

# **Forestway Shopping Centre Redevelopment**

## **Noise Impact Assessment**

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## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>4</b>
<b>2</b>	<b>SITE DESCRIPTION AND PROPOSED WORKS.....</b>	<b>4</b>
<b>3</b>	<b>NOISE DESCRIPTORS .....</b>	<b>6</b>
<b>4</b>	<b>SURVEY OF EXISTING NOISE CONDITIONS.....</b>	<b>7</b>
<b>4.1</b>	<b>SURVEY OF AMBIENT NOISE .....</b>	<b>7</b>
4.1.1	Measured Noise Levels.....	7
<b>4.2</b>	<b>SURVEY OF ROAD TRAFFIC NOISE SURROUNDING SITE .....</b>	<b>8</b>
<b>5</b>	<b>NOISE EMISSION CRITERIA .....</b>	<b>9</b>
<b>5.1</b>	<b>WARRINGAH DEVELOPMENT CONTROL PLAN 2011 .....</b>	<b>9</b>
<b>5.2</b>	<b>EPA - NOISE POLICY FOR INDUSTRY (NPI) .....</b>	<b>10</b>
5.2.1	NPI - Intrusiveness Noise Goals .....	10
5.2.2	NPI – Project Amenity Goals.....	10
<b>5.3</b>	<b>SLEEP AROUSAL CRITERIA.....</b>	<b>11</b>
<b>5.4</b>	<b>NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS.....</b>	<b>12</b>
<b>5.5</b>	<b>CRITERIA FOR CHILDCARE CENTRE .....</b>	<b>13</b>
5.5.1	Association of Australian Acoustical Consultants – Technical Guideline – Child Care Centre Noise Assessment 2013 .....	13
5.5.2	Summary of Noise Emission Criteria for Child Care Centre.....	14
<b>6</b>	<b>NOISE EMISSION ASSESSMENT.....</b>	<b>15</b>
<b>6.1</b>	<b>ASSESSMENT OF PATRON NOISE FROM SKYPARK.....</b>	<b>16</b>
<b>6.2</b>	<b>ASSESSMENT OF PATRON NOISE FROM OUTDOOR DINING AREAS.....</b>	<b>17</b>
<b>6.3</b>	<b>ASSESSMENT OF OPERATIONAL NOISE FROM CHILDCARE CENTRE.....</b>	<b>19</b>
<b>6.4</b>	<b>ASSESSMENT OF NOISE FROM CARPARK .....</b>	<b>20</b>
6.4.1	Assessment of <i>Average</i> ( $L_{eq(15min)}$ ) Noise Emissions. ....	21
6.4.2	Assessment of <i>Peak</i> ( $L_{Max}$ ) noise emissions for Sleep Disturbance .....	22
<b>6.5</b>	<b>LOADING DOCK ASSESSMENT .....</b>	<b>23</b>
6.5.1	Loading Dock Noise – Average ( $L_{eq(15min)}$ ) Noise Emission Assessment. ....	23
<b>6.6</b>	<b>NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS.....</b>	<b>24</b>
<b>6.7</b>	<b>NOISE FROM MECHANICAL PLANT .....</b>	<b>25</b>
<b>7</b>	<b>RECOMMENDATIONS .....</b>	<b>26</b>
<b>7.1</b>	<b>RECOMMENDATIONS FOR ‘SKYPARK’ .....</b>	<b>26</b>
<b>7.2</b>	<b>RECOMMENDATIONS FOR OUTDOOR DINING AREAS .....</b>	<b>26</b>
<b>7.3</b>	<b>RECOMMENDATIONS FOR CARPARK AREAS.....</b>	<b>26</b>
<b>7.4</b>	<b>RECOMMENDATIONS FOR LOADING DOCKS.....</b>	<b>26</b>
<b>7.5</b>	<b>MECHANICAL PLANT &amp; EQUIPMENT .....</b>	<b>27</b>
<b>8</b>	<b>CONCLUSION .....</b>	<b>28</b>
	<b>APPENDIX ONE – UNATTENDED NOISE MONITORING DATA – 58 GRACE AVENUE, FRENCHS FOREST .....</b>	<b>29</b>
	<b>APPENDIX TWO – UNATTENDED NOISE MONITORING DATA – 21 FOREST WAY, FRENCHS FOREST.....</b>	<b>42</b>

## 1 INTRODUCTION

Acoustic Logic Consultancy has been engaged to undertake an assessment of operational noise likely to be associated with the proposed Forestway Shopping Centre redevelopment.

In this report, we will:

- Identify nearby noise sensitive receivers and anticipated operational noise sources with the potential to adversely impact nearby development.
- Identify relevant Council and EPA acoustic criteria applicable to the development.
- Predict operational noise emissions and assess them against acoustic criteria.
- If necessary, determine building and/or management controls necessary to ensure ongoing compliance with noise emission goals.

## 2 SITE DESCRIPTION AND PROPOSED WORKS

The site is located along Forest Way, near the intersection of Warringah Road. The site is currently operating as a retail shopping centre. The proposal is to redevelop a majority of the site, to incorporate underground and rooftop parking space as well as additional retail facilities for patrons.

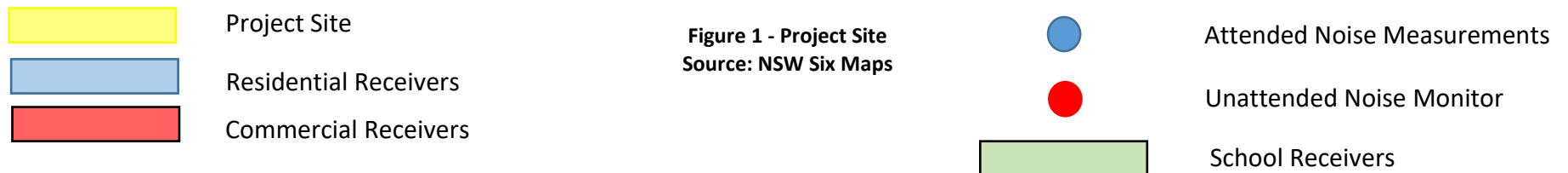
The proposed development consists of:

- Existing shopping centre with major and minor retail outlets;
- Restaurants and cafés with outdoor dining areas;
- Loading dock areas;
- Basement car park and rooftop carpark (including external ramp);
- Child care centre;
- Rooftop community area – ‘Skypark’;

Noise sensitive development in the vicinity of the site is as follows:

- Residents to the west along Grace Ave (R1)
- Residents to the east along Forest Way (R1)
- Frenches Forest School to the south (S1)
- Commercial / medical premises to the north along Russel Avenue, as well as to the east along Forest Way (C1)

Refer to Figure 1 showing site location and the location of noise measurements conducted as part of this assessment.



**Figure 1 - Project Site**  
Source: NSW Six Maps

### 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 15-20 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 traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

$L_1$  levels represent is the loudest 1% noise event during a measurement period.



## 4 SURVEY OF EXISTING NOISE CONDITIONS

### 4.1 SURVEY OF AMBIENT NOISE

Both long term unattended noise logging and attended noise measurements were conducted to quantify the existing acoustic environmental at the site.

Unattended noise monitoring was conducted over an eleven-day period between 15<sup>th</sup> of June & 25<sup>th</sup> of June 2018 using Acoustic Research Laboratories monitors set on A-weighted fast response mode. The monitors were calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded. Periods of adverse weather have been omitted when determine the Rating Background Noise Level. Logging data and daily noise level results are presented in Appendix One and Two.

Two monitors were installed (refer to Figure 1):

- Monitor One – 58 Grace Avenue: Monitor was installed within the property along the eastern boundary of the site. This monitor was installed within a current commercial property and is representative of the noise environment for residents along Grace Avenue (R1).
- Monitor Two – 21 Forest Way: Monitor was installed within an existing residential property at the western boundary of the site. This monitor was installed within an existing residential property and is representative of the noise environment for residents along Forest Way (R2).

These monitoring locations were selected as they were both secure for monitoring equipment and would provide background noise data representative of the nearest noise receivers. The predominant noise in the vicinity of the logger is road traffic, and there was no local plant noise in the area which impacted the measurements.

All attended measurements were made using a Norsonic 140 Type 1 sound analyser set on A-weighted fast response mode. Calibration of the meter was checked at the beginning and end of the measurement period, with no significant drift noted.

#### 4.1.1 Measured Noise Levels

Measured noise levels are presented in Table 1 below.

**Table 1 – Long Term Noise Logging Data (L<sub>eq</sub> and Rating Background Noise Levels)**

Monitor Location	Measured Noise Level - Time of Day		
	Daytime (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
Monitor One (Grace Avenue – 5m from kerb)	58 dB(A) <sub>L<sub>eq</sub>(Period)</sub> 47 dB(A) <sub>L<sub>90</sub></sub>	58 dB(A) <sub>L<sub>eq</sub>(Period)</sub> 44 dB(A) <sub>L<sub>90</sub></sub>	53 dB(A) <sub>L<sub>eq</sub>(Period)</sub> 38 dB(A) <sub>L<sub>90</sub></sub>
Monitor Two (Forest Way – 5m from kerb)	69 dB(A) <sub>L<sub>eq</sub>(Period)</sub> 58 dB(A) <sub>L<sub>90</sub></sub>	69 dB(A) <sub>L<sub>eq</sub>(Period)</sub> 51 dB(A) <sub>L<sub>90</sub></sub>	65 dB(A) <sub>L<sub>eq</sub>(Period)</sub> 35 dB(A) <sub>L<sub>90</sub></sub>

## 4.2 SURVEY OF ROAD TRAFFIC NOISE SURROUNDING SITE

In addition, the noise logging and attended measurements were used to determine the existing traffic noise levels at the site. This is relevant to the assessment of noise due additional traffic created by the site (as per the EPA Road Noise Policy), and for the assessment of noise intrusion to the development.

For the purpose of assessment:

- Forest Way is considered an arterial road (and utilises the  $L_{eq(Period)}$  time descriptor in the Road Noise Policy); and
- Grace Avenue is considered a local road (and utilises the  $L_{eq(1hr)}$  time descriptor in the Road Noise Policy).

When applying the EPA Road Noise Policy, it is the traffic noise level at the façade line of nearby residences which must be considered. The tables below present the logger measured noise level, and the corresponding noise at the building façade (taking into account the difference in distance).

**Table 2 – Road Traffic Noise Level – Grace Avenue**

Time of Day	Noise Level	
	At Monitor One (5m from Grace Avenue)	At Façade Line of Residents Along Grace Avenue (12m from Grace Avenue)
Day (7am-10pm)	58 dB(A) $L_{eq(1hr)}$	56 dB(A) $L_{eq(1hr)}$
Night (10pm-7am)	53 dB(A) $L_{eq(1hr)}$	56 dB(A) $L_{eq(1hr)}$

**Table 3 – Road Traffic Noise Level – Forest Way**

Time of Day	Noise Level	
	At Monitor Two (5m from Forest Way)	At Façade Line of Residents Along Forest Way (12m from Forest Way)
Day (7am-10pm)	69 dB(A) $L_{eq(Period)}$	67 dB(A) $L_{eq(Period)}$
Night (10pm-7am)	65 dB(A) $L_{eq(Period)}$	63 dB(A) $L_{eq(Period)}$



## 5 NOISE EMISSION CRITERIA

The following noise controls and guidelines are applicable to the site:

- Northern Beaches Council – Warringah Local Environment Plan & Development Control Plan 2011
- NSW EPA Noise Policy for Industry.
- NSW EPA Road Noise Policy.

### 5.1 WARRINGAH DEVELOPMENT CONTROL PLAN 2011

#### **D3 Noise**

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

*See also NSW Industrial Noise Policy Appendices*

2. *Development near existing noise generating activities, such as industry and roads, is to be designed to mitigate the effect of that noise.*
3. *Waste collection and delivery vehicles are not to operate in the vicinity of residential uses between 10pm and 6am.*
4. *Where possible, locate noise sensitive rooms such as bedrooms and private open space away from noise sources.*

Warringah Council Land Zoning Map 8 identifies the land which Forestway Shopping Centre lies upon as B2 Local Centre, which is covered in Part F of the DCP. This section of the DCP does not contain any specific control relating to noise.

## 5.2 EPA - NOISE POLICY FOR INDUSTRY (NPI)

Noise sources covered by this code will include vehicle noise (generated on the site), mechanical services noise, and some operational noise (as indicated). Both the Intrusiveness and the Project Amenity criteria (as set out below) must be complied with.

Noise from traffic on public roads are subject to different acoustic criteria (detailed in Section 5.4 and Section 8 of this report).

### 5.2.1 NPI - Intrusiveness Noise Goals

Intrusiveness criteria permit noise generation to be no more than 5dB(A) above existing background noise levels. The criteria is as follows:

**Table 4 – EPA Intrusiveness Criteria**

Location	Time of Day	Background Noise Level - dB(A) <sub>L90</sub>	Intrusiveness Noise Objective dB(A) <sub>L<sub>eq</sub>(15min)</sub> (Background + 5dB)
R1 - Grace Avenue Residences	Day Time (7am - 6pm)	47	52
	Evening (6pm - 10pm)	44	49
	Night (10pm - 7am)	38	43
R2 – Forest Way Residences	Day Time (7am - 6pm)	58	63
	Evening (6pm - 10pm)	51	56
	Night (10pm - 7am)	35	40

### 5.2.2 NPI – Project Amenity Goals

Project amenity criteria are determined based on the land use in the area (residential/commercial/industrial). The residential land use is then further categorised into rural, sub-urban and urban areas.

Based on the measured background noise levels at both monitor locations, residents surrounding the site are classified by the Noise Policy for Industry as in the urban category.

**Table 5 – EPA Project Amenity Criteria**

Noise Receiver	Amenity Noise Level – dB(A) <sub>L<sub>eq</sub>(15min)</sub>		
	Daytime	Evening	Night
Surrounding Residential (Urban)	58	48	43

### 5.3 SLEEP AROUSAL CRITERIA

Potential sleep arousal impacts should be considered for noise generated after 10pm.

Sleep arousal is a function of both the noise level and the duration of the noise.

As recommended in the NPI, to assess potential sleep arousal impacts, a two-stage test is carried out:

- Step 1 – Section 2.5 *Maximum noise level event assessment* from the NPfI states the following:  
*Where the subject development/premises night-time noise levels at a residential location exceed:*
  - $L_{Aeq,15min}$  40dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
  - $L_{AFmax}$  52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater,*a detailed maximum noise level event assessment should be undertaken.*

Based on the above the following noise objectives apply:

**Table 6 – Sleep Arousal Criteria (Average/ $L_{eq}$  Noise Levels)**

Location	Rating Background Level dB(A) $L_{90}$	Rating Background Level + 5dB(A)	Governing Criteria dB(A) $L_{Aeq(15mins)}$
R1 - Grace Avenue Residences	38	43	43
R2 – Forest Way Residences	35	40	40

**Table 7 – Sleep Arousal Criteria (Maximum/ $L_{max}$  Noise Events)**

Location	Rating Background Level dB(A) $L_{90}$	Rating Background Level + 15dB(A)	Governing Criteria dB(A) $L_{(Max)}$
R1 - Grace Avenue Residences	38	53	53
R2 – Forest Way Residences	35	50	52

- Step 2 - If there are noise events that could exceed the average/maximum criteria detailed in the tables 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 test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Noise Policy for Industry, 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.*

#### 5.4 NOISE FROM INCREASED TRAFFIC GENERATION ON PUBLIC STREETS

For land use developments with the potential to create additional traffic on public streets the development should comply with the EPA Road Noise Policy.

Noise levels generated by traffic should not exceed the noise levels set out in the table below when measured at a nearby property.

