ACOUSTIC LOGIC

DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

301 & 305 Kent Street and 35-39 Erskine Street, Sydney

Noise Impact Assessment - SSD 9694

SYDNEY
A: 9 Sarah St
MASCOT 2020
T: (02) 8339 8000

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

ABN: 11 068 954 343

DOCUMENT CONTROL REGISTER

Project Number	20181608.1
Project Name	301 & 305 Kent Street and 35-39 Erskine Street, Sydney
Document Title	Noise Impact Assessment - SSD 9694
Document Reference	20181608.1/1601A/R1/AW
Issue Type	Email
Attention To	Romanous Construction Pty Ltd

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	16/01/2019	20181608.1/1601A/R0/AW	AW		
1	16/01/2019	20181608.1/1601A/R1/AW	AW		GW

TABLE OF CONTENTS

1 INTRODUCTION

This report presents an analysis of the acoustic impacts associated with the proposed hotel development at 301 & 305 Kent Street, and 35-39 Erskine Street, Sydney (the site).

In this report we will:

- Conduct an external noise intrusion assessment and propose indicative acoustic treatments that will ensure a reasonable level of amenity is achieved for future occupants.
- Identify potential noise sources generated by the site and determine noise emission goals for the development to meet relevant acoustic requirements, ensuring that nearby developments are not adversely impacted by the subject development.

2 SITE DESCRIPTION

The proposed development includes the establishment of a building envelope and use as a 29-storey hotel development comprising:

- Hotel entrance lobby from Kent Street at upper ground floor;
- Hotel facilities and outdoor terraces at Level 2;
- Twenty-four (24) storeys of hotel, comprising indicatively 360 rooms;
- Rooftop bar and outdoor landscaped terrace;
- One level of plant services, hotel back of house and loading dock at lower ground level accessed from Erskine Street; and
- Five (5) basement levels containing 81 car parking spaces.

Refer to Figure 1 for site location. The site and surrounding context is located as follows;

- The north eastern corner of the site adjoins the commercial building at 41-45 Erskine Street. It is noted that 41-45 currently has deferred commencement with City of Sydney Council for construction of a 16 storey hotel building.
- Erskine Street bounds the site to the north. Existing commercial development is located on the northern side of Erskine Street at 42-66 Erskine Street;
- Adjoining the site to the west are existing commercial buildings located at 25-33 Erskine Street & 82-84 Sussex Street.
- Adjoining the site to the south is existing commercial building located at 309 Kent Street;
- Kent Street bounds the site to the east, with commercial development located across at 117 Clarence Street & 123-129 Clarence Street.
- Approximately 80m to the west is the Western Distributor, which is an elevated roadway. This roadway is defined as a classified road by the NSW Department of Planning SEPP (Infrastructure) legislation (traffic volume greater than 40, 000 vehicles/day). Although there is a relatively large distance between the roadway and proposed development, as the roadway is elevated there will be direct line of sight for upper levels of the hotel.

2.1 NEARBY SENSITIVE RECEIVERS

Noise sensitive receivers in the vicinity of the site are as follows;

- **C1** – Commercial Receiver: 41-45 Erskine Street, Sydney. The western and southern boundaries of this commercial premises bound the development site.
- **C2** – Commercial Receiver: 309 Erskine Street, Sydney. The northern boundary of this commercial premises bounds the development site.
- **C3** – Commercial Receiver: 25-33 Erskine Street & 82 – 84 Sussex Street, Sydney. The eastern boundaries of these commercial premises bound the development site.
- **C4** – Commercial Receiver: 117 Clarence Street & 123-129 Clarence Street, Sydney. High rise commercial development across Kent Street from the proposed site.
- **C5** – Commercial Receiver: 42-66 Erskine Street, Sydney. 2-3 Storey commercial development located across Erskine Street from the proposed site.

As far as was evident from the site survey conducted of surrounding development, there were no residential buildings in the immediate vicinity of the development. Notwithstanding, noise emission criteria to residential receivers will be presented for reference.

Refer to Figure 1 for detailed location of surrounding receivers.

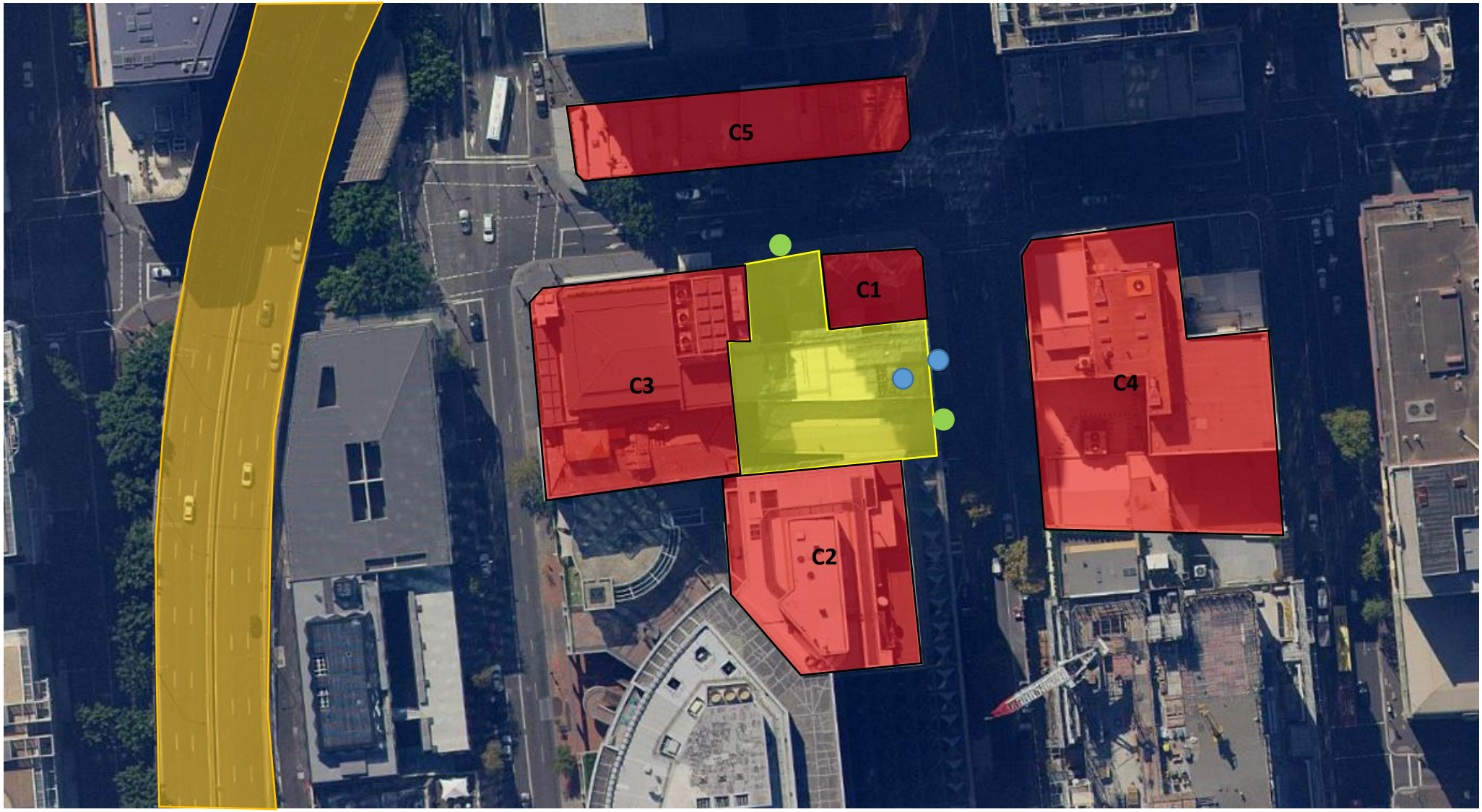


Figure 1 - Site Location & Context
Source: NSW Six Maps

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic 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. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of 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 interval.

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 measurement 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 traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

The $L_{Amax, fast}$ parameter represents the A weighted maximum noise level during noise measurement period, with sound level meter set on fast response. This is used in the assessment of sleep disturbance from peak noise events during the night time 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 a thirteen-day period between 22nd of November and 4th of December 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 determining the rating background noise level (RBL). Logging data is presented in Appendix One.

Two monitors were installed (refer to Figure 1):

- Monitor 1 (Street Level Monitor) was installed on the existing shop awning along the eastern boundary of the proposed site. Noise levels at this logger will be indicative of ambient noise levels at nearby receivers exposed to significant road traffic noise, such as those facing Erskine Street & Kent Street directly.

- Monitor 2 (Roof Level Monitor) was installed on the rooftop of the proposed development site. Noise levels at this logger will be indicative of ambient noise levels at nearby receivers screened from road noise by existing buildings, such as those at the rear of Sussex Street.

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 as well as indiscernible sources of mechanical noise from existing development.

4.1.1 Measured Noise Levels

Measured noise levels are presented in Table 1 below.

Table 1 – Long Term Noise Logging Data (L_{eq} and Rating Background Noise Levels)

Monitor Location	Measured Noise Level - Time of Day		
	Daytime (7am-6pm)	**Evening (6pm-10pm)**	**Night (10pm-7am)**
Monitor 1 (Kent Street– 3m from Kerb on Shop Awning)	69 dB(A)$L_{eq(Period)}$ 64 dB(A)$L_{90(Period)}$	68 dB(A)$L_{eq(Period)}$ 61 dB(A)$L_{90(Period)}$	65 dB(A)$L_{eq(Period)}$ 54 dB(A)$L_{90(Period)}$
Monitor 2 (Rooftop of 301 Kent Street)	64 dB(A)$L_{eq(Period)}$ 62 dB(A)$L_{90(Period)}$	63 dB(A)$L_{eq(Period)}$ 59 dB(A)$L_{90(Period)}$	60 dB(A)$L_{eq(Period)}$ 54 dB(A)$L_{90(Period)}$

4.1.2 Background Noise Spectrum

Noise monitor 2 (rooftop location) was setup to measure the background noise spectrum also. The measured background noise spectrum for the relevant measurement periods are presented in Table 2.

Table 2 – Measured Background Spectrum

Time	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-Weighted Level
Day (7am – 6pm	62	60	61	60	60	57	53	51	40	**62**
Evening (6pm – 10pm)	60	58	57	58	58	54	49	46	34	**59**
Night (10pm – 7am)t	54	52	51	53	52	49	45	44	33	**54**

4.2 SURVEY OF ROAD TRAFFIC NOISE FROM ADJACENT ROADWAYS

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 to the potential for road noise impacts on future occupants of the proposed hotel development.

For the purpose of assessment, the Western Distributor, Regent Street and Gibbons Street are considered arterial roads (as they are classified roads under NSW Planning maps), and so the $L_{eq(period)}$ time descriptor in the Road Noise Policy will be used.

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).

Measurements of traffic noise impact from the Western Motorway were taken from the rooftop of the existing building, however noise from the motorway was not discernible from the traffic noise from closer surrounding roadways (predominantly Erskine Street). It is possible that for upper levels of the development traffic noise from this motorway will be the dominant source.

Measurements were conducted in the following locations;

- Location 1 (Kent Street) – Noise measurement at the façade line of buildings on the street level of Kent Street, approximately 3m from the kerb of the roadway. Measurement was taken in front of a driveway, and as such there is no correction for façade reflection;
- Location 2 (Erskine Street) – Noise measurement along Erskine Street, approximately 2m from the kerb of the roadway. Measurement was not impacted by façade reflection;
- Location 3 (Western Motorway) – Noise measurement of Western Distributor at Darling Harbour, approximately 8m from the roadway. Measurement was not impacted by façade reflection.

Table 3 – Road Traffic Noise Level – Kent Street

Time of Day	Noise Level	
	Kent Street (3m from Roadway)	**At Façade Line of Proposed Building (9m from Roadway)**
Day (7am-10pm)	69 dB(A)$L_{eq(Period)}$ 72 dB(A)$L_{eq(1\ Hour)}$	67 dB(A)$L_{eq(Period)}$ 70 dB(A)$L_{eq(1\ Hour)}$
Night (10pm-7am)	65 dB(A)$L_{eq(Period)}$ 68 dB(A)$L_{eq(1\ Hour)}$	63 dB(A)$L_{eq(Period)}$ 66 dB(A)$L_{eq(1\ Hour)}$

Table 4 – Road Traffic Noise Level – Erskine Street

Time of Day	Noise Level	
	Erskine Street (2m from Roadway)	**At Façade Line of Proposed Building (6m from Roadway)**
Day (7am-10pm)	70 dB(A)$L_{eq(Period)}$ 73 dB(A)$L_{eq(1\ Hour)}$	68 dB(A)$L_{eq(Period)}$ 71 dB(A)$L_{eq(1\ Hour)}$
Night (10pm-7am)	66 dB(A)$L_{eq(Period)}$ 69 dB(A)$L_{eq(1\ Hour)}$	64 dB(A)$L_{eq(Period)}$ 67 dB(A)$L_{eq(1\ Hour)}$

Table 5 – Road Traffic Noise Level – Western Distributor

Time of Day	Noise Level	
	Western Distributor (8m from Roadway)	**At Façade Line of Proposed Building (80m from Roadway)**
Day (7am-10pm)	77 dB(A)$L_{eq(Period)}$ 79 dB(A)$L_{eq(1\ Hour)}$	68 dB(A)$L_{eq(Period)}$ 70 dB(A)$L_{eq(1\ Hour)}$
Night (10pm-7am)	73 dB(A)$L_{eq(Period)}$ 77 dB(A)$L_{eq(1\ Hour)}$	64 dB(A)$L_{eq(Period)}$ 68 dB(A)$L_{eq(1\ Hour)}$

5 EXTERNAL NOISE INTRUSION ASSESSMENT

The predominant external noise source impacting the development is traffic noise from surrounding roadways – namely Kent Street, Erskine Street & the Western Distributor.

5.1 NOISE INTRUSION CRITERIA

External noise impact into the proposed development will be assessed in with reference to State Environment Planning Policy (Infrastructure), the NSW Department of Planning document *Development Near Rail Corridors and Busy Roads – Interim Guideline (2008),* City of Sydney *Development Control Plan 2012* and AS2107:2016 (for commercial spaces).

Whilst it is noted that the acoustic requirements of the above NSW Planning documents and City of Sydney requirements predominantly refer to residential development, it is proposed to adopt the internal noise levels detailed for hotel suites.

5.1.1 NSW Department of Planning – *Development near Rail Corridors or Busy Roads – Interim Guideline*

Section 3.5 of the NSW Department of Planning's 'Development near Rail Corridors and Busy Roads (Interim Guideline)' states:

"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

- *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*

    - *in any bedroom in the building: 35dB(A) at any time 10pm-7am*

    - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

5.1.2 NSW Department of Planning – *State Environmental Planning Policy (SEPP) (INFRASTRUCTURE) 2007*

Clause 102 of the NSW SEPP for road traffic noise stipulates

"This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

(a) a building for residential use,

(b) a place of public worship,

(c) a hospital,

(d) an education establishment or child care centre.

If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

(a) in any bedroom in the building – 35 dB(A) at any time between 10 pm and 7am,

(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."

Map 16 of the traffic volume maps for Infrastructure SEPP (from the road and maritime services website) classifies the section of Western Distributor nearby to the subject site as a carriageway carrying more than 40,000 vehicles per day. Refer to Figure 2 for map and site location.

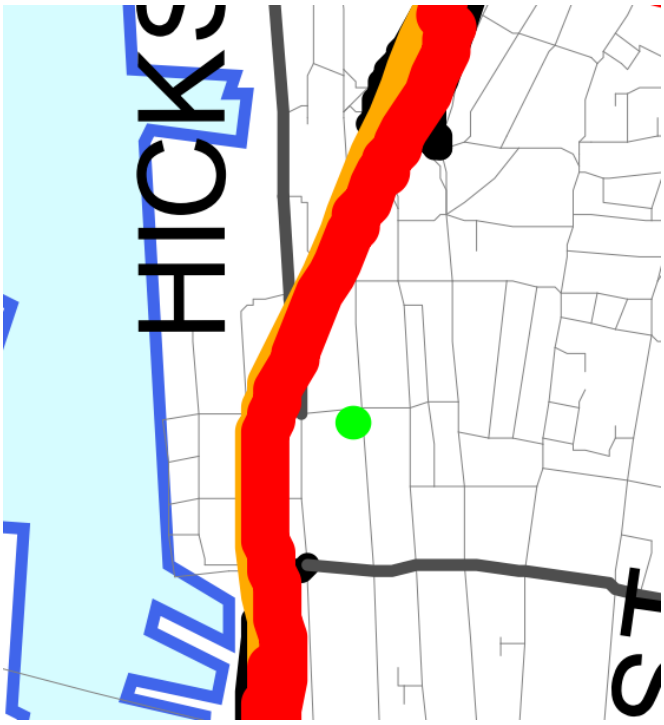


Figure 2 - Site Location and SEPP (Infrastructure) 2007 Classified Roads

5.1.3 Australian Standard AS2107:2016 – *Recommended Design Sound Levels and Reverberation Times for Building Interiors*

Australian Standard AS 2107-2016 details recommended ranges of noise levels for various internal spaces. Table 6 presents the sound levels applicable to the proposed redevelopment.

