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SSDA Acoustic Assessment

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Project ID	20200376.1
Document Title	SSDA Acoustic Assessment
Attention To	Fabcot Pty Ltd

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	17/07/2020	20200376.1/1707A/R0/WY	WY		GC
1	26/08/2020	20200376.1/2608A/R1/WY	WY		GC
2	15/10/2020	20200376.1/1510A/R2/WY	WY		GW
3	5/02/2021	20200376.1/0502A/R3/WY	WY		GC
4	9/03/2021	20200376.1/0903A/R4/WY	WY		
5	9/06/2021	20200376.1/0906A/R5/WY	WY		AW
6	6/08/2021	20200376.1/0608A/R6/WY	AW		AW
7	1/09/2021	20200376.1/0109A/R7/WY	WY		AW

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1 INTRODUCTION

Acoustic Logic (AL) has been engaged to conduct an acoustic assessment of potential noise and vibration 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 aircraft), and
- 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, and
- 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 Environmental Protection Authority (EPA) *Noise Policy for Industry* (NPI) 2017
- German Standard DIN 4150-3 (1999-02), and
- NSW EPA *Assessing Vibration – A Technical Guideline*.

This assessment has been conducted using the Nettleton Tribe architectural drawings for SSDA submission (*Project No: 10437*, Issue 43, dated 11th February 2021).

2 SITE DESCRIPTION

The proposed development comprises of two floors of industrial warehouse, small associated offices, two storeys of car/ van parking, a partially enclosed loading dock area for outbound vans on the south western façade and a partially enclosed loading dock for inbound articulated trucks on the south western and south eastern façades.

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.

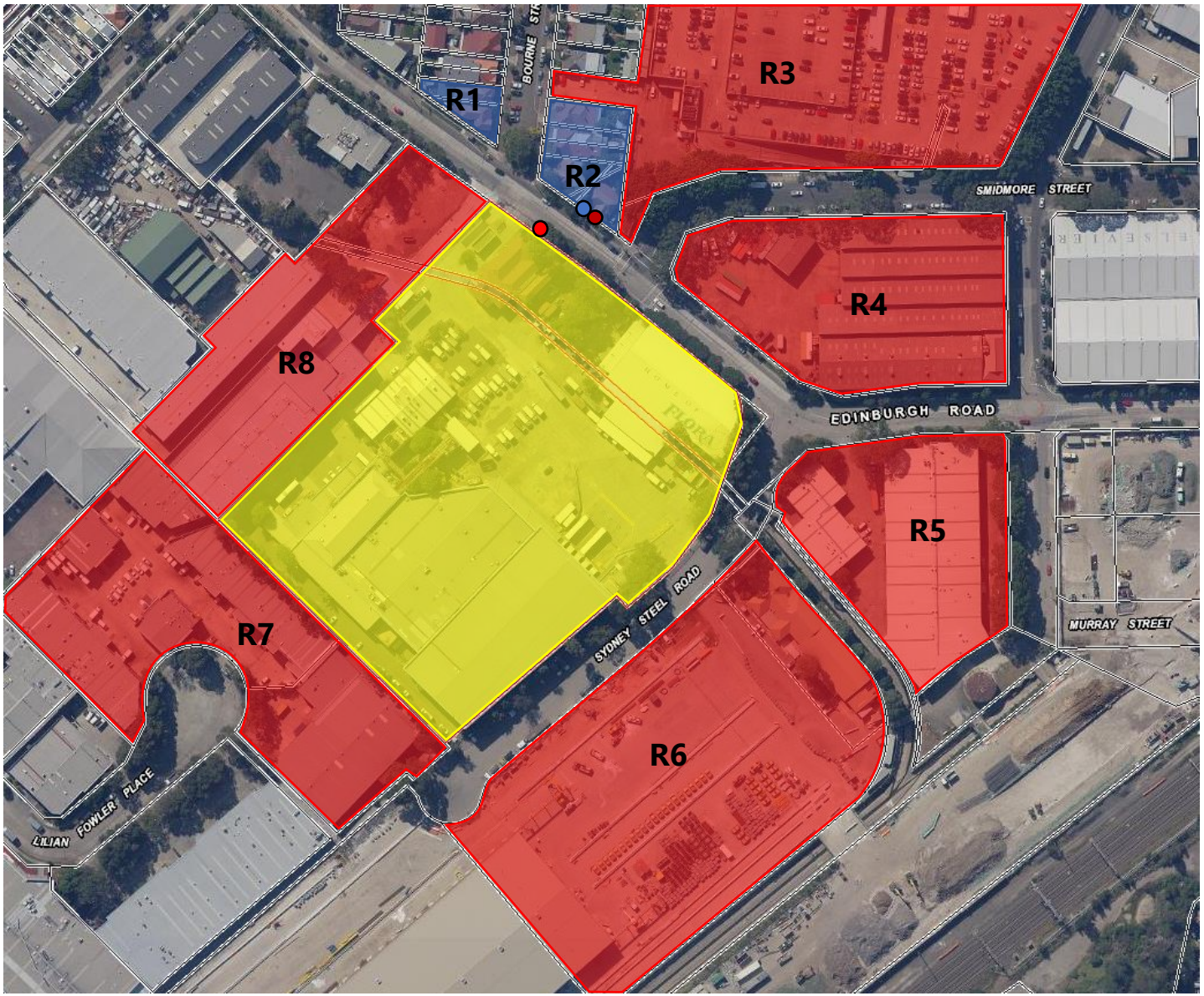
The nearest noise receivers around the site include:

- **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 – Marrickville Metro extension current in development to the north east at 13-55 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.

Note that where land is zoned for industrial use according to the LEP for the area, the NPI suggests adoption of the industrial amenity level. This includes isolated residents located within industrial land zones, however it is noted that this specific situation is not applicable in this case. As such, **R4-R8** have been assessed as industrial receivers.

It is also noted that the façades of **R7** and **R8** that share a boundary with the site are of concrete/ masonry construction with no glazed elements. The worst affected façades of these developments to consider noise emissions impacts as defined by the NPI are the western facades of **R7** and the internal façades of **R8**.

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

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

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

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

The L_{max} parameter represents the maximum sound pressure level during a measurement period.

4 ENVIRONMENTAL 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.

Measurement Position

One unattended noise monitor was located in the front yard of 65 Edinburgh Road (**R2**). Attended short term measurements of traffic noise were undertaken to supplement the unattended noise monitoring. 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. All attended measurements were taken 1.5m above the local ground height.

In addition to long term unattended measurements, short term attended measurements were undertaken on the evening of 7 September 2021. The purpose of measurements was to determine the difference in background noise levels between the long term monitoring position and residents set back from Edinburgh Road, along both Bourne Street and Leicester Street.

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 and the 7th of September 2021.

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 SUMMARISED RATING BACKGROUND NOISE LEVELS

Summarised rating background noise levels for residents surrounding the proposed development are presented below. 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 in accordance with Fact Sheets A & B of the NPI.

Table 4-1 – Measured Background Noise Levels

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

Table 4-2 – Attended Noise Measurement (Monitor – Residence Background Noise Correlation)

Monitor Location	Attended Measurement Location	Time of Day	Measured Noise Level
65 Edinburgh Road, Marrickville	Location 1 -At Monitor Location	9pm – 10pm 7th of September 2021	46 dB(A)L_{90}
	Location 2 -14 Bourne Street., Marrickville (approximately 65m from Edinburgh Road)		44 dB(A)L_{90}
	Location 3 – 10 Leicester Street, Marrickville (approximately 65m from Edinburgh Road)		44 dB(A)L_{90}

Background noise levels measured at residents set back from Edinburgh Road is marginally less than by the noise monitor adjacent to Edinburgh Road for the same time period. As such, the assessment rating background noise levels at these receivers will be reduced by 2dB(A) when considering the establishment of noise goals from the site.

Table 4-3 – Measured Traffic Noise Levels

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

The measured traffic noise levels above are based on measurements conducted at 1.5m above ground level at the property boundary of the residence. All measurements were conducted at least 3m away from any façades.

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 north-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 25 and 30 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.

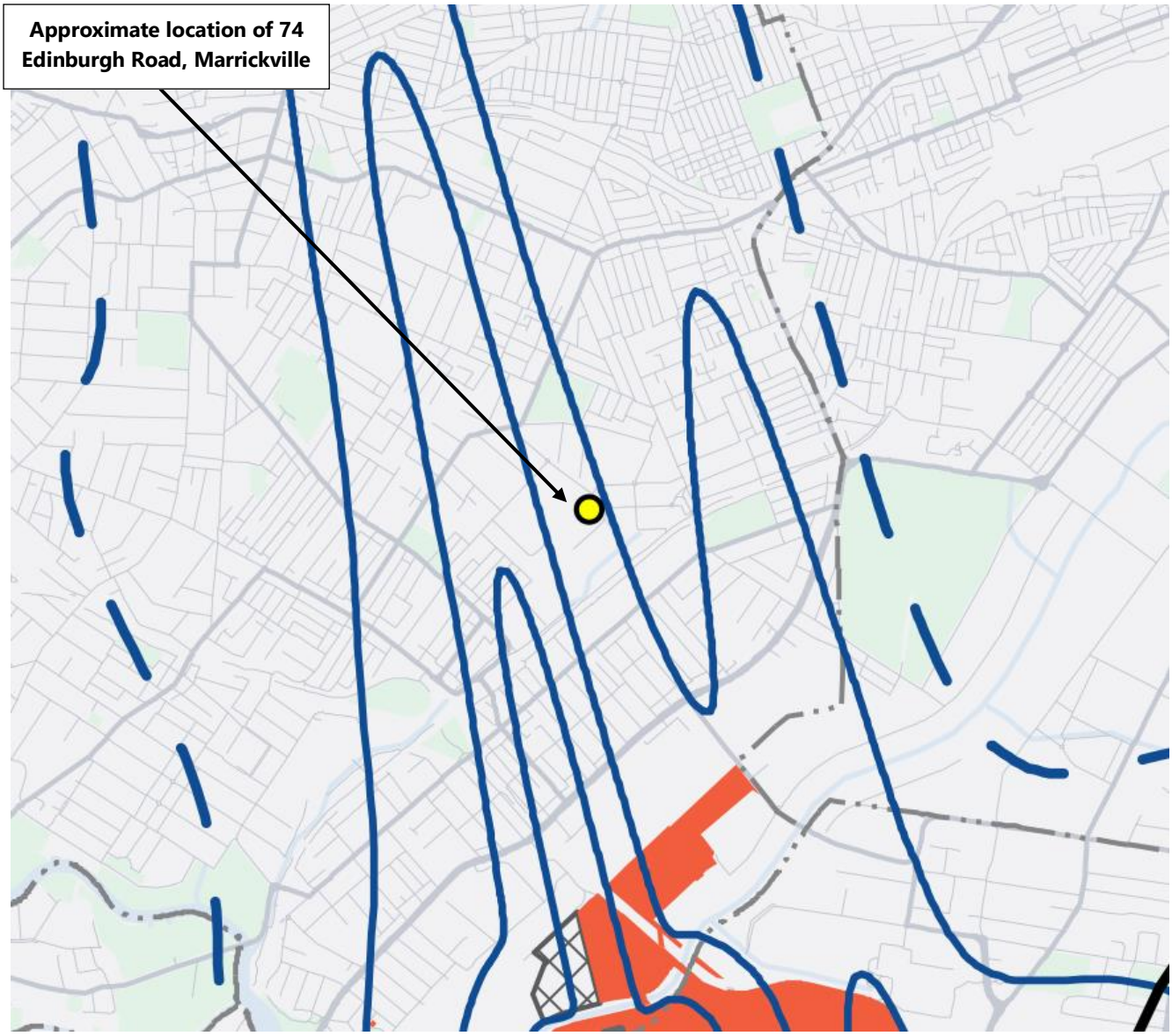


Figure 2 – ANEF 2039 Chart and Approximate Location of Proposed Development

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 5.2.

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
Drafting. Open Offices	65 $dB(A)_{(Slow, Lmax)}$
Typing, Data Processing/ Warehouse	70 $dB(A)_{(Slow, Lmax)}$
Shops, Industrial Precision Work	75 $dB(A)_{(Slow, Lmax)}$

5.2 COMPLYING 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.

5.2.1 Glazed Windows and Doors

The following constructions 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 5-2.

Table 5-2 – Recommended Glazing Construction

Room	Glazing Thickness	Acoustic Seals
Open Office Spaces	6.38mm Laminated	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 5-3 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 5-3 – Minimum R_w of Glazing Assembly (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
6.38mm Laminated	31

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.

5.2.2 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.

5.2.3 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, it is recommended that construction details be reviewed during the detailed design phase of the project to ensure that the identified internal noise levels from aircraft movements are able to be achieved.

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 EPA *Road Noise Policy* 2011
- NSW EPA *Noise Policy for Industry* (NPI) 2017.

The SEARs also require consideration of the following documents:

- Assessing Vibration: A Technical Guideline (DECC, 2006), and
- 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 are 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
Sub-Arterial Roads (Edinburgh Road)	Day (7am to 10pm)	60 dB(A) $L_{eq(15hr)}$
	Night (10pm to 7am)	55 dB(A) $L_{eq(9hr)}$

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 a number of factors, including the receiver type, measured background noise levels at residential receivers, the zoning of the site and prevailing acoustic environment. Based on these factors, the 'urban' categorisation has been adopted for the residences surrounding site.

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

$L_{Aeq,15min}$ = *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 2.2 of the NPI also details the recommended amenity noise level for industrial receivers as shown below.

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

Type of Receiver	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	Recommended Noise Level dB(A) $L_{eq(15\ min)}$
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

6.4.3 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
Residents Facing Edinburgh Road Night (10pm – 7am)	42 dB(A) L_{90}	47 dB(A)$L_{eq, 15min}$; 57 dB(A)L_{Fmax}
Residents Set Back from Edinburgh Road Night (10pm – 7am)	40 dB(A) L_{90}	45 dB(A)$L_{eq, 15min}$; 55 dB(A)L_{Fmax}

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

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

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

6.5 SUMMARISED NOISE EMISSION CRITERIA

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

Receiver	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
Residents Facing Edinburgh Road	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}**
Residents Set Back from Edinburgh Road	Day	52	58	**57**	N/A
	Evening	42	48	**47**	N/A
	Night	40	**43**	45	**45 dB(A)$L_{eq, 15min}$; 55 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) $L_{eq(15min)}$
Commercial premises	When in use	63
Industrial premises	When in use	68

Table 6-7 – Criteria for Additional Traffic Noise on Public Roads

Road Type	Time of day	Permissible Overall Traffic Noise Level
Sub-Arterial Roads (Edinburgh Road)	Day (7am to 10pm)	69 dB(A) $L_{eq(15hr)}$
	Night (10pm to 7am)	62 dB(A) $L_{eq(9hr)}$

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:
    - Locate refrigeration plant as far as practicable from adjacent noise sensitive development, preferably within plant rooms. Noise screening (using either a dedicated noise screen or the building shell between the plant items and noise sensitive buildings) will be beneficial.
- 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 85 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 85 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 OPERATIONAL NOISE SOURCES

Assessment of operational noise emissions have been modelled with the following delineations:

1. Noise emissions from articulated trucks manoeuvring at the south-eastern and south-western loading docks, including reversing manoeuvres. These noise sources have been modelled as area sources emitted from the building structure as the loading docks are partially enclosed. All sound power levels are as described in Table 7-1.

2. Noise emissions from outbound delivery vans (small rigid vehicles) manoeuvring in the upper floor of the south-western loading dock (on level 2) including reversing manoeuvres. These noise sources have been modelled as area sources emitted from the building structure as the loading docks are partially enclosed.