**Table 8 – Criteria for Traffic Noise Generated by New Development**

Road Type	Time of day	Permissible Noise Generation
Arterial (Forest Way)	Day (7am to 10pm)	60 dB(A) <sub>Leq(15hr)</sub>
	Night (10pm to 7am)	55 dB(A) <sub>Leq(9hr)</sub>
Local Road (Grace Avenue)	Day (7am to 10pm)	55 dB(A) <sub>Leq(1hr)</sub>
	Night (10pm to 7am)	50 dB(A) <sub>Leq(1hr)</sub>

However, if existing noise levels exceed those in the table above, section 3.4 of the Road Noise Policy is applicable, which requires noise impacts are reduced through feasible and reasonable measures. However, in determining what is feasible/reasonable, the Policy notes that an increase of less than 2dB(A) is a minor impact and would be barely perceptible.

## 5.5 CRITERIA FOR CHILDCARE CENTRE

Noise future usage of the proposed childcare centre will be assessed with reference to the Association of Australian Acoustical Consultants – Technical Guideline Child Care Centre Noise Assessment – 2013.

### 5.5.1 Association of Australian Acoustical Consultants – Technical Guideline – Child Care Centre Noise Assessment 2013

There is no specific reference to childcare centres in the Warringah Development Control Plan. In this regard guidance will be sought from the AAAC guidelines for childcare centre noise assessment.

#### **Residential Receptors**

##### **Outdoor Play Area**

*For most centres as the duration of time that children are allowed to play outside is reduced than the overall noise impacts reduces. Therefore, it is reasonable to allow a higher level of noise impact for shorter duration of outdoor play. AAAC members regard that a total time limit of approximately 2 hours outdoor play per day (e.g. 1 hour in the morning and 1 hour in the afternoon) should allow an additional emergence above the background of 5dB.*

*Up to 2 hours (total) per day – The Leq,15minute noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10 dB at the assessment location.*

*More than 2 hours per day – The Leq,15minute noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.*

*The assessment location is defined as the most affected point on or within any residential receiver property boundary. Examples of this location may be:*

- *1.5m above ground level;*
- *On a balcony at 1.5 above floor level;*
- *Outside a window on the ground on higher floors.*

##### **Indoor Play Area, Mechanical Plant, Pick up and Drop Off**

*The Leq,15minute noise level emitted from the cumulative noise impact of children playing indoors, mechanical plant and traffic on the site shall not exceed the background noise level by more than 5 dB(A) at the assessment location.*

#### **Commercial Receptors**

*The Leq,15minute noise level emitted from the Child Care Centre shall not exceed 65 dB(A) when assessed the most affected location.*

## School Receptors

Noise emissions to school buildings is not specifically addressed within the AAAC guidelines. In this regard, reference will be made to Australian Standard AS2107:2016 which provides guidance as the recommended indoor sound levels appropriate for various spaces.

For classrooms within educational buildings, AS2107 recommends a maximum internal sound level of 45 dB(A)  $L_{eq(15min)}$ . Typically, there is a 10 dB(A) reduction in noise level when an external noise source is transmitted into a building with windows / doors open to 5% of floor area. On this basis, the criteria established for the school will be 45 dB(A)  $L_{eq(15min)}$  *internally*, or 55 dB(A)  $L_{eq(15min)}$  *externally* at the façade of classroom buildings.

### 5.5.2 Summary of Noise Emission Criteria for Child Care Centre

Table 9 presents the summarised noise emission criteria for the proposed child care centre.

**Table 9 – Noise Emission Criteria for Child Care Centre**

Noise Receiver	Rating Background Noise Level dB(A) $L_{90(Period)}$	Criteria Noise Level dB(A) $L_{eq(15min)}$
R1 - Grace Avenue Residences	47 Daytime (7am – 6pm)	52 (External) Daytime (7am – 6pm)
R2 – Forest Way Residences	58 Daytime (7am – 6pm)	63 (External) Daytime (7am – 6pm)
S1 – Frenchs Forest Public School	N/A	45 (Internal) 55 (External)
C1 - Commercial Receivers	N/A	65 (External)

## 6 NOISE EMISSION ASSESSMENT

An assessment of operational noise emissions is presented. The following noise sources are assessed:

- Patron (vocal) noise on site from use of the 'Skypark' area;
- Patron (vocal) noise from use of outdoor dining areas;
- Operational noise from childcare centre;
- Vehicular noise on site from use of the attached carpark (basement and above ground);
- Noise generated through use of the attached loading docks;
- Noise created on public roads as a result of traffic generated by the site; and
- A preliminary assessment of noise from mechanical plant.

The predicted noise levels from operation at peak times are presented in the following tables. Predicted noise levels factor in losses due to distance attenuation, barrier effects, and transmission losses through the building structure where applicable.

Predicted noise emissions have been calculated on the assumption that recommendations in Section 7 of this report have been implemented.



## 6.1 ASSESSMENT OF PATRON NOISE FROM SKYPARK

Operational noise levels are predicted and assessed against the NPI criteria detailed in section 5.2. Assessment with reference to evening and night time noise goals (most stringent relevant criteria) will be conducted.

This assessment will include review of average ( $L_{eq}$ ) criteria. Noise emissions from the 'Skypark' area has been assessed at predicted peak usage, and is based on the following:

- Use of the Skypark is generally assumed to be used a passive recreation area, and for patrons of the shopping centre / community to relax and consume food / beverages purchased at the shopping centre.
- In this regard, it has been assumed that the typical loudest sources of noise that would be likely to occur would be from children playing in the large outdoor area.
- It has been assumed that up to 60 children are playing in within the Skypark area;
- AAAC guidelines for child care centre assessment detail the following sound power levels;
  - 10 3-5 year old children mid-point sound power level of 87 dB(A)

**Table 10 – 'Skypark' Outdoor Area – Noise Impact Assessment on Grace Avenue Residents (Average /  $L_{eq}$  Noise Emission Assessment)**

Activity	Time	Permitted Noise Level	Predicted Noise Level	Complies
Patron / Children Noise from use of 'Skypark' Area	Night 10pm – 7am	43 dB(A) $L_{eq(15min)}$ (Amenity Criteria)	40 dB(A) $L_{eq(15min)}$	Yes
		43 dB(A) $L_{eq(15min)}$ (Intrusiveness Criteria)	40 dB(A) $L_{eq(15min)}$	Yes
		43 dB(A) $L_{eq(15min)}$ (Sleep Disturbance – Average/ $L_{eq}$ Noise Level)	40 dB(A) $L_{eq(15min)}$	Yes

## 6.2 ASSESSMENT OF PATRON NOISE FROM OUTDOOR DINING AREAS

Operational noise levels are predicted and assessed against the NPI criteria detailed in section 5.2. As it has been assumed that operation of outdoor dining areas will not continue past 10pm, assessment has been with reference to evening noise goals (most stringent relevant criteria).

Additionally, all dining areas have been assessed as unlicensed – it has been assumed that if a venue were to be licensed this would be subject to a separate development application, at which time a separate acoustic assessment with reference to specific usage of the tenancy and the requirements of the NSW Liquor and Gaming could be undertaken.

There are two primary outdoor dining areas located on the site, nominally on the Grace Avenue frontage and the Forest Way frontage. Due to the lower environmental noise levels for residents along Grace Avenue, noise emission from outdoor dining areas in this location are expected to be most critical. Additionally, there is an outdoor dining area located on the first level of the Forestway Shopping Centre facing Russel Avenue.

The scale of currently proposed outdoor dining areas is as follows;

- Grace Avenue Outdoor Seating
  - Seating for approximately 50 patrons, located near the entrance to the shopping center at the rear of the Council car park along Sorlie Place.
- Forest Way Outdoor Seating
  - Seating for approximately 120 patrons, located on ground level at the corner of Forest Way and Russel Avenue, as well as a first floor terrace area.
- First Floor Restaurant Outdoor Dining
  - Seating for approximately 110 patrons located on the outdoor terrace of the level one restaurant tenancy.
- Patron (vocal) sound powers as follows:
  - Patron (vocal) noise - raised voice: 75dB(A)<sub>Leq</sub> sound power.

**Table 11 – Grace Avenue Outdoor Area – Noise Impact Assessment on Grace Avenue Residents**  
**(Average / L<sub>eq</sub> Noise Emission Assessment)**

Activity	Time	Permitted Noise Level	Predicted Noise Level	Complies
Grace Avenue Outdoor Dining Areas	Evening 6pm – 10pm	48 dB(A) <sub>L<sub>eq</sub>(15min)</sub> (Amenity Criteria)	45 dB(A) <sub>L<sub>eq</sub>(15min)</sub>	Yes
		49 dB(A) <sub>L<sub>eq</sub>(15min)</sub> (Intrusiveness Criteria)	45 dB(A) <sub>L<sub>eq</sub>(15min)</sub>	Yes

**Table 12 – Forest Way Outdoor Area – Noise Impact Assessment on Forest Way Residents**  
**(Average / L<sub>eq</sub> Noise Emission Assessment)**

Activity	Time	Permitted Noise Level	Predicted Noise Level	Complies
Forest Way Outdoor Dining Areas	Evening 6pm – 10pm	48 dB(A) <sub>L<sub>eq</sub>(15min)</sub> (Amenity Criteria)	45 dB(A) <sub>L<sub>eq</sub>(15min)</sub>	Yes
		56 dB(A) <sub>L<sub>eq</sub>(15min)</sub> (Intrusiveness Criteria)	45 dB(A) <sub>L<sub>eq</sub>(15min)</sub>	Yes

**Table 13 – Restaurant Terrace Area – Noise Impact Assessment on Grace Avenue Residents**  
**(Average / L<sub>eq</sub> Noise Emission Assessment)**

Activity	Time	Permitted Noise Level	Predicted Noise Level	Complies
Restaurant Outdoor Terrace	Evening 6pm – 10pm	48 dB(A) <sub>L<sub>eq</sub>(15min)</sub> (Amenity Criteria)	43 dB(A) <sub>L<sub>eq</sub>(15min)</sub>	Yes
		49 dB(A) <sub>L<sub>eq</sub>(15min)</sub> (Intrusiveness Criteria)	43 dB(A) <sub>L<sub>eq</sub>(15min)</sub>	Yes

### 6.3 ASSESSMENT OF OPERATIONAL NOISE FROM CHILDCARE CENTRE

The child care centre at this stage does not have an operator. As such key operational details (such as number of children within the centre, age breakdown proposed & hours of operation etc) are not yet known. As such, a full and proper assessment of the childcare centre cannot be undertaken at this stage.

Notwithstanding the above, through use of appropriate management controls and acoustic treatments to internal spaces and facade, use and operation of the childcare centre has the ability to comply with the criteria detailed in Section 5.5 of this report. Examples of treatments which may be required to achieve the criteria detailed above include (but are not necessarily limited to);

- Design of outdoor play areas to minimise potential impact on neighbouring residents;
- Use of building form as an acoustic barrier;
- Absorptive treatments where appropriate;
- Treatment to building façade to prevent noise transmission through lightweight elements such as glazing.

It has been assumed that any future tenant of this space would be required to submit a development application prior to commencement, at which time compliance with the acoustic criteria detailed in Section 5.5 of this report would be demonstrated.

## 6.4 ASSESSMENT OF NOISE FROM CARPARK

Operational noise levels are predicted and assessed against the NPI criteria detailed in section 5.2. Assessment with reference to evening and night time noise goals (peak usage and most stringent criteria respectively) will be conducted.

This assessment will include review of both average ( $L_{eq}$ ) and maximum/sleep disturbance ( $L_{max}$ ) criteria.

Noise emissions from the attached car park at peak / worst case usage is based on the following assumptions:

- Daytime Periods (Peak Usage) – Peak period traffic movements have been based on the Traffic Report prepared for this project by Colston Budd Rogers & Kafes Pty Ltd (document reference 10857/1). Expected peak traffic movements to the shopping centre are detailed in Section 3 of the report. Peak traffic movements associated with the development are expected to occur on Saturday midday peak hour, with associated peak volumes of site access detailed in Table 3.1 of the report as follows;
  - Forest Way – A total of 600 vehicle movements per hour to the Forest Way carparking facilities;
  - Grace Avenue – A total of 600 vehicle movements per hour to the Grace Avenue carparking facilities.
- Night Time Periods (peak usage) – During the night time period, it has been assumed that typically peak usage would correspond to a large quantity of patrons exiting the shopping centre at the conclusion of an event (such as multiple cinema screenings finishing simultaneously). The following volumes of vehicles have been used to assess noise to each receiver from vehicles leaving the centre:
  - Grace Avenue Basement Exit: up to 30 cars exiting the basement car park in a given peak period 15 minute period.
  - Forest Way Rooftop Carpark: up to 30 cars exiting the rooftop carpark in a given peak period 15 minute period.
- Peak noise events from carparks (typically vehicle door closing) have been assumed to occur at the boundary of the carpark closest to adjacent residential receivers.
- Vehicle sound powers as follows:
  - Engine noise from cars manoeuvring within the car park: 84dB(A) $L_{eq}$  sound power.
  - Vehicle Door Close: 95dB(A) $L_{max}$  sound power.

#### 6.4.1 Assessment of Average ( $L_{eq(15min)}$ ) Noise Emissions.

**Table 14 – Attached Car Park – Noise Impact Assessment on Forest Way Residences  
(Average /  $L_{eq}$  Noise Emission Assessment)**

Activity	Time	Permitted Noise Level	Predicted Noise Level	Complies
Noise from Vehicles Entering / Manoeuvring in Attached Car Park	Daytime Peak (Saturday Middyay) 12pm – 1pm	58 dB(A) $L_{eq(15min)}$ (Amenity Criteria)	42 dB(A) $L_{eq(15min)}$	Yes
		63 dB(A) $L_{eq(15min)}$ (Intrusiveness Criteria)	42 dB(A) $L_{eq(15min)}$	Yes
Noise from Vehicles Exiting from Rooftop Car Ramp	Night 10pm – 7am	43 dB(A) $L_{eq(15min)}$ (Amenity Criteria)	36 dB(A) $L_{eq(15min)}$	Yes
		40 dB(A) $L_{eq(15min)}$ (Intrusiveness Criteria)	36 dB(A) $L_{eq(15min)}$	Yes
		40 dB(A) $L_{eq(15min)}$ (Sleep Disturbance – Average/ $L_{eq}$ Noise Level)	36 dB(A) $L_{eq(15min)}$	Yes

**Table 15 – Attached Car Park – Noise Impact Assessment on Grace Avenue Residences  
(Average /  $L_{eq}$  Noise Emission Assessment)**

Activity	Time	Permitted Noise Level	Predicted Noise Level	Complies
Noise from Vehicles Entering / Exiting Attached Car Park	Daytime Peak (Saturday Middyay) 12pm – 1pm	58 dB(A) $L_{eq(15min)}$ (Amenity Criteria)	46 dB(A) $L_{eq(15min)}$	Yes
		52 dB(A) $L_{eq(15min)}$ (Intrusiveness Criteria)	46 dB(A) $L_{eq(15min)}$	Yes
Noise from Vehicles Exiting From Attached Car Park	Night 10pm – 7am	43 dB(A) $L_{eq(15min)}$ (Amenity Criteria)	39 dB(A) $L_{eq(15min)}$	Yes
		43 dB(A) $L_{eq(15min)}$ (Intrusiveness Criteria)	39 dB(A) $L_{eq(15min)}$	Yes
		43 dB(A) $L_{eq(15min)}$ (Sleep Disturbance – Average/ $L_{eq}$ Noise Level)	39 dB(A) $L_{eq(15min)}$	Yes

#### 6.4.2 Assessment of *Peak* ( $L_{Max}$ ) noise emissions for Sleep Disturbance

**Table 16 – Attached Car Park – Noise Impact Assessment on Forest Way Residences  
(Sleep Arousal /  $L_{Max}$  Noise Emission Assessment)**

Activity	Criteria	Permitted Noise Level	Predicted Noise Level	Complies
Door Slam in Rooftop Car Park	Sleep Disturbance – Maximum Noise Level	52 dB(A) $L_{(Max)}$	39 dB(A) $L_{Max}$	Yes
Car Leaving Site from Ramp Exit		52 dB(A) $L_{(Max)}$	34 dB(A) $L_{Max}$	Yes

**Table 17 – Attached Car Park – Noise Impact Assessment on Grace Avenue Residences  
(Sleep Arousal /  $L_{Max}$  Noise Emission Assessment)**

Activity	Criteria	Permitted Noise Level	Predicted Noise Level	Complies
Door Slam in Rooftop Car Park	Sleep Disturbance – Maximum Noise Level	53 dB(A) $L_{(Max)}$	32 dB(A) $L_{Max}$	Yes
Car Leaving Site from Basement Exit		53 dB(A) $L_{(Max)}$	46 dB(A) $L_{Max}$	Yes

Use of the car park is predicted to comply with EPA guidelines at all times.