Table 6 – Recommended Design Sound Levels of AS2107:2016

Space /Activity Type	Recommended Maximum Design Sound Level
Coffee Shops / Restaurants	50 dB(A)$L_{eq(15min)}$
Bars & Lounges	< 50 dB(A) $L_{eq(15min)}$
Foyers & Recreation Areas	50 dB(A) $L_{eq(15min)}$

5.1.4 City of Sydney Development Control Plan (DCP) 2012

Section 4.2.3.11 of the City of Sydney DCP states the following with regard to acoustic privacy, specifically in relation to external noise sources such as road traffic noise;

4.2.3.11 Acoustic Privacy

(2) Where necessary, a residential development is to include acoustic measures to reduce the impact of noise from external sources

(3) Development is to incorporate measures that reduce the entry of noise from external sources to buildings

(7) The repeatable maximum $L_{Aeq(1\ hour)}$ for residential buildings and serviced apartments must not exceed the following levels:

(a) for closed windows and doors

(i) 35 dB for bedrooms (10pm – 7am); and

(ii) 45dB for main living areas (24 hours)

(a) for open windows and doors

(i) 45 dB for bedrooms (10pm – 7am); and

(ii) 55dB for main living areas (24 hours)

5.1.5 Summarised External Noise Intrusion Criteria

Summarised internal noise criteria adopted for each internal space is summarised below.

Table 7 – Adopted Internal Noise Levels

Space / Activity Type	Design Internal Noise Level
Hotel Suites (Daytime)	40 dB(A) $L_{eq\ (15hr)}$ ***SEPP (Infrastructure) 2007***
Hotel Suites (Night Time)	35 dB(A) $L_{eq\ (9hr)}$ ***SEPP (Infrastructure) 2007***
Coffee Shops / Restaurants	50 dB(A) $L_{eq(15min(}$ ***AS2107:2016***
Bars & Lounges	< 50 dB(A) $L_{eq(15min)}$ ***AS2107:2016***
Foyers & Recreation Areas	50 dB(A) $L_{eq(15min)}$ ***AS2107:2016***

5.2 RECOMMENDED CONSTRUCTIONS

Recommended treatments to meet the criteria detailed in Section 5.1 have been determine based on the room dimensions, setbacks from roadways, window openings and floor areas detailed in architectural drawings prepared by *DBI Design* for the development (Reference 185050, Revision A, dated November 2018). A full assessment of all treatments recommended within this report should be conducted after building designs have been finalised to ensure that the criteria determined within this report is met.

5.2.1 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. (**Mohair Seals are unacceptable**).

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 detailed in Table 9.

Mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the R_w rating of the glazing assembly below the values nominated in the table above. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. **Note that mohair of fin type seals will not be acceptable for the windows requiring acoustic seals.**

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum listed R_w requirements. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

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

Glazing Assembly	Minimum R_W of Installed Window (with acoustic seals)
10.38mm Laminated	35
10.38mm / 12mm Airgap / 6mm IGU	37
10.38mm Laminated / 100m Airgap / 10mm	50
10.38mm Laminated / 150m Airgap / 10mm	52

Table 9 – Recommended Glazing Constructions

Façade	Area	Recommended Construction	Acoustic Seals Required
Eastern (Kent Street Façade)	Hotel Suites	10.38mm Laminated / 100m Airgap / 10mm	Yes
Northern (Erskine Street Façade)		10.38mm Laminated / 150m Airgap / 10mm	Yes
Western (Facing Western Distributor)		10.38mm Laminated / 100m Airgap / 10mm	Yes
All	Commercial & Retail (Ground and First)	10.38mm Laminated OR 10.38mm/ 12mm Airgap / 6mm IGU	Yes

5.2.2 Roof / Ceiling

The proposed concrete roof structure with ceiling below will be acoustically acceptable without additional acoustic treatments.

5.2.3 External Walls

The proposed masonry external wall constructions will be acoustically acceptable without additional acoustic treatments. If masonry walls are not used, then external wall systems with equivalent acoustic ratings will be required.

5.2.4 Ventilation and Air Conditioning

With respect to natural ventilation of a dwelling, both City of Sydney Council and NSW Planning requirements allow internal noise levels to be up to 10 dB(A) higher than the specified criterion with windows and doors to a dwelling open. The allowable noise levels inside habitable rooms of a with doors or windows to the façade open are provided below;

- NSW Planning Requirements – SEPP (Infrastructure) requirements:
  - Living Rooms: 50 dB(A) $L_{eq(15hour)}$
  - Bedrooms: 45 dB(A) $L_{eq(9hour)}$
- City of Sydney Council Requirements
  - Living Rooms: 55 dB(A) $L_{eq(1hour)}$ (7am – 10pm)
  - Bedrooms: 45 dB(A) $L_{eq(1hour)}$ (10pm – 7am)

Based on the above, allowable internal noise levels will only be achieved in hotel suites with windows and doors closed.

Where the recommended internal noise levels cannot be achieved with windows open within the development, consultation on the requirements of alternative outside air supply or air conditioning will be required.

Any supplementary ventilation system proposed to be installed should be acoustically designed to ensure that the acoustic performance of the acoustic treatments outlined above is not reduced and does not exceed Council criteria for noise emission to nearby properties.

6 NOISE EMISSION ASSESSMENT

Noise emissions from the site should be assessed to ensure that the amenity of nearby land users is not adversely affected. The primary potential ongoing noise sources from the site will be noise generated by mechanical plant and from use of lounge/bar areas.

Noise emissions noise will be assessed to the following criteria:

- City of Sydney Standard Conditions (for typical operational noise).
- The NSW EPA Noise Policy for Industry (for mechanical plant).

6.1 NOISE EMISSION OBJECTIVES

6.1.1 Mechanical Plant Noise (EPA Noise Policy for Industry)

The EPA NPI has two criteria which both are required to be satisfied, namely Intrusiveness and amenity. The NPI sets out acceptable noise levels for various localities. The policy indicates four categories to assess the appropriate noise level at a site. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residential receivers would be assessed against the urban criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

6.1.1.1 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 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

6.1.1.2 Project 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.

The EPA's NPI sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Section 4.1, the Noise Policy for Industry suggests the adoption of the 'urban' categorisation.

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

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

The amenity levels appropriate for the receivers surrounding the project site are presented in Table 10.

Table 10 – EPA NPI Project Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15min)}$
Residential – Urban	Day	60	58
	Evening	50	48
	Night	45	43
Commercial premises	When in use	65	63
Industrial premises	When in use	70	68

The NSW EPA Noise Policy for Industry (2017) defines;

- Day as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening as the period from 6pm to 10pm.
- Night as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays

6.1.1.3 Sleep Arousal Criteria

The Noise Policy for Industry recommends the following noise limits to mitigate sleeping disturbance:

> *Where the subject development / premises night -time noise levels at a residential location exceed:*
>
> - *$L_{Aeq,15min}$ 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.*

Table 11 - Sleep Arousal Criteria for Residential Receivers

Receiver	Rating Background Noise Level (Night) dB(A)L_{90}	Emergence Level
Adjacent Residential Receivers Night (10pm – 7am)	54	59 dB(A)$L_{eq,\ 15min}$; 69 dB(A)L_{Fmax}

In addition, NSW EPA Road Noise Policy states:

- *Maximum internal noise levels below 50–55 dB(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*

6.1.1.4 Summarised Noise Policy for Industry Requirements

Table 12 – EPA NPI Project Noise Trigger Level (Residential)

Time Period	Assessment Background Noise Level dB(A)L_{90}	Project Amenity Criteria dB(A) L_{eq}	Intrusiveness Criteria $L_{eq(15min)}$	NPI Criteria for Sleep Disturbance
Day	62	58	67	N/A
Evening	59	48	64	N/A
Night	54	43	59	59 dB(A)$L_{eq,\ 15min}$; 69 dB(A)L_{Fmax}

Table 13 – EPA NPI Project Noise Trigger Level (Non-Residential)

Receiver	Time of Day	Amenity Criteria dB(A) $L_{eq,\ 15min}$
Commercial	When in use	63
Industrial	When in use	68

6.1.2 City of Sydney Council Standard Conditions of Consent

Noise – Commercial Plant / Industrial Development

(a) Noise from commercial plant and industrial development must not exceed a project amenity/intrusiveness noise level or maximum noise level in accordance with relevant requirements of the NSW EPA Noise Policy for Industry 2017 (NPfI) unless agreed to by the City's Area Planning Manager. Further:

(i) Background noise monitoring must be carried out in accordance with the long-term methodology in Fact Sheet B of the NPfI unless otherwise agreed by the City's Area Planning Manager.

(ii) Commercial plant is limited to heating, ventilation, air conditioning, refrigeration and energy generation equipment.

(b) An LAeq,15 minute (noise level) emitted from the development must not exceed the LA90, 15 minute (background noise level) by more than 3dB when assessed inside any habitable room of any affected residence or noise sensitive commercial premises at any time. Further:

(i) The noise level and the background noise level shall both be measured with all external doors and windows of the affected residence closed.

(ii) Background noise measurements must not include noise from the development but may include noise from necessary ventilation at the affected premise.

(c) Corrections in Fact Sheet C of the NPfI are applicable to relevant noise from the development measured in accordance with this condition, however duration corrections are excluded from commercial noise.

6.2 NOISE EMISSION ASSESSMENT

6.2.1 Noise Emissions from External Mechanical Plant

Primary mechanical plant and equipment will likely consist of ventilation, refrigeration and air conditioning plant. It is currently proposed that the majority of mechanical plant would be located within plant rooms on the lower ground and rooftop (level 27) areas of the development.

Allocation of plant rooms for major equipment items during the design phase will allow for appropriate equipment locations to be provided, such that noise impacts to surrounding receivers can be minimised where practical.

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

Noise emissions from all mechanical services to the closest residential and commercial receivers should comply with the requirements of Section 6.1.

Detailed acoustic review should be undertaken once the mechanical design has been developed and equipment selected to determine acoustic treatments to control noise emissions to satisfactory levels

6.2.2 Noise from Commercial / Retail Spaces

The predominant source of operational noise from the hotel will be from use of the attached function centre and bar/lounge areas. Noise from these areas will be required to achieve the noise emission requirements detailed in Section 6.1, as well as any relevant Department of Industry Office of Liquor & Gaming requirements (if a liquor licence is proposed by the future tenant).

It is noted that a majority of the lounge/bar areas are located internally within the development, and as such noise emissions could likely be mitigated through appropriate treatment of the building façade. In this regard 10.38mm glazing has generally been proposed for commercial areas of the development, however this is to be confirmed once an operator (and associated plan of management) has been engaged.

There are two outdoor terraces as part of the development (levels 2 & 27), both located along the northern façade of the building. The level 2 terrace is semi-enclosed, with only one side open to Erskine Street due to enclosure from adjacent buildings. The rooftop terrace located on level 27 is proposed to be largely open.

7 CONSTRUCTION NOISE IMPACT

7.1 CONSTRUCTION NOISE

Relevant guidelines are:

- NSW Environmental Protection Authority (EPA) document – *"Interim Construction Noise Guideline (ICNG) 2009"*; and
- Australian Standard AS2436:2010 – *"Guide to noise and vibration control on construction, demolition and maintenance sites"*.

7.1.1 NSW Environmental Protection Authority (EPA) document – Interim Construction Noise Guideline (ICNG) 2009

This guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours the guideline recommends a noise level of 10dB(A) above the background for residential receivers – this level is referred to as the "noise affected level".

In addition to the above goals for residential receivers, the ICNG nominates management levels for other types of land use. These are detailed in Table 15.

The noise emission goals for nearby development is as follows:

Table 14 – Noise Emission Goal – Residential Properties

Noise Receiver	Measured Background Noise Levels dB(A) $L_{90(7am-6pm)}$	Noise Affected Level BG + 10 dB(A) $L_{eq(15min)}$	Highly Noise Affected Level dB(A) $L_{eq(15min)}$
Any Affected Residential Receivers	62	72	75

Table 15 - Noise Management Levels – Other Receivers

Location	Noise Management Level (When in Use) dB(A)$L_{eq(15min)}$
Commercial Development Surrounding Site	70 dB(A) (External)

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, a residential receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended.

7.1.2 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site"

Where compliance with DECCW cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established (i.e. – adopt DECC/Council guidelines).
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

7.1.3 Construction Noise Impacts

Predictions of noise levels from likely construction activities at the sensitive receivers identified have been made of the construction processes with the potential to produce significant noise.

It is noted that:

- Many of the noise sources are present over a small period of the day or may be present for a few days with a significant intervening period before the activity occurs again.
- The distance between the noise source and the receiver.

The A-weighted sound power levels for all the component parts of the above-described activities are outlined in the table below.

Table 16 – Sound Power Levels (SWL) of the Typical Construction Equipment

Stage	Activity	Sound Power Level (SWL) dB(A)
Excavation	Excavator (with bucket attachment)	107
	Bobcat	105
Construction	Angle Grinders	105
	Electric Saw	102
	Drilling	95
	Concrete Vibrator	100
	Cement Mixing Truck	105
	Concrete Pumps	105

The noise levels presented in the above table are derived from the following sources, namely:

- On-site measurements;
- Table A1 of Australian Standard 2436-2010;
- Data held by this office from other similar studies.

7.1.3.1 Predicted Noise Levels

The following table presents the predicted noise levels from construction activities.

Table 17 – Predicted Construction Noise Level

Work Item	Receiver	Predicted Noise Level dB(A)$L_{eq,\ 15min}$	Noise Management Level dB(A) $L_{eq(15min)}$
Excavation	Commercial Receivers Immediately Adjacent to Site (C1-3)	66 – 85	70 (When in Use)
	Commercial Receivers Near to Site (C4-5)	63 – 73	70 (When in Use)
Construction	Commercial Receivers Immediately Adjacent to Site (C1-3)	56 - 83	70 (When in Use)
	Commercial Receivers Near to Site (C4-5)	53 - 71	70 (When in Use)

*Refer to Figure 1 for receiver locations.

**Note: The predicted noise levels exceed the noise management level for commercial receivers immediately adjacent to the site. Noise management for the excavation and construction of project site is required (for example, acoustic barrier, respite hours, noise monitoring, contingency plan).

Specific details of noise management measures are to be determined at Construction Certificate stage (once a construction program and work methods have been determined) to ensure that construction noise emissions from the project site are minimised where practical.

8 CONSTRUCTION VIBRATION

8.1 CONSTRUCTION VIBRATION

Vibration caused by construction should be limited to:

- For structural damage vibration, German Standard DIN 4150-3 Structural Vibration: Effects of Vibration on Structures; and
- For human exposure to vibration (amenity), the evaluation criteria presented in the British Standard BS 6472:1992 Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz) for low probability of adverse comment

The criteria and the application of this standard are discussed in separate sections below.

8.2 STRUCTURE BORNE VIBRATIONS

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 1.

It is noted that the peak velocity is the absolute 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 18 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

8.2.1 Assessing Amenity

Department of Environment and Conservation NSW *Assessing Vibration: A Technical Guideline* (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings. The recommendations of this guideline should be adopted to assess and regulate vibration within the construction site.

Table 19 – EPA Recommended Vibration Criteria

		RMS acceleration (m/s^2)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	**Time**	**Preferred**	**Maximum**	**Preferred**	**Maximum**	**Preferred**	**Maximum**
Continuous Vibration							
Residences	**Daytime**	0.01	0.02	0.2	0.4	0.28	0.56
Impulsive Vibration							
Residences	**Daytime**	0.3	0.6	6.0	12.0	8.6	17.0

8.3 CONSTRUCTION VIBRATION IMPACTS

Typically, excavation and piling are the activities with the greatest potential for generation of vibration. Excavation of building footings and basement levels has the potential to produce vibration levels approaching the criteria set out in Section 8.2.

It is not possible to accurately predict the vibrations induced by the demolition/excavation/construction operations on site at potentially affected receivers. This is because vibration level is principally proportional to the energy impact (which is unknown), the geotechnical properties of the substrate, drop weight, height etc.

The project acoustic consult is to undertake monitoring of initial demolition/excavation process when conducted near potentially affected receivers (C1 – C3) to ensure that vibration criteria detailed in Section 8.2 are assessed with any mitigation measures to be determined.

The proposed vibration monitoring equipment is to include Blastronics type monitors with externally mounted geophones installed along C1 to C3. The monitors are to be fitted with GSM modem alarms for vibration exceedance. In addition, the vibration monitors are to have the ability to be accessed remotely for analysis of any vibration exceedances.

9 CONCLUSION

This report presents the assessment of acoustic impacts associated with the proposed hotel development at 301 & 305 Kent Street, and 35-39 Erskine Street, Sydney.

