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TABLE OF CONTENTS

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 11-13 Percy Street, Auburn.

In accordance with the SEARs issued for SSD 10470, this document addresses noise impacts associated with the following:

- Noise intrusion to project site from adjacent roadways; and
- 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.

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

- Cumberland City Council Advice Letter dated 25th June 2020;
- Cumberland City Council – '*Auburn Development Control Plan 2010';*
- NSW Planning SEARs document (Ref: SSD-10470) dated 30th June 2020;
- Australian Standard AS2107:2016 – '*Recommended Design Sound Levels and Reverberation Times for Building Interiors*'; and
- 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 (project no. 11250) dated 27/05/2020 for D.A Submission.

2 SITE DESCRIPTION

The proposed development comprises of two floors of industrial warehouse, a commercial suite, a two-storey carpark and a loading dock area.

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 west along St Hillers Road;
- Existing Industrial receivers to the east and west along St Hillers Road and Boorea Street; and
- Existing commercial receivers to the north, south and east along Percy Street and St Hillers Road.

The nearest noise receivers around the site include:

- **R1**: Residential Receiver 1 – Multi storey residential dwellings to the west and south west at 30-80 St Hillers Road, Auburn.
- **I1:** Industrial Receiver 1 – Multi storey industrial development to the west at 75-81 St Hillers Road, Auburn;
- **I2:** Industrial Receiver 2 – Multi storey industrial development to the east at 42 Boorea Street, Lidcombe;
- **C1:** Commercial Receiver 1 – Multi storey commercial development to the north at 15 Percy Street, Auburn;
- **C2:** Commercial Receiver 2 – Multi storey commercial development to the south at 7-9 Percy Street, Auburn; and
- **C3:** Commercial Receiver 3 – Multi storey commercial development to the south-west at 57-73 St Hillers Road, Auburn and 42-58 Percy Street, Auburn.

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

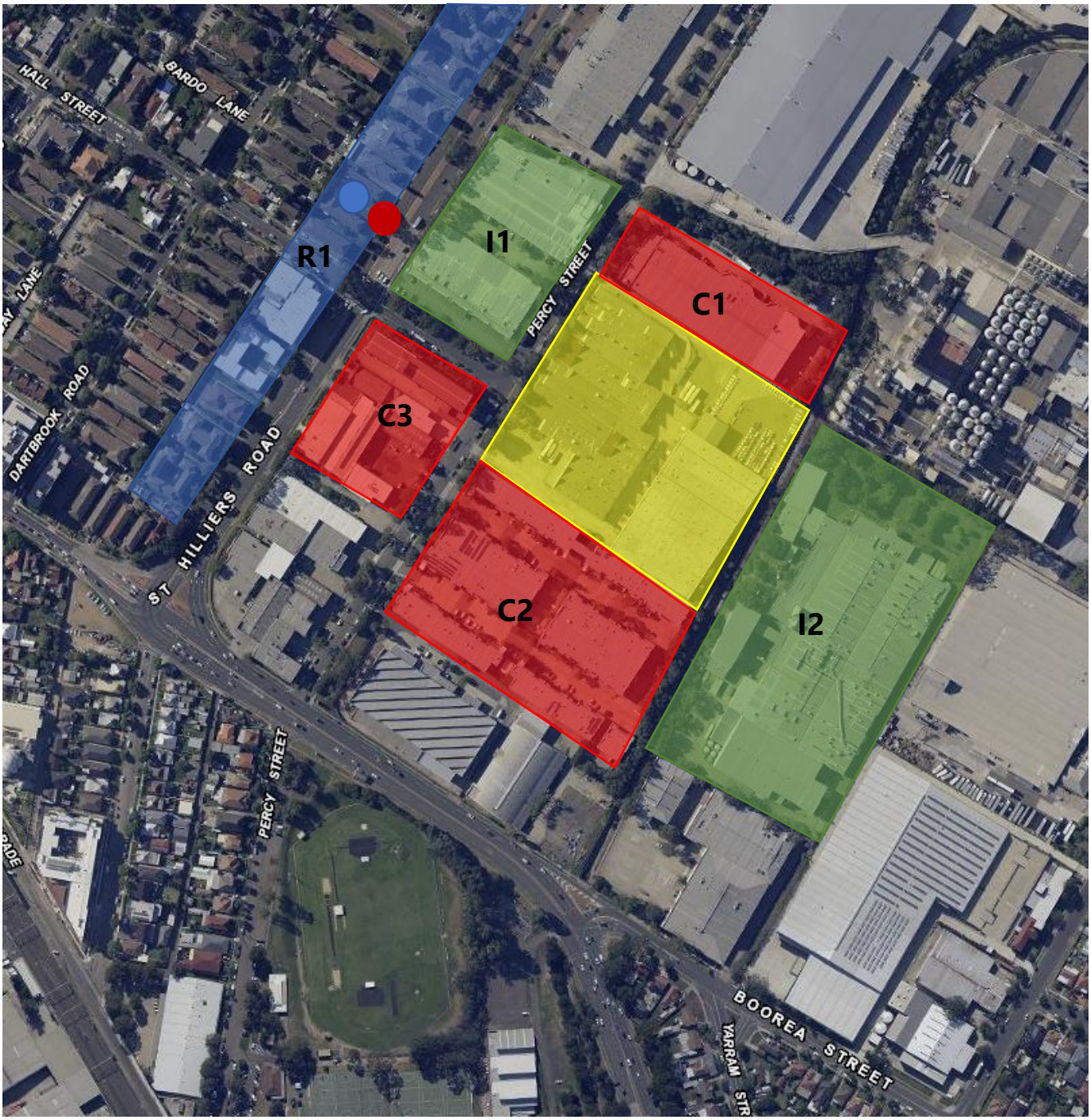


Figure 1 – Project Site
Source: NSW Six Maps

Project Site

Residential Receivers

Industrial Receivers

Commercial Receivers

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.

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

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 MEASUREMENT POSITION

One unattended noise monitor was located on the existing residential site at 56-60 Hillers Road, Auburn.. Refer to Figure 1 for detailed location.

4.2 MEASUREMENT PERIOD

Unattended noise monitoring was conducted from Friday 26th of June 2020 to Friday 10th of July 2020.

4.3 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 1 – Unattended Noise Monitoring.

4.4 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 $dB(A)_{L90(Period)}$
56-60 St Hillers Road, Auburn	Day (7am – 6pm)	60
	Evening (6pm – 10pm)	56
	Night (10pm – 7am)	46

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 project site are from traffic movements along St Hillers Road, to the western 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;

- Cumberland City Council – '*Auburn Development Control Plan 2010*';
- Australian Standard AS2107:2016 – '*Recommended Design Sound Levels and Reverberation Times for Building Interiors.*'

5.1.1 Cumberland City Council – 'Auburn Development Control Plan 2010'

The Auburn Development Control Plan 2010 does not provide any specific criteria for noise intrusion into industrial or commercial dwellings. Therefore AS/NZS 2107:2016 will be adopted for the purposes of established noise intrusion criterion.

5.1.2 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 industrial 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 5-1 – Recommended Design Sound Levels

Space /Activity Type	Recommended Design Sound Levels
General Industrial Areas/ Warehouse	<60 dB(A)$L_{eq(when\ in\ use)}$
Private offices/Board and Conference Rooms	30-40 dB(A)$L_{eq(when\ in\ use)}$
General Office Areas	45-50 dB(A)$L_{eq(when\ in\ use)}$
Lunchrooms/break rooms	40-50 dB(A)$L_{eq(when\ in\ use)}$

5.1.3 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 5-2 – Adopted Internal Noise Levels

Space / Activity Type	Required Internal Noise Level
General Industrial Areas/ Warehouse	60 dB(A)$L_{eq(when\ in\ use)}$
Private offices/Board and Conference Rooms	40 dB(A)$L_{eq(when\ in\ use)}$
General Office Areas	50 dB(A)$L_{eq(when\ in\ use)}$
Lunchrooms/break rooms	50 dB(A)$L_{eq(when\ in\ use)}$

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

Attended measurements were taken at 56-60 Hillers Road west of project site. The Sound level meter had an unobstructed view of traffic and was approximately 8m from the kerb. Refer to Figure 1 for detailed location.

5.2.3 Measurement Period

Attended noise measurements were undertaken between the hours of 4:00pm and 5:00pm on Friday 10th of June 2020.

5.2.4 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 5-3 – Measured Traffic Noise Levels

Location	Time of Day	Noise Level – L_{eq}
56-60 Hillers Road, Auburn	Daytime 7am – 10pm	73 dB(A) $L_{eq\ (worst\ 1hr)}$, 72 dB(A) $L_{eq\ (15hr)}$
	Night Time 10pm – 7am	73 dB(A) $L_{eq\ (worst\ 1hr)}$, 69 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 5-4.

Table 5-4 - Recommended Glazing Construction

Room	Glazing Thickness	Acoustic Seals
CFC Ground Office/Traffic Office	6mm Float	Yes
Driver breakroom	4mm Float	Yes
Open planned office areas L1 facing Percy Street and Boorea Street	6mm Float	Yes
Private offices/ Board and Conference Rooms L1 facing Percy Street	6mm Float	Yes
Private offices/ Board and Conference Rooms L1 facing Boorea Street	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 5-5 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 5-5 - Minimum R_w of Glazing Assembly (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
10.38mm Laminated	35
10mm Float	33
6mm Float	29
4mm Float	27

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 light wight elements, therefore; acoustic upgrading is required as per the below table.

