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5 Skyline Place, Frenchs Forest (Stage 2)

DA Acoustic Assessment

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1 INTRODUCTION

Acoustic Logic has been engaged to provide an acoustic assessment for Stage 2 of the proposed seniors housing, disability housing and affordability housing development located at 5 Skyline Place, Frenchs Forest.

This report addresses noise impacts associated with the following:

- Traffic noise intrusion from Frenchs Forest Road East
- Noise emissions from:
    - Mechanical plant (in principle)
    - Outdoor communal area
    - Indoor communal areas

Acoustic Logic have utilised the following documents and regulations in the assessment of noise emanating from the development:

- Northern Beaches Council – *'Warringah Development Control Plan 2011'*
- Northern Beaches Council – *'Warringah Local Environment Plan 2011'*
- Australian and New Zealand AS/NZS 3671:1989 - *'Acoustics - Road traffic noise intrusion - Building siting and construction'*
- Australian and New Zealand AS/NZS 2107:2016 - *'Recommended design sound levels and reverberation times for building interiors'*
- NSW EPA – '*Noise Policy for Industry (NPfI) 2017*'
- NSW EPA – '*NSW Road Noise Policy*'

This assessment has been conducted using the preliminary architectural drawings, prepared by PA Studio (Issue A, dated 21/08/2020).

2 SITE DESCRIPTION

The proposed development, located at 5 Skyline Place, Frenchs Forest aims to create a community and blend of senior / disability / affordability housing for woman over the age of 55. Stage 1 of this development has already been approved under DA2018/0995, and this report assesses only Stage 2, which is approximately 7800m^2 in area and consists of the following:

- 133 seniors' units.
- 22 affordable / disability housing.
- Approx. 1,000m^2 of commercial space. Commercial space, similar to uses identified in Stage 1; Allied Health, Restaurant, Co-working Spaces, Dentistry, Hospital uses, Home care provision and /or day-care respite centres.

The site is located within the 'Business Park' zone (B7) under Warringah Local Environment Plan 2011. Onsite acoustic surveying has been carried out by this office on the surrounding environment. The nearest sensitive noise receivers around the project site include the following:

- Receiver 1 – Residential receivers situated north of the project site, across Frenchs Forest Road.
- Receiver 2 – Commercial receivers situated east of the project site (as part of the 'Business Park' zone)
- Receiver 3 – Commercial receivers situated south of the project site (as part of the 'Business Park' zone)
- Receiver 4 – Commercial receivers situated west of the project site (as part of the 'Business Park' zone)

A layout of the project site, measurement locations and receiver locations are summarised in Figure 1 below.

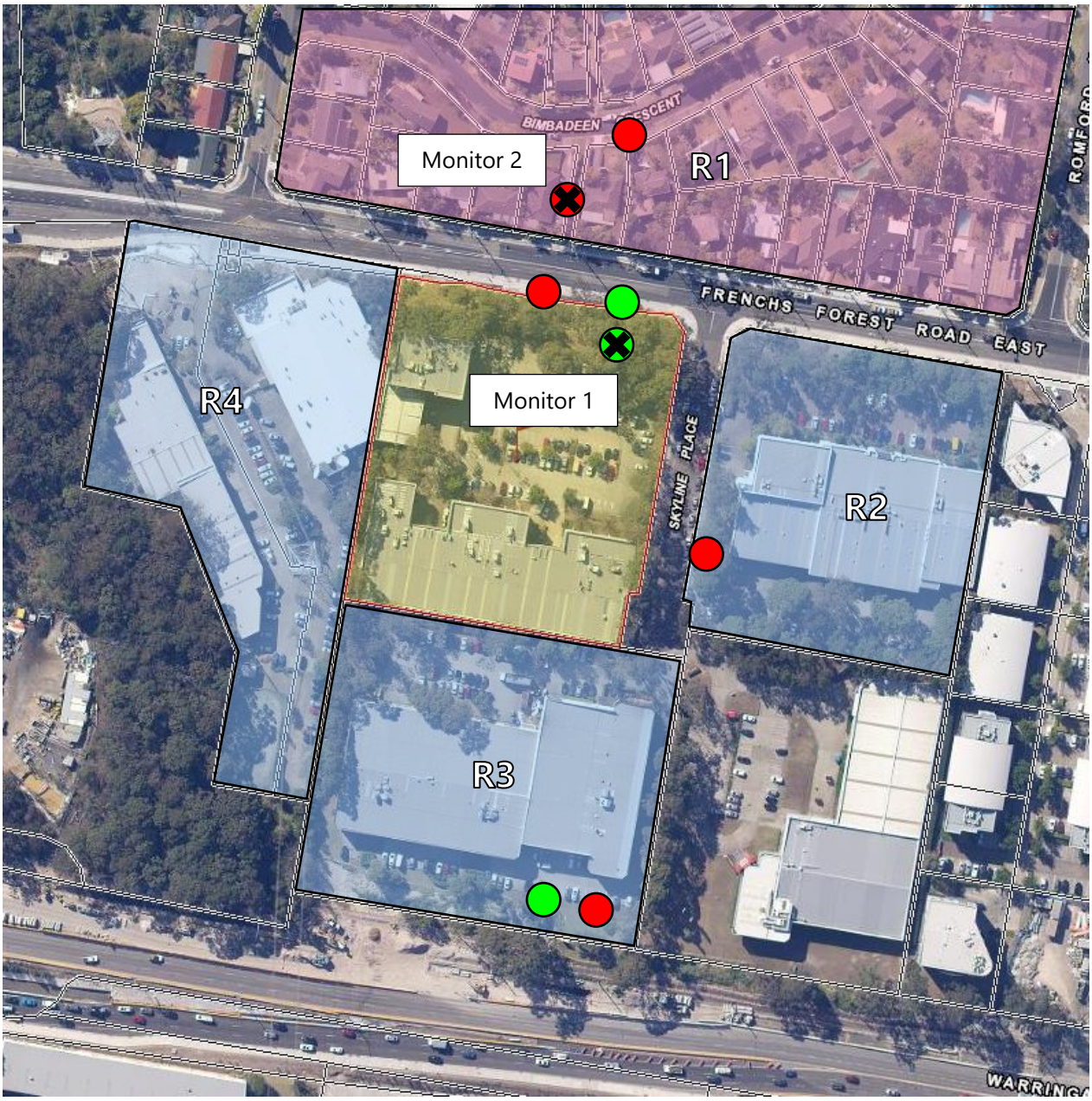


Figure 1 – Detail of Site Layout & Measurements (Source: SIX Maps NSW)

Proposed Site

Residential Receivers

Commercial Receivers

Unattended Noise Monitor (conducted for Stage 2)

Attended Noise Measurement (conducted for Stage 2)

Unattended Noise Monitor (previously conducted)*

Attended Noise Measurement (previously conducted)*

*Note: Previously conducted measurements for the project site have been presented in the Acoustic Report prepared by Wood & Grieve Engineers (project number. 32417-SYD-N, revision 2).

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}. The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15-minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

The L_{max} parameter represents the loudest noise event during a measurement period.

4 AMBIENT NOISE SURVEY

Background noise levels have been measured through both long-term noise monitoring and attended short-term measurements. These are detailed below.

4.1 MEASUREMENT EQUIPMENT

Long-term noise monitoring was undertaken with noise monitors provided Acoustic Research Laboratories Pty Ltd. The loggers were programmed to store 15-minute statistical noise levels throughout the monitoring period and was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

Attended measurements were undertaken to supplement the unattended noise monitoring. Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

4.2 MEASUREMENT LOCATIONS

Please refer to Figure 1.

4.3 MEASUREMENT PERIOD

The monitoring periods are as follows:

Conducted for Stage 2 (Monitor 1)

- Monitoring period was 11/01/2021 to 17/01/2021.
- Attended measurements were conducted on 11/01/2021.

Previously conducted by Wood & Grieve (Monitor 2)

- Monitoring period was 17/01/2018 to 24/01/2018.
- Attended measurements were conducted on 24/01/2018 and 04/05/2018.

4.4 MEASURED BACKGROUND NOISE LEVELS

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix A provides detailed results of the unattended noise monitoring. Adverse weather affected data was excluded from the assessment.

Based on the monitoring and measurements, the Rating Background Noise Levels (lowest 10^{th} percentile noise levels during operation time period) are established for the surrounding receivers and are presented in the table below.

Table 4-1 - Rating Background Noise Levels

Time of Day	Rating Background Noise Level dB(A)$L_{90(Period)}$	
	Monitor 1	**Monitor 2**
Day (7:00am-6:00pm)	50	41
Evening (6:00pm-10:00pm)	44	36
Night (10:00pm-7:00am)	33	35

5 EXTERNAL NOISE INTRUSION ASSESSMENT

Based on our survey around the project site, the main noise source is traffic noise from Frenches Forest Road East. Noise intrusion from this source will be assessed in accordance with criteria nominated in section 4.1 below.

5.1 NOISE INTRUSION CRITERIA

A noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria/standards:

- Northern Beaches Council – *'Warringah Development Control Plan 2011'*
- Northern Beaches Council – *'Warringah Local Environment Plan 2011'*
- Australian and New Zealand AS/NZS 3671:1989 - *'Acoustics - Road traffic noise intrusion - Building siting and construction'*
- Australian and New Zealand AS/NZS 2107:2016 - *'Recommended design sound levels and reverberation times for building interiors'*

5.1.1 Warringah DCP / LEP 2011

Warringah DCP / LEP 2011 does not stipulate any requirements in relation to noise intrusion for senior / disability / affordable housing developments. In this absence of this, the below Standards will be adopted to establish a requirement.

5.1.2 AS/NZS 3671:1989

Australian Standard AS/NZS 3671:1989 *'Acoustics—Road traffic noise intrusion—Building siting and construction'* notes the following in relation to traffic noise:

- Internal noise levels should be determined in accordance with AS/NZS 2107:2016 'Acoustics – Recommended design sound levels and reverberation times for building interiors'.
- A suitable descriptor should be adopted relevant to the use of the development. As AS2107:2016 adopts the L_{eq} descriptor, Acoustic Logic shall also use this descriptor.
- AS3671 does not specifically recommend a time interval. On this basis, Acoustic Logic have adopted the interval used by the EPA Road Noise Policy for main/arterial roads, that being:
    - Day – 7am to 10pm (15 hour); and
    - Night – 10pm to 7am (9 hour).
- Acoustic Logic have applied the daytime interval to the living/dining areas and the night time interval to the bedrooms of residential spaces.

Internal noise levels have been selected in accordance with AS 2107:2016, as presented in the below section.

5.1.3 AS/NZS 2107:2016

AS2107-2016 recommends design criteria for internal spaces within various types of spaces/occupancies to ensure a healthy, comfortable and productive environment for the occupant. As the standard does not present a design criteria for aged-care facilities, the design criteria for houses and apartments near minor roads will be used instead.

Table 5-1 – Recommended Design Sound Level

Occupancy/Activity Type Houses and Apartments near Minor Roads	Recommended Design Sound Level
Sleeping Areas (Night Time)	30-35 dB(A)L_{eq}
Living Areas	30-40 dB(A)L_{eq}

5.1.4 Summarised Internal Noise Criteria

The following maximum internal noise criteria is summarised below.