Noise intrusion to the development from external noise sources (predominantly traffic) has been assessed and confirmed to achieve the required internal noise levels of the following;

- State Environment Planning Policy (Infrastructure) 2007
- NSW Planning document Development near rail corridors and busy roads – Interim guideline;
- City of Sydney Council Development Control Plan (2012); and
- Australian Standard AS2107:2016 Acoustics - noise criteria.

Required façade treatments should be reviewed once building layouts and glazing sizes have been finalised to ensure required internal noise levels are achieved.

External noise emission levels have been established in Section 6 of this report based on the requirements of NSW EPA and Sydney City Council. Detailed plant noise control is to be determined once mechanical design has been progressed.

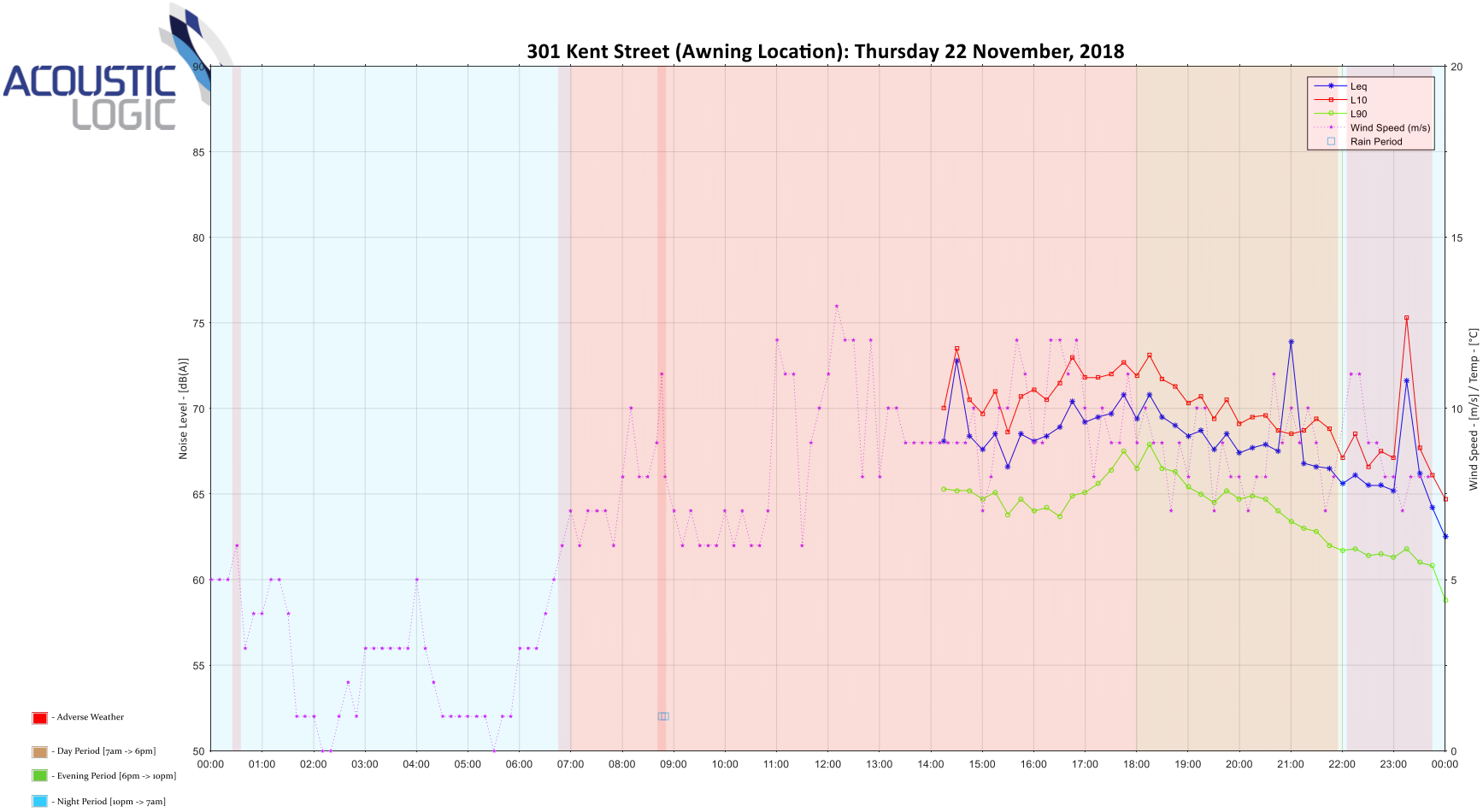
Preliminary construction noise and vibration impacts have been determined with reference to the NSW EPA *Interim Construction Noise Guideline*. Initial assessment indicates that a detailed construction noise and vibration management plan will be required to manage noise and vibration impacts to surrounding receivers.

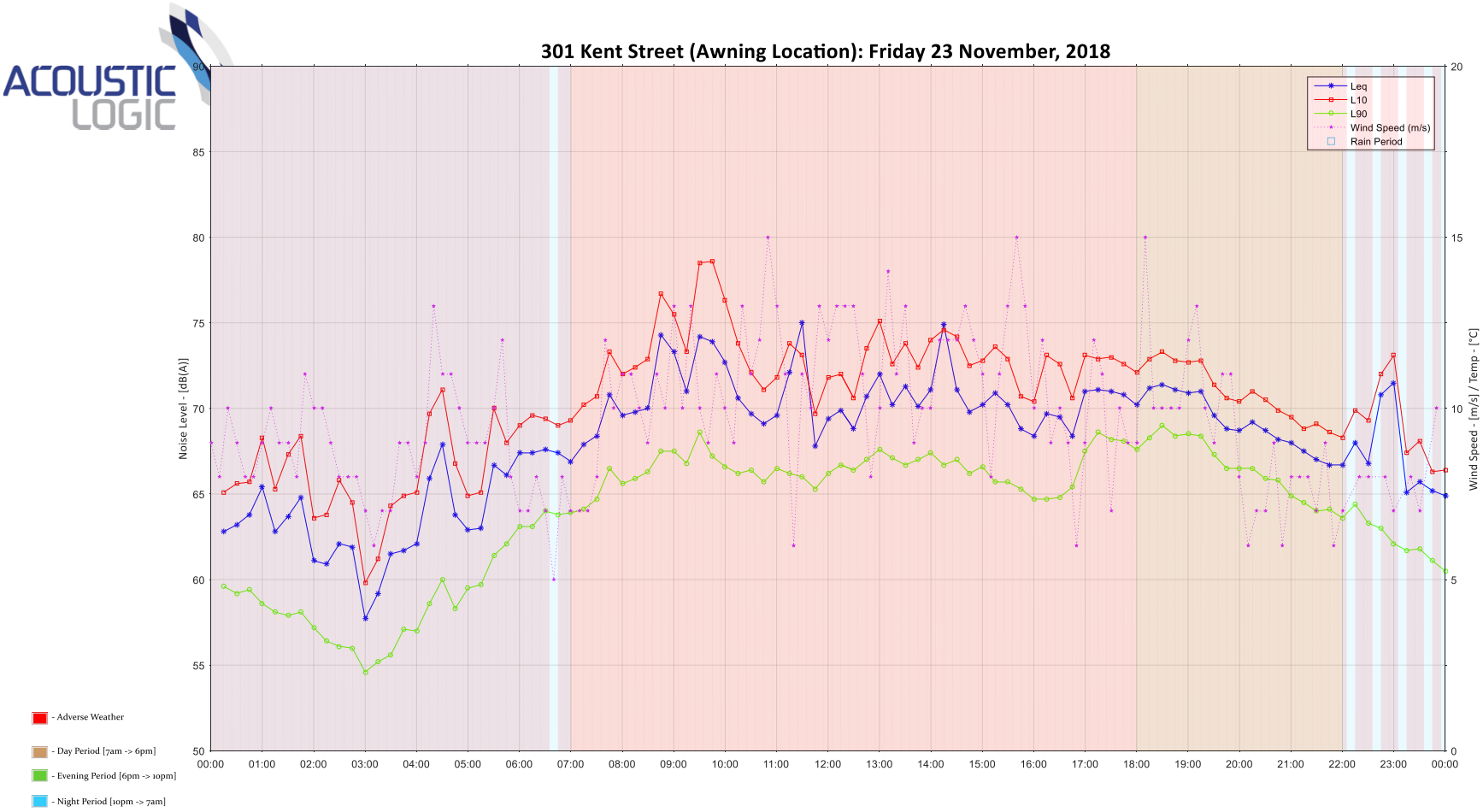
Please contact us should you have any further queries.

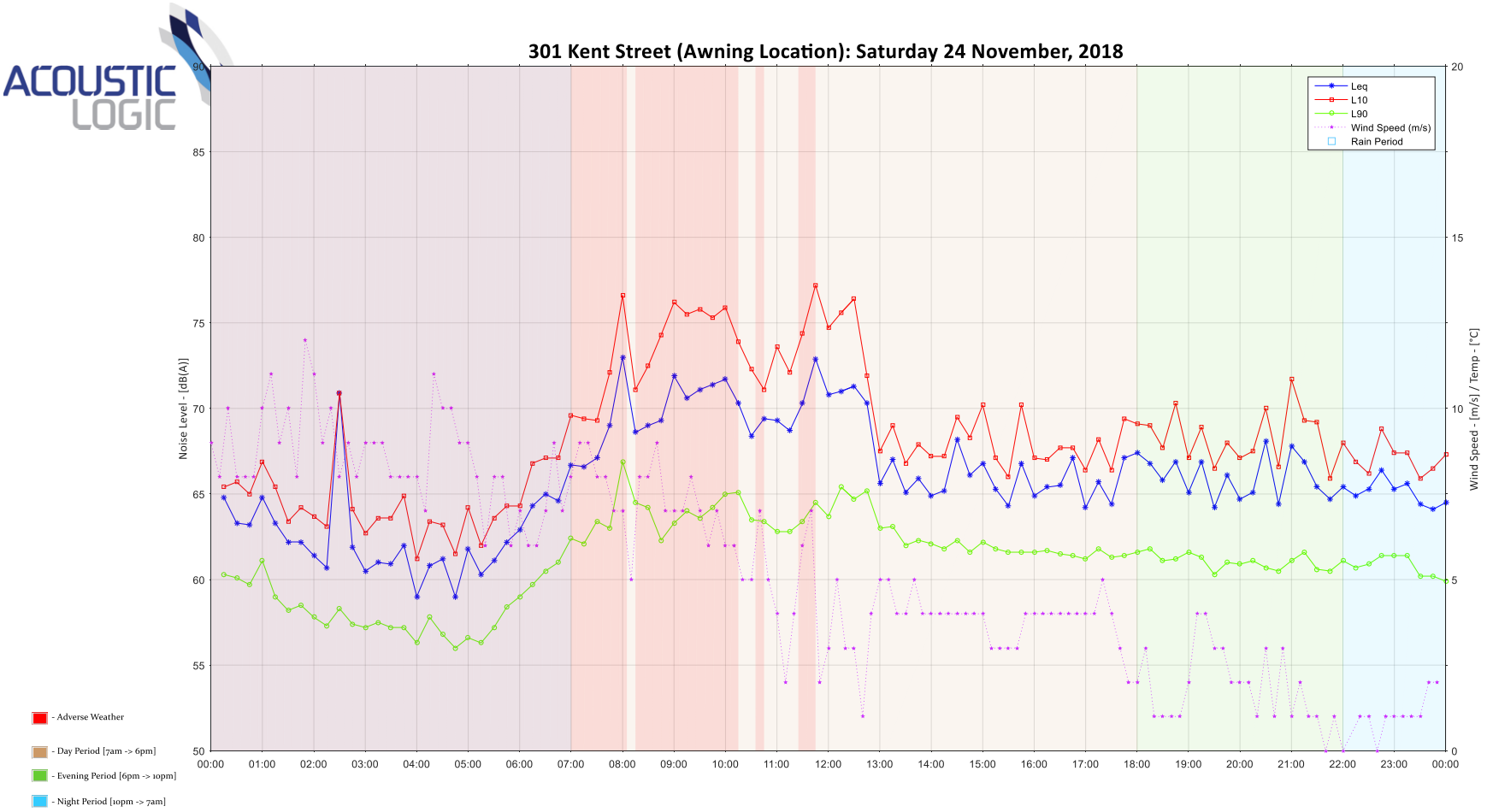
Yours faithfully,

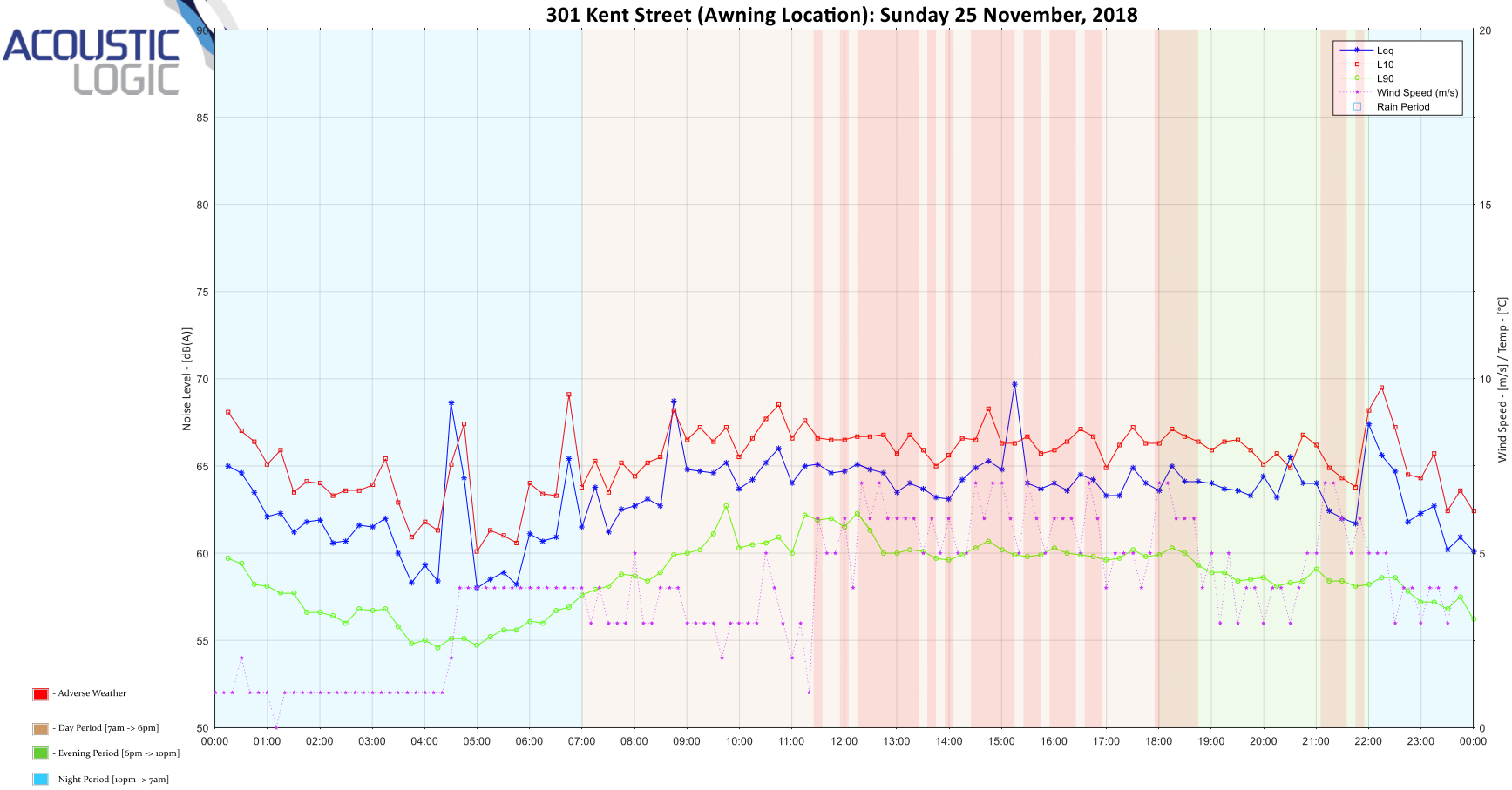
Acoustic Logic Consultancy Pty Ltd
Alex Washer