3. Noise emissions from outbound delivery vans (small rigid vehicles) manoeuvring to park above the loading docks.

4. Noise emissions from staff parking vehicles manoeuvring in the two-storey carpark.

5. Noise emissions from individual plant rooms above the office building and to the south-western plant room of the site. The plant rooms have been modelled as area sources emitted from the plant room structure as the plant rooms are partially enclosed. The assumed cumulative sound power level used for each plant room is 85dB(A) SWL.

6. Key L_{max} events have been separately modelled to determine any influence of night time operations on sleep disturbance. Specifically, car engine starting and door slamming have been modelled as a point sources at 1m above the staff carpark ground and first floor heights. Locations have been modelled for all car spaces along boundary of the carpark. Medium truck engine starting and heavy truck airbrake release has also been modelled in a similar way for the loading docks at the rear of the site.

Each individual noise source with their indicative source area has been marked in Figure 3 below as sources 1 to 5 respectively. The cumulative noise from all operational sources is presented in the following sections, based on the proposed operating scenarios.

Specific assumptions for each of the above operational noise sources are detailed in Section 7.3.

Project Site

Sources 1-3 – Medium and Heavy Trucks

Source 4 – Staff Parking Facilities

Source 5 – Plant Rooms

Source 6 – Individual Lmax Events

Figure 3 – Project Site
Source: NSW Six Maps

7.3 OPERATIONAL ASSUMPTIONS

7.3.1 Acoustic Data

The following noise level data for vehicle-related noise sources have been used for the assessment. These noise levels have been taken from measurements conducted by this office of Woolworths delivery vans (medium trucks). Specifically, on-site testing was performed in a currently operating Woolworths CFC to ascertain the sound power levels of the delivery vans in a typical pass-by event accelerating up a ramp (for conservative analysis). The measured noise level for medium trucks was of an idling Hino 616 IFS 300 Series (medium truck classification, a typical Woolworths delivery van) with a Thermo King V-500 Max refrigeration unit running concurrently.

Further measurements were undertaken at TRS in St Peters, which manufacture and install the refrigeration compressors installed above the cabin of the delivery vans. Measurements at this location were undertaken to determine the noise level of compressors when connected to 15 amp external power for deliveries with van engines turned off. Compressors has been modelled as a point source at 2.5m above ground level. Woolworths has confirmed that the vans will be plugged in to external power during loading activities, and as such engine idling will not be required to maintain the cold chain.

Table 7-1 – Sound Power Levels of Typical Automotive Movements Within the Site

Noise Source	Noise Level, dB(A)	Noise Characteristic	Applied Noise Source
Loading Dock Activities	75 L_{eq} SPL	Quasi-steady	Open Roller Doors at Loading Docks
Automobile Manoeuvring @ 10km/h	84 L_{eq} SWL	Quasi-steady	Passenger Vehicles to Carpark
Medium Truck @ 10km/h	91 L_{eq} SWL	Quasi-steady	Home Delivery Vans
Medium Truck Reversing @ 5km/h	96 L_{eq} SWL	Quasi-steady	Home Delivery Vans
Medium Truck Engine Off with Refrigeration Compressor Running	83 L_{eq} SWL	Quasi-steady	Home Delivery Vans
Heavy Truck @ 10km/h	106 L_{eq} SWL	Quasi-steady	Inbound Heavy Vehicles
Heavy Truck Reversing @ 5km/h	111 L_{eq} SWL	Quasi-steady	Inbound Heavy Vehicles
Car Starting	91 L_{max} SWL	Instantaneous	Passenger Vehicles to Carpark
Car Door Slamming	96 L_{max} SWL	Instantaneous	Passenger Vehicles to Carpark
Truck Engine Starting	100 L_{max} SWL	Instantaneous	Home Delivery Vans
Truck Airbrake Release	121 L_{max} SWL	Instantaneous	Inbound Heavy Vehicles

The noise levels of automobile and heavy truck movements directly correlate to those utilised by the US-FHWA-TNM 2.5 technical model. These noise levels were adopted to present a conservative level of assessment for these movements. Additionally, a 5 dB addition to the sound power levels of medium and heavy trucks performing reversing manoeuvres compared to account to the additional noise source of the reversing beacon.

The US FHWA-TNM Technical Model 2.5 delineates each vehicle type per the following:

- *Automobiles: all vehicles having two axles and four tires – designated primarily for transportation of nine or fewer passengers, i.e., automobiles, or for transportation of cargo, i.e., light trucks. Generally, the gross vehicle weight is less than 4500 kg (9900 lb).*
- *Medium trucks: all cargo vehicles with two axles and six tires. Generally, the gross vehicle weight is greater than 4,500 kg (9,900 lb), but less than 12,000 kg (26,400 lb).*
- *Heavy trucks: all cargo vehicles with three or more axles. Generally, the gross vehicle weight I greater than 12,000 kg (26,400 lb).*

For the purpose of streamlining definitions, large articulated vehicles are to be defined as heavy trucks, small rigid trucks are to be defined as medium trucks, and cars and vans are to be defined as automobiles per the definitions above.

7.3.2 Typical Movements from Woolworths Operational History

Woolworths has provided the following information from typical operational usage of currently operational Customer Fulfilment Centres (CFC's):

Expected truck/ vehicle movements in typical operation during all time periods, in particular expected movements between 10pm and 7am.

- Between 10pm and 5am an estimated 44 delivery vans returning. These vans will return to allocated parking areas with no further loading during this time.
- Between 5am and 7am there will be 4 delivery waves (1 wave every 30 minutes starting at 5am, assuming 22 vans per wave at peak). This means ~88 delivery vans will be leaving the CFC during the early morning peak two hour period.
- The same number of drivers will be arriving at the facility (~88). Assuming 30% use of public transport, approximately 62 passenger vehicles will arrive to the facility over the early morning peak two-hour peak period.
- Between 10pm and 7am approximately 5 to 7 inbound truckloads are expected.

During the daytime period, the same outbound delivery wave will occur between 1-2pm.

7.3.3 Noise Emissions from the Staff Carpark

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) and the operational guidance provided by Woolworths as described in the section above.

With the early morning peak two-hour period likely requiring a complete changeover of staff, 88 staff will arrive and depart the site for this period. With the stated 30% of staff utilising public transport as presented in the traffic report, 62 cars are estimated to arrive and depart during the early morning peak. Computational noise modelling has been conducted to predict noise levels occurring at surrounding noise sensitive receivers during a 15-minute peak of traffic movements during this early morning two-hour peak period, with the worst affected residential receiver being the residential receiver **R2** along Edinburgh Road.

7.3.4 Noise Emissions from Site Loading/ Truck Movements

The primary noise associated with the use of the loading dock will consist of medium and heavy trucks moving into or out of their respective loading bays and the medium truck refrigeration compressor running whilst the truck is being loaded. 8 large articulated vehicle loading bays (inbound) are located on the south-western and façade with 22 small rigid truck loading bays (outbound) on level 2 of the south-western façade of the development, and 2 back of house loading bays for large articulated vehicles within an enclosed space on the south-eastern façade.

The most noise intensive use of the site occurs during the loading and entering/exiting of home delivery vehicles from the western loading dock, particularly during the early morning period (5am – 7am). Noise emission predictions during this time at the nearby development will be made based on the following data/assumptions:

- Automobile, medium and heavy truck sound power levels as defined in Table 7-1 travelling at 10 km/h in the forward direction and at 5 km/h when reversing, noting that the sound power level for medium trucks moving forward was measured per a typical Woolworths delivery van accelerating up a ramp (Section 7.3.1) for conservative calculation.
- Reversing manoeuvres have a 5 dB addition to the sound power levels of trucks travelling forwards to account for the additional noise source of the reversing beacon, as a conservative assessment.
- Heavy truck reversing manoeuvres will take no longer than 30 seconds and medium truck reversing manoeuvres will take no longer than 8 seconds per truck based on swept path distances presented in the traffic report.
- 22 medium truck (delivery van) movements are expected per wave during peak loading periods (generally over a 30-minute time span per wave), based on movements for similar Woolworths sites per Section 7.3.2.

It is noted that the traffic report states that 10-15 inbound deliveries are expected per day, with these deliveries being made with heavy trucks (semi-trailers up to 20 metres long). For the purposes of this assessment, it has been assumed that there may be 1 semi-trailer movements in a given 15-minute period (i.e., one inbound or outbound movement).

Based on the above information, the following scenario has been modelled as the worst-case scenario of peak intensity in cumulative noise levels. This scenario is typical of what will occur in the early morning shoulder period (5am – 7am).

- 1 heavy truck movement in any hour period
- 11 medium truck movements in a given 15-minute period (medium trucks will on average load for around 30 minutes. With all docks filled at the same time, this amounts to 22 movements per 30 minutes or 44 movements per hour)
- 22 medium trucks idling in a 15-minute period per the number of medium trucks expected in the same period, carrying over from the previous 15-minute period in a 30-minute time span of a typical wave during loading
- Loading and unloading industrial activity noise for each active medium truck dock is modelled in a 15-minute period per the number of medium trucks expected in the same period, and
- 16 automobile movements in a given 15-minute period (62 movements per hour).

The above number of movements has been determined using typical movement information from Woolworths operational history as described in Section 7.3.2 and represents the worst-case scenario.

For the assessment of sleep disturbance, peak noise levels from the site have been calculated from the staff carpark and loading docks. Noise emission from heavy truck airbrake release has also been calculated at the rear of the site at the loading docks.

7.4 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS

Noise generated as a result an increase in traffic on public roads is assessed with reference to the EPA Road Noise Policy utilising the US FHWA-TNM Technical Model 2.5, specifically the A-weighted sound pressure levels measured at 15 metres of automobiles, medium trucks and heavy trucks on average pavement. The relevant noise levels for different speeds of travel and acceleration have been adopted through the TNM 2.5 module of SoundPlan™ 8.0.

Access/egress to the site is via Edinburgh Road and Sydney Steel Road. Predictions of traffic noise generation have been made using the following modelling assumptions:

- Automobile, medium and heavy truck sound power levels as defined in Table 7-1 travelling at 50 km/h along Edinburgh Road and Sydney Steel Road. Movements from Sydney Steel Road will stop at the T-intersection to Edinburgh Road.
- A traffic light control device at the intersection between Edinburgh Road and Smidmore Street affection 50% of all vehicle movements passing through the intersection, constraining the affected vehicles to 0km/h when affected by the control device.
- The following numbers of vehicles have been assumed for the prediction of traffic noise generation:
    - For the typical night time period (10pm – 7am), the following number of vehicle movements are expected:
        - 18 heavy truck movements (1 inbound and 1 outbound movement per hour)
        - 110 medium truck movements (44 inbound between 10pm-5am and 66 outbound between 5am-7am (3 of the 4 waves during the early morning two-hour peak)), and
        - 124 automobile movements (62 inbound and 62 outbound per the shift changeover).
    - For the typical daytime period (7am – 10pm), the following number of vehicle movements are expected:
        - Up to 60 heavy truck movements (2 inbound and 2 outbound movement per hour)
        - 242 medium truck movements (the remaining 22 outbound vehicles from the early morning wave, 88 outbound between 1pm – 2pm, 88 delivery vans returning from the early morning wave and 44 returning from the afternoon wave), and
        - 248 automobile movements (62 inbound and 62 outbound for two shift changeovers).

    The above number of movements has been determined using typical movement information from Woolworths operational history as described in Section 7.3.2
- All heavy truck movements (deliveries to the site, and exiting once unloaded) during the night time period (10pm – 7am) have been modelled as accessing and leaving the site via Sydney Steel Road/Edinburgh Road to the east, away from immediately adjacent residents. That is, inbound heavy vehicles have been assumed to turn left into Sydney Steel Road to access the site, and depart Sydney Steel road via a right hand turn during the night time period.
- All inbound medium truck movements (returning delivery vans) during the night time period (10pm – 7am) have been modelled as accessing the site via a left hand turn into Sydney Steel Road (from the east of the site), away from immediately adjacent residents. That is, returning delivery vans have been assumed to return to site by turning left on to Sydney Steel Road.

- Outbound delivery vans (medium trucks) during the early morning delivery wave have been modelled as travelling both east and west along Edinburgh Road, with movements equally distributed east and west.

- All other inbound and outbound movements of all vehicle types are equally distributed moving eastbound and westbound on Edinburgh Road, per the traffic report.

The existing traffic noise level has been modelled based on the long-term noise monitoring conducted at **R2**. The potential for additional noise from traffic generation associated with the facility was calculated by adding the additional vehicle movements from the site to the existing traffic noise levels.

Noise emissions have been predicted at the worst affected residential receivers and compared against the acoustic criteria set out in Section 6.5. The cumulative traffic noise generation at the worst affected point at R2 (the worst affected residential façade of 65 Edinburgh Road) is presented below.

Table 7-2 – Cumulative Traffic Noise Including Noise Generated by Additional Road Traffic

Receiver Location	Existing Traffic Noise Level – dB(A)L_{eq}	Predicted Cumulative Noise Level – dB(A)L_{eq}	Predicted Traffic Noise Increase	Compliance
R2 residence (building façade)	Day: 67.3 dB(A)$L_{eq(15hr)}$	Day: 68.4 dB(A)$L_{eq(15hr)}$	1.1 dB(A) $L_{eq(15hr)}$	Less than 2dB(A) increase in overall traffic noise level
	Night: 60.3 dB(A)$L_{eq(9hr)}$	Night: 61.9 dB(A)$L_{eq(9hr)}$	1.6 dB(A) $L_{eq(15hr)}$	

Cumulative increase in traffic noise level inclusive of traffic noise generation from the site is within the guidance from the NSW EPA *Road Noise Policy*.

7.5 CUMULATIVE PREDICTED OPERATIONAL NOISE EMISSIONS

7.5.1 SoundPlan 8.0 Noise Modelling

Noise levels have been predicted at the receiver locations using SoundPlan™ modelling software implementing the ISO 9613-2:1996 "Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation" noise propagation standard.

Noise enhancing meteorological conditions have been adopted as recommended by the NPI, noting that the ISO 9613 modelling approach assumes that all receivers are 'downwind' (i.e., that noise enhancing wind conditions are in effect at all times).

The following figures detail computational noise modelling for closest noise sensitive receivers and façades relating to the operational noise emissions of the site through the presentation of a façade noise map onto the respective buildings and a grid noise map at different elevations mapped to the ground model. Numerical results are presented in Section 7.5.3. All noise levels are presented based on the noise control recommendations in Section 7.6.

Ground absorption was conservatively calculated with a ground factor of 0 for all areas except for localised lawns and greenery, which have been modelled with a ground factor of 0.6 as recommended in *Engineering Noise Control* (Bies & Hanson).

In line with Factsheet C of the NPI, penalties for annoying noise characteristics should be applied at the receiver, where applicable. Based on the predicted noise levels, no penalty should be applied (either for tonality, intermittency, or otherwise).