Table 5-2 – Summarised Maximum Internal Noise Criteria

Space /Activity Type	Maximum Internal Noise Criteria
Sleeping Areas	35 dB(A)$L_{eq(9hour)}$
Living Areas	40 dB(A)$L_{eq(15hour)}$

5.2 EXTERNAL NOISE MEASUREMENTS

This section of the report details noise measurements conducted at the site to establish road traffic environmental noise levels impacting the development.

5.2.1 Measurement Equipment

Attended short term measurements of traffic noise were undertaken by this office to supplement the unattended noise monitoring. Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

An unattended noise monitor (labelled as Monitor 1 in Figure 1) was installed onsite using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

5.2.2 Measurement Location

Monitor 1 was installed at 5 Skyline Place, Frenchs Forest, as indicated in Figure 1. The monitor was installed approximately 15m from the kerb and had a 180° view of the road.

A simultaneous attended noise measurement was also conducted along Frenchs Forest Road East, approximately 3m from the kerb and had a 180° view of the road.

5.2.3 Measurement Period

The monitoring periods are as follows:

- Monitoring period was 11/01/2021 to 17/01/2021.
- Attended measurement was conducted on 11/01/2021.

5.2.4 Measured Traffic Noise Measurements

Results of the unattended noise monitoring and measurements conducted at the project site have been summarised below. Values have been corrected for façade reflections were applicable. Further detailed results can be found in the appendix of this report.

Table 5-3 - Unattended Traffic Noise Measurements (Monitor 1)

Date	Daytime (7am-10pm) dB(A)$L_{eq(15hr)}$	Night Time (10pm-7am) dB(A)$L_{eq(9hr)}$
11/01/2021	-	51
12/01/2021	60	50
13/01/2021	61	52
14/01/2021	62	54
15/01/2021	65	51
16/01/2021	58	48
17/01/2021	58	-
Logarithmic Average	**61**	**51**

Table 5-4 – Attended Traffic Noise Measurements

Location	Time of Measurement	Measured Noise Level dB(A)L_{eq}
Frenchs Forest East 3m from kerb 180° view of the road	2:45pm – 3:00pm 11/01/2021	67 dB(A)$_{(15min)}$

Note: During the time of monitoring and measurements (shown above in Table 5-3 and 5-4), it can be reasonably assumed that traffic volumes along Frenchs Forest Road East is lower than normal due to the impact of COVID-19 as well as the fact that many residents may not have returned from holiday. As such, the presented traffic noise levels may be lower than what can be expected during normal conditions. To be conservative, the traffic noise levels which have been monitored previously at 22 Frenchs Forest Road East, Frenchs Forest in March 2018 have also been included as part of this assessment, with the results/details presented below.

Figure 2 – Measurement at 22 Frenchs Forest Road East (Source: SIX Maps NSW)

Proposed Site

Unattended Noise Monitor (previously conducted)*

*Note: Previously conducted measurements at 22 Frenchs Forest Road East have been presented in the Acoustic Report prepared by Acoustic Logic (document ref.: 20180310.1/1004A/R1/JR, dated 10/04/2018).

Table 5-5 - Unattended Traffic Noise Measurements (22 Frenchs Forest Road East)

Date	Daytime (7am-10pm) dB(A)$L_{eq(15hr)}$	Night Time (10pm-7am) dB(A)$L_{eq(9hr)}$
09/03/2018	-	56
10/03/2018	60	53
11/03/2018	58	56
12/03/2018	62	60
13/03/2018	63	59
14/03/2018	64	58
15/03/2018	62	58
Logarithmic Average	**61**	**57**

5.2.5 Summarised Traffic Noise Levels

The existing traffic noise levels listed in the table below were determined based on the recently and previously conducted monitoring/measurements presented above.

Table 5-6 – Summarised Traffic Noise Levels

Location	Summary of Measured Existing Traffic Noise Level	
	Daytime	Night Time
5 Skyline Place (Monitor 1)	61 dB(A)$L_{eq(15hr)}$	51 dB(A)$L_{eq(9hr)}$
	62 dB(A)$L_{eq(1hr)}$	55 dB(A)$L_{eq(1hr)}$
22 Frenchs Forest Road East	61 dB(A)$L_{eq(15hr)}$	57 dB(A)$L_{eq(9hr)}$
	64 dB(A)$L_{eq(1hr)}$	61 dB(A)$L_{eq(1hr)}$

5.3 NOISE INTRUSION ANALYSIS

Traffic noise intrusion into the proposed development was assessed using the highest measured noise levels from the two locations presented above.

Calculations were undertaken taking into account the location of measurements, orientation of windows, barrier effects *(where applicable)*, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

5.4 RECOMMENDED CONSTRUCTIONS

5.4.1 Glazed Windows and Doors

The following constructions are recommended to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-Lon type acoustic seals. (Note: Mohair Seals are not considered acoustic seals).

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

The recommended constructions are listed in Table 6 below.

Table 5-7 - Glazing Thickness Requirements

Façade	Level	Space	Glazing Construction	Acoustic Seals
All	All	Bedroom/Living	6mm Float	Yes

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the R_W rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in Table 7 for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

Table 5-8 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_W of Installed Window
6mm Float	29

5.4.2 Roof/Ceiling Construction

Roof constructions of masonry system (e.g. concrete slab) will be acoustically acceptable without additional treatment.

If any penetrations are required through any of the external lining of any of the systems above for other building services, all gaps should be filled with acoustic sealant to ensure compliance with internal noise level requirements.

5.4.3 External Wall Construction

External wall constructions of masonry system (e.g. brick, Hebel, etc.) will be acoustically acceptable without additional treatment.

If any penetrations are required through any of the external lining of any of the systems above for other building services, all gaps should be filled with acoustic sealant to ensure compliance with internal noise level requirements.

6 NOISE EMISSION CRITERIA

Noise emissions from the project site will be assessed against the requirements of the following:

- Northern Beaches Council – *'Warringah Development Control Plan 2011'*
- Northern Beaches Council – *'Warringah Local Environment Plan 2011'*
- NSW EPA – '*Noise Policy for Industry (NPfI) 2017'*

6.1 WARRINGAH DCP / LEP 2011

Warringah DCP / LEP 2011 states the following requirements in relation to noise emissions.

D3 Noise

Requirements

1. Noise from combined operation of all mechanical plant and equipment must not generate noise levels that exceed the ambient background noise by more than 5dB(A) when measured in accordance with the NSW Industrial Noise Policy at the receiving boundary of residential and other noise sensitive land uses.

6.2 EPA NOISE POLICY FOR INDUSTRY (NPFI)

The EPA NPfI provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The NPfI has two requirements which must both be complied with, namely an amenity criterion and an intrusiveness criterion.

6.2.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A).

To be conservative, the lower background noise levels out of the two noise monitors (as presented in Table 4-1) have been adopted to determine the project intrusiveness noise level below.

Table 6-1 - NPfI Project Intrusiveness Criteria

Receiver	Time of Day	Background Noise Level dB(A)$L_{90(Period)}$	Project Intrusiveness Noise Level dB(A)$L_{eq(15min)}$
Residential Receivers (R1)	Day (7:00am-6:00pm)	41	46
	Evening (6:00pm-10:00pm)	36	41
	Night (10:00pm-7:00am)	33	38

6.2.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment (e.g. cumulative noise from project site and other developments).

The EPA's NPI sets out acceptable noise levels for different residential areas, being rural, suburban and urban. When determining types of residential receiver, the NPI considers the land zoning, existing noise levels and environmental noise characteristics of the area being assessed. Based on the measured noise levels and environmental noise characteristics, the 'Suburban' classification is most appropriate and has been selected.

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

Project Amenity Noise Level dB(A)$L_{eq(15min)}$ = Recommended Amenity Noise Level – 5 dB(A) + 3 dB(A)

Table 6-2 - NPfI Project Amenity Criteria

Receiver	Time of Day	Recommended Amenity Noise Level dB(A)$L_{eq(15min)}$	Project Amenity Noise Level dB(A)$L_{eq(15min)}$
Residential Receivers (R1)	Day (7:00am-6:00pm)	55	53
	Evening (6:00pm-10:00pm)	45	43
	Night (10:00pm-7:00am)	40	38
Commercial Receivers (R2, R3, R4)	When in use	65	63

6.2.3 Sleep Disturbance Criterion

The NPfI recommends the following noise limits to mitigate sleeping disturbance:

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

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

  a detailed maximum noise level even assessment should be undertaken.

The following sleep emergence noise objectives then apply.

Table 6-3 - Sleep Disturbance Criteria for Residential Receivers

Residential Receiver	Rating Background Noise Level (Night) dB(A)L_{90}	Emergence Level
Residential Receivers (R1)	33	40 dB(A) $L_{eq(15min)}$; 52 dB(A) L_{Fmax}

If there are noise events that could exceed the emergence levels detailed in the table above, then an assessment of sleep arousal impact is required to be carried out, taking into account the level and frequency of noise events during the night, existing noise sources, etc. This more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

For the research on sleep disturbance to date it can be concluded that:

- *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
- *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

6.2.4 Summarised Noise Emission Criteria (Mechanical Plant)

Table 6-4 - Summary of Noise Emission Criteria

Receiver	Time of Day	Project Intrusiveness dB(A)$L_{eq(15min)}$	Project Amenity dB(A)$L_{eq(15min)}$	Sleep Disturbance
Residential Receivers (R1)	Day (7:00am-6:00pm)	**46**	53	N/A
	Evening (6:00pm-10:00pm)	**41**	43	N/A
	Night (10:00pm-7:00am)	**38**	**38**	**40 dB(A)$L_{eq, 15min}$; 52 dB(A) L_{Fmax}**
Commercial Receivers (R2, R3, R4)	When in use	N/A	**63**	N/A

The project noise trigger levels have been selected (and bolded above) as the lower out of the intrusiveness and amenity criteria.

7 NOISE EMISSION ASSESSMENT

7.1 MECHANICAL PLANT NOISE

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services plant to the closest receivers are to comply with the noise emission criteria stipulated above.

7.2 OUTDOOR COMMUNAL AREA

7.2.1 Assumptions and Noise Levels

An outdoor communal space (community garden) is located on Level 6 of the eastern building (closer to Skyline Place). Noise emission predictions will be based on the following assumptions.

- The average sound power level per resident has been assumed to be 75 dB(A) L_{eq} (raised voice)
- Only 1 in 2 people will be talking at any one time, which is representative of normal conversations.
- Up to 20 residents (with residents evenly distributed throughout the area) at any given time:
- Outdoor areas are not used during the night time period (10pm to 7am).
- No music is played in outdoor areas.
- Recommendations in Section 7.4 of this report are implemented.

The following spectrums have been used in this assessment.

Table 7-1 - Spectrum for Raised Voice Conversation (Sound Power Level)

63	125	250	500	1000	2000	4000	8000	A-Wt
60	68	68	74	71	66	57	45	75

7.2.2 Predicted Noise Levels

The NPfI applies only to activities detailed in Schedule 1 of the Protection of the Environment Operations Act, of which housing communal areas are not listed. Notwithstanding the above, noise impacts from communal areas has been assessed to the project noise trigger levels established in Section 6.2.4 to maintain the amenity of surrounding receivers.