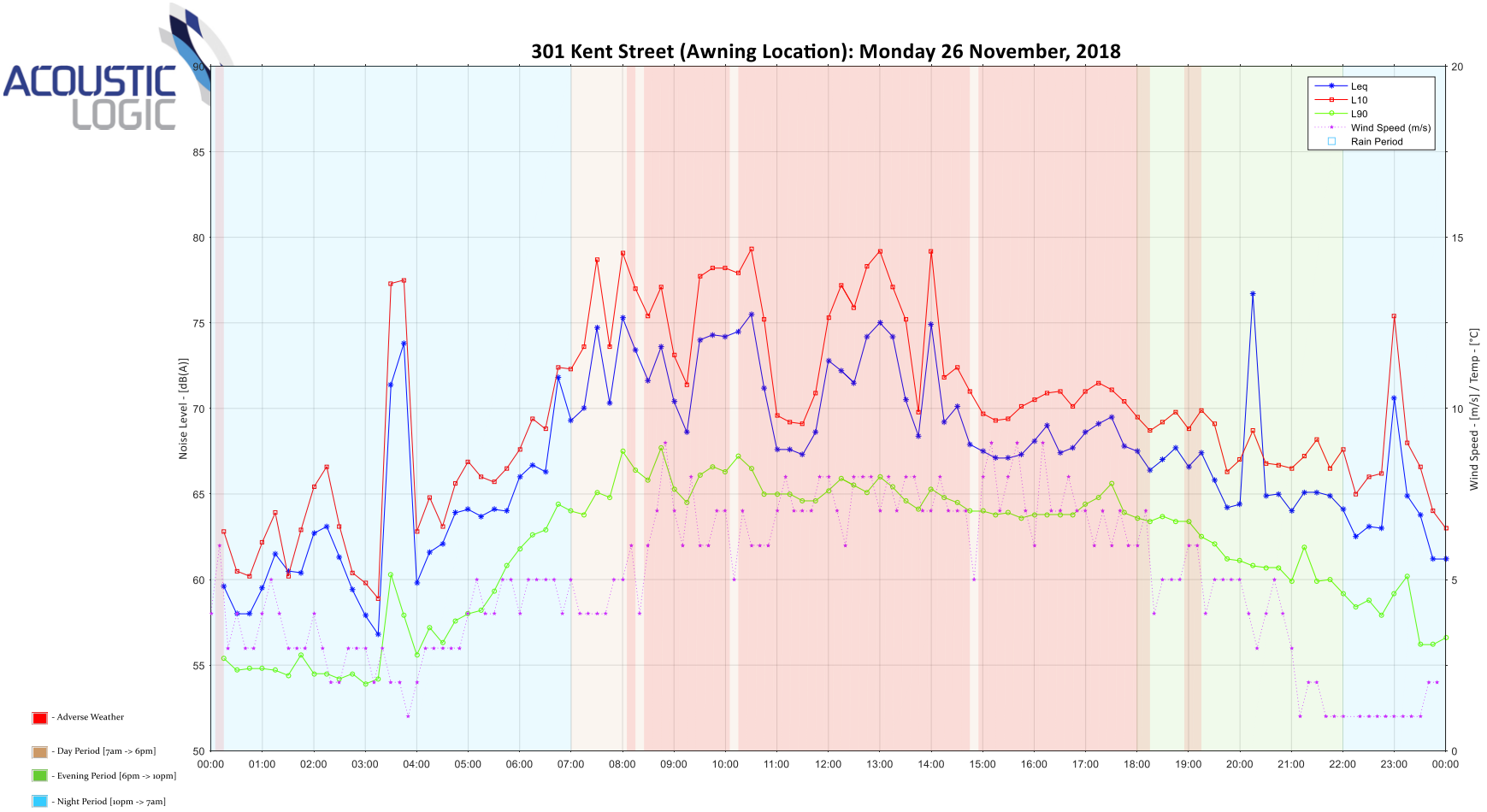
APPENDIX ONE – UNATTENDED NOISE MONITORING DATA – MONITOR 1 (AWNING LOCATION)

