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SSDA Acoustic Assessment

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) has been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed development at Woolworths Customer Fulfillment Centre (CFC), 74 Edinburgh Road, Marrickville.

In accordance with the SEARs issued for SSD 10468, this document addresses noise impacts associated with the following:

- An assessment of potential aircraft noise impacts, including a consideration of the site within the 25-30 ANEF contour (noise intrusion to project site from adjacent roadways and aircraft)
- A cumulative noise impact assessment of all potential noise sources in accordance with relevant EPA Guidelines (noise emissions from mechanical plant to service the project site in principle).

A separate Preliminary Construction Noise and Vibration Management Plan has been prepared to address the following in accordance with the SEARs:

- All potential noise and vibration sources during the construction and operational phases of the development, including on and off-site traffic noise
- Details of noise mitigation, management and monitoring measures.

ALC have utilised the following documents and regulations in the noise assessment of the development;

- Inner West Council (formerly Marrickville) DCP and LEP 2011;
- Australian Standard AS2021:2015 – *'Acoustics–Aircraft noise intrusion–Building siting and construction'*;
- Australian Standard AS2107:2016 – '*Recommended Design Sound Levels and Reverberation Times for Building Interiors*';
- NSW Department of Environment and Heritage, Environmental Protection Agency document – '*Noise Policy for Industry*' (NPI) 2017;
- German Standard DIN 4150-3 (1999-02); and
- NSW EPA document – '*Assessing Vibration – A Technical Guideline.*'

This assessment has been conducted using the Nettleton Tribe architectural drawings for SSDA submission (*Project No: 10437*, Issue 1, dated 28th August 2020).

2 SITE DESCRIPTION

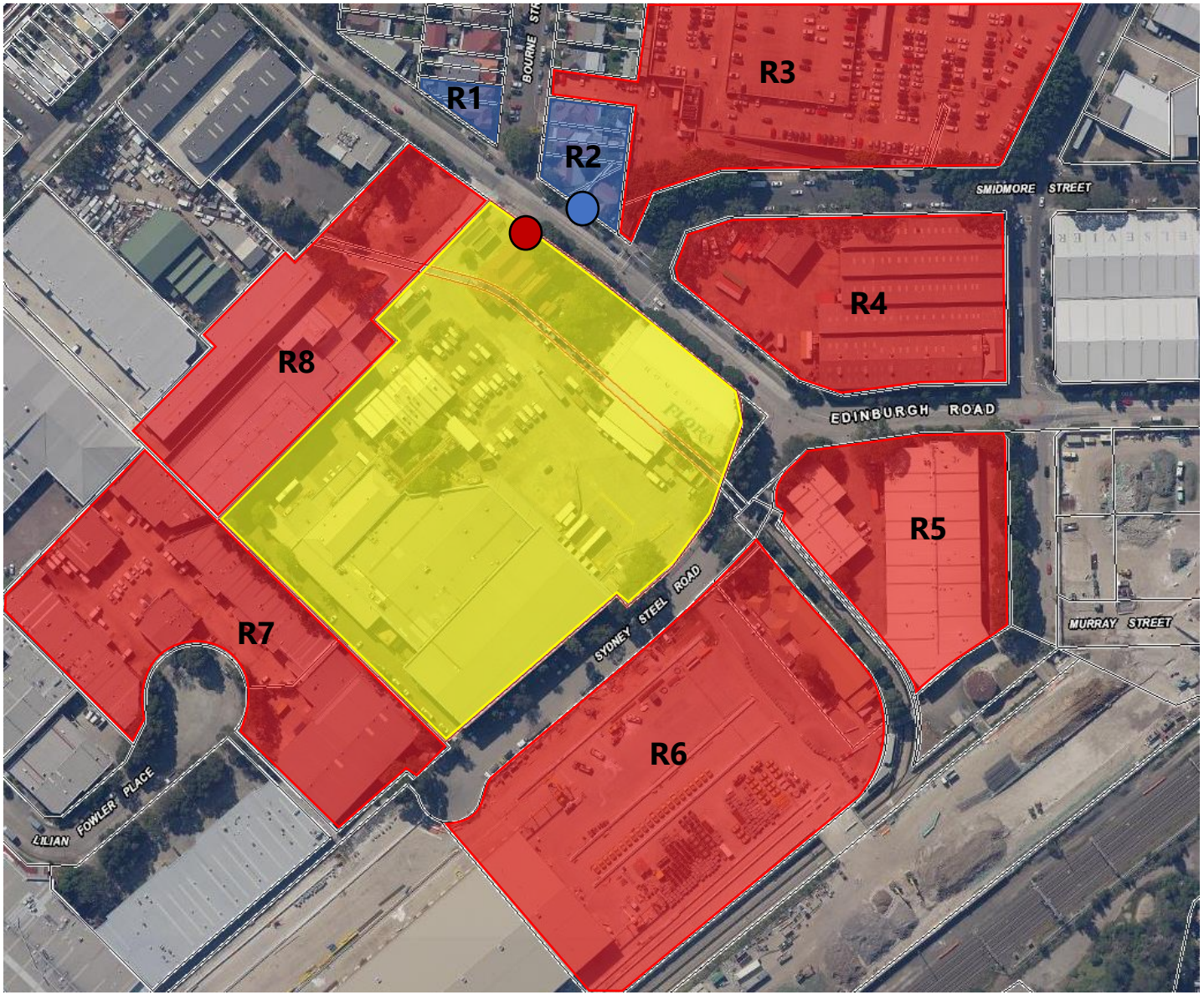
Investigation has been carried out by this office in regards to the existing properties and noise impacts surrounding the proposed development, which is detailed below:

- Existing residential blocks to the north east along Edinburgh Road; and
- Existing industrial receivers surrounding the site.

The nearest noise receivers around the site include:

- **R1:** Residential Receiver 1 – Single storey residential development to the north at 2-4 Bourne Street;
- **R2:** Residential Receiver 2 – Single storey residential development to the north at 1-7 Bourne Street and 65 Edinburgh Road;
- **R3:** Commercial Receiver 3 – Commercial development to the north at Marrickville Metro Shopping Centre, 34 Victoria Road;
- **R4:** Industrial Receiver 4 – Industrial development to the north east at 45-51 Edinburgh Road;
- **R5:** Industrial Receiver 5 – Industrial development to the east at 108-112 Edinburgh Road;
- **R6:** Industrial Receiver 6 – Industrial development to the south at 1 Sydney Steel Road;
- **R7:** Industrial Receiver 7 – Industrial developments to the south west at 10-16 Lilian Fowler Place; and
- **R8:** Industrial Receiver 8 – Industrial development to the north west at 76 Edinburgh Road.

A site map, measurement description and surrounding receivers are presented in Figure 1 below.



Project Site

Residential Receivers

Commercial/ Industrial Receivers

Figure 1 – Project Site
Source: NSW Six Maps

Unattended Noise Monitor

Attended Measurements

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

4 AMBIENT NOISE SURVEY

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

Appendices in this report present results of unattended noise monitoring conducted at the project site. Weather affected data was excluded from the assessment. The processed RBL (lowest 10th percentile noise levels during operation time period) are presented in Table 4-1.

4.1.1 Measurement Position

One unattended noise monitor was located in the front yard of 65 Edinburgh Road. Refer to Figure 1 for detailed location.

4.1.2 Measurement Period

Unattended noise monitoring was conducted from Wednesday 10th of June 2020 to Monday 22nd of June 2020. Attended noise measurements were undertaken between the hours of 11:00am and 12:00pm on 22nd of June 2020.

4.1.3 Measurement Equipment

Equipment used consisted of an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise logger data is provided in Appendix One – Unattended Noise Monitoring.

4.1.4 Summarised Rating Background Noise Levels

Summarised rating background noise levels for the project site and immediate surroundings are presented below.

Table 4-1 – Measured Noise Levels

Monitor	Time of day	Rating Background Noise Level dB(A)$_{L90(Period)}$
65 Edinburgh Road	Day (7am – 6pm)	54
	Evening (6pm – 10pm)	44
	Night (10pm – 7am)	42

On review of the monitoring data, the measured L_{90} noise levels during high wind speed days do not increase background noise levels significantly as periods with little to no wind. This demonstrates that even though wind speeds measured at Sydney Airport exceed EPA guidelines, either:

- The wind speed on site at this time was significantly lower than at Sydney Airport (which is likely given Sydney Airport is located in a very exposed area) and/or
- The wind on site was not sufficiently consistent to increase background noise levels compared to calm periods.

Therefore, only periods of adverse weather that were determined to have affected the noise data have been eliminated when determining the rating background noise level at the site, which is presented above.

5 EXTERNAL NOISE INTRUSION ASSESSMENT

Site investigation indicates that the major external noise sources around the project site are from traffic movements along Edinburgh Road, adjacent to the eastern boundary of the site.

5.1 NOISE INTRUSION CRITERIA

A noise intrusion assessment has been conducted based on the requirements of the following acoustic noise criteria and standards;

- Inner West Council (formerly Marrickville) DCP and LEP 2011;
- Australian Standard AS2021:2015 – *'Acoustics–Aircraft noise intrusion–Building siting and construction'*; and
- Australian Standard AS2107:2016 – '*Recommended Design Sound Levels and Reverberation Times for Building Interiors.*'

5.1.1 Inner West Council (formerly Marrickville) DCP and LEP 2011

Part 5 of the Inner West Council (formerly Marrickville) DCP states the following with regard to acoustic privacy, specifically in relation to acoustic privacy relating to commercial developments;

> ***5.3.1.2 Noise and vibration generation***
>
> ***C75*** *All development must comply with the relevant noise control guidelines.*

5.1.2 Australian Standard AS/NZS 2021:2015 *'Acoustics – Aircraft noise intrusion – Building siting and Construction'* (Aircraft Noise Intrusion)

The acceptability of Aircraft Noise exposure is assessed using Australian Standard AS2021:2015 *'Acoustics–Aircraft noise intrusion – Building siting and construction'*.