Table 5-3 – External Light Weight Roof Construction

Space	Internal Lining	Truss System	External Lining
Private offices/ Board and Conference Rooms L1	2x16mm plasterboard	Minimum of 250mm truss with 75mm thick 11kg/m^3 glasswool insulation in cavity	0.56mm Metal Deck Roof
Open planned office areas L1	1x16mm plasterboard		
WC	1x10mm plasterboard		
Warehouse areas	1x10mm plasterboard		

In the event that any penetrations are required through the external skin, an acoustic sealant should be used to minimise all gaps.

5.3.3 External Wall Construction

The proposed external walls will be constructed from lightweight elements, these walls will require acoustic upgrading as per the below table. There should not be vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed.

Table 5-6 – External Light Weight Wall Construction

Area	Material
Open planned office areas (L1)	9mm fibre cement, 90mm stud with 75mm thick 11kg/m^3 glasswool insulation, 1x16mm plasterboard
Private Offices (Ground and L1)	9mm fibre cement, 90mm stud with 75mm thick 11kg/m^3 glasswool insulation, 2x16mm plasterboard
Lunchroom/ Break rooms	9mm fibre cement, 90mm stud with 75mm thick 11kg/m^3 glasswool insulation, 1x10mm plasterboard
Industrial/ Warehouse areas	0.5mm Metal Deck

6 NOISE EMISSION CRITERIA

The noise emission from the project site shall comply with the requirements of the following documents;

- Cumberland City Council Advice Letter dated 25th June 2020;
- NSW Planning SEARs document (Ref: SSD-10470) dated 30th June 2020;
- Cumberland City Council – *'Auburn Development Control Plan 2010';* and
- NSW Department of Environment and Heritage, Environmental Protection Agency document – Noise Policy for Industry (NPI) 2017.

6.1 CUMBERLAND CITY COUNCIL ADVICE LETTER

Part 9 of the Cumberland City Council Advice Letter dated 25th June 2020 states the following in regard to noise emissions from the proposed site:

> 9. **Assessment of the cumulative noise impact from 24/7 operation of the facility including mechanical plant, vehicle/truck movements within site, delivery and receiving docks, and contribution to traffic noise on nearby roads from increased vehicle movements to and from the site will need to be undertaken. The assessment should be included in the EIS.**

6.2 NSW PLANNING SEARS DOCUMENT (REF: SSD-10470)

Part 9 of the NSW Planning Secretary's Environmental Assessment Requirements (Application SSD-10470) dated 30th June 2020 states the following in regard to noise emissions from the proposed site:

> 9. **Noise and Vibration** – including:
>
> · a description of all potential noise and vibration sources during the construction and operational phases of the development, including on and off-site traffic noise
>
> · a cumulative noise impact assessment of all potential noise sources in accordance with relevant Environment Protection Authority guidelines
>
> · details of noise mitigation, management and monitoring measures.

6.3 AUBURN DEVELOPMENT CONTROL PLAN 2010

The Cumberland City Council – '*Auburn Development Control Plan 2010*' details the following criterion regarding noise emissions from an industrial site:

8.2 Noise

Performance criteria

P1 Development minimises the possibility of noise to the occupants of adjoining or neighbouring dwellings. The use of premises, any plant, equipment and building services associated with a premise does not create an offensive noise or add significantly to the background noise level of a locality.

P2 Where practicable, sources of noise such as garbage collection, machinery, parking areas and air conditioning plants are sited away from adjoining properties and, where necessary screened by walls or other acoustical treatment.

Development controls

D1 All development applications for potential noise generating industries adjacent to residential zoned land shall be accompanied by relevant documentation from a qualified acoustic engineer. The documentation shall also comply with the relevant Acts, Regulations, Australian Standards and guidelines by the NSW Department of Environment, Climate Change and Water (DECCW) below, as applicable for noise, vibration and quality assurance.

- NSW Industrial Noise Policy
- Interim Construction Noise Guideline
- Noise from Rail Infrastructure Projects
- Environmental Criteria for Road Traffic Noise.

As the Auburn Development Control Plan 2010 does not specify any quantitative noise emission data, the NSW EPA Noise Policy for Industry (NPI) 2017 will be adopted.

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 6-1.

Table 6-1 – 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

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 6-2 – Sleep Arousal Criteria for Residential Receivers

Receiver	Rating Background Noise Level (Night) dB(A)L_{90}	Emergence Level
Residences Surrounding Site Night (10pm – 7am)	46 dB(A) L_{90}	51 dB(A)$L_{eq, 15min}$; 61 dB(A)L_{Fmax}

6.5 SUMMARISED NOISE EMISSION CRITERIA

Table 6-3 – 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	60	**58**	65	N/A
Evening	56	**48**	61	N/A
Night	46	**43**	51	**51 dB(A)$L_{eq, 15min}$; 61 dB(A)L_{Fmax}**

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

Table 6-4 – 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

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. It should be noted that the closest noise affected receivers are commercial blocks located along the northern and southern boundaries of the site at **C1** and **C2**.

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

7.2 NOISE EMISSIONS FROM THE 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: 11555/3, dated September 2020). The traffic report gives an estimated 160 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 **R1.**

It is noted that the carpark is unlikely to be used during the night time period, this decrease is expected to be approximately less than 50%. A conservative prediction of 80 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 dB(A)$L_{eq(15\ min)}$
Car Door Slamming	96 dB(A)L_{Max}
Car Starting	91 dB(A)L_{Max}

7.3 NOISE EMISSIONS FROM THE 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.

In predicting noise emissions emanating from the loading dock servicing the development, the following assumptions have been made with reference to the submitted traffic report provided by Colston Budd Rogers & Kafes Pty Ltd (ref: 11555/3, dated September 2020):

- A sound power level of 105 dB(A) has been adopted for all heavy vehicle movements (typically travelling at 10km/h) with a 5 dB tonality penalty (see Factsheet C of the Noise Policy for Industry) for a reverse beacon, typical of large articulated vehicles. This noise emission level has been obtained from noise measurements carried out at a similar loading dock facility. Noise measurements were obtained using a Norsonics Nor118 sound level analyser, set to fast response. The sound level analyser was calibrated before and after the measurements using a Rion NC-73 calibrator with no significant drift detected during the measurement; and

- It has been predicted that during a typical day of operation, there will be a 10-15 inbound deliveries per day. Inbound deliveries will be made by semi-trailers up to 20 metres long.

    - During a typical 15-minute period within a peak hour of operation, we have assumed up to 4 inbound or outbound. This corresponds to a maximum of 15 heavy vehicle movements on site in each peak hour period. Based on this we believe this represents an accurate and conservative assumption.

- Given the proposed development is to operate 24 hours, 7 days a week, noise emissions have been assessed to the most stringent criterion for each receiver type.

Average noise emissions from loading dock operation readily comply with the requirements of the NSW EPA Noise Policy for Industry when assessed to the surround sensitive noise receivers at all time periods when the proposed development is operational. Given the proposed development is to operate 24/7, it is recommended that for a large volume deliveries or waste collection, a separate plan of management shall be accompanied (typical of warehouse distribution centre operation), demonstrating how acoustic controls for the site will be implemented to avoid further risk of complaints. This may include the absorptive treatments to the soffits of loading dock areas, scheduling of deliveries and times of operation.

7.4 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 **R1, C1 & I2** and have been summarised below.

Table 7-2 – Predicted Cumulative Noise Levels to Residential Receiver R1

Time Period	Predicted Noise	Criteria	Complies?
Day (7am to 6pm)	<48 dB(A) L_{eq}	58 dB(A) L_{eq}	Yes
Evening (6pm to 10pm)	<38 dB(A) L_{eq}	48 dB(A) $L_{eq,}$	Yes
Night (10pm to 7am)	<33 dB(A) L_{eq}	43 dB(A) $L_{eq,}$	Yes
Sleep disturbance L_{max}	<51 L_{max}	61 dB(A) L_{max}	Yes

Table 7-3 – Predicted Cumulative Noise Levels to Commercial Receiver C1

Receiver	Time Period	Predicted Noise	Criteria	Complies?
C1	When in use	65 dB(A) L_{eq}	65 dB(A) L_{eq}	Yes
C2	When in use	< 55 dB(A) L_{eq}	65 dB(A) L_{eq}	Yes
I1	When in use	< 60 dB(A) L_{eq}	70 dB(A) L_{eq}	Yes
I2	When in use	60 dB(A) L_{eq}	70 dB(A) L_{eq}	Yes

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 and vibration impacts associated with the development to be located at 11-13 Percy Street, Auburn.