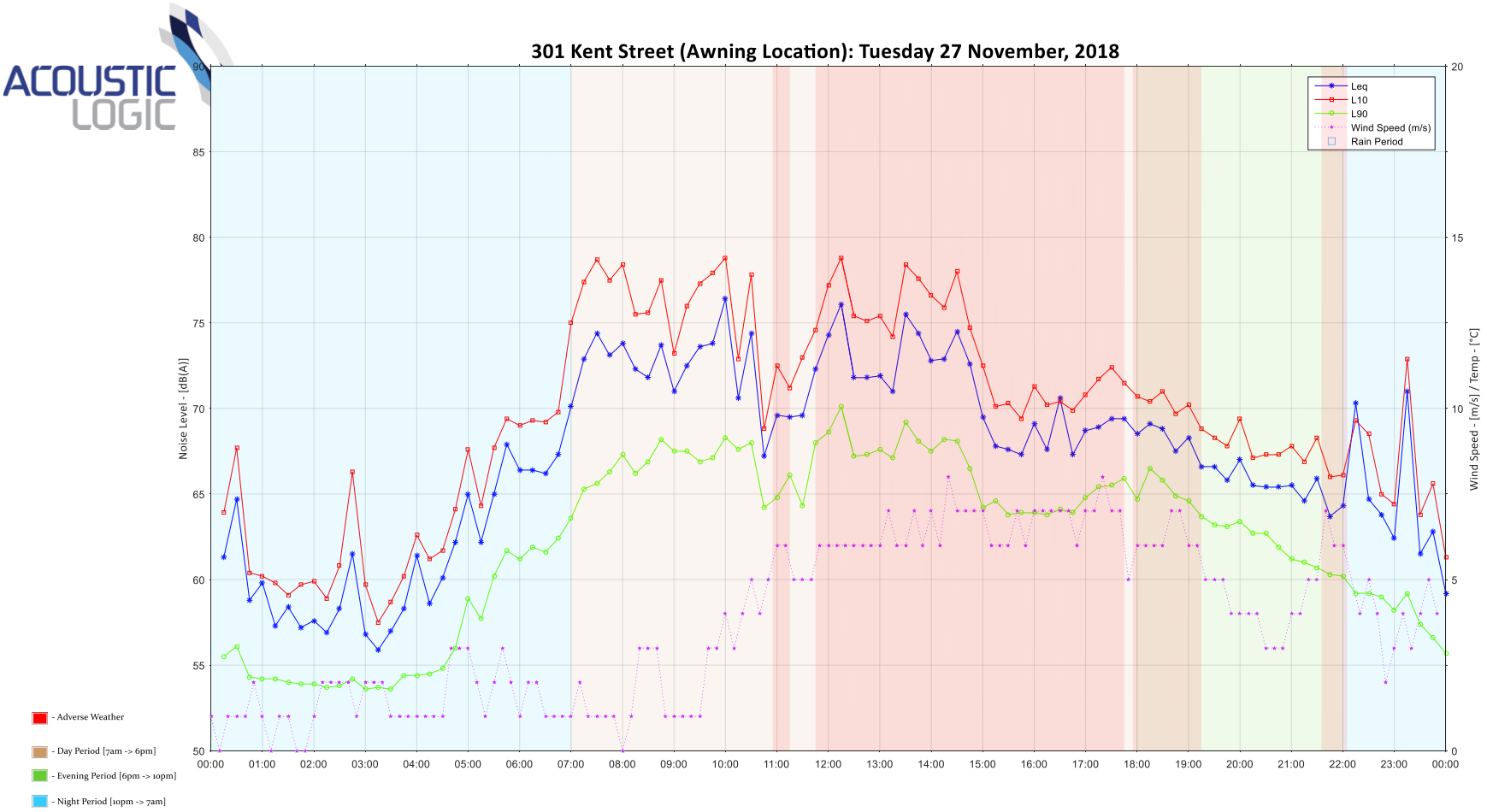

301 Kent Street (Awning Location): Thursday 22 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

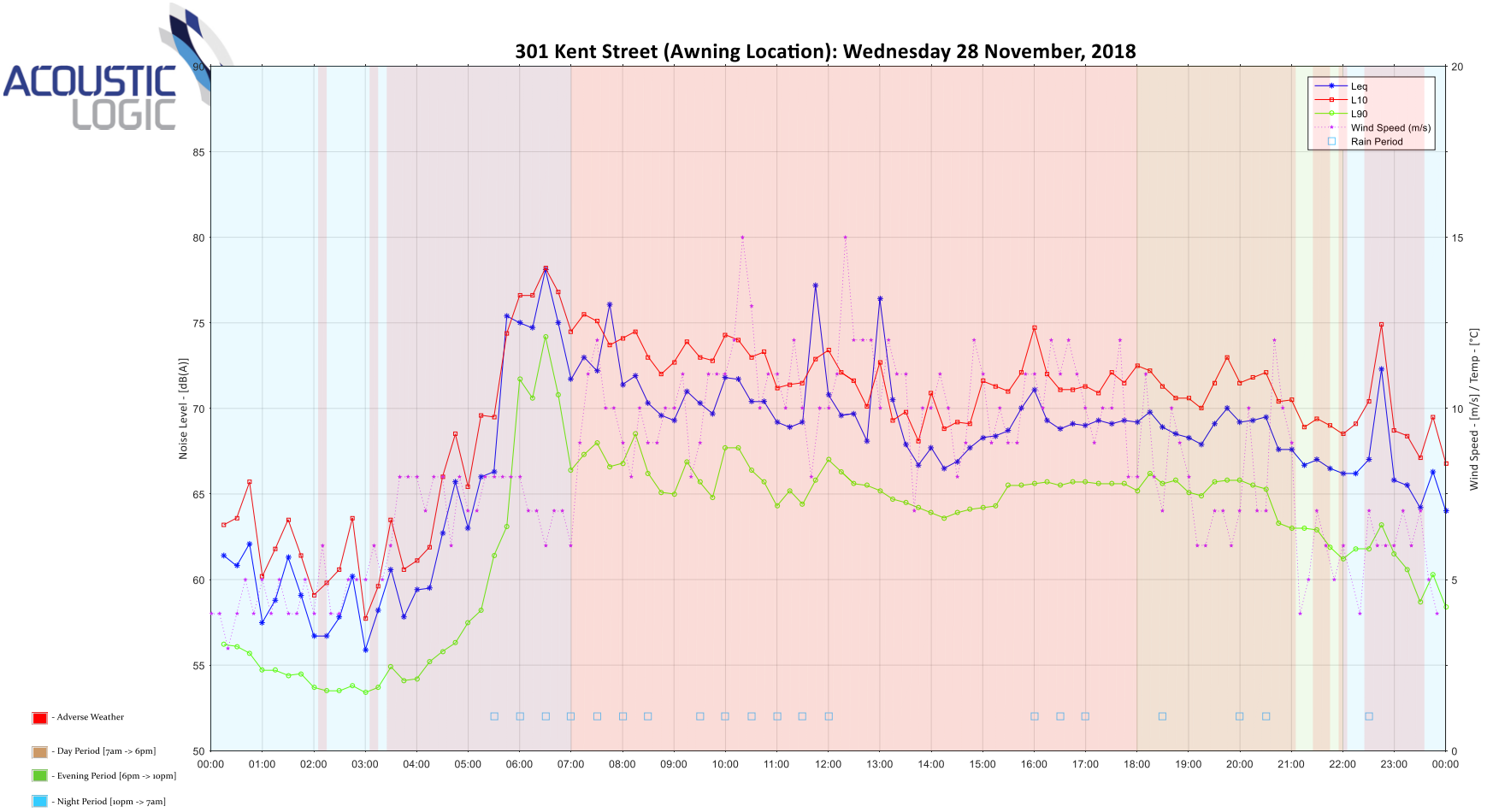

301 Kent Street (Awning Location): Friday 23 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

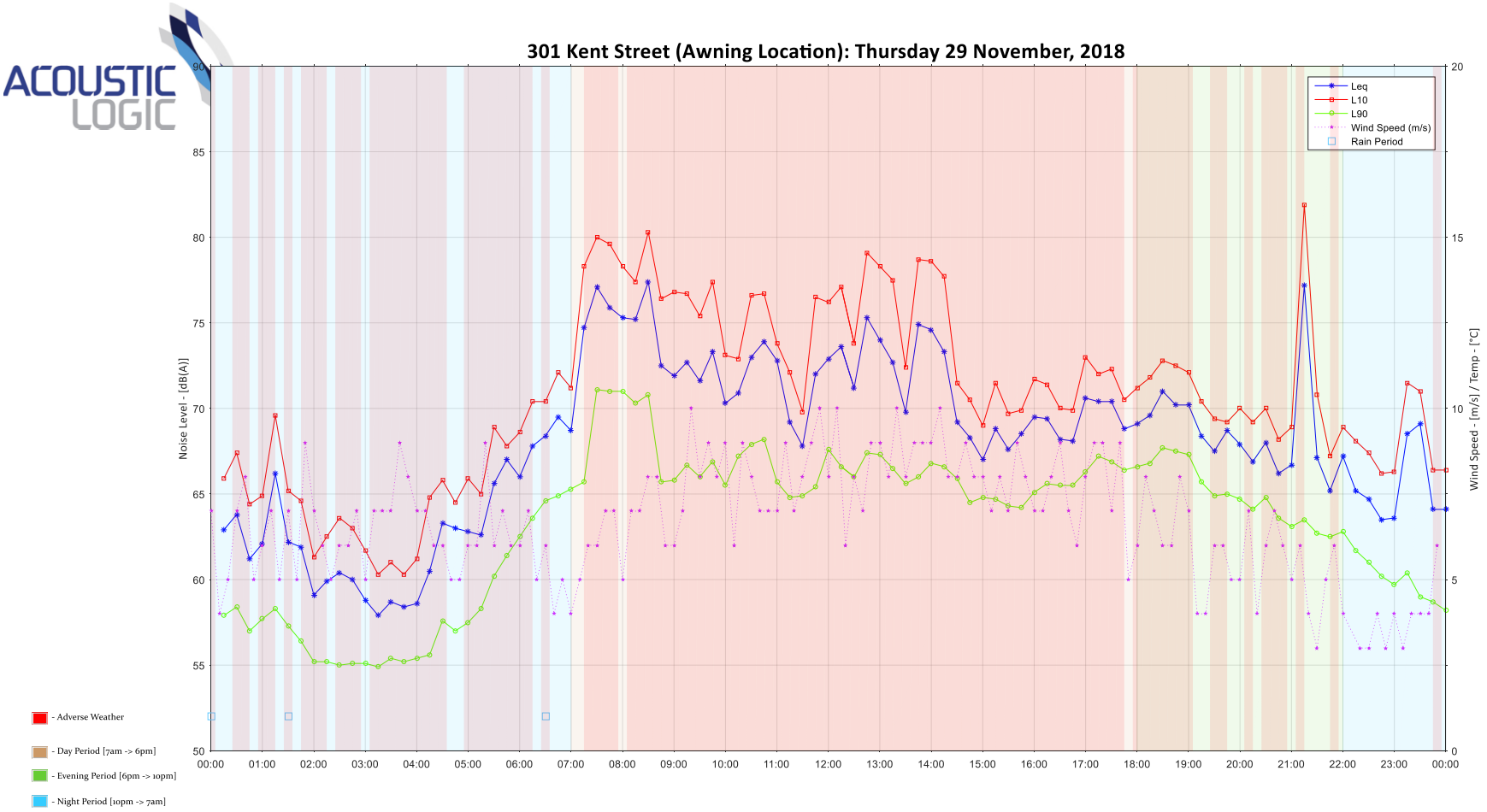

301 Kent Street (Awning Location): Saturday 24 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

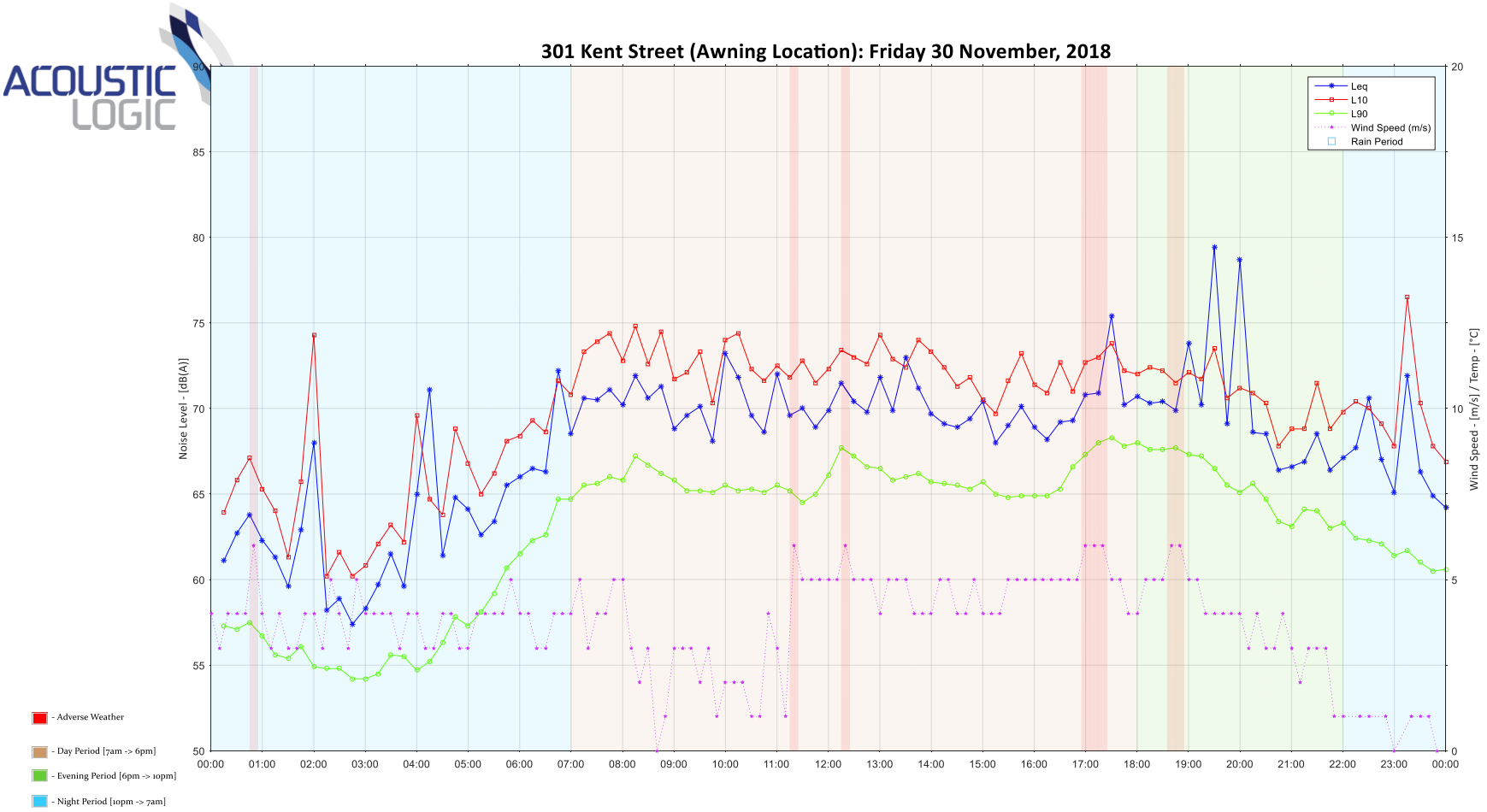

301 Kent Street (Awning Location): Sunday 25 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

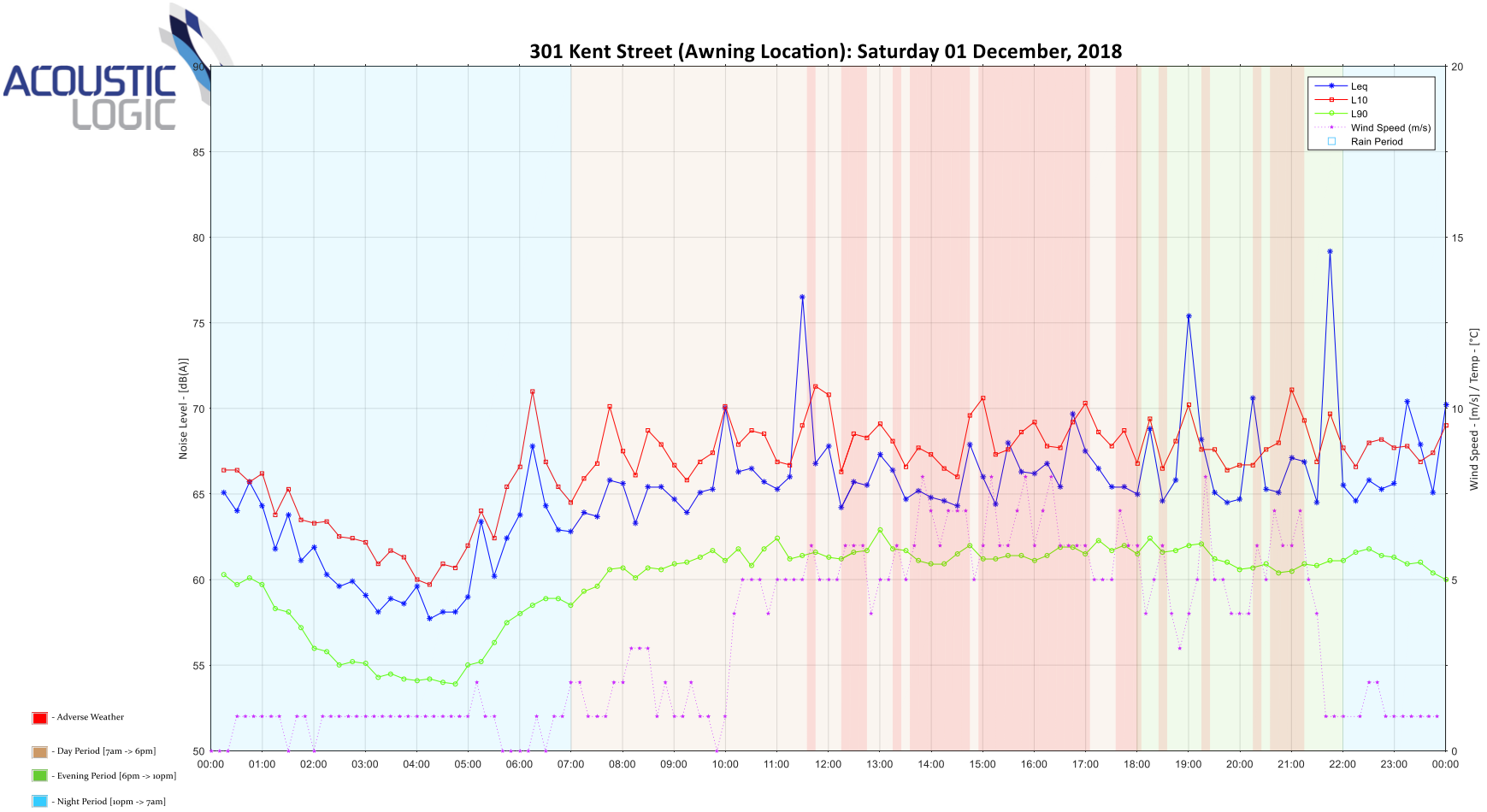