The acceptability of a site in terms of aircraft noise exposure is assessed using the Australian Noise Exposure Forecast System (ANEF). Three basic parameters influence perception of aircraft noise: the frequency of aircraft movements overhead, the noise level and duration of individual aircraft movements, and the time of the day in which they occur. ANEF was developed to provide a rating system that reflects actual human response to these factors so that the noise exposure of a particular location can be readily assessed.

The project site is located between the ANEF 30 and 35 contours, based on the Sydney Airport 2039 ANEF contour map. Therefore, AS2021:2015 states that a full evaluation of internal noise levels is to be carried out. This evaluation requires an examination of the likely levels of internal noise from aircraft flyovers. The approximate location of the development is shown below.

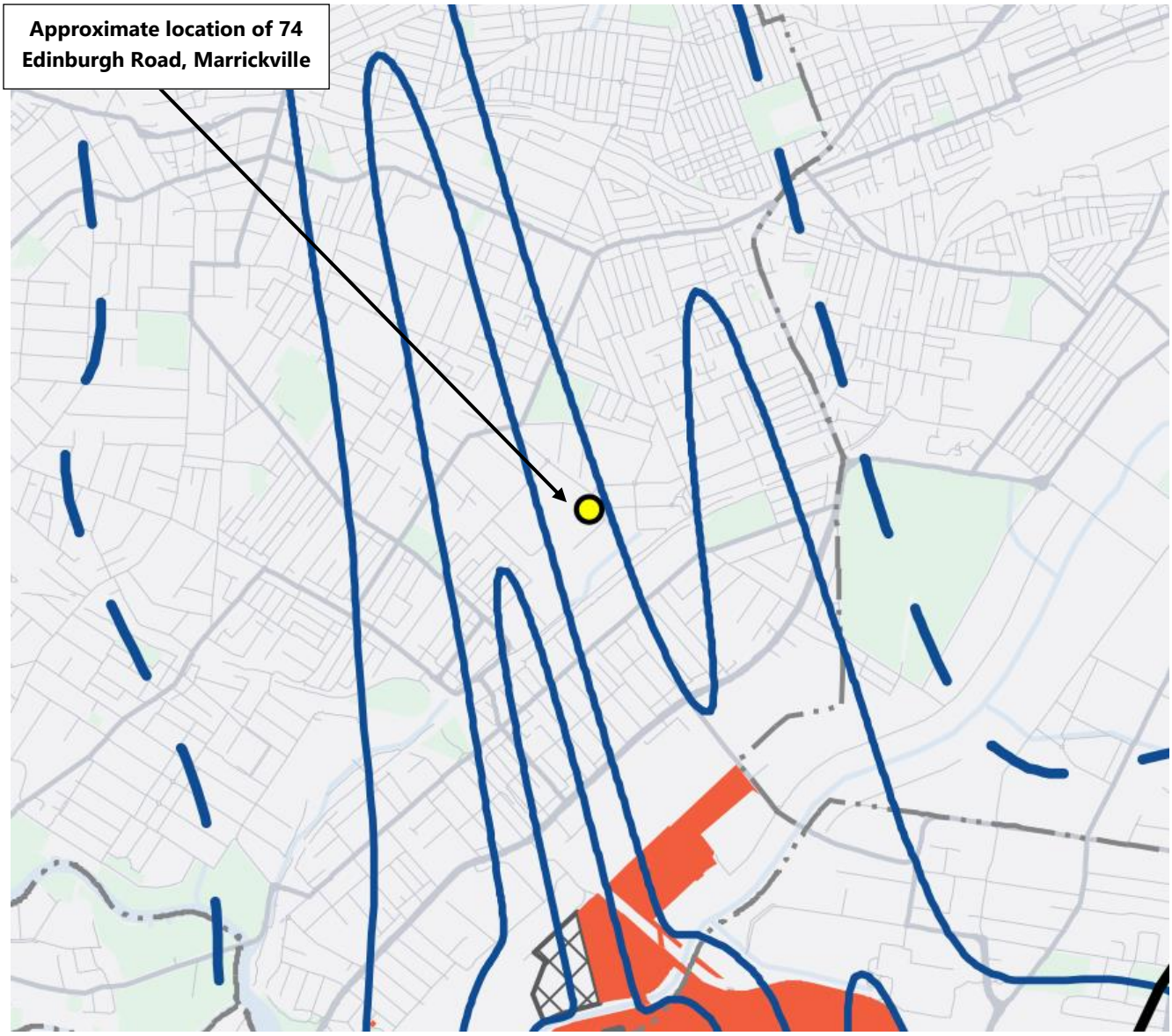


Figure 5-1 – ANEF 2039 Chart and Approximate Location of Proposed Development

It is noted that the land height correction in Table 3.2 of AS2021:2015 is inapplicable as the difference in elevation between the site and the aerodrome is less than 10m. Specifically, the elevation of Sydney Airport is 6m, and the elevation of the site is also 6m.

Aircraft noise levels at the site were determined using AS2021. The Standard gives aircraft noise levels for aircraft landing and taking off for locations near airports. The location of the runways was obtained from the Sydney Airport ANEF 2039.

Based on the distance from the site to the runways, the flight path and the site elevation, AS2021 predicts that the loudest typical aircraft movement will be from a A330 aircraft departing on the main runway. The noise level at the site as indicated by the standard is 84dB(A). This noise level has been used to predict the resultant internal noise levels through recommendations in Section 5.3.

AS2021:2015 stipulates the internal noise levels listed in the table below for commercial buildings. These levels will be used to assess aircraft noise intrusion into the commercial and industrial levels of the development.

Table 5-1 – Indoor Design Sound Levels for Aircraft Noise Reduction Assessment

Activity	Indoor Design Sound Level from Aircraft Flyover
Private Offices, Conference Rooms	55 dB(A)$_{(Slow, Lmax)}$
Drafting. Open Offices	65 dB(A)$_{(Slow, Lmax)}$
Typing, Data Processing/ Warehouse	70 dB(A)$_{(Slow, Lmax)}$
Shops, Industrial Precision Work	75 dB(A)$_{(Slow, Lmax)}$

5.1.3 Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'*

AS2107:2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within residential and commercial buildings. Table 1, in Section 5 of AS2107:2016, gives the following maximum internal noise levels for commercial buildings and residential buildings near major roads.

Table 5-2 – Recommended Design Sound Levels

Space /Activity Type	Recommended Design Sound Levels
Board and Conference Rooms	30-40 dB(A)$L_{eq(anytime)}$
General Office Areas	40-45 dB(A)$L_{eq(anytime)}$
Corridors and Lobbies	45-50 dB(A)$L_{eq(anytime)}$
Toilets	45-55 dB(A)$L_{eq(anytime)}$

5.1.4 Summarised External Noise Intrusion Criteria

The internal noise criteria adopted for each internal space is therefore summarised below based on the relevant State, Council and Australian Standard requirements.

Table 5-3 – Adopted Internal Noise Levels (Traffic)

Space / Activity Type	Required Internal Noise Level
Board and Conference Rooms	40 dB(A)$L_{eq(anytime)}$
General Office Areas	45 dB(A)$L_{eq(anytime)}$
Corridors and Lobbies	45 dB(A)$L_{eq(anytime)}$
Toilets	55 dB(A)$L_{eq(anytime)}$

Table 5-4 – Adopted Internal Noise Levels (Aircraft)

Activity	Indoor Design Sound Level from Aircraft Flyover
Private Offices, Conference Rooms	55 dB(A)$_{(Slow, Lmax)}$
Drafting. Open Offices	65 dB(A)$_{(Slow, Lmax)}$
Typing, Data Processing	70 dB(A)$_{(Slow, Lmax)}$
Shops, Industrial Precision Work	75 dB(A)$_{(Slow, Lmax)}$

5.2 EXTERNAL NOISE MEASUREMENTS

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

5.2.1 Measurement Equipment

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

Unattended noise monitoring was conducting using one Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to continuously store statistical noise levels as well as audio files throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

5.2.2 Measurement Location

One unattended noise monitor was located in the existing front yard of 65 Edinburgh Road. Refer to Figure 1 for detailed location.

Attended measurements were taken at 74 Edinburgh Road north of the project site. Sound level meter had an unobstructed view of traffic and was approximately 3m from the kerb. Refer to Figure 1 for detailed location.

5.2.3 Measurement Period

Unattended noise monitoring was conducted from Wednesday 10th of June 2020 to Monday 22nd of June 2020. Attended noise measurements were undertaken between the hours of 11:00am and 12:00pm on 22nd of June 2020.

5.2.4 Attended Noise Measurements

Attended noise measurements have been summarised below for each location.

Table 5-5 – Attended Noise Measurements

Location	Measure Noise Level dB(A) $L_{Aeq\ (15\ minute)}$
65 Edinburgh Road Measurement was conducted 3m from kerb	68 dB(A)$L_{eq(15min)}$

5.2.5 Summarised External Noise Levels

The following noise levels for the site have been established based on short term attended measurements and long-term noise monitoring.

Table 5-6 – Measured Traffic Noise Levels

Location	Time of Day	Noise Level – L_{eq}
74 Edinburgh Road	Daytime 7am – 10pm	67 dB(A) $L_{eq\ (15hr)}$
	Night Time 10pm – 7am	60 dB(A) $L_{eq\ (9hr)}$

5.3 RECOMMENDED CONSTRUCTIONS

Assessment of façade requirements to achieve required indoor noise levels has been undertaken. Dimensions of rooms, setbacks from roadways, window openings and floor areas have been used.

5.3.1 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 5-7.

Table 5-7 – Recommended Glazing Construction

Room	Glazing Thickness	Acoustic Seals
Open Office Spaces	6.38mm Laminated	Yes
Private Office/Conference Rooms ≤ 15m^2 external glazed area	12.38mm Laminated	Yes
Private Office/Conference Rooms > 15m^2 external glazed area	10.38mm Laminated/ 100mm airgap/ 4mm Float	Yes

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

In addition to complying with the minimum scheduled glazing thickness, the R_w rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in Table 5-8 for all areas. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

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

Glazing Assembly	Minimum R_w of Installed Window
6.38mm Laminated	31
10.38mm Laminated	35
12.38mm Laminated	37

Note: Façade constructions to be reviewed at CC stage based on construction drawings. The glazing types listed above are indicative and for authority approvals purposes only

5.3.2 External Roof/Ceiling Construction

External roof construction will be constructed from concrete elements, therefore; acoustic upgrading is not required. In the event that any penetrations are required thru the external skin, an acoustic sealant should be used to minimise all gaps.