The NPfI requires that noise levels are assessed at the closest façade of a habitable space, e.g. a bedroom or living area. The predicted levels take into account any expected noise reduction provided by distance losses, barrier effects and the recommendations set out in Section 7.4.

Table 7-2 – Predicted Noise Levels at Receivers from Outdoor Communal Area

Receiver	Time of Day	Predicted Noise Level dB(A)$L_{eq(15min)}$	Project Noise Trigger Level dB(A)$L_{eq(15min)}$	Complies (Yes/No)
Receiver 1	Evening (6pm to 10pm)	<35	41	Yes
Receiver 2	When in use	<40	63	Yes
Receiver 3		<40		Yes
Receiver 4		<40		Yes

7.3 INDOOR COMMUNAL AREAS

7.3.1 Assumptions and Noise Levels

Indoor communal spaces are located throughout the development. Noise emission predictions will be based on the following assumptions.

- The average sound pressure level inside enclosed communal rooms have been assumed to be 70 dB(A) L_{eq} (representative of a lively / conversational space with no loud music playing)
- Indoor communal areas are not used during the night time period (10pm to 7am).
- No loud music is played.
- Areas are enclosed, with windows and doors closed whilst in use.
- Recommendations in Section 7.4 of this report are implemented.

The following spectrums have been used in this assessment.

Table 7-3 - Spectrum for Indoor Communal Area (Sound Pressure Level)

63	125	250	500	1000	2000	4000	8000	A-Wt
55	63	63	69	66	61	52	40	70

7.3.2 Predicted Noise Levels

The NPfI applies only to activities detailed in Schedule 1 of the Protection of the Environment Operations Act, of which housing communal areas are not listed. Notwithstanding the above, noise impacts from communal areas has been assessed to the project noise trigger levels established in Section 6.2.4 to maintain the amenity of surrounding receivers.

The NPfI requires that noise levels are assessed at the closest façade of a habitable space, e.g. a bedroom or living area. The predicted levels take into account any expected noise reduction provided by distance losses, barrier effects and the recommendations set out in Section 7.4.

Table 7-4 – Predicted Noise Levels at Receivers from Indoor Communal Areas

Receiver	Time of Day	Predicted Noise Level dB(A)$L_{eq(15min)}$	Project Noise Trigger Level dB(A)$L_{eq(15min)}$	Complies (Yes/No)
Receiver 1	Evening (6pm to 10pm)	<35	41	Yes
Receiver 2	When in use	<40	63	Yes
Receiver 3		<40		Yes
Receiver 4		<40		Yes

7.4 RECOMMENDATION & MANAGEMENT CONTROLS

It is recommended that the following recommendations and management controls be implemented into the design and operation of the proposed development to satisfy all noise criteria outlined in Section 6.

- Up to 20 residents (with residents evenly distributed throughout the area) in the Level 6 outdoor communal area at any given time.
- Communal areas are to not be used during the night time period (10pm to 7am).
- No music is played in outdoor communal areas.
- Music played indoors is restricted within the hours of 7am to 10pm.
- Windows and doors for indoor communal areas are to be closed while in use.

8 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with Stage 2 of the proposed seniors housing, disability housing and affordability housing development located at 5 Skyline Place, Frenchs Forest. Based on our assessment, the following is concluded:

Provided that the recommendations set out in Section 5.4 of this report are employed, internal noise levels shall satisfy requirements outlined in:

- Northern Beaches Council – *'Warringah Development Control Plan 2011'*
- Northern Beaches Council – *'Warringah Local Environment Plan 2011'*
- Australian and New Zealand AS/NZS 3671:1989 - *'Acoustics - Road traffic noise intrusion - Building siting and construction'*
- Australian and New Zealand AS/NZS 2107:2016 - *'Recommended design sound levels and reverberation times for building interiors'*

Provided that the recommendations set out in Section 7.4 of this report are employed, external noise emissions shall satisfy requirements outlined in:

- Northern Beaches Council – *'Warringah Development Control Plan 2011'*
- Northern Beaches Council – *'Warringah Local Environment Plan 2011'*
- NSW EPA – '*Noise Policy for Industry (NPfI) 2017'*

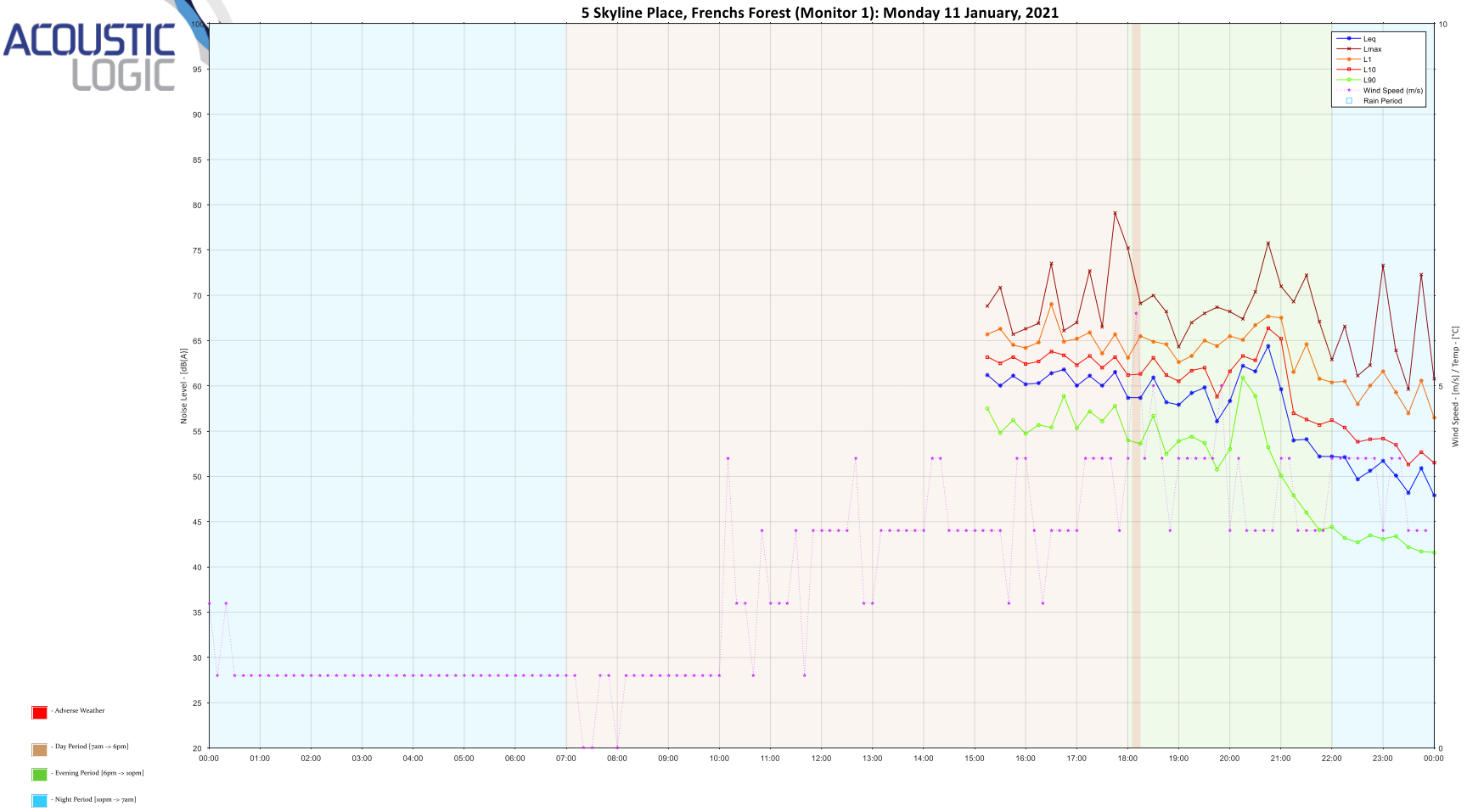
Detailed acoustic control measures for the mechanical plant servicing the proposed development are to be determined later during CC stage.

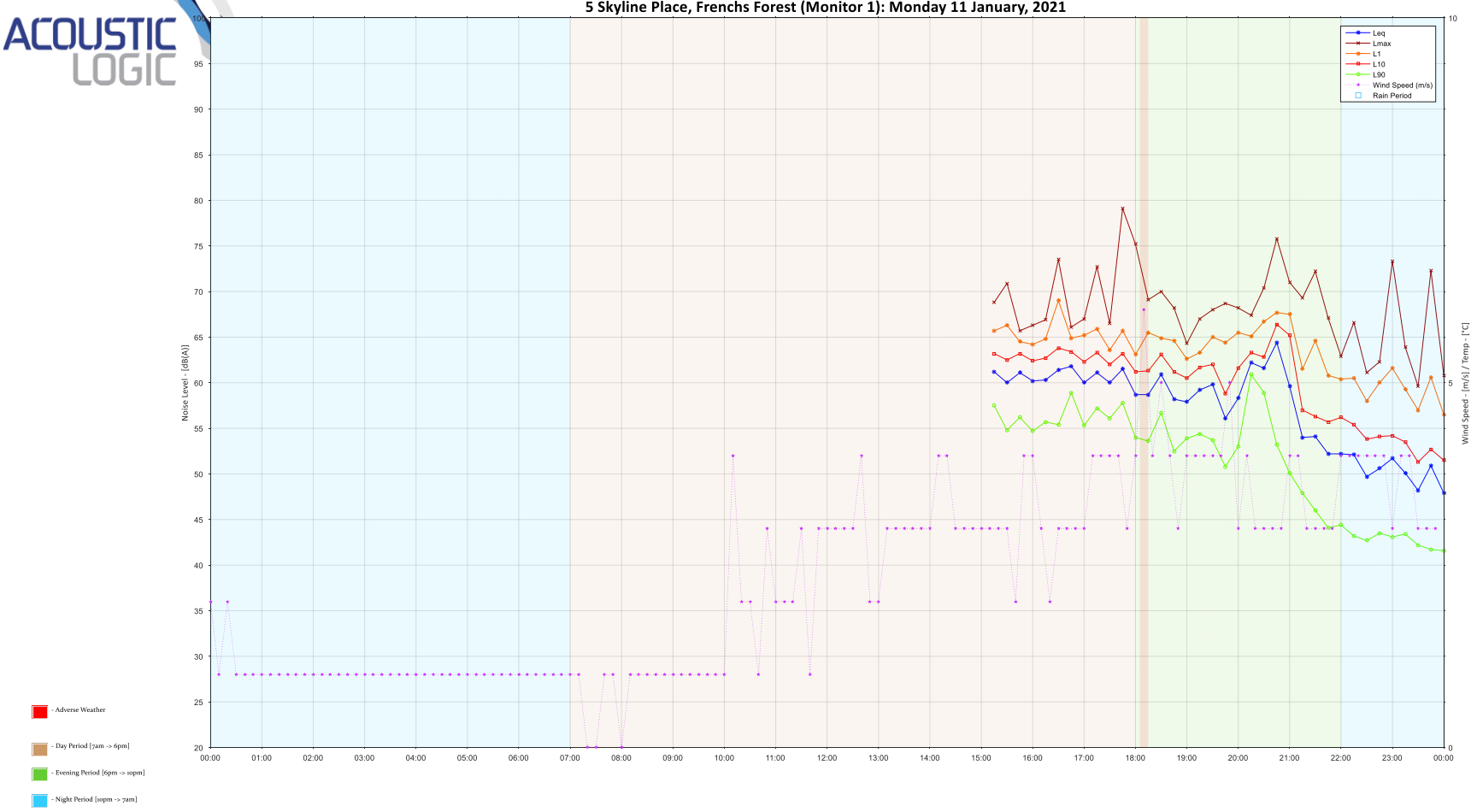
We trust this information is satisfactory. Please contact us should you have any further queries.