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:

- Cumberland City Council – '*Auburn Development Control Plan 2010';*
- 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 from the following documents;

- Cumberland City Council Advice Letter dated 25th June 2020;
- NSW Planning SEARs document (Ref: SSD-10470) dated 30th June 2020;
- Cumberland City Council – '*Auburn Development Control Plan 2010';* and
- 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:

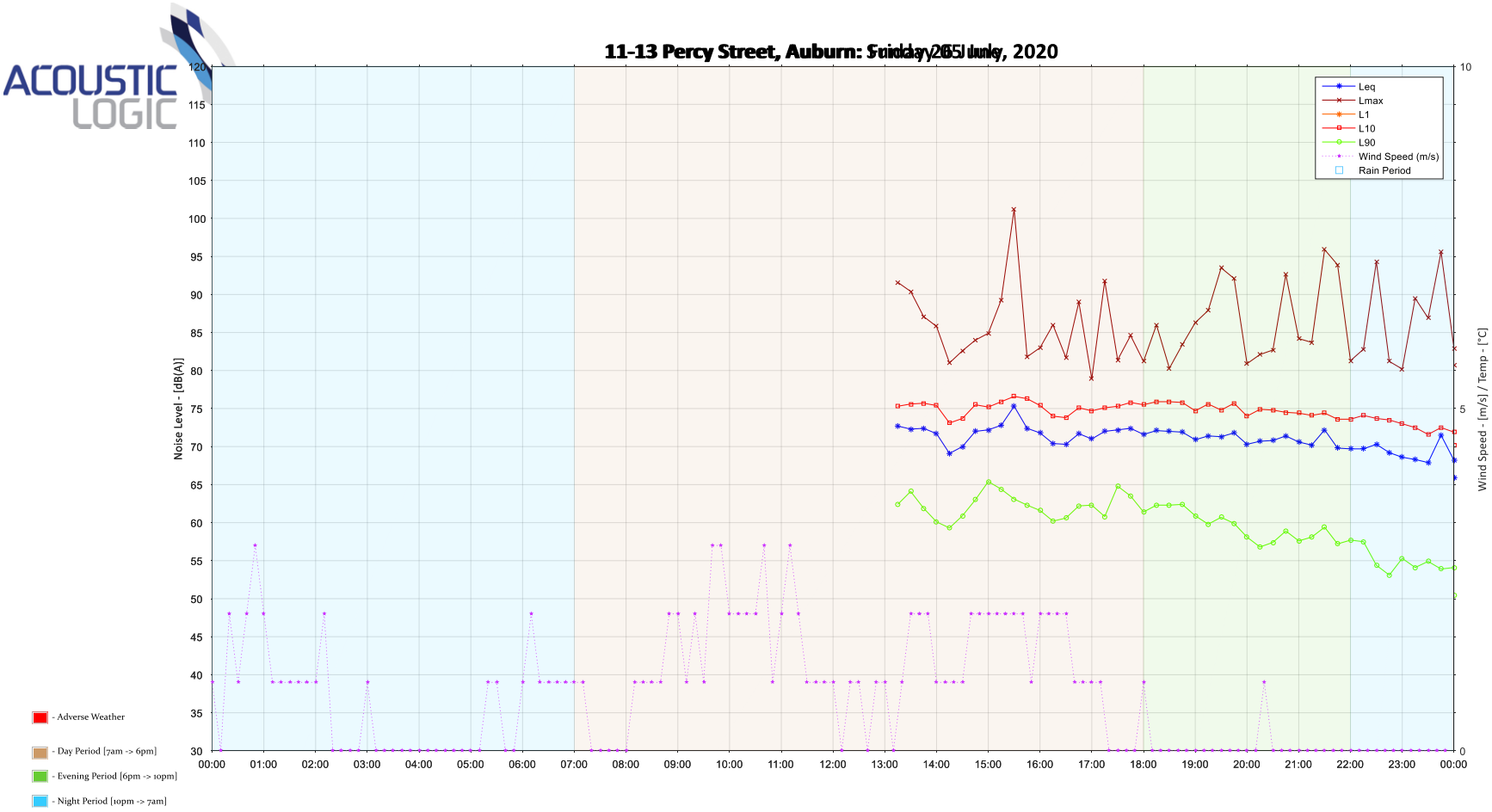
- German Standard DIN 4150-3 (1999-02); and
- NSW EPA document – '*Assessing Vibration – A Technical Guideline.*'

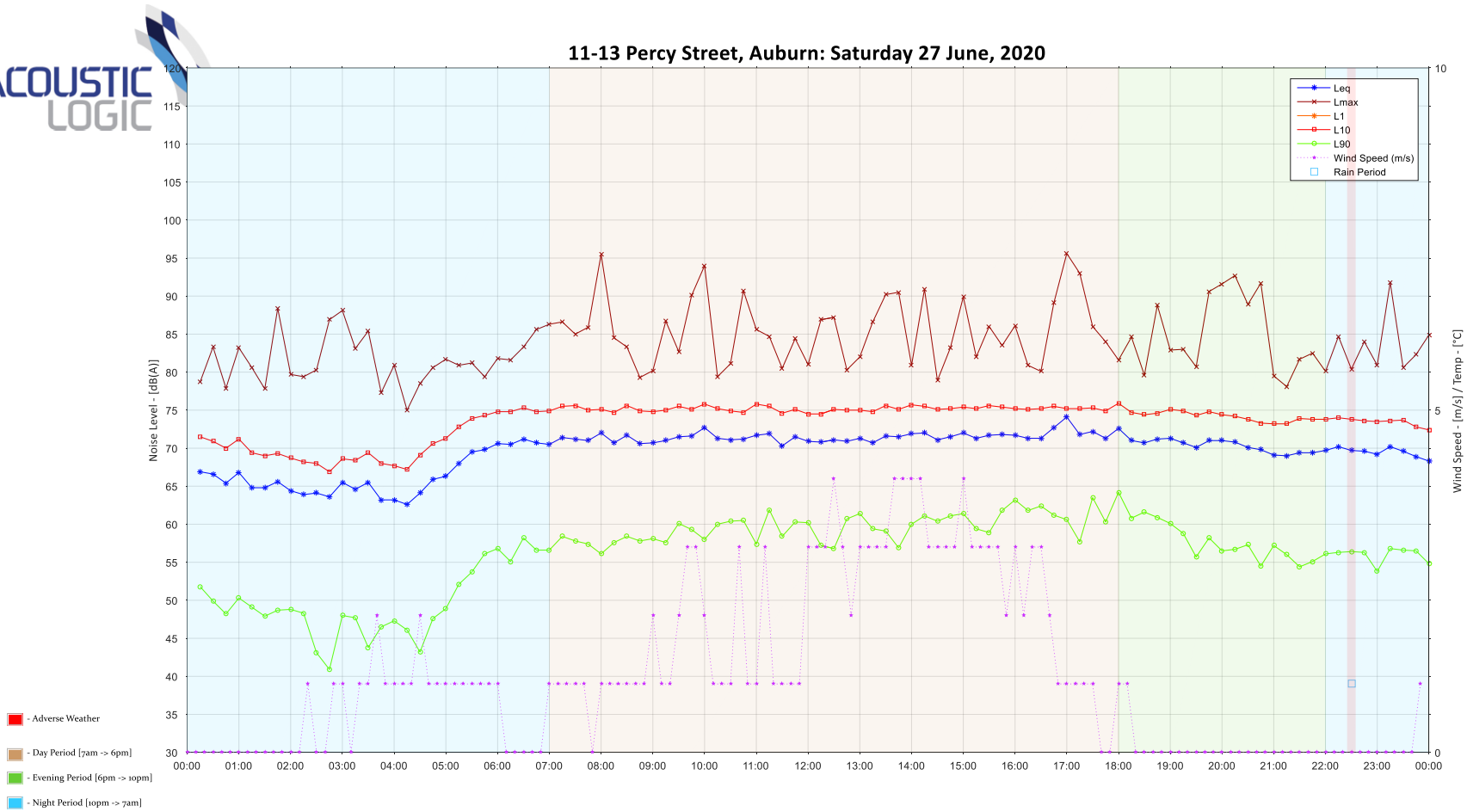
We trust this information is satisfactory. Please contact us should you have any further queries.