## 6.5 LOADING DOCK ASSESSMENT

Operational noise levels are predicted and assessed against the NPfI criteria detailed in section 5.2. Assessment with reference to night time noise goals (most stringent criteria) will be conducted. The assessment will include review of both average ( $L_{eq}$ ) and maximum/sleep disturbance ( $L_{max}$ ) criteria.

Noise emissions from the two loading docks at peak usage is based on the following assumptions:

- Two movements (in or out) from large trucks to loading dock during a given 15-minute period
- It takes 1 minute for a truck to manoeuvre into/out of the loading dock.
- Engine noise from articulated truck manoeuvring within the loading dock: 100 dB(A) $L_{eq}$  sound power.

### 6.5.1 Loading Dock Noise – Average ( $L_{eq(15min)}$ ) Noise Emission Assessment.

**Table 18 – Attached Loading Docks – Noise Impact Assessment on Grace Avenue Residents (Average /  $L_{eq}$  Noise Emission Assessment)**

Activity	Time	Permitted Noise Level	Predicted Noise Level	Complies
Noise from Use of Loading Docks	Evening 6pm – 10pm	48 dB(A) $L_{eq(15min)}$ (Amenity Criteria)	45 dB(A) $L_{eq(15min)}$	Yes
		49 dB(A) $L_{eq(15min)}$ (Intrusiveness Criteria)	45 dB(A) $L_{eq(15min)}$	Yes

## 6.6 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS

Traffic generation from the proposed shopping centre redevelopment have been based on the Traffic Report prepared for this project by Colston Budd Rogers & Kafes Pty Ltd (document reference 10857/1). The existing and proposed traffic movements for roads surrounding the project site are detailed in Table 3.1 of the Traffic Report, as follows;

<b>Table 3.1: Existing + Development Two-Way (Sum of Both Directions) Peak Hour Traffic Flows</b>				
<b>Road</b>	<b>Weekday Afternoon</b>		<b>Saturday Midday</b>	
	Existing	+ Dev	Existing	+ Dev
Warringah Road				
– east of Forest Way	3705	+95	3515	+120
– west of Forest Way	3175	+65	2775	+110
Forest Way				
– north of Naree Road	3340	+40	4165	+45
– south of Naree Road	3120	+55	4110	+65
– south of Russell Avenue	2970	+95	3815	+90
– north of Warringah Road	3390	+160	4020	+250
Russell Avenue				
– east of Forest Way	510	-95	465	-85
– west of Grace Avenue	400	-40	385	-30
Grace Avenue				
– north of Russell Avenue	835	+115	695	+105
– south of Russell Avenue	835	+305	650	+375
– north of Sorlie Place (N)	845	+100	610	+70
– south of Sorlie Place (S)	830	+100	595	+70
Sorlie Place				
– entry	130	+0	160	+0
– exit	140	+0	150	+0
Naree Road				
– east of Forest Way	640	+15	555	+20
Site Accesses				
– Forest Way (entry only)	160	+315	200	+400
– Russell Avenue	285	-285	355	-355
– Grace Avenue	120	+405	155	+445

With consideration to above and compliance with the criteria of the NSW Road Noise Policy, we provide the following commentary;

- Both Forest Way and Grace Avenue currently exceed the respective noise requirement of arterial and local roads of the Road Noise Policy (as detailed in Table 8).
- The NSW Road Noise Policy notes that an increase of less than 2 dB(A) is a minor impact and would be barely perceptible;
- Based on the above predicted traffic generation volumes, the location experiencing the highest increase in traffic volumes would be for Grace Avenue residents south of Russell Avenue.
- Predicted increases in road traffic noise during Saturday midday peak traffic would be expected to be up to 2 dB(A) at the Grace Avenue residents south of Russell Avenue, which represents the most significantly impacted location and period.
- Based on this, noise generated by additional traffic on public roads would be expected to represent a minor impact only.

## 6.7 NOISE FROM MECHANICAL PLANT

An assessment of initial design of primary plant items is presented below.

- Roof top plant:
  - Refrigeration equipment:
    - Refrigeration compressors are recommended to be located within enclosure plant rooms.
    - Locate refrigeration condensers as far as practicable from adjacent noise sensitive development. Noise screening (using either a dedicated noise screen or the building shell between the condensers and noise sensitive buildings) may be required.
    - To ensure compliance with NPI requirements during day, evening and night time, additional review is recommended following final plant selection and review of night time operational speeds.
  - Major fans (such as kitchen exhaust, major toilet exhaust and major relief air fans) will require acoustic treatment if located externally. Whenever possible for major fans, it is recommended that axial (as opposed to roof mounted fans) are to be used as this will enable acoustic treatment to be incorporated within ductwork running to atmosphere.

Cumulative assessment of both plant noise with other noise sources is recommended when conducting acoustic design of plant items. This is particularly important for plant noise near the property boundary, where cumulative assessment with the plant/vehicle noise is to be considered.

Compliance with EPA acoustic criteria (as set out in Section 5.2) will be achievable, provided that detailed acoustic review of plant items is undertaken once plant is selected, and acoustic treatments similar to those outlined above are adopted.

## **7 RECOMMENDATIONS**

This section details the recommendations to achieve the noise levels detailed in Section 6.

### **7.1 RECOMMENDATIONS FOR 'SKYPARK'**

- A 1.5m high imperforate barrier is to be installed to the Grace Avenue / Sorlie Place perimeter.
  - Barrier may be constructed of constructed of lapped and capped timber, flexi-glass, 4mm Perspex, Colorbond, 9mm fibrous cement sheet, or equivalent. Fencing to be installed with no gaps between the panels.
  - It is noted that the current proposal incorporates a barrier of this height through the use of planter boxes and screening along the Grace Avenue perimeter of the Skypark.

### **7.2 RECOMMENDATIONS FOR OUTDOOR DINING AREAS**

- The total number of patrons in outdoor dining areas is not to exceed the following limits;
  - Grave Avenue seating – 50 patrons
  - Forest Way seating – 120 patrons
  - Restaurant Terrace Seating – 110 patrons
- Outdoor dining areas to be in use between the hours of 7am – 10pm
- Internal dining areas to be in use between the hours of 7am – 12am.
- In the event a venue is licenced, a separate acoustic assessment should be conducted in accordance with the requirements of the NSW Liquor and Gaming should be undertaken.

### **7.3 RECOMMENDATIONS FOR CARPARK AREAS**

- A 1.5m high imperforate parapet is to be installed to the perimeter of the rooftop car park.
  - Barrier may be constructed of constructed of lapped and capped timber, flexi-glass, 4mm Perspex, Colorbond, 9mm fibrous cement sheet, or equivalent. Fencing to be installed with no gaps between the panels.

### **7.4 RECOMMENDATIONS FOR LOADING DOCKS**

- Loading dock to be in operation only between the hours of 7am – 10pm.
- Garbage collection is to occur only between the hours of 7am – 10pm
- Forklifts to service loading / unloading of delivery vehicles should be electric or LPG type (no diesel forklifts) and use non-tonal movement beacons.

## 7.5 MECHANICAL PLANT & EQUIPMENT

- Detailed acoustic review of all plant items should be undertaken following equipment selection and duct layout design. Initial analysis (Section 0) indicates that with acoustic treatment, all plant items will be capable of meeting noise emission requirements. However, this is likely to require:
  - Refrigeration condensers - Noise screening (using either a dedicated noise screen or the building shell between the condensers and adjacent residents) may be required.
  - Use of axial fans and induct acoustic lining to major external fans.
  - Further acoustic review of external louvres for any plant room to determine whether acoustic louvres/attenuators or blanking off of those louvres is required. This must be conducted once equipment selections are finalised.

## 8 CONCLUSION

Noise emissions impacts to surrounding residents associated with the proposed Forestway Shopping Centre redevelopment have been assessed with reference to relevant EPA and Council acoustic guidelines.

An analysis of typical operational noise (patron, vehicle, plant / equipment) indicates that the site is capable of complying with relevant noise emission criteria. Recommendations contained in Section 7 of this report detail the requirements to achieve compliant noise levels.

Review indicates that acoustic treatment to major plant items is likely to be required (screens, in-duct attenuation and enclosures) however through appropriate treatment, noise emissions are capable of complying with EPA and Council requirements.

Please contact us if you have any queries.

Yours faithfully,

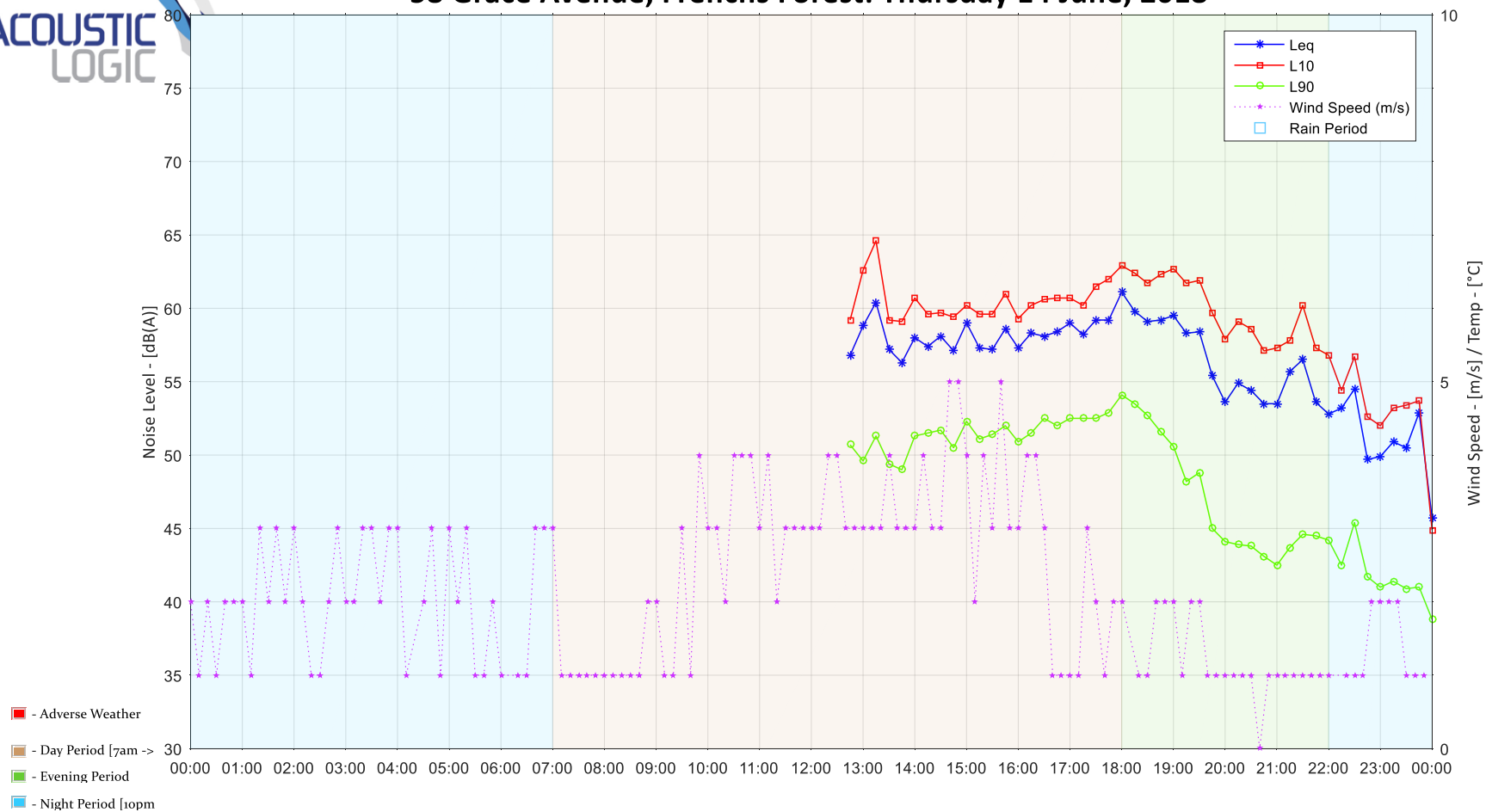
A handwritten signature in black ink, appearing to read 'Alex Washer', with a stylized, cursive script.

Acoustic Logic Consultancy Pty Ltd  
Alex Washer

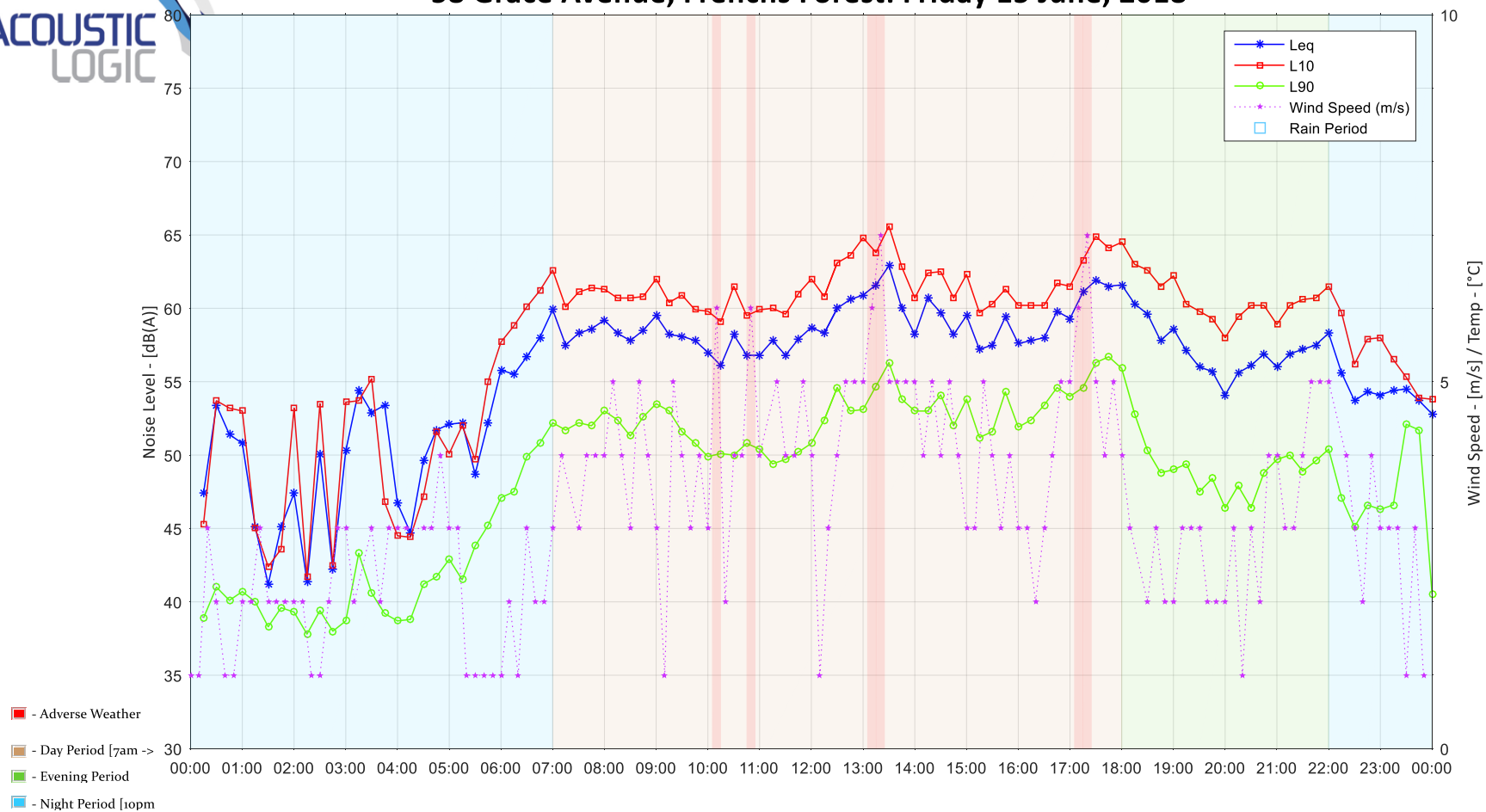
## **APPENDIX ONE – UNATTENDED NOISE MONITORING DATA – 58 GRACE AVENUE, FRENCHS FOREST**