For warehouse areas, a minimum construction of 0.5mm metal deck is required.

5.3.3 External Wall Construction

External wall construction will be constructed from of a combination of concrete/masonry and lightweight elements. For walls of concrete/masonry construction, acoustic upgrading is not required. There should not be vents on the internal skin of external walls. In the event that any penetrations are required thru the external skin, an acoustic sealant should be used to minimise all gaps.

For external walls constructed from lightweight materials, the minimum construction is as below.

Table 5-9 – External Light Weight Wall Construction

Area	Material
General Office Areas	9mm fibre cement, 90mm stud with 75mm thick 11kg/m^3 glasswool insulation, 1x10mm plasterboard
Private Offices	9mm fibre cement, 90mm stud with 75mm thick 11kg/m^3 glasswool insulation, 2x16mm plasterboard
Industrial/ Warehouse	0.5mm Metal Deck

6 NOISE EMISSION CRITERIA

The noise emission from the project site shall comply with the requirements of the following documents. We note that the SEARs requires consideration of the Environmental Criteria for Road Traffic Noise (1999), which has been superseded by the EPA Road Noise Policy 2011, therefore the Road Noise Policy shall be adopted.

- NSW EPA Noise Guide for Local Government 2013
- Inner West Council (formerly Marrickville) DCP and LEP 2011
- NSW Department of Environment, Climate Change and Water, Environmental Protection Agency document – Road Noise Policy 2011
- NSW Department of Environment and Heritage, Environmental Protection Agency document – Noise Policy for Industry (NPI) 2017.

The SEARs also require consideration of the following documents:

- Assessing Vibration: A Technical Guideline (DECC, 2006)
- Interim Construction Noise Guideline (DECC, 2009).

As both documents are in reference to construction noise, they have been assessed in the Preliminary Construction Noise and Vibration Management Plan prepared as a separate document.

6.1 NSW EPA NOISE GUIDE FOR LOCAL GOVERNMENT 2013

As there is no specific criteria relevant to this site, the documents below shall be adopted.

6.2 INNER WEST COUNCIL (FORMERLY MARRICKVILLE) DCP AND LEP 2011

Part 5 of the Inner West Council (formerly Marrickville) DCP states the following with regard to acoustic privacy, specifically in relation to acoustic privacy relating to commercial developments;

5.3.1.2 Noise and vibration generation

C75 *All development must comply with the relevant noise control guidelines.*

C76 *Where sites adjoin a residential area or are located within a mixed use building, Council will consider the potential noise generation of any proposed activities including the use of equipment or machinery, the use of amplified music/noise on the site and proposed hours of operation.*

C77 *Other sources of noise such as garbage collection, deliveries, ventilation systems, parking areas and air-conditioning plants are to be sited away from adjoining properties, where practicable, and be screened by walls or other acoustic treatment if necessary*

C78 *All applications for noise generating uses adjacent to or located in a building containing a residential use must be accompanied by documentation from a qualified acoustic engineer certifying that the acoustic standards can be met.*

6.3 NSW EPA ROAD NOISE POLICY 2011

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 6-1 – Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Permissible Noise Generation
Local Roads (Edinburgh Road)	Day (7am to 10pm)	55 dB(A) $L_{eq(1hr)}$
	Night (10pm to 7am)	50 dB(A) $L_{eq(1hr)}$

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.

6.4 NSW EPA NOISE POLICY FOR INDUSTRY (NPI) 2017

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.

6.4.1 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 Table 4-1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

6.4.2 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 Table 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 site are presented in Table 6-2.

Table 6-2 – EPA Amenity Noise Levels

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Project Amenity Noise Level dB(A)$L_{eq(15\ minute)}$
Residential – Urban	Day	60	58
	Evening	50	48
	Night	45	43

Table 6-3 – EPA NPI Noise Emission Criteria (Non-Residences Surrounding Project Site)

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$
Commercial premises	When in use	65
Industrial premises	When in use	70

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

6.4.3 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:

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

a detailed maximum noise level even assessment should be undertaken.

Table 6-4 – Sleep Arousal Criteria for Residential Receivers

Receiver	Rating Background Noise Level (Night) dB(A)L_{90}	Emergence Level
Residences Surrounding Site Night (10pm – 7am)	42 dB(A) L_{90}	47 dB(A)$L_{eq,\ 15min}$; 57 dB(A)L_{Fmax}

6.5 SUMMARISED NOISE EMISSION CRITERIA

Table 6-5 – EPA NPI Noise Emission Criteria (Residents Surrounding Project Site)

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	54	**58**	59	N/A
Evening	44	**48**	49	N/A
Night	42	**43**	47	**47 dB(A)$L_{eq,\ 15min}$; 57 dB(A)L_{Fmax}**

The project noise trigger levels are indicated by the bolded values in the table above.

Table 6-6 – EPA NPI Noise Emission Criteria (Non-Residences Surrounding Project Site)

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$
Commercial premises	When in use	65
Industrial premises	When in use	70

Table 6-7 – Criteria for Traffic Noise Generated by New Developments

Road Type	Time of day	Permissible Noise Generation
Local Roads (Edinburgh Road)	Day (7am to 10pm)	69 dB(A) $L_{eq(1hr)}$
	Night (10pm to 7am)	63 dB(A) $L_{eq(1hr)}$

7 NOISE EMISSIONS ASSESSMENT

7.1 NOISE FROM MECHANICAL PLANT WITHIN PROPOSED SITE GENERALLY

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 6.5.

Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels.

7.1.1 Preliminary Mechanical Treatment Advice

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

- Generators may be used for standby power, to ensure compliance these may require attenuation to radiators and air intakes, as well as silencers/mufflers to the exhaust.
- 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).
    - Night time operational speeds shall be restricted.
- Major fans (typically with a sound power over 80dB(A) – such as kitchen exhaust, major toilet exhaust and major relief air fans) may require acoustic treatment if located externally near sensitive receivers. 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 and with attenuators if necessary. Indicatively a 1d unpodded attenuator with 2m of 50mm internally lined ductwork.
- The indicative location of external PAC units is spaced around the warehouse roof. Conservative calculation with a sound power up to 90 dB(A) shows compliance with noise emission levels through the erection of an acoustic barrier facing residential receivers to break line of sight.
- The indicative location of air-cooled chillers will be above the office building. Conservative calculation with a sound power up to 90 dB(A) shows compliance with noise emission levels through the erection of an acoustic barrier facing residential receivers to break line of sight. This includes replacing sections of louvred surfaces in the rooftop plant room with imperforate walls.

Cumulative assessment of both plant noise with other noise sources is recommended when conducting acoustic design of plant items.

Compliance with EPA acoustic criteria (as set out in Section 6.5) 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.

The above recommendations are indicative. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels.

7.2 CARPARK NOISE

Assessment of the carpark noise emissions has been undertaken based on the traffic trip generation information provided in the traffic report for the development prepared by Colston Budd Rogers & Kafes (*Ref 11441*, dated September 2020). The traffic report gives an estimated 230 maximum vehicle movements during AM and PM peak hour. Calculations have been made to predict noise levels occurring at sensitive receivers during a one hour peak of traffic movements, with the worst affected residential receiver being the residential receiver **R2**.

It is noted that the carpark is unlikely to be used during the night time period. A conservative prediction of 100 vehicle movements during peak hour of the night time period has been undertaken.

The following noise emission data for vehicle-related noise sources measured by this office have been used for the assessment.

Table 7-1 – Sound Power Levels of Typical Car Movements

Car Movement	Sound Power Level, dB(A)
Car Manoeuvring @ 10km/h	84 $L_{eq(15\ min)}$
Car Door Slamming	96 L_{max}
Car Starting	91 L_{max}

7.3 LOADING DOCK AND WASTE COLLECTION

The primary noise associated with the use of the loading dock will consist of trucks moving into or out of the loading dock.

Noise emission predictions at the nearby development will be made based on the following data/assumptions:

- A typical truck sound power level of 100dB(A)Leq; and
- There are no more than eight truck movements in any 15 minute period during all time periods.

7.4 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS

Noise created as a result an increase in traffic on public roads is assessed with reference to the EPA Road Noise Policy.

Access/egress to the site is via Edinburgh Road and Sydney Steel Road. Predictions of noise generation are based on the following:

- An assumed sound power level for cars driving on a public road at approximately 50km/h of 94dB(A);
- An assumed sound power level for trucks driving on a public road at approximately 50km/h of 100dB(A)
- We assume there are in a peak one-hour period up to 32 truck and 250 cars movements (worst one hour) attributed to the site.
- We assume there are up to 32 truck and 100 car movements attributed to the site during night time periods.
- Noise emissions are predicted at the building facade of the 65 Edinburgh Road residence and compared against the acoustic criteria set out in Section 6.5.

7.5 CUMULATIVE PREDICTED NOISE EMISSIONS

Cumulative noise emission predictions to the most sensitive receivers around the development are summaries below. Detailed acoustic review should be undertaken at CC stage to determine mechanical acoustic treatments to control noise emissions to satisfactory levels. The worst affected receivers are **R2** and **R7** and have been summarised below.

Table 7-2 – Predicted Cumulative Noise Levels to Residential Receiver R2

Time Period	Predicted Noise	Criteria	Complies?
Day (7am to 6pm)	46 dB(A) L_{eq}	58 dB(A) L_{eq}	Yes
Evening (6pm to 10pm)	46 dB(A) L_{eq}	48 dB(A) $L_{eq,}$	Yes
Night (10pm to 7am)	42 L_{eq}	43 dB(A) $L_{eq,}$	Yes
Sleep disturbance L_{max}	55 L_{max}	57 dB(A) L_{max}	Yes

Table 7-3 – Predicted Cumulative Noise Levels to Industrial Receiver R7

Time Period	Predicted Noise	Criteria	Complies?
When in Use	65 dB(A) L_{eq}	70 dB(A) L_{eq}	Yes

Table 7-4 – Noise Generated by Additional Road Traffic – Noise Impact Assessment

Receiver Location	Predicted Noise Level – dB(A)L_{eq}	Compliance
65 Edinburgh Road residence (building façade)	Day: 57 dB(A)$L_{eq(1hr)}$*	Complies (< 69dB(A) day time criteria) **
	Night: 55 dB(A)$L_{eq(1hr)}$*	Complies (< 62dB(A) night time criteria) **

*Note: This predicted noise level is conservative in that it is based on a worst one-hour peak as discussed in Sections 7.2 and 7.3.