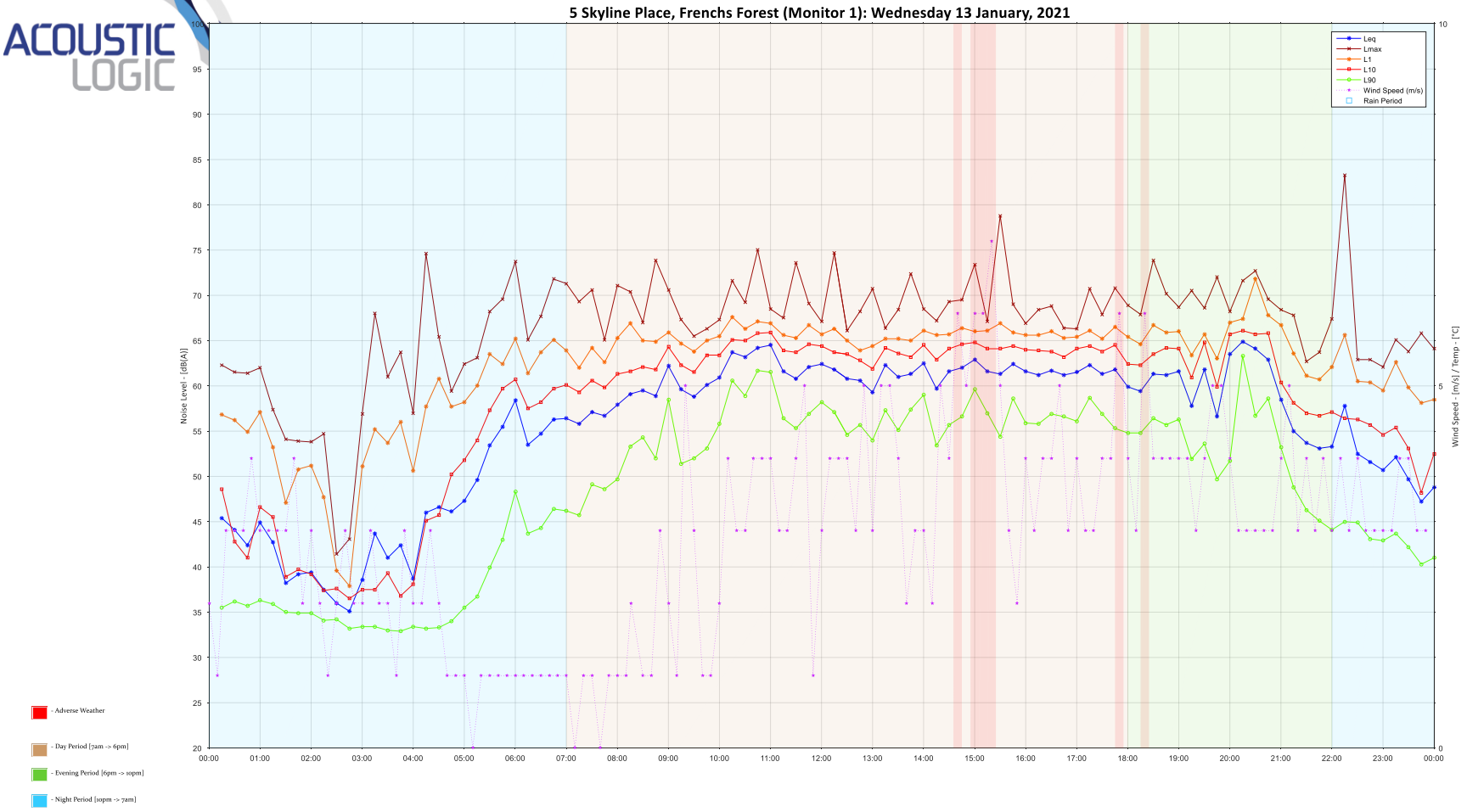
Yours faithfully,

Acoustic Logic Pty Ltd
Kanin Mungkarndee

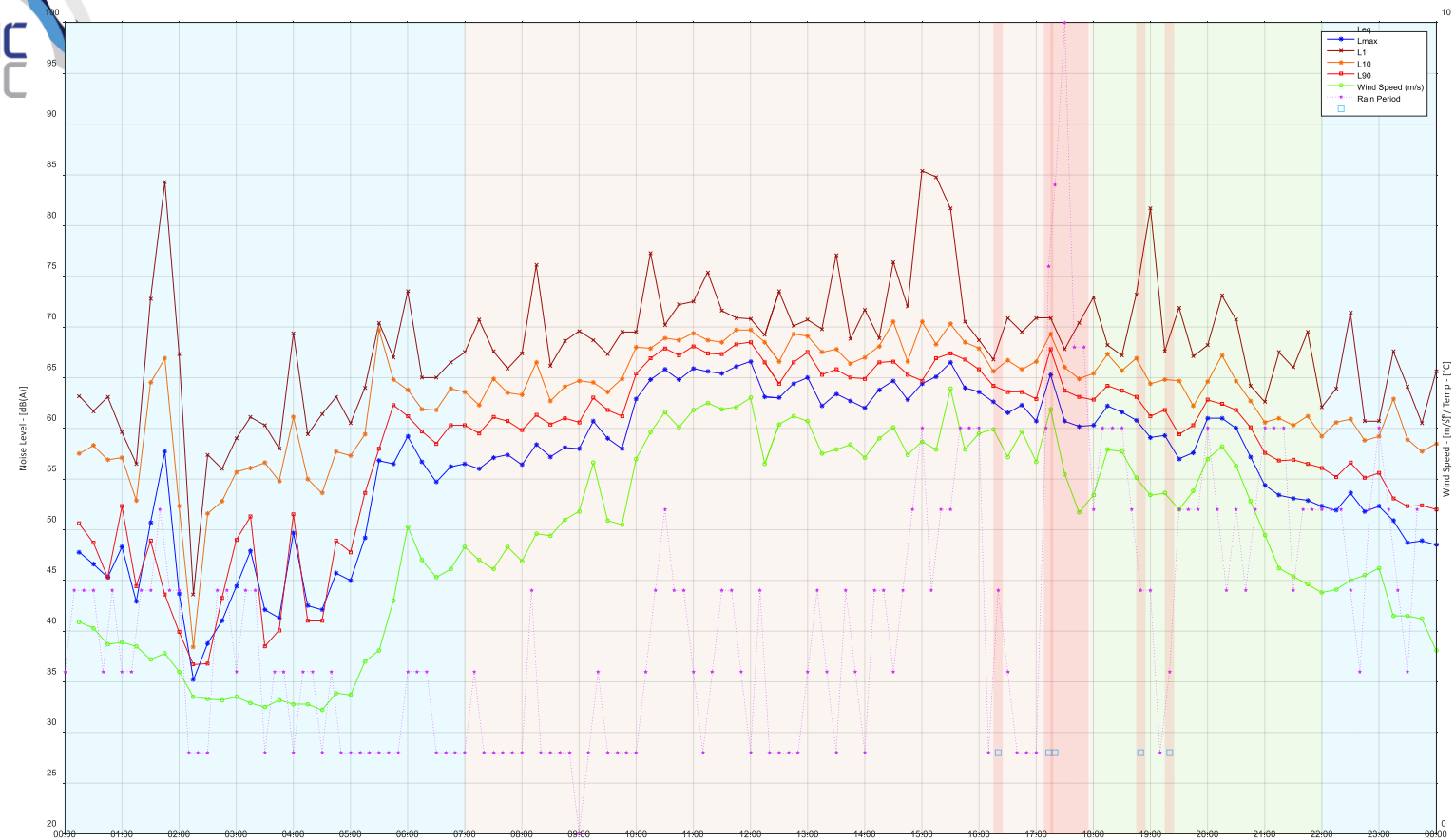
APPENDIX A – 5 SKYLINE PLACE (MONITOR 1) NOISE DATA

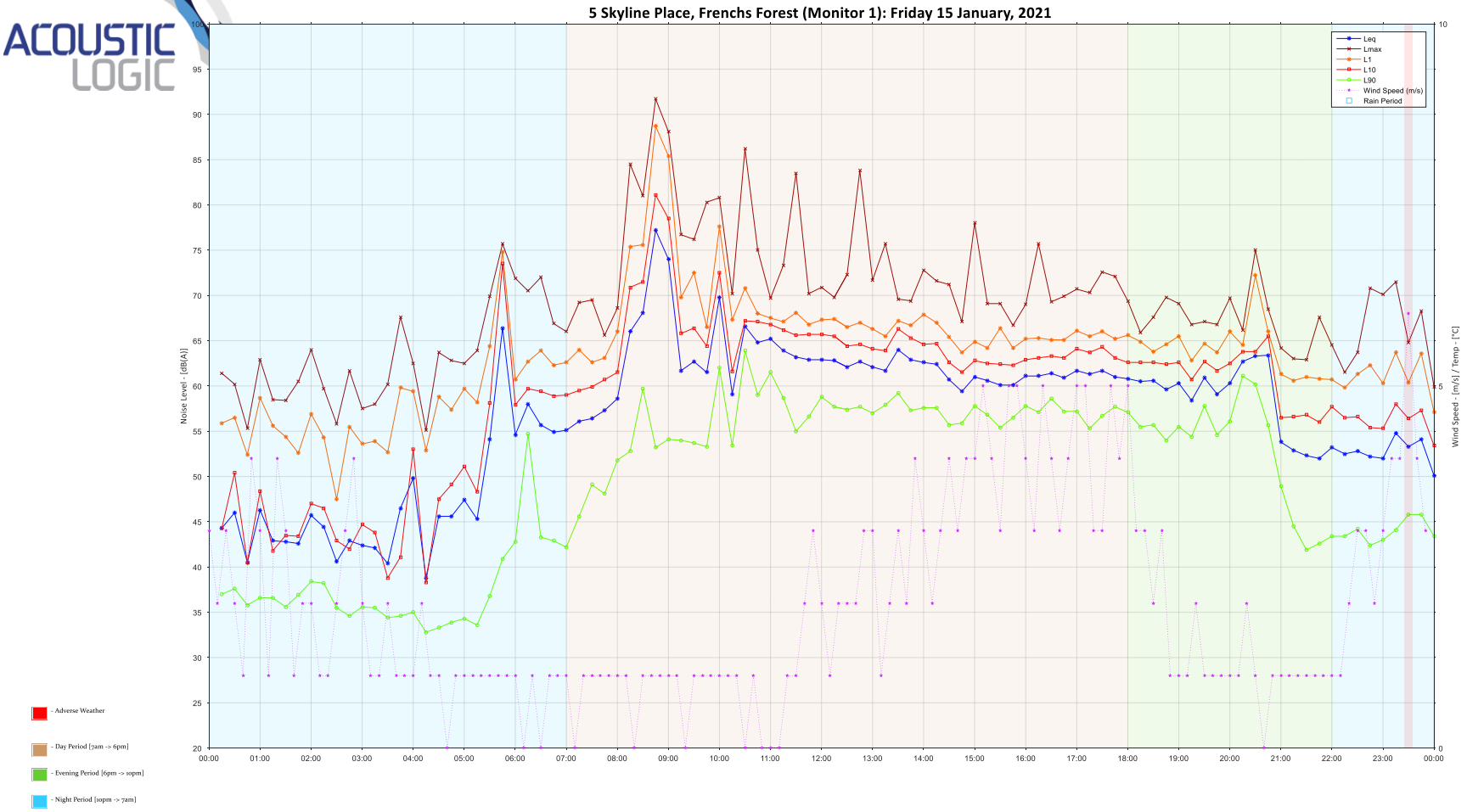

5 Skyline Place, Frenchs Forest (Monitor 1): Monday 11 January, 2021
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