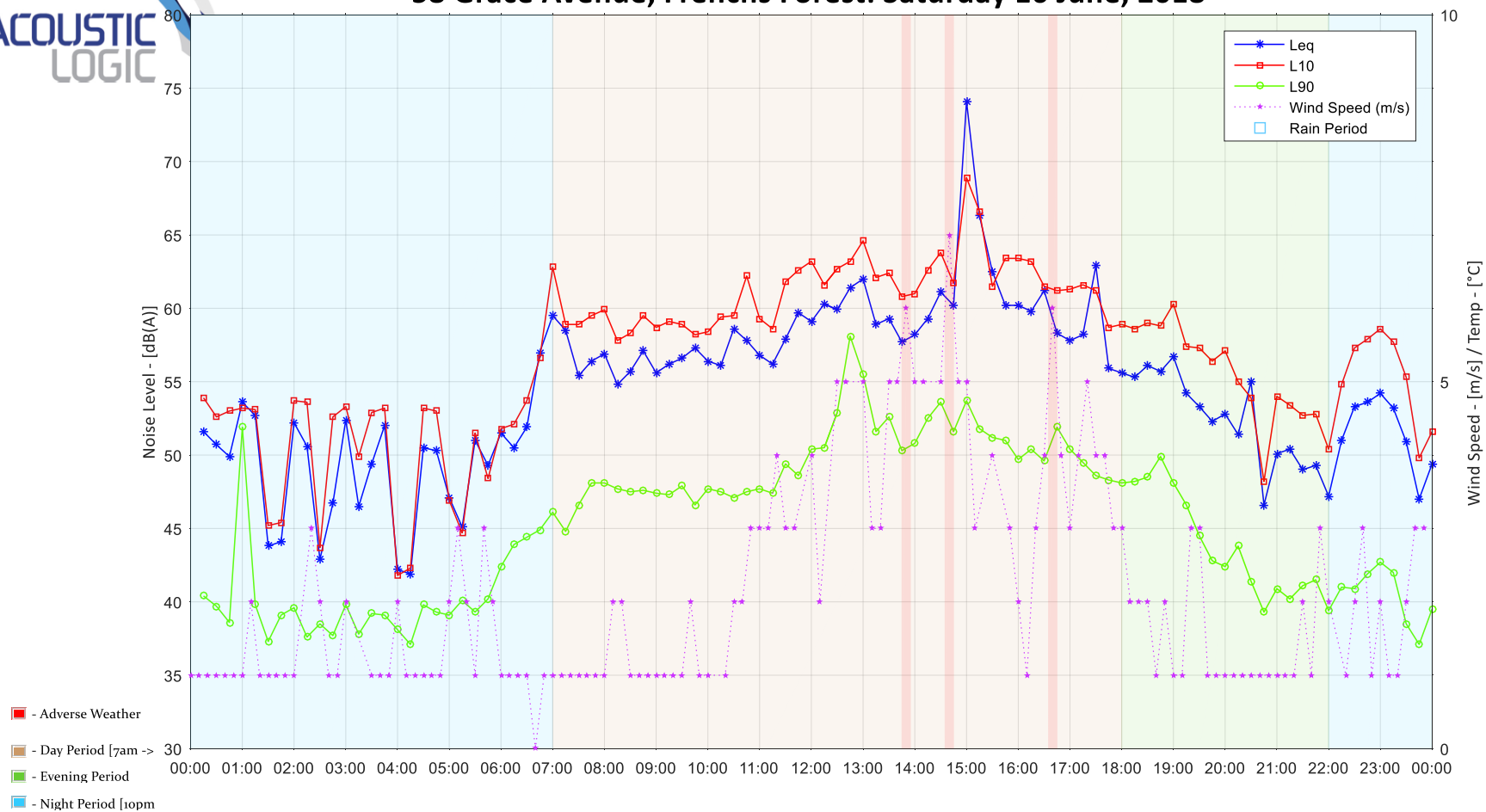
# 58 Grace Avenue, Frenchs Forest: Thursday 14 June, 2018



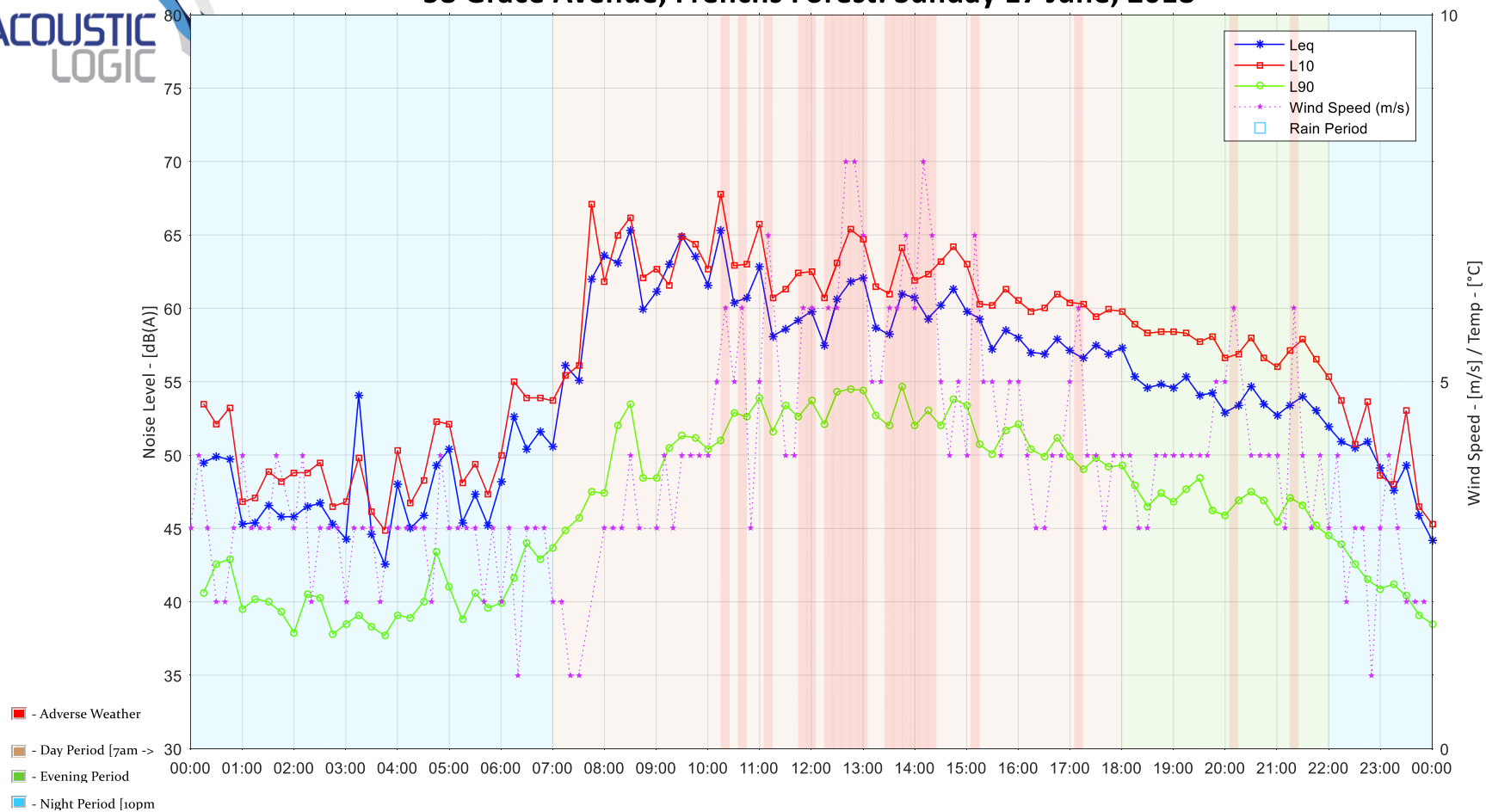
## 58 Grace Avenue, Frenchs Forest: Friday 15 June, 2018



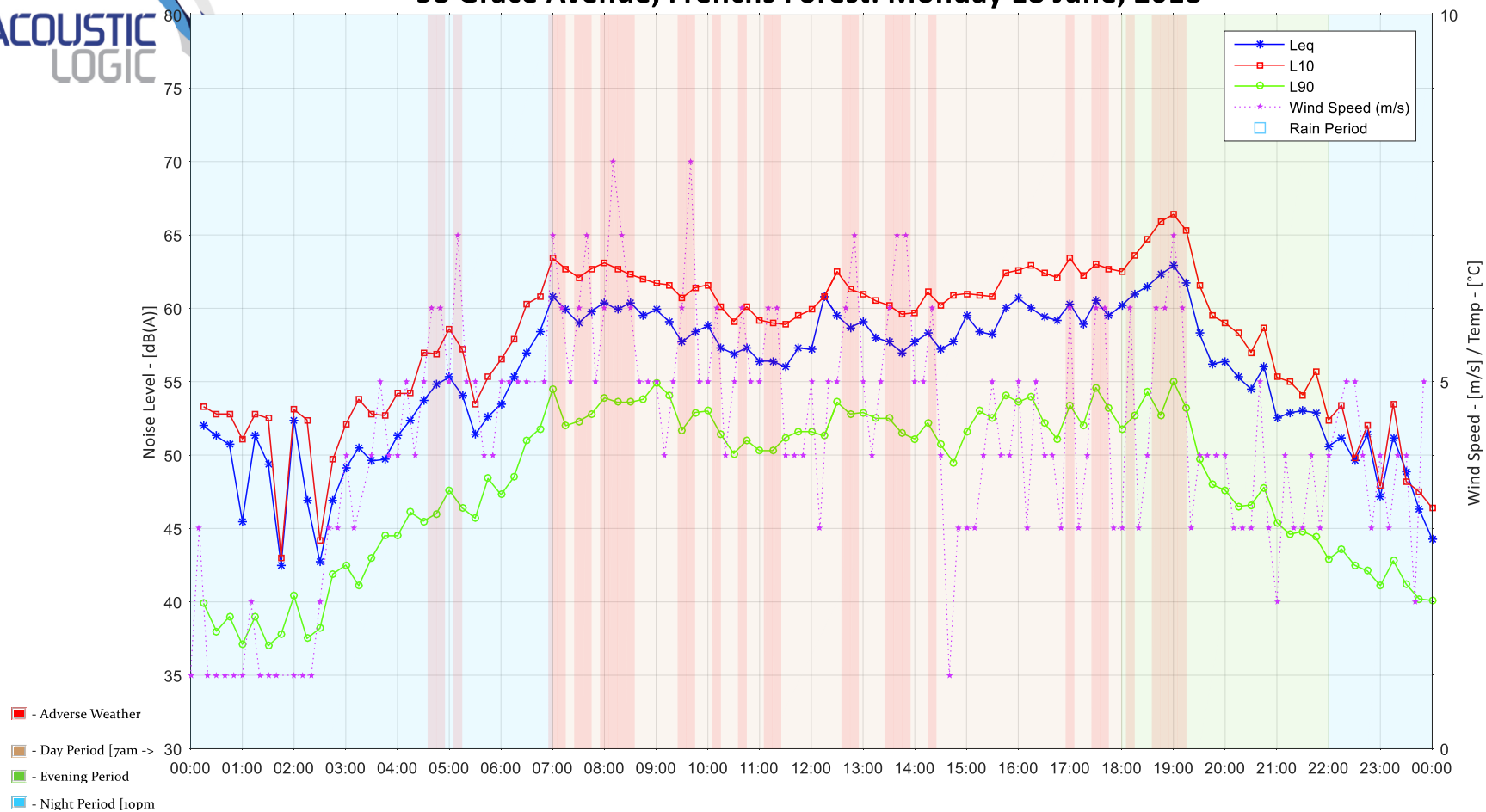
# 58 Grace Avenue, Frenchs Forest: Saturday 16 June, 2018



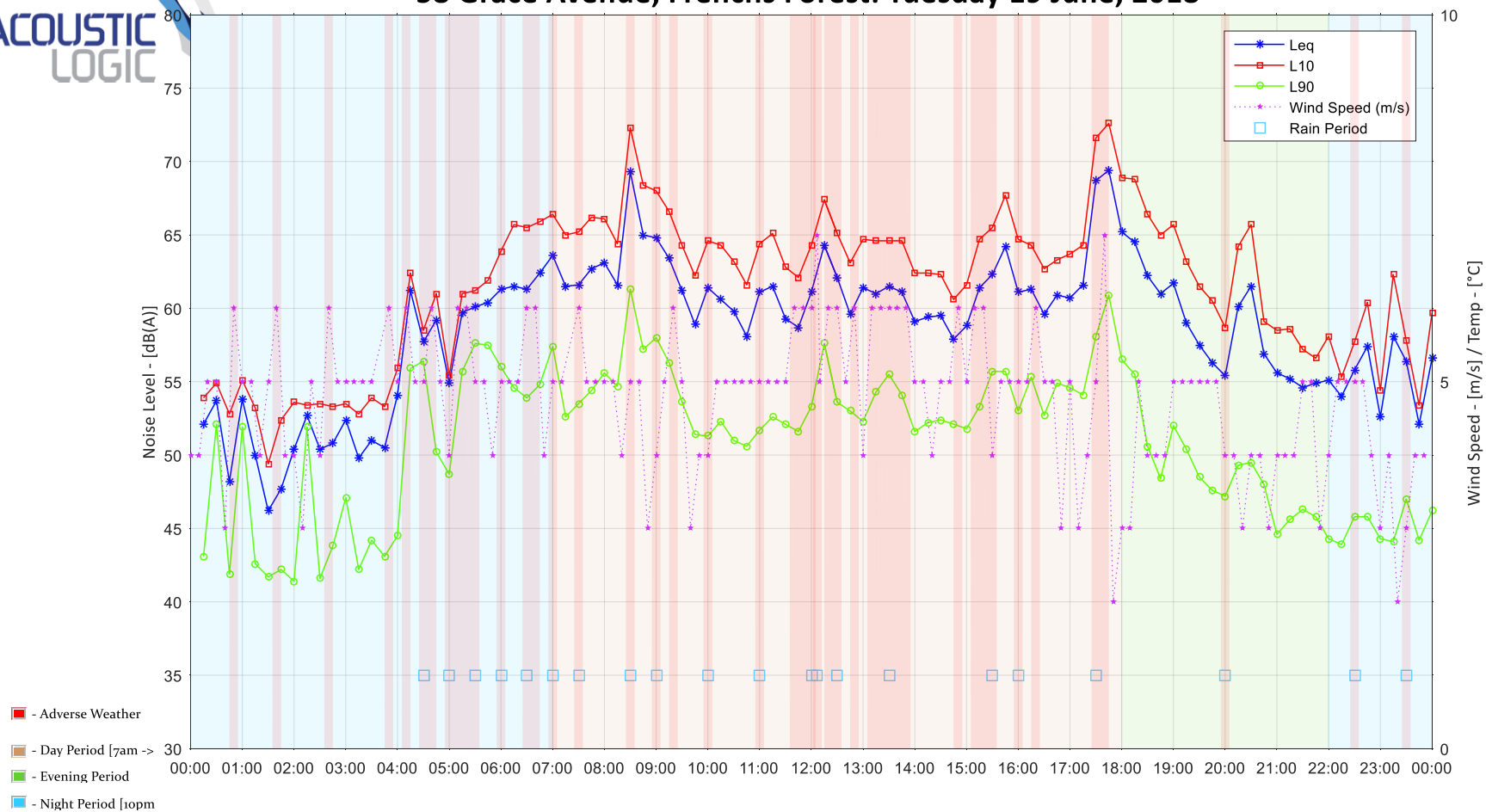
## 58 Grace Avenue, Frenchs Forest: Sunday 17 June, 2018



