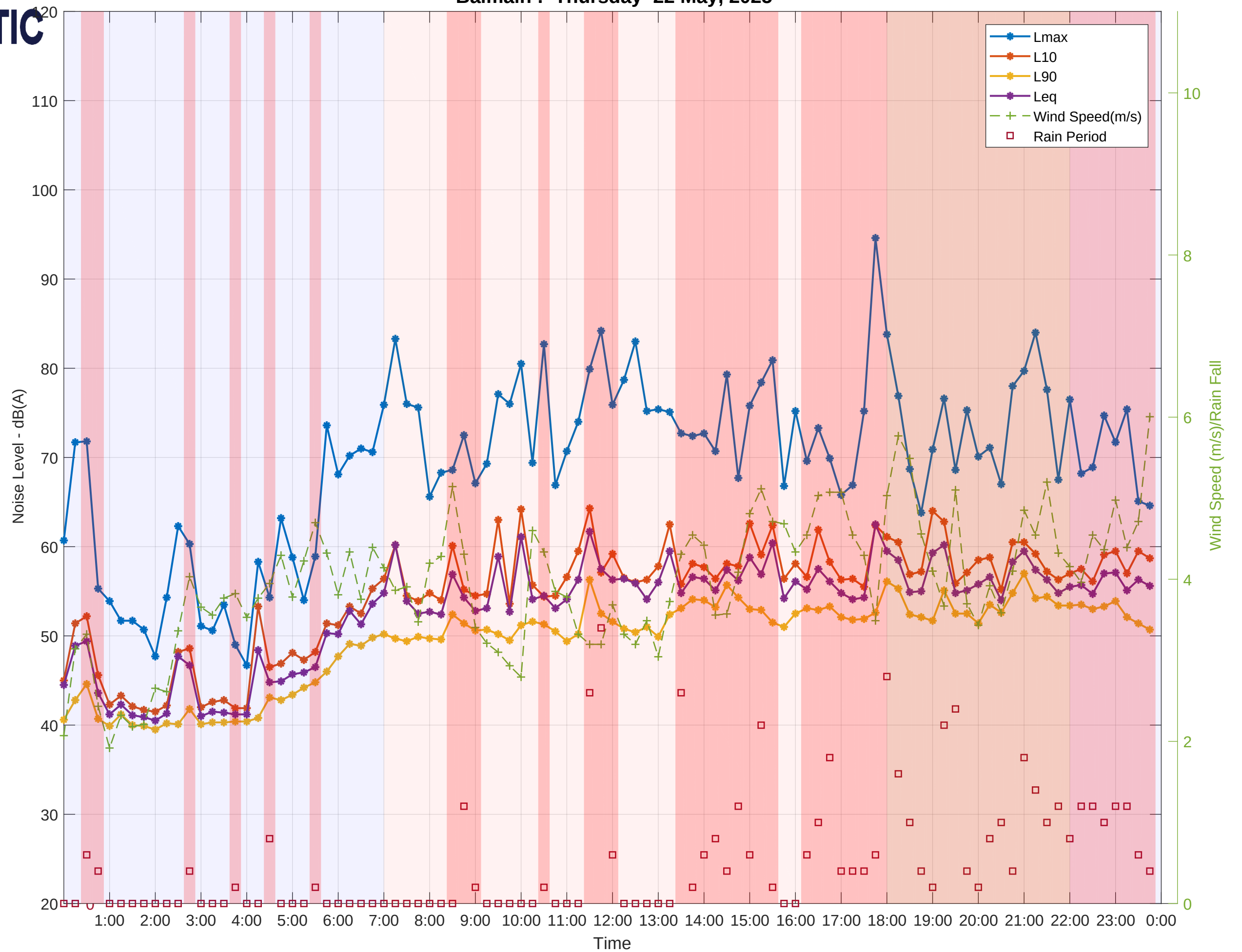


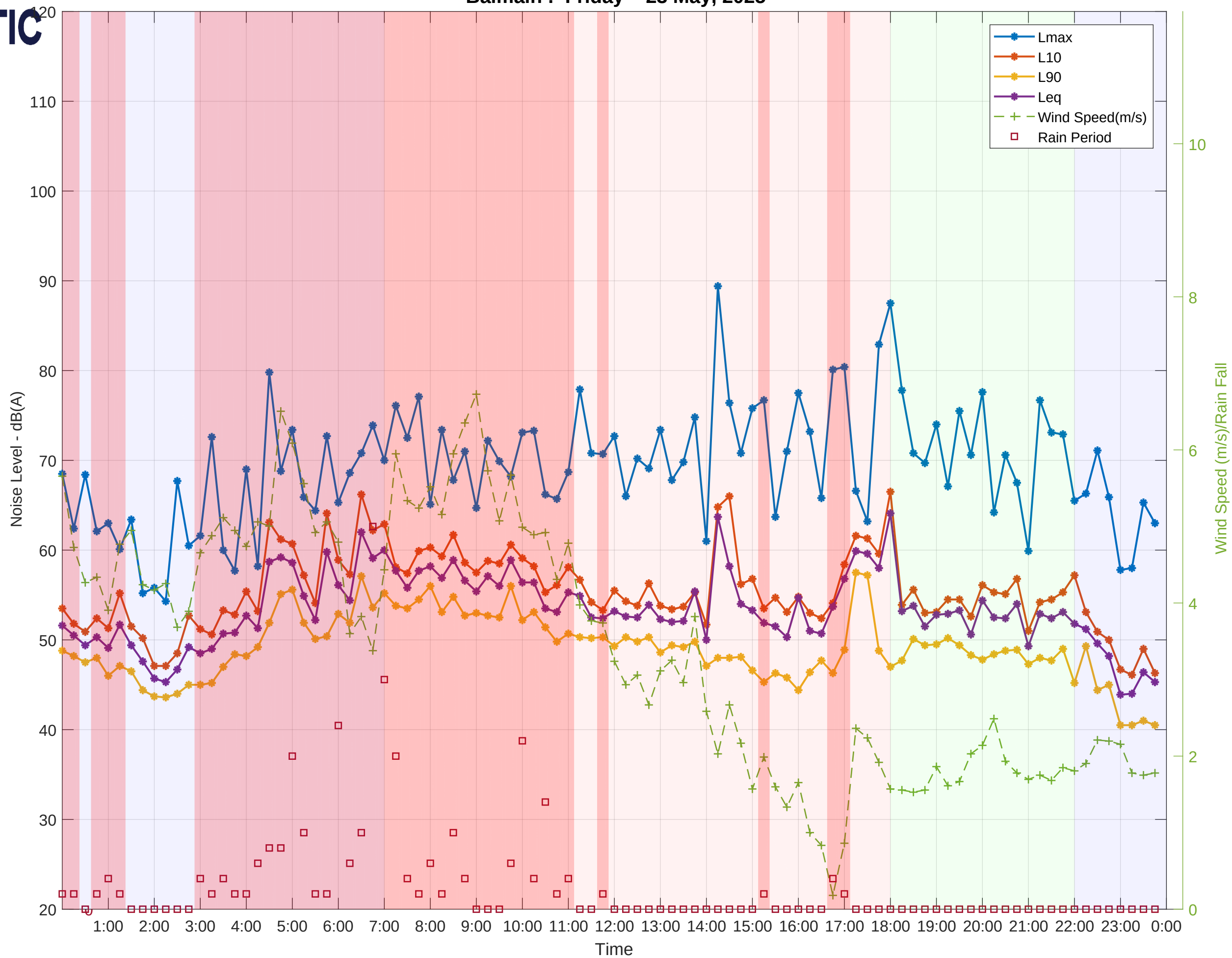


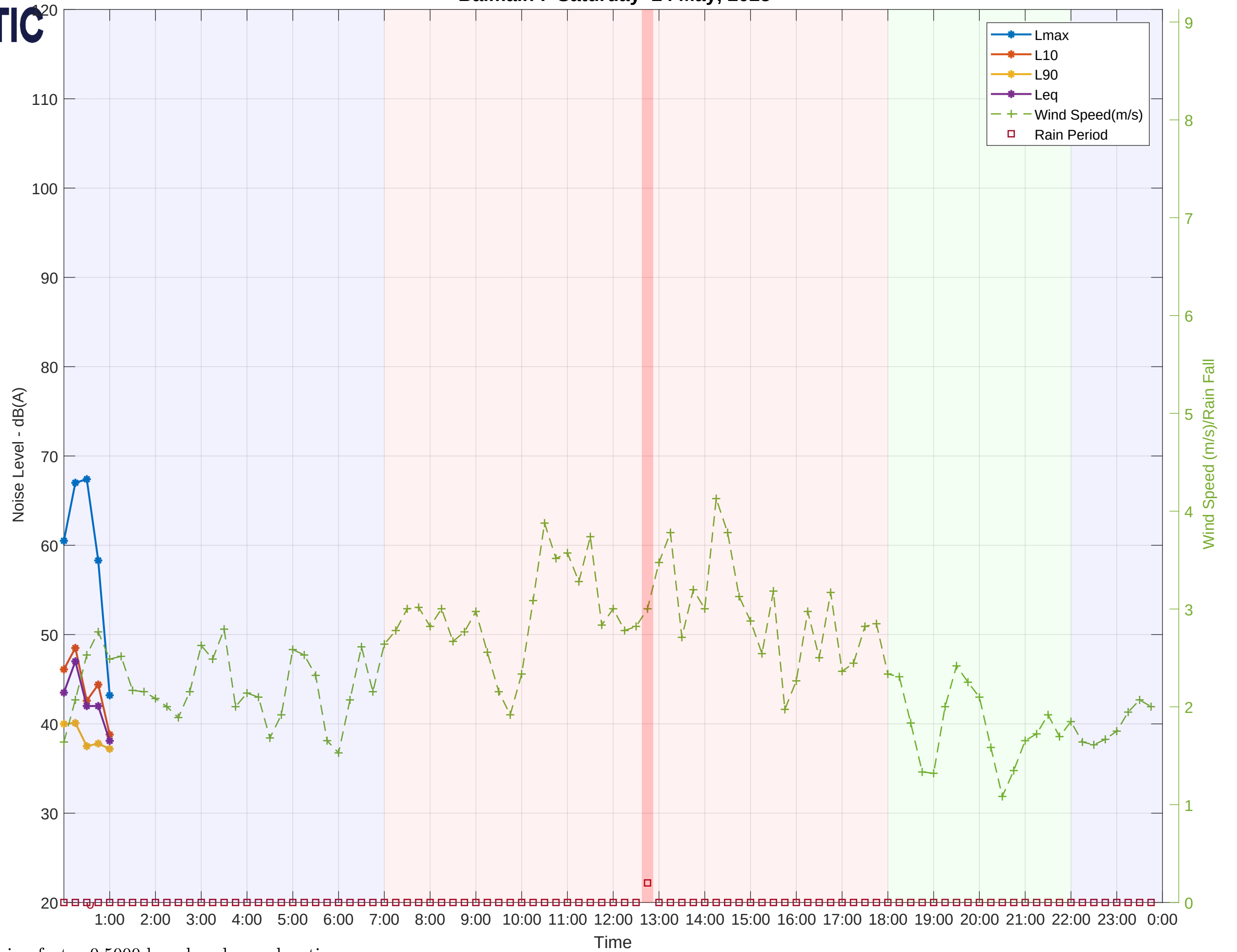




Balmain : Thursday 22 May, 2025







Wind Speed is corrected using factor 0.5000 based on logger location

APPENDIX F – INDICATIVE CONSTRUCTION NOISE AND VIBRATION MONITORING
LOCATION MARKUP



Figure 6 – Indicative Construction Monitoring Locations