7.5.2 Operational Noise Modelling Results

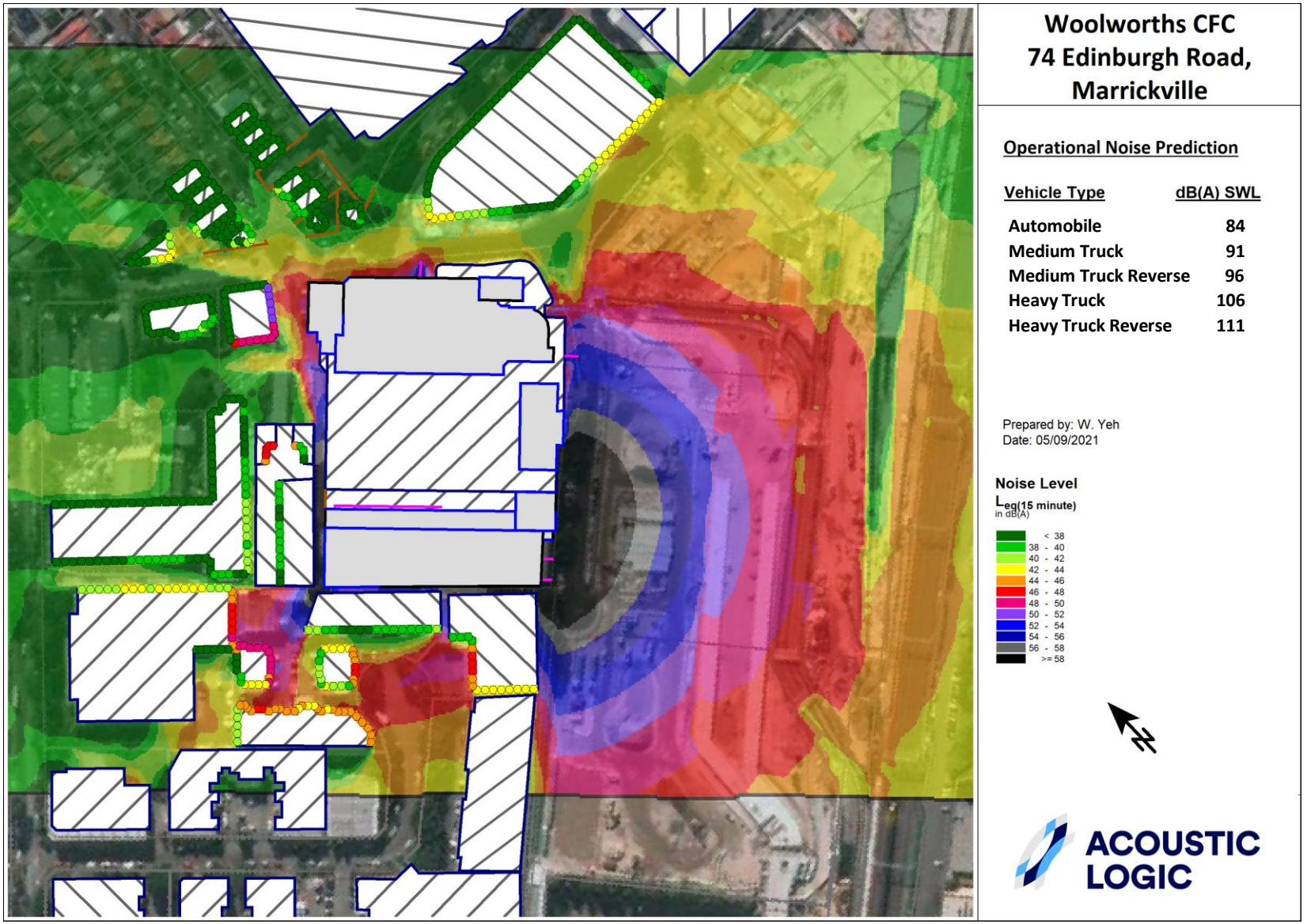


Figure 4 – Overall 2D View, Grid Noise Map at 1.5m

Figure 5 –Residential Focus 2D View, Grid Noise Map at 1.5m

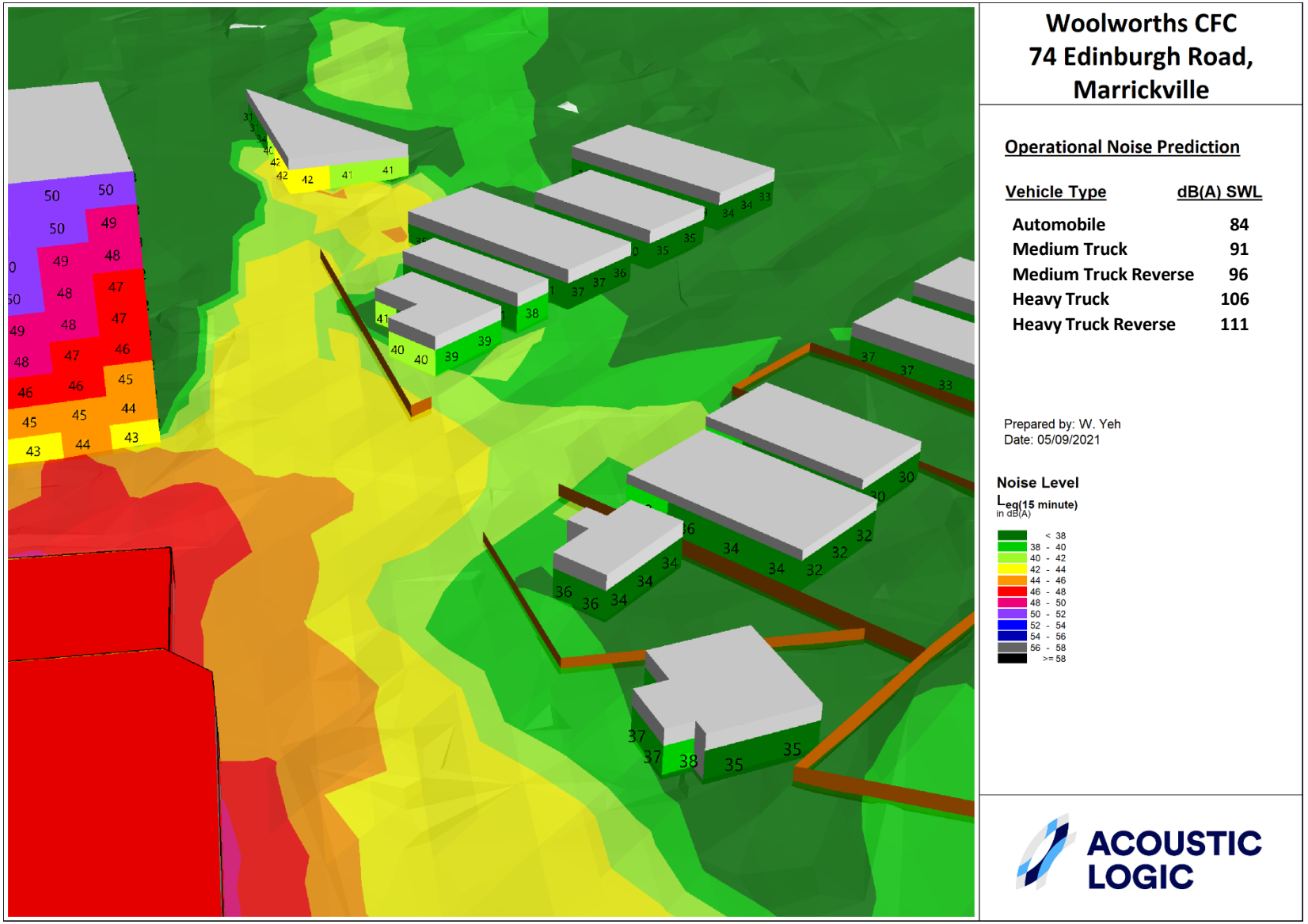


Figure 6 – Overall 3D View to R1, Grid Noise Map at 1.5m

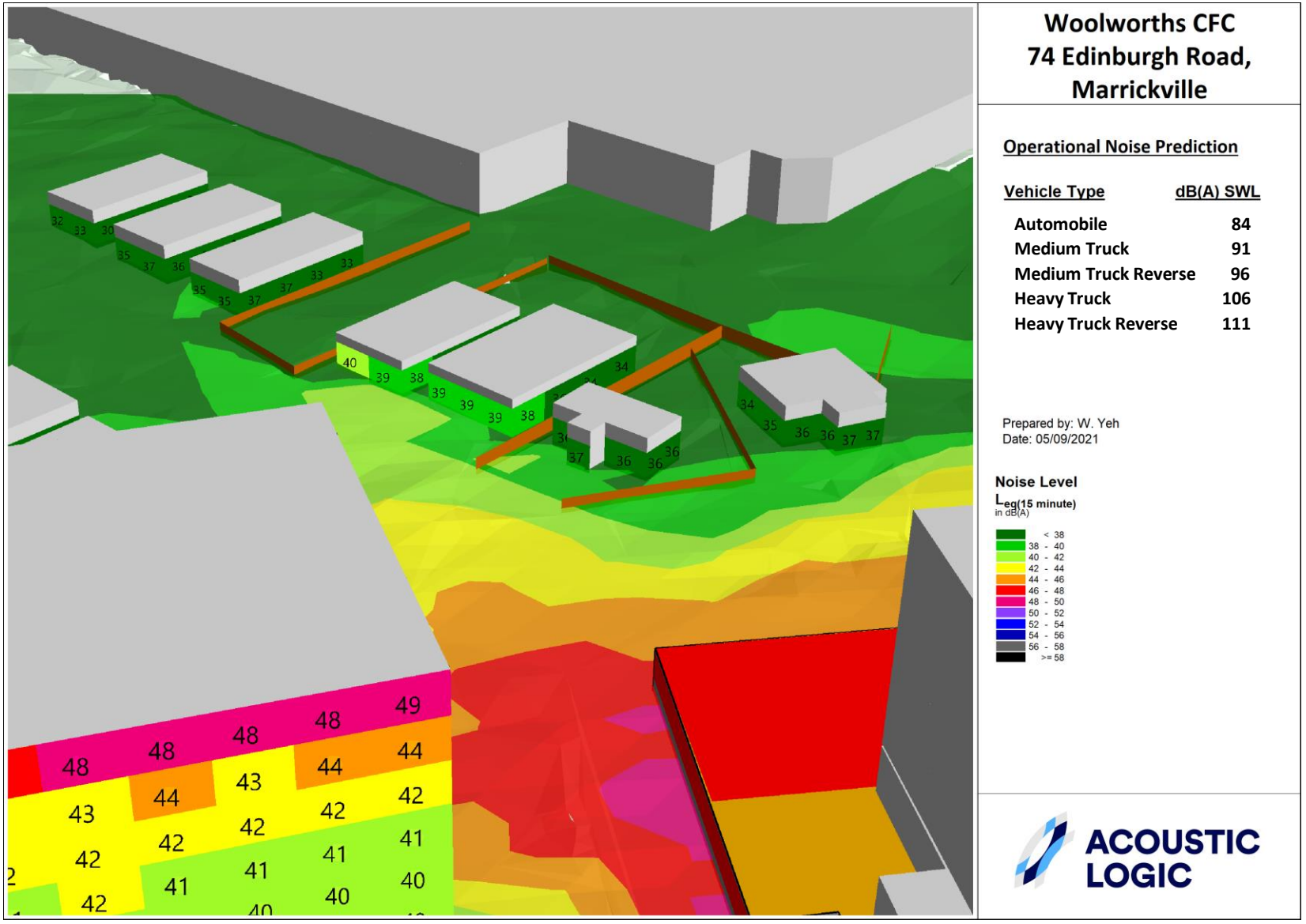


Figure 7 – Overall 3D View to R2, Grid Noise Map at 1.5m

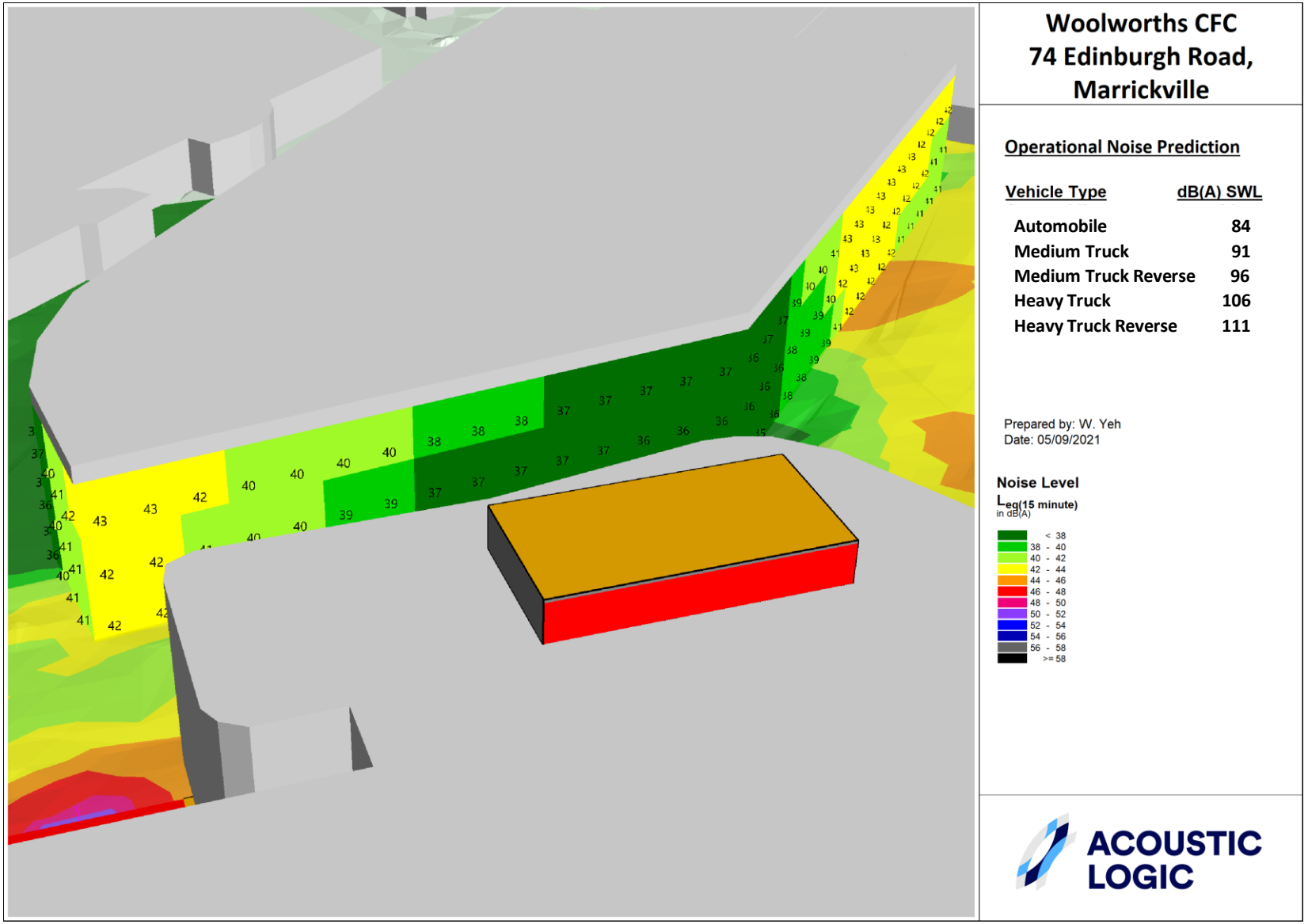


Figure 8 – Overall 3D View to R3 and R4, Grid Noise Map at 1.5m

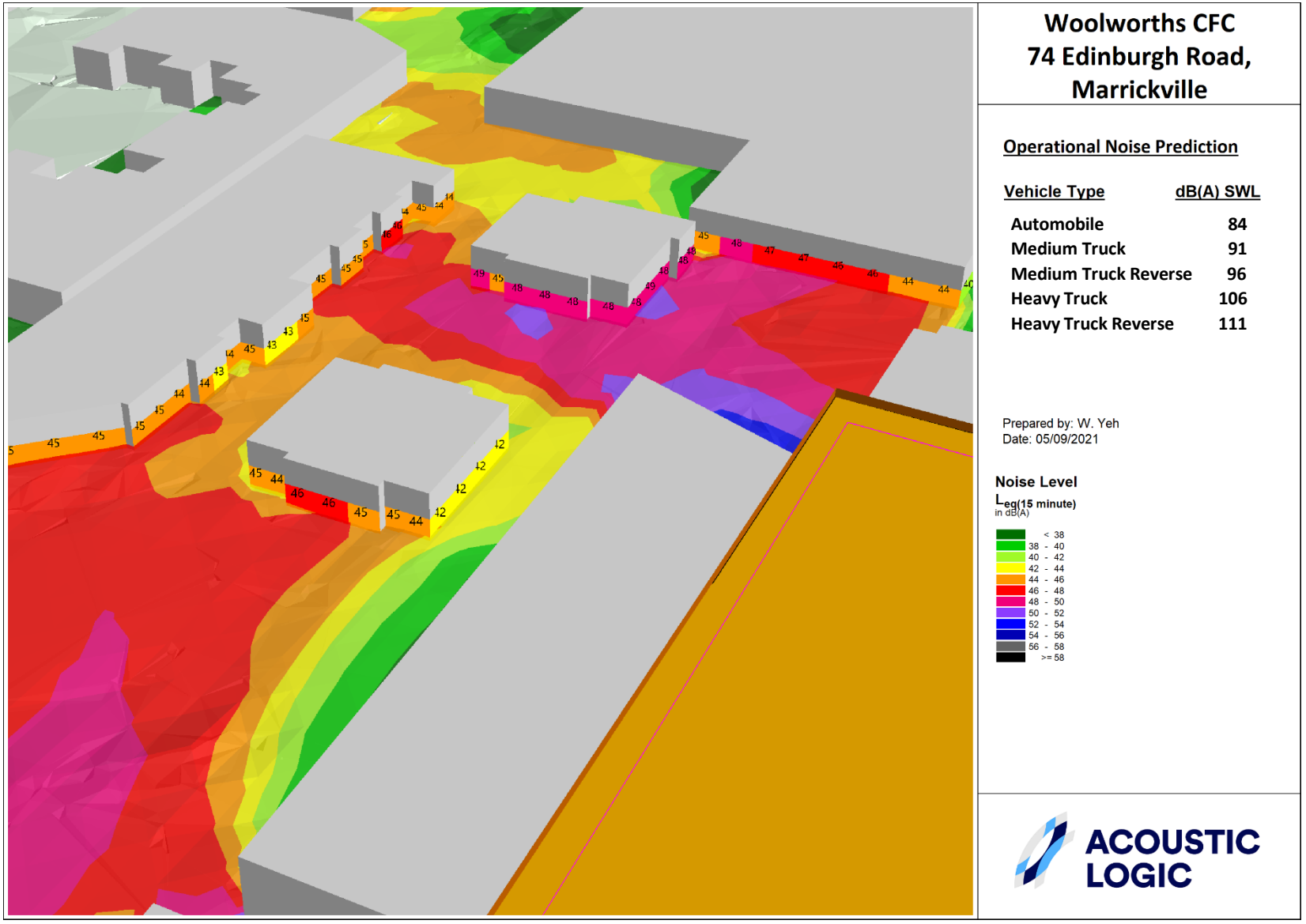


Figure 9 – Overall 3D View to R7, Grid Noise Map at 1.5m

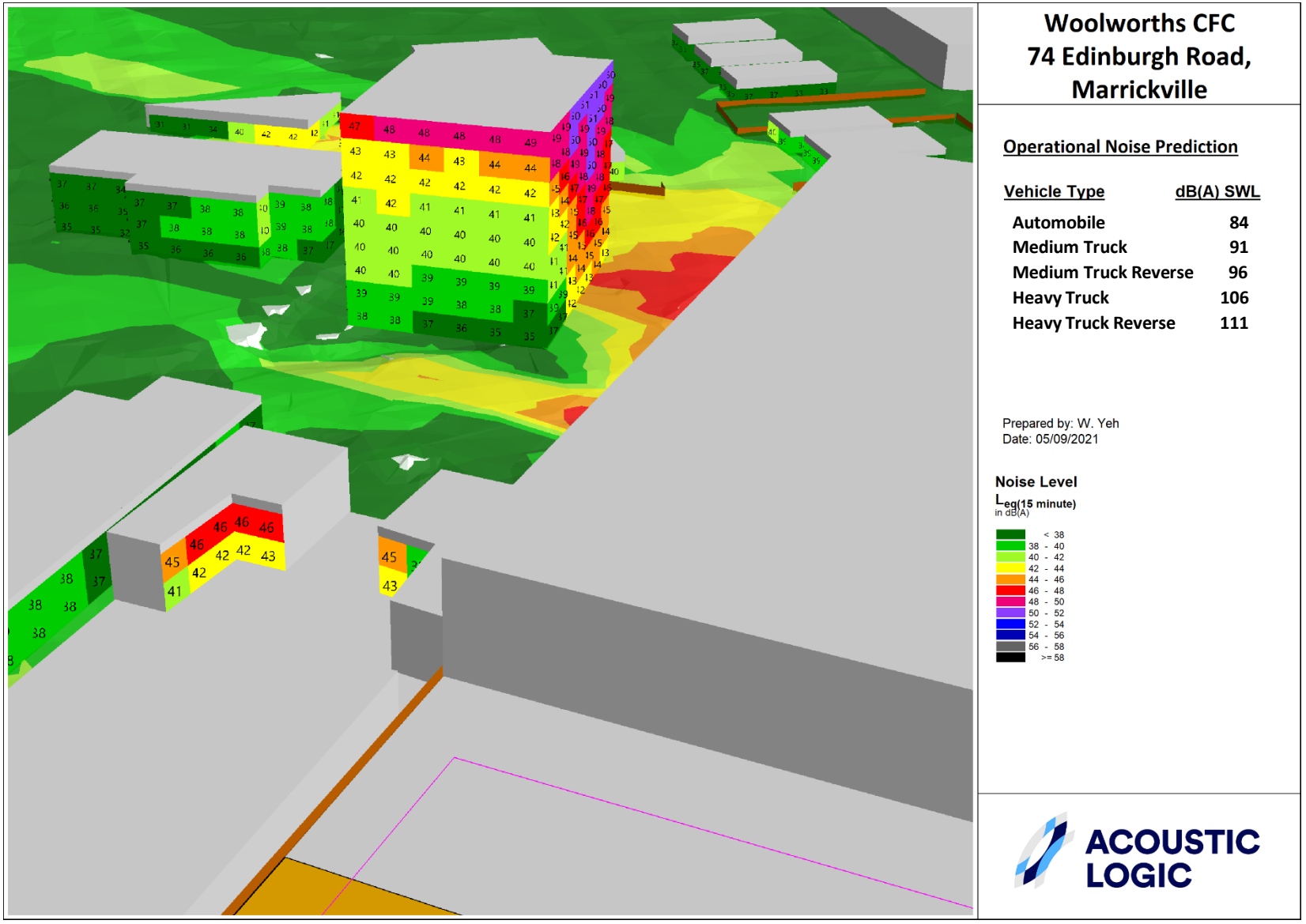