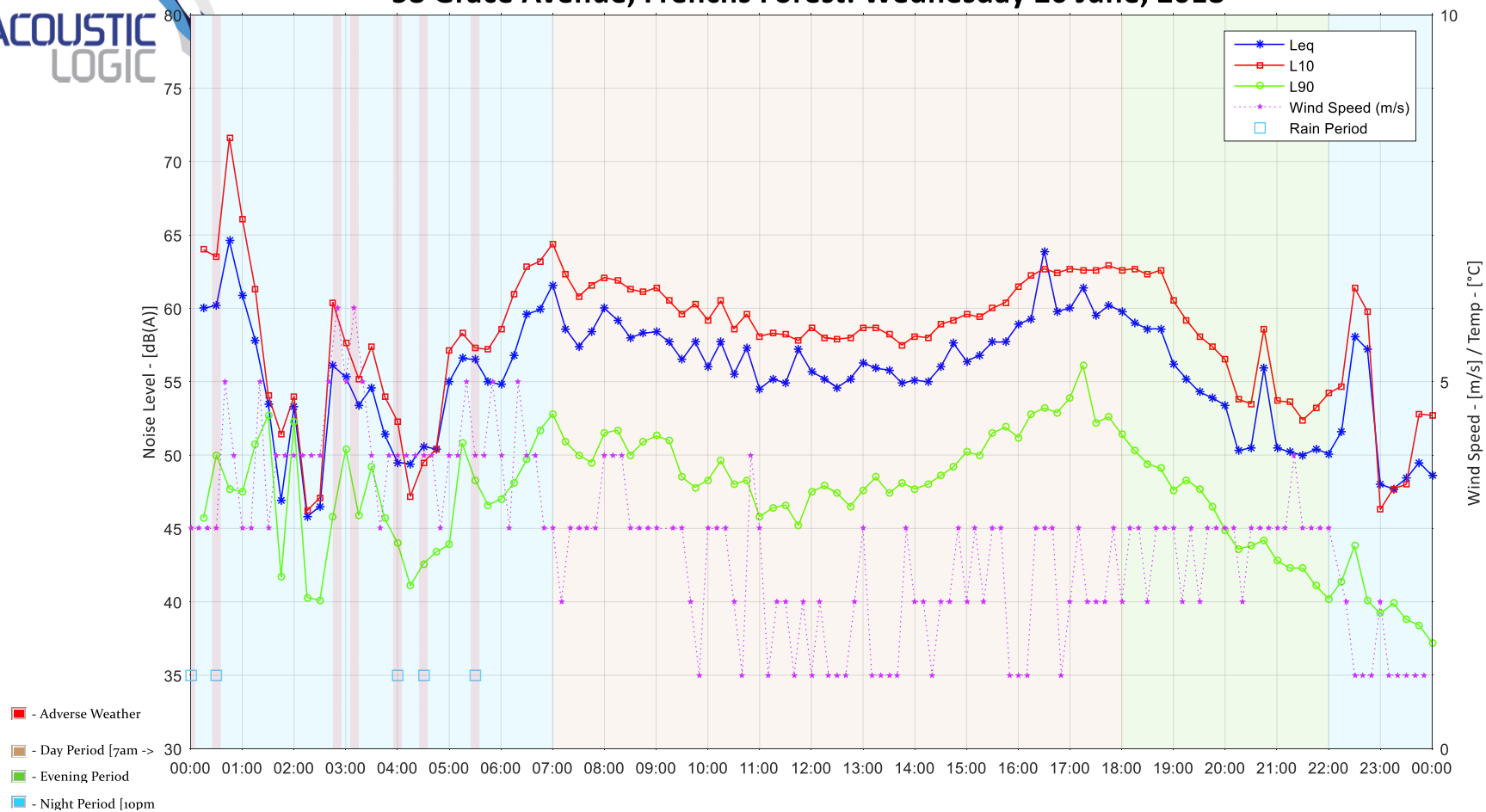
# 58 Grace Avenue, Frenchs Forest: Monday 18 June, 2018



## 58 Grace Avenue, Frenchs Forest: Tuesday 19 June, 2018

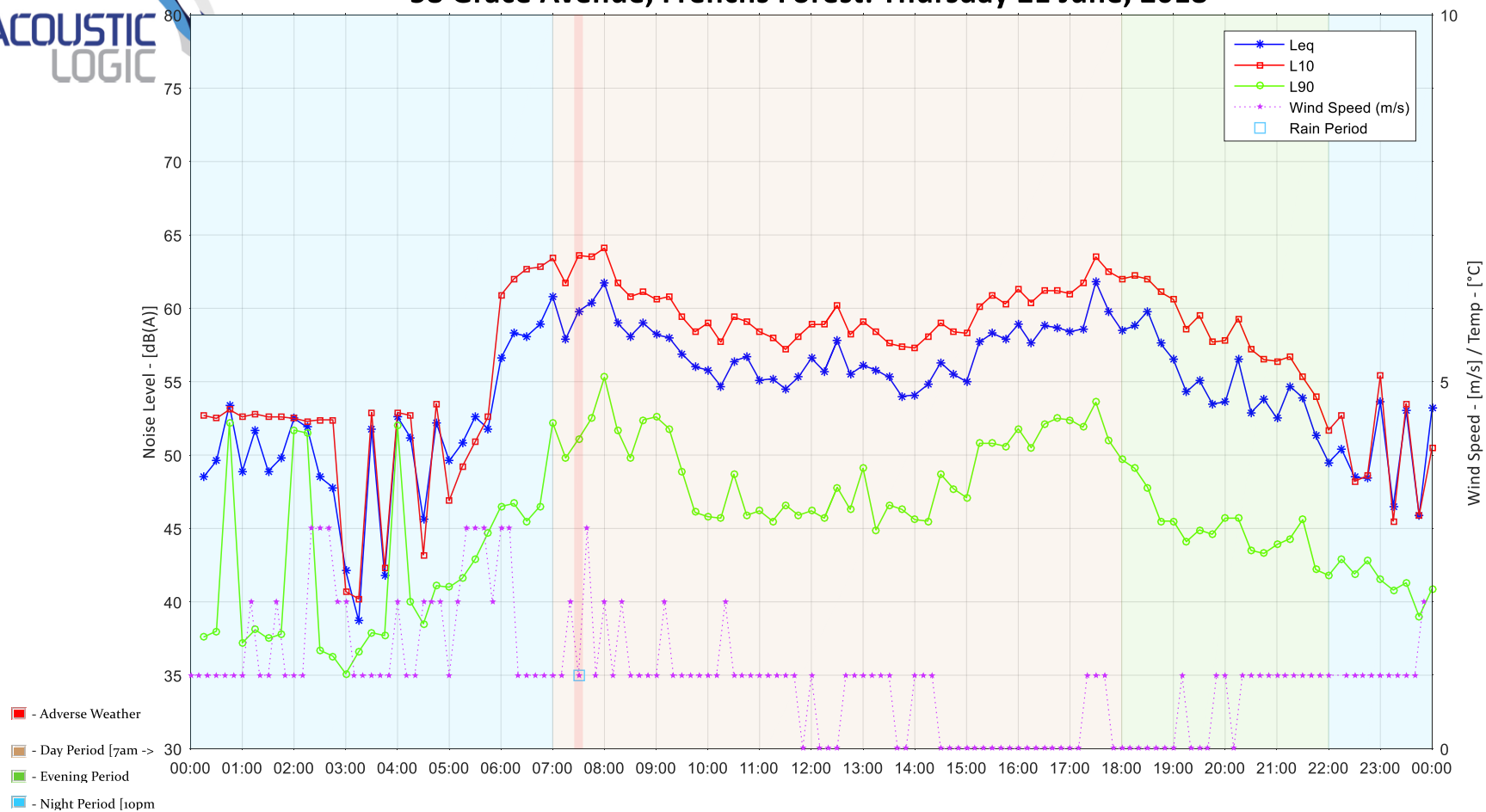


## 58 Grace Avenue, Frenchs Forest: Wednesday 20 June, 2018

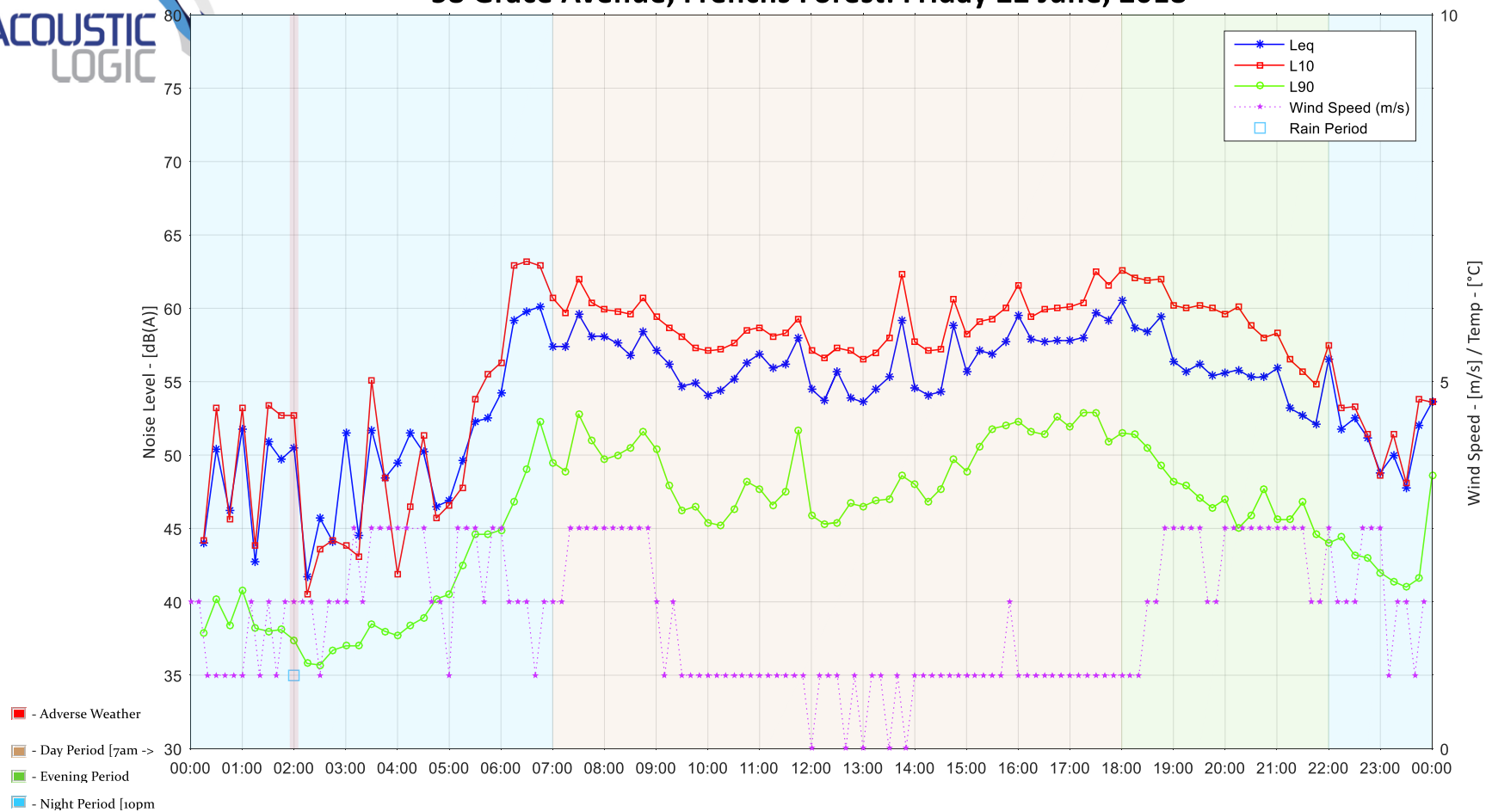




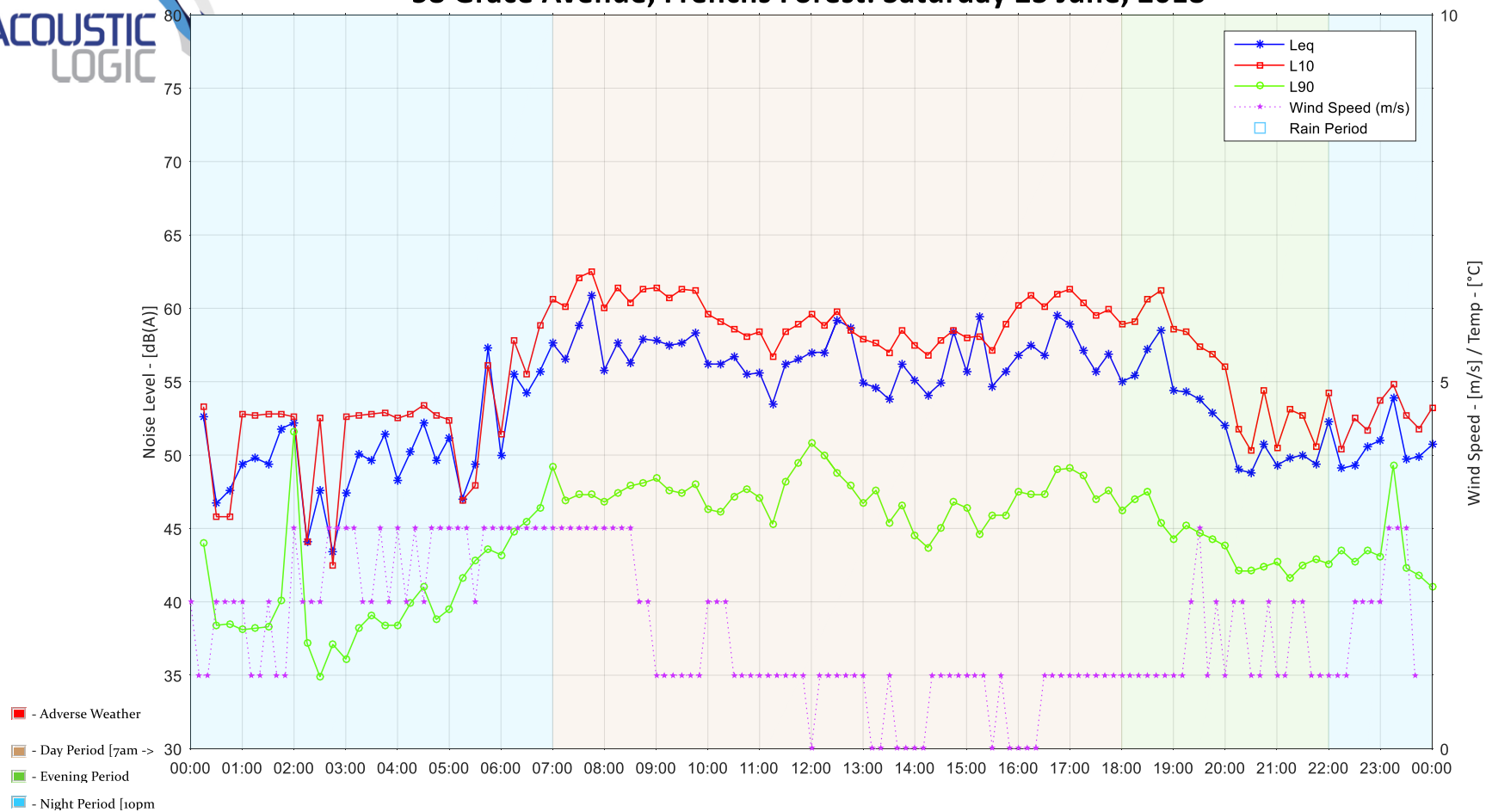
# 58 Grace Avenue, Frenchs Forest: Thursday 21 June, 2018