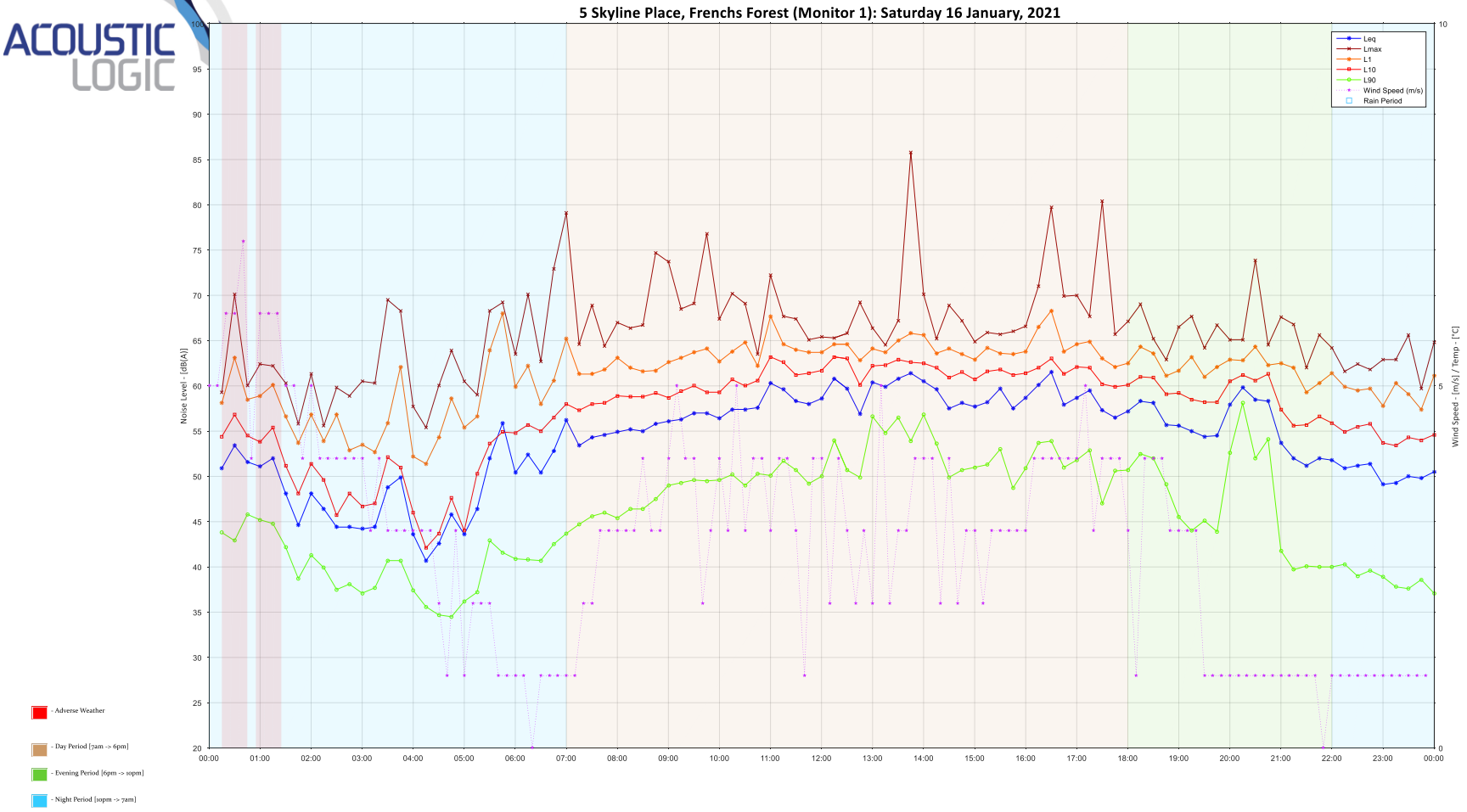

5 Skyline Place, Frenchs Forest (Monitor 1): Monday 11 January, 2021
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

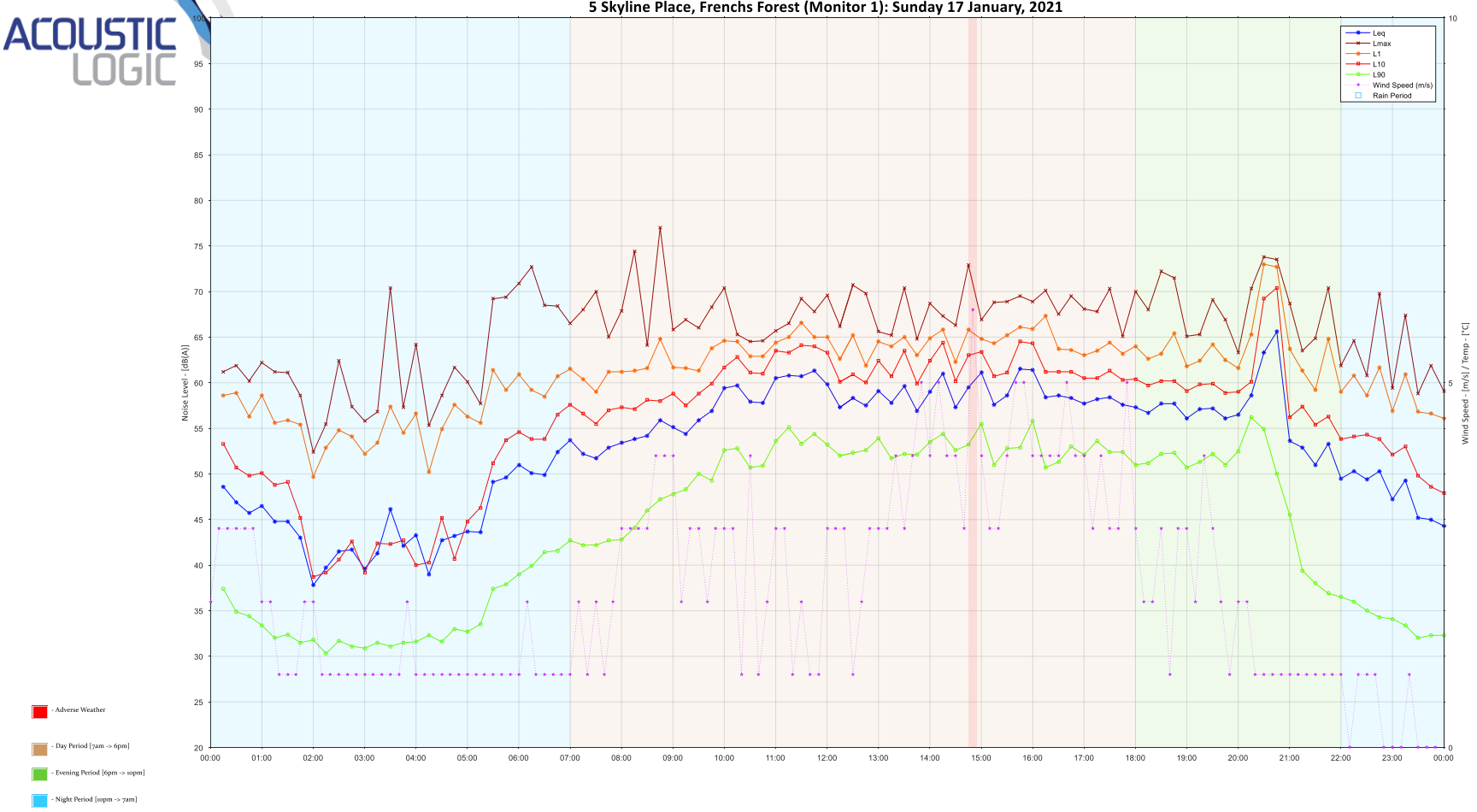

5 Skyline Place, Frenchs Forest (Monitor 1): Wednesday 13 January, 2021
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