301 Kent Street (Awning Location): Monday 26 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

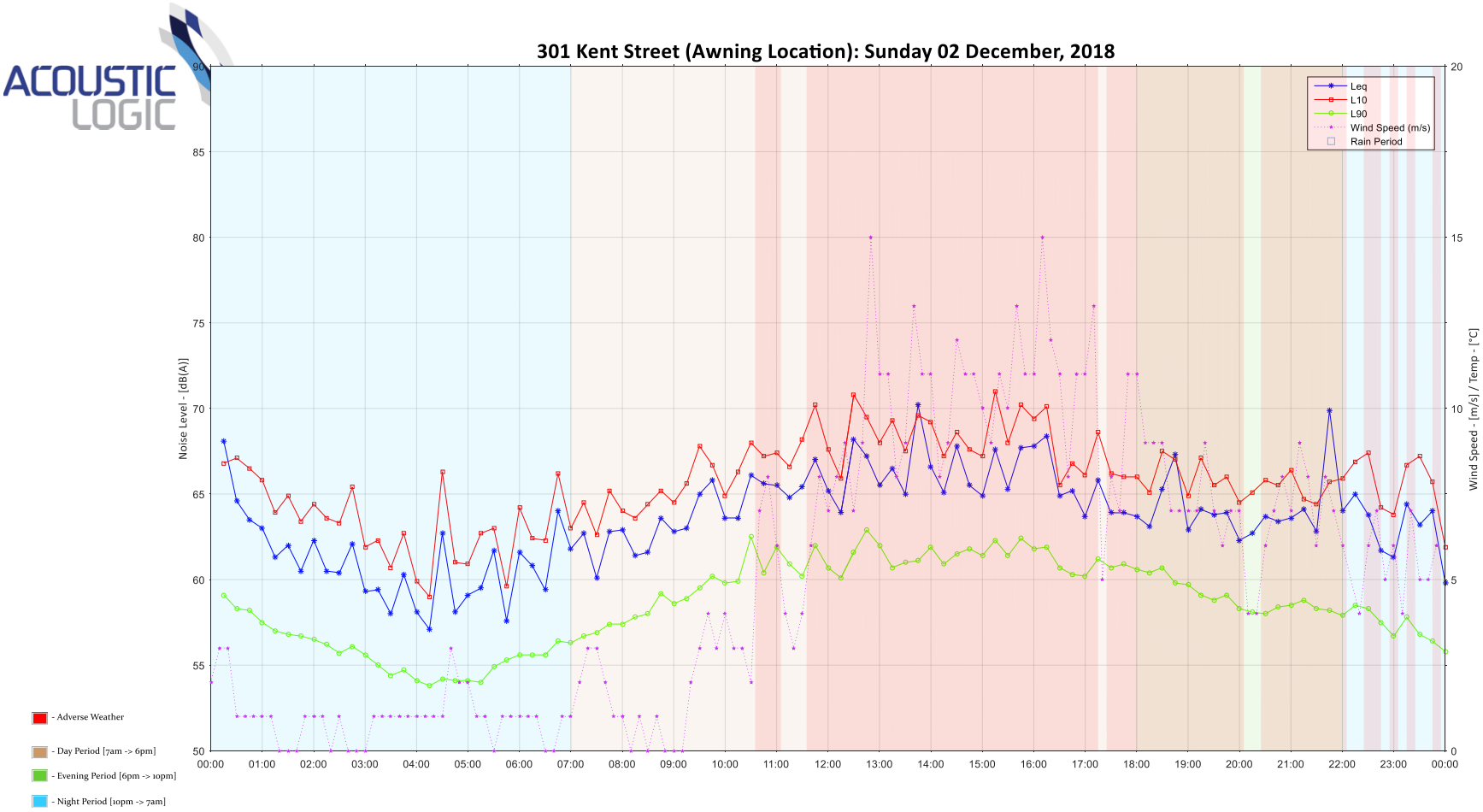

301 Kent Street (Awning Location): Tuesday 27 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

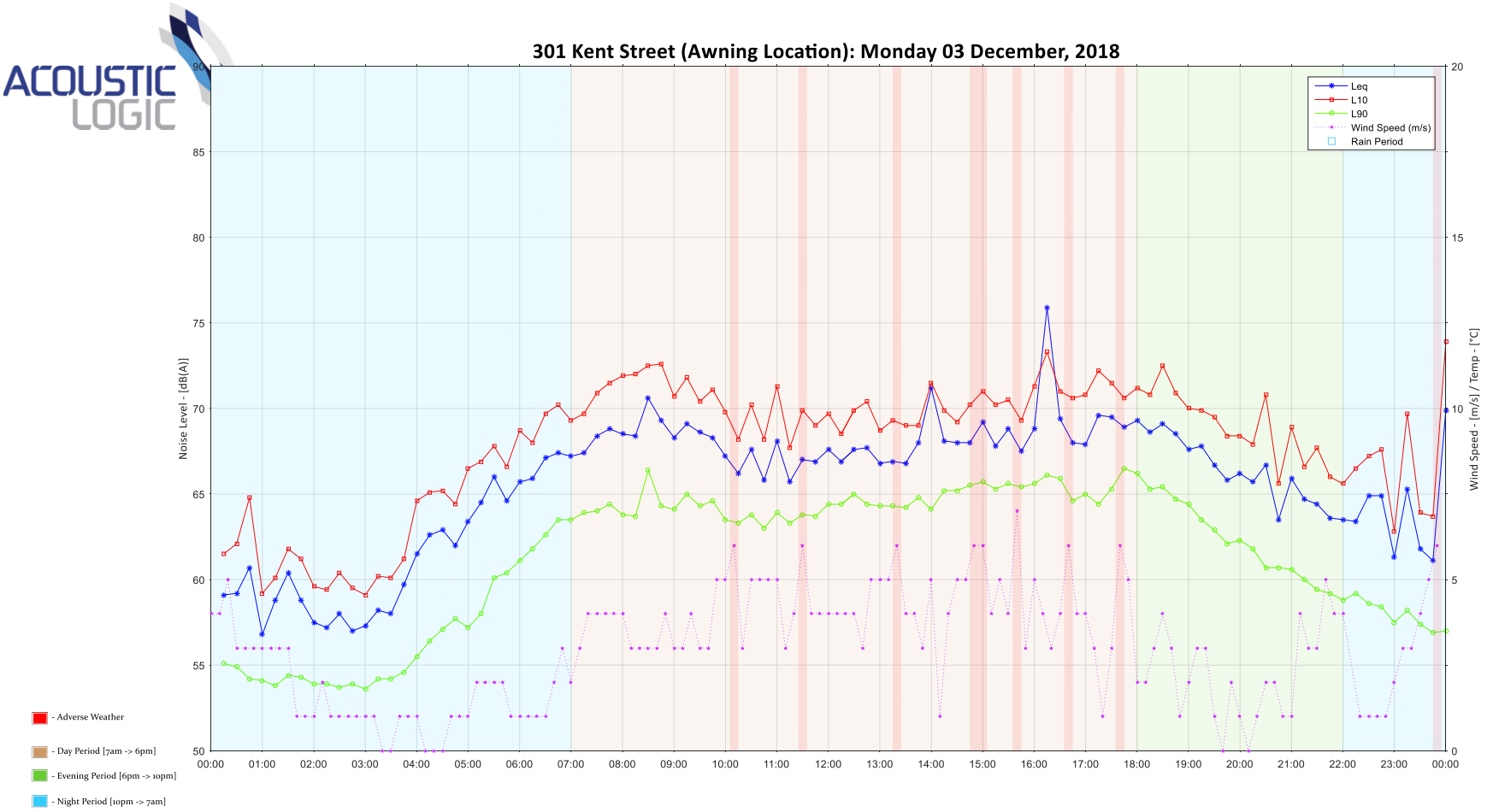

301 Kent Street (Awning Location): Wednesday 28 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

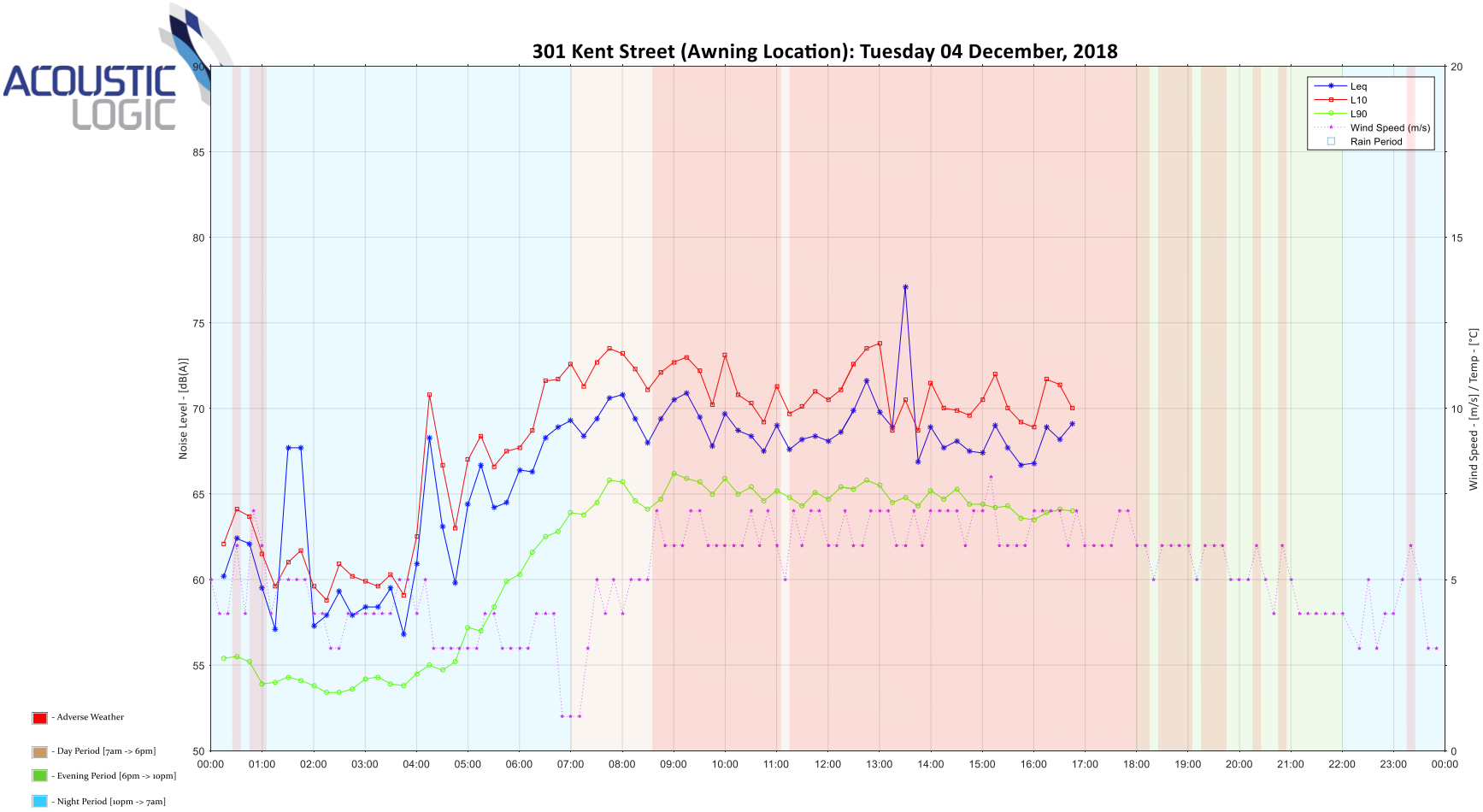

301 Kent Street (Awning Location): Thursday 29 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


301 Kent Street (Awning Location): Friday 30 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

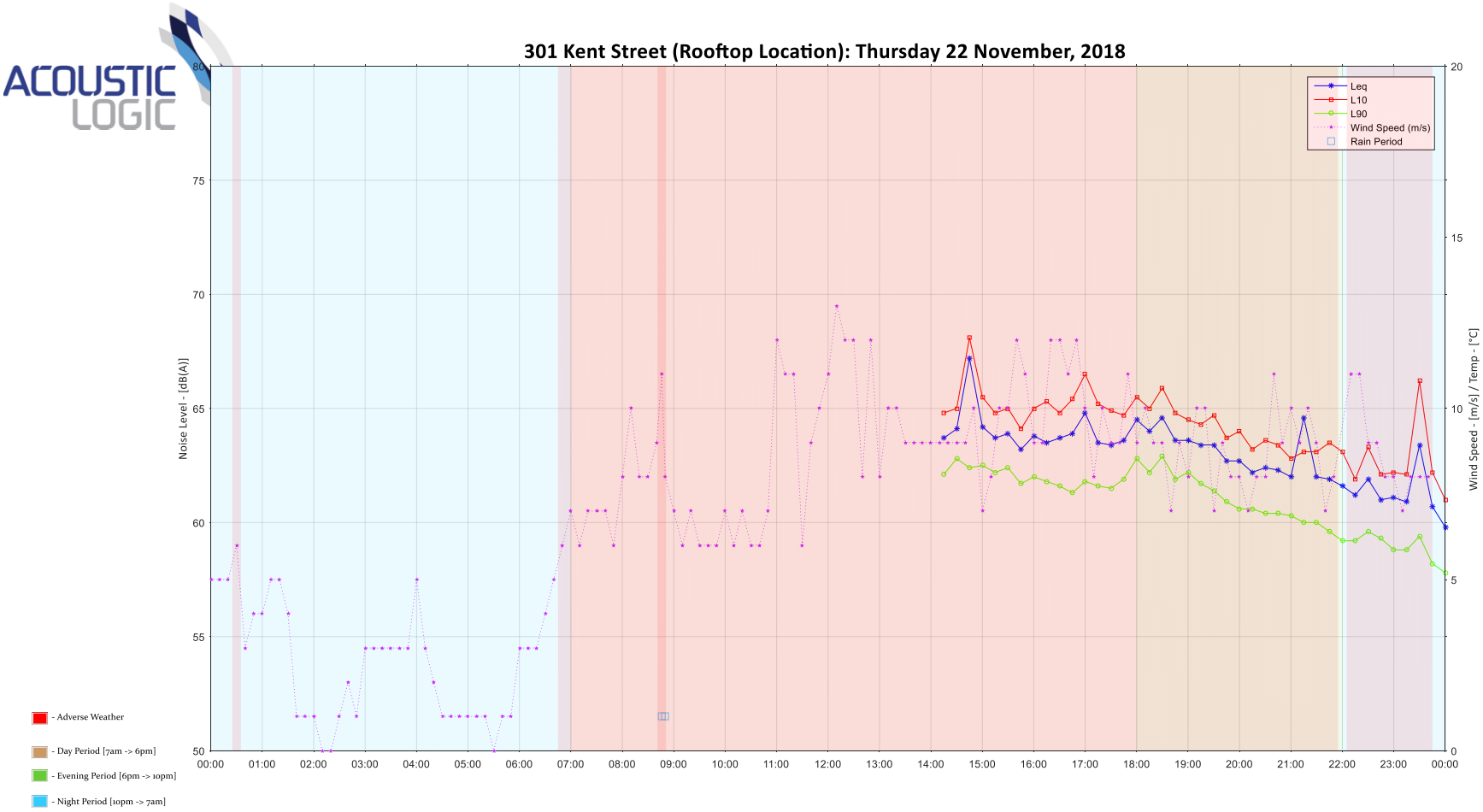