**As discussed in Section 6.3 and with reference to the measured traffic noise levels in Table 5-6.

Predicted cumulative noise emissions to the most sensitive receivers are compliant with the EPA Noise Policy for Industry. Noise as a result of additional traffic generation is compliant with the EPA Road Noise Policy.

8 VIBRATION OBJECTIVES

Vibration caused by construction at any residence or structure outside the subject site will be assessed with reference to the following:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures*; and
- For human exposure to vibration, Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in 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.

8.1 STRUCTURE BORNE VIBRATIONS

German Standard DIN 4150-3 (1999-02) provides a guideline for acceptable levels of vibration velocity in building foundations, to assess the effects of vibration on structures. The table give guidance on the maximum accepted values of velocity at the foundation and in the plane of the highest floor of various types of buildings, to prevent any structural damage.

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

Table 8-1 – 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 ASSESSING AMENITY

The NSW EPA's *Assessing Vibration – A technical guideline* is based on the guidelines contained in British Standard BS 6472-1992 '*Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz*'. 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 manage vibration from the site. Where vibration exceeds, or is likely to exceed, the recommended levels then an assessment of reasonable and feasible methods for the management of vibration should be undertaken.

Table 8-2 – BS 6472 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
Offices	Day or night-time	0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices	Day or night-time	0.64	1.28	13	26	18	36
Workshops		0.64	1.23	13	26	18	36

Note 1: Continuous vibration relates to vibration that continues uninterrupted for a defined period (usually throughout the daytime or night-time), e.g. continuous construction or maintenance activity. (DECC, 2006).

Note 2: Impulsive vibration relate to vibration that builds up rapidly to a peak followed by a damped decay and that may or may not involve several cycles of vibration (depending on frequency and damping), with up to three occurrences in an assessment period, e.g. occasional loading and unloading, or dropping of heavy equipment. (DECC, 2006).

9 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the development to be located at Woolworths Customer Fulfillment Centre (CFC), 74 Edinburgh Road, Marrickville.

Provided that the recommendations presented in Section 5.3 are adopted, internal noise levels for the development will comply with the acoustic requirements of the following documents:

- Inner West Council (formerly Marrickville) DCP and LEP 2011;
- Australian Standard AS2021:2015 – *'Acoustics–Aircraft noise intrusion–Building siting and construction'*; and
- Australian Standard AS2107:2016 – '*Recommended Design Sound Levels and Reverberation Times for Building Interiors.*'

External noise emissions criteria have been established in this report to satisfy the requirements of the following documents:

- NSW EPA Noise Guide for Local Government 2013
- Inner West Council (formerly Marrickville) DCP and LEP 2011
- NSW Department of Environment, Climate Change and Water, Environmental Protection Agency document – Road Noise Policy 2011
- NSW Department of Environment and Heritage, Environmental Protection Agency document – '*Noise Policy for Industry*' (NPI) 2017.

Vibration objectives have been established in this report to satisfy the requirements of the following documents:

- German Standard DIN 4150-3 (1999-02); and
- NSW EPA document – '*Assessing Vibration – A Technical Guideline.*'

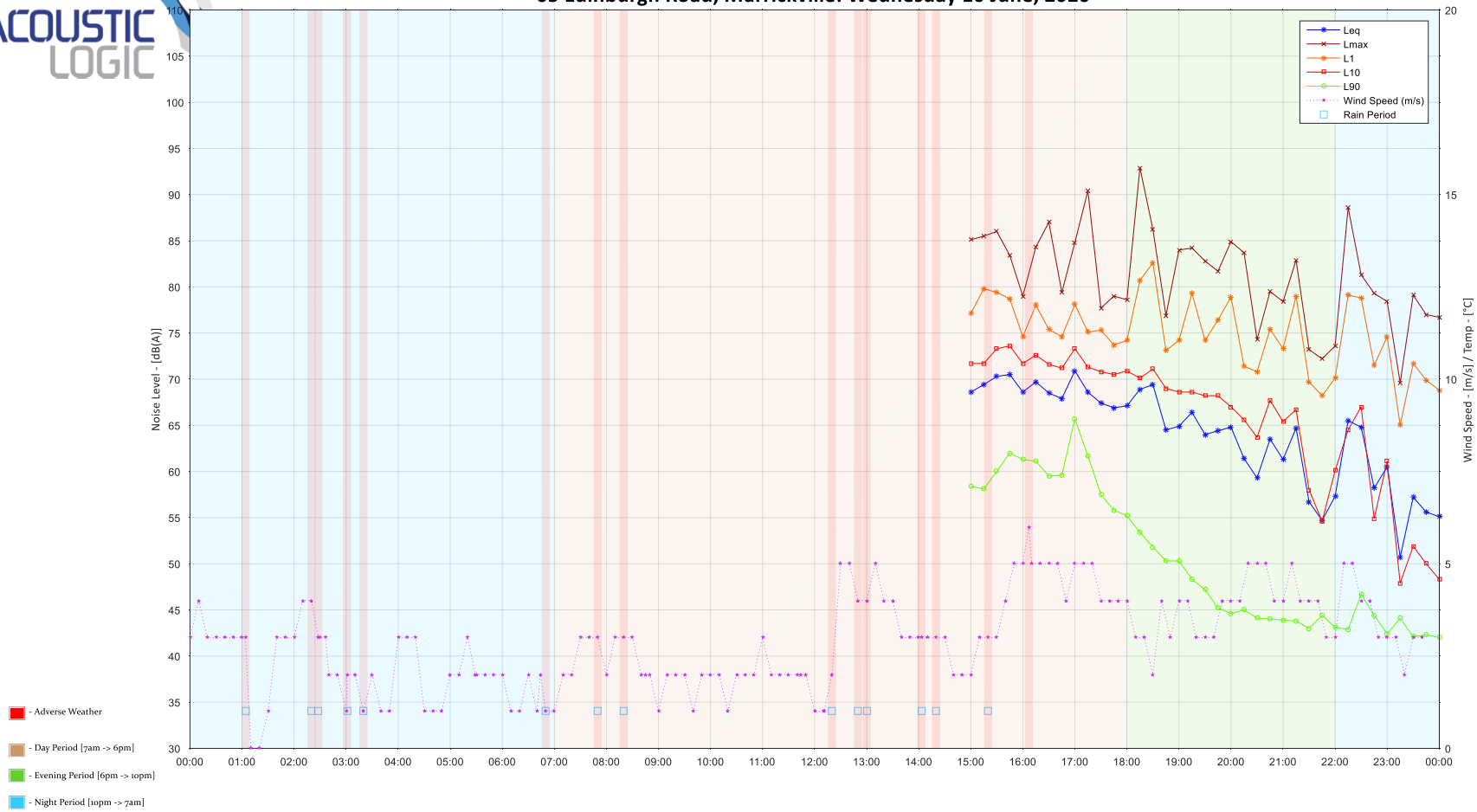
We trust this information is satisfactory. Please contact us should you have any further queries.

