

Green Square Town Centre - Sites 8 & 19

Noise and Vibration Impact Assessment (NVIA)

Prepared For: Mirvac Green Square Pty Ltd

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TABLE OF CONTENTS

1	INTRODUCTION	5
1.1	BACKGROUND – HOUSING DELIVERY AUTHORITY	5
2	SITE DESCRIPTION	6
2.1	EARLY WORKS SSDA	6
2.2	OVERVIEW OF THE PROPOSED DEVELOPMENT	7
3	SECRETARY’S ENVIRONMENTAL ASSESSMENT REQUIREMENTS.....	9
4	REFERENCED DOCUMENTATION.....	10
5	RECEIVERS.....	11
6	ABBREVIATIONS AND DEFINITIONS.....	13
7	AMBIENT NOISE SURVEY	14
7.1	MEASUREMENT EQUIPMENT	14
7.2	MEASUREMENT LOCATION	14
7.3	MEASUREMENT PERIOD	14
7.4	MEASURED UNATTENDED NOISE LEVELS.....	14
8	NOISE AND VIBRATION INTRUSION ASSESSMENT	16
8.1	NOISE INTRUSION CRITERIA	16
8.1.1	Aircraft noise intrusion Requirements	16
8.1.2	Green square DCP 2012	16
8.1.3	State Environmental Planning Policy (Transport and Infrastructure) 2021.....	17
8.1.4	Development Near Rail Corridors and Busy Roads – Interim Guideline	18
8.1.5	Ventilation.....	18
8.1.6	NSW Apartment Design Guide.....	18
8.2	VIBRATION & STRUCTURE BORNE NOISE	19
8.2.1	Structure Borne Noise.....	19
8.2.2	Structure Borne Vibration.....	19
8.3	SUMMARISED NOISE AND VIBRATION CRITERIA	20
8.4	INTRUSION MODELLING.....	20
9	RAIL IMPACT ASSESSMENT	21
9.1	MEASURED VIBRATION LEVELS	21
9.1.1	Structure Borne Noise.....	21
9.1.2	Vibration Dose Values.....	21
10	COMPLYING MITIGATION AND CONTROLS	22
10.1	GLAZED WINDOWS AND DOORS.....	22
10.2	EXTERNAL WALL CONSTRUCTION.....	23
10.3	EXTERNAL ROOF/CEILING CONSTRUCTION	23
10.4	VENTILATION REQUIREMENTS	24
11	NOISE EMISSION ASSESSMENT	25
11.1	NOISE CRITERIA	25
11.1.1	Green Square DCP 2012.....	25
11.1.2	City of Sydney DCP 2012	25
11.1.3	NSW EPA Noise Policy for Industry (NPfI) 2017	25
11.2	MECHANICAL PLANT NOISE (IN PRINCIPLE).....	29
11.3	NOISE FROM RETAIL SPACES.....	30
11.4	NOISE FROM COMMUNAL AREAS	31
12	CONSTRUCTION NOISE AND VIBRATION ASSESSMENT.....	32
12.1	EPA INTERIM CONSTRUCTION NOISE GUIDELINE	32
12.2	VIBRATION CRITERIA	32

12.2.1	Structure Borne Vibrations (Building Damage Criteria)	33
12.2.2	Assessing Amenity	33
12.3	PRELIMINARY CONSTRUCTION NOISE AND VIBRATION IMPACT DISCUSSION	34
12.3.1	Predicted Noise Impact.....	35
12.4	MITIGATION MEASURES	41
12.4.1	Noise and Vibration Management Plan.....	41
12.4.2	Noise and Vibration Monitoring, Reporting and Response Procedures	41
12.4.3	Noise and Vibration Management and Control	43
12.5	CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PROCEDURAL STEPS	45
13	SUMMARY OF MITIGATION MEASURES	46
14	CONCLUSION.....	47
APPENDIX A:	UNATTENDED MONITORING GRAPHS	49
	LOCATION M1 – EBSWORTH STREET	49
	LOCATION M2 – BOTANY ROAD.....	67
	LOCATION M3 – BOTANY ROAD / GEDDES AVENUE.....	85
APPENDIX B:	SOUNDPLAN FAÇADE AND GRID NOISE MAP	103

1 INTRODUCTION

This report supports one of the detailed State Significant Development Applications (SSDA) (SSD- 84322496) and concurrent rezoning being lodged with the Department of Planning, Housing and Infrastructure (DPHI) for the construction of five mixed-use residential buildings and one mixed-use student accommodation building at 411 Botany Road and 6 Geddes Avenue, Zetland (the site). The site is also known collectively as Sites 8A, 8B, 8C, 8D, 19A and 19B (Sites 8A-D and 19A-B) of the Green Square Town Centre (GSTC) and is legally described as Lot 11 and 12 in DP 1225135. The proponent for the SSDA is Mirvac Green Square Pty Limited.

The proposal aims to:

- Respond to the housing challenges facing Sydney through the delivery of diverse housing types in a highly accessible location;
- Demonstrate the strategic and site-specific merit of accommodating the proposed height and FSR of development on the site;
- Contribute to the establishment of Green Square as a town centre through a mixed-use approach and use urban design principles to integrate residential and non-residential land uses;
- Improve the pedestrian connectivity throughout the site, while encouraging the direct connections to public transport and the existing street network; and
- Appropriately respond to neighbouring development and public domain within the GSTC through podium and tower forms with appropriate massing, which protect solar access and minimise environmental impacts.

1.1 BACKGROUND – HOUSING DELIVERY AUTHORITY

On 19 December 2024, the Housing Development Authority (HDA) was established by DPHI to accelerate the delivery of housing across NSW, under the Environmental Planning and Assessment (Housing Delivery Authority) Order 2024. This has provided a new State Significant Development pathway in which the proposed redevelopment can be undertaken through.

The site was declared State Significant Development (SSD) pursuant to State Significant Declaration Order 2025 (No 2) issued on 26 February 2025. The order specifies development in EOI application 232525 dated 17 January 2025, including development for the purposes of mixed use development comprising commercial premises and residential accommodation with the provision for affordable housing and Build to Rent (BTR) at 960A Bourke Street, 6 Geddes Ave and 411 Botany Road, Zetland as identified in Schedule 18, is declared to be SSD.

The HDA SSD pathway has been established to accelerate delivery of housing and requires that the subject SSD is lodged within 9 months from receipt of the Secretary's Environmental Assessment Requirements (SEARs). Current SEARs for the project were issued for Early Works on 20 October 2025 (SSD-82328958) (SSDA 1), Sites 7, 17 and 18 on 15 May 2025 (SSD-83899206) (SSDA 2) and for Sites 8 and 19 on 15 May 2025 (SSD- 84322496) (SSDA 3).

The key features of the Mirvac Green Square HDA proposal are:

- Detailed development consent for the purposes of a mixed use development, with significant residential components comprising build to sell, student accommodation and build to rent dwelling stock and ground floor non-residential uses.

- Delivery of between 1,000 to 1,200 dwellings across 9 buildings in low rise and high rise tower formats.
- Delivery of Affordable Housing dwellings.
- Delivery of the components in two-stage detailed SSDA process.

In conjunction with the SSDA, a State-assessed rezoning process is intended to facilitate the proposed development.

This SSDA forms the third application as part of broader HDA declared development and forms the main works to develop Sites 8A-D and 19A-B of the GSTC.

2 SITE DESCRIPTION

The site is located at 411 Botany Road and 6 Geddes Avenue, Zetland and is located within the GSTC. It is situated within the Sydney Local Government Area (LGA) and is located approximately 3.5km south of the Sydney CBD and within immediate proximity of the Green Square Railway Station. The site forms the southern component of the Mirvac HDA proposal, consisting of two lots which is legally described as Lot 11 and 12 in DP1225135. An aerial photo of the site is shown at Figure 1.



Figure 1. Sites 8A-D and 19A-B Aerial (Source: Nearmap, Colliers Urban Planning edits.)

2.1 EARLY WORKS SSDA

This application is preceded by a separate SSDA for early works that prepare the site for the proposed development. SSDA (SSD-82328958) has been submitted to DPHI to seek approval for the carrying out of site preparatory, excavation, soil treatment works and civil works relating to a future mixed-use development on the site. The application also included a procedural stratum subdivision to create site 8B and the development lot, which will be further subdivided in the Main Works SSDA.

2.2 OVERVIEW OF THE PROPOSED DEVELOPMENT

The proposed development seeks to deliver the construction of five mixed-use residential buildings and one mixed-use student accommodation building which will integrate residential, retail, resident amenity and public domain uses. Specifically, the proposal seeks approval for:

- Construction of shared basement, incorporating waste facilities, servicing, 581 car spaces and bicycle spaces.
- Construction of site 8A as a mixed use residential building up to 29 storeys in height, comprising:
 - 266 dwellings including a variety of dwelling types including 1, 2,3 and four-bedroom apartments.
 - Non-residential floor space including retail, food and beverage tenancies, and a resident lobby.
- Construction of site 8B as a mixed use student accommodation building up to 22 storeys in height, comprising:
 - 514 rooms (711 beds).
 - Non-residential floor space including retail, food and beverage tenancies, a residential lobby and loading dock.
 - Residential amenities including communal space.
- Construction of site 8C as a mixed use residential building up to 29 storeys in height, comprising:
 - 254 dwellings including a variety of dwelling types including 1, 2,3 and four-bedroom apartments.
 - Non-residential floor space including retail, food and beverage tenancies, a resident lobby and loading dock.
 - Residential amenities including communal space and a pool.
- Construction of site 8D as a mixed use residential building up to 8 storeys in height, comprising:
 - 51 dwellings including a variety of dwelling types including 1, 2 and three-bedroom apartments.
 - Non-residential floor space including retail, a resident lobby and loading dock.
 - Residential amenities including communal space.
- Construction of site 19A as a mixed use residential building up to 29 storeys in height, comprising:
 - 187 dwellings including a variety of dwelling types including 1, 2, 3 and four-bedroom apartments.
 - Non-residential floor space including retail, food and beverage tenancies, and a resident lobby.
 - Residential amenities including communal space and a pool.

- Construction of site 19B as a mixed use residential building up to 8 storeys in height, comprising:
 - 42 dwellings including a variety of dwelling types including 1, 2 and three-bedroom apartments.
 - Non-residential floor space including retail, and resident lobby.
- Public domain and landscaping improvements, including:
 - External pedestrian laneways, pathways and through-site links.
 - Construction of Woolpack Street and Hinchcliffe Street as a vehicular access road.
 - Tree removal, protection, new plantings and landscaping works.
- Utility and stormwater connections to support the new development.
- Staged stratum subdivision of the development lot to create the stratum lots associated with the residential buildings above.
- Concurrent amendments to the Sydney Local Environmental Plan (Green Square Town Centre) 2013 to facilitate the SSDA.

3 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

In accordance with section 4.39 of the Environmental Planning & Assessment Act 1979 (EP&A Act), Secretary's Environmental Assessment Requirements (SEARs) (SSD-83899206) have been issued. This report has been prepared to respond to the issued SEARs, as set out in the table below.

Table 1 - SSD-SEARs

SEAR	Component	Response/Location Addressed in Report
Noise and Vibration Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	Traffic/Rail/Aircraft Noise & Vibration Intrusion	Sections 7, 8, 9 & 10
	Operational Noise/Vibration Emissions Impacts	Section 11
	Construction Noise/Vibration Emissions Impacts	Section 12

4 REFERENCED DOCUMENTATION

The assessment is based on the following architectural drawings –

- Green Square Site 8A & 8C architectural plans prepared by Mirvac Design, dated 18th December 2025
- Green Square Site 8B & 8D architectural plans prepared by design architect DKO with executive architect Mirvac Design, dated 18th December 2025
- Green Square Site 19A & 19B architectural plans prepared by design architect TZG with executive architect Mirvac Design, dated 18th December 2025

Noise levels at the site have been measured using EPA recommended methodologies. The predicted likely impacts have been assessed using criteria established using the following guidelines:

- State Environmental Planning Policy (Transport and Infrastructure) ("T&I SEPP") 2021
- NSW Department of Planning – 'Development Near Rail Corridors and Busy Roads – Interim Guideline' (2008) ("DNRCBR")
- NSW EPA – 'Noise Policy for Industry' ("NPfl") October 2017
- City of Sydney Development Control Plan ("DCP") 2012.
- Green Square Development Control Plan ("DCP") 2012

A preliminary construction noise and vibration impact assessment have been conducted in accordance with the following guidelines:

- NSW EPA 'Interim Construction Noise Guideline' (ICNG)
- Australian Standard AS2436:2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites"
- DIN4150, 'Vibration in Buildings (2016-12)
- EPA "Assessing Vibration: A Technical guideline". The subject site and identified sensitive receivers are indicated in Figure 1 below.

The report has been prepared for the submission of a State Significant Development Application and should not be used or relied on for any other purpose.

5 RECEIVERS

Receivers along with unattended noise monitoring and attended measurement locations are indicated in Figure 2. Noise sensitive receivers can be summarised by the following:

- Receiver **R1** – Multistorey shop top housing development located on the northern corner of Bourke and Ebsworth St at 2-6 Ebsworth St
- Receiver **R2** – Multistorey shop top housing development located on Ebsworth St, to the north east of the project site at 8-30 Ebsworth St
- Receiver **R3** – Multistorey shop top housing development located at 2-6 Paul St, to the east of the project site.
- Receiver **P1** – Park receiver 'The Drying Green', located south east of the project site
- Receiver **R4** (Future) – Future multistorey shop top housing developments to be built as part of the Mirvac Green Square development sites 7/17 & 18, located north of the project site
- Receiver **E1** – Green Square Library, 355 Botany Road
- Receiver **R5** – 'Infinity' building located at 301-303 Botany St, Zetland, multistorey shop top housing development located on the north western boundary of the project site
- Receiver **R6** – Multistorey residential developments located at 23 Geddes Avenue, Zetland
- Receiver **C1**: Commercial development along Botany Road

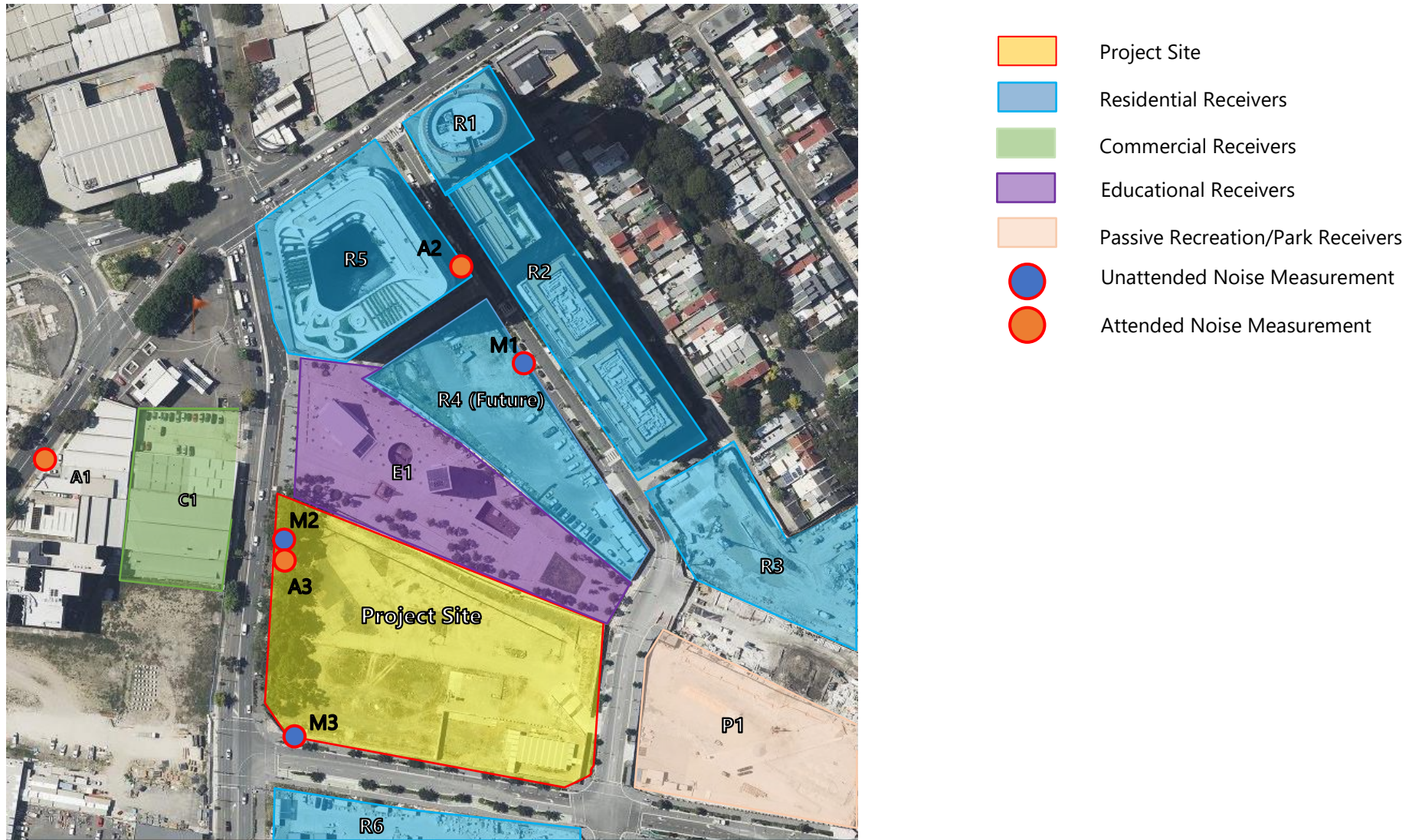


Figure 2 : Aerial view of the site location, sensitive receivers and monitored locations

6 ABBREVIATIONS AND DEFINITIONS

The following Abbreviations and definitions are used in this noise impact assessment.

dB	Decibels - unit for the measurement of sound
dB(A)	A-weighted decibels. Unit of measurement for broadband sound with the A-frequency weighting applied to approximate human loudness perception to sounds of different pitch.
L_{eq}	Energy, time averaged sound level
L_{max}	Maximum sound pressure level, fast response
L₉₀	Sound level exceeded for 90% of the measurement period
R_w	Frequency weighted sound reduction index.
NRC	Average absorption co-efficient for the octave bands with centre frequencies of 250Hz to 2 kHz inclusive.
Day*	For noise emissions assessment - the period from 7 am to 6 pm (Monday to Saturday) and 8 am to 6 pm(Sundays and public holidays). For transportation noise - the period from 7 am to 10 pm
Evening*	Refers to the period from 6 pm to 10 pm.
Night*	The period from 10 pm to 7 am (Monday to Saturday), and 10 pm to 8 am(Sundays and public holidays). For transportation noise - the period from 10 pm to 7am
Project Trigger Level	Target receiver noise levels for a particular noise-generating facility.
Assessment Level (ABL)	Background A-weighted background noise level representative of a single period. (Calculated in accordance with NPfI unless noted otherwise)
Rating Background Level (RBL)	The overall, single-figure A-weighted background level representing each assessment period (day/evening/night) over the whole monitoring period. (Calculated in accordance with NPfI unless noted otherwise)

* Unless nominated otherwise.

7 AMBIENT NOISE SURVEY

7.1 MEASUREMENT EQUIPMENT

Unattended noise monitoring was conducted using three Acoustic Research Laboratories Pty Ltd noise loggers. The loggers were programmed to store 15-minute statistical noise levels 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.

In addition to the above, attended measurements were undertaken to supplement unattended noise monitoring. Attended short term measurements have been undertaken by this office 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.

7.2 MEASUREMENT LOCATION

The unattended noise monitors were installed at the following locations (also refer to Figure 2):

- **Noise Monitor M1** – Eastern boundary of the project site along Ebsworth Street, approximately 3.5 metres off the ground and 5m from the kerb
- **Noise Monitor M2** – Botany Road monitor placed approximately 4m from the kerb, approximately 2.5 metres from the ground
- **Noise Monitor M3** – Monitor placed on the corner of Geddes and Botany Road, approximately 3.5 metres off the ground and 5m from the kerb
- **Attended Measurement A1** - 3m from the kerb of O’Riordan St
- **Attended Measurement A2** – 2m from the kerb of Ebsworth Street in front of receiver R5
- **Attended Measurement A3** - 4m from the kerb of Botany Road, in line with monitor M2

7.3 MEASUREMENT PERIOD

Noise monitoring was undertaken during between Monday the 28th July 2025 and Wednesday 13th August 2025.

7.4 MEASURED UNATTENDED NOISE LEVELS

NSW EPA’s 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. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in the table below.

Table 2 – Measured Unattended Noise Monitoring Levels

Monitor Location	Time of Day	Rating Background Noise Level (RBL) dB(A) $L_{90}(\text{period})$	Traffic Noise Levels dB(A) $L_{eq}(\text{period})$
Noise Monitor M1 (Ebsworth St)	Day (7:00am-6:00pm)	52	Daytime – 58 dB(A) $L_{eq}(15 \text{ hour})$
	Evening (6:00pm-10:00pm)	51	59 dB(A) $L_{eq}(1 \text{ hour})$
	Night (10:00pm-7:00am)	45	Nighttime – 54 dB(A) $L_{eq}(9 \text{ hour})$ 57 dB(A) $L_{eq}(1 \text{ hour})$
Noise Monitor M2 (Botany Road)	Day (7:00am-6:00pm)	56	Daytime – 66 dB(A) $L_{eq}(15 \text{ hour})$
	Evening (6:00pm-10:00pm)	54	68 dB(A) $L_{eq}(1 \text{ hour})$
	Night (10:00pm-7:00am)	49	Nighttime – 62 dB(A) $L_{eq}(9 \text{ hour})$ 65 dB(A) $L_{eq}(1 \text{ hour})$
Noise Monitor M2 (Cnr Geddes and Botany Road)	Day (7:00am-6:00pm)	54	Daytime – 64 dB(A) $L_{eq}(15 \text{ hour})$
	Evening (6:00pm-10:00pm)	52	65 dB(A) $L_{eq}(1 \text{ hour})$
	Night (10:00pm-7:00am)	45	Nighttime – 60 dB(A) $L_{eq}(9 \text{ hour})$ 63 dB(A) $L_{eq}(1 \text{ hour})$

Attended short term noise measurements were undertaken to supplement the unattended noise monitoring data. The measurements presented below are within a 15-minute time period, and as they were taken during typical peak period will generally be higher than the longer term noise descriptors (i.e. 15-hour, 9-hour or 1-hour period), where results are averaged over a longer period of time (as presented above).

Notwithstanding the measured attended traffic noise levels are detailed in Table 3 below.

Table 3– Measured Attended Noise Measurements

Measured Location	Time of day	Measured Noise Level dB(A) $L_{eq}(15 \text{ min})$
A1 -O’Riordan St	Monday 28 th July (9:00am to 11:00am)	67
A2 -Ebsworth St		63
A3 – Botany Road		63

8 NOISE AND VIBRATION INTRUSION ASSESSMENT

External noise intrusion into the development shall comply with the requirements of the following documents:

- Green Square DCP 2012
- City of Sydney DCP 2015.
- State Environmental Planning Policy (Transport and Infrastructure) 2021 ("T & I SEPP")
- NSW Department of Planning Development Near Rail Corridors & Busy Roads – Interim Guideline("DNRCBR")
- NSW Government Planning & Environment: Apartment Design Guide
- British Standard BS 7385 Part 2 1993
- Australian Standard AS 2670.2 1990
- British Standard BS 6472:1992

8.1 NOISE INTRUSION CRITERIA

8.1.1 Aircraft noise intrusion Requirements

As no part of the development falls within the Sydney Airport ANEF contours, a detailed aircraft noise intrusion assessment is not required for the development.

8.1.2 Green square DCP 2012

"GSTC 6.10.8 Acoustic and visual privacy

(1) Dwellings are to be constructed so that the repeatable maximum LAeq (1 hour) level does not exceed:

(a) for closed windows and doors:

(i) bedrooms (10pm-7am), 35dB; and

(ii) main living area (24 hours), 40dB.

(b) for open windows and doors:

(i) bedrooms (10pm-7am), 45dB; and

(ii) main living area (24 hours), 55dB.

(2) The levels above are to include the combined measured level of noise from both external sources and the ventilation system operating normally. (3) Noise from plant and equipment (including roof plant, and plant and servicing associated with green infrastructure) is to be attenuated to an appropriate level to ensure the amenity of adjacent and nearby uses is achieved and maintained."

8.1.3 State Environmental Planning Policy (Transport and Infrastructure) 2021

Clause 2.100 of the NSW SEPP for rail traffic noise stipulates

- (1) This section applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration—*
 - (a) residential accommodation,*
 - (b) a place of public worship,*
 - (c) a hospital,*
 - (d) an educational establishment or centre-based child care facility.*
- (2) Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Secretary for the purposes of this section and published in the Gazette.*
- (3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded—*
 - (a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10.00 pm and 7.00 am,*
 - (b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time."*

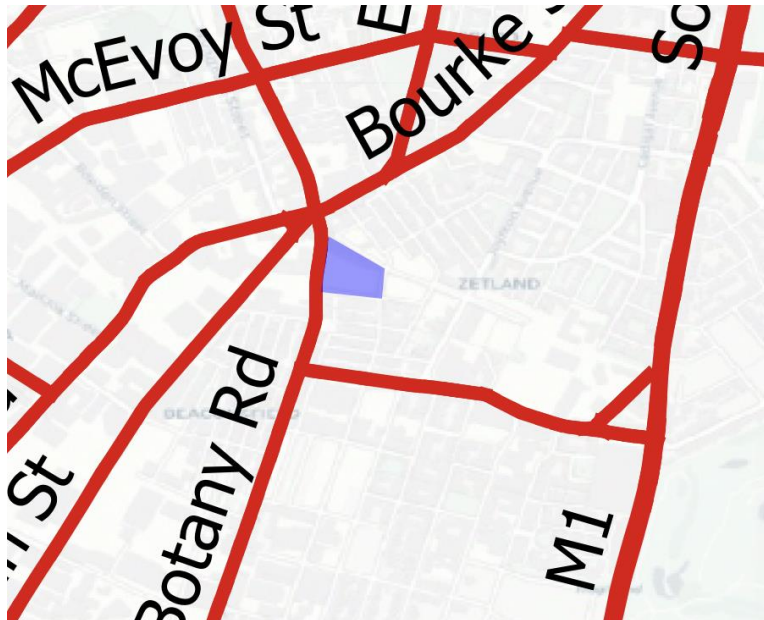
Certain development adjacent to major roadways must have regard to TI SEPP Clause 2.120 repeated below:

Section 2.120 Impact of Road Noise or Vibration on Non-Road Development

- (1) This section applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration—*
 - (a) residential accommodation,*
 - (b) a place of public worship,*
 - (c) a hospital,*
 - (d) an educational establishment or centre-based child care facility.*
- (2) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
 - (a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7am,*
 - (b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom, or hallway)—40 dB(A) at any time.*

Existing rail noise surrounding the site is below ground, and so airborne noise impacts are not relevant. Structure borne noise and vibration has been assessed in line with the requirements.

Map 12D of the traffic volume maps for T&I SEPP (from the TfNSW website) classifies the section of Botany Road (and further roadways near to site) as a carriageway carrying more than 20,000 vehicles per day. Refer below for map and site location.



8.1.4 Development Near Rail Corridors and Busy Roads – Interim Guideline

This guideline provides general and specific advice for the planning and assessment of noise sensitive development impacted by roads and railways, and in particular those uses required to be addressed under the TI SEPP. The assessment criteria broadly mirror those in the TI SEPP, noting that the DNRCBR recommends adoption of the $L_{eq(period)}$ noise descriptors for airborne noise impacts to residential development.

8.1.5 Ventilation

With respect to natural ventilation of a dwelling, NSW Planning requirements allow internal noise levels to be up to 10 dB(A) higher than the specified criterion with windows/doors to a dwelling open to allow for ventilation.

The DNRCBR recommends that when “windows open” noise levels are exceeded (or likely to be exceeded) the occupants should be able to *“leave their windows closed, if they so desire, and also meet the ventilation requirements of the Building Code of Australia (BCA).”*

The rooms that will exceed the DNRCBR “windows open” noise level are nominated in Section 10.4. Mechanical engineer to review & advise on suitable approach to address the above requirements

8.1.6 NSW Apartment Design Guide

This document provides additional design guidance for multi-unit residential apartment developments. These include residential flat buildings, shop top housing and the residential component of fixed use developments.

Although the ADG is applied as a guide, the Housing SEPP refers to some parts of the ADG that must be applied when assessing development applications. Section 4J of the ADG provides guidelines for acoustically constrained sites near transportation noise sources and hostile environments such as industrial areas, substations, sports stadiums, etc. It also requires that all Housing SEPP development adjacent to rail corridors and busy roads must have regard to DNRCBR.

8.2 VIBRATION & STRUCTURE BORNE NOISE

8.2.1 Structure Borne Noise

The DNRCBR only requires structure borne noise assessment to be conducted where buildings or adjacent lands are over railway tunnels. This requires:

"...Where building are constructed over or adjacent to land over tunnels, ground-born noise may be present without the normal masking effects of air born noise. In such cases, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-borne L_{Amax} noise limit of 40 dB(A)(daytime and 35 dB(A) (night time) measured using the "slow" response time setting on a sound level meter."

8.2.2 Structure Borne Vibration

Human comfort is normally assessed with reference to the British Standard BS 7385 Part 2 1993 or Australian Standard AS 2670.2 1990.

The Interim Guideline references the DECCW *Assessing Vibration- A technical guideline* which recommends that habitable rooms should comply with the criteria therein which is in line with the requirements of British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)".

British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)" is recommended by the RIC's and SRA's Interim Guidelines for Councils "Consideration of rail noise and vibration in the planning process" as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies, which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 "Evaluation of Human Exposure to Vibration and Shock in

Buildings (1 to 80Hz)" which represents the worst case of the X, Y and Z axes. Filtered measurements are made in all three co-ordinate axes and the highest value axis used.

This standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively the VDV may be estimated by the eVDV which is derived by a simpler calculation using an empirical factor. The VDV or eVDV is calculated for the two periods of the day being the "Daytime" (6am-10pm) and "Night time" (10pm-6am). The overall value is then compared to the levels in Table 6. For this project the aim will be for a low probability of adverse comment.

Table 4 - Vibration Dose Values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in residential buildings

Place	Low Probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
16hr day (Daytime)	0.13	0.26	0.51

8.3 SUMMARISED NOISE AND VIBRATION CRITERIA

Botany Road adjacent to the site is required to be assessed under the Transport & Infrastructure SEPP, as it carries annual average traffic volume greater than 20, 000 vehicles. Where a legislative requirement applies to the site, this supersedes a local Council's DCP requirement. In this instance, the requirements of the T&I SEPP and associated *Development near railways and busy roads – Interim guideline* are adopted as summarised in the table below.

Table 5 - DNRCBR Airborne Noise Criteria

Building Use	Room	Window State	Noise Level dB(A) L _{eq} (period)
Residential	Sleeping Area (Bedroom)	Closed	35 dB(A) L _{eq} (9 hour)
		Open	45 dB(A) L _{eq} (9 hour)
	Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	Closed	40 dB(A) L _{eq} (9-hour)
		Open	50 dB(A) L _{eq} (9-hour)

Table 6 – T&I SEPP and DNRCBR Structure Borne Noise Criteria

Scenario	Room	Noise Level dB(A) L _{eq} (period)
Structure Borne Noise from Rail Line	Sleeping Area (Bedroom)	35 dB(A) L _{max} (slow)
	Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40 dB(A) L _{max} (slow)

Table 7 - Vibration Dose Values (m/s^{1.75}) above which various degrees of adverse comment may be expected in residential buildings

Place	Low Probability of adverse comment	Adverse comment possible	Adverse comment probable
Residential buildings	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
16hr day (Daytime)	0.13	0.26	0.51

8.4 INTRUSION MODELLING

A 3D Soundplan model has been created for the project site, see Appendix B. A combination of grid and façade noise maps have been utilised to determine predicted façade noise levels, with corresponding required façade upgrades required subsequently being calculated.

9 RAIL IMPACT ASSESSMENT

9.1 MEASURED VIBRATION LEVELS

Rail vibration measurements were conducted along the eastern boundary of the site, at a distance of 80 metres from the Railway Line running adjacent to the site. For a detailed location, refer to figure 1.

Attended train vibration measurements were conducted on Monday, 28th of July 2025. A Svantek 958 Vibration Analyser was used for the vibration measurements. The analyser was fitted with three Svantek SV80 accelerometers.

9.1.1 Structure Borne Noise

Structure borne noise has been predicted to the development based on the above attended on site measurements. Predicted noise levels are based on measured acceleration levels of the slab during train pass by converted to a in room predicted sound pressure level based on assumed radiation efficiency, room noise absorption, and transfer functions through room slab/floors.

Table 8 - Predicted Structure Borne Noise Levels

Time Period	Predicted Structure Borne Noise Level dB(A) $L_{\max-\text{slow}}$	Criteria dB(A) $L_{\max-\text{slow}}$	Compliance
Day (7am – 10pm)	<33	40	Yes
Night (10pm -7am)		35	Yes

The calculated levels comply with the structure borne noise vibration requirements of the T&I SEPP & DNRCBR.

9.1.2 Vibration Dose Values

The measured vibration levels, duration of train pass by and the number of rail movements per hour were used to determine the overall vibration dose (VDV) at the proposed development for both daytime and night-time periods. The results are presented the table below.

Table 9- Vibration Dose Values

Time Period	Calculated VDV $\text{m/s}^{1.75}$	Criteria VDV $\text{m/s}^{1.75}$	Compliance
Day (7am – 10pm)	≤ 0.12	0.2 to 0.4	Yes
Night (10pm -7am)	≤ 0.1	0.13	Yes

In the event the future train use increases, say by 10%, predicted VDV values will not increase significantly (no more than approximately 0.004 more than the levels predicted in the table above) and will not impact recommended vibration isolation treatments.

The calculated levels comply with the tactile vibration requirements for the site.

No further consideration is required for rail noise and vibration impacts to the site.

10 COMPLYING MITIGATION AND CONTROLS

The following treatment and controls are indicated for the proposed development to comply with the nominated assessment criteria, based on the current architectural drawings referenced within this report.

10.1 GLAZED WINDOWS AND DOORS

Acoustically rated external windows and doors are required. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. The complying constructions are listed below.

Table 10 – Minimum Glazing Constructions

Building	Orientation	Level	Space Type	Recommended Construction
19A and 19B	East (Paul Street)	All	Living Room	6.38mm / 12mm airgap / 6mm IGU System
			Bedroom	
	South (Facing Geddes Ave)		Living Room	
			Bedroom	
	West (Facing 8C/8D)		Living Room	
			Bedroom	
	North (Facing Green Square Plaza)		Living Room	
			Bedroom	
8C, 8D	East (Facing 19A/19B)	All	Living Room	6.38mm / 12mm airgap / 6mm IGU System
			Bedroom	
	South (Facing Geddes Ave)		Living Room	
			Bedroom	
	West (Facing 8A/8B)		Living Room	
			Bedroom	
	North (Facing Green Square Plaza)		Living Room	
			Bedroom	
8A, 8B	East (Facing 8C/8D)	All	Living Room	6.38mm / 12mm airgap / 6mm IGU System
			Bedroom	
	South (Geddes Avenue)	2-8	Living Room	11.52mm / 12mm airgap / 8mm IGU System
			Bedroom	
		All other	Living Room	6.38mm / 12mm airgap / 6mm IGU System
			Bedroom	
		All	Living Room	

Building	Orientation	Level	Space Type	Recommended Construction
	West (Botany Road)		Bedroom	11.52mm / 12mm airgap / 8mm IGU System
	North (Facing Green Square Plaza)	2-18	Living Room	11.52mm / 12mm airgap / 8mm IGU System
			Bedroom	
		All other	Living Room	6.38mm / 12mm airgap / 6mm IGU System
			Bedroom	

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.

All external windows and doors listed are required to be fitted with Q-Ion type (or equal) acoustic seals. (**Mohair Seals are unacceptable**). The suitability of alternative seal types should be determined to an appropriately qualified acoustic expert.

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 the following table. 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 11 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window (with acoustic seals)
6.38mm / 12mm airgap / 6mm IGU System	35
11.52mm / 12mm airgap / 8mm IGU System	42

10.2 EXTERNAL WALL CONSTRUCTION

Solid walls constructed of masonry elements will be acceptable acoustically. In the event any penetrations are required through the external lining of any of the system for other building services, gaps should be filled with acoustic sealant to ensure compliance with acoustic criteria stipulated within this report.

10.3 EXTERNAL ROOF/CEILING CONSTRUCTION

Masonry roof systems will be acceptable acoustically. In the event any penetrations are required through the external lining of any of the system for other building services, gaps should be filled with acoustic sealant to ensure compliance with acoustic criteria stipulated within this report.

10.4 VENTILATION REQUIREMENTS

With respect to natural ventilation of a dwelling, NSW Planning requirements allow internal noise levels to be up to 10 dB(A) higher than the specified criterion with windows and doors to a dwelling open to allow for ventilation.

Based on the current layouts and noise levels from surrounding roads, assessment of internal noise levels with 'windows open' indicates that the following apartments exceed the open window threshold and alternative ventilation should be considered–

- Sites 8A and 8B western façade (facing Botany Road)
 - Living rooms to level 15
 - Bedrooms to level 20
- Sites 8A and 8B side façades (northern and southern facing):
 - Living rooms to level 5
 - Bedrooms to level 8

All other apartments and elevations will be able to retain windows or doors open to 5% of the floor area whilst maintaining nominated internal noise levels.

11 NOISE EMISSION ASSESSMENT

This section provides the noise emission assessment of the proposed development, this will include:

- Establishing noise emission limits from operational noise emitted from the development.
- Preliminary operational noise assessment.

11.1 NOISE CRITERIA

11.1.1 Green Square DCP 2012

GSTC 6.10.8 Acoustic and visual privacy

- (3) *Noise from plant and equipment (including roof plant, and plant and servicing associated with green infrastructure) is to be attenuated to an appropriate level to ensure the amenity of adjacent and nearby uses is achieved and maintained.*

11.1.2 City of Sydney DCP 2012

4.2.3.11 Acoustic privacy

A Noise Impact Assessment prepared by a suitably qualified acoustic consultant may be required when submitting a development application for commercial and retail uses which may affect the acoustic privacy of the adjacent residential use.

11.1.3 NSW EPA Noise Policy for Industry (NPfI) 2017

The NSW EPA Noise Policy for Industry (NPfI) 2017, has two criteria which need to be satisfied; namely the Intrusiveness noise level criteria and the Project amenity noise level criteria. The project noise trigger level is then established based on the lower of the intrusiveness and project amenity levels.

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

11.1.3.1 Project Intrusiveness Noise Level

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 do not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 7.4. Noise emissions from the development should comply with the noise levels presented below when measured at nearby property boundary.

Table 12 – Project Intrusiveness Noise Levels

Receivers	Period/Time	Rating Background Noise Level dB(A)$L_{90}(\text{Period})$	Project Intrusiveness Noise Levels dB(A)$L_{Aeq}(15\text{min})$
Residential – R1, 2, 3 & 5	Day (7:00am-6:00pm)	52	57
	Evening (6:00pm-10:00pm)	51	56
	Night (10:00pm-7:00am)	45	50
Residential – R4, R6	Day (7:00am-6:00pm)	54	59
	Evening (6:00pm-10:00pm)	52	57
	Night (10:00pm-7:00am)	45	50

*Background noise levels have been corrected based on the NPfI requirements when evening noise levels are higher than the daytime period.

11.1.3.2 Project Amenity Noise Levels

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 NSW EPA Noise Policy for Industry sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 3 categories to distinguish different residential areas. They are rural, suburban, urban. This site is categorised by urban receivers.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.
- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

The project amenity noise level is calculated by taking the recommended amenity noise level (as presented in table 2.2 of the policy). A 5 decibel reduction is applied to these overall levels to account for cumulative noise impacts from surrounding developments, and 3dB(A) addition is applied to convert from $L_{Aeq, period}$ to a $L_{Aeq, 15-minute}$ descriptor for consistency with the intrusiveness level. The project amenity noise level criteria are presented in the table below.

Table 13– Project Amenity Noise Levels

Location	Period/Time	Project Amenity Noise Levels dB(A)$L_{Aeq(15min)}$
Nearby residences – urban receivers	Day (7:00am-6:00pm)	58
	Evening (6:00pm-10:00pm)	48
	Night (10:00pm-7:00am)	43
Commercial	When In Use	63
Library	Noisiest 1 hour when in use	35 (internal)
Park	When in use	48

11.1.3.3 Project Noise Trigger Levels

The project noise trigger level (as outlined in section 2.1 of the policy) is the lower of the intrusiveness and project amenity noise levels. The project noise trigger levels are presented in the table below.

Table 14 – Project Noise Trigger Levels

Location	Period/Time	Rating Background Noise Level dB(A)_{L90(Period)}	Project Intrusiveness Noise Levels dB(A)_{L_{Aeq}(15min)}	Project Amenity Noise Levels dB(A)_{L_{Aeq}(15min)}	Project Noise Trigger Levels dB(A)_{L_{Aeq}(15min)}
Residential – R1, 2, 3 & 5	Day (7:00am- 6:00pm)	52	57	58	57
	Evening (6:00pm- 10:00pm)	51	56	48	48
	Night (10:00pm- 7:00am)	45	50	43	43
Residential – R4, R6	Day (7:00am- 6:00pm)	54	59	58	58
	Evening (6:00pm- 10:00pm)	52	57	48	48
	Night (10:00pm- 7:00am)	45	50	43	43
Commercial	When In Use	-	-	63	63
Library	Noisiest 1 hour when in use	-	-	35 (internal)	35 (internal)
Park	When in use	-	-	48	48

11.2 MECHANICAL PLANT NOISE (IN PRINCIPLE)

An assessment of preliminary plant layouts and locations is presented below, noting that it is likely for layouts or equipment types to vary during the detailed design phase of the project.

- Enclosed plant rooms are proposed in the following areas
 - Basement level under sites 8A, 8C, 19A and 19B
 - Pool plant within level 2 of site 19A
 - As the plant is enclosed the majority of radiated noise will be contained with inlet/outlet noise leakage (if applicable) treatable through lined duct work, acoustic louvres and the like.
- External/Rooftop Plant
 - External plant on level 4 of building 19A
 - Rooftop plant on all sites
 - Plant on levels 2 and 10 of building 8C
- Condenser Decks are specified as follows:
 - Proposed on levels 2-19, plus on rooftop of sites 8a and 8c
 - Proposed on level 5-25 of building 19A
 - Condenser units located on decks can be treated with physical controls such as acoustic louvres and management controls such as night/quiet modes.
- Roof top plant:
 - Rooftop plant is envisaged to consist of
 - Retail and residential kitchen exhaust fans
 - Basement, retail and lobby supply/exhaust air fans.
 - Major fans (typically with a sound power over 80(A) – such as kitchen exhaust, major toilet exhaust and major relief air fans) will require acoustic treatment if located externally. Whenever possible for major fans, it is recommended that axial (as opposed to roof mounted fans) are to be used as this will enable acoustic treatment to be incorporated within ductwork running to atmosphere.
 - Minor ventilation fans (typically individual apartment mechanical plant) is unlikely to require specific acoustic treatment.
 - All rooftop plant is expected to be semi-enclosed and is therefore treatable with one or more of the following physical controls
 - Silencers and lined ductwork (with lined bends) on outlet/inlets
 - Acoustic Louvres or attenuators
- Pumps:
 - Locate heat pumps as far as practicable from adjacent noise sensitive development. Noise screening (using either a dedicated noise screen or the building shell between the pumps and noise sensitive buildings) may be required.
 - To ensure compliance with NPfI requirements during day, evening and night time, additional review is recommended following final plant selection and review of night time operational speeds.

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

11.3 NOISE FROM RETAIL SPACES

The proposed retail tenancies will be subjected to a separate acoustic assessment as the noise generation for the use will likely be associated to the number of patrons speaking and the use of background noise music.

Noise from licensed food and beverage tenancies (i.e restaurants and bars) will be typically associated with:

- Patron noise.
- Music noise.
- Mechanical plant.

Noise generated by specialised retail tenancies will be typically associated with:

- Mechanical plant servicing these uses.
- Cars entering and exiting car parking areas.
- Loading docks operational activity.
- Each of these noise sources will be addressed as part of the individual use development applications in compliance with the NSW EPA requirements presented within Section 11.1.3.3 of this document, as well as any other relevant statutory requirements specific to the individual land use.
- It is expected that compliance with relevant noise emission objectives is to be reviewed based on a separate planning approval as part of a fit-out development application subject to the specific operations of each individual tenancy once operators have been determined. Tenancies are capable of achieving noise emission objectives provided the appropriate acoustic treatments and management controls are implemented for each specific application.
- If tenancies were to become licensed for the service of alcohol, this use would be subject to a separate planning application which would be accompanied by a noise impact assessment of the proposed use typical for Liquor and Gaming NSW. Acoustic treatments and management controls could be applied to these tenancies use to achieve the relevant noise emission requirements from internal activities (such as upgraded glazing); however, the use of external areas (if any) would be likely management of patron numbers/hours of use to achieve compliance.

11.4 NOISE FROM COMMUNAL AREAS

Communal areas are proposed on the following areas –

- Site 8B:
 - Ground level internal communal areas
 - Level 2 internal communal areas
 - Level 3 internal/external communal areas
 - Level 22 internal/external communal areas
- Site 8C:
 - Level 10 communal open space
- Site 8D:
 - Level 8 external communal areas
- Site 19A:
 - Level 2 gym
 - Level 3 pool
 - Level 11 communal open space

In regard to the proposed communal outdoor areas, we note the following:

- There will be significant distance attenuation from outdoor communal areas to surrounding residential receivers.
- Elevated existing background noise levels associated with the busy urban environment in which the site is located means that, in a relative sense, the noise levels from the communal areas are unlikely to cause disturbance to surrounding noise sensitive receivers.
- Landscaping/planting is being used to visually screen the communal area to the surrounding receivers.
- The communal area is for the use of residents (rather than retail tenants) and would accommodate the use by the apartments included in the development. General activities to be associated with its use is anticipated to be mainly passive activities.
- Additionally, use of the area would also be part of the strata management plan, and, where required, would be subject to ongoing controls or restrictions to how it is used. This may include, for example:
 - Limits on the times of use.
 - Limits on the types of activities which can be undertaken (for example, the playing of amplified music).
 - Restrictions on the numbers of people which can use the space at given times.
- In addition to the above management controls communal areas such as the 19A level 2 gym are to be located indoors, which will limit airborne noise emissions to surrounding receivers through glazed or solid facades. Structure borne noise emissions will be limited through isolated floors and typical structure borne management controls such as avoidance of weight drops. Exact extent of airborne and structure borne noise control (façade requirements and floor isolation requirements respectively) that is required for the gym is to be confirmed in detail design by an appropriately qualified project acoustic engineer.

12 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

A preliminary construction noise and vibration assessment is provided in the following section, a detailed assessment is typically conducted once the proposed construction activities and equipment has been finalised. This assessment will present the relevant the noise management levels, and vibration criteria based on industry standards as follows:

- NSW EPA 'Interim Construction Noise Guideline' (ICNG)
- Australian Standard AS2436:2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites"
- DIN4150, 'Vibration in Buildings (2016-12)
- EPA "Assessing Vibration: A Technical guideline".

12.1 EPA INTERIM CONSTRUCTION NOISE GUIDELINE

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise generation goals (based on ambient noise monitoring).
- Review of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission goals is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest receivers. As the surrounding receivers are Industrial, the following management levels applies.

Table 15– Summarised Noise Management Levels

Receivers	Noise Management Level – dB(A)L_{eq}(15min) RBL + 10	Highly Noise Affected level dB(A)L_{eq}(15min)
Residential	62	75

If noise levels exceeded the management levels identified in the table above, reasonable and feasible noise management techniques will be reviewed.

12.2 VIBRATION CRITERIA

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

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

12.2.1 Structure Borne Vibrations (Building Damage Criteria)

German Standard DIN 4150-3 (2016-12) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (2016-12) are presented in Table 3.

It is noted that the peak velocity is the value of the maximum of any of the three orthogonal component particle v-ocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 16– DIN 4150-3 (2016-12) 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

Surrounding buildings would generally be classified as a type 1 or type 2 use.

12.2.2 Assessing Amenity

The NSW EPA document “Assessing Vibration: A Technical Guideline” provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity.

Relevant criteria are presented below.

Table 17– EPA Recommended Vibration Criteria

		RMS acceleration Z-axis (m/s ²)		RMS velocity Y-axis (m/s ²)		Peak velocity X-axis (m/s ²)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.010	0.020	0.0071	0.014	0.0071	0.014
	Night-time	0.007	0.014	0.005	0.010	0.005	0.010
Impulsive Vibration							
Residences	Daytime	0.30	0.60	0.21	0.42	0.21	0.42
	Night-time	0.10	0.20	0.071	0.14	0.071	0.14

12.3 PRELIMINARY CONSTRUCTION NOISE AND VIBRATION IMPACT DISCUSSION

For this project, the most significant sources of noise or vibration generated during construction will be building excavation works. Note that as the depth of excavation will be limited, the anticipated duration of the excavation phase will be shorter than typical for this project.

The following table presents a general assessment of noise levels for typical construction equipment expected to be used during the construction of the proposal. A detailed assessment is recommended to be undertaken once the construction methodologies have been finalised.

Table 18 -- Sound Power Levels of the Typical Equipment

Equipment / Process	Sound Power Level dB(A)*
Excavator with Hydraulic Hammer	120
Jack Hammering	113
Concrete Pump	110
Trucks	100
Bobcat	105
Crane (electric)	85
Powered Hand Tools	95-100

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

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

Noise levels take into account correction factors (for tonality, intermittency where necessary).

The predicted noise levels during excavation and construction will depend on:

- The activity undertaken.
- The distance between the work site and the receiver. The distance between the noise source and the receiver will vary depending on which end of the site the work is undertaken. For this reason, the predicted noise levels will be presented as a range.
- Predicted noise levels are presented in the following tables. Predictions take into account the expected noise reduction as a result of distance only.

12.3.1 Predicted Noise Impact

12.3.1.1 Receiver R1

Table 19 -- Predicted Noise Generation to Residential Receiver R1

Activity	Predicted Level dB(A) $L_{eq}(15min)$ (External)	Comment
Excavator with Hydraulic Hammer	48-70	May exceed noise management level when working at or near site boundary, generally at or below noise management level
Jack Hammering	41-63	
Concrete Pump	38-60	Below noise management level
Trucks	<30-50	
Bobcat	33-55	
Crane/hoist (electric)	<30-35	
Powered hand tools	<30-45	

Discussion

When completed on the northern boundary the site demolition/excavation works such as hydraulic/jack hammering may result in occasional exceedances of the management noise levels. Other works such as concrete pumping and bobcat use will not result in exceedances of the management noise levels at R1. Refer Section 12.4 for mitigation measures.

Table 20 -- Predicted Noise Generation to Residential Receiver R2

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)	Comment
Excavator with Hydraulic Hammer	53-70	May exceed noise management level when working on site boundary adjacent to sensitive residential receiver, generally below noise management level
Jack Hammering	46-63	
Concrete Pump	43-60	Below noise management level
Trucks	33-50	
Bobcat	38-55	
Crane/hoist (electric)	<30-35	
Powered Hand Tools	30-45	

Discussion

When completed on the northern boundary of the site demolition/excavation/construction works such as hydraulic/jack hammering may result in occasional exceedances of the highly affected noise levels. Other works such as bobcat use, craning etc will not result in exceedances of the highly noise affected level at R2 but may result in exceedances of the management level. Other works such as hand tool use will not result in exceedances of management levels. Refer Section 12.4 for mitigation measures.

Table 21 -- Predicted Noise Generation to Residential Receiver R3

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)	Comment
Excavator with Hydraulic Hammer	57-84	May exceed highly affected noise level when working on site boundary adjacent to sensitive residential receiver, generally at or below noise management level
Jack Hammering	50-77	
Concrete Pump	47-75	
Trucks	37-64	May exceed noise management level when working on site boundary adjacent to sensitive residential receiver, generally below noise management level
Bobcat	42-69	
Crane/hoist (electric)	<30-49	Below noise management level
Powered hand tools	32-59	

Discussion

When completed on the eastern boundary of the site demolition/excavation/construction works such as hydraulic/jack hammering and concrete pumping may result in occasional exceedances of the highly affected noise levels. Other works such as bobcat use, truck use etc will not result in exceedances of the highly noise affected level at R3 but may result in exceedances of the management level. Other works such as hand tool use will not result in exceedances of management levels. Refer Section 12.4 for mitigation measures.

Table 22 -- Predicted Noise Generation to Residential Receiver R4 (Future)

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)	Comment
Excavator with Hydraulic Hammer	65-84	May exceed highly affected noise level when working on site boundary adjacent to sensitive residential receiver
Jack Hammering	58-77	
Concrete Pump	55-75	
Trucks	45-64	May exceed noise management level when working on site boundary adjacent to sensitive residential receiver, generally below noise management level
Bobcat	50-69	
Crane/hoist (electric)	30-49	Below noise management level
Powered hand tools	40-59	

Discussion

When completed on the northern boundary of the site demolition/excavation/construction works such as hydraulic/jack hammering and concrete pumping may result in occasional exceedances of the highly affected noise levels. Other works such as bobcat use, truck use etc will not result in exceedances of the highly noise affected level at R4 but may result in exceedances of the management level. Other works such as hand tool use will not result in exceedances of management levels. Refer Section 12.4 for mitigation measures.

Table 23 -- Predicted Noise Generation to Residential Receiver R5

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)	Comment
Excavator with Hydraulic Hammer	53-70	May exceed noise management level when working on site boundary adjacent to sensitive residential receiver, generally below noise management level
Jack Hammering	46-63	
Concrete Pump	43-60	Below noise management level
Trucks	33-50	
Bobcat	38-55	
Crane/hoist (electric)	<30-35	
Powered Hand Tools	30-45	

Discussion

When completed on the northern boundary of the site demolition/excavation works such as hydraulic/jack hammering may result in occasional exceedances of the highly affected noise levels. Other works such as bobcat use, truck use etc will not result in exceedances of the highly noise affected level at R5 but may result in exceedances of the management level. Other works such as hand tool use will not result in exceedances of management levels. Refer Section 12.4 for mitigation measures.

Table 24 -- Predicted Noise Generation to Receiver R6

Activity	Predicted Level dB(A) $L_{eq(15min)}$ (External)	Comment
Excavator with Hydraulic Hammer	58-87	May exceed highly affected noise level when working on site boundary adjacent to sensitive residential receiver
Jack Hammering	51-80	
Concrete Pump	48-77	
Trucks	38-67	May exceed noise management level when working at or near site boundary
Bobcat	43-72	
Crane/hoist (electric)	<30-52	Below noise management levels
Powered hand tools	33-61	

Discussion

When completed on the southern boundary of the site demolition/excavation/construction works such as hydraulic/jack hammering and concrete pump use may result in occasional exceedances of the highly affected noise levels. Other works such as bobcat use, truck use etc will not result in exceedances of the highly noise affected level at R6 but may result in exceedances of the management level. Other works such as hand tool use will not result in exceedances of management levels. Refer Section 12.4 for mitigation measures.

12.4 MITIGATION MEASURES

12.4.1 Noise and Vibration Management Plan

The project specific noise and vibration management plan should be implemented to manage noise and vibration impacts. The Plan should be revised as the works proceed in response to changing or latent conditions and to incorporate the results of additional analysis, monitoring or modified work practices implemented to minimise impacts.

The management plan has been prepared in accordance with ICNG guideline and includes:

- Identification of sensitive receivers and applicable noise and vibration management levels
- A description of the main noise or vibration producing activities, processes and equipment that will be employed and an indicative construction programme.
- Proposed construction hours.
- A prediction of likely noise/vibration levels at the most impacted receivers.
- The assessment and recommendation of mitigation methods to be applied where the predicted levels exceed the management levels, as indicated below.
- A monitoring plan including the type and extent of monitoring, reporting procedures.
- Recommended management procedures including complaints handling, response to monitoring exceedances, reporting, site training, etc.
- Community liaison.

12.4.2 Noise and Vibration Monitoring, Reporting and Response Procedures

Noise and vibration monitoring may either consist of manned and/or unmanned measurements. Active monitoring may be undertaken during the construction work phase of the project if required in the event complaints are received from neighbours.

In the event that complaints are received from neighbours the following process should be considered:

1. Assessing impacts and determining the offending plant/equipment/process and.
2. Locating the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implementing additional acoustic treatment in the form of localised barriers, silencers etc.
4. Selecting alternative equipment/processes

Where monitoring is required and indicates exceedances of the predicted noise impacts immediate action should be taken to identify any further controls as required to reduce noise emissions so that the noise limits are complied with. Monitoring of the activities following the implementation of these additional controls will be undertaken to confirm compliance.

12.4.2.1 Reporting Requirements

The following is an example of reporting which may be kept on site;

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed below.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedances occurring including, the actions taken and results of follow up monitoring.
4. A report detailing complaints received and actions taken shall be presented.
5. All monitoring and reporting shall be conducted in conjunction with the conditions of consent.

12.4.2.2 Response Procedures

Complaints associated with noise and vibration generated by site activities shall be recorded on a Noise Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager and the general public and their contact telephone number

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form may list:

- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Indicate what operations were occurring on site at the time of the complaint.
- Required remedial action, if required
- Validation of the remedial action.
- Summary of feedback to the complainant.

12.4.3 Noise and Vibration Management and Control

The flow chart that follows illustrate the process followed to assess construction activities prior to the start of work on site, and for the ongoing investigation of noise and vibration impacts during the construction period.

12.4.3.1 General Noise Control Methods

The determination of appropriate additional noise control measures will be dependent on the particular activities and the construction equipment and plant identified as requiring future acoustic treatments to those already identified in this report. This section provides an outline of available methods which have previously been used on similar construction sites and may be possible on this site.

12.4.3.2 Selection of Alternate Appliance or Process

Where a particular activity or plant and equipment is found to generate noise levels that exceed the management levels, it may be possible to select an alternative approach or plant and equipment. For example; the use of excavator mounted hydraulic hammers of the site may potentially generate high levels of noise. By carrying this activity by using concrete saws or smaller plant here practical, construction noise levels and/or length of exposure to construction noise levels may be reduced.

12.4.3.3 Acoustic Barriers

The placement of barriers at the source is generally only effective for static plant. Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

The degree of noise reduction provided by barriers is dependent on the amount by which the line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

Barriers are used to provide shielding and do not act as an enclosure. The material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier screening. In this case, the use of a material such as 15mm plywood (or equivalent material) would be acceptable for the barriers.

12.4.3.4 Silencing Devices

Where construction methodologies or plant and equipment permit, investigate the use of silencing devices. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts, for example.

12.4.3.5 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

12.4.3.6 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes, for example, investigating the possibility of locating fixed plant items as far as possible from residents, rotating plant and activities to provide respite to receivers, scheduling activities after the construction of buildings that will screen receivers, avoiding noise sensitive periods for receivers, identify "safe" working distances, etc.

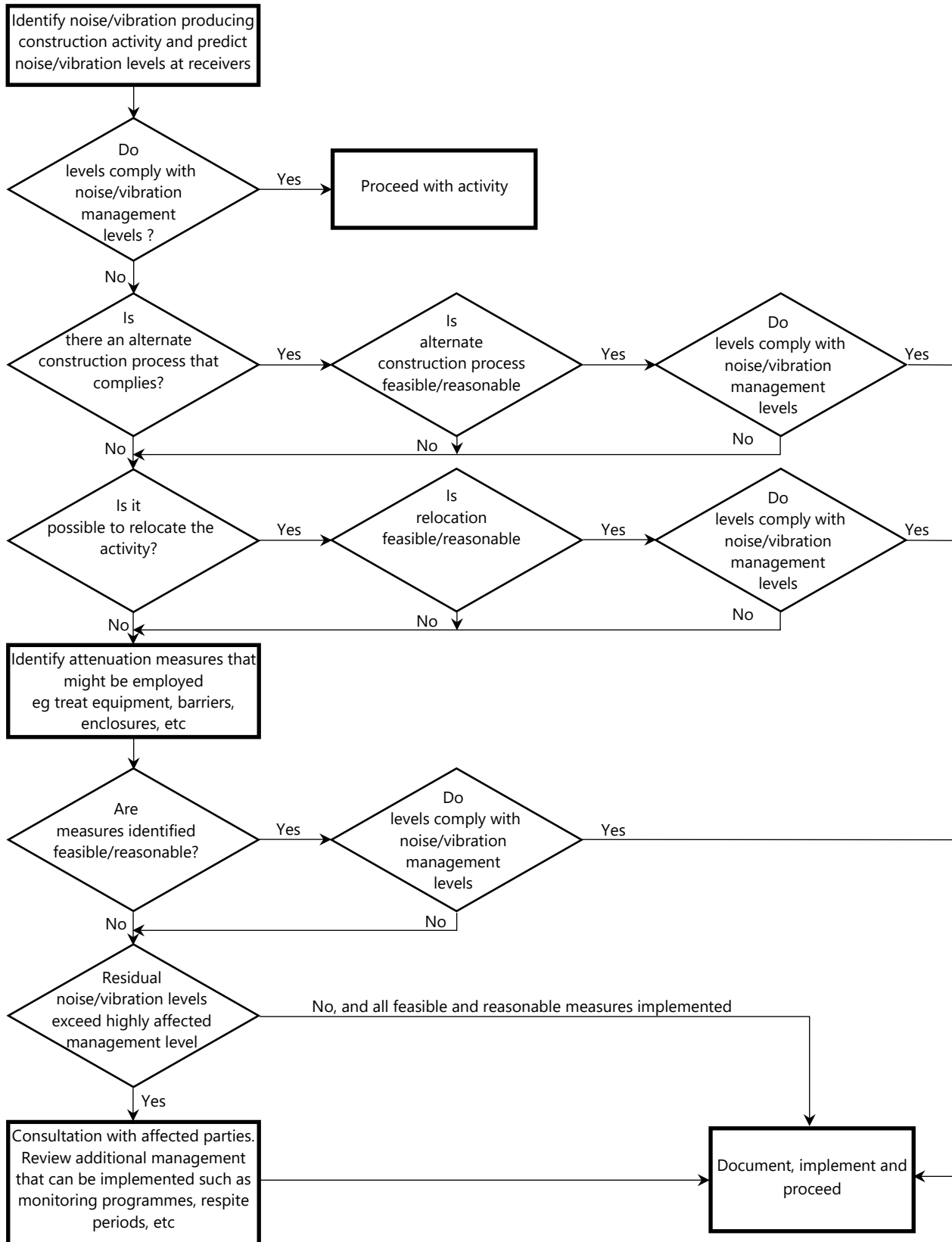
12.4.3.7 Vibration Management

The following principles should be considered to manage adverse vibration impacts identified:

- Obtaining separate structural or specialist advice for critical or fragile structures as to the level of damage risk.
- Selection of processes that minimise structure and ground vibration – generally avoiding percussive methods.
- Use smallest plant that is able to efficiently undertake the work activity.
- Lay vibration absorbing mats to cushion impacts from falling debris.
- Application of vibration dampening pads to metal surfaces subject to impacts.
- When demolishing, cut control joints in structures to form vibration “breaks”, or work away from sensitive receiver locations to form natural vibration breaks in propagation path.
- Monitoring of structures using attended and/or unattended monitors with alarms.
- Time scheduling works to minimise amenity impacts.
- Communicating with affected receivers.
- Identify “safe” working distances to sensitive receivers/structures for various activities by conducting site simulation tests, and limiting activities within those distances to those that are not likely to exceed vibration goals. Vary locations/equipment/techniques used as determined by the simulation testing. The following table provides an initial guide to working distances that should be confirmed by site measurement.

12.5 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PROCEDURAL STEPS

The flow chart presented below illustrates the process that should be followed in assessing construction activities.



Noise and Vibration Management Flow Chart

13 SUMMARY OF MITIGATION MEASURES

Table 25 – Summarised Mitigation Measurements

ID	Mitigation Measure
<u>Traffic/Rail/Aircraft Noise & Vibration Intrusion</u>	
NV/I001	Acoustically rated external windows and doors are required. Preliminary constructions to meet internal noise requirements have been provided, to be finalised during the detailed design of the project.
NV/I003	Any penetrations or gaps required through the external lining of any of the system for services etc should be acoustically treated.
<u>Operational Noise/Vibration Emissions Impacts</u>	
NV/E001	Detailed review of plant and equipment to be completed during detailed design by appropriately qualified acoustic consultant following final plant selection, plant locations and operational requirements.
<u>Construction Noise/Vibration Emissions Impacts</u>	
C/NV001	A detailed noise management plan should be developed by the main contractor that describes in detail the construction phases, programme, processes and equipment used, noise impact assessment and proposed mitigation and management

14 CONCLUSION

This report has been prepared in support of a State Significant Development Application (SSDA), progressed under the Housing Delivery Authority pathway, for the proposed mixed-use residential development sore sites 8A/B/C/D and 19A/B of Mirvac's Green Square project. This report is specifically addressing the noise and vibration impacts for the development.

The assessment concludes the following outcomes:

- Traffic noise impacts from surrounding roads have been considered, and recommended treatments provided in Section 10 have been provided to reduce noise to comply with the Transport & Infrastructure SEPP requirements.
- Noise emission limits have been established for use of mechanical plant noise in Section 11.2.
- General assessment for the retail use and the proposed outdoor communal areas have been provided in Sections 11.3 and 11.4 respectively.
- A preliminary construction noise and vibration assessment has been conducted and the recommended mitigation methods have been provided in Section 12 of the report.
- A summary of mitigation measures have been presented in section 13 of this report.

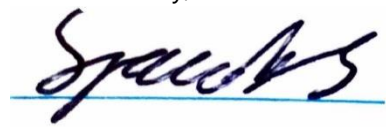
Based on the assessment, the development is able to meet all relevant acoustic requirements to mitigate external noise impacts, and the noise impacts to surrounding receivers can be adequately controlled to mitigate potential impacts.

The assessment has been conducted in accordance with the following guidelines and requirements:

- Planning Secretary Secretary's Environmental Assessment Requirements (SEARs)
- City of Sydney Development Control Plan (DCP) 2015.
- Green Square Development Control Plan (DCP) 2012.
- NSW Government Planning & Environment: Apartment Design Guide
- State Environmental Planning Policy (Transport and Infrastructure) 2021 ("TISEPP")
- NSW Department of Planning Development Near Rail Corridors & Busy Roads – Interim Guideline("DNRCBR")
- NSW Environmental Protection Authority (EPA) *Noise Policy for Industry (NPfI) 2017*.
- NSW EPA 'Interim Construction Noise Guideline' (ICNG)
- Australian Standard AS2436:2010 "Guide to Noise Control on Construction, Maintenance and Demolition Sites"
- DIN4150, 'Vibration in Buildings (2016-12)
- EPA "Assessing Vibration: A Technical guideline".
- British Standard BS 7385 Part 2 1993
- Australian Standard AS 2670.2 1990

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

Yours faithfully,

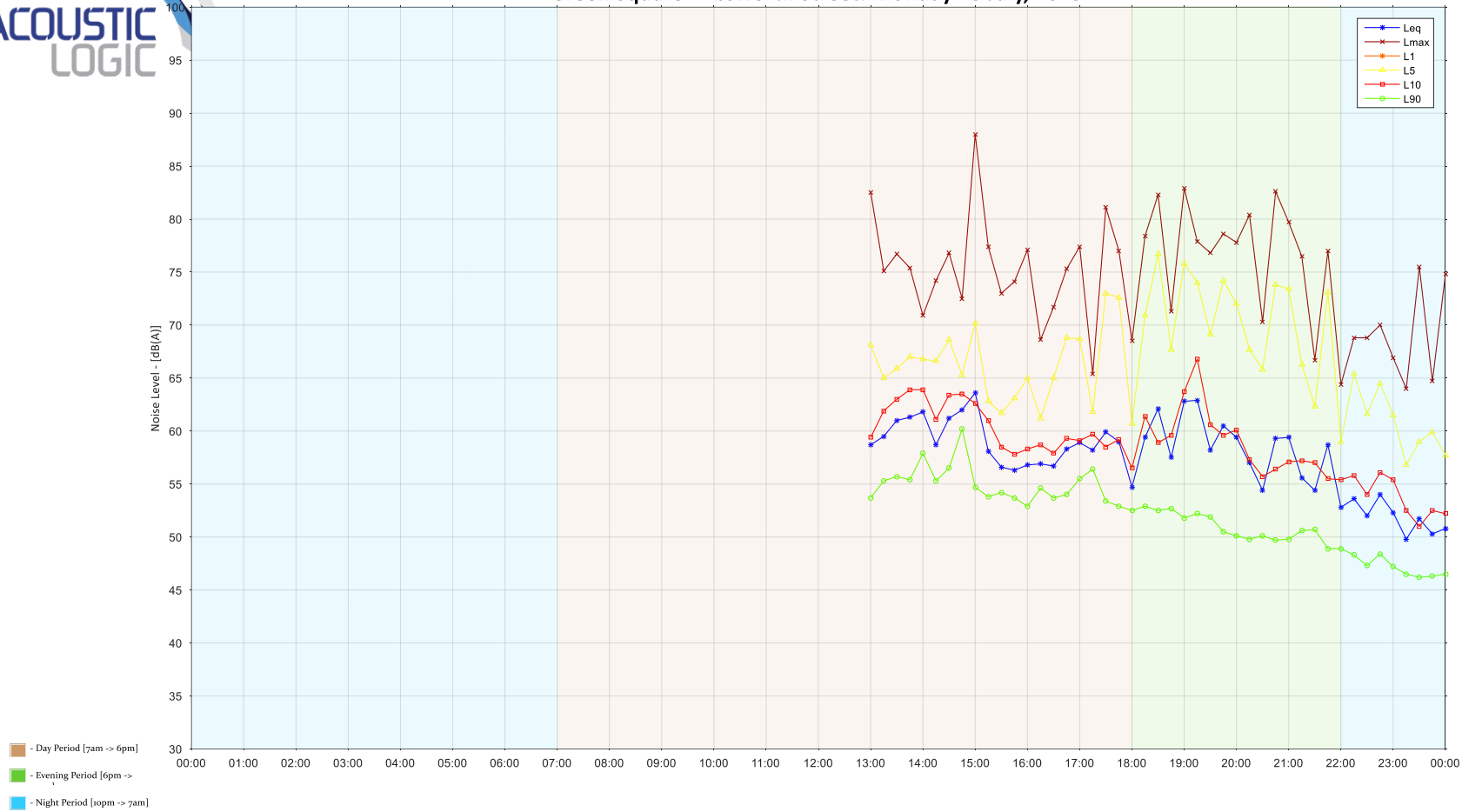
A handwritten signature in blue ink, appearing to read 'Scott Jacobs', is written over a horizontal blue line.

Acoustic Logic Pty Ltd
Scott Jacobs

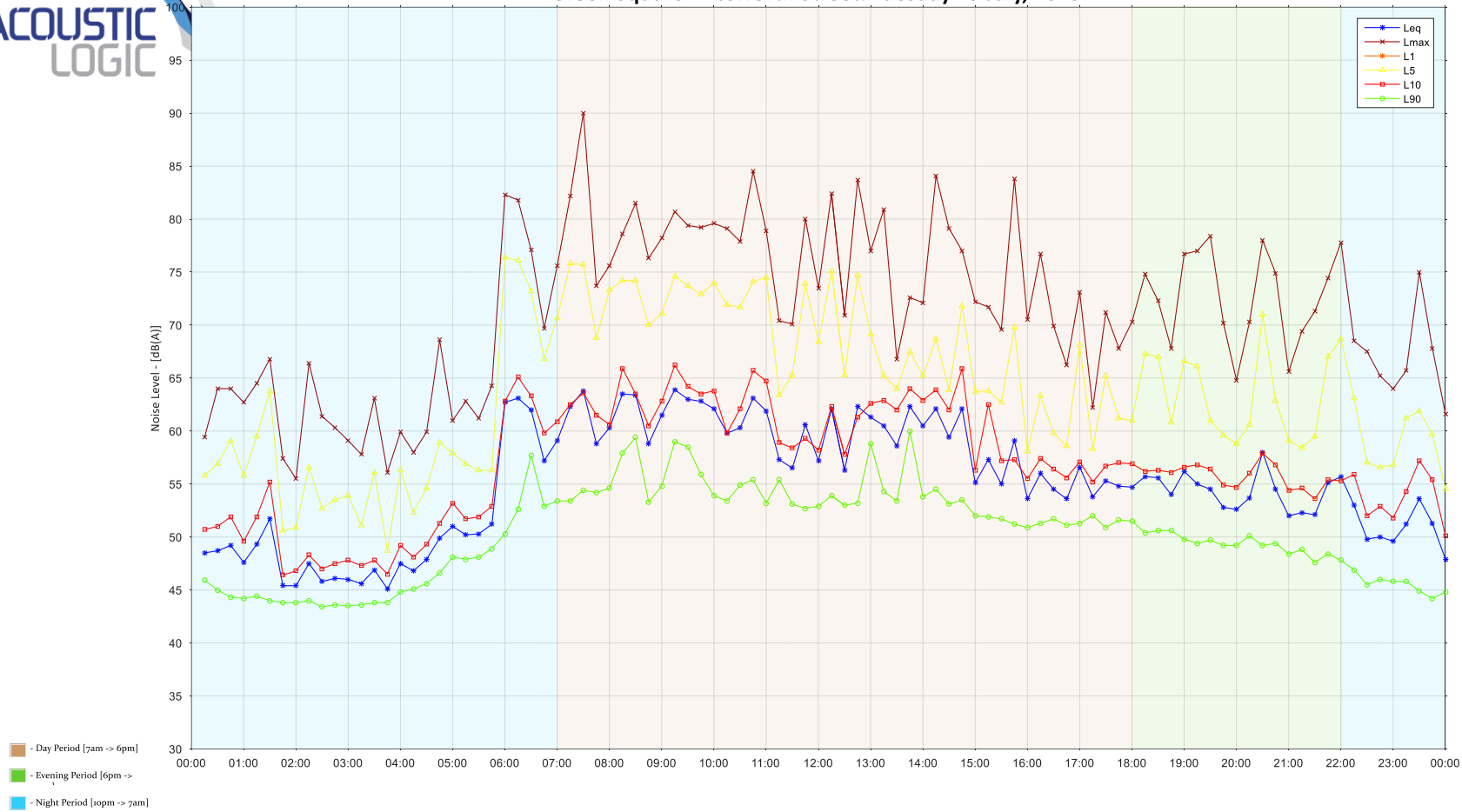
APPENDIX A: UNATTENDED MONITORING GRAPHS

LOCATION M1 – EBSWORTH STREET

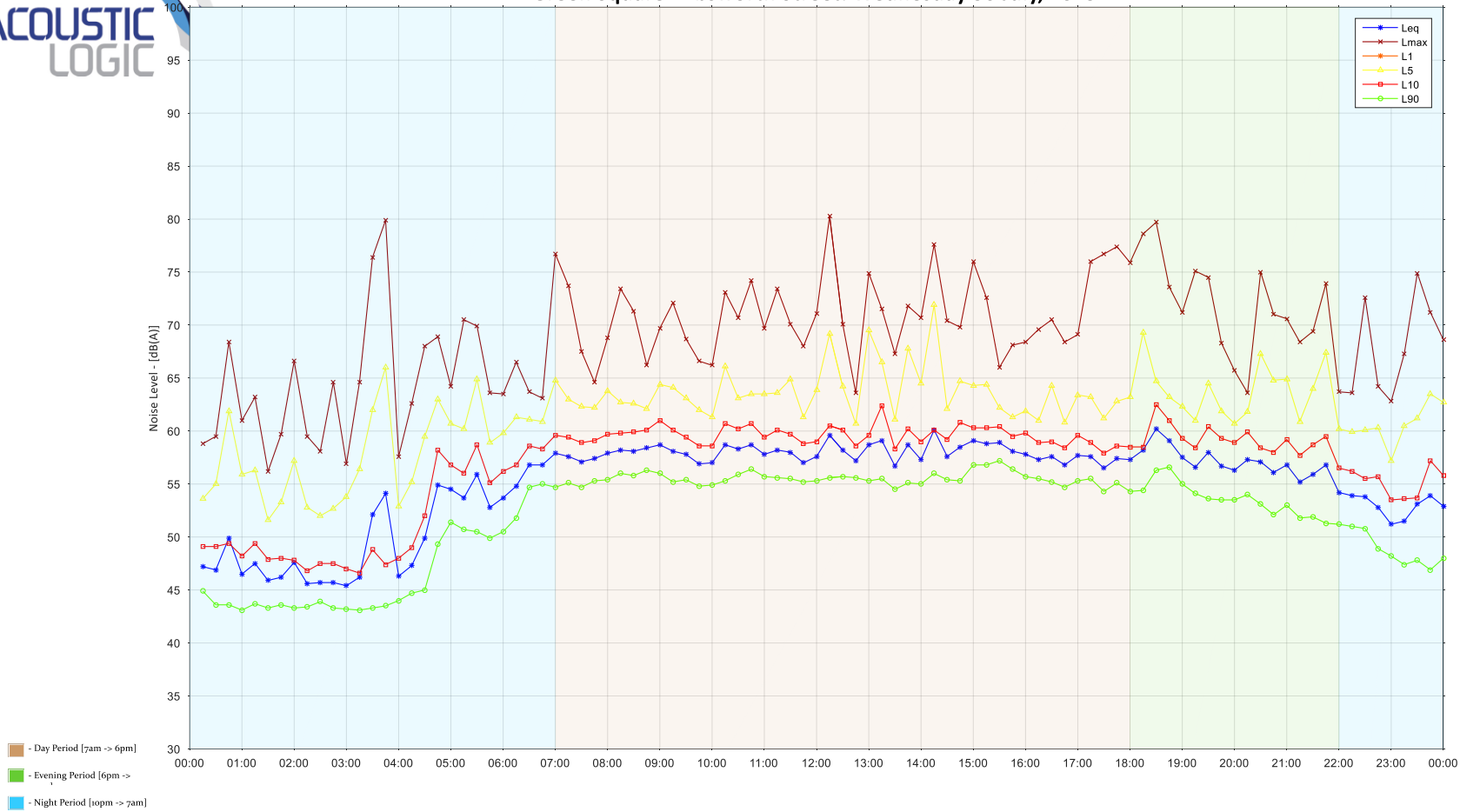
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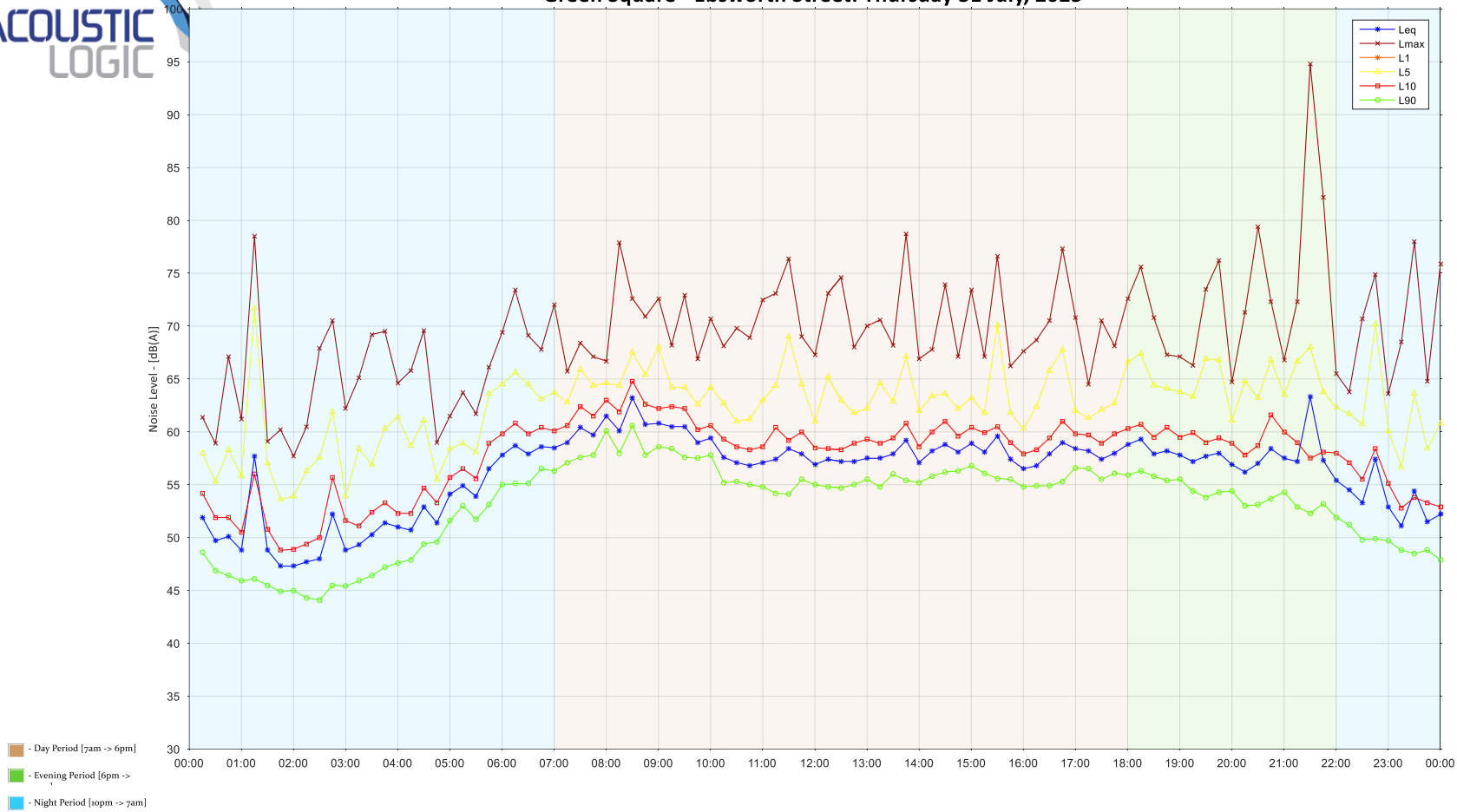
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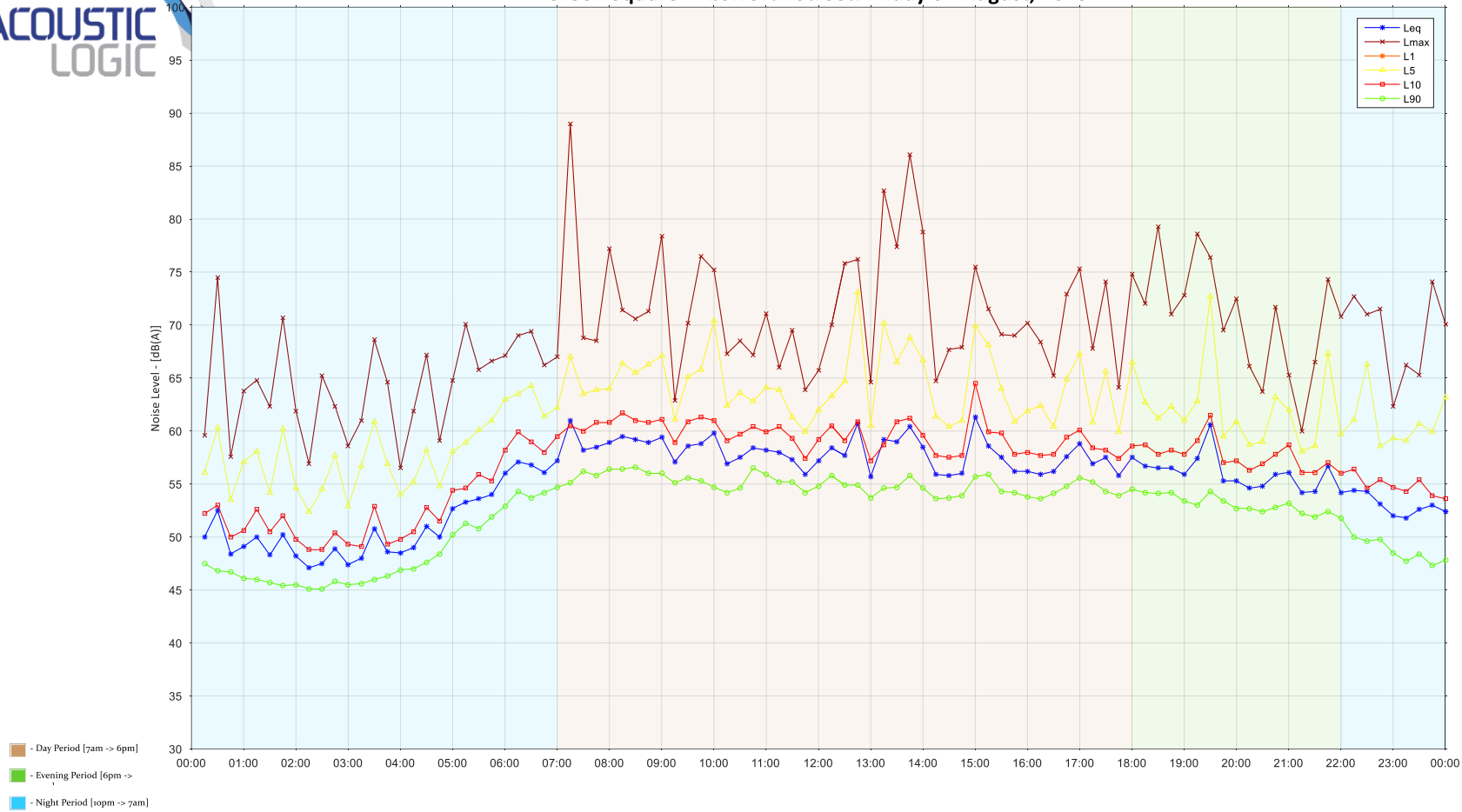
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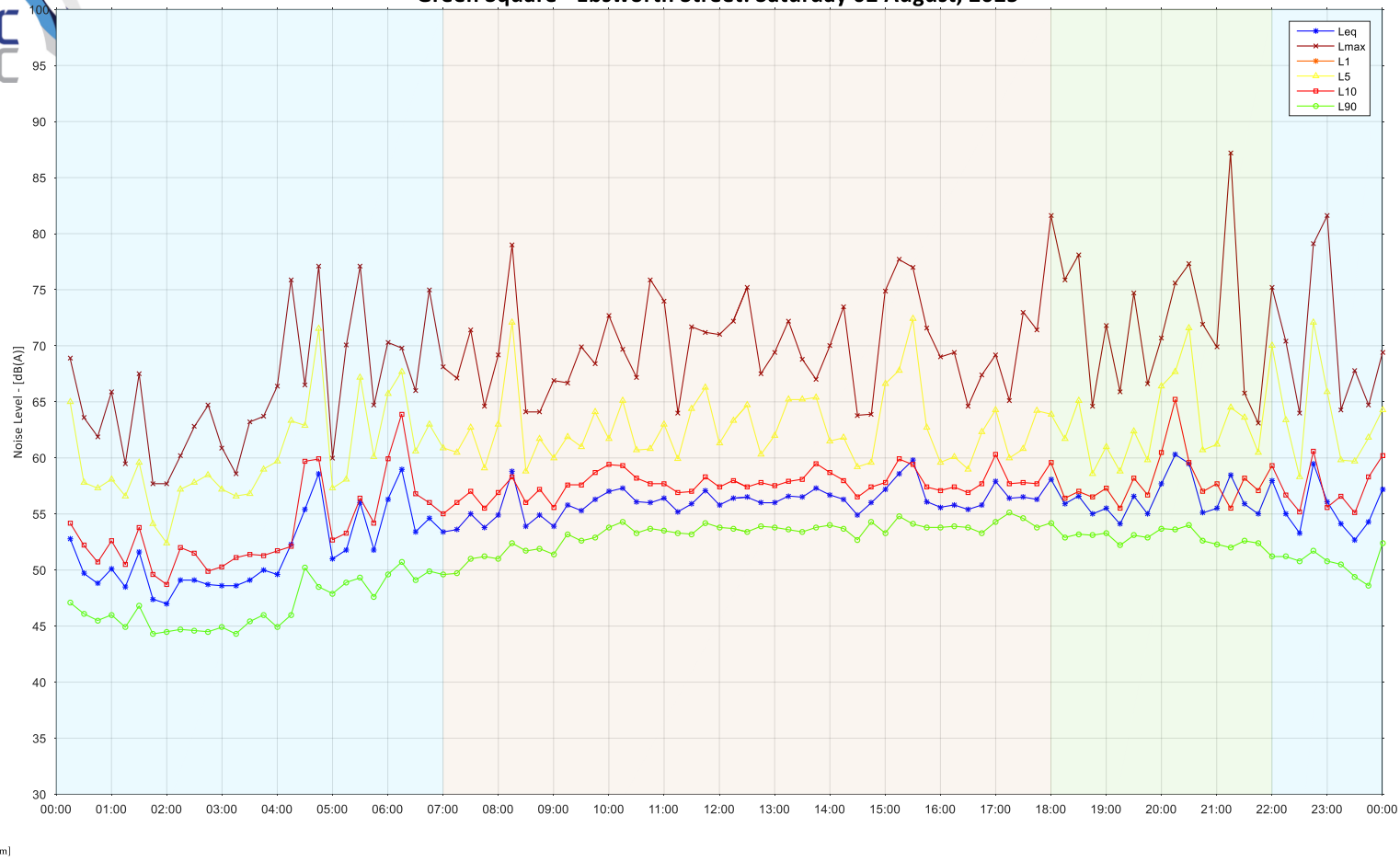
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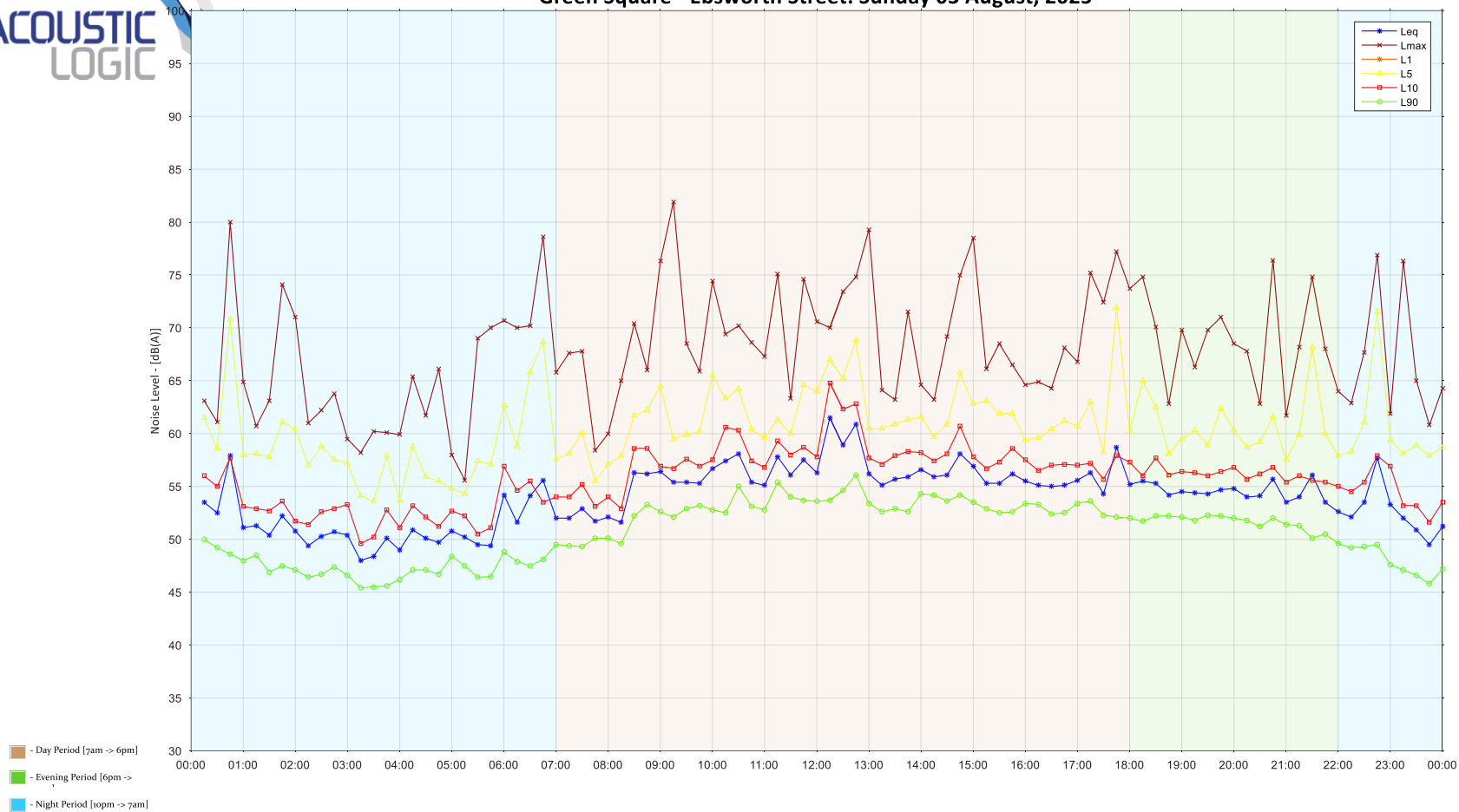
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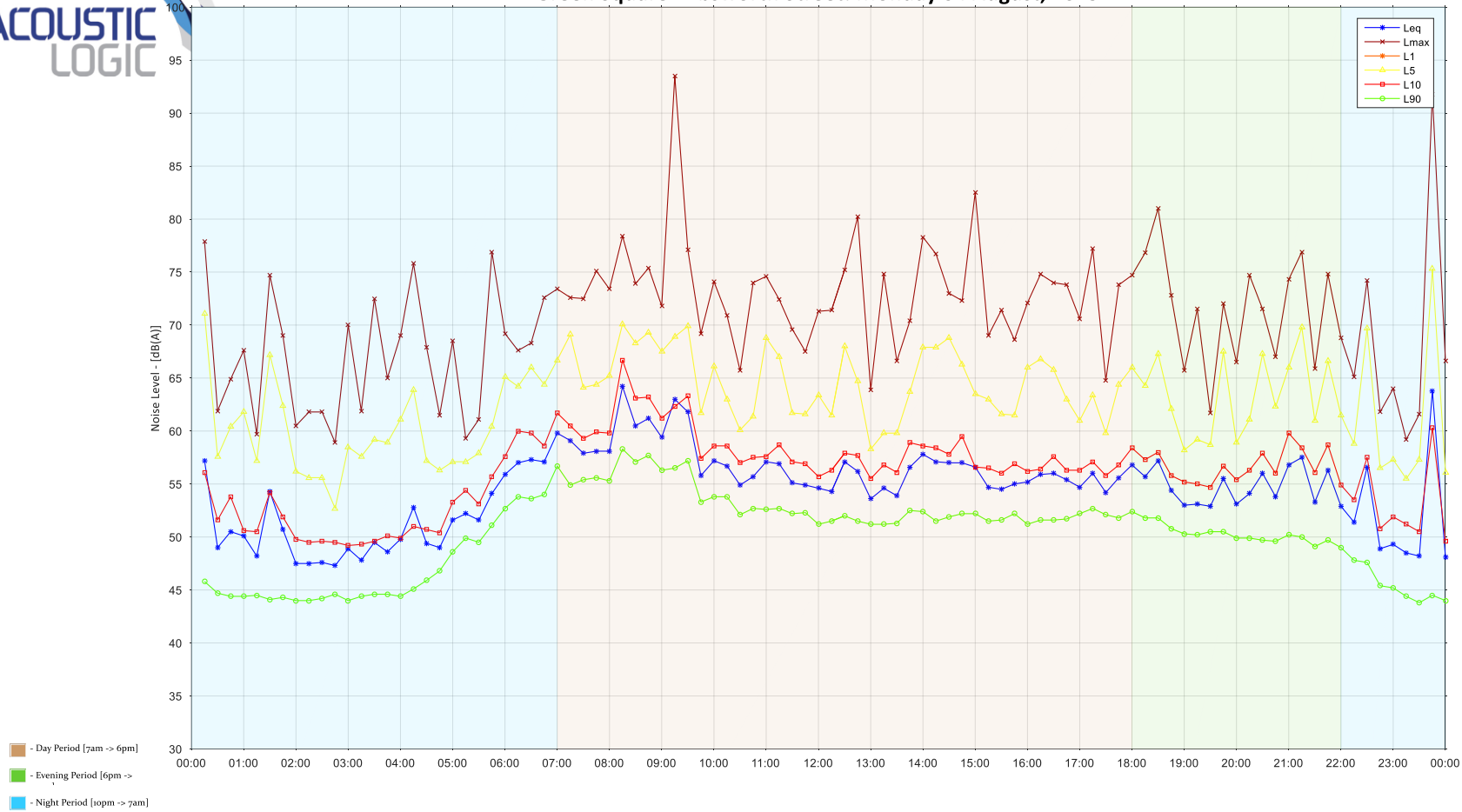
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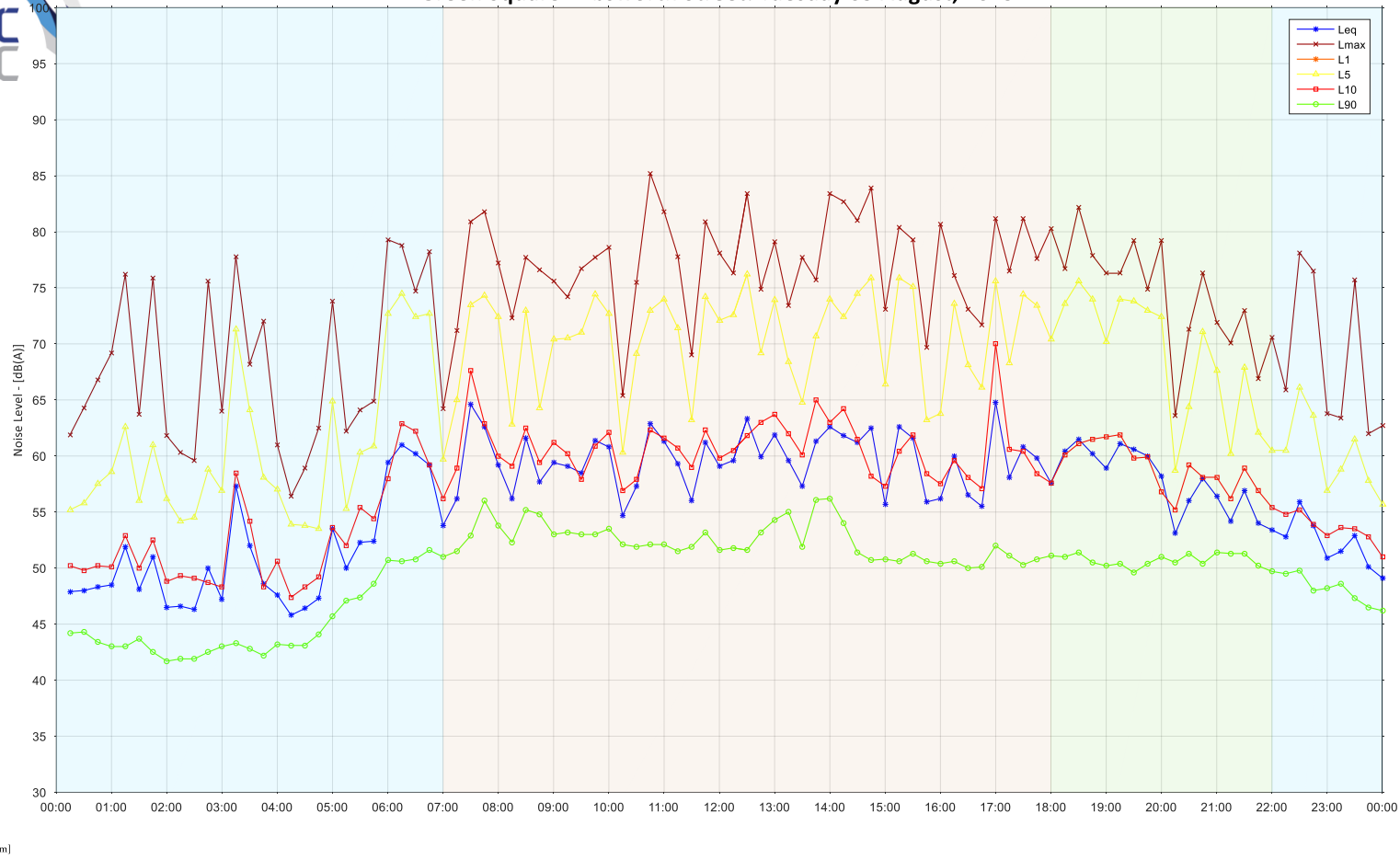
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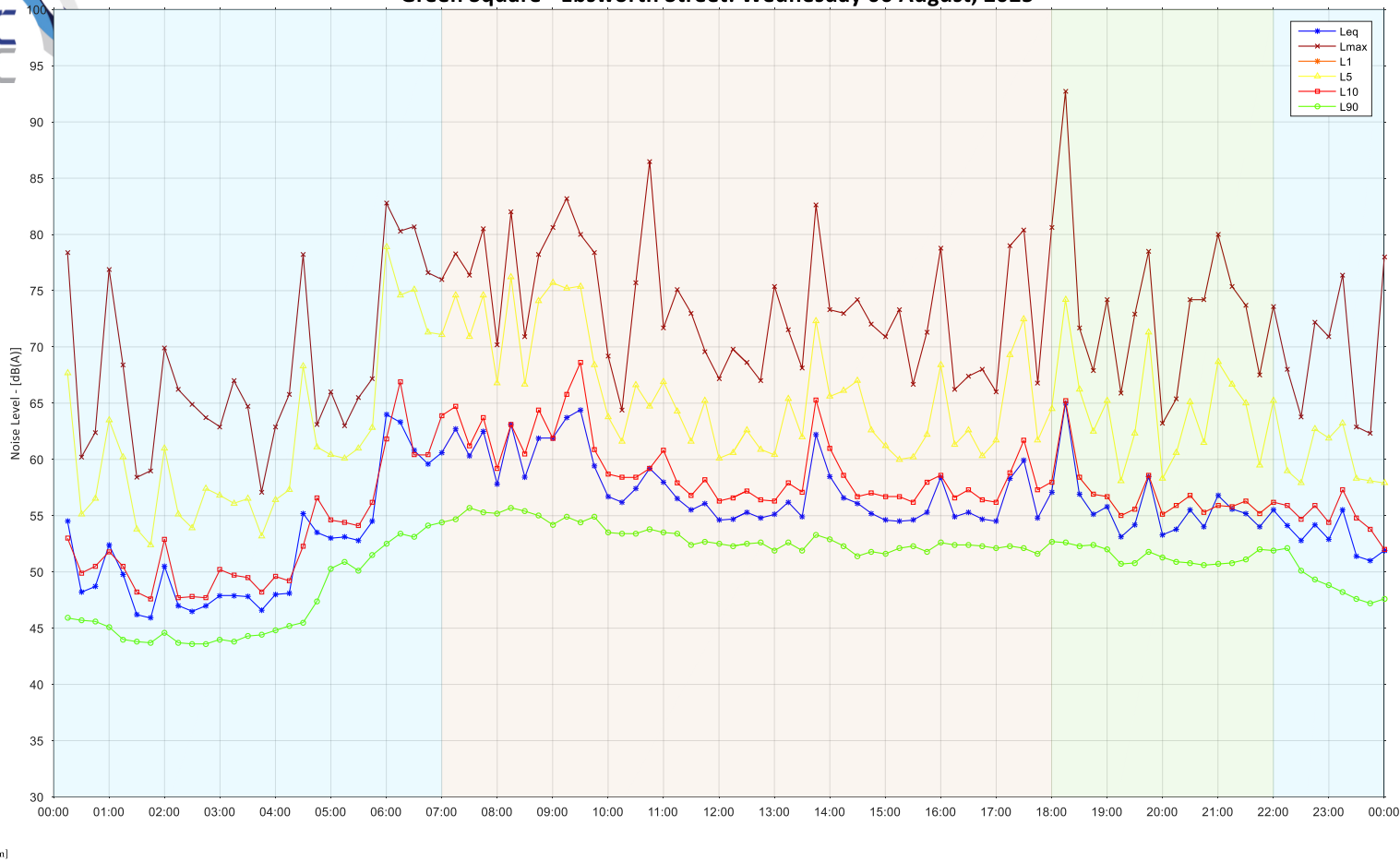
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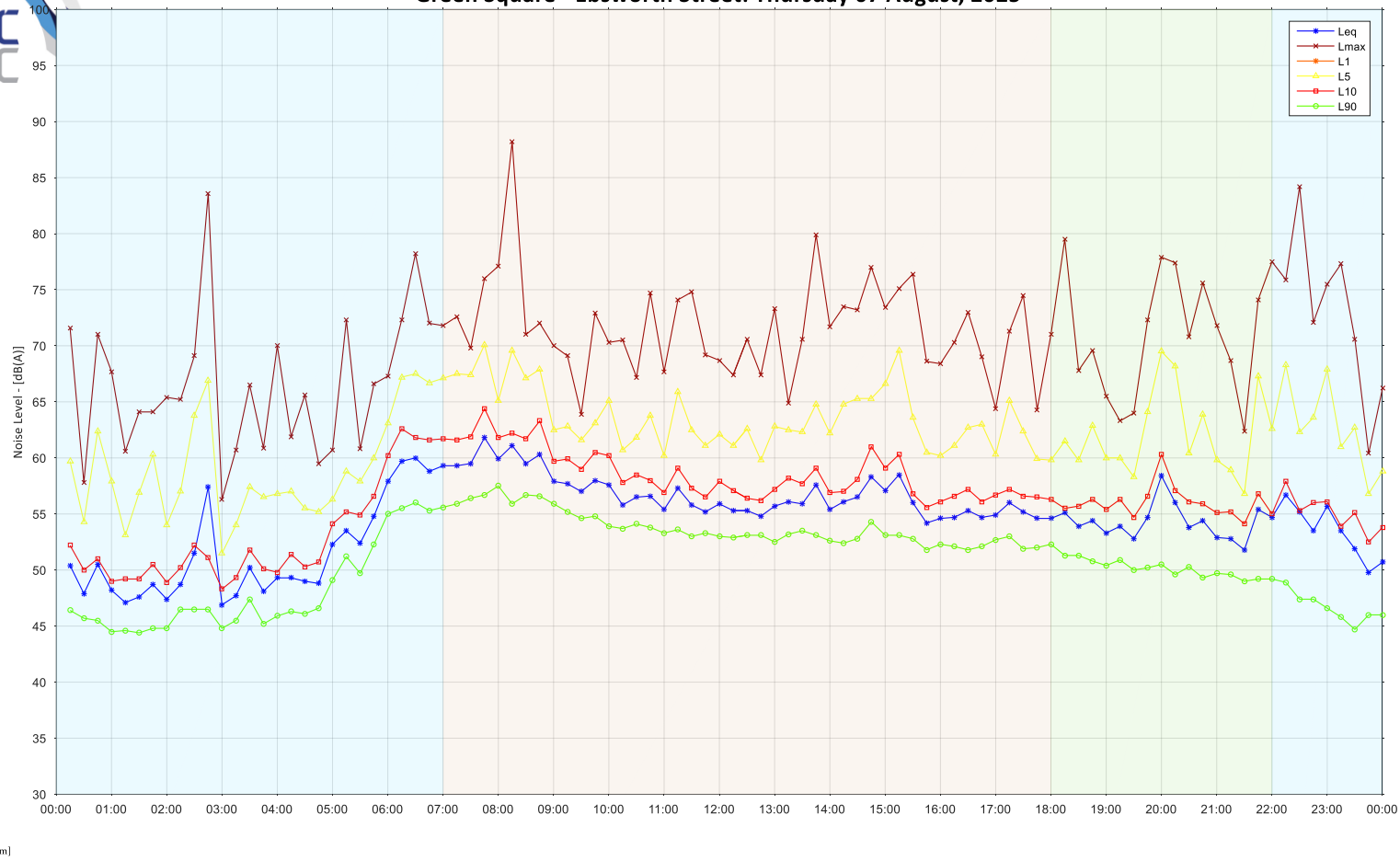
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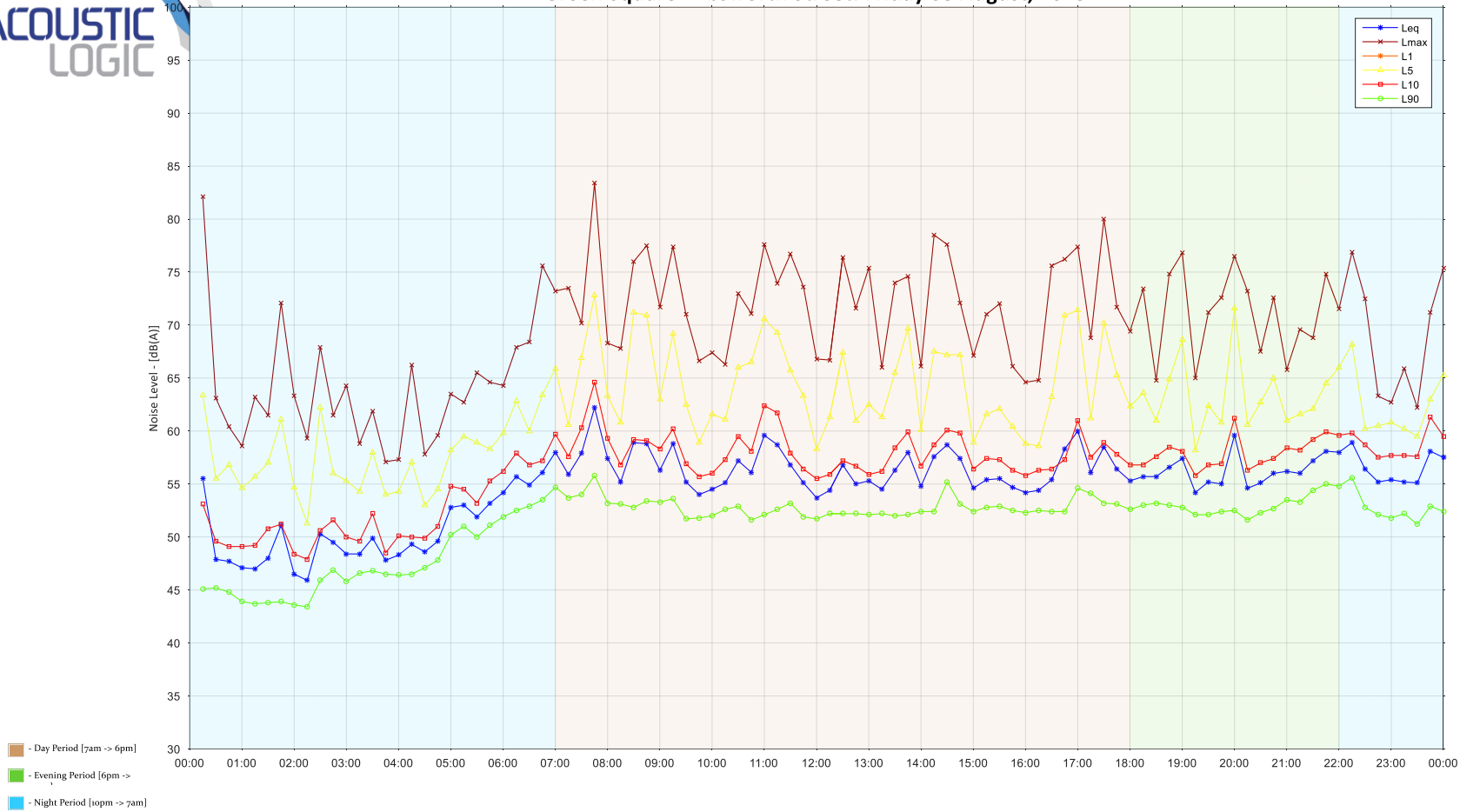
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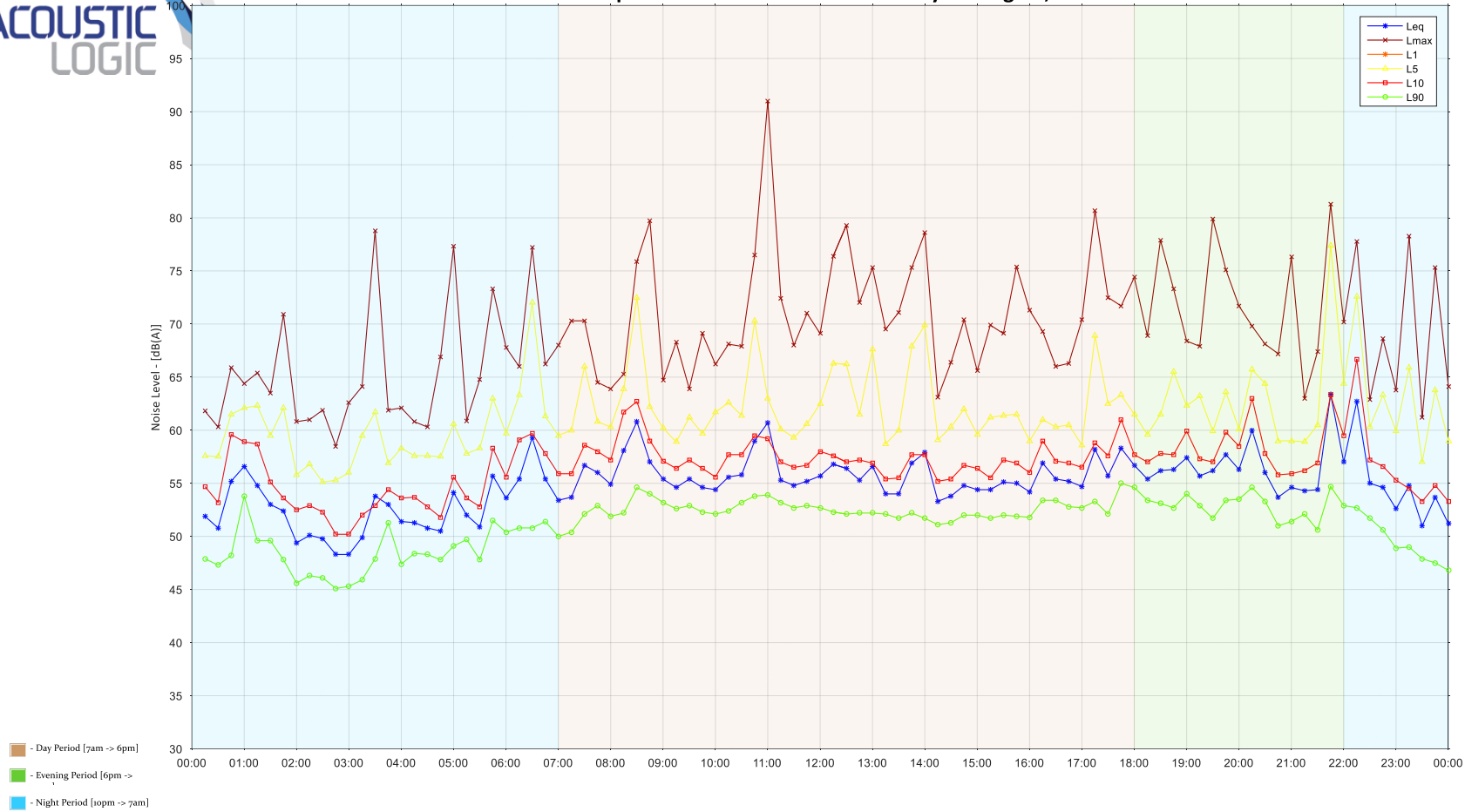
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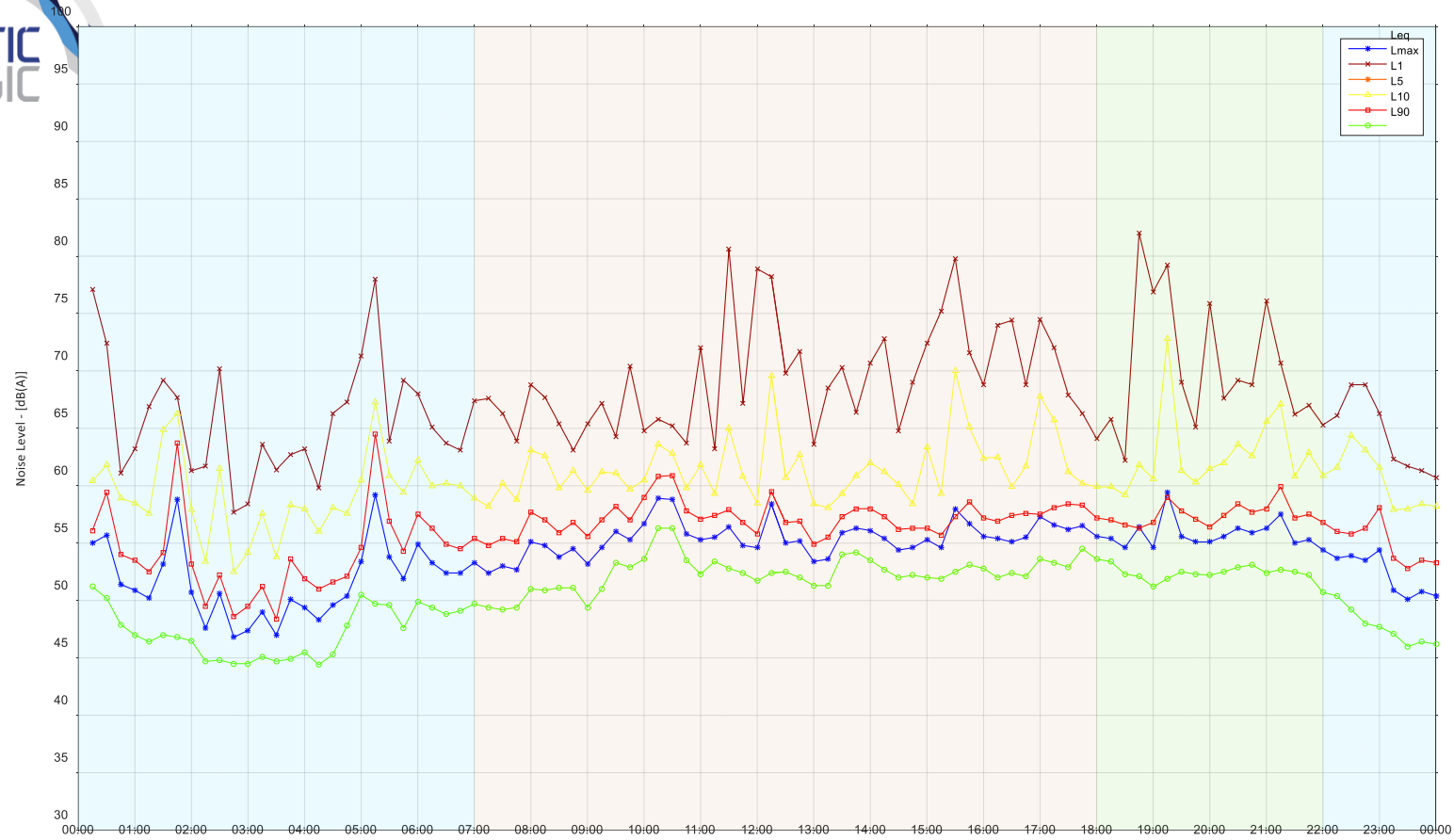
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Green Square - Ebsworth Street: Saturday 09 August, 2025

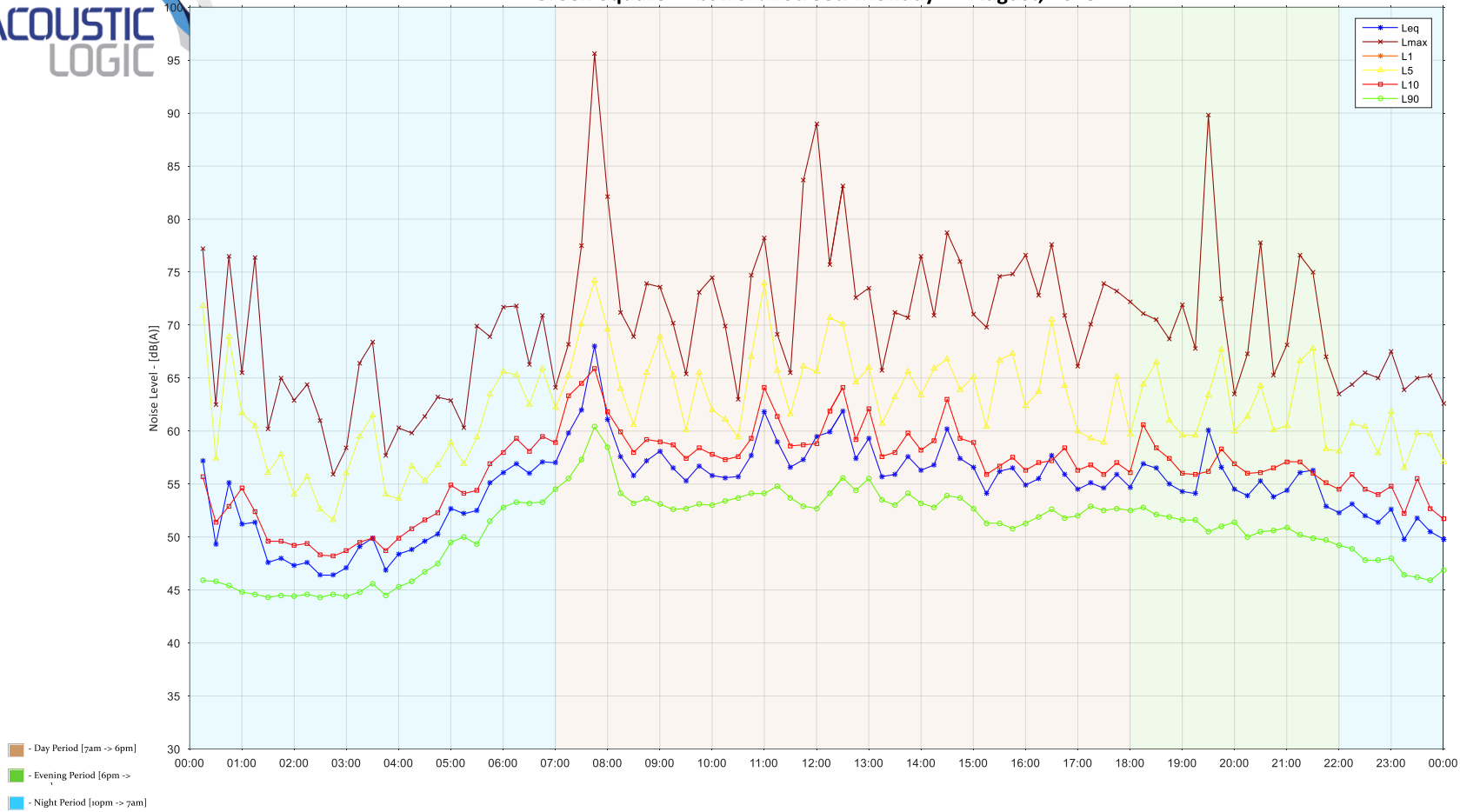


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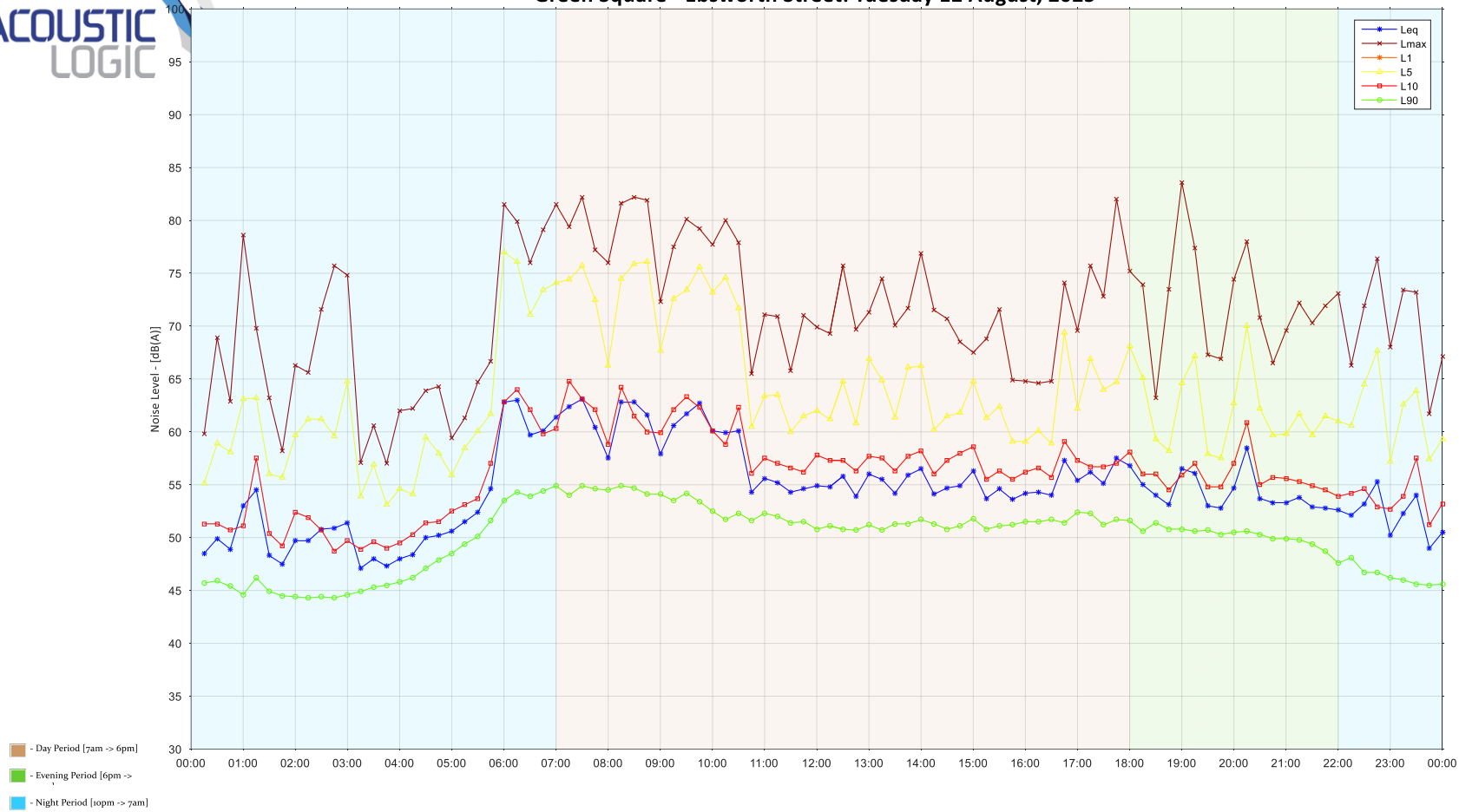


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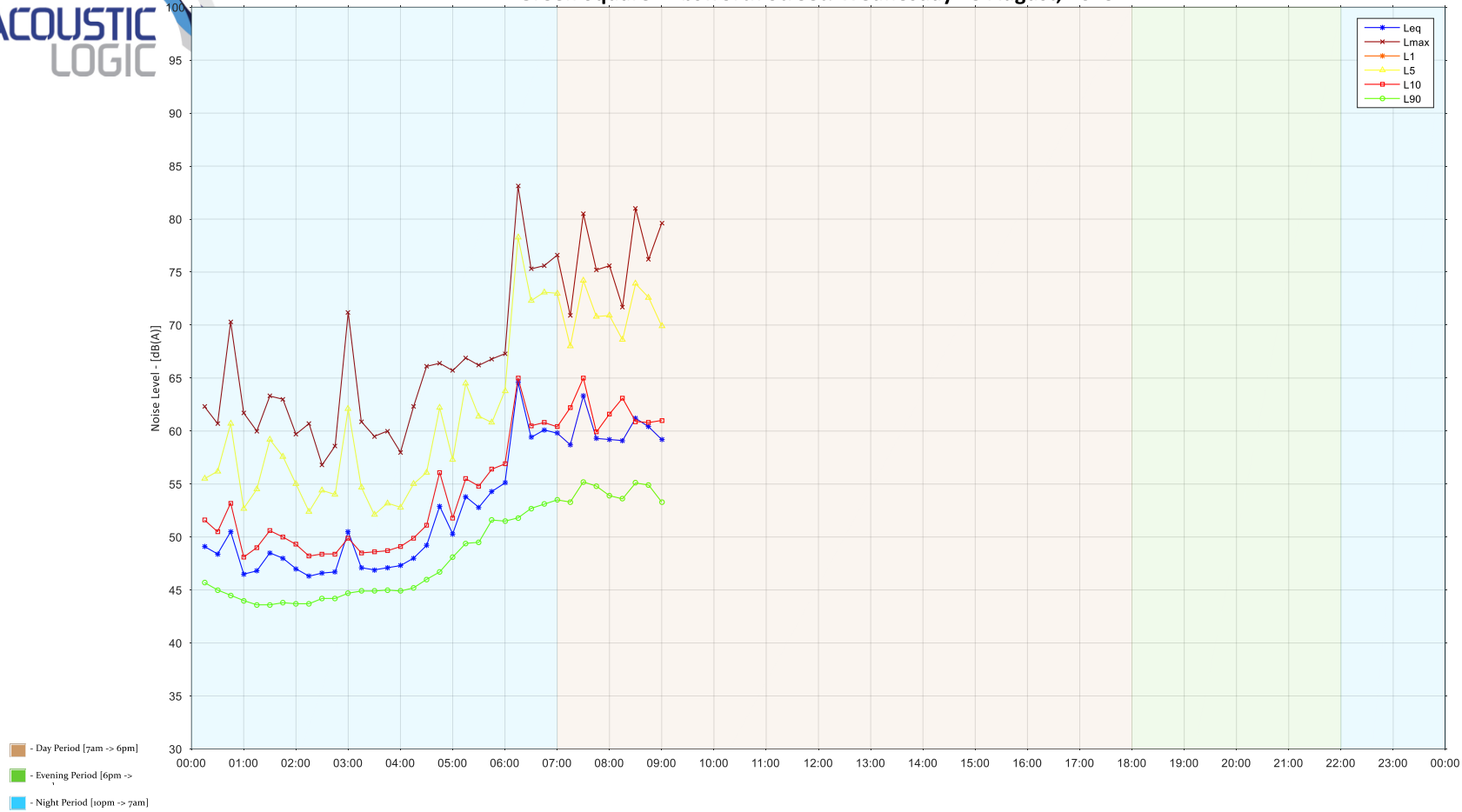
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Green Square - Ebsworth Street: Tuesday 12 August, 2025

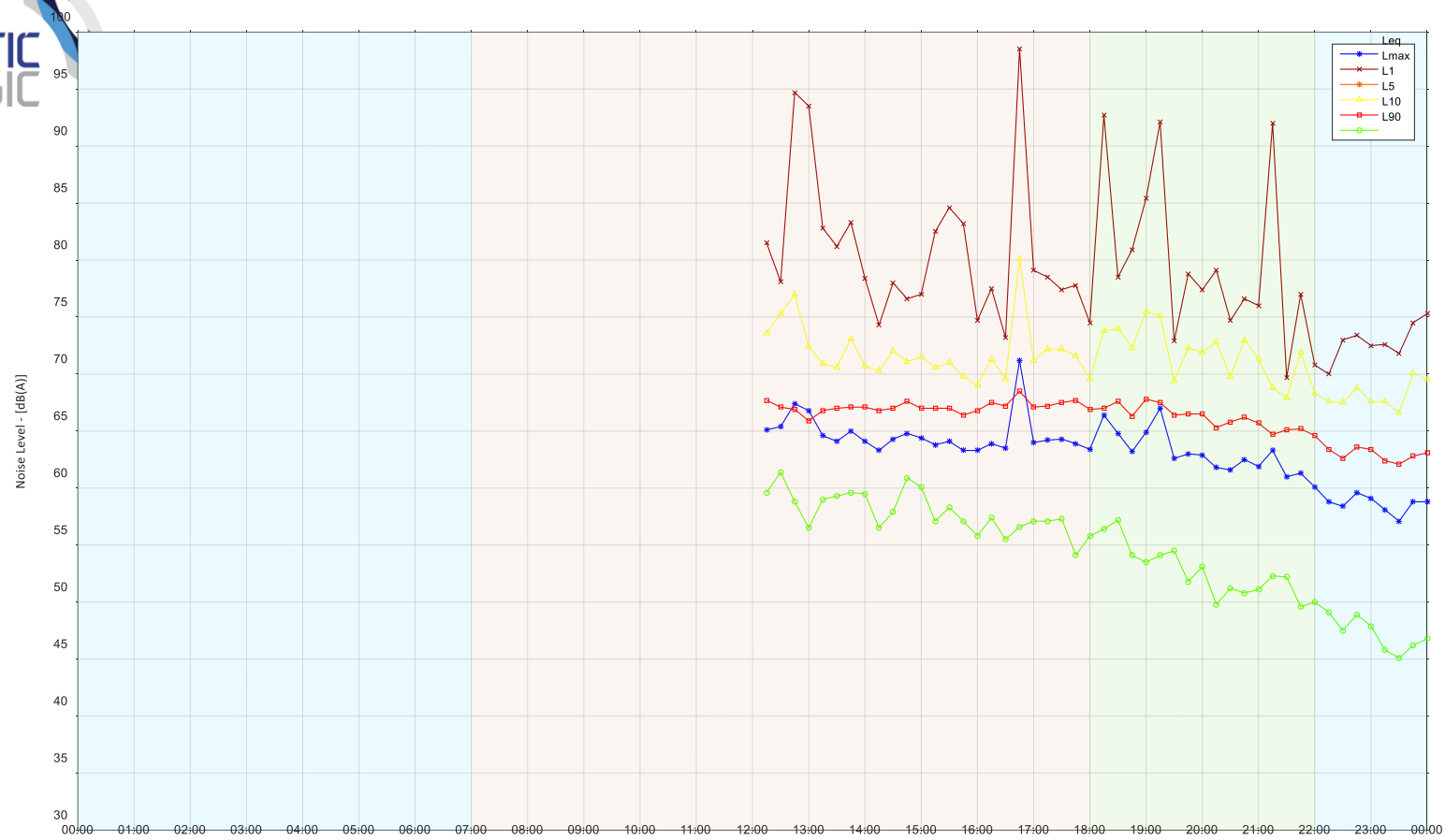


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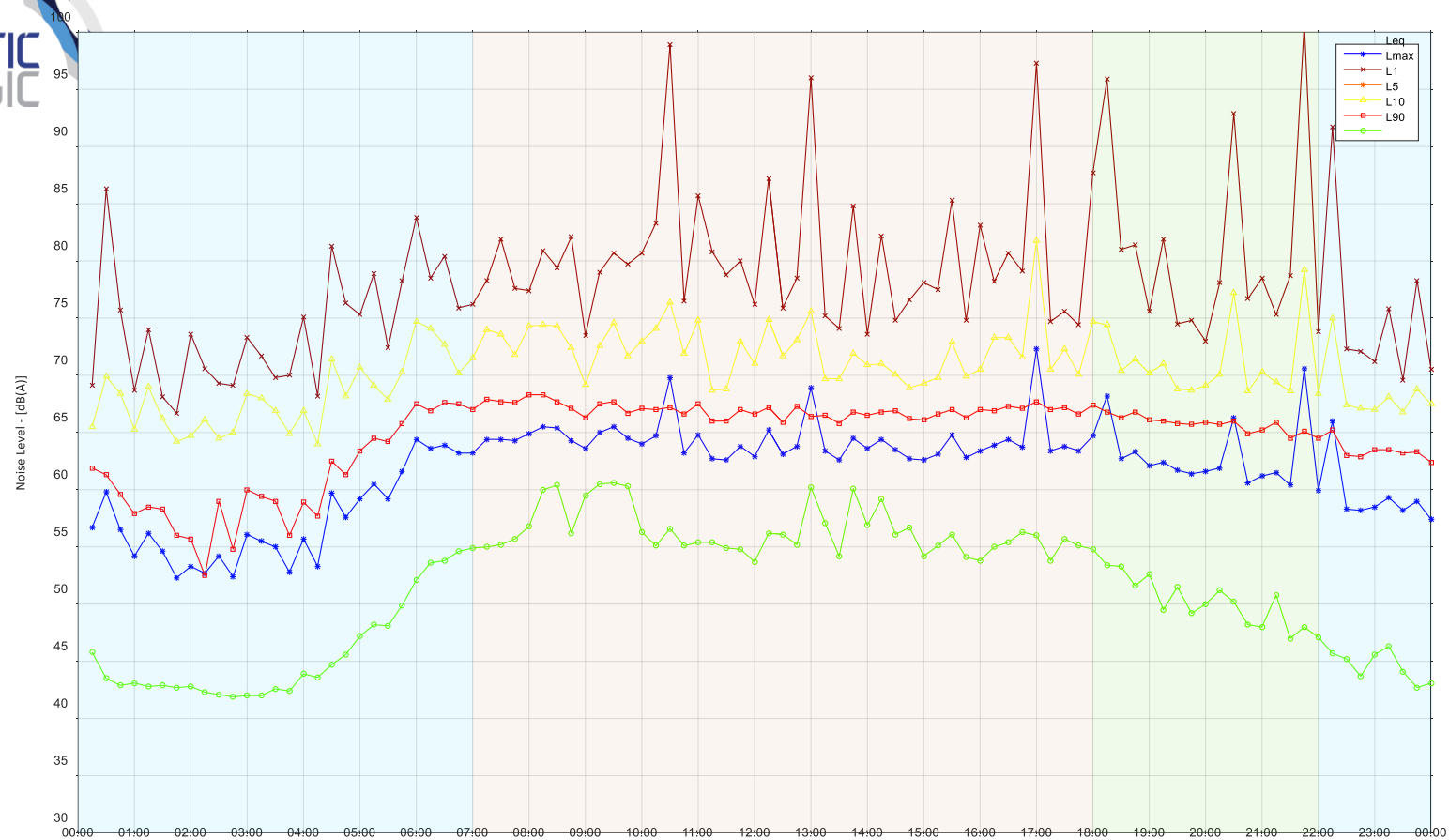


LOCATION M2 – BOTANY ROAD

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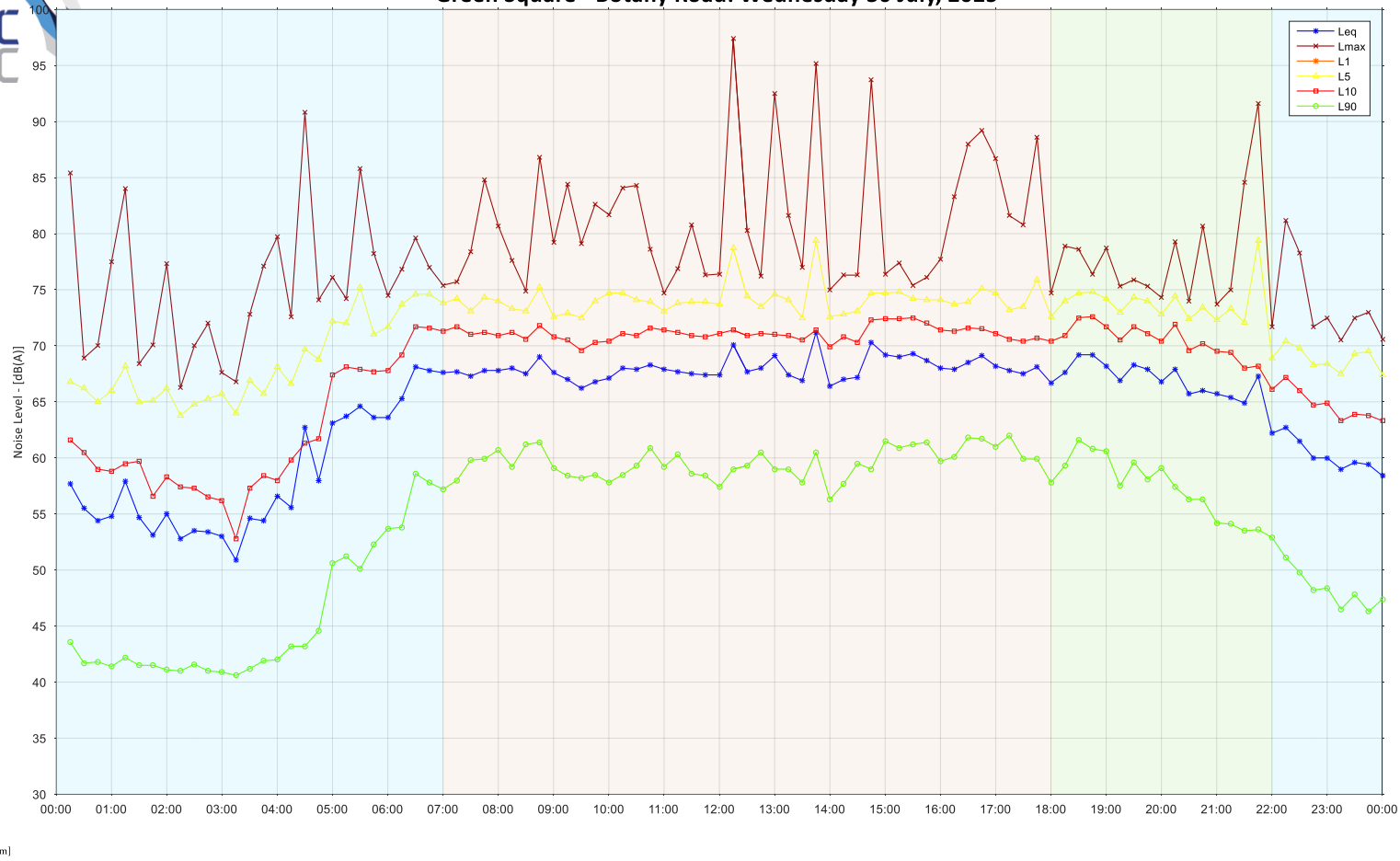


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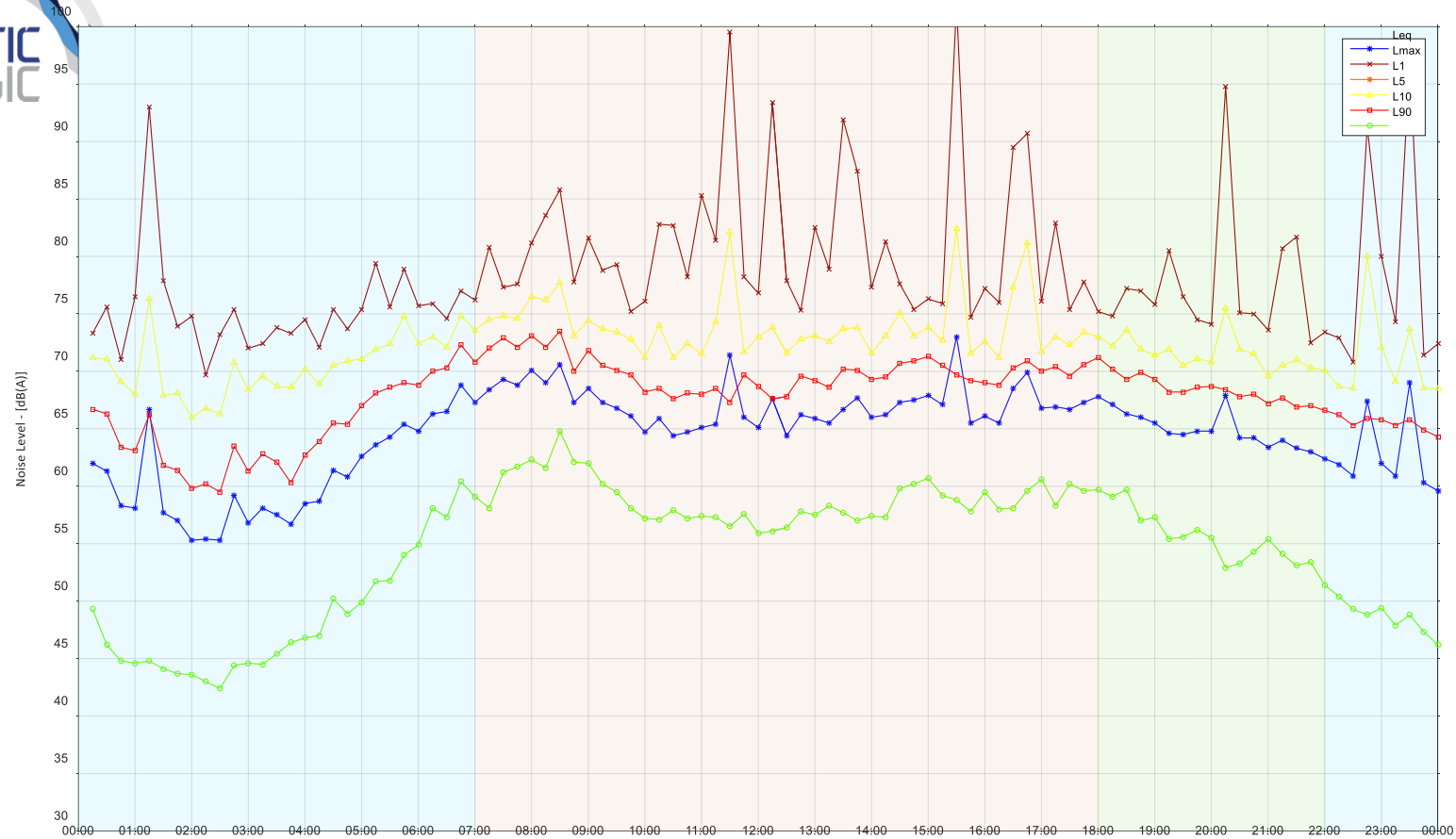


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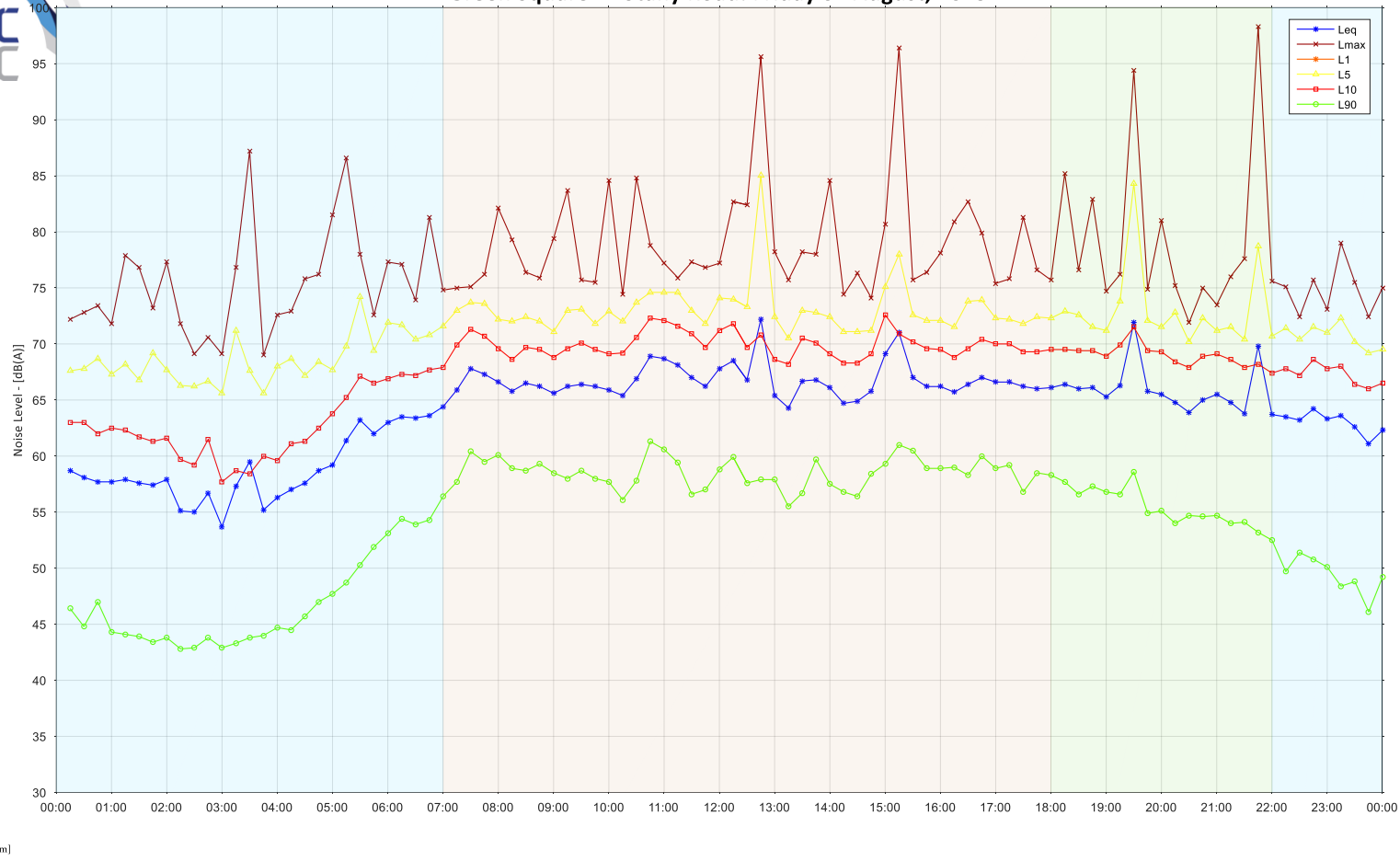
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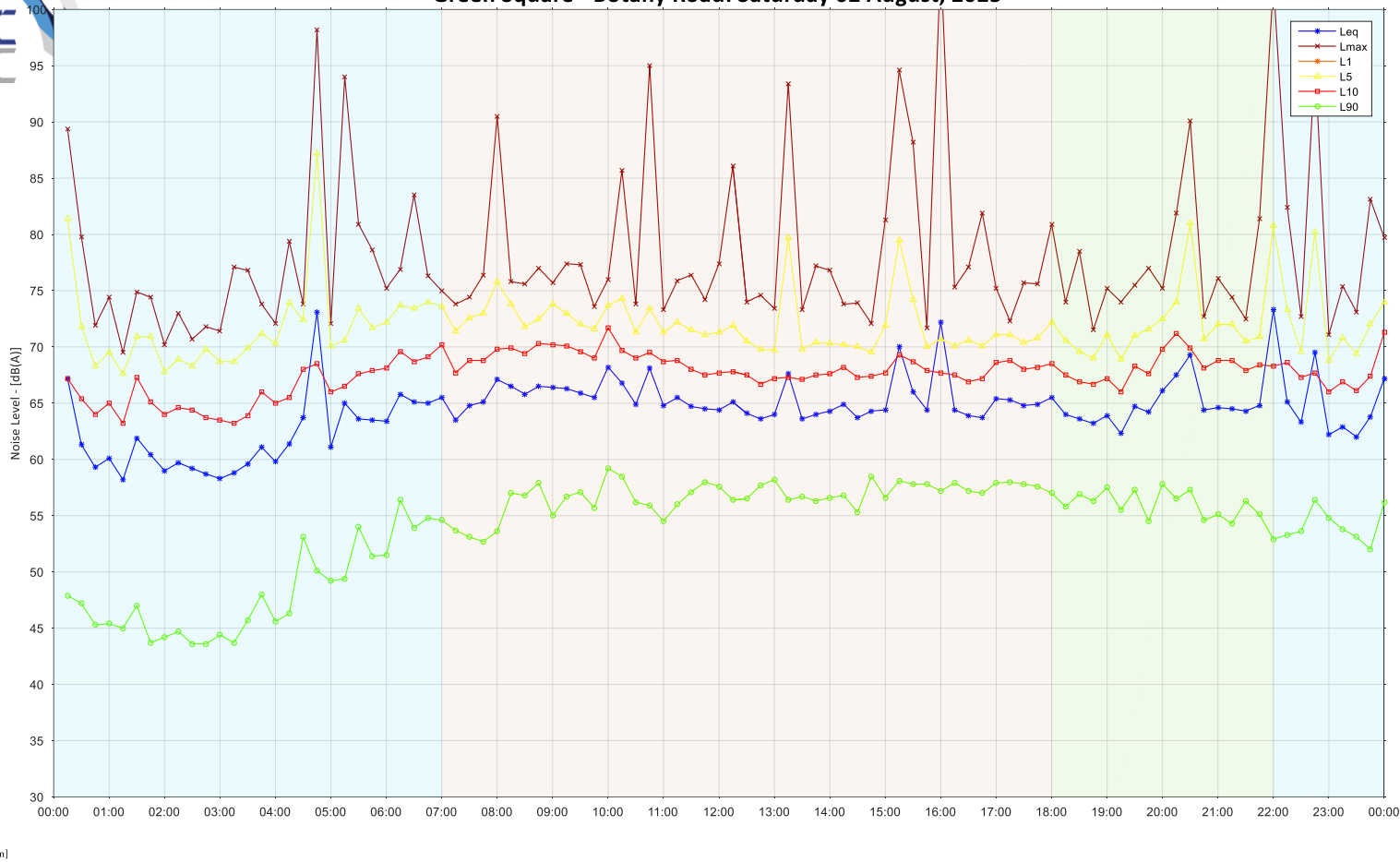
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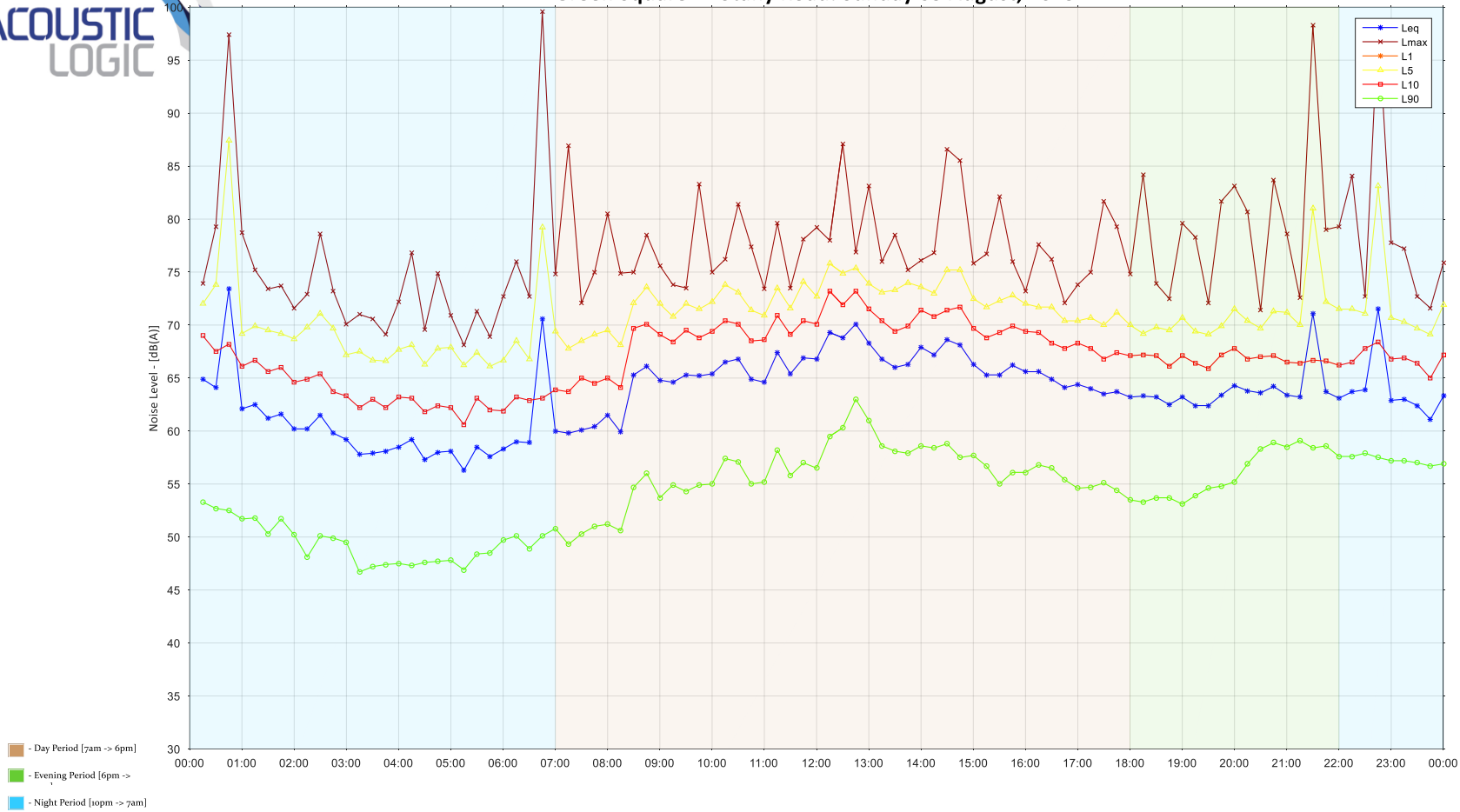
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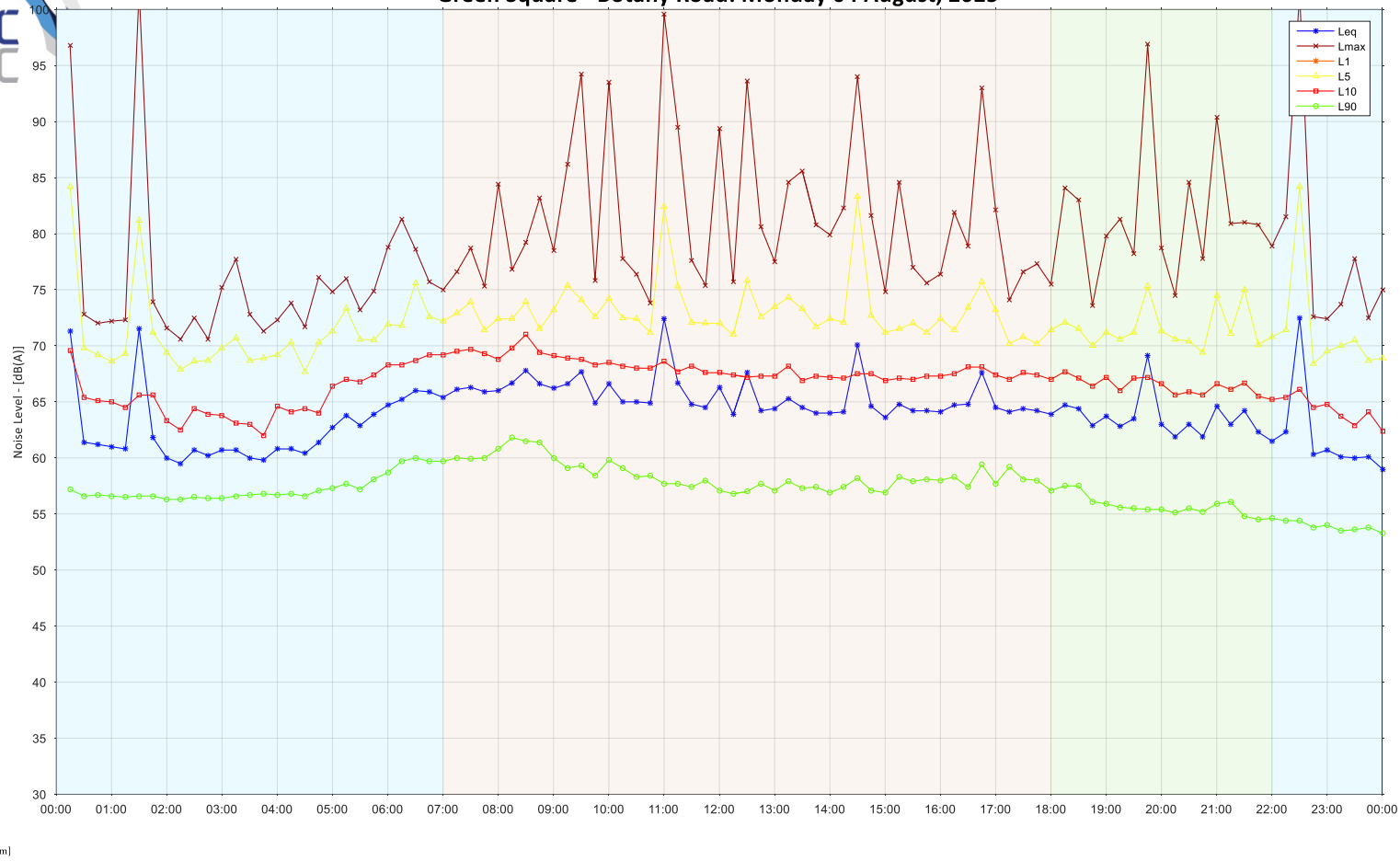
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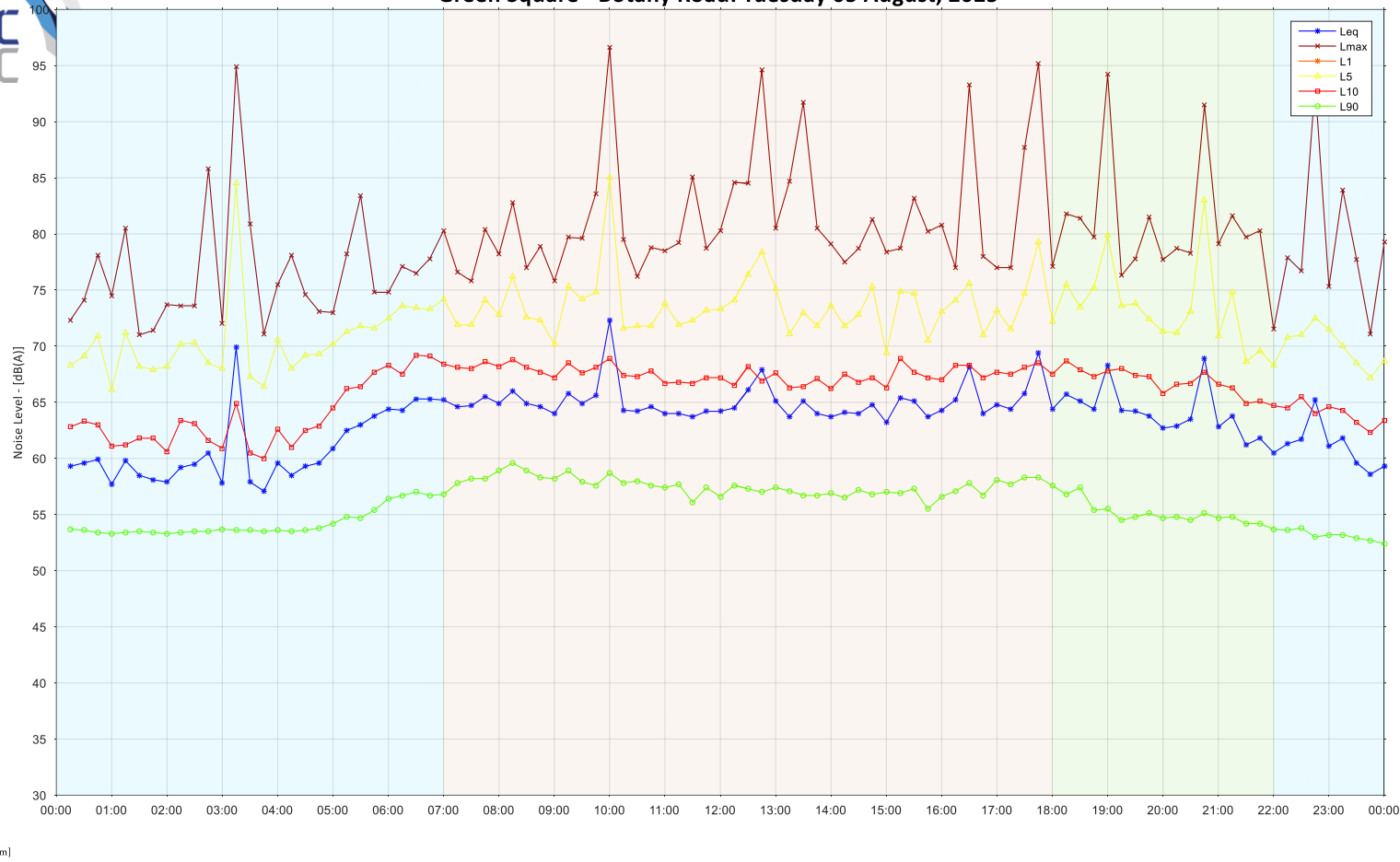
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