Figure 10 – Overall 3D View to R8, Grid Noise Map at 1.5m

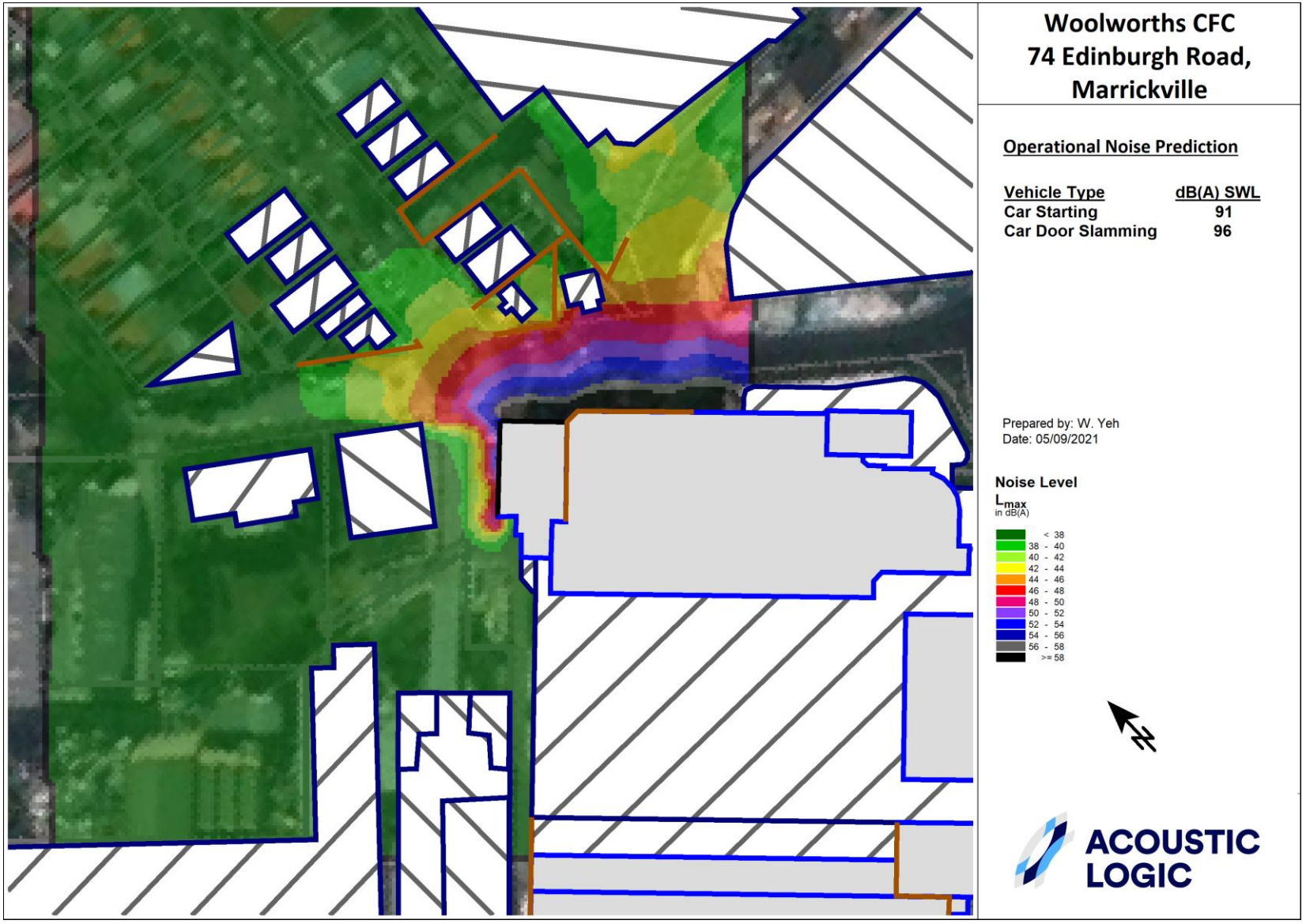


Figure 11 – Residential Focus 2D View, L_{max} of Ground Floor Carpark, Grid Noise Map at 1.5m

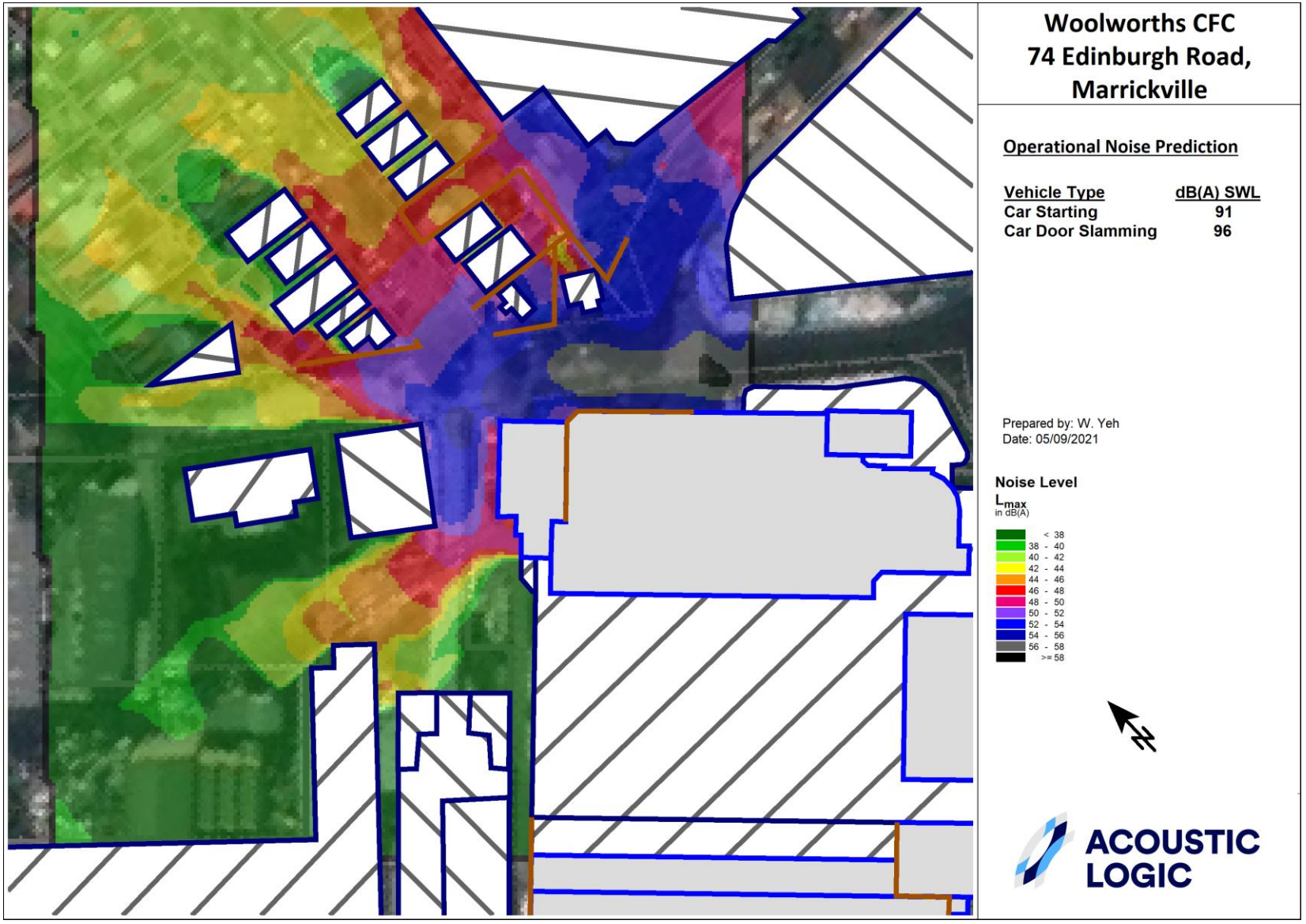


Figure 12 – Residential Focus 2D View, L_{max} of First Floor Carpark, Grid Noise Map at 1.5m

7.5.3 Summary

Cumulative noise emission predictions from delivery van loading and general site operations (being the most noise intensive use of the site) are presented below to the most sensitive receivers around the development. The highest predicted noise level at each receiver is summarised below.