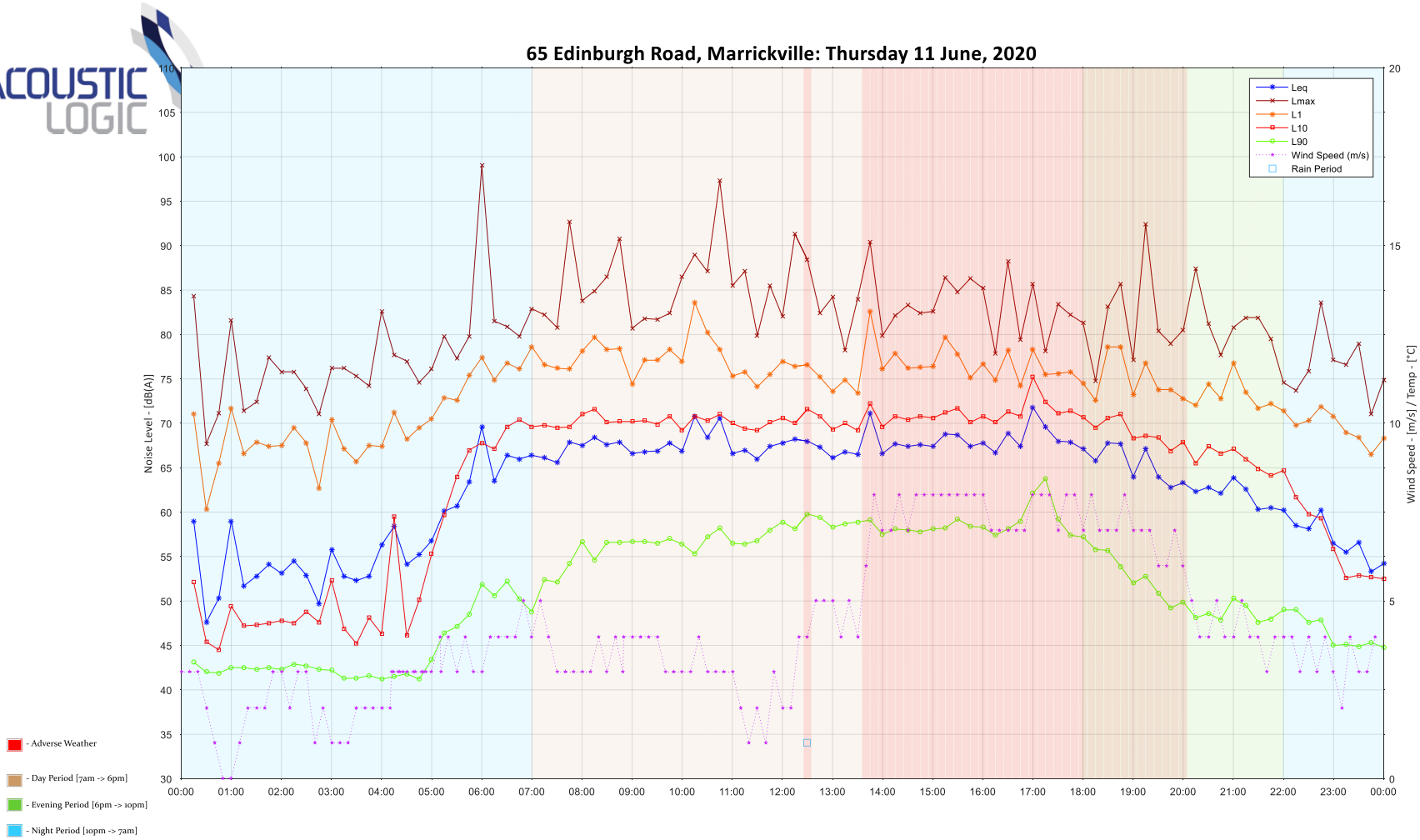
Yours faithfully,

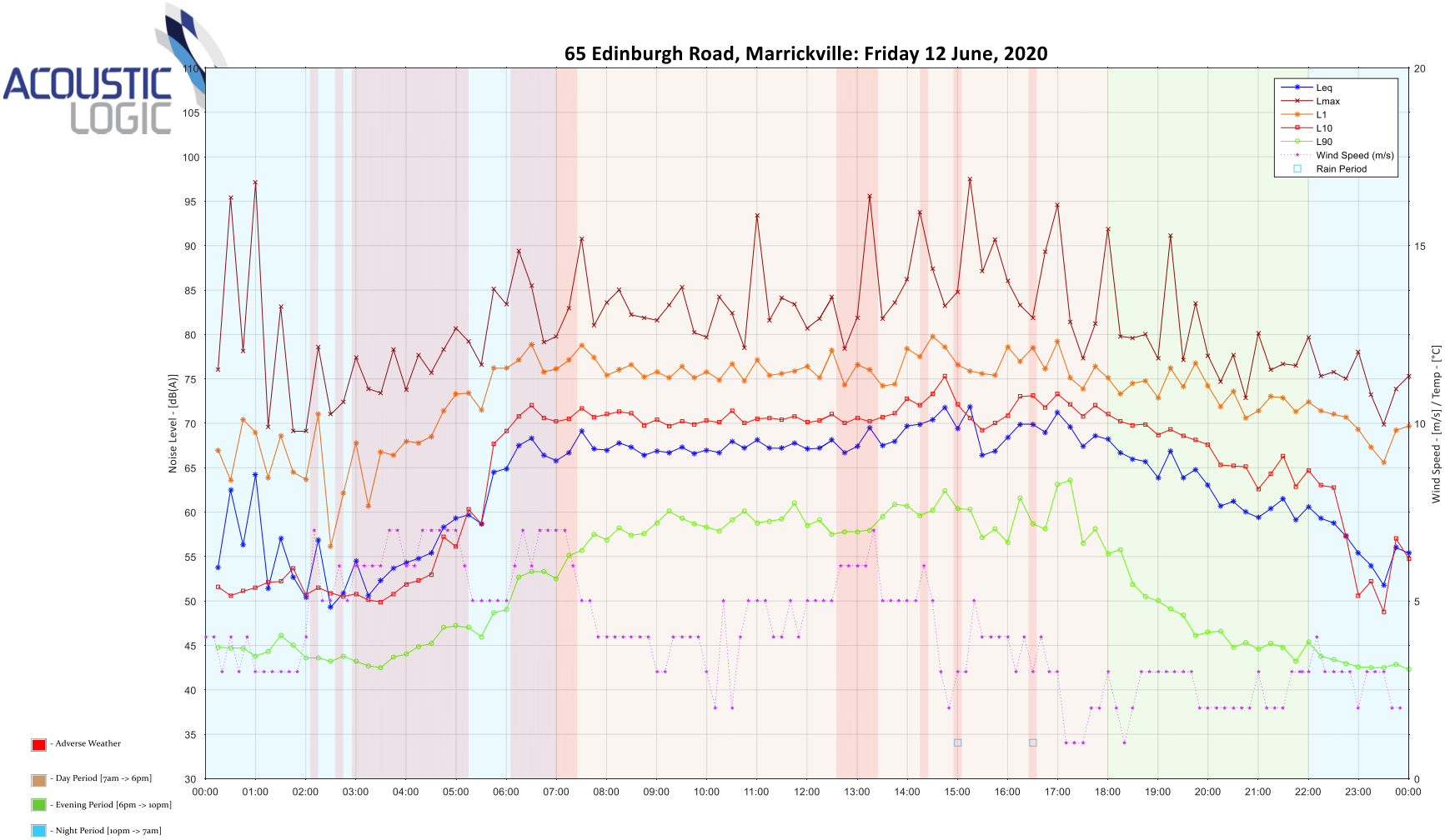
Acoustic Logic Consultancy Pty Ltd
Weber Yeh

APPENDIX ONE – UNATTENDED NOISE MONITORING

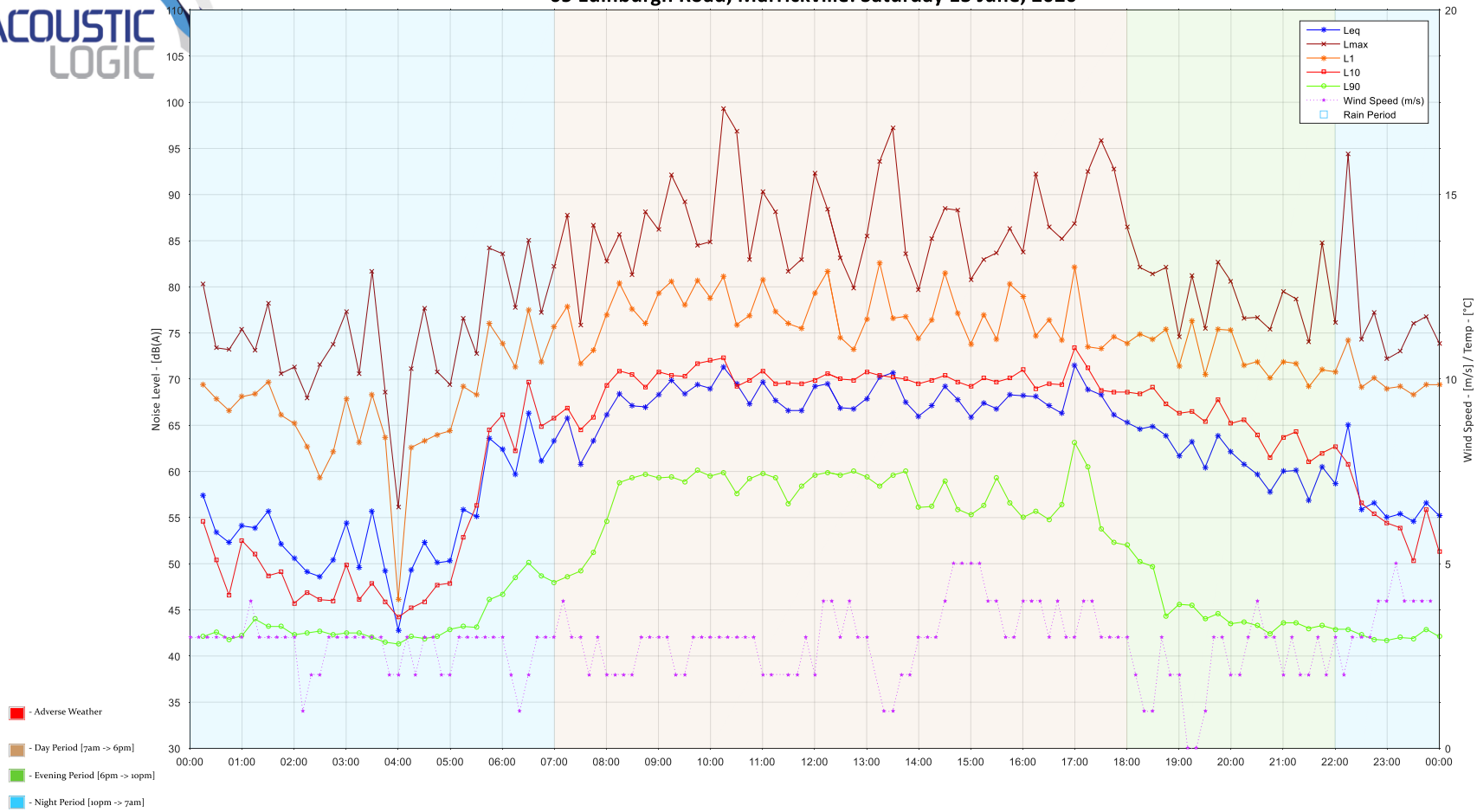
65 Edinburgh Road, Marrickville: Wednesday 10 June, 2020