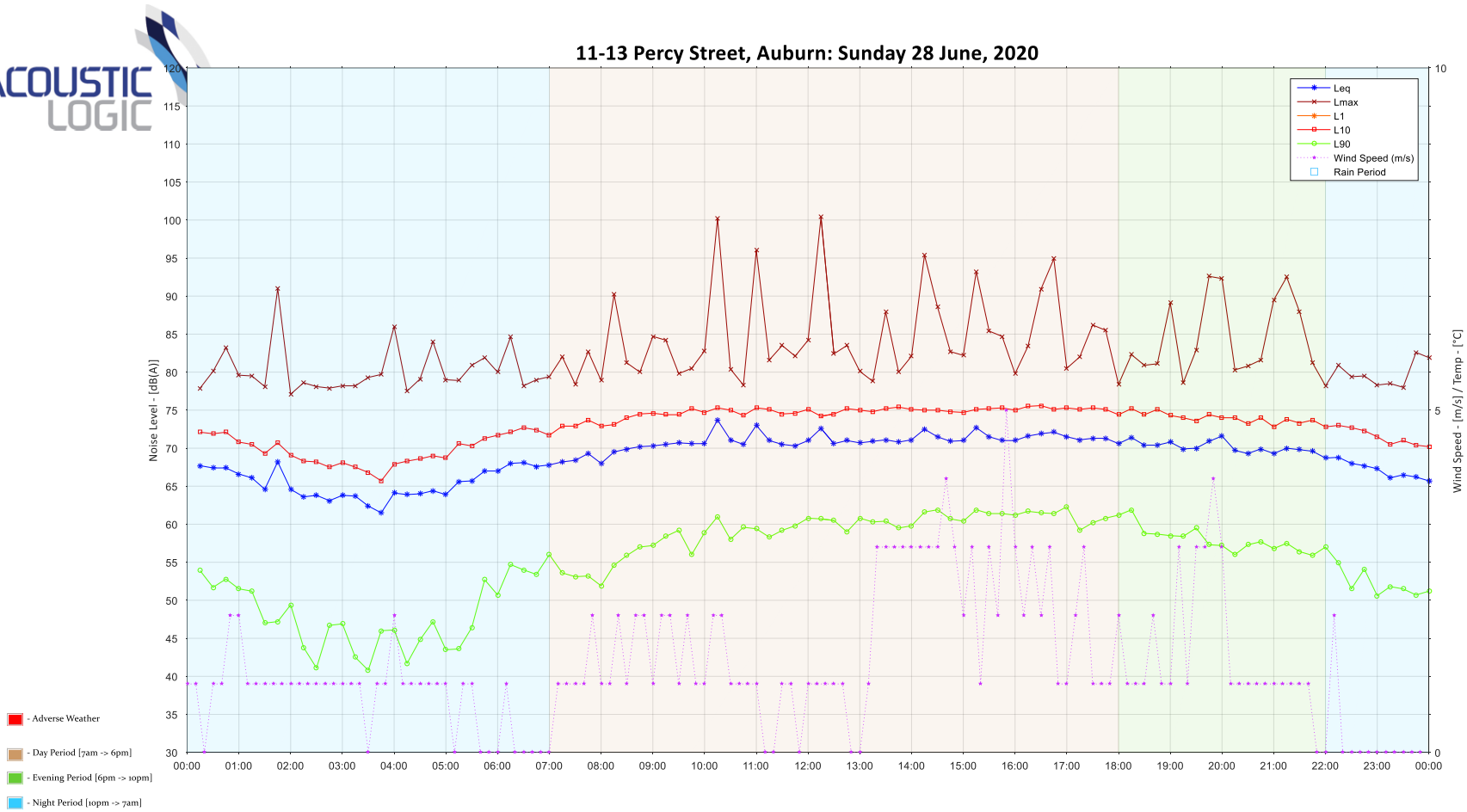
Yours faithfully,

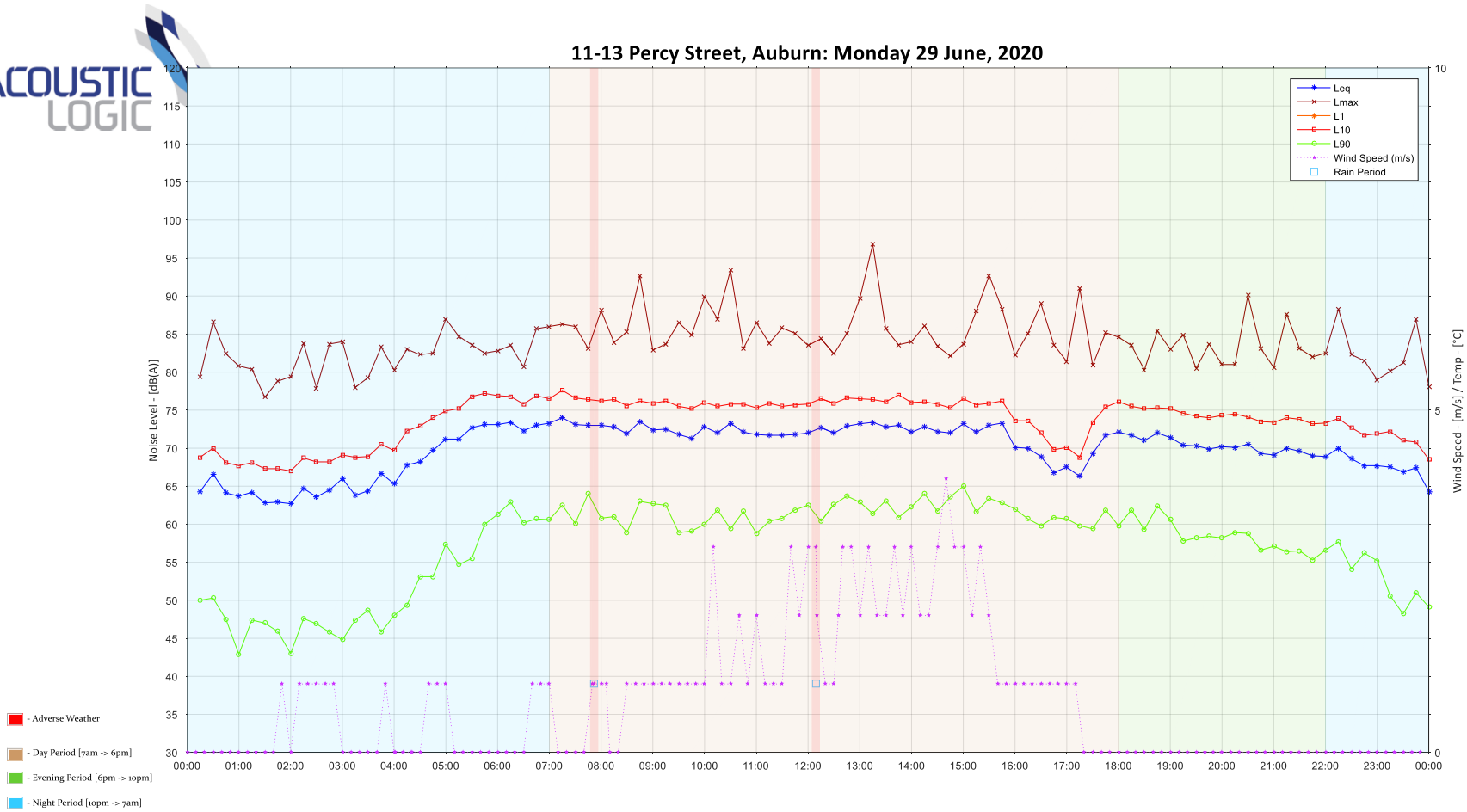
Acoustic Logic Pty Ltd
Lillian Lockett

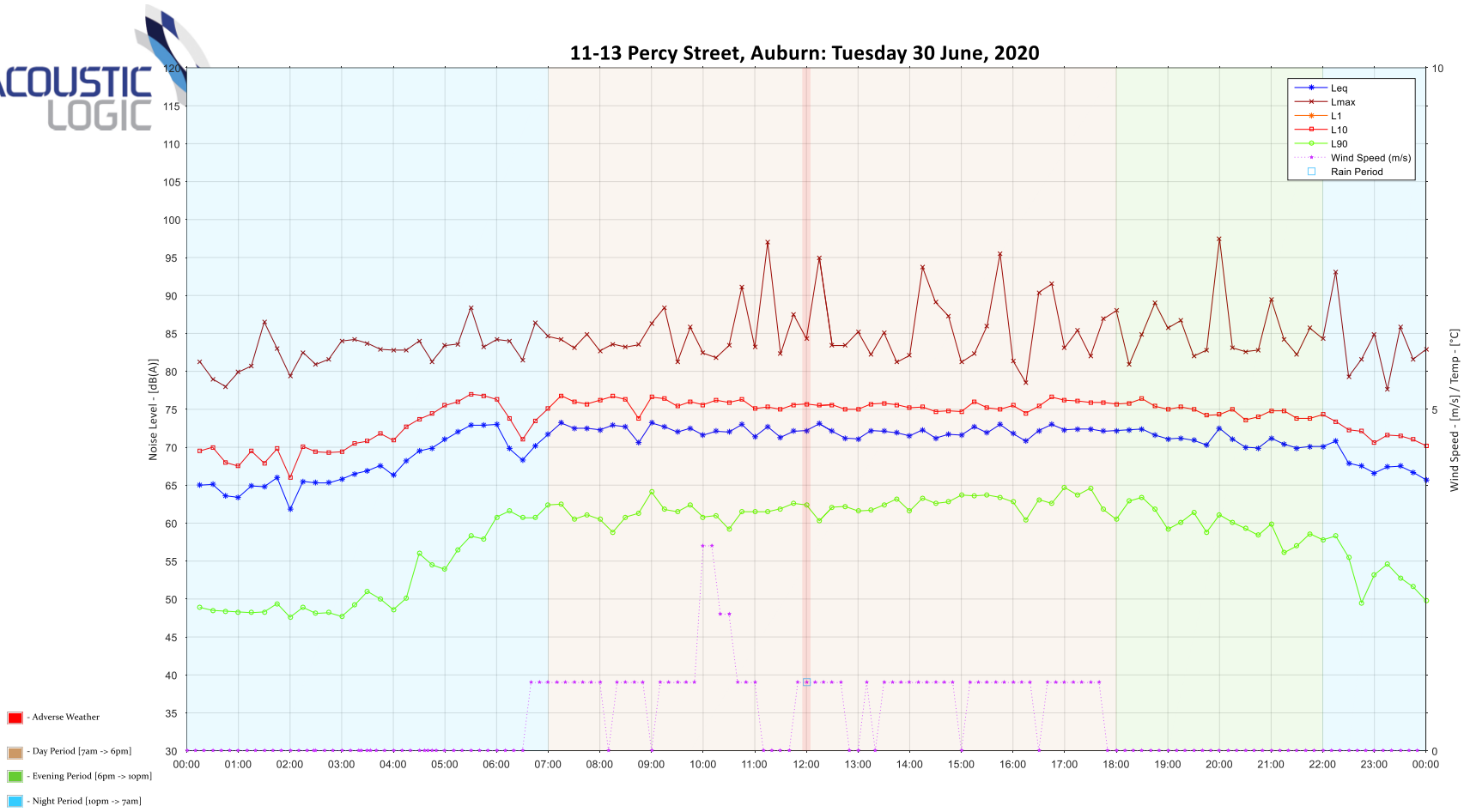
10 APPENDIX 1 – UNATTENDED NOISE MONITORING

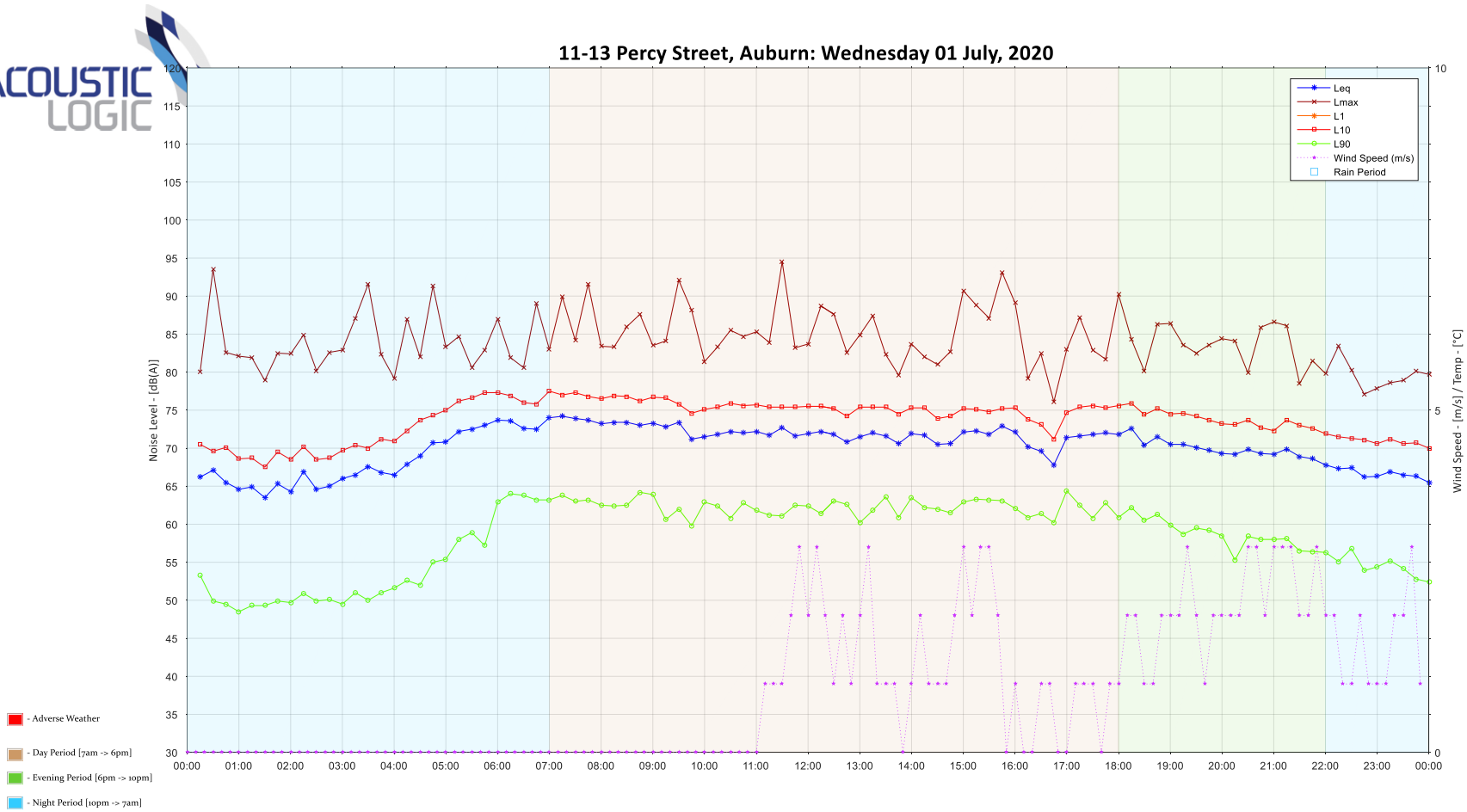

11-13 Percy Street, Auburn: Sunday 05 July, 2020
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