Table 7-3 – Predicted Cumulative Noise Levels to R1 Residential Receiver

Operational Source	Predicted Noise Level	Criteria	Comment
Cumulative Noise from Site Operation, Including Home Delivery Loading, Staff Parking and Inbound Heavy Vehicle Deliveries Refer Section 7.2	42 dB(A) $L_{eq(15min)}$	57 dB(A) L_{eq} Dayti7e (7am – 6pm)	Meets NSW EPA Noise Emission Requirements
		48 dB(A) $L_{eq,}$ Evening (6pm – 10pm)	
		43 dB(A) $L_{eq,}$ Night (10pm – 7am)	
Peak Loading Dock/Carparking Activities Refer Section 7.2	50 L_{max}	55 dB(A) L_{max}	

Table 7-4 – Predicted Cumulative Noise Levels to R2 Residential Receiver

Operational Source	Predicted Noise	Criteria	Comment
Cumulative Noise from Site Operation, Including Home Delivery Loading, Staff Parking and Inbound Heavy Vehicle Deliveries Refer Section 7.2	40 dB(A) $L_{eq(15min)}$	57 dB(A) L_{eq} Dayti7e (7am – 6pm)	Meets NSW EPA Noise Emission Requirements
		48 dB(A) $L_{eq,}$ Evening (6pm – 10pm)	
		43 dB(A) $L_{eq,}$ Night (10pm – 7am)	
Peak Loading Dock/Carparking Activities Refer Section 7.2	54 L_{max}	55 dB(A) L_{max}	

Table 7-5 – Predicted Cumulative Noise Levels to Industrial and Commercial Receivers

Noise Source	Receiver	Time Period	Predicted Noise Level	Criteria	Comment
Cumulative Noise from Site Operation, Including Home Delivery Loading, Staff Parking and Inbound Heavy Vehicle Deliveries Refer Section 7.2	**R3**	When in use	< 38 dB(A) $L_{eq(15min)}$	63 dB(A) L_{eq}	Meets NSW EPA Noise Emission Requirements
	R4		43 dB(A) $L_{eq(15min)}$	68 dB(A) L_{eq}	
	R5		56 dB(A) $L_{eq(15min)}$		
	R6		46 dB(A) $L_{eq(15min)}$		
	R7		49 dB(A) $L_{eq(15min)}$		
	R8		48 dB(A) $L_{eq(15min)}$		

7.6 DISCUSSION & COMPLYING CONTROLS

Predicted noise levels from the operation of the proposed customer fulfillment centre show that it is capable of meeting the noise emission requirements of the NSW EPA Noise Policy for Industry at all times. It is noted that the noise level from home delivery loading activities (identified as the most noise intensive use) meets the night time noise emission level, however it is not proposed that this activity would occur between 10pm – 5am.

On this basis, noise from the use of the facility can be justified, noting the following recommended mitigation measures:

- It is recommended that a review and detailed design of all mechanical plant associated with the site be undertaken prior to the issue of a construction certificate to ensure plant noise levels meet the noise emission requirements detailed in Section 6.5. Any review of mechanical plant noise should take into consideration the operational noise levels from the site, such that the cumulative noise does not exceed the PNTL's.
- Install a 1.5m high imperforate acoustic barrier to the locations marked in green at minimum in Figure 13 and Figure 14 below. The barrier may be constructed of lapped and capped timber, plexiglass, 4mm Perspex, Colorbond, 9mm fibrous cement sheet or equivalent, installed with no gaps between the panels, and maximum of a 20mm gap at the bottom to allow water flow if required.

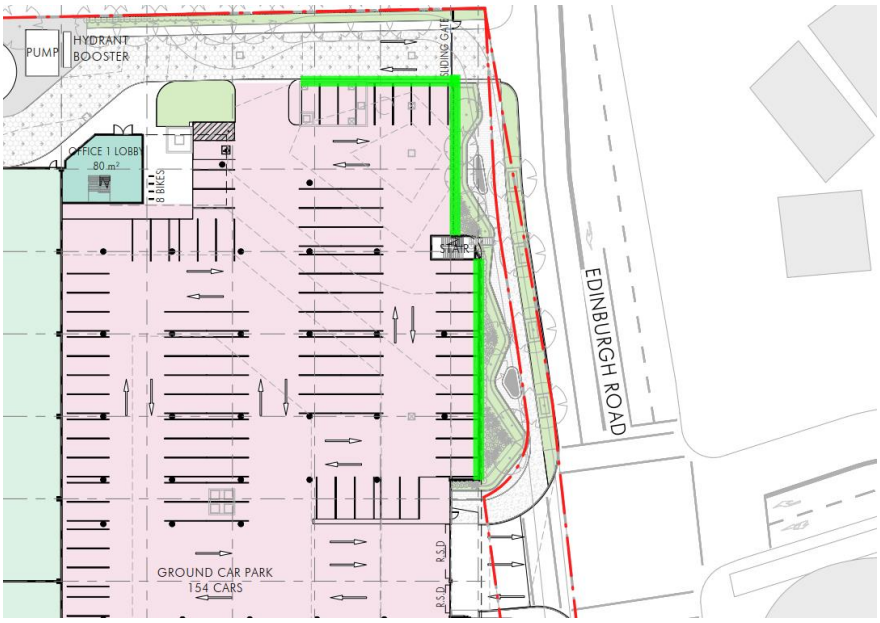


Figure 13 – Required Acoustic Barriers for Ground Floor Carpark

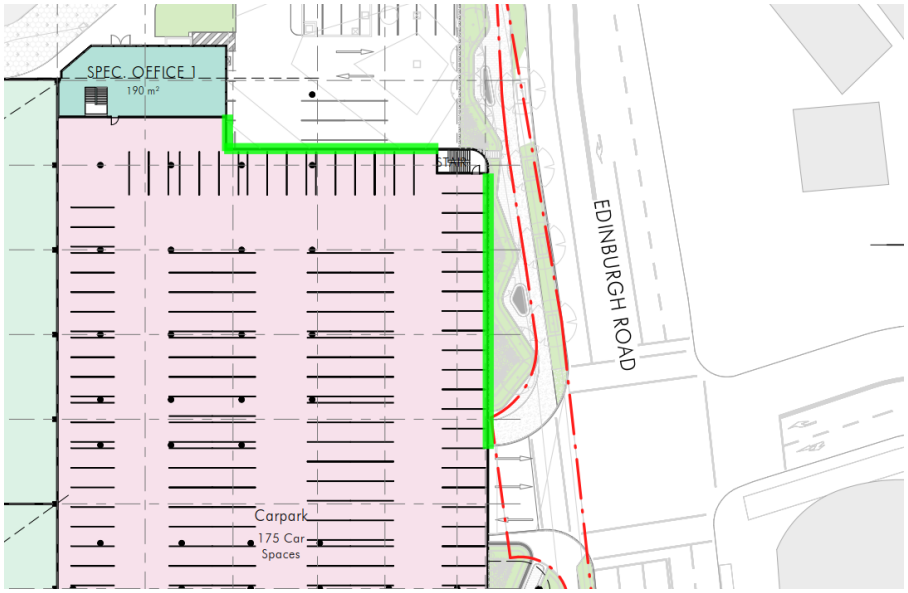


Figure 14 – Required Acoustic Barriers for Level 1 Carpark

- Opening to the eastern portion of loading dock for levels 2 & 3 (double height space) to be blanked off to the underside of the slab above with plexiglass, 4mm Perspex, Colorbond, 9mm fibrous cement sheet or equivalent, installed with no gaps between the panels.

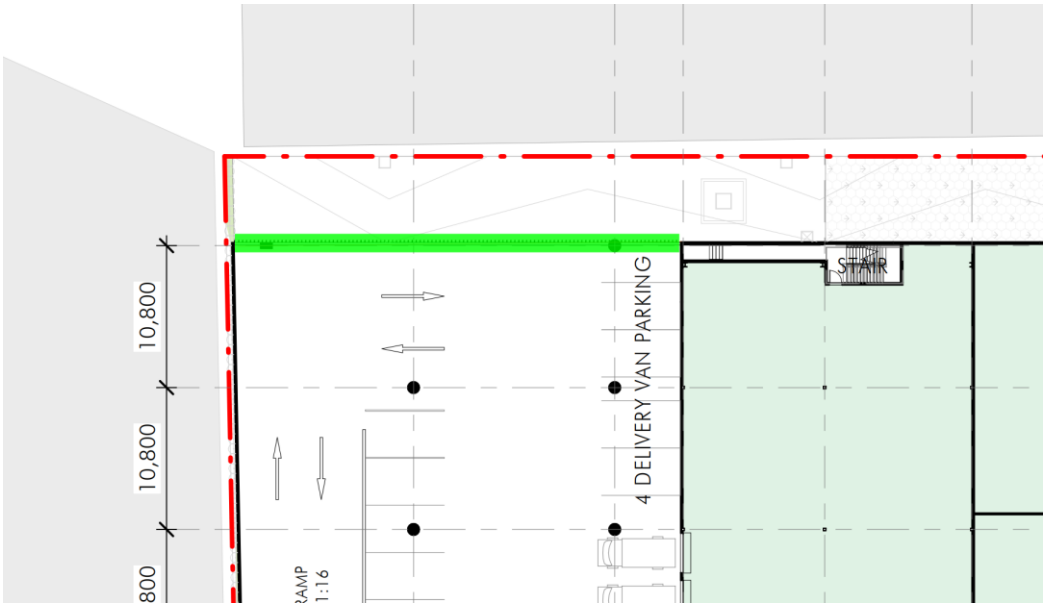


Figure 15 – Required Acoustic Barriers for Level 2/3 Loading Docks

- The driveway between 76 Edinburgh Road (receiver **R8**) and the site (north western façade) shall not be used for routine site activities.

- The following office building plant room façades are to be blanked off/ closed to provide acoustic screening to local residents. This requirement of this screening is to be confirmed based on the review of mechanical services once available, as detailed in item 1 of this section.

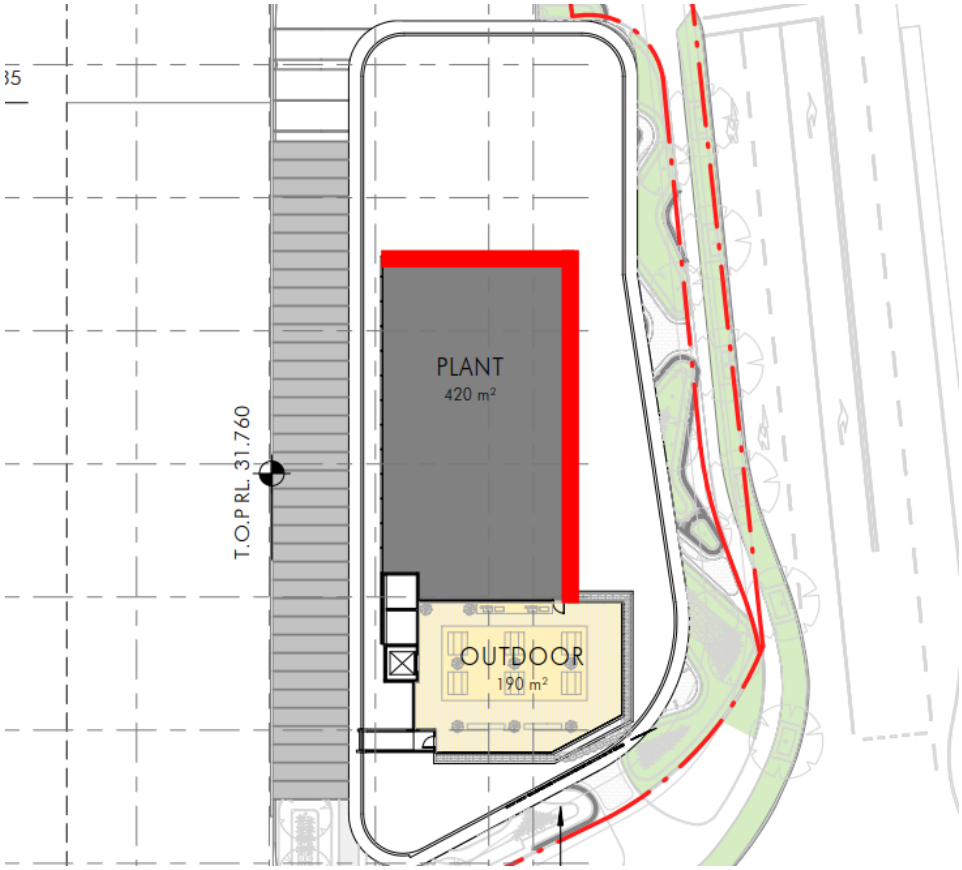


Figure 16 – Required Acoustic Barriers for Level 1 Carpark

- All medium truck movements (returning delivery vans) returning to site during the night time period (10pm – 7am) are to access the site via Edinburgh Road in the westbound direction (from the east of the site), away from immediately adjacent residents. That is, returning delivery vans will need to enter site by turning left on to Sydney Steel Road.

- All heavy truck movements (deliveries to the site, and exiting once unloaded) during the night time period (10pm – 7am) are to access and leave the site via Sydney Steel Road/Edinburgh Road to the east, away from immediately adjacent residents. That is, inbound heavy vehicles will need to turn left into Sydney Steel Road to access the site, and depart Sydney Steel road via a right hand turn during the night time period.

- For the northern carpark, all pavement should be smooth and level to ensure minimum vertical displacement and potential for noise generated by wheel to concrete impacts. The surface finish should be of a type that minimises the squealing of car tyres.

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 5.2 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*.'

Provided that the recommendations presented in Section 7.6 are adopted, noise emission levels for the development will comply with the acoustic requirements of the following documents:

- NSW EPA Noise Guide for Local Government 2013
- Inner West Council (formerly Marrickville) DCP and LEP 2011
- NSW EPA *Road Noise Policy* 2011, and
- EPA *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 *Assessing Vibration – A Technical Guideline*.

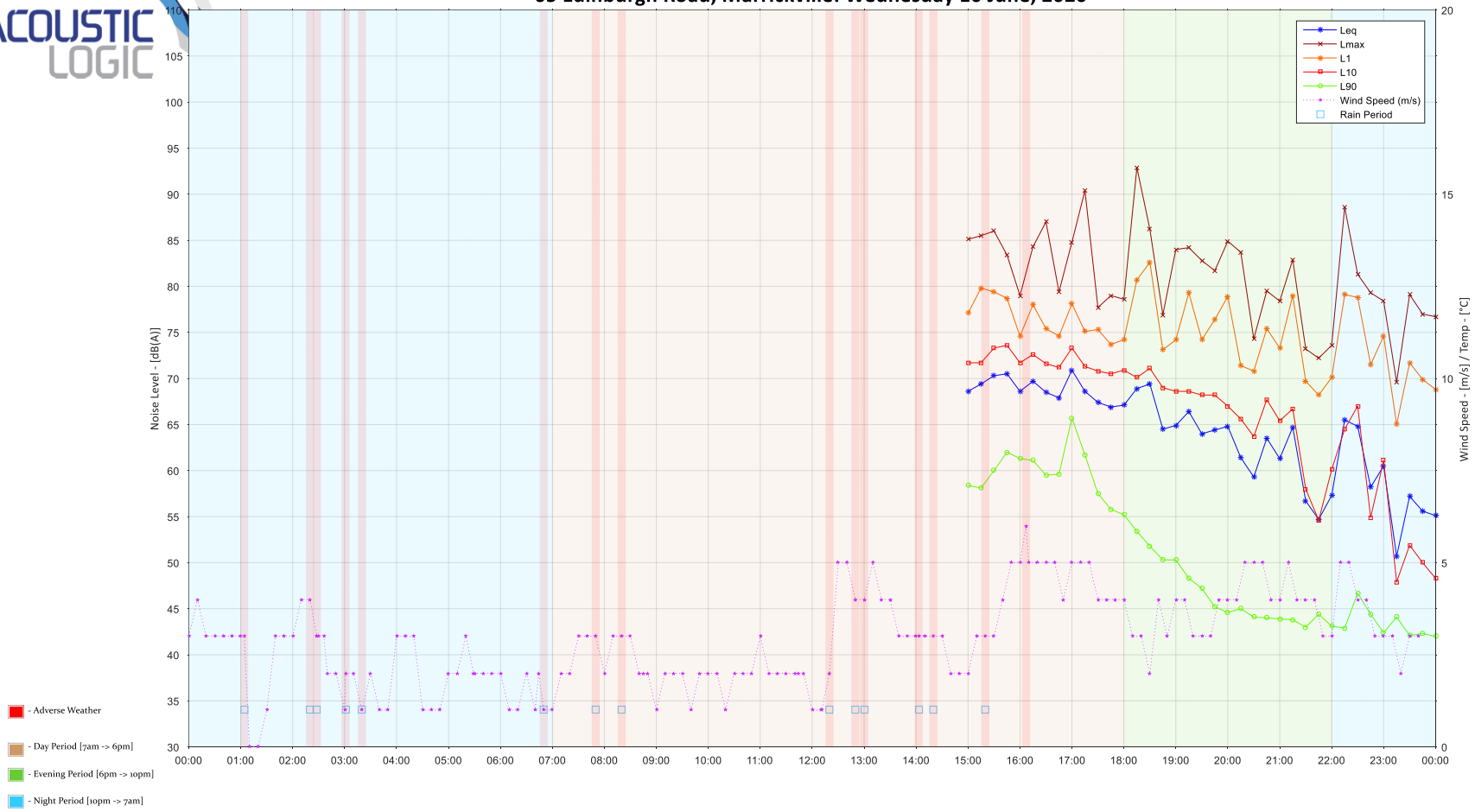
We trust this information is satisfactory. Please contact us should you have any further queries.