301 Kent Street (Awning Location): Saturday 01 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

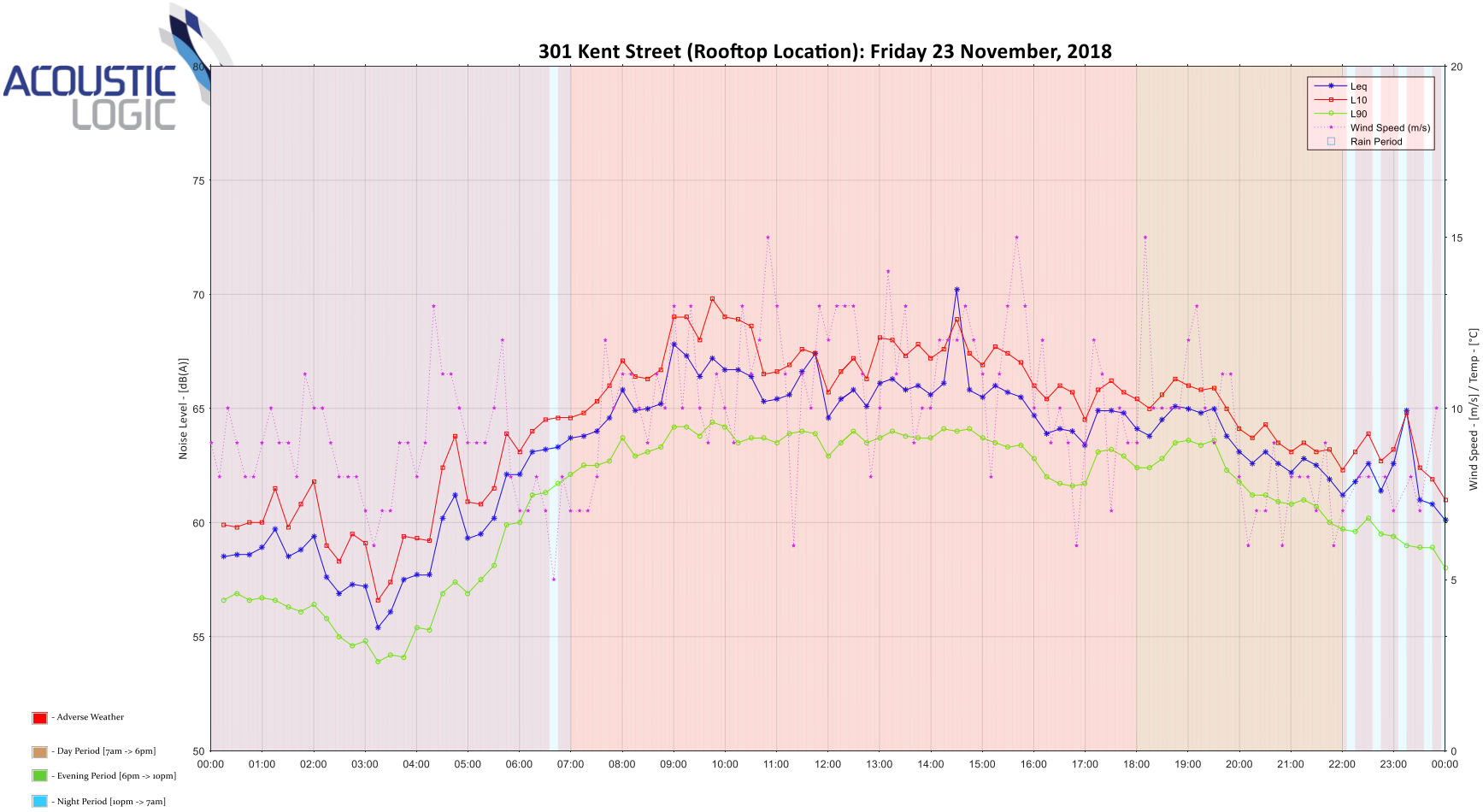

301 Kent Street (Awning Location): Sunday 02 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

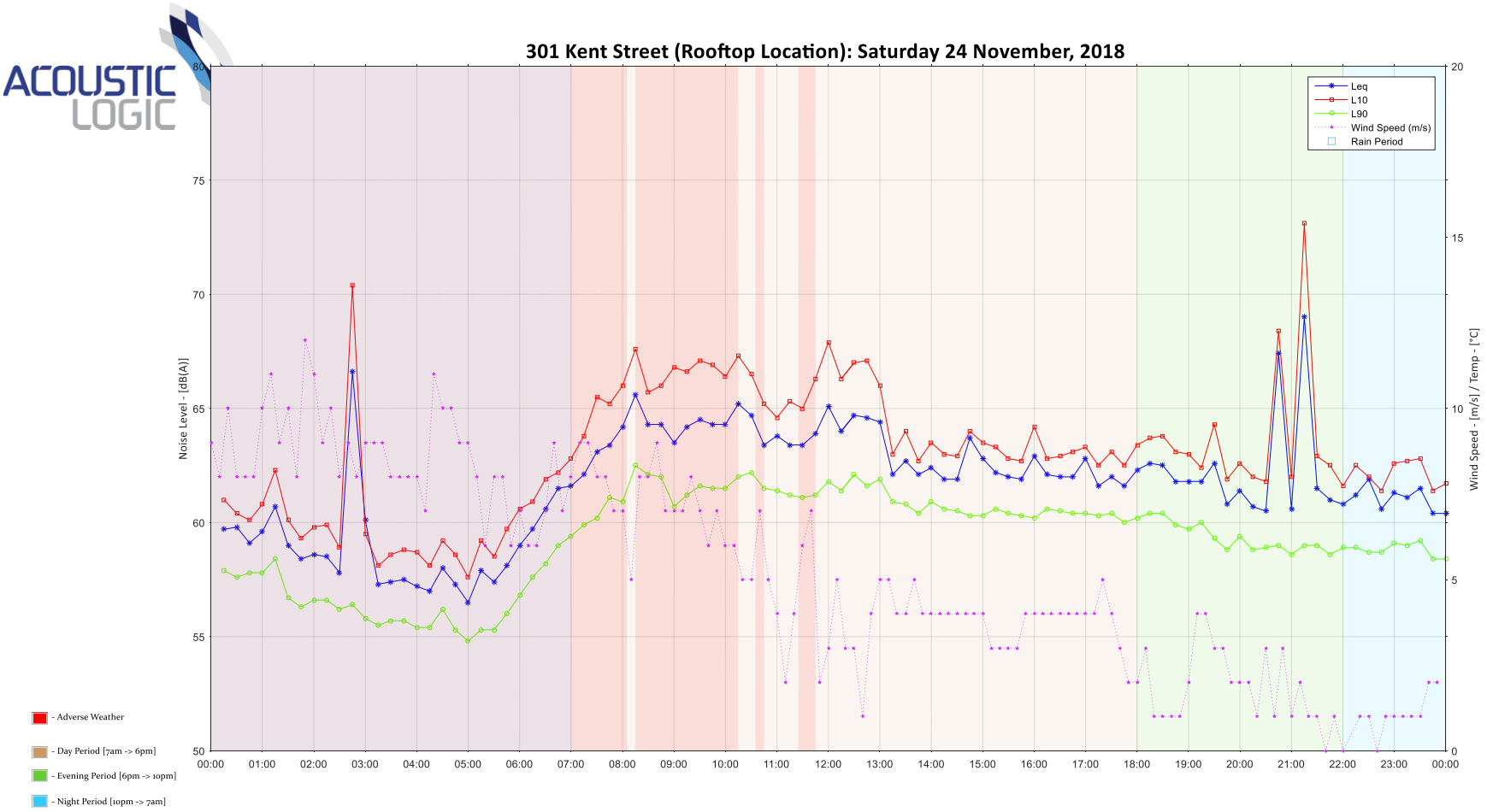

301 Kent Street (Awning Location): Monday 03 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

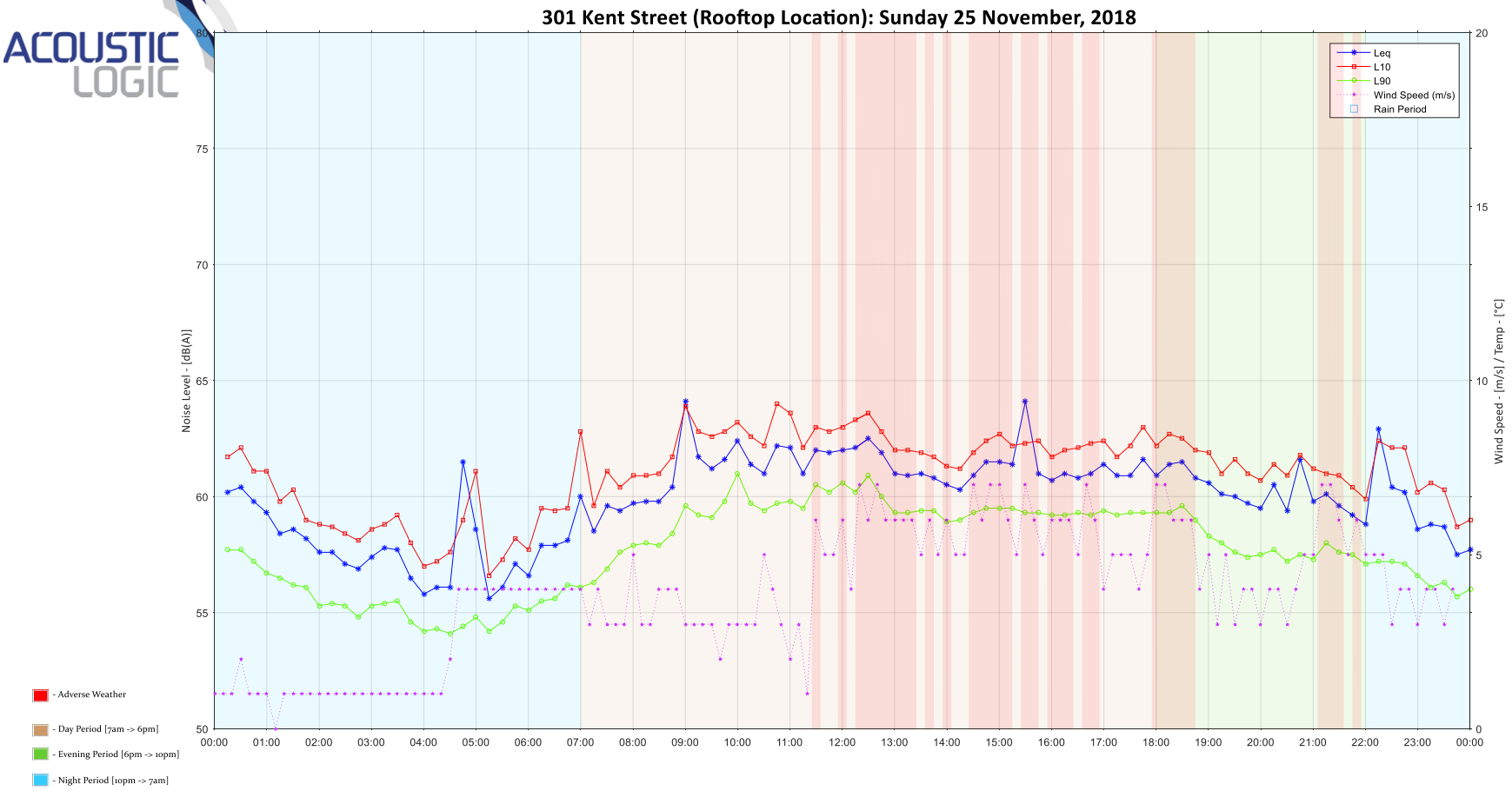

301 Kent Street (Awning Location): Tuesday 04 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

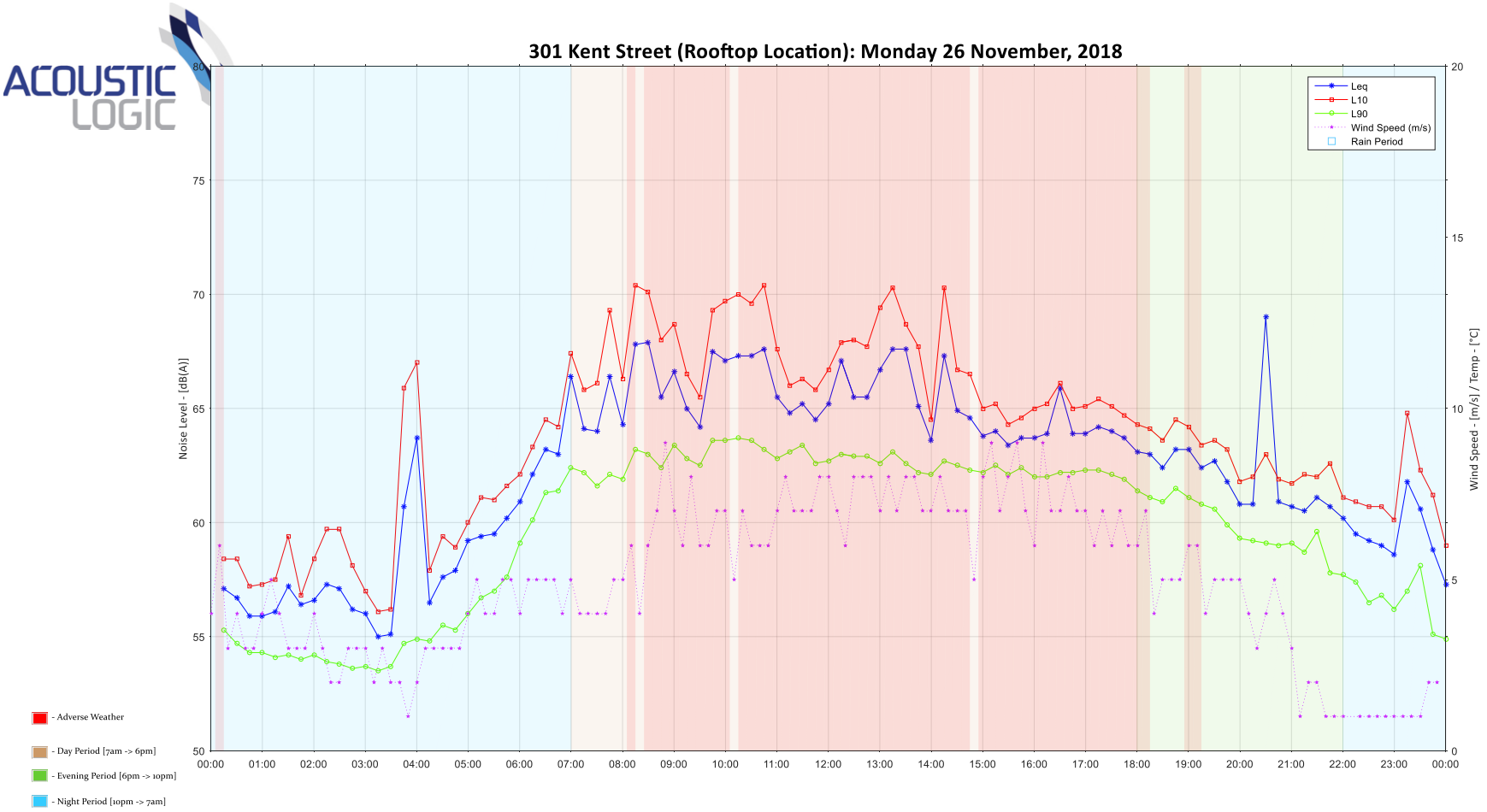
APPENDIX TWO – UNATTENDED NOISE MONITORING DATA – MONITOR 2 (ROOFTOP LOCATION)