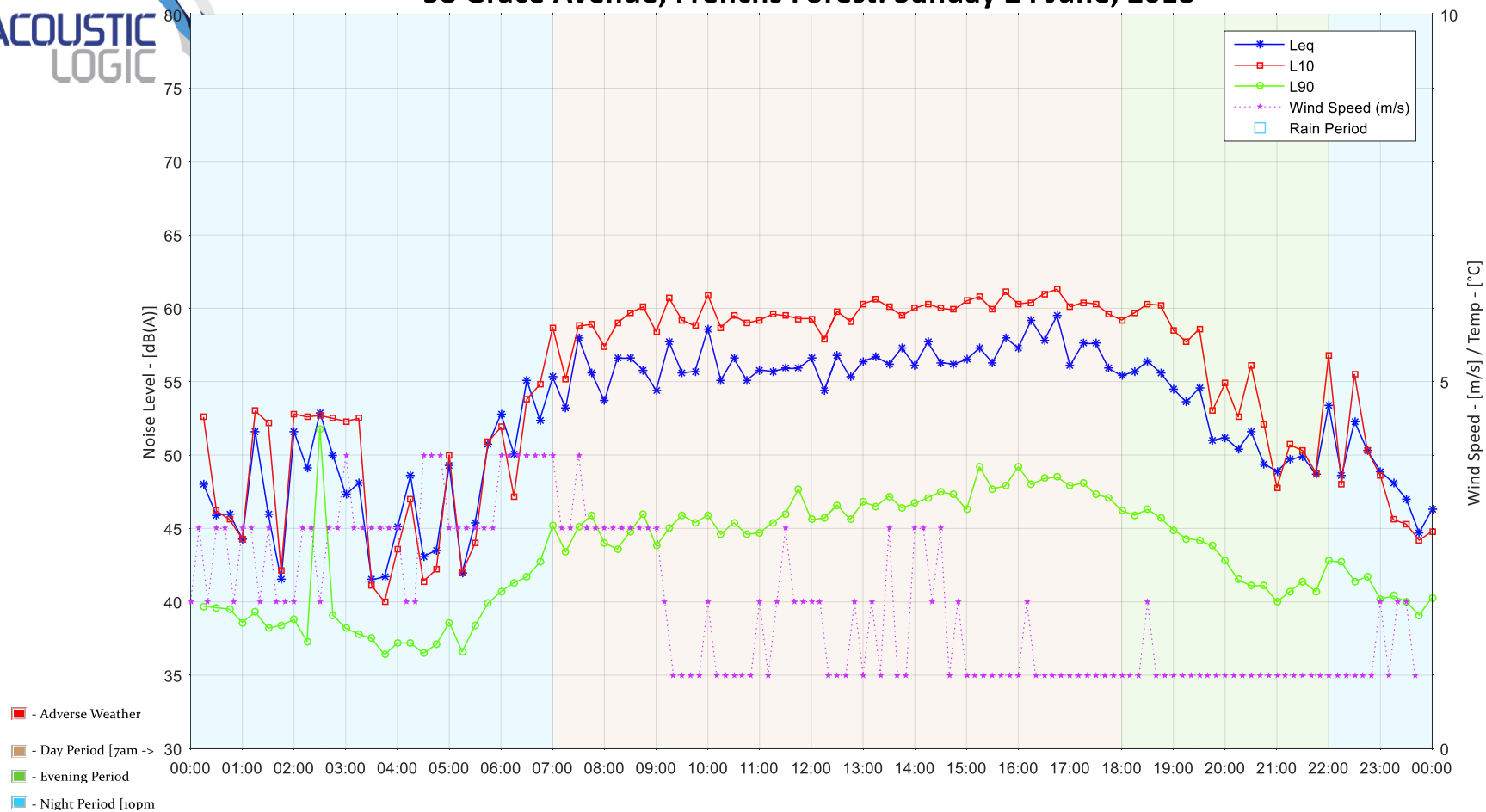
# 58 Grace Avenue, Frenchs Forest: Friday 22 June, 2018