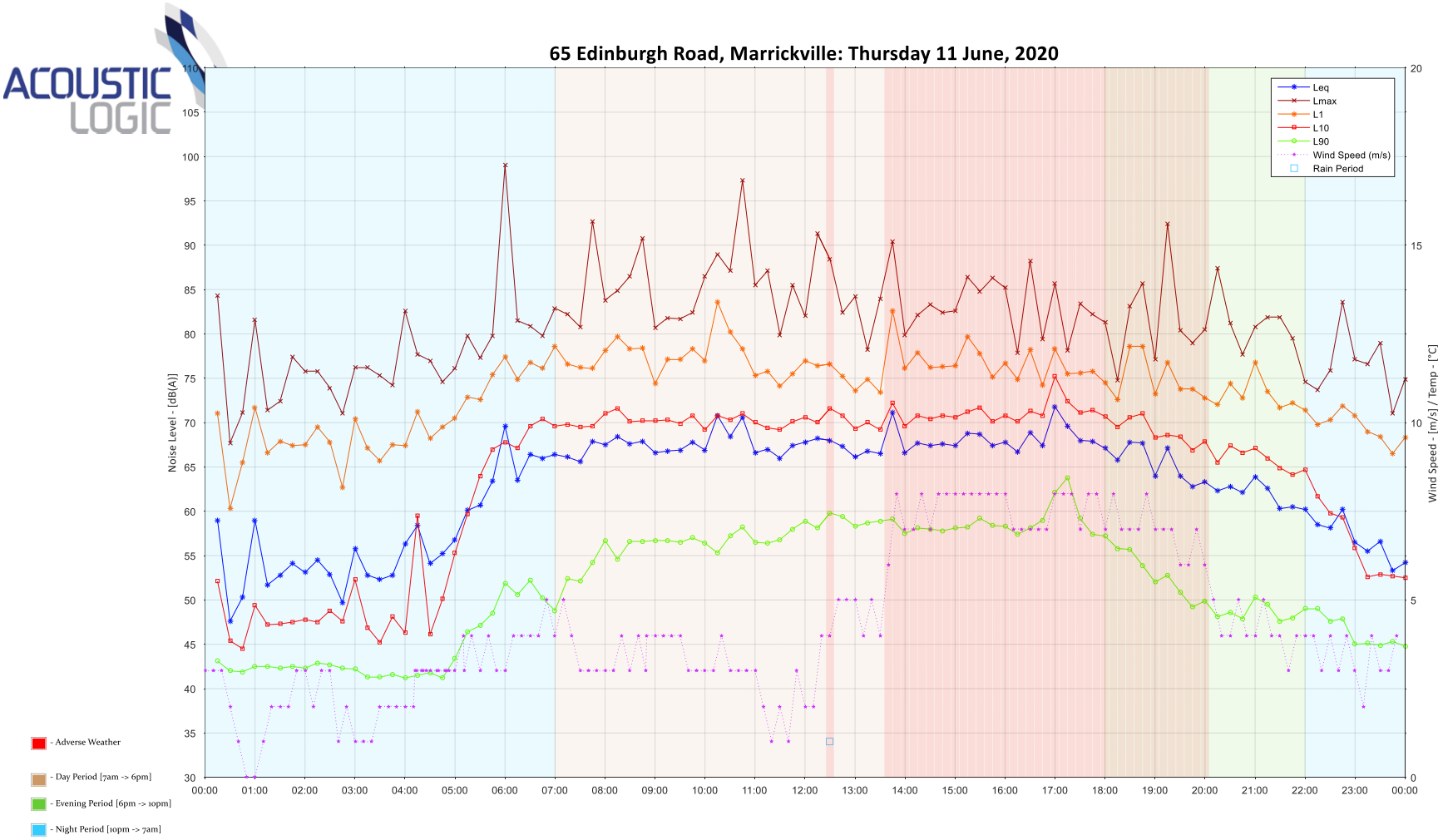
Yours faithfully,

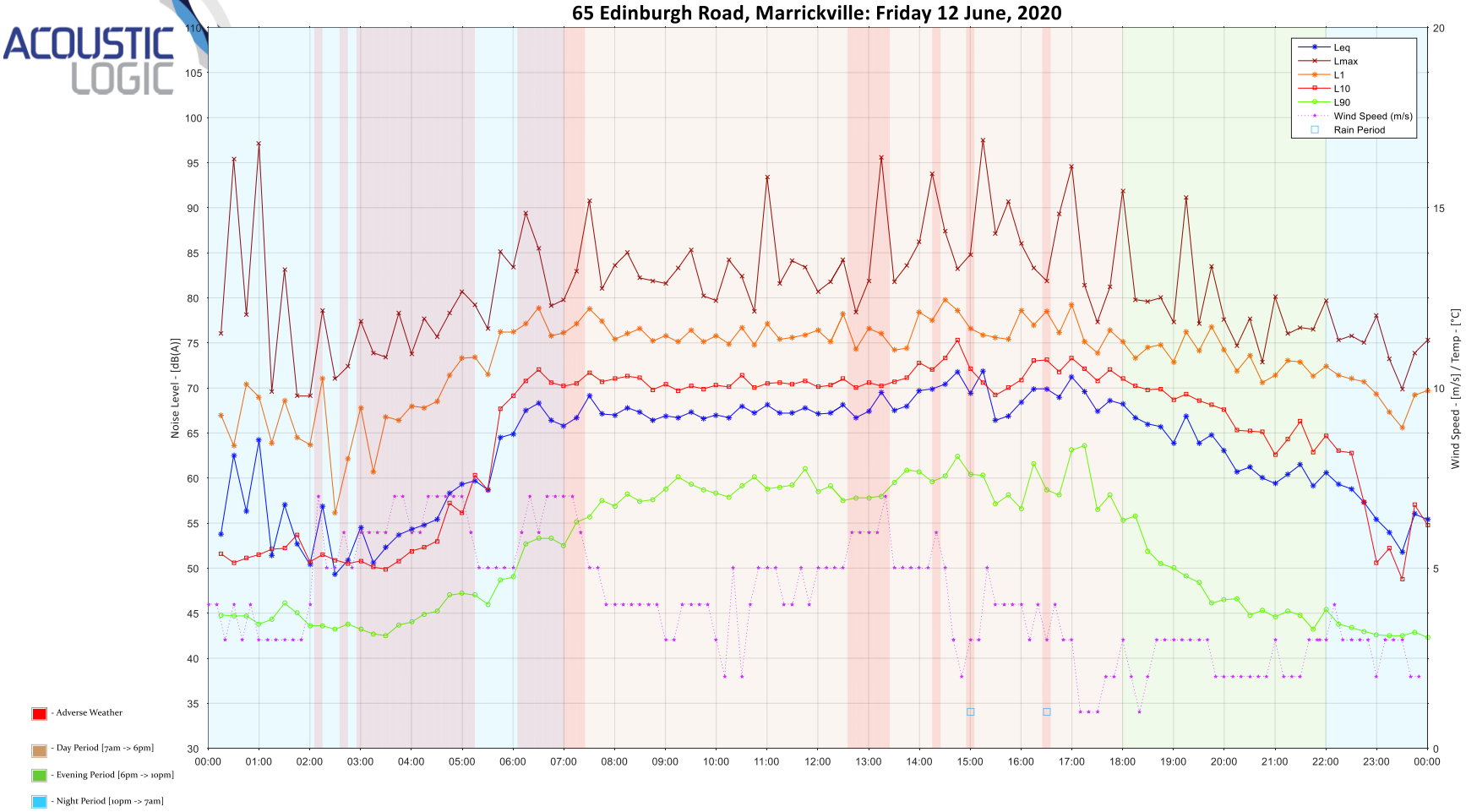
Acoustic Logic Consultancy Pty Ltd
Weber Yeh