5 Skyline Place, Frenchs Forest (Monitor 1): Thursday 14 January, 2021

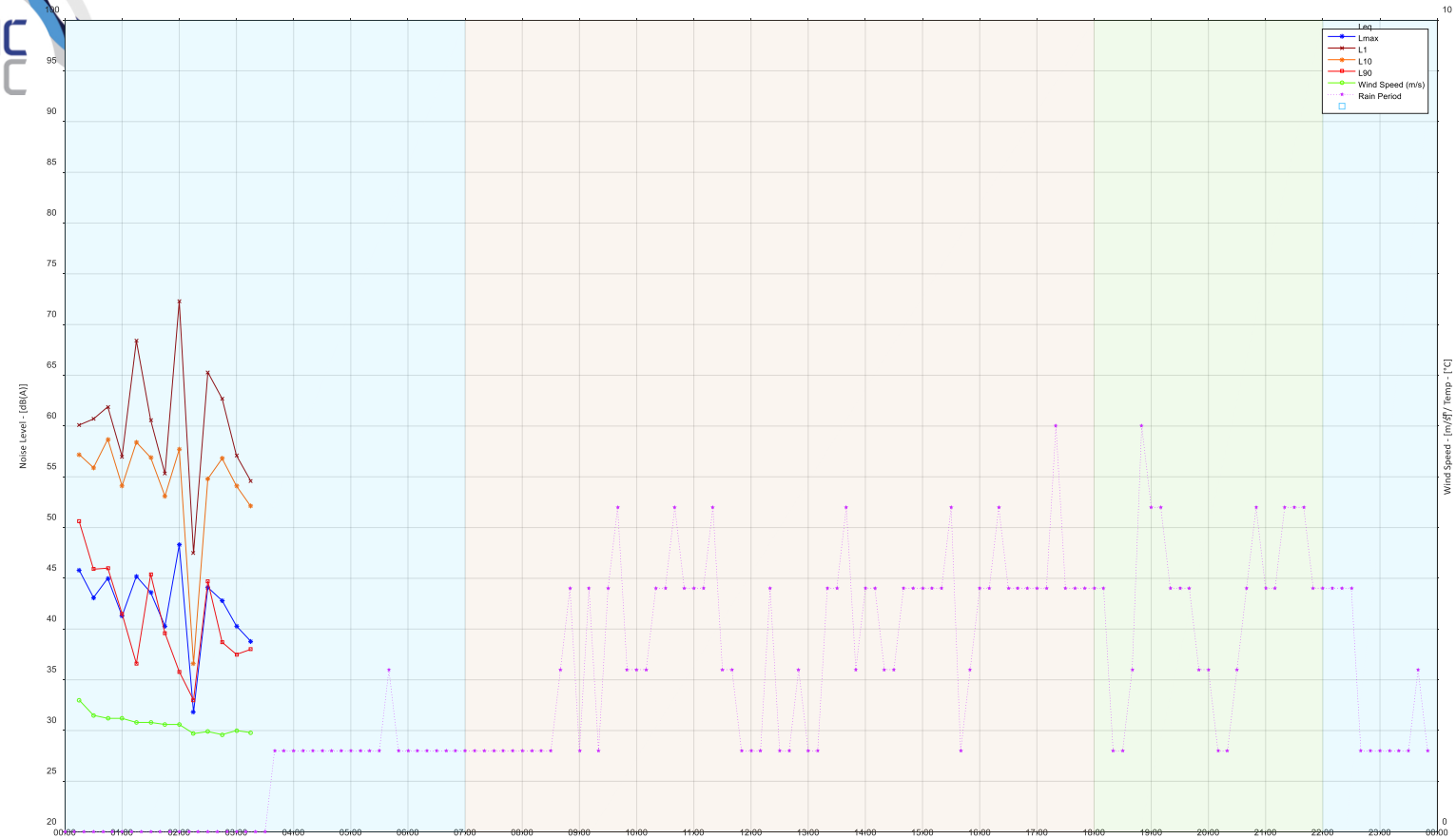



5 Skyline Place, Frenchs Forest (Monitor 1): Friday 15 January, 2021
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

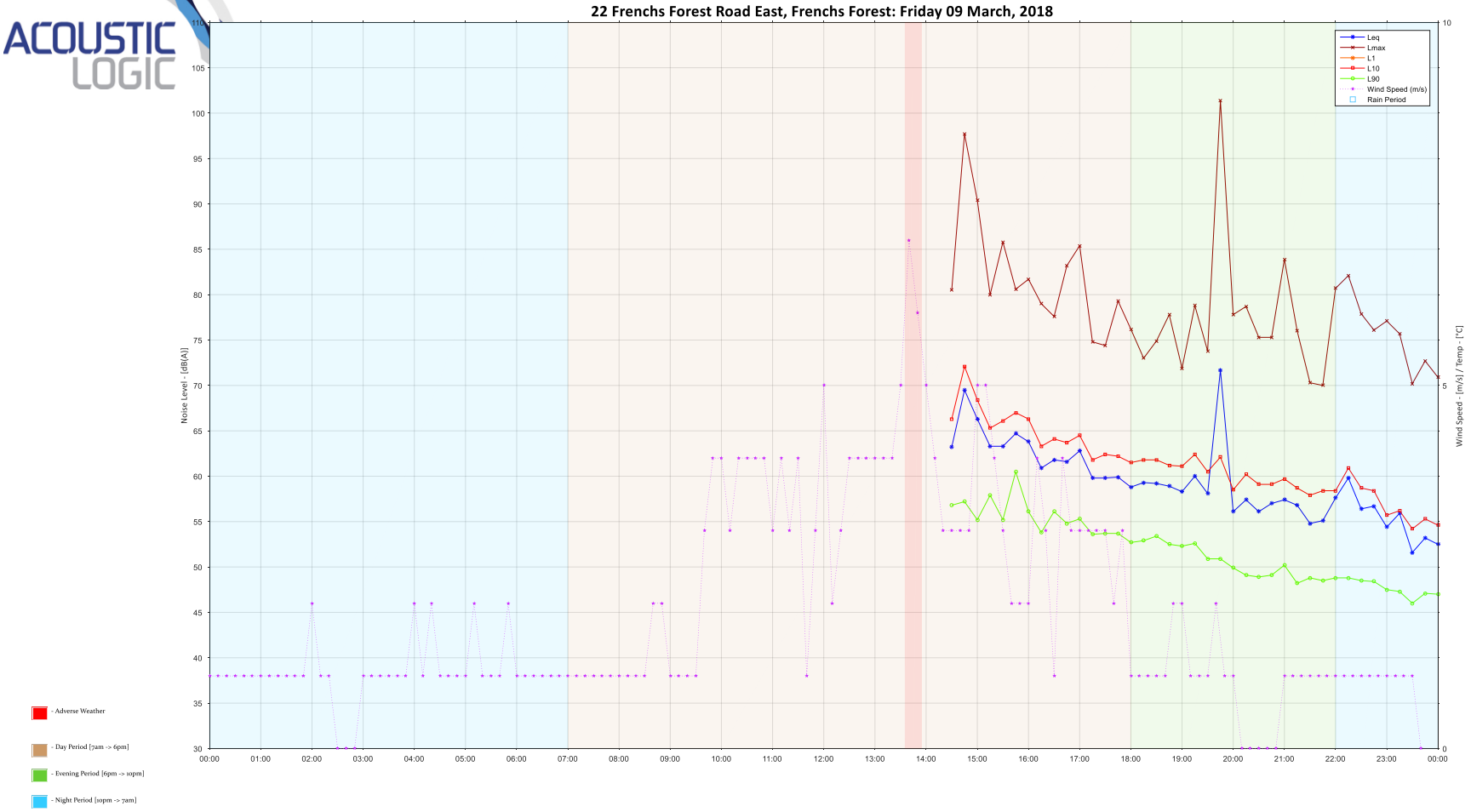

5 Skyline Place, Frenchs Forest (Monitor 1): Saturday 16 January, 2021
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

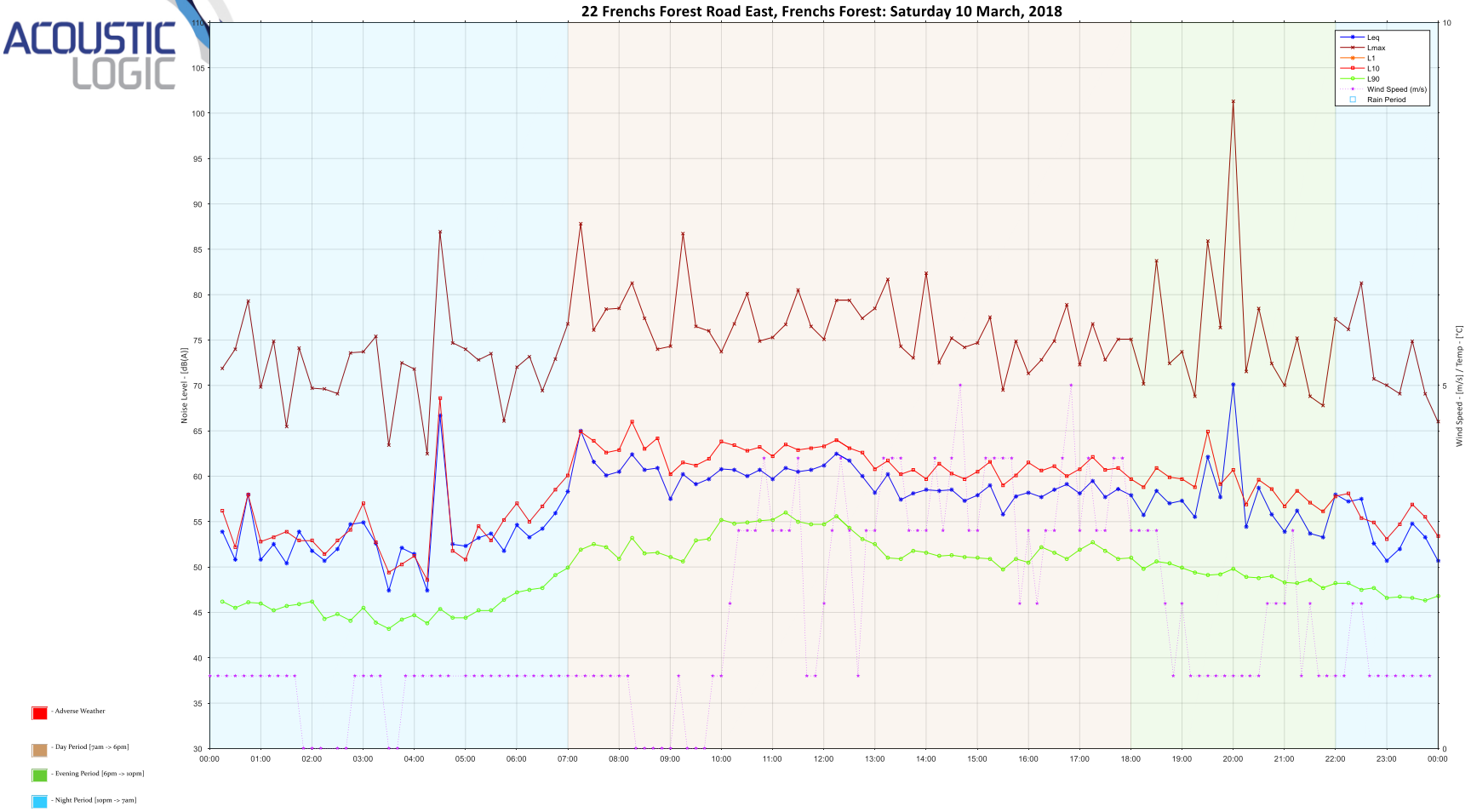

5 Skyline Place, Frenchs Forest (Monitor 1): Sunday 17 January, 2021
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