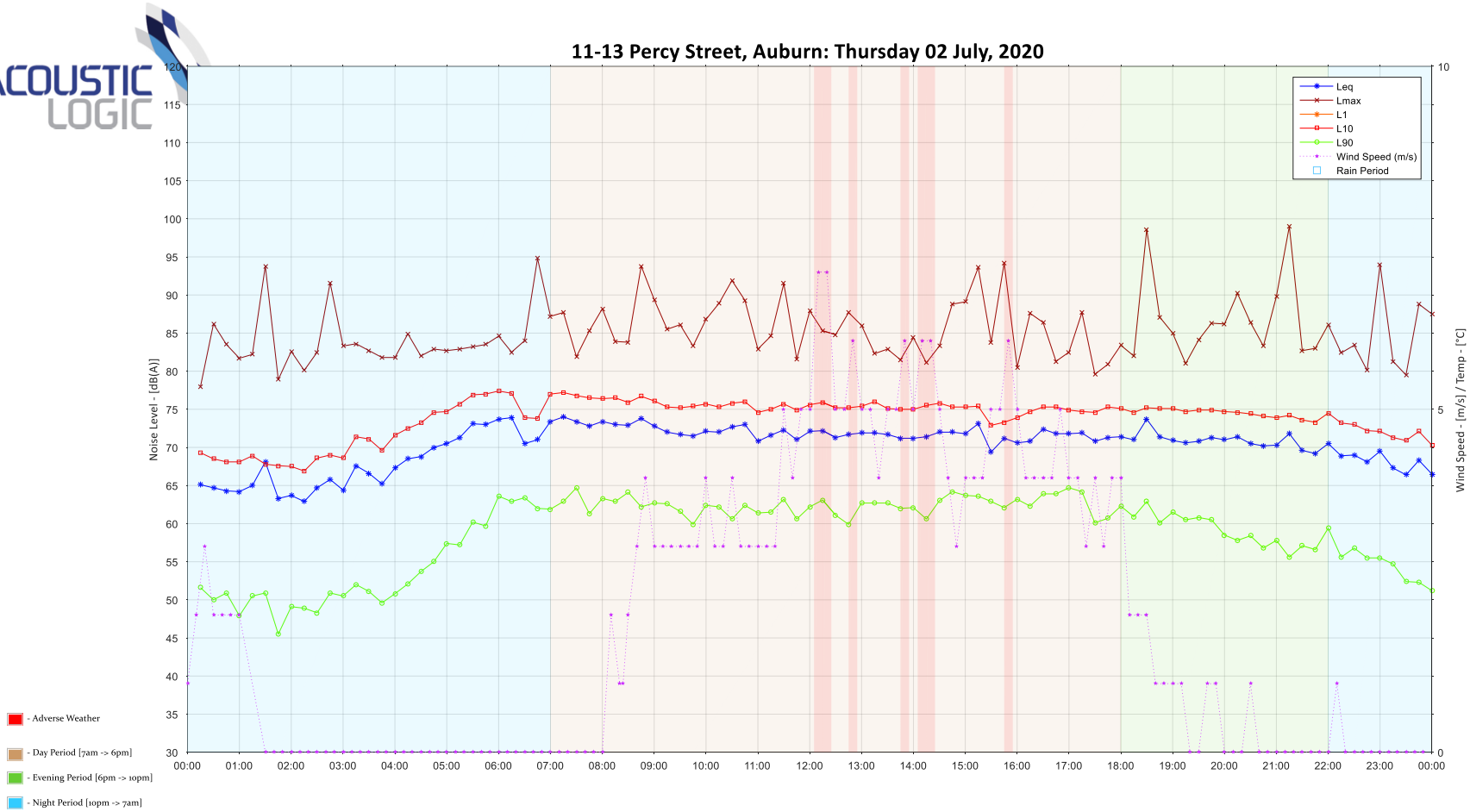

11-13 Percy Street, Auburn: Saturday 27 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


11-13 Percy Street, Auburn: Sunday 28 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]

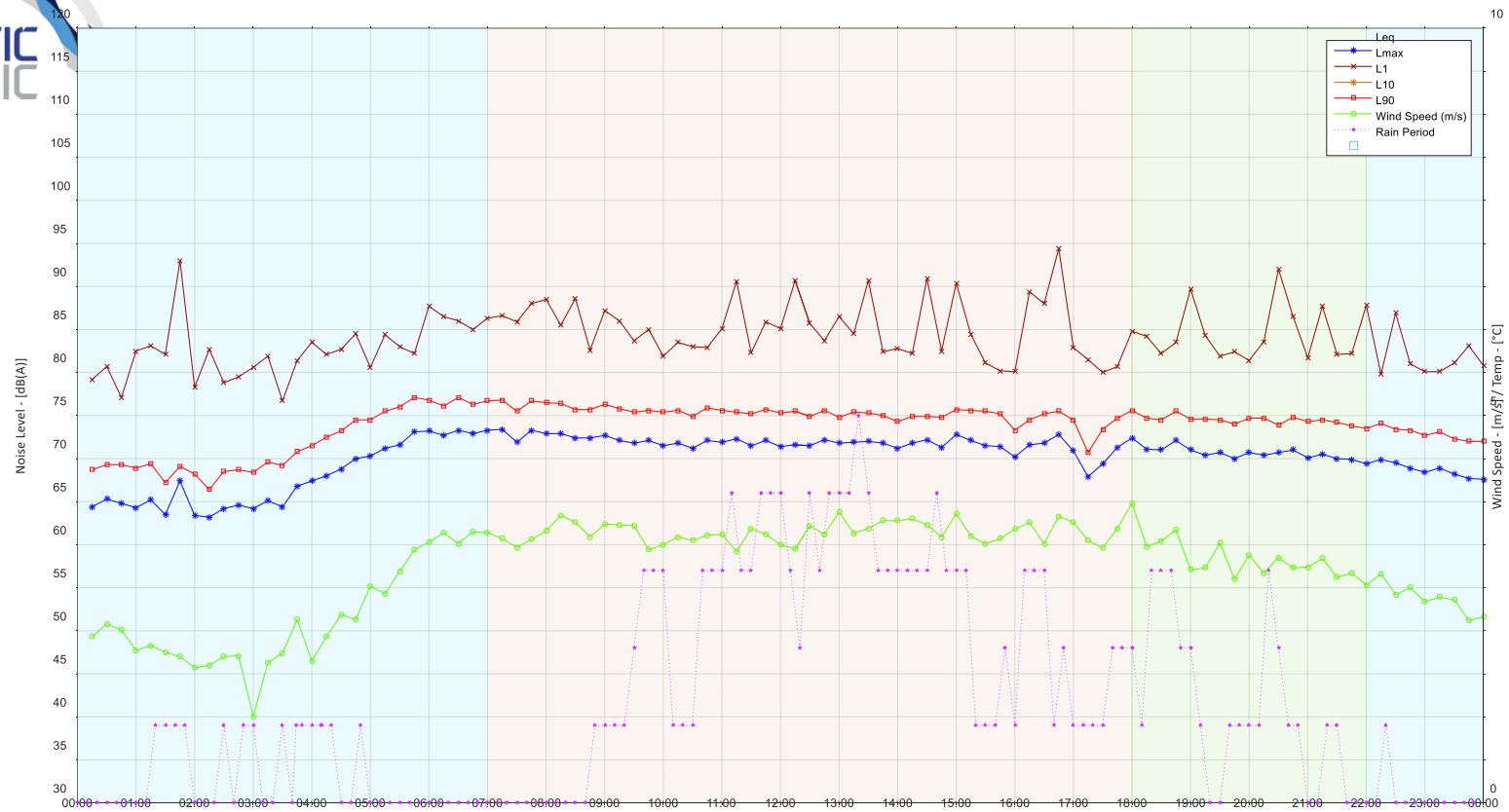

11-13 Percy Street, Auburn: Monday 29 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