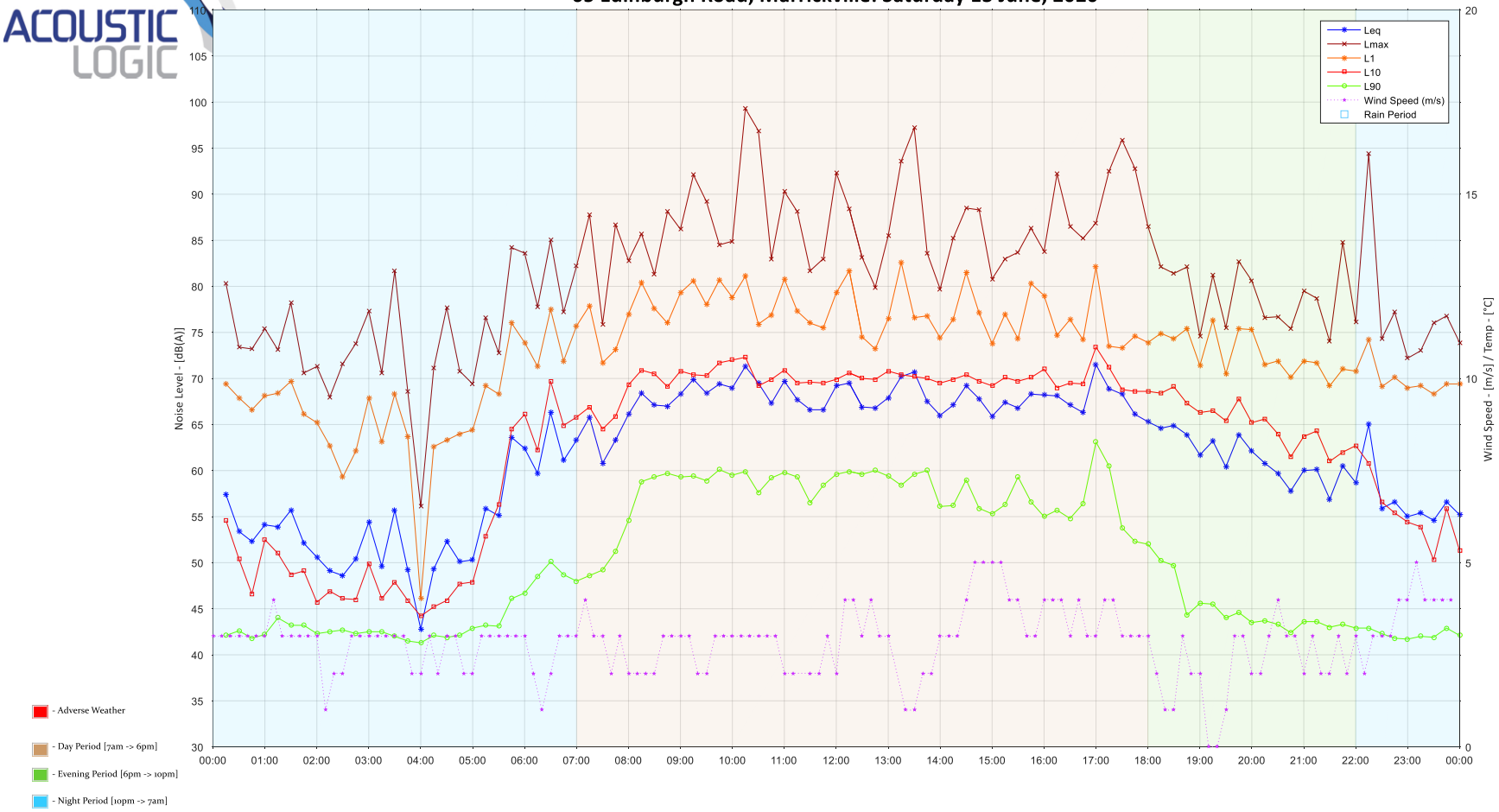
APPENDIX ONE – UNATTENDED NOISE MONITORING

65 Edinburgh Road, Marrickville: Wednesday 10 June, 2020

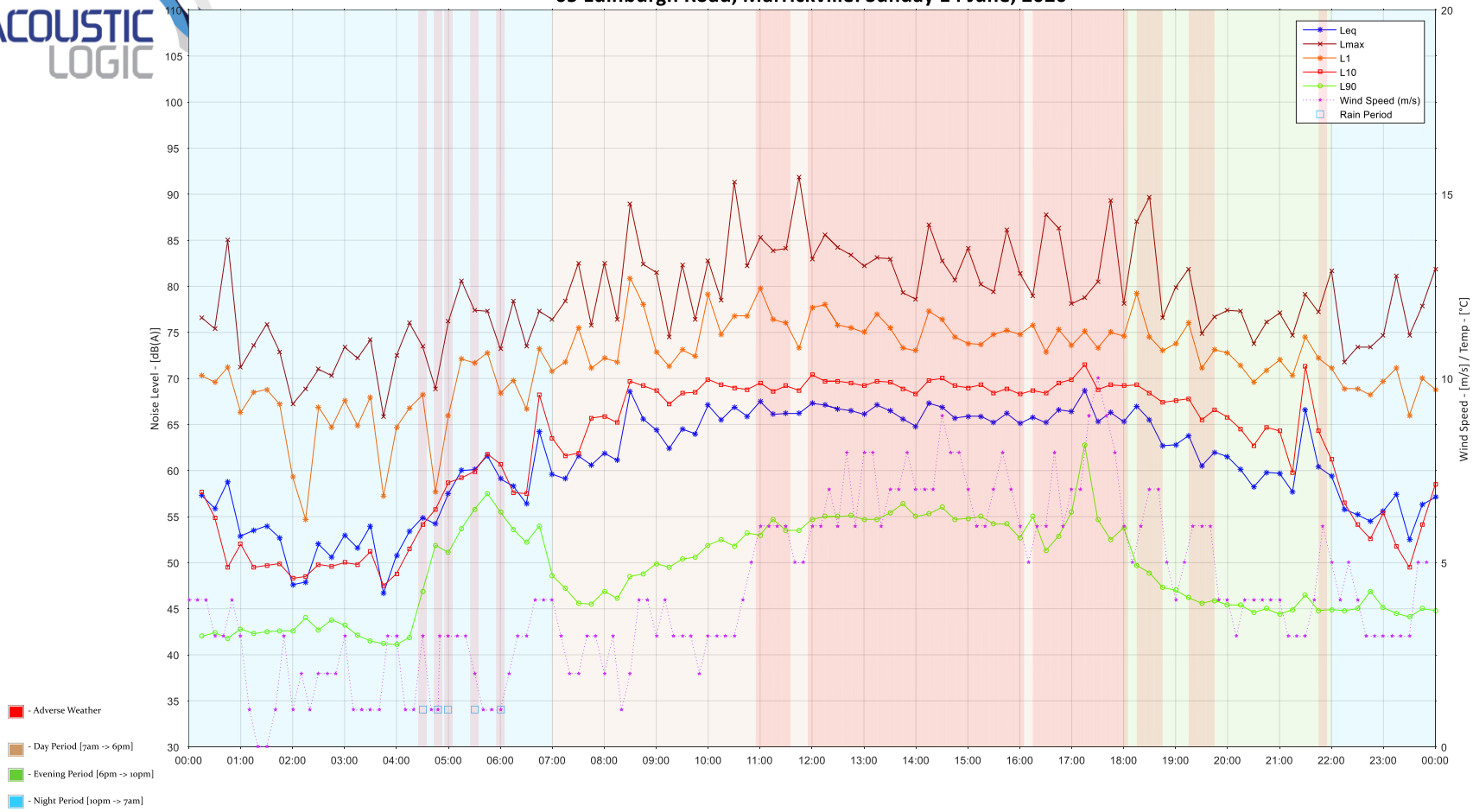


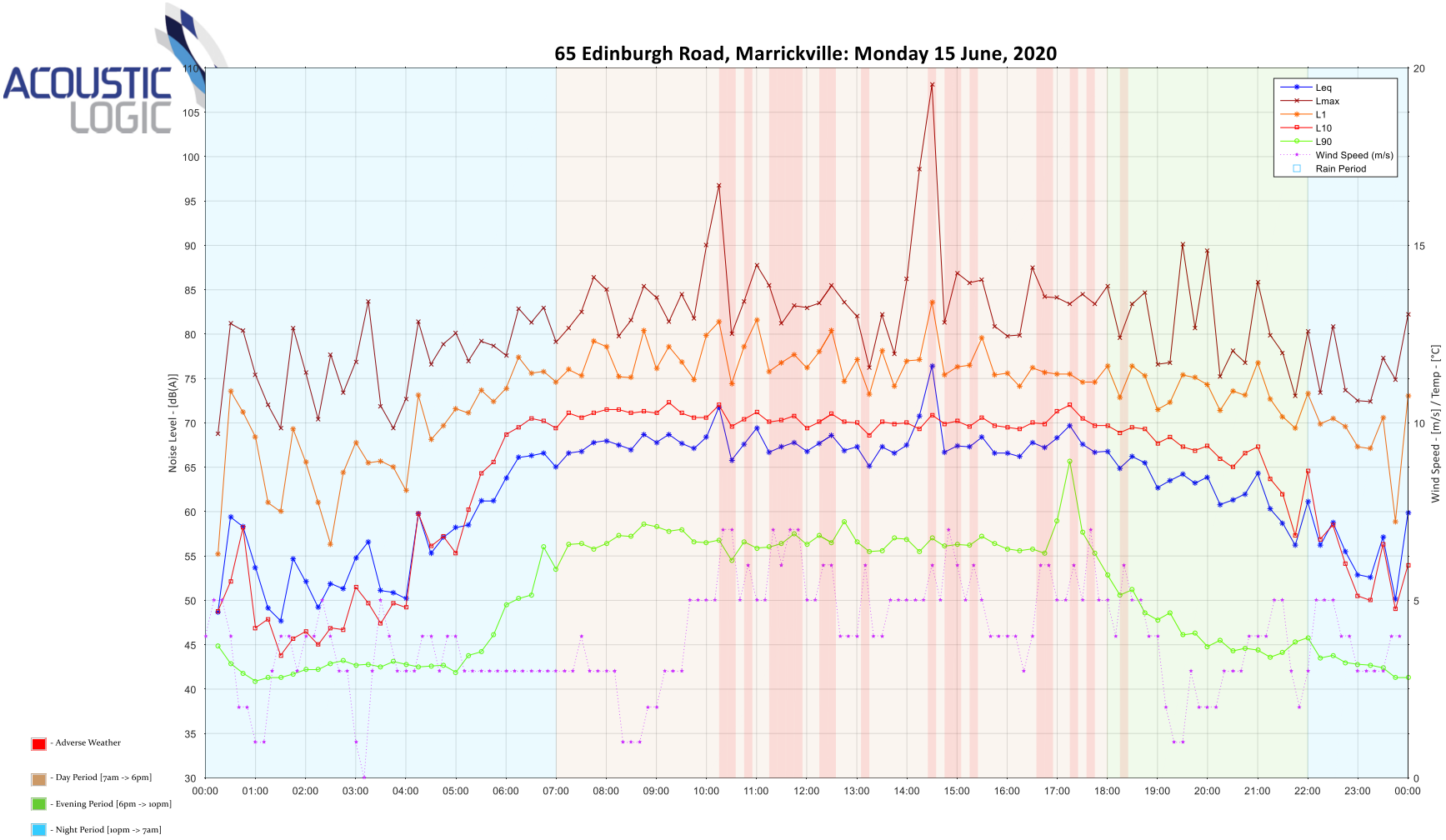

65 Edinburgh Road, Marrickville: Thursday 11 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

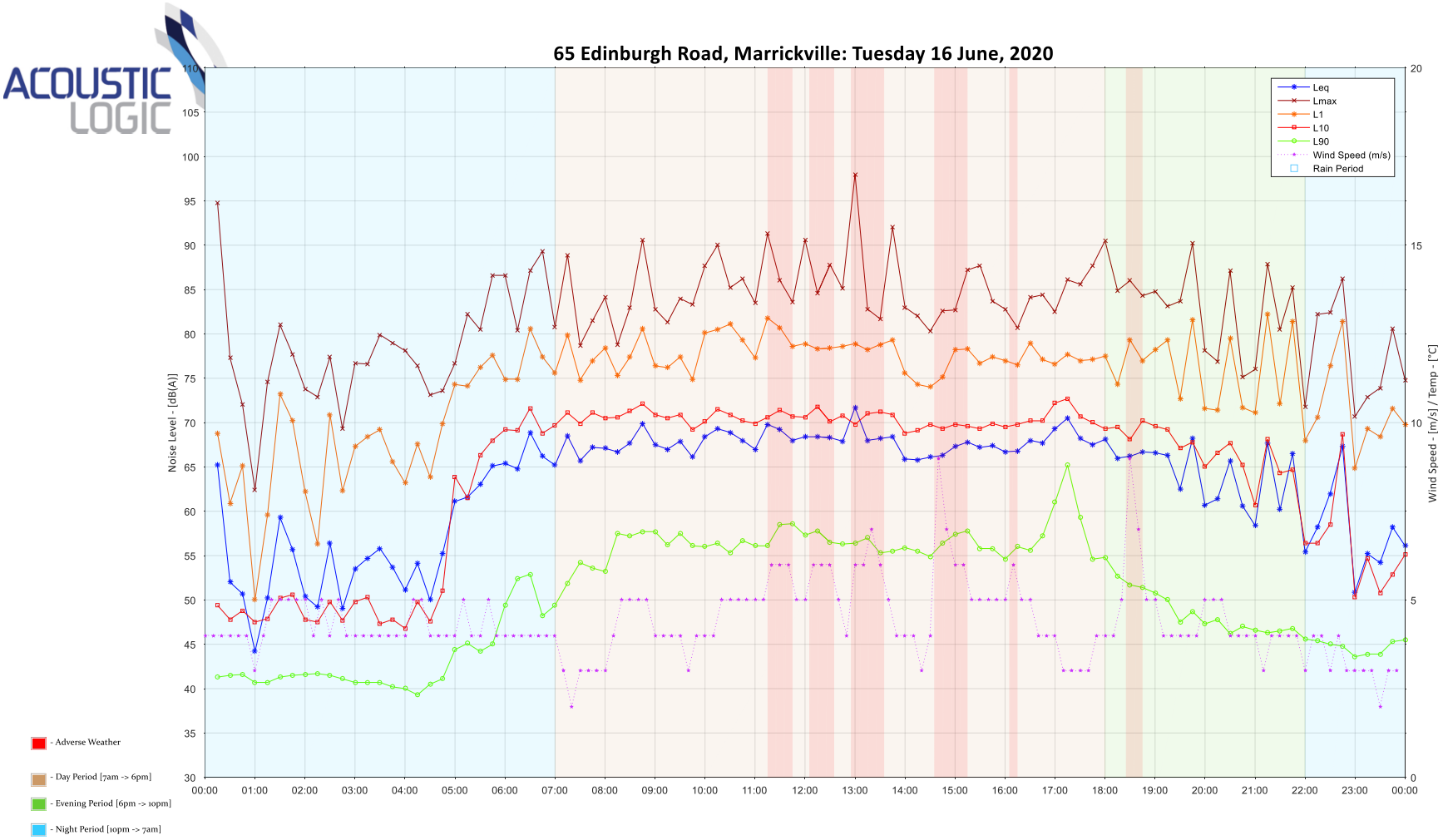

65 Edinburgh Road, Marrickville: Friday 12 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

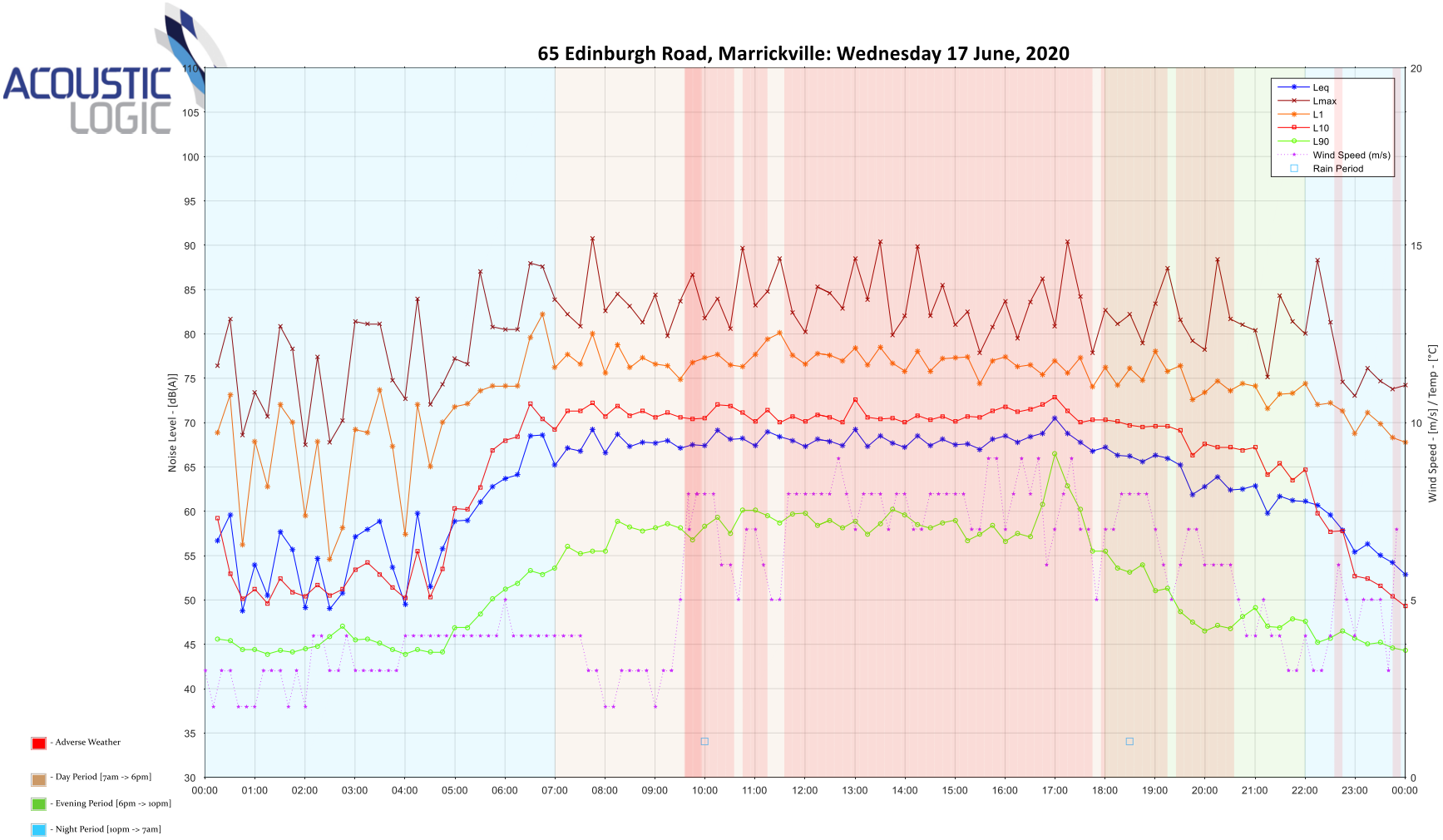

65 Edinburgh Road, Marrickville: Saturday 13 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

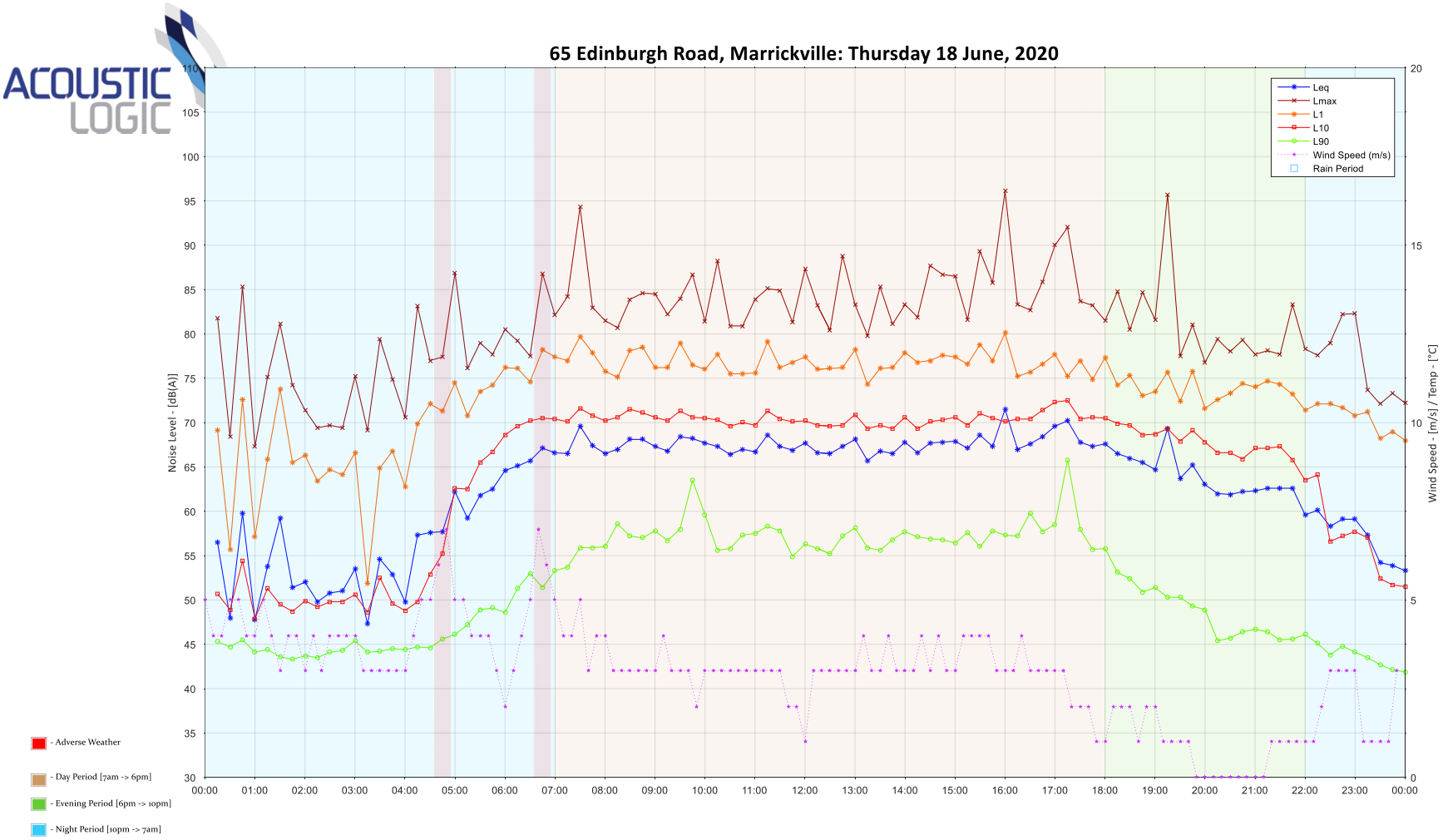
65 Edinburgh Road, Marrickville: Sunday 14 June, 2020