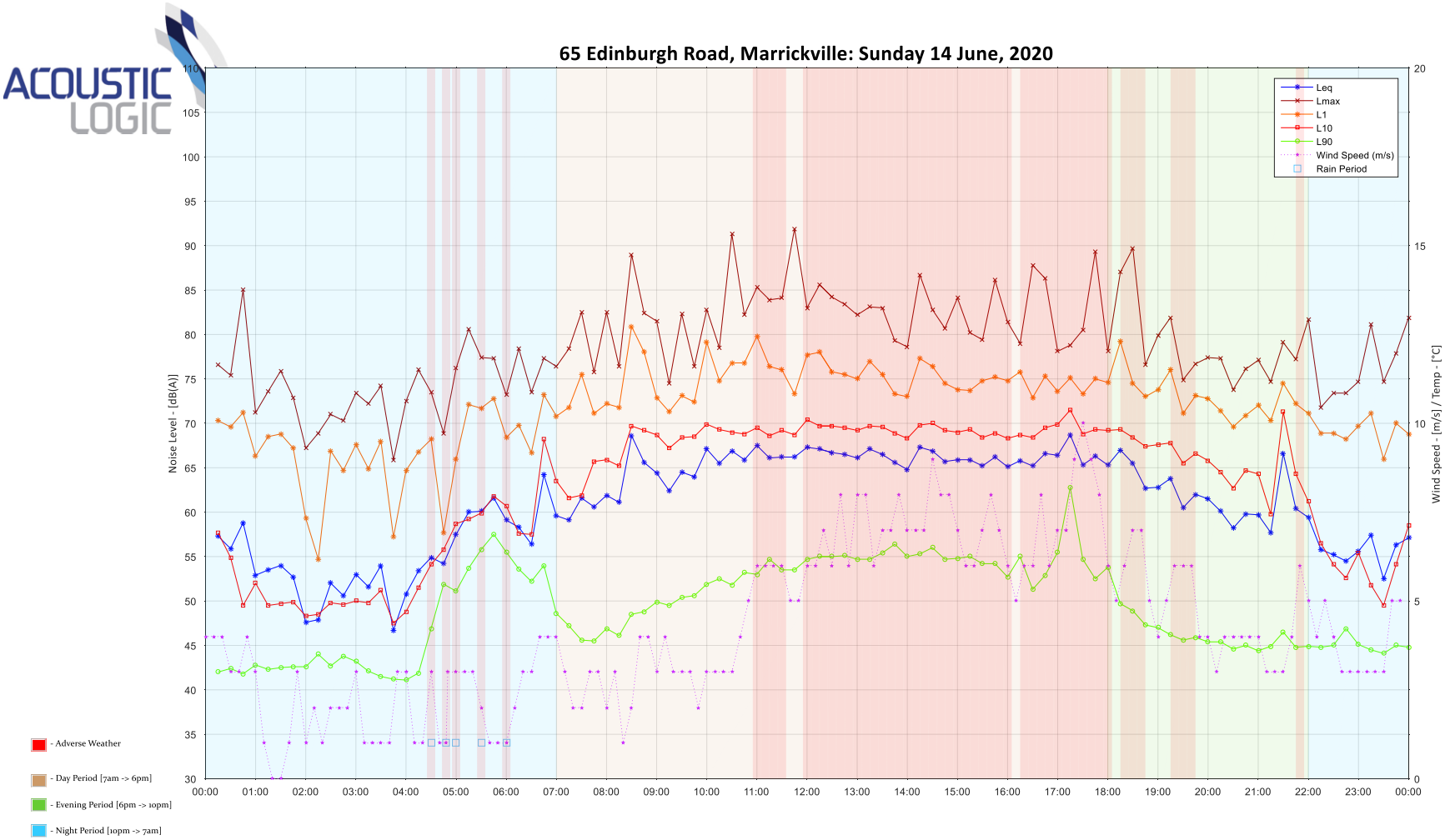


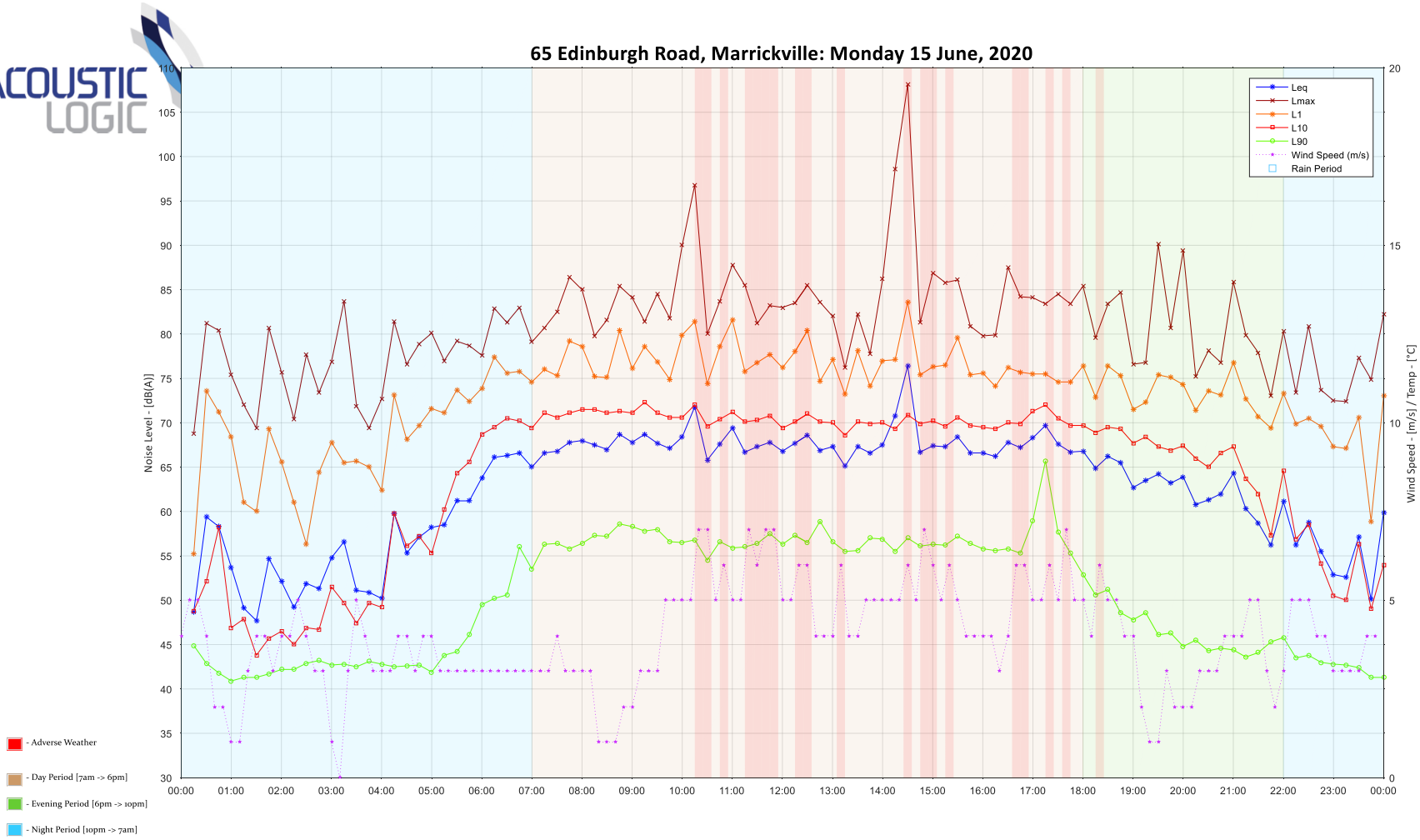

65 Edinburgh Road, Marrickville: Thursday 11 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

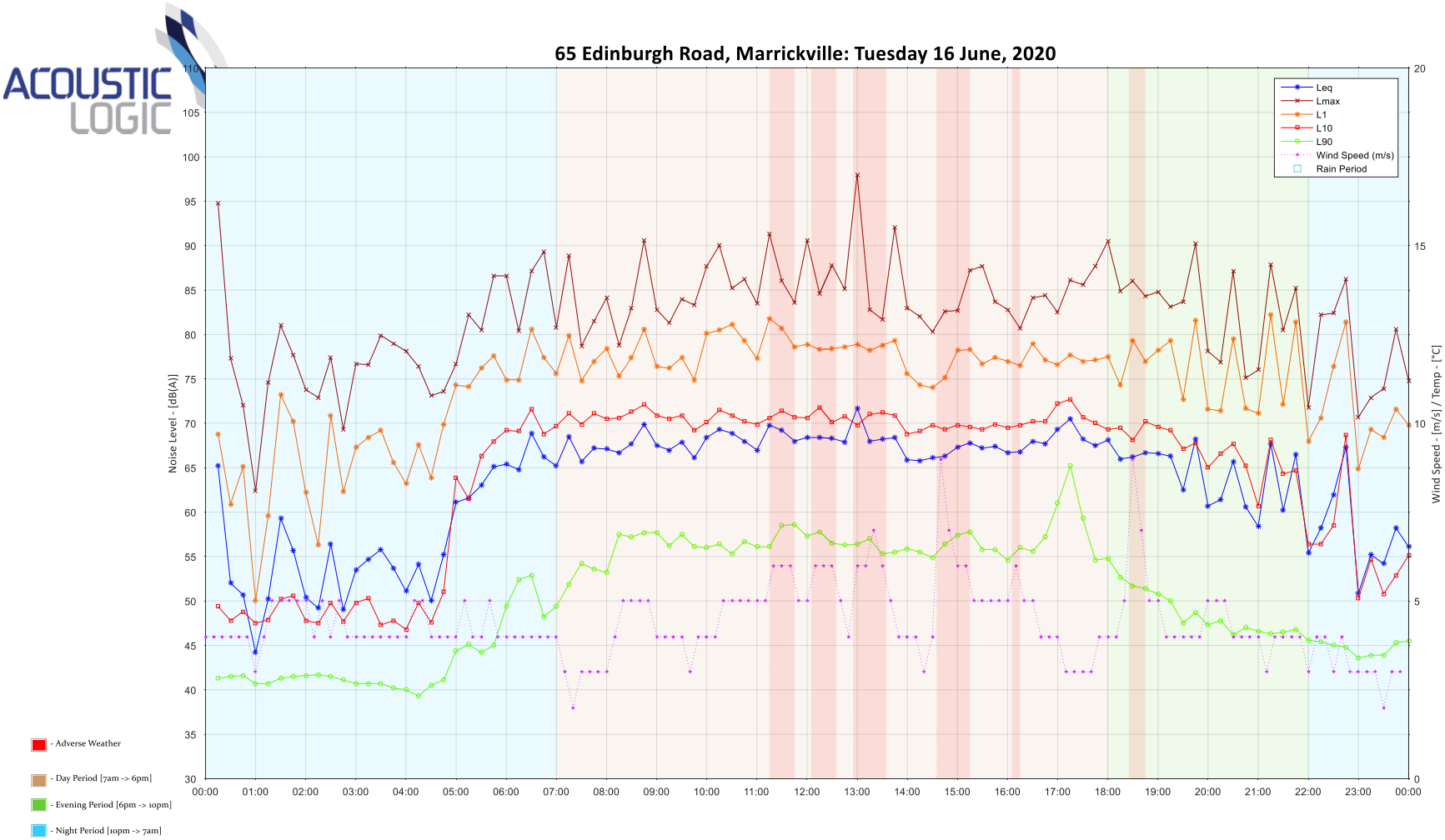

65 Edinburgh Road, Marrickville: Friday 12 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

65 Edinburgh Road, Marrickville: Saturday 13 June, 2020