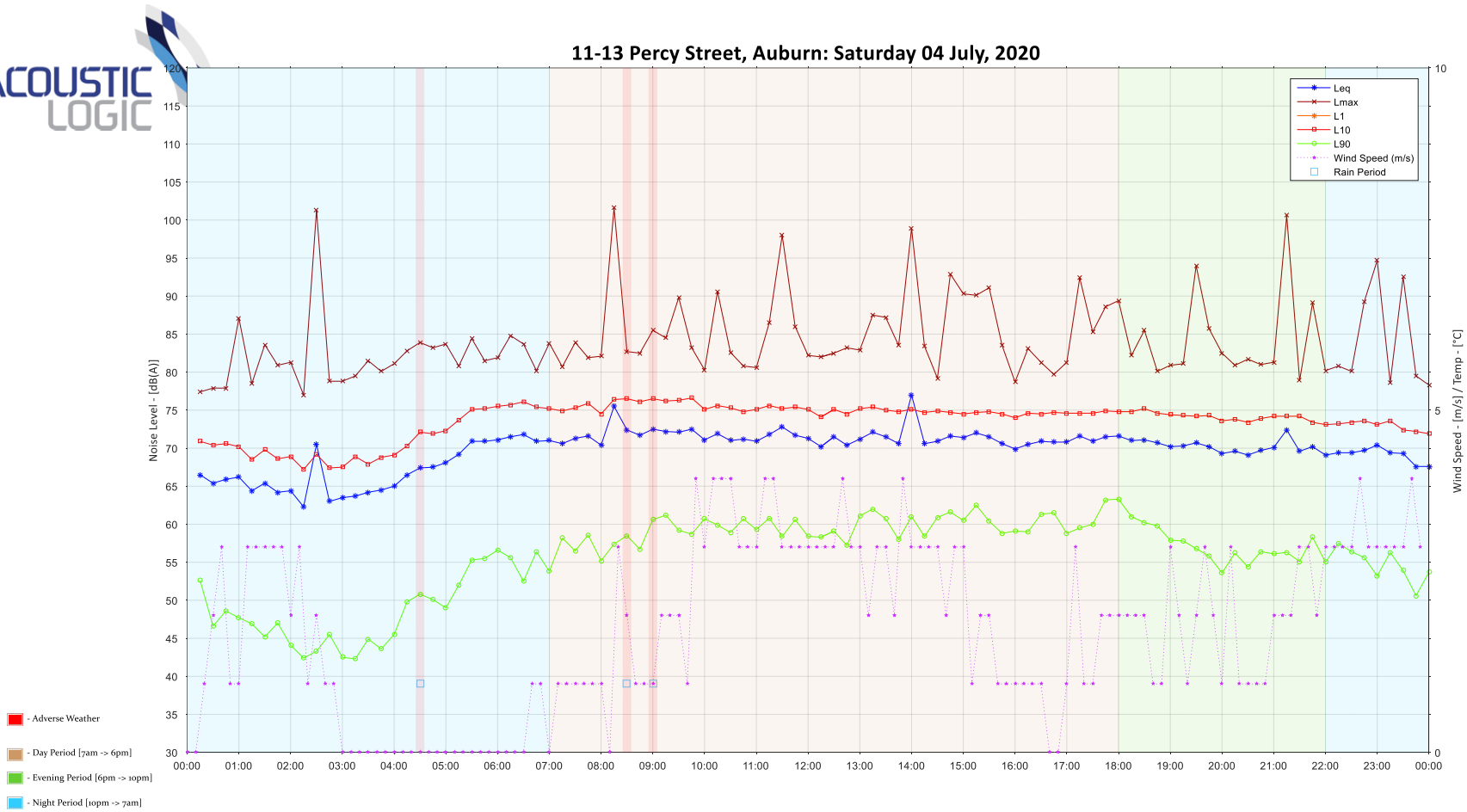

11-13 Percy Street, Auburn: Tuesday 30 June, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

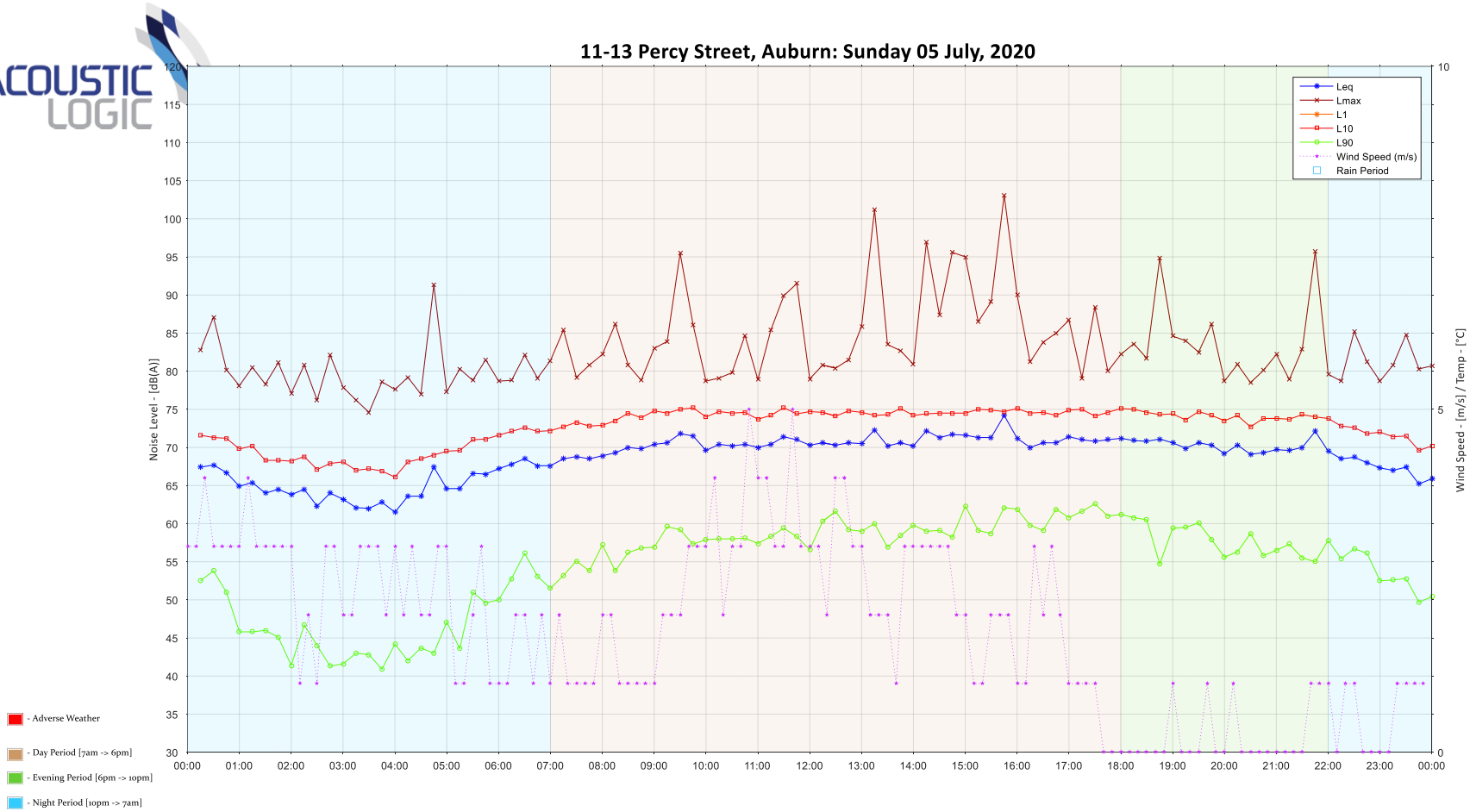

11-13 Percy Street, Auburn: Wednesday 01 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