# 58 Grace Avenue, Frenchs Forest: Saturday 23 June, 2018



## 58 Grace Avenue, Frenchs Forest: Sunday 24 June, 2018

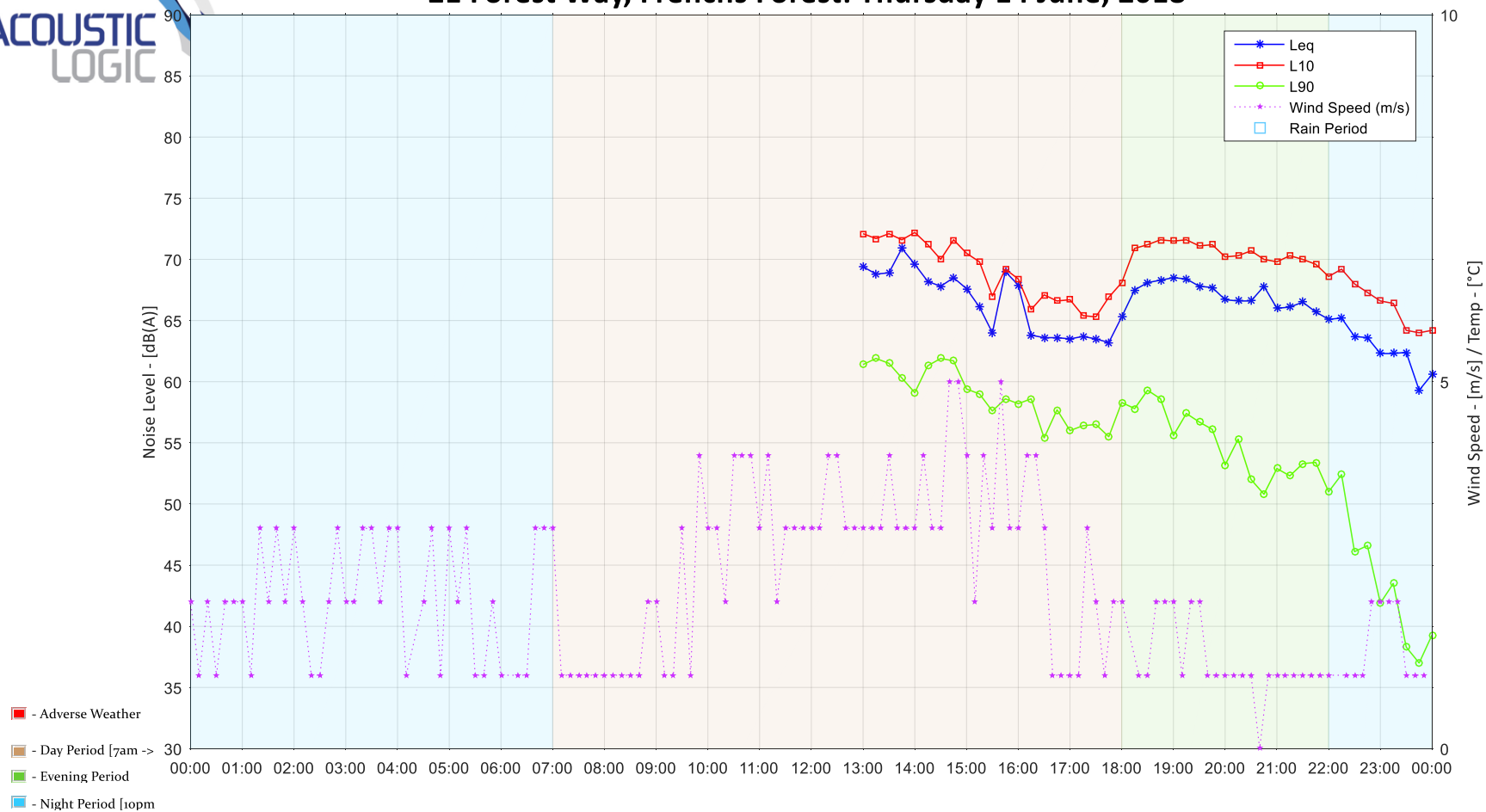


## 58 Grace Avenue, Frenchs Forest: Monday 25 June, 2018

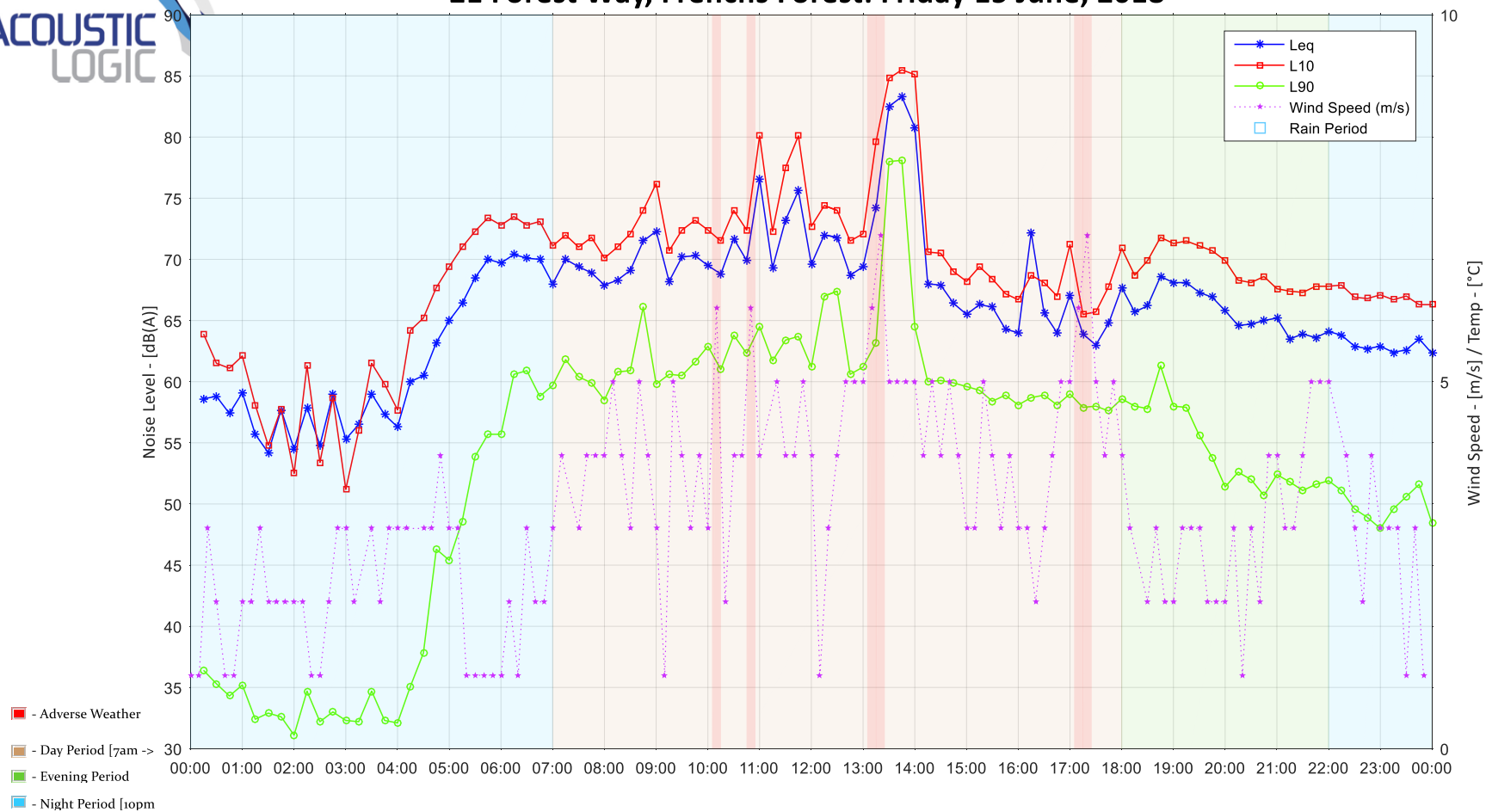


**APPENDIX TWO – UNATTENDED NOISE MONITORING DATA – 21  
FOREST WAY, FRENCHS FOREST.**

## 21 Forest Way, Frenchs Forest: Thursday 14 June, 2018

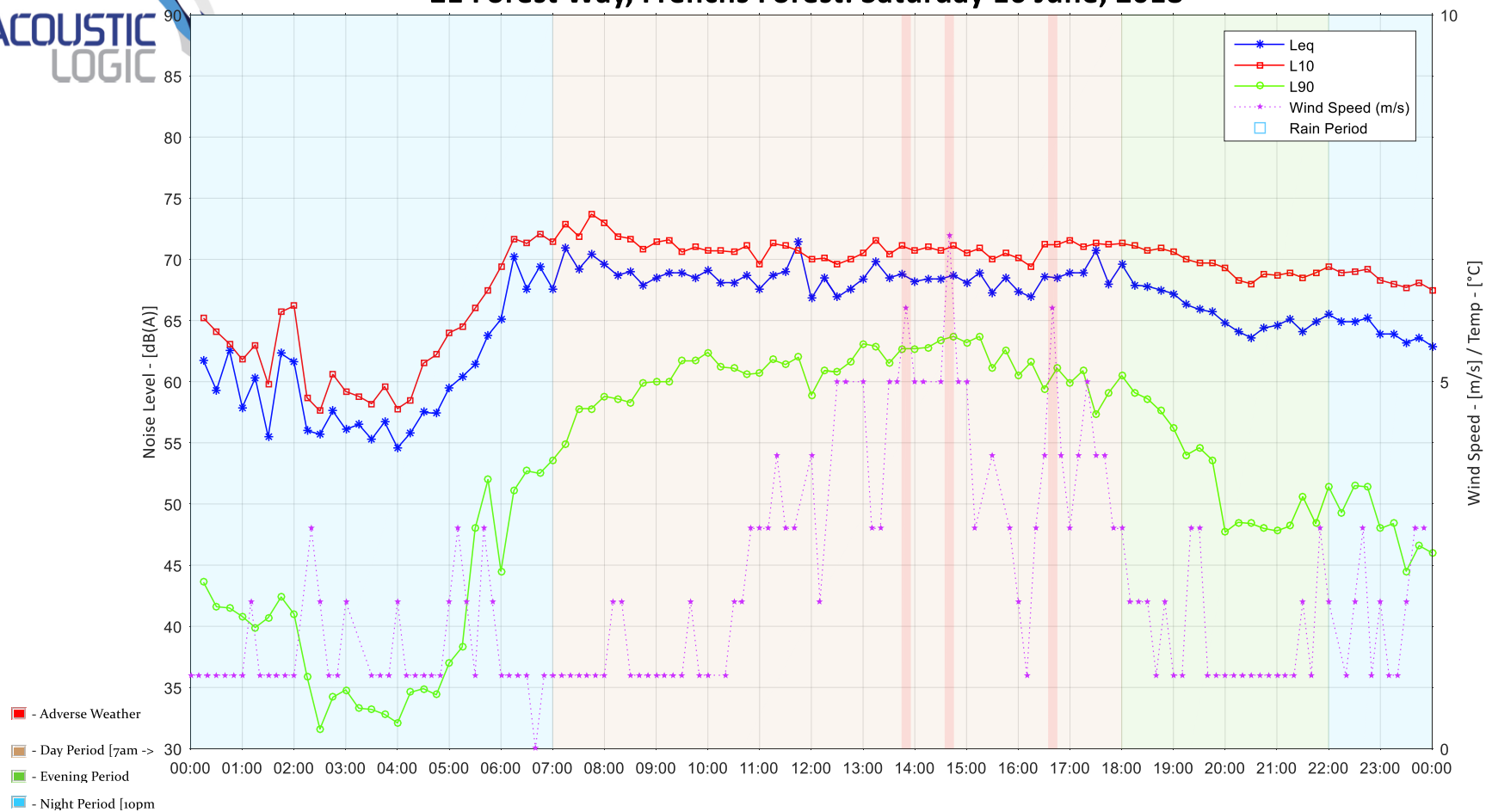


## 21 Forest Way, Frenchs Forest: Friday 15 June, 2018

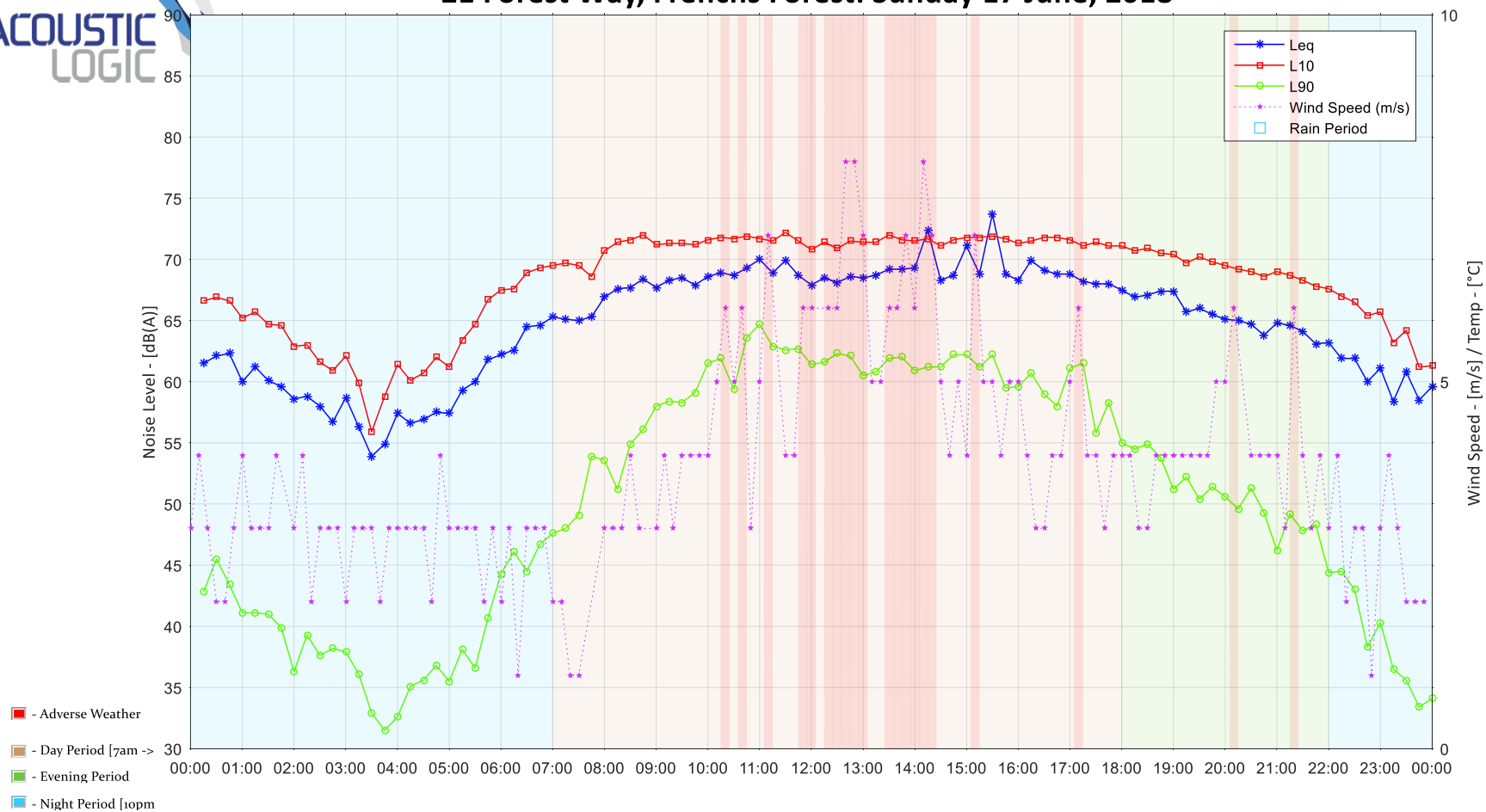




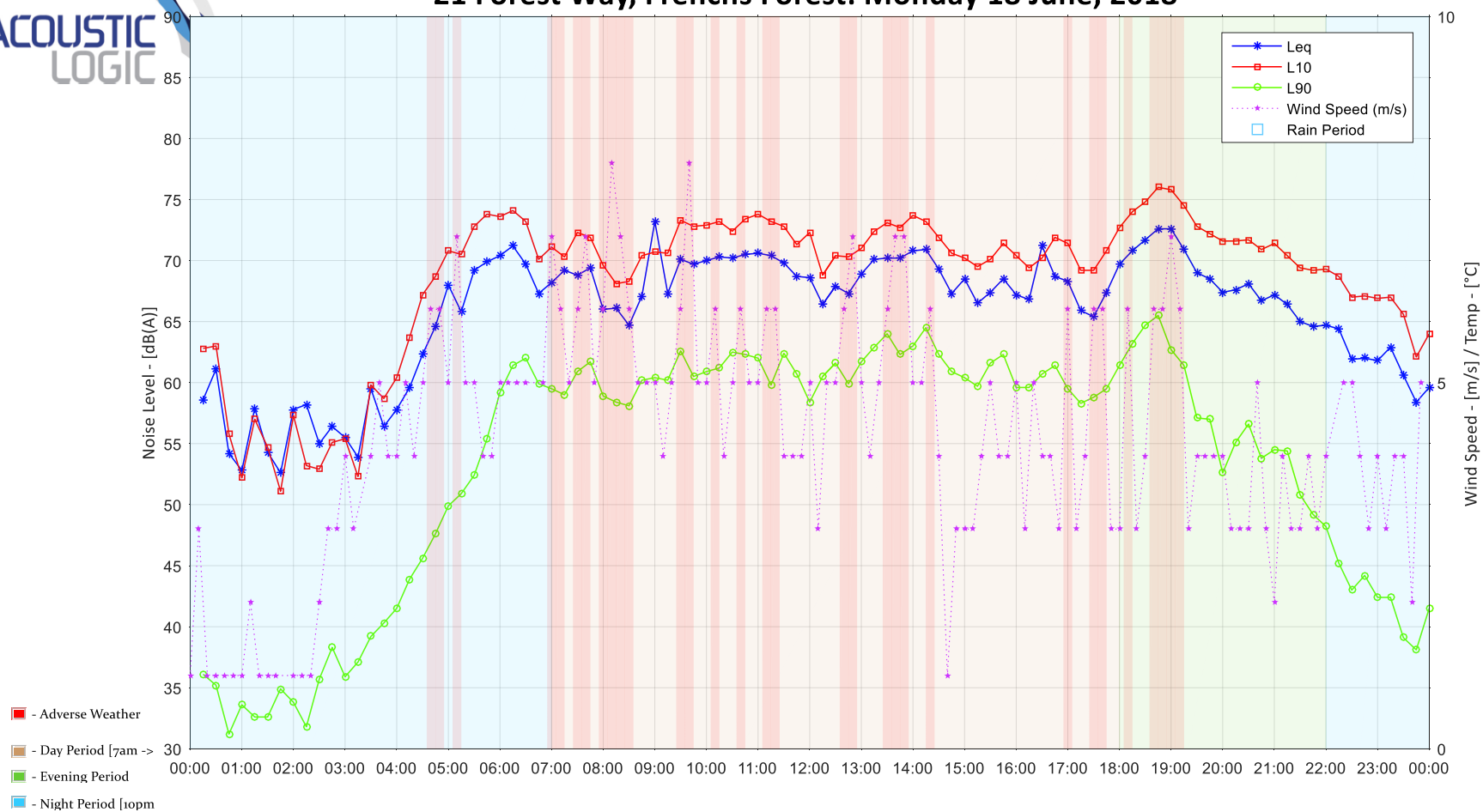
## 21 Forest Way, Frenchs Forest: Saturday 16 June, 2018



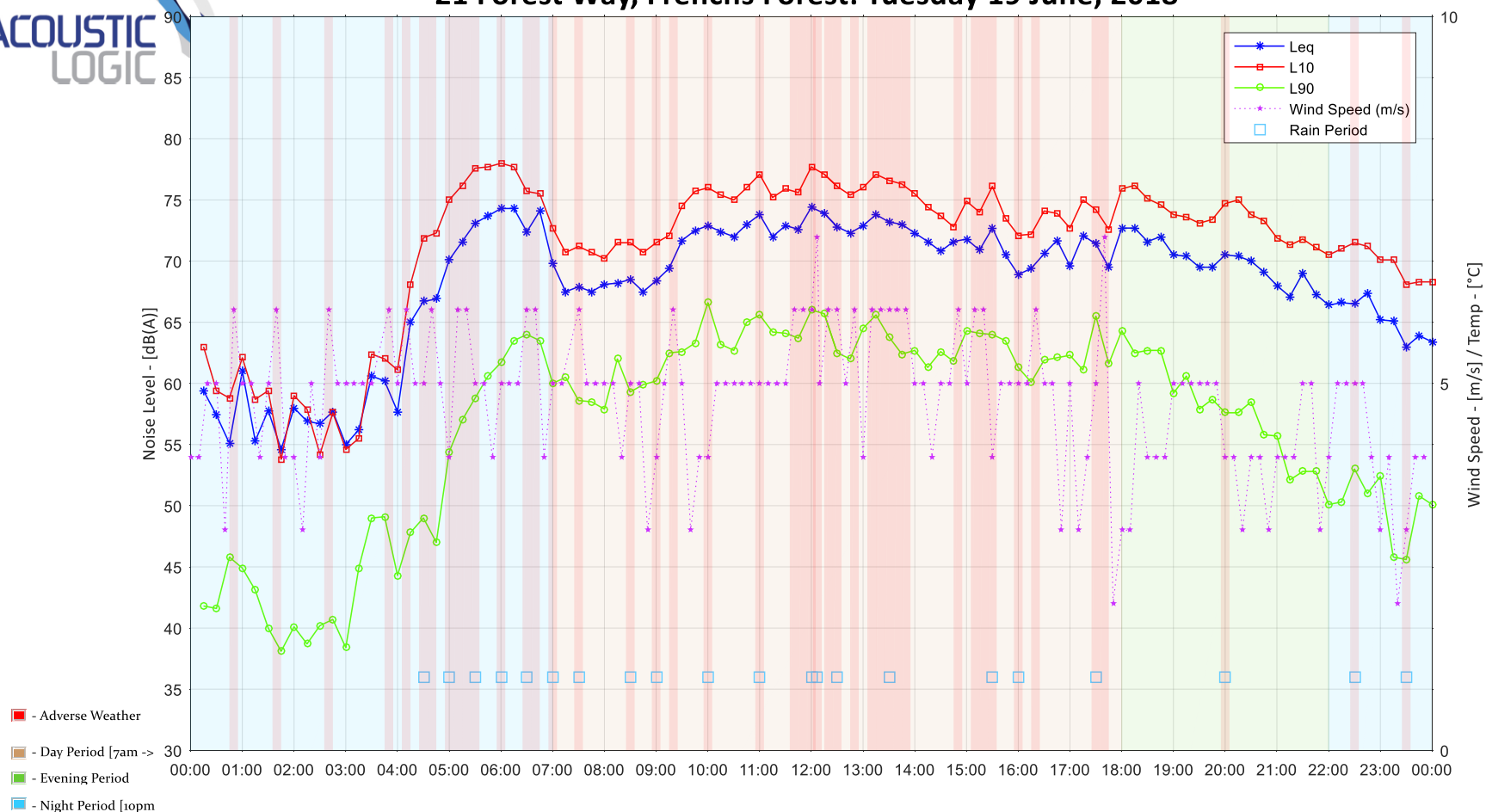
## 21 Forest Way, Frenchs Forest: Sunday 17 June, 2018



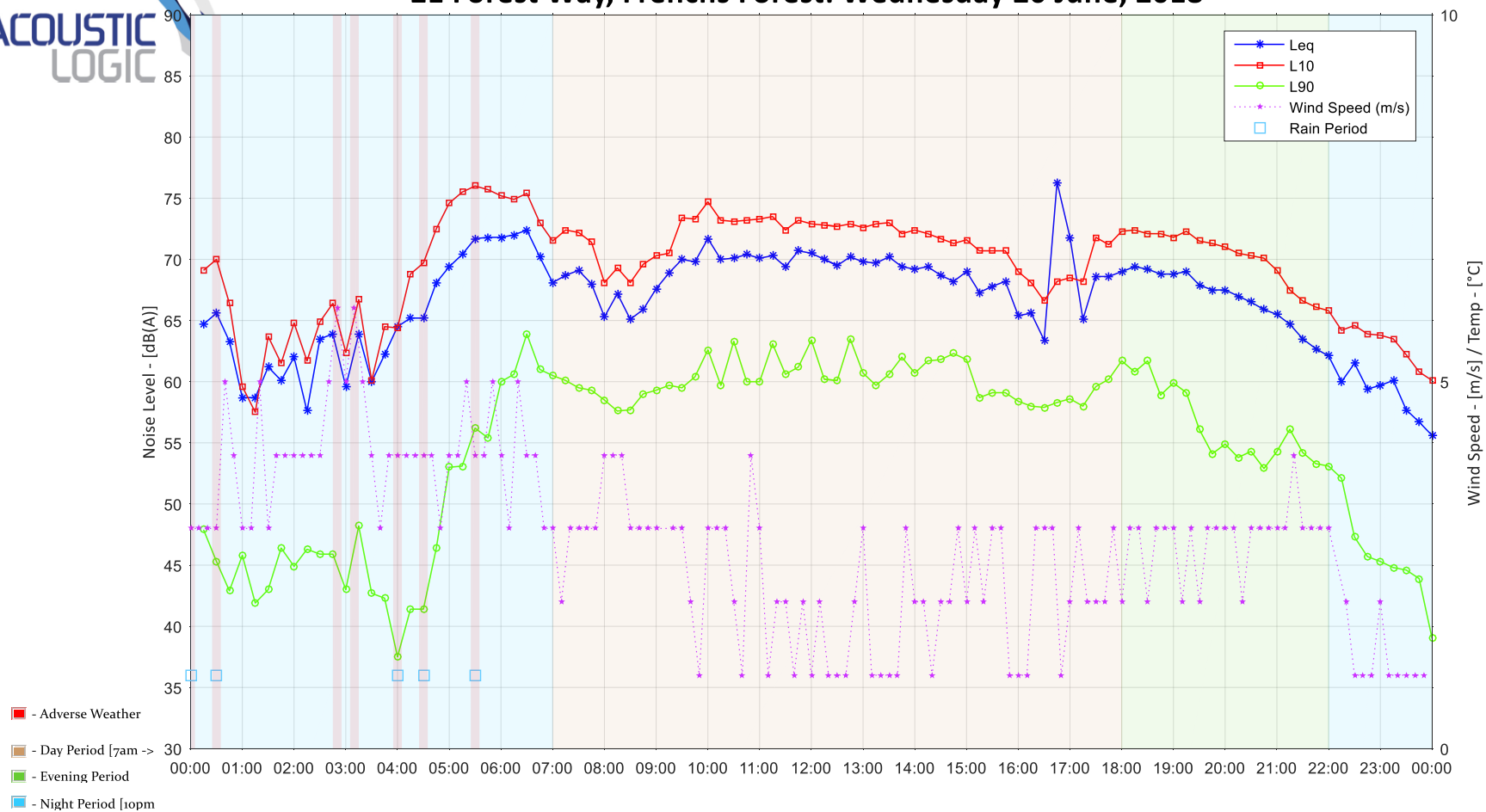
## 21 Forest Way, Frenchs Forest: Monday 18 June, 2018