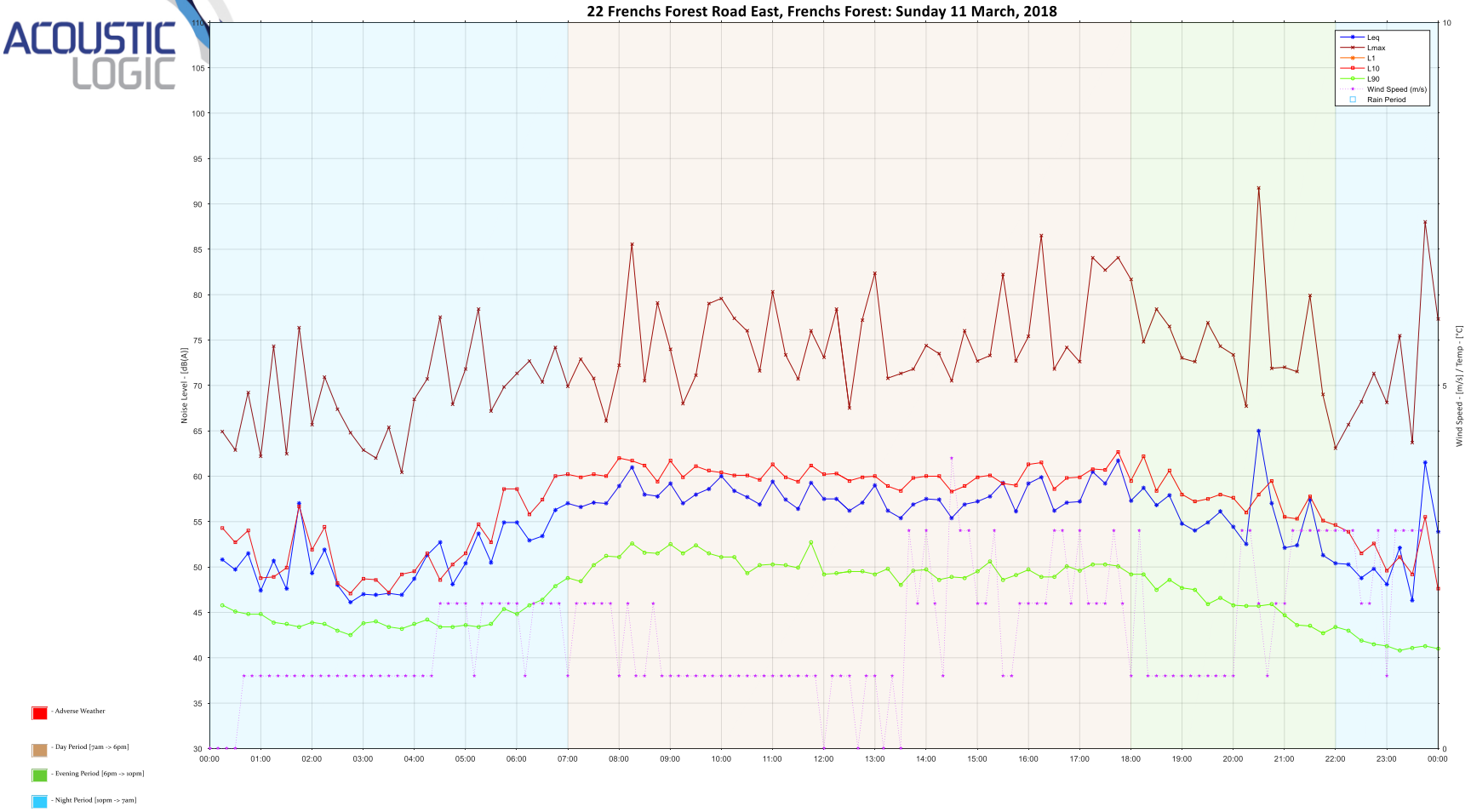
5 Skyline Place, Frenchs Forest (Monitor 1): Monday 18 January, 2021