65 Edinburgh Road, Marrickville: Sunday 14 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


65 Edinburgh Road, Marrickville: Monday 15 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]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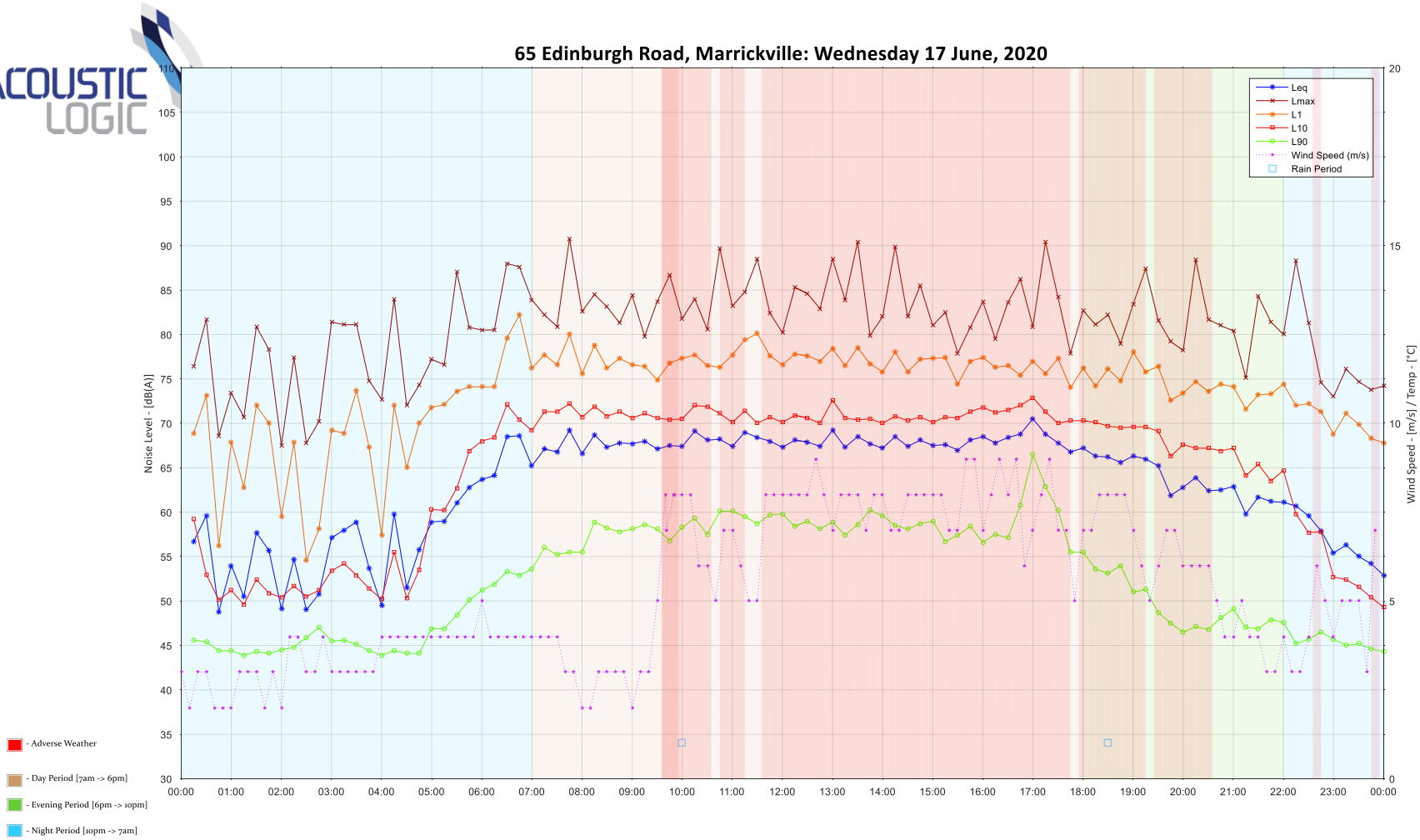
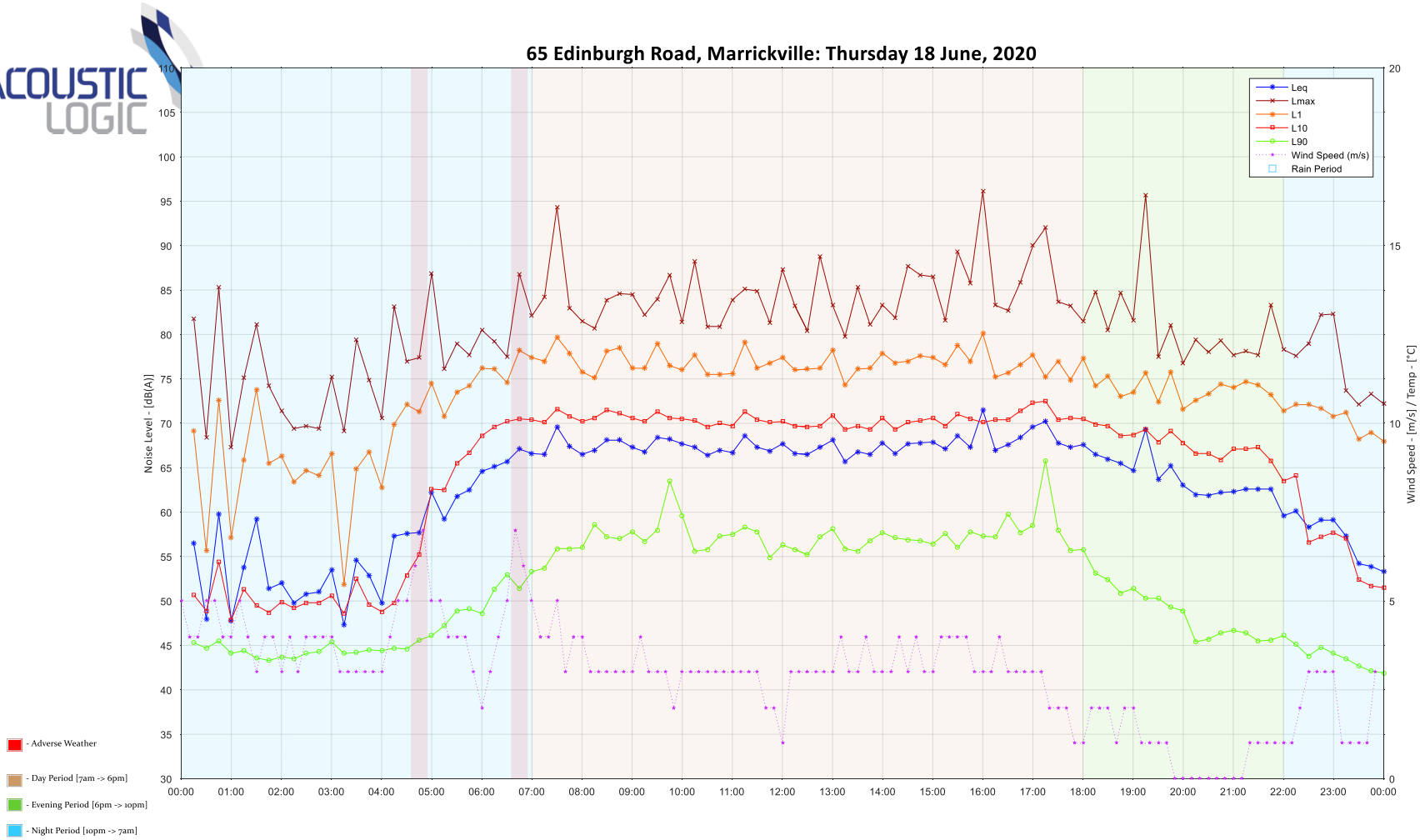
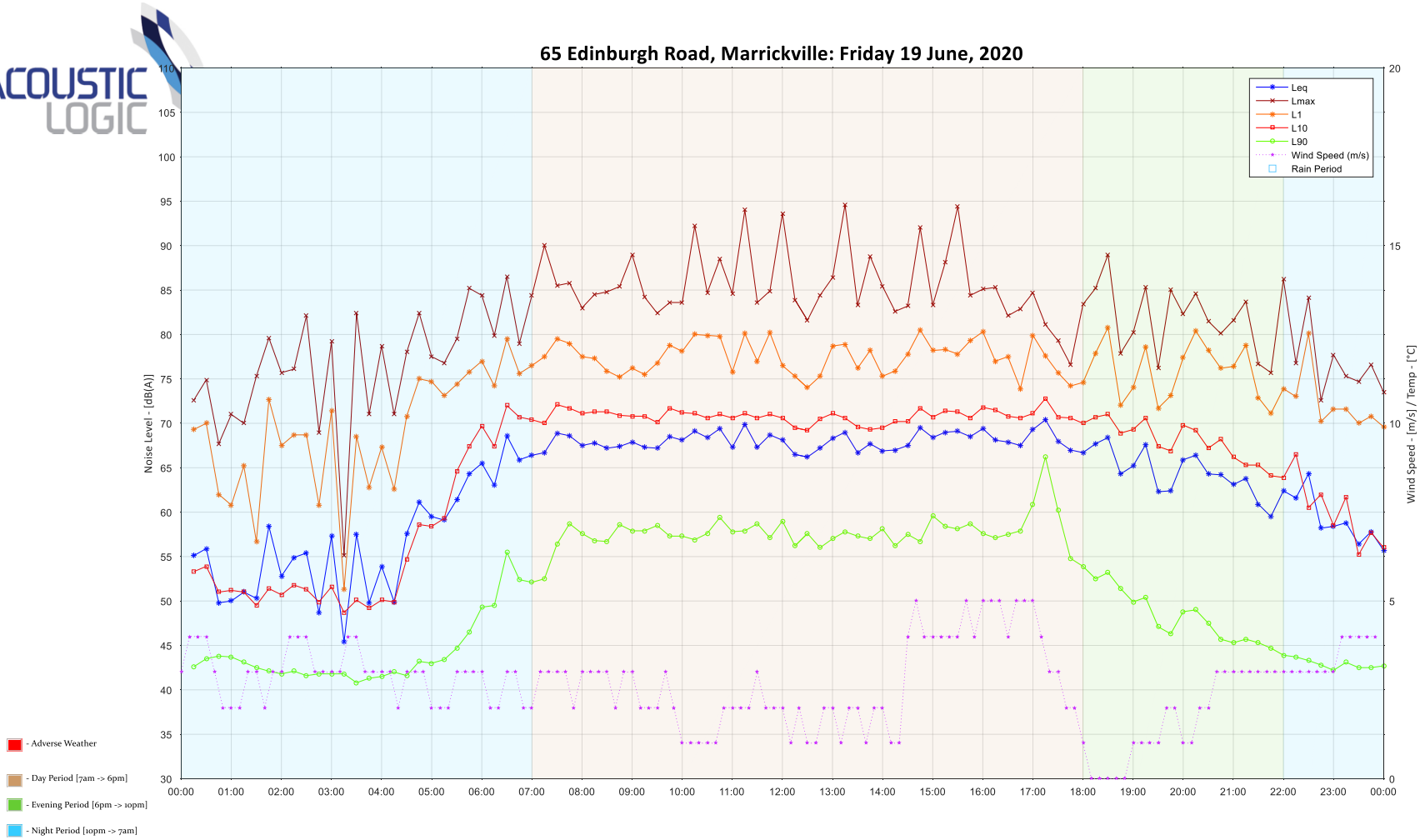
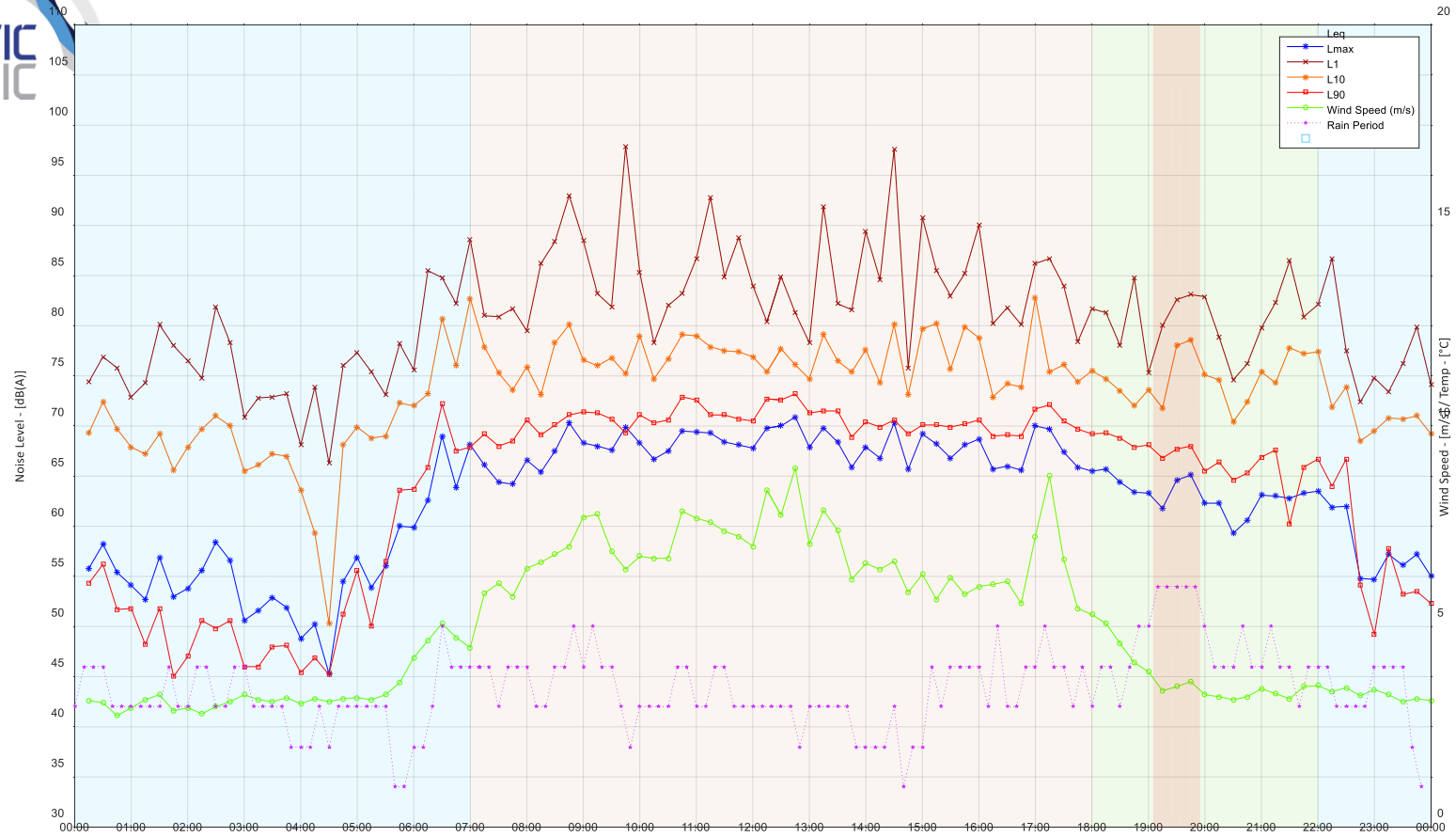
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