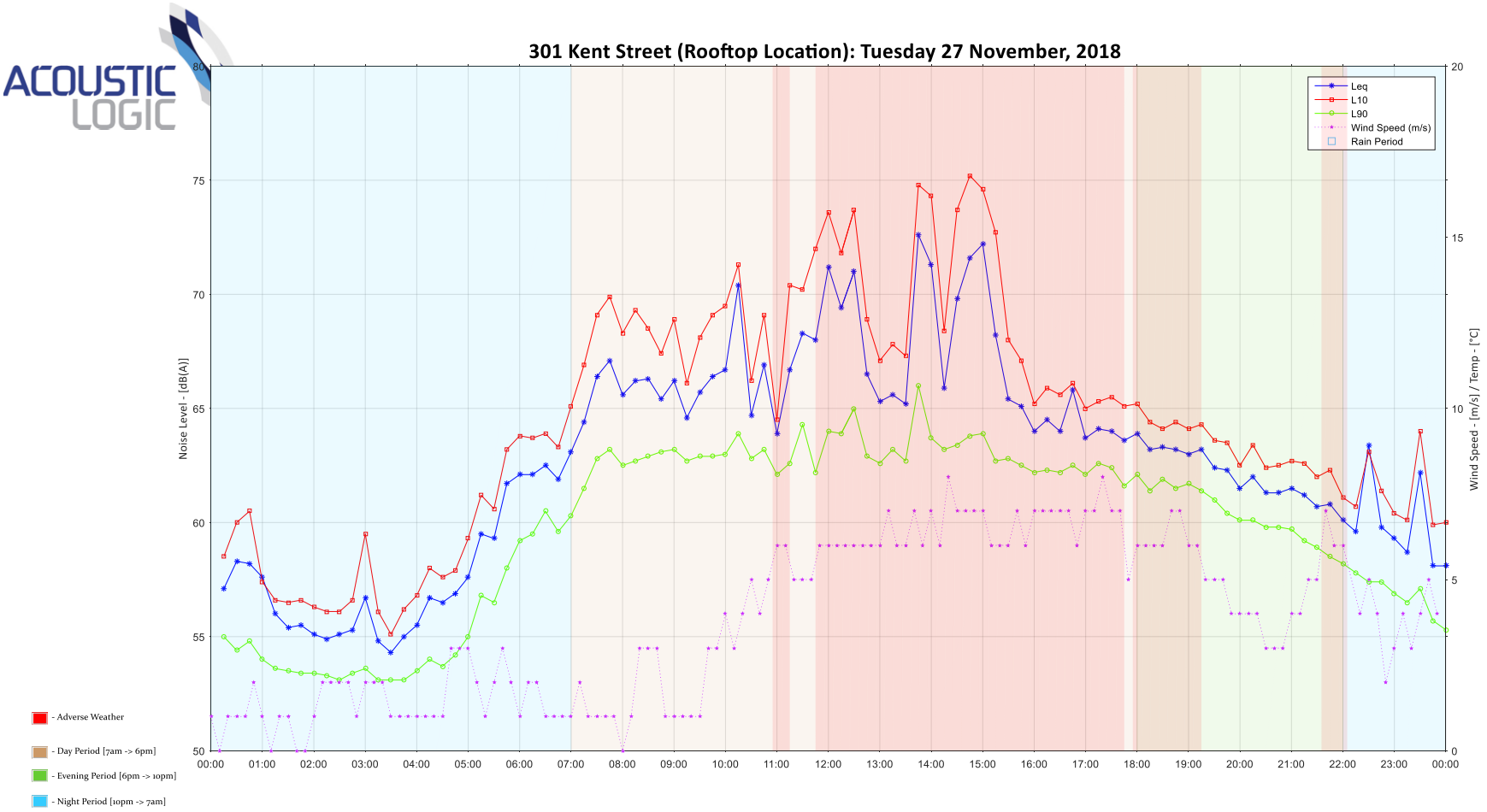

301 Kent Street (Rooftop Location): Thursday 22 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

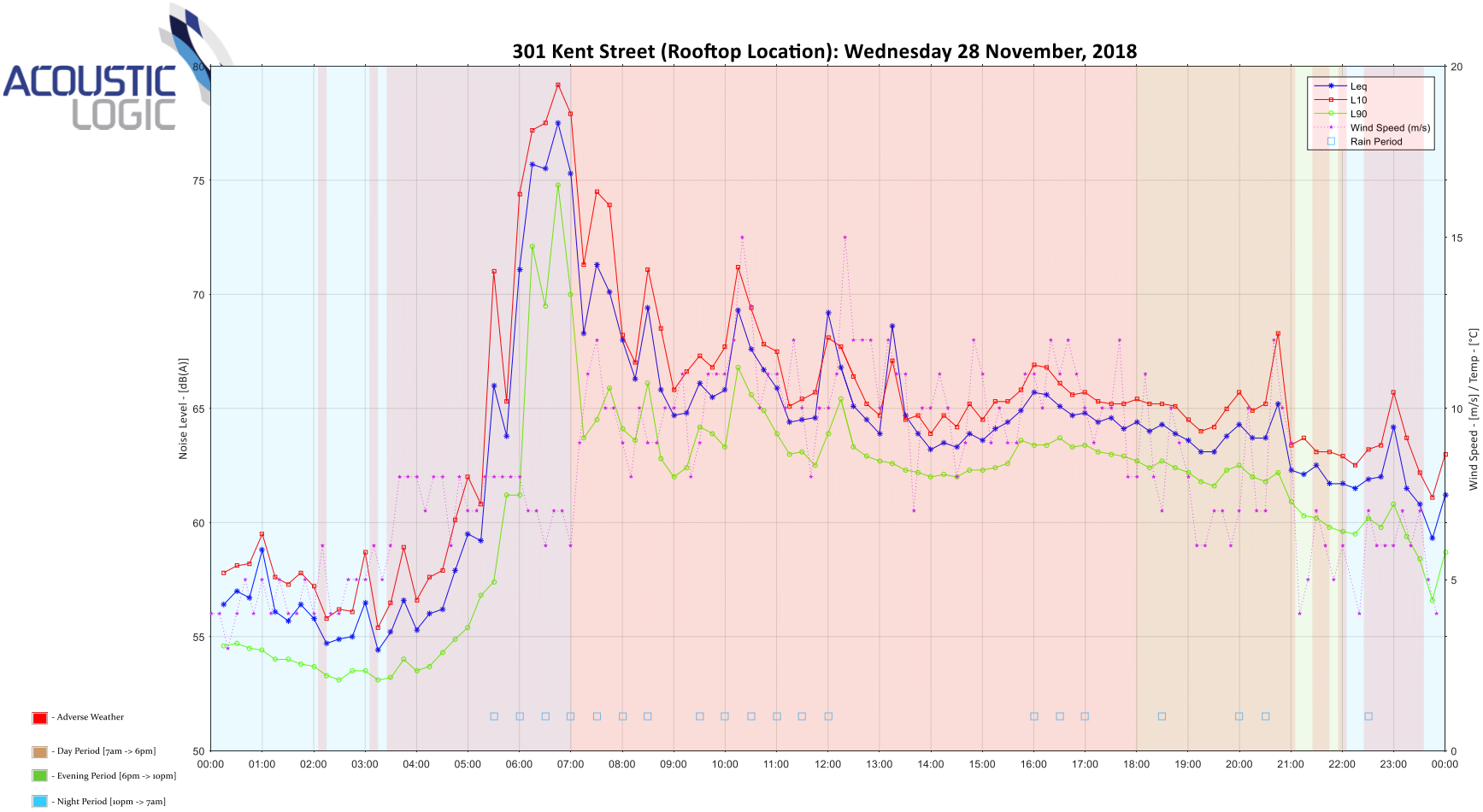

301 Kent Street (Rooftop Location): Friday 23 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

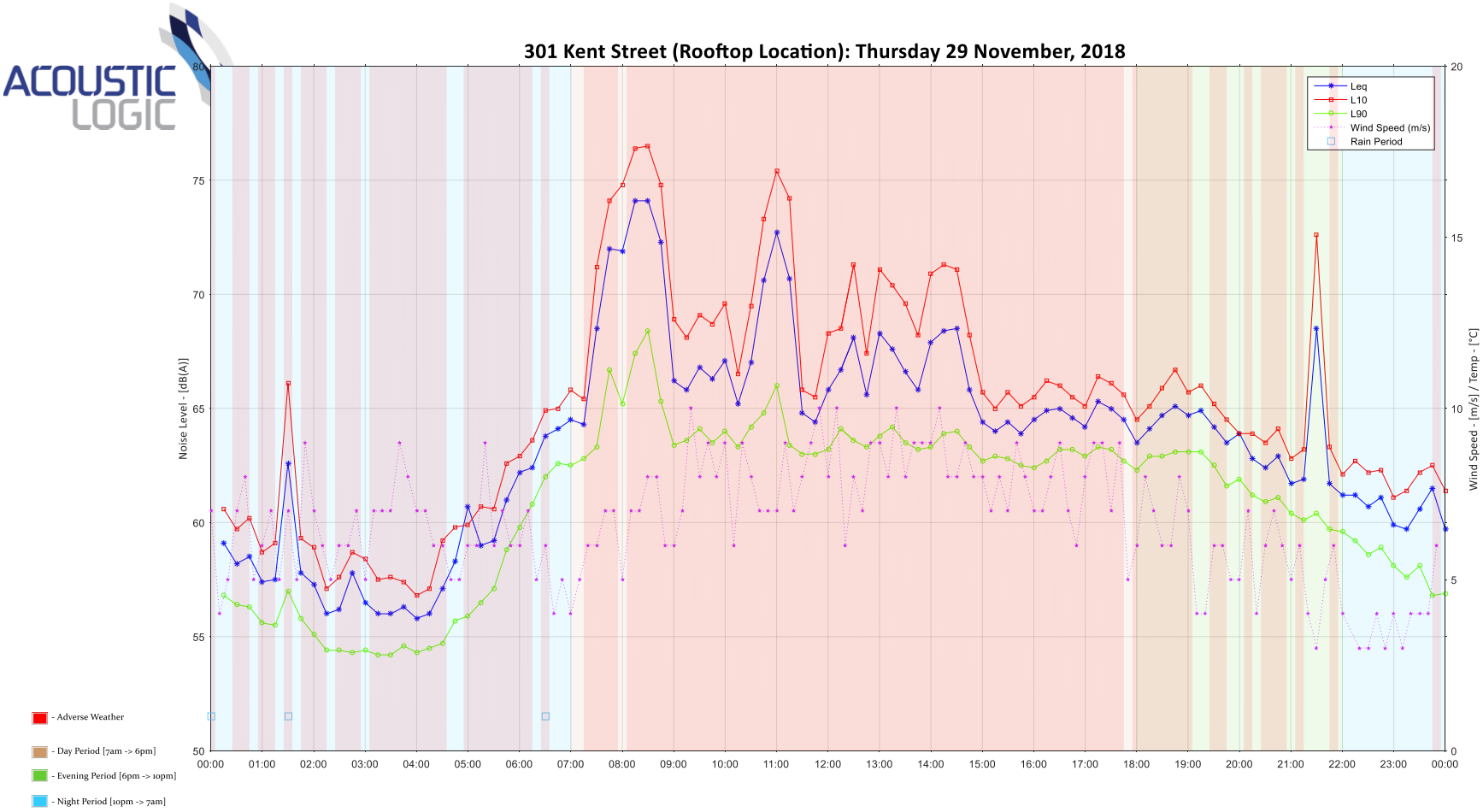

301 Kent Street (Rooftop Location): Saturday 24 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

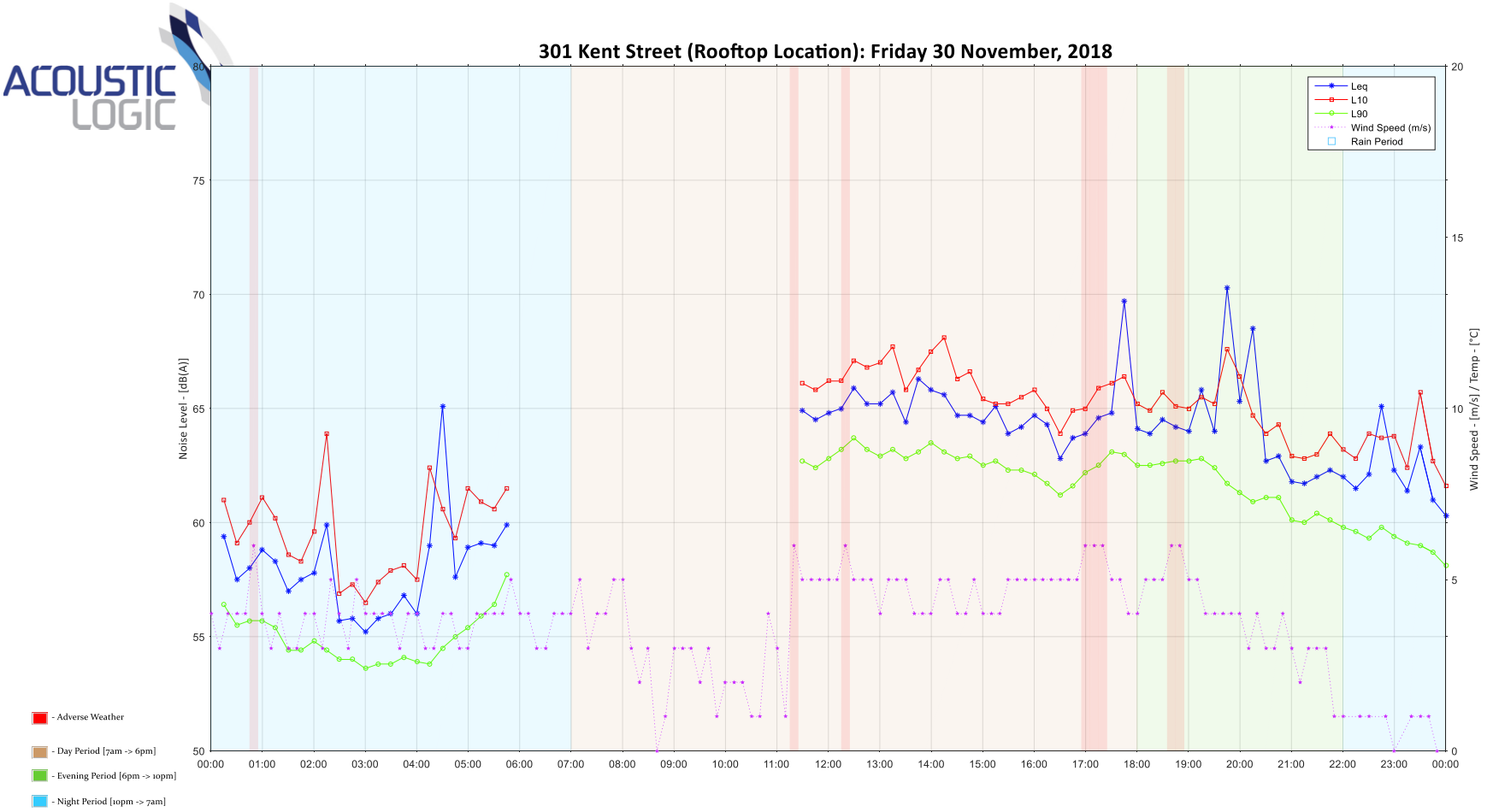

301 Kent Street (Rooftop Location): Sunday 25 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

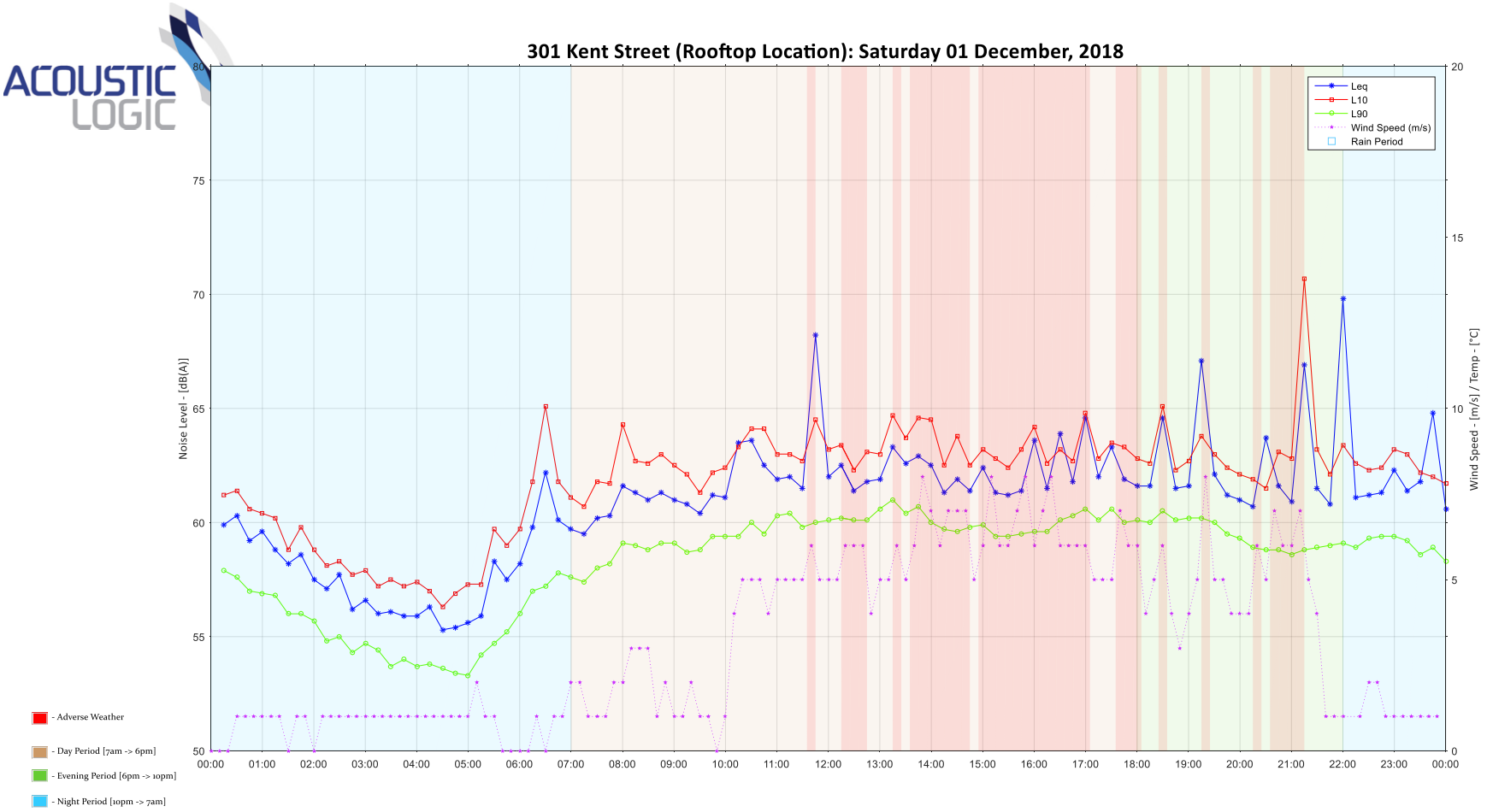

301 Kent Street (Rooftop Location): Monday 26 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

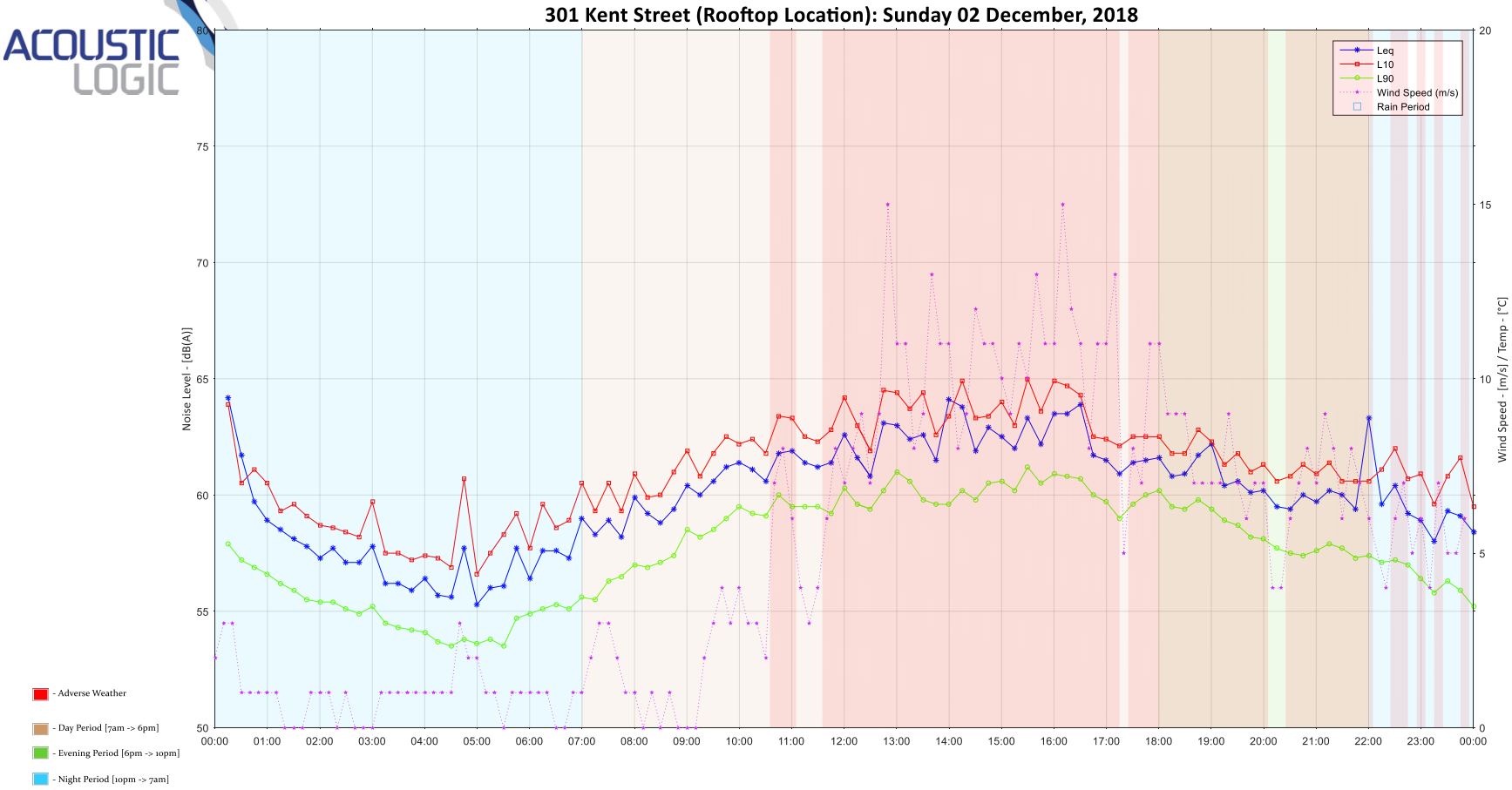

301 Kent Street (Rooftop Location): Tuesday 27 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

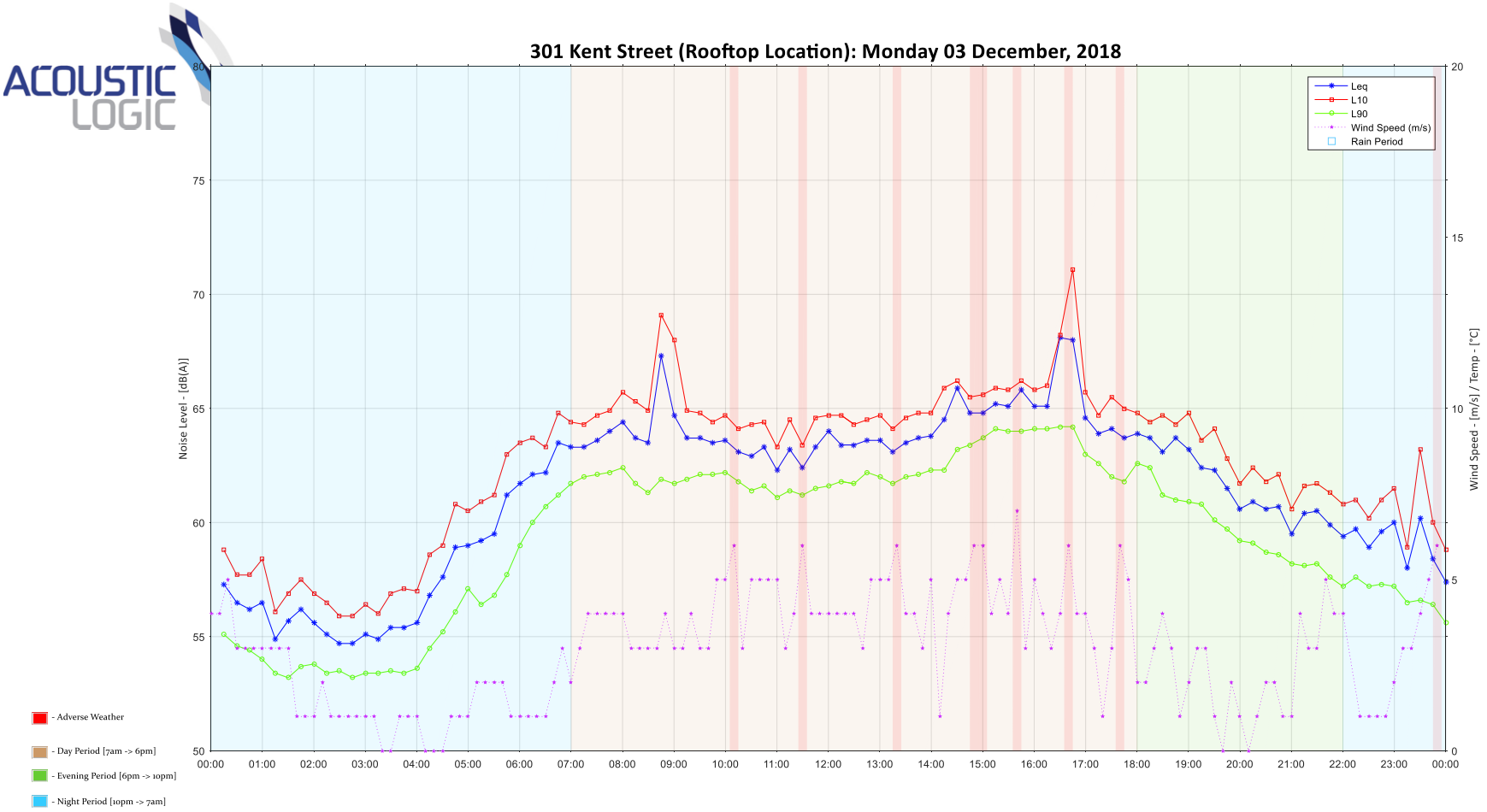

301 Kent Street (Rooftop Location): Wednesday 28 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

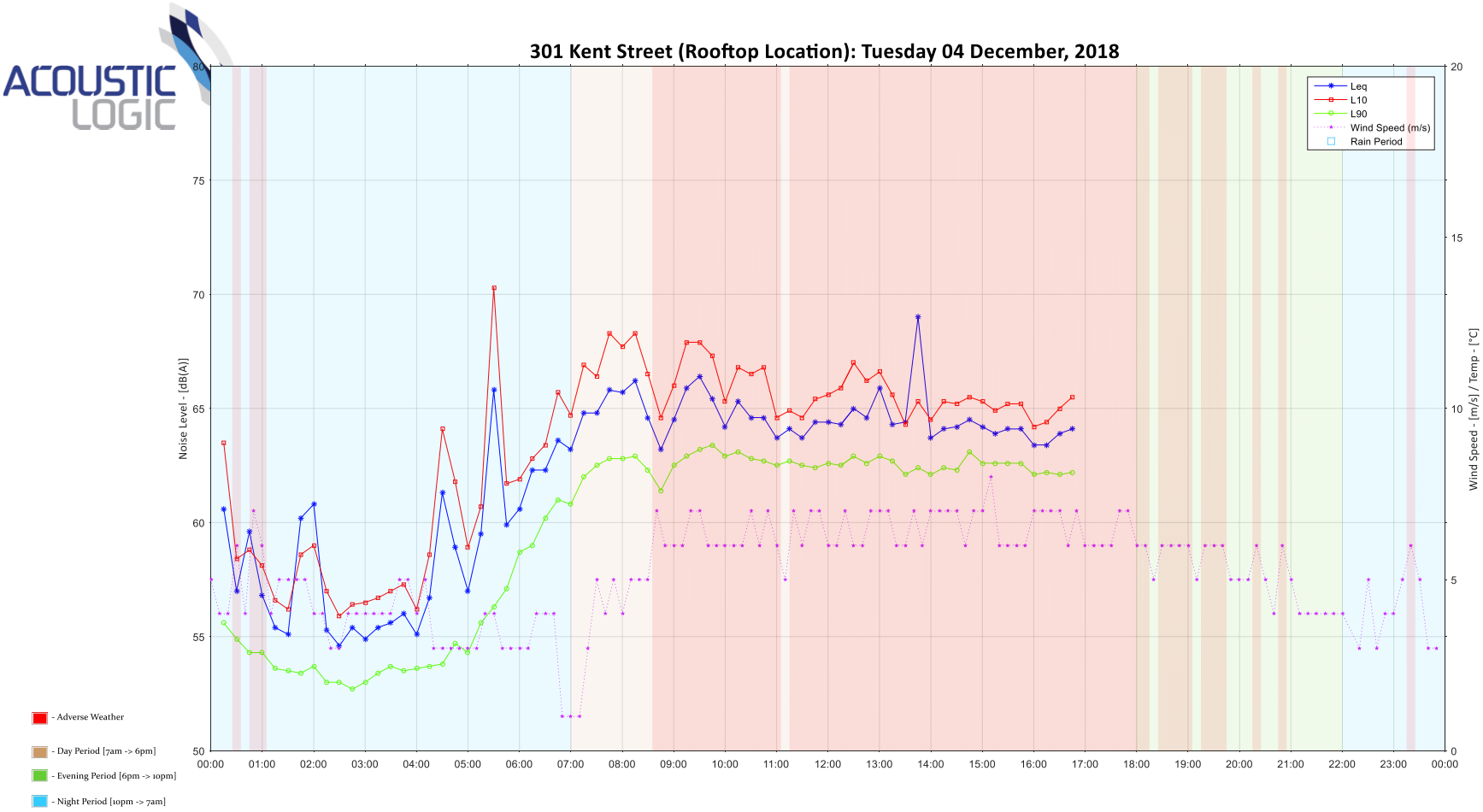

301 Kent Street (Rooftop Location): Thursday 29 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


301 Kent Street (Rooftop Location): Friday 30 November, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


301 Kent Street (Rooftop Location): Saturday 01 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


301 Kent Street (Rooftop Location): Sunday 02 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


301 Kent Street (Rooftop Location): Monday 03 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


301 Kent Street (Rooftop Location): Tuesday 04 December, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]