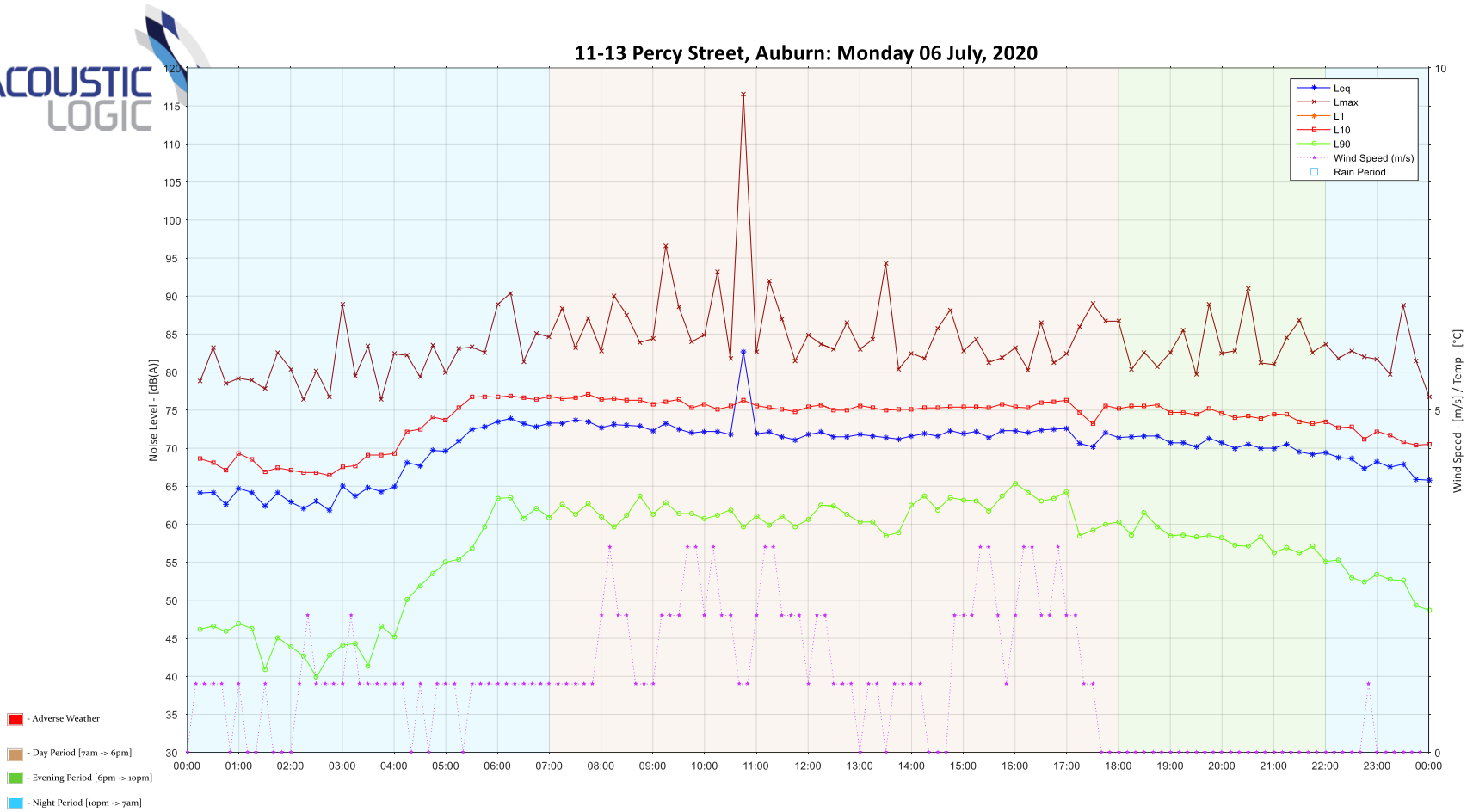

11-13 Percy Street, Auburn: Thursday 02 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