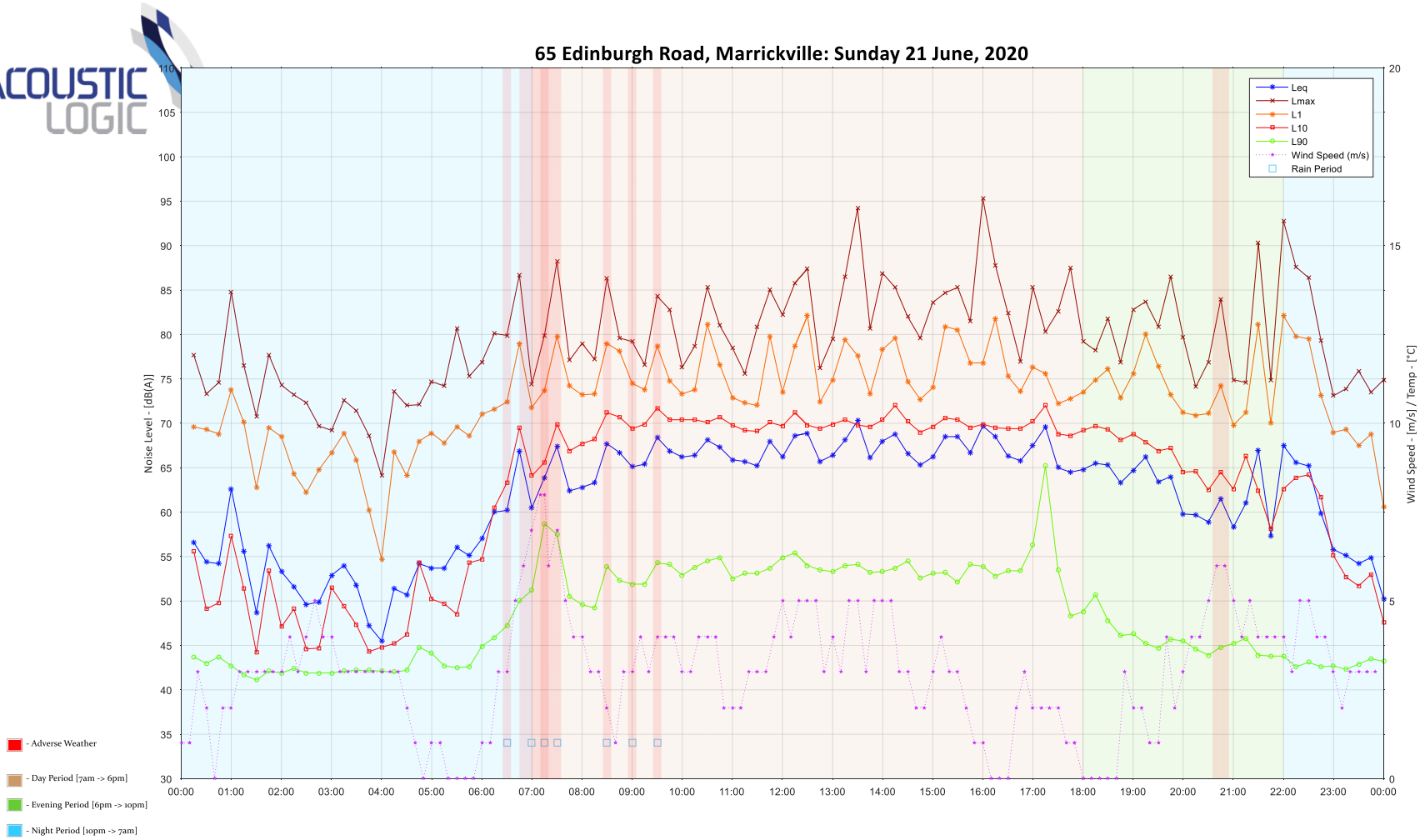

65 Edinburgh Road, Marrickville: Wednesday 17 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


65 Edinburgh Road, Marrickville: Thursday 18 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


65 Edinburgh Road, Marrickville: Friday 19 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

65 Edinburgh Road, Marrickville: Saturday 20 June, 2020




65 Edinburgh Road, Marrickville: Sunday 21 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

65 Edinburgh Road, Marrickville: Monday 22 June, 2020