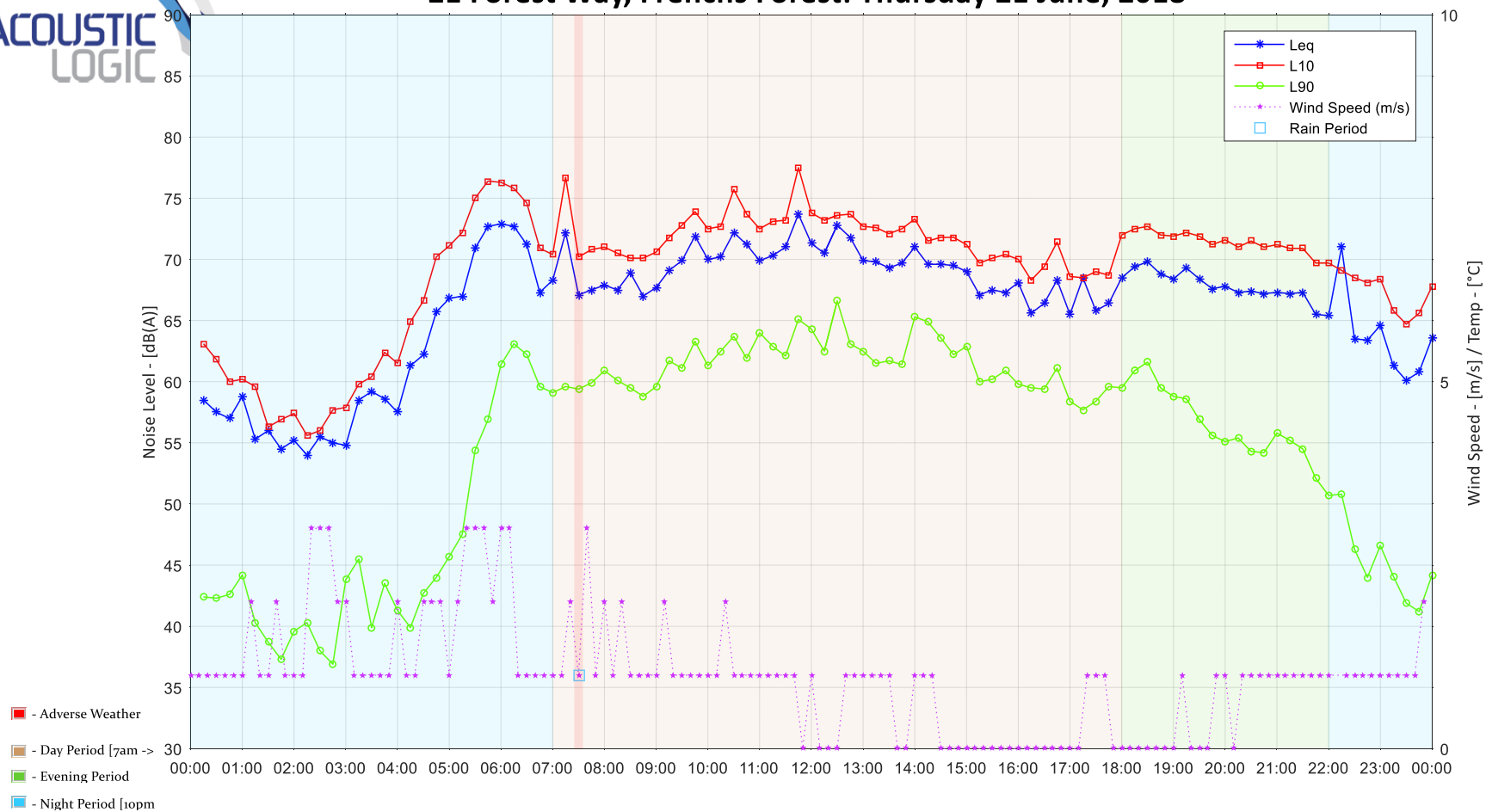
## 21 Forest Way, Frenchs Forest: Tuesday 19 June, 2018



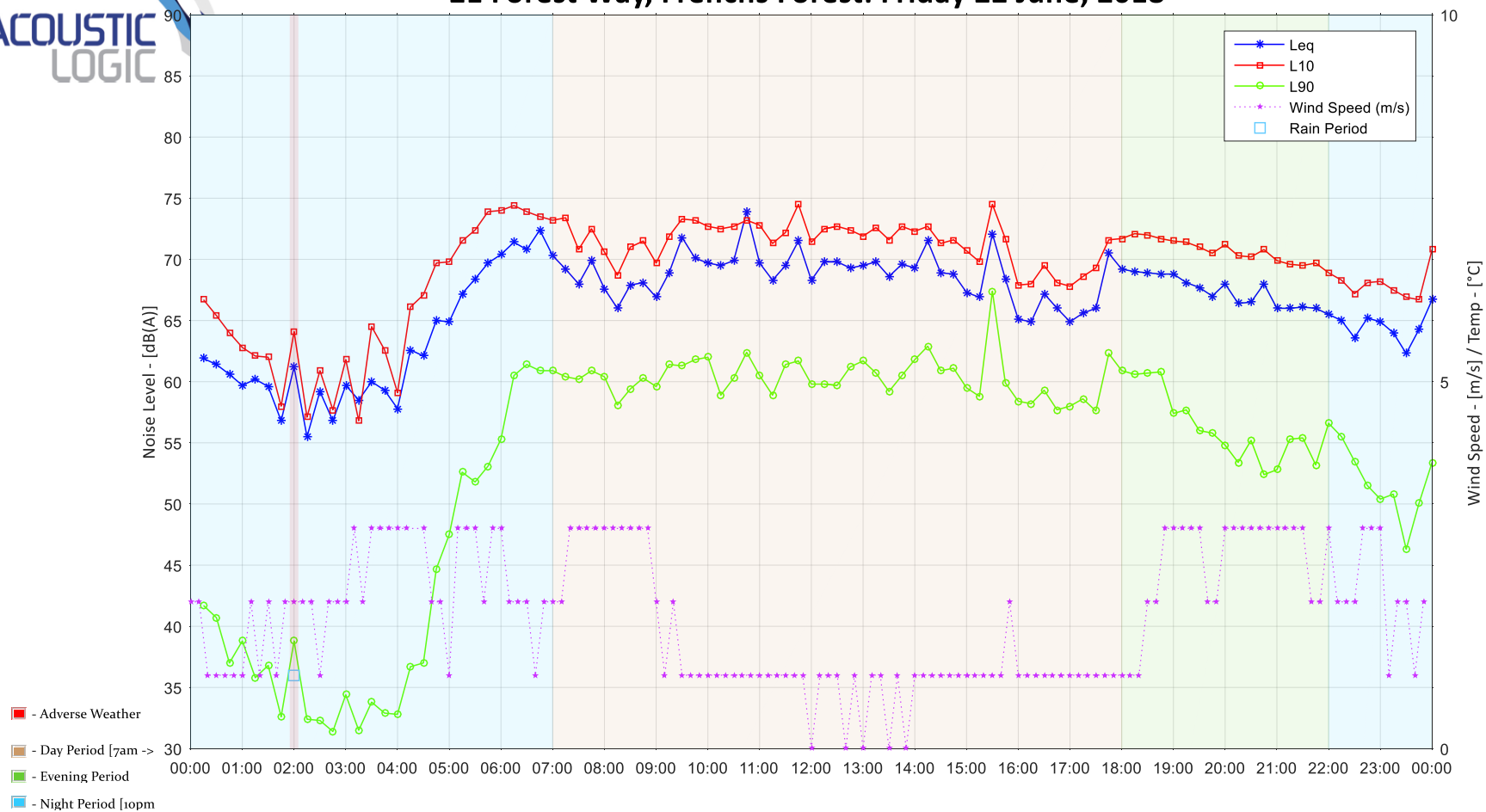
## 21 Forest Way, Frenchs Forest: Wednesday 20 June, 2018



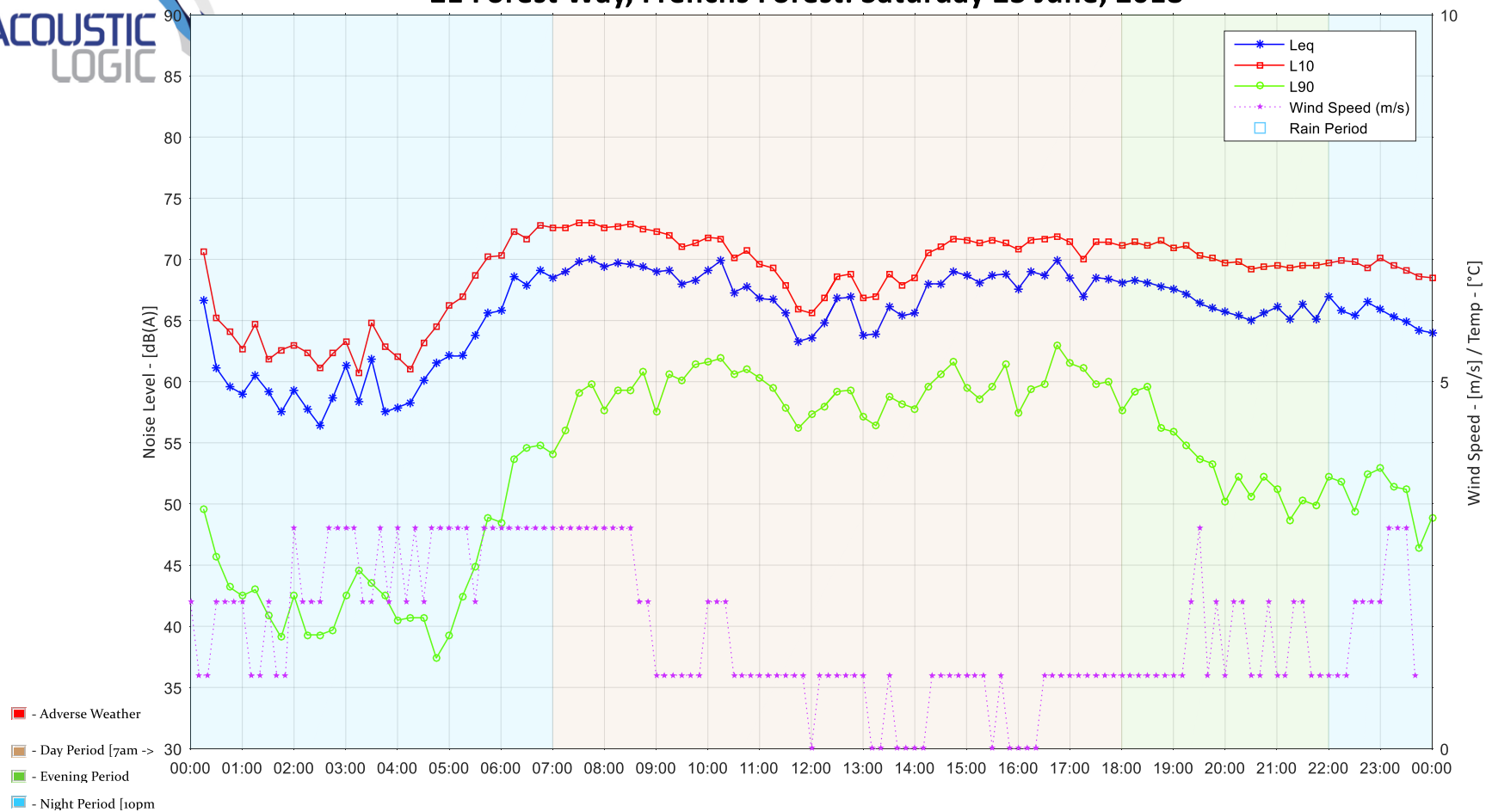
## 21 Forest Way, Frenchs Forest: Thursday 21 June, 2018



## 21 Forest Way, Frenchs Forest: Friday 22 June, 2018

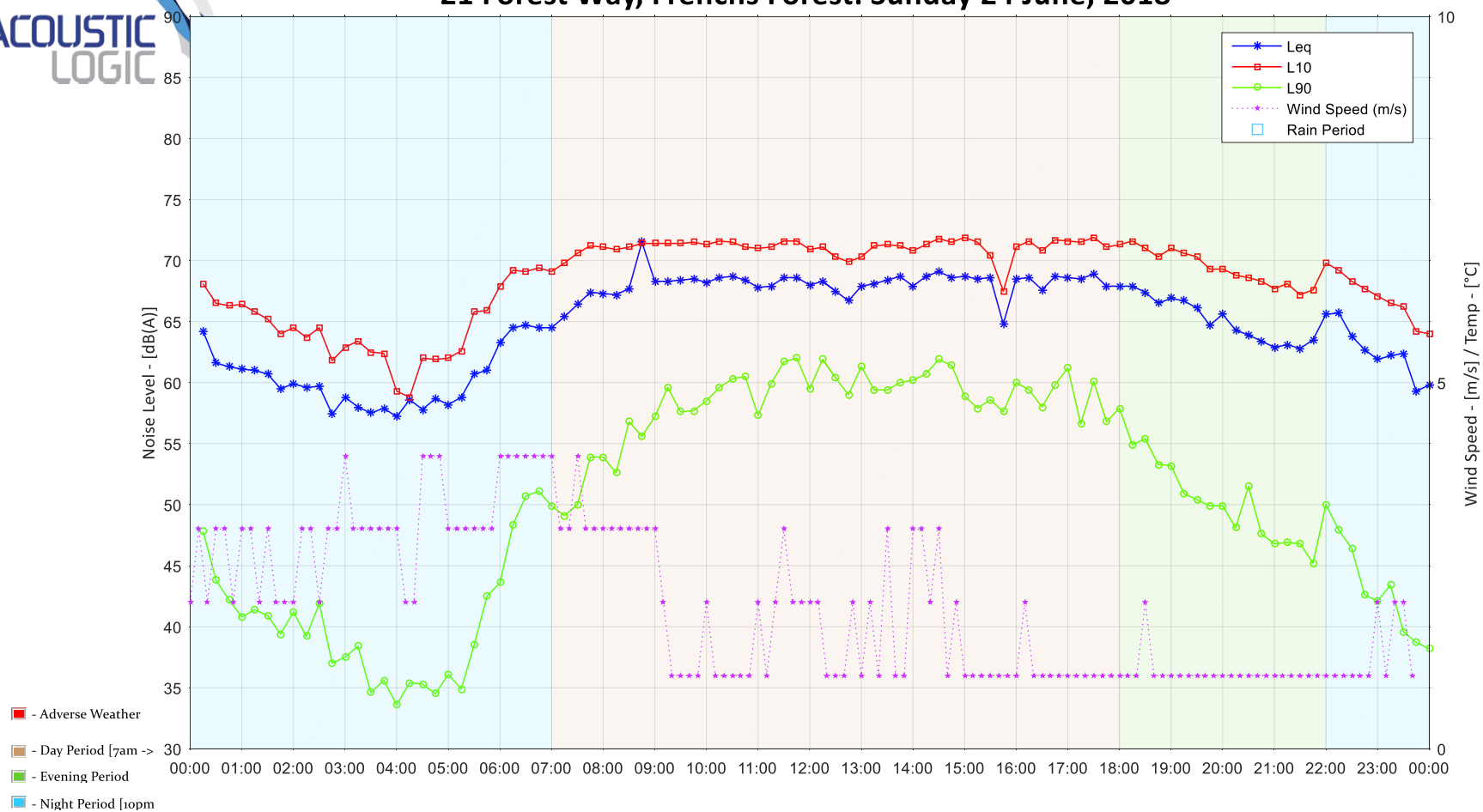


## 21 Forest Way, Frenchs Forest: Saturday 23 June, 2018





## 21 Forest Way, Frenchs Forest: Sunday 24 June, 2018



## 21 Forest Way, Frenchs Forest: Monday 25 June, 2018