11-13 Percy Street, Auburn: Friday 03 July, 2020

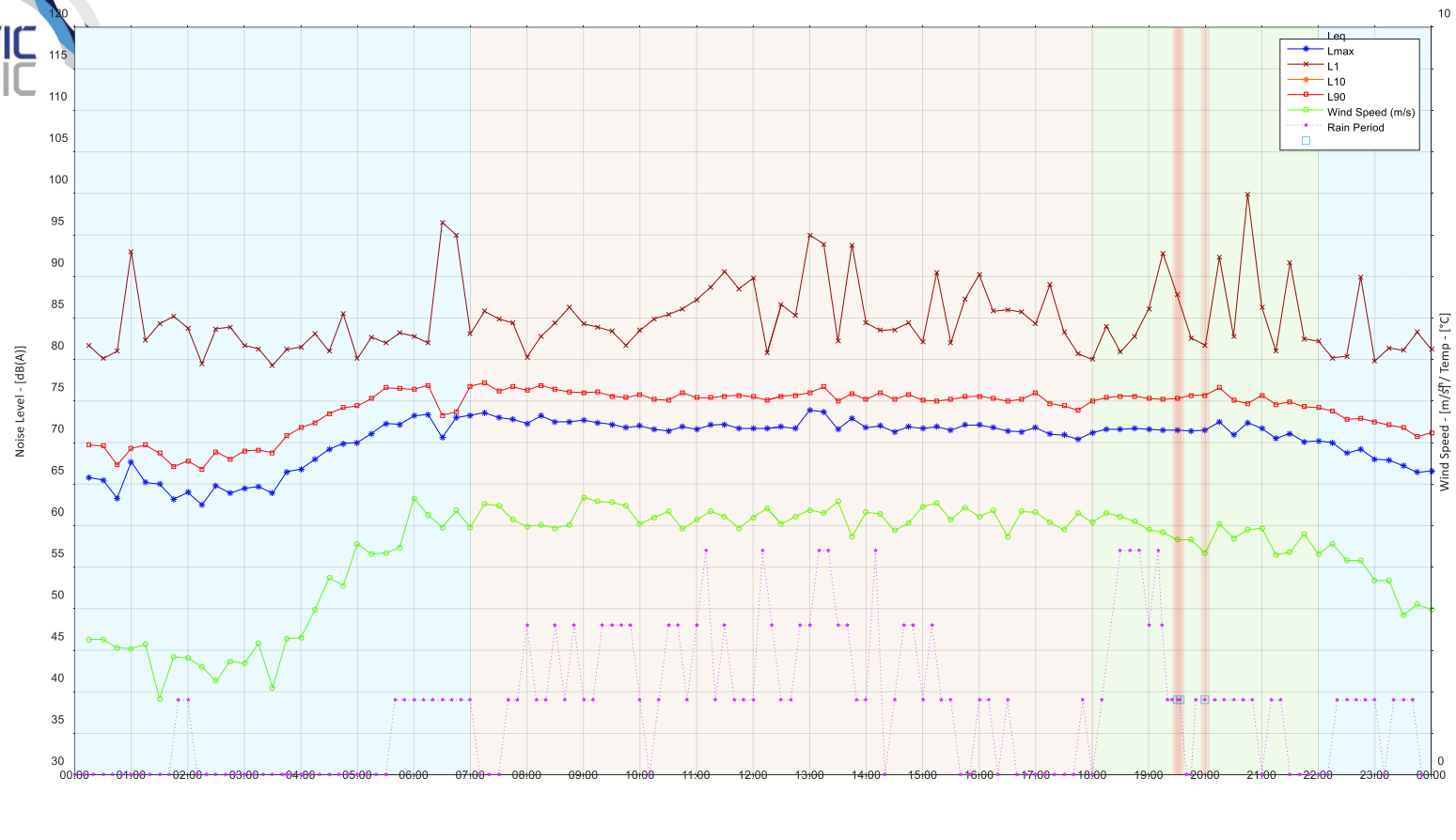


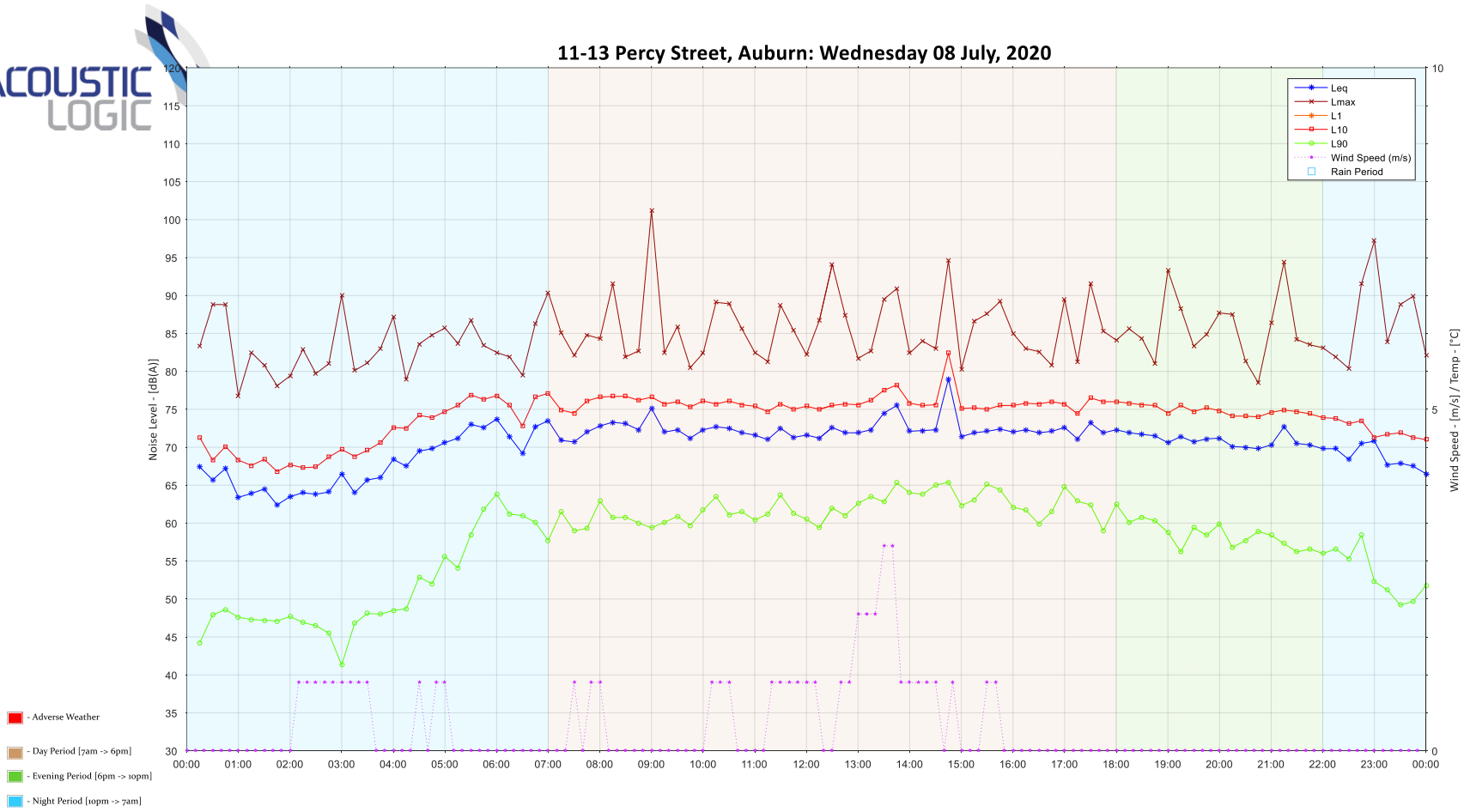

11-13 Percy Street, Auburn: Saturday 04 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

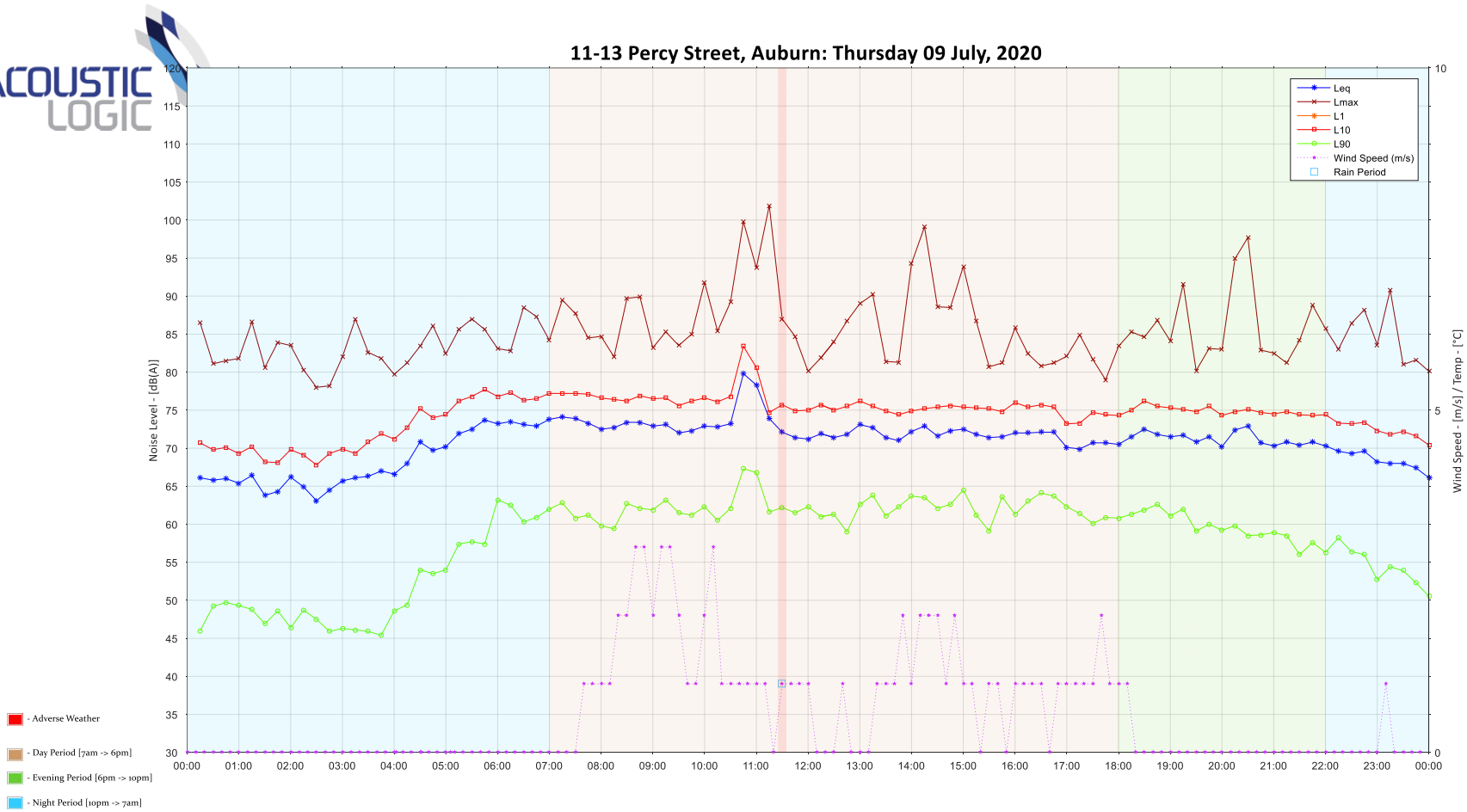

11-13 Percy Street, Auburn: Sunday 05 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

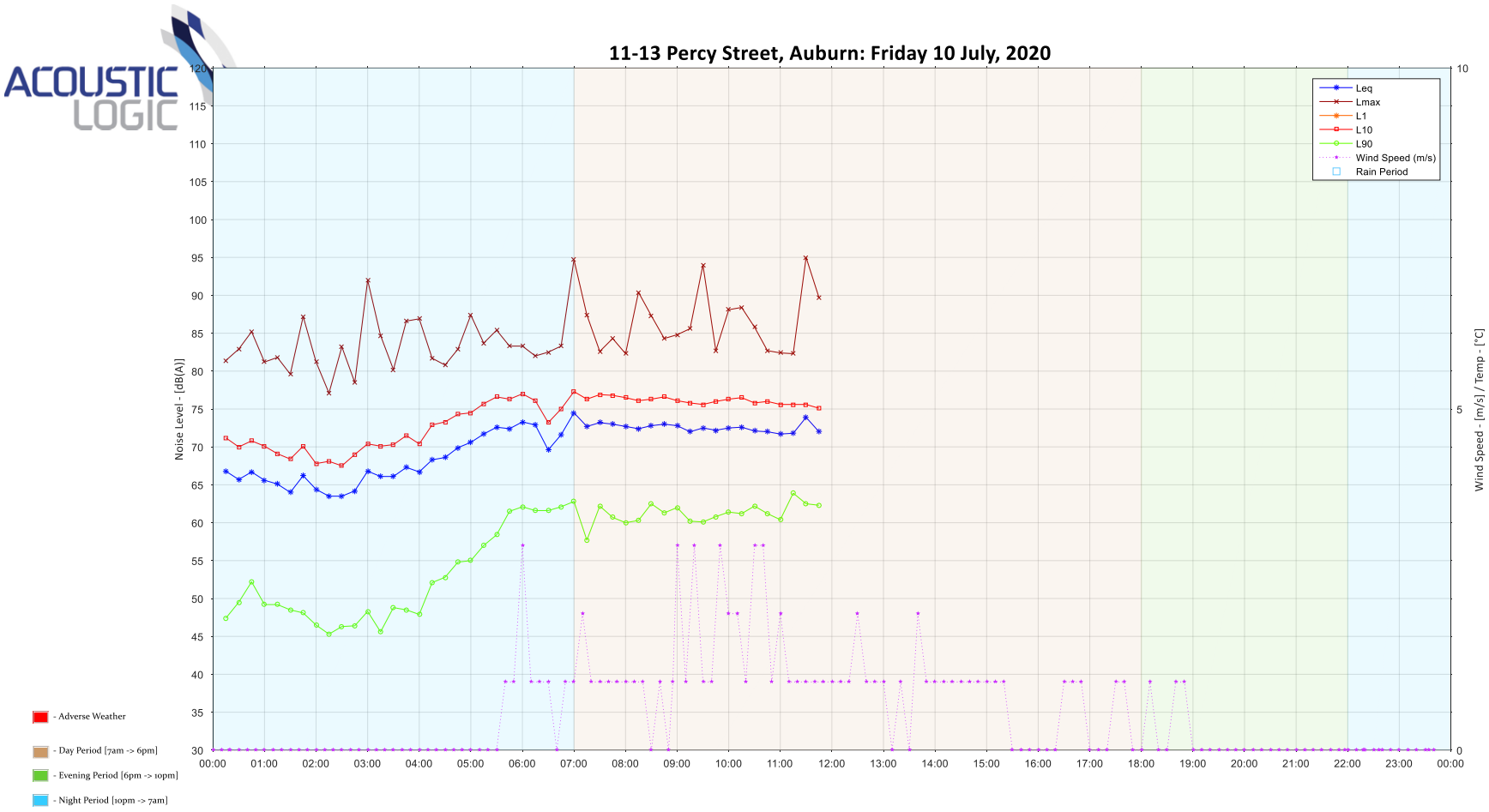

11-13 Percy Street, Auburn: Monday 06 July, 2020
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
Lmax
L1
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

11-13 Percy Street, Auburn: Tuesday 07 July, 2020




11-13 Percy Street, Auburn: Wednesday 08 July, 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]


11-13 Percy Street, Auburn: Thursday 09 July, 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]


11-13 Percy Street, Auburn: Friday 10 July, 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]