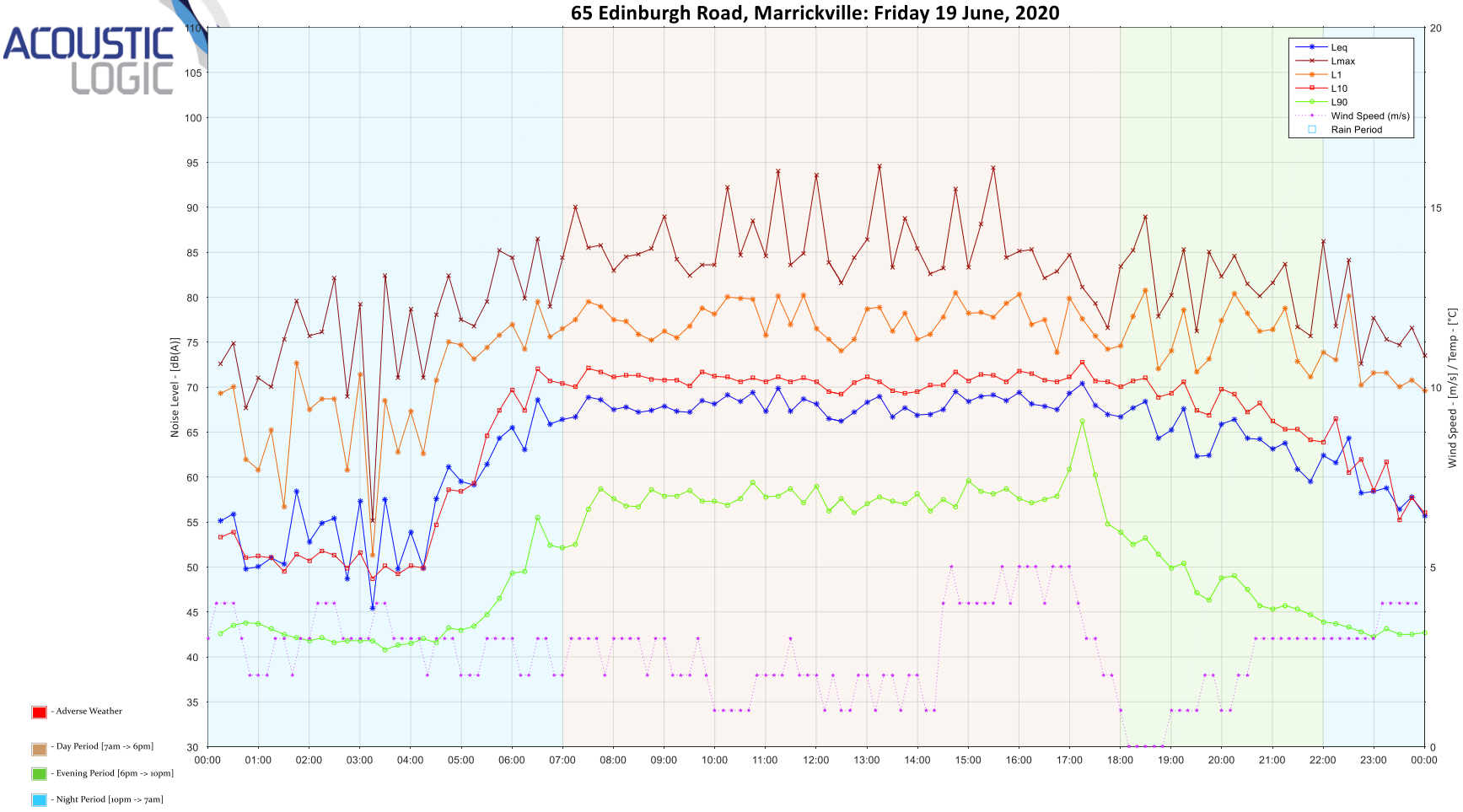



65 Edinburgh Road, Marrickville: Monday 15 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

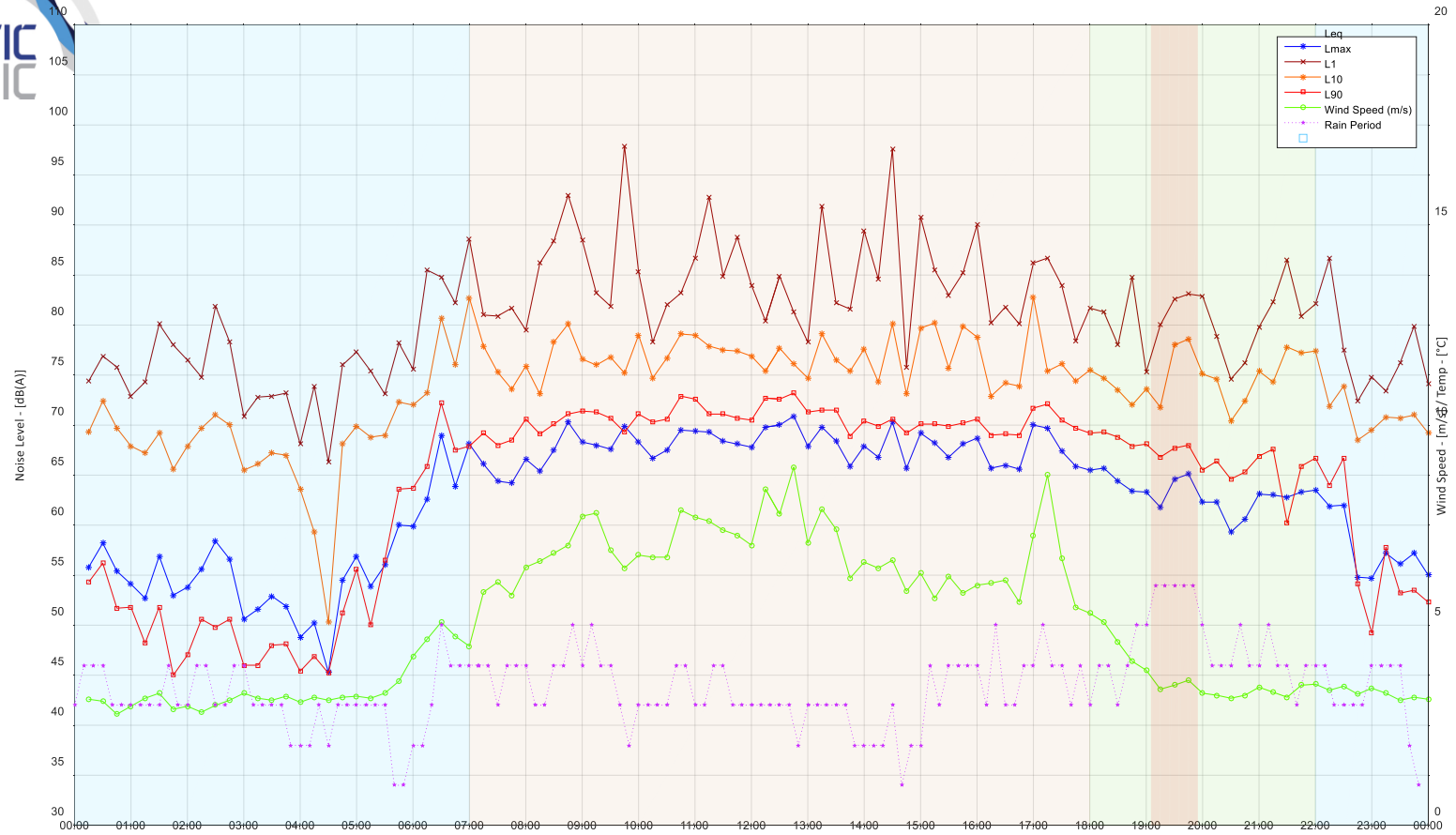

65 Edinburgh Road, Marrickville: Tuesday 16 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

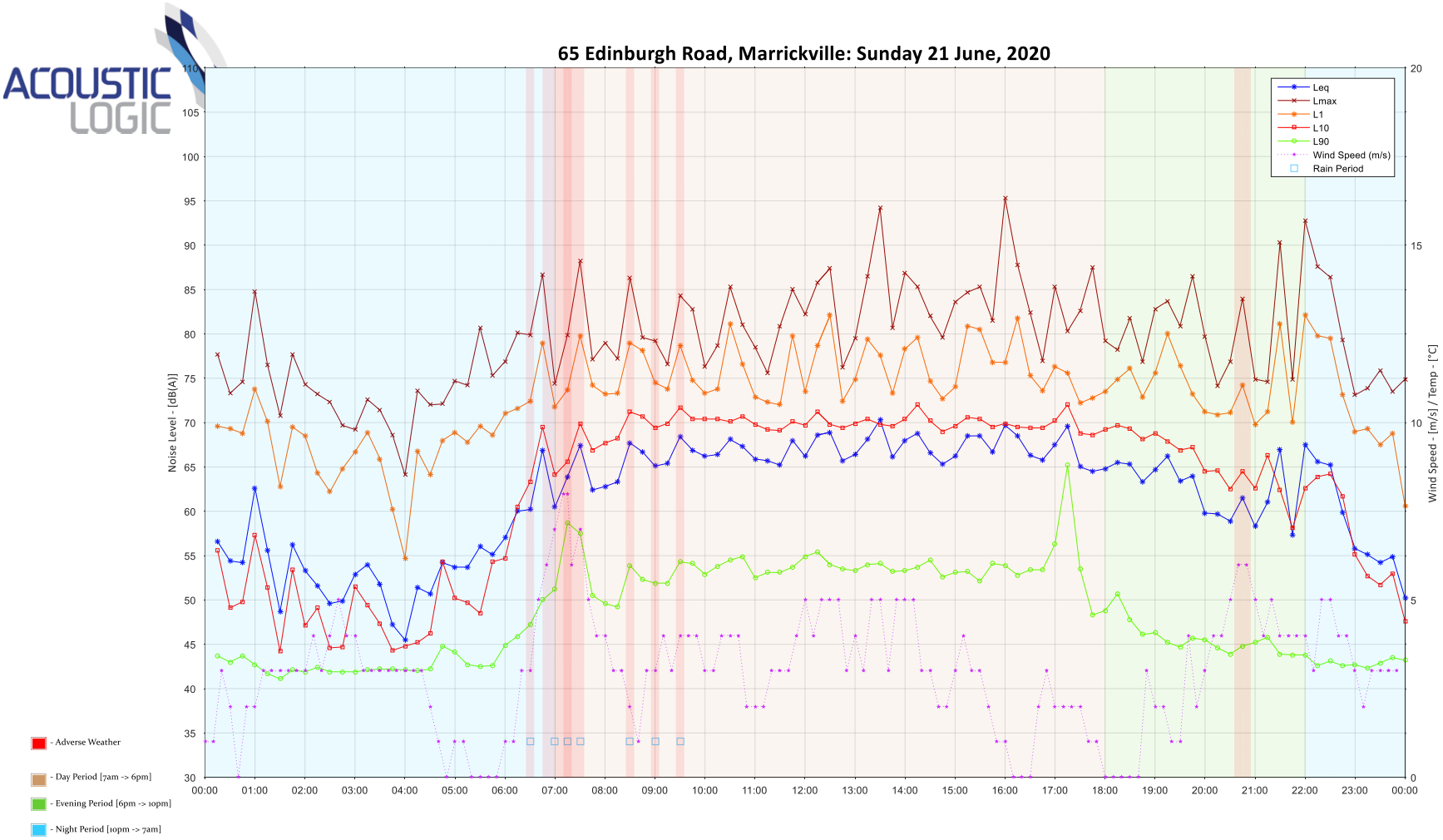

65 Edinburgh Road, Marrickville: Wednesday 17 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

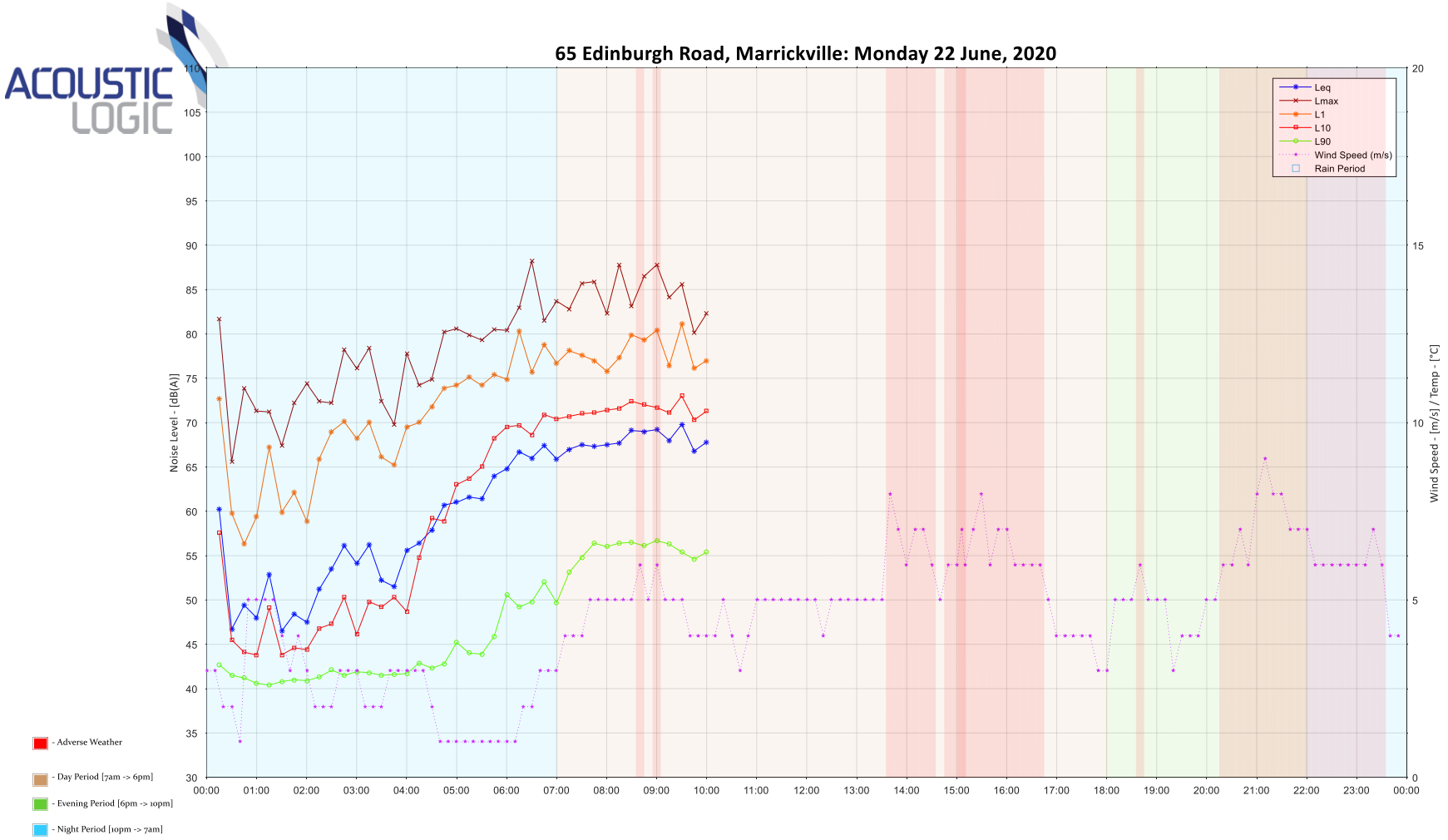

65 Edinburgh Road, Marrickville: Thursday 18 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


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
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]