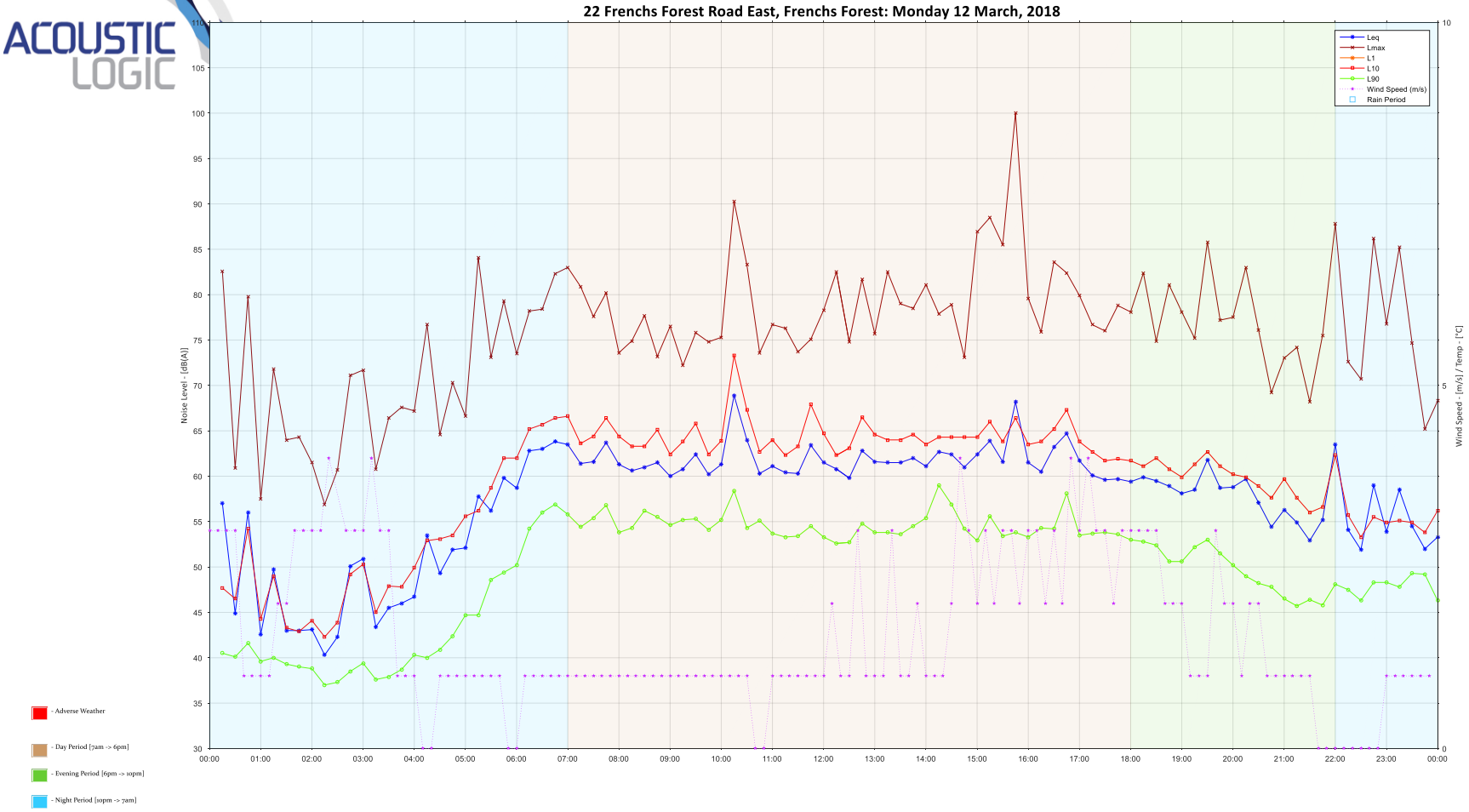


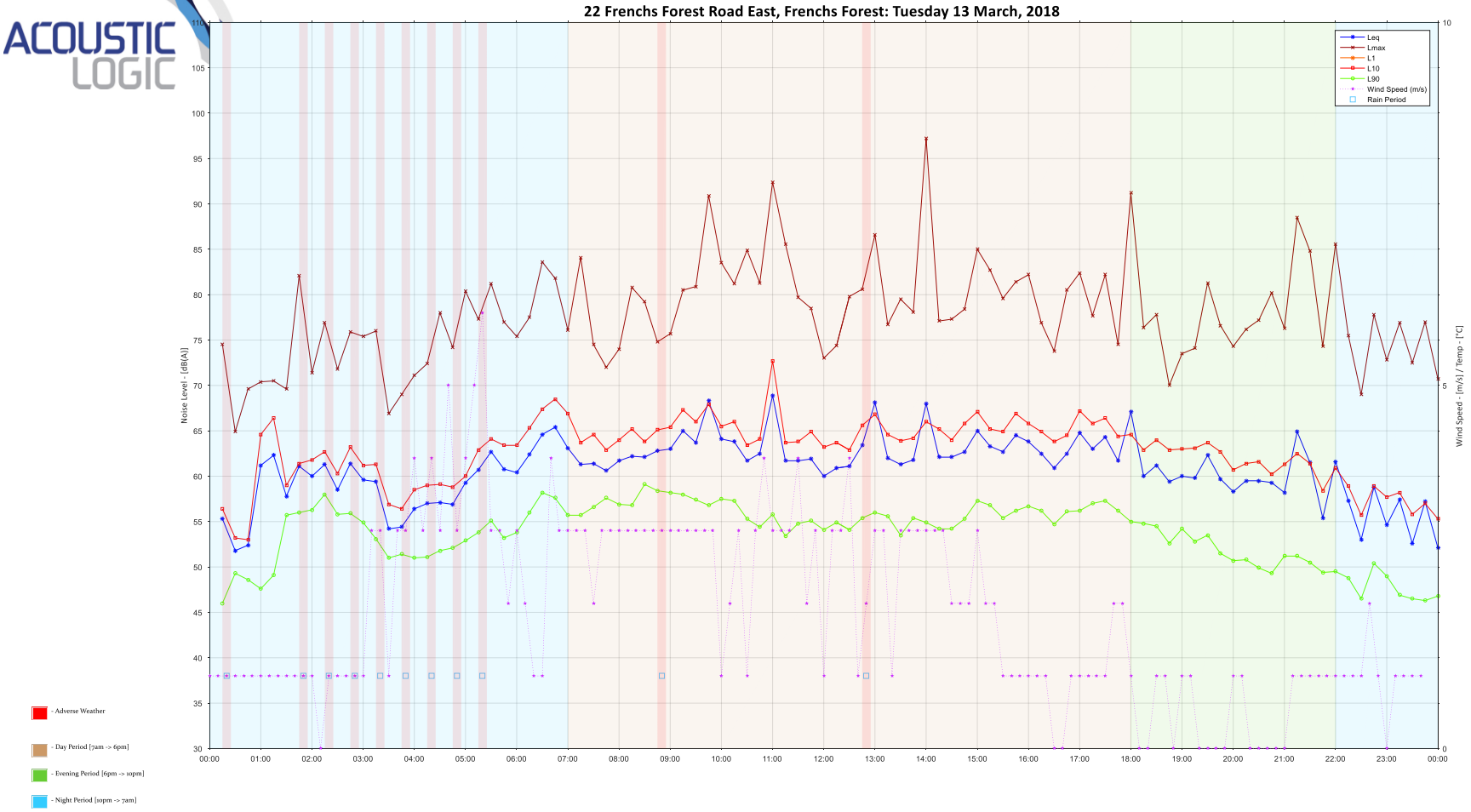
APPENDIX B – 22 FRENCHS FOREST ROAD EAST NOISE DATA

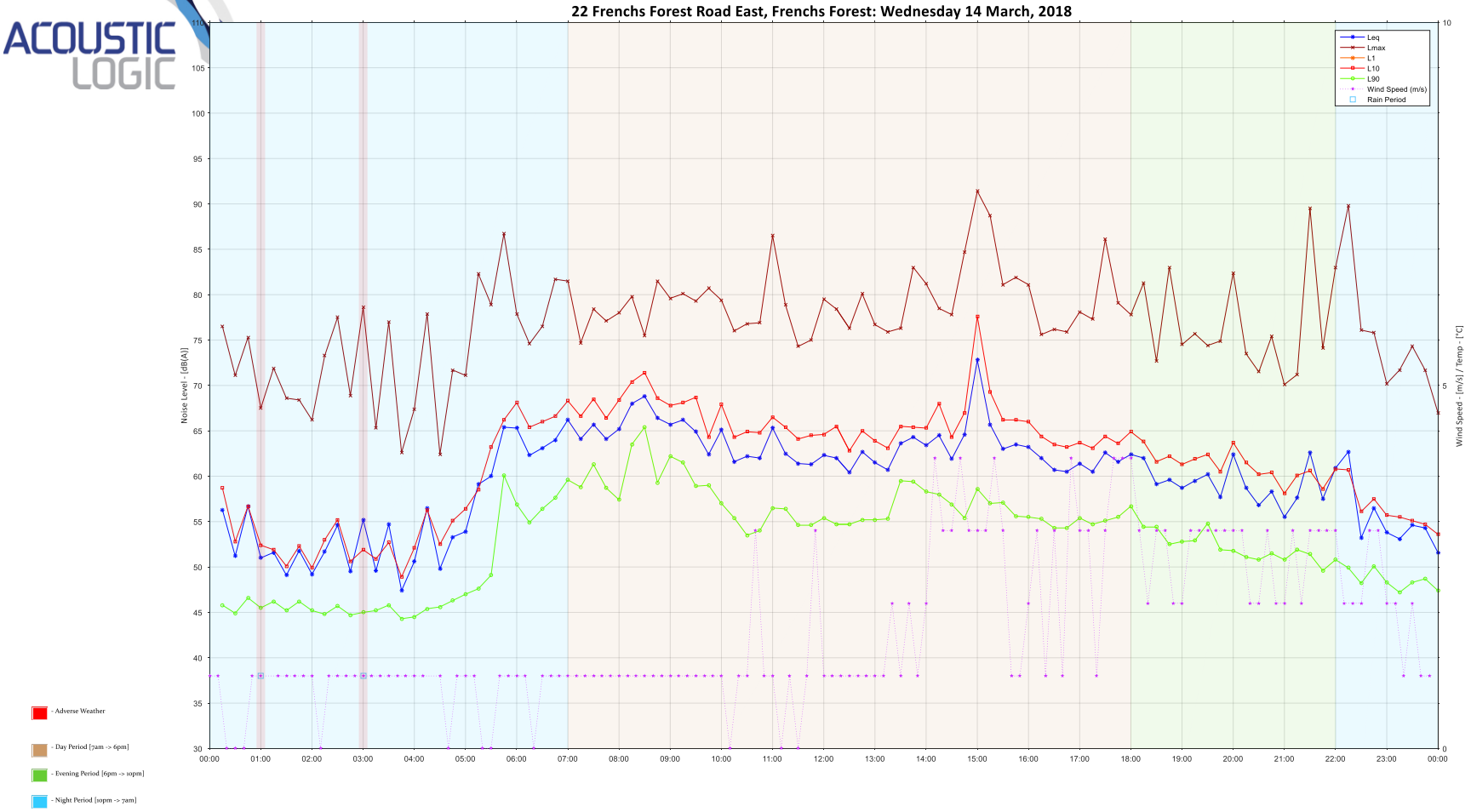

22 Frenchs Forest Road East, Frenchs Forest: Friday 09 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

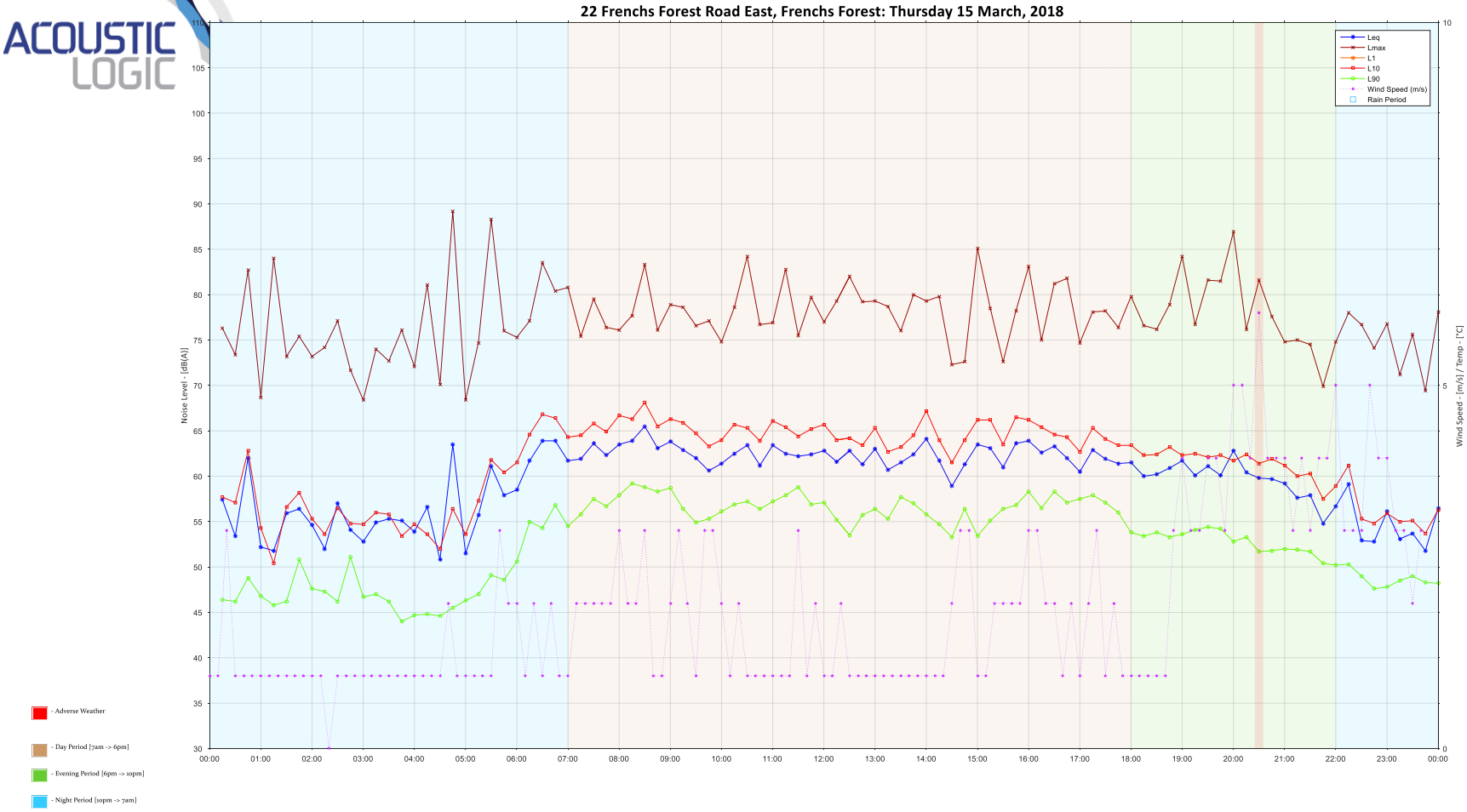

22 Frenchs Forest Road East, Frenchs Forest: Saturday 10 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

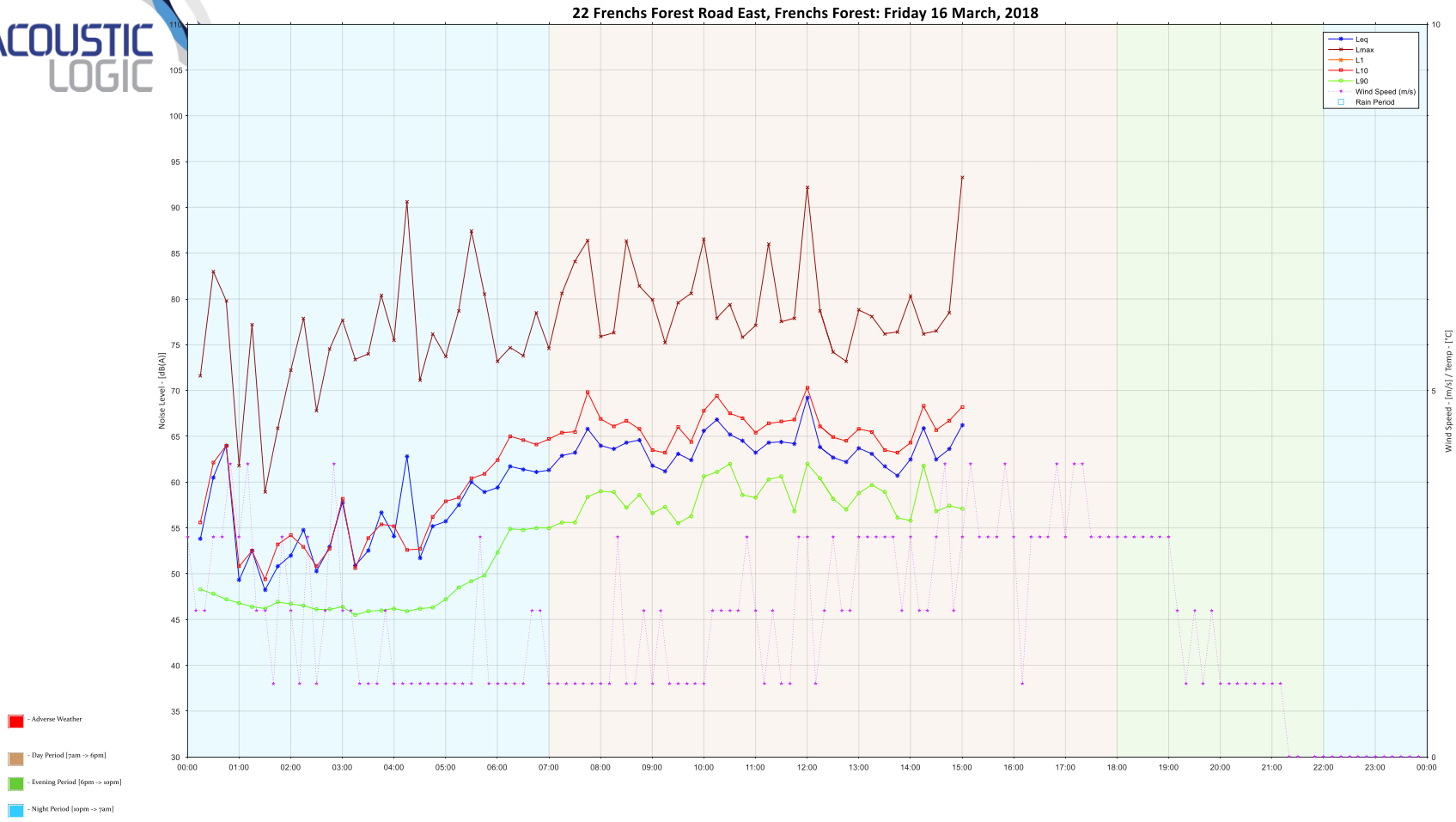

22 Frenchs Forest Road East, Frenchs Forest: Sunday 11 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


22 Frenchs Forest Road East, Frenchs Forest: Monday 12 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


22 Frenchs Forest Road East, Frenchs Forest: Tuesday 13 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


22 Frenchs Forest Road East, Frenchs Forest: Wednesday 14 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


22 Frenchs Forest Road East, Frenchs Forest: Thursday 15 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


22 Frenchs Forest Road East, Frenchs Forest: Friday 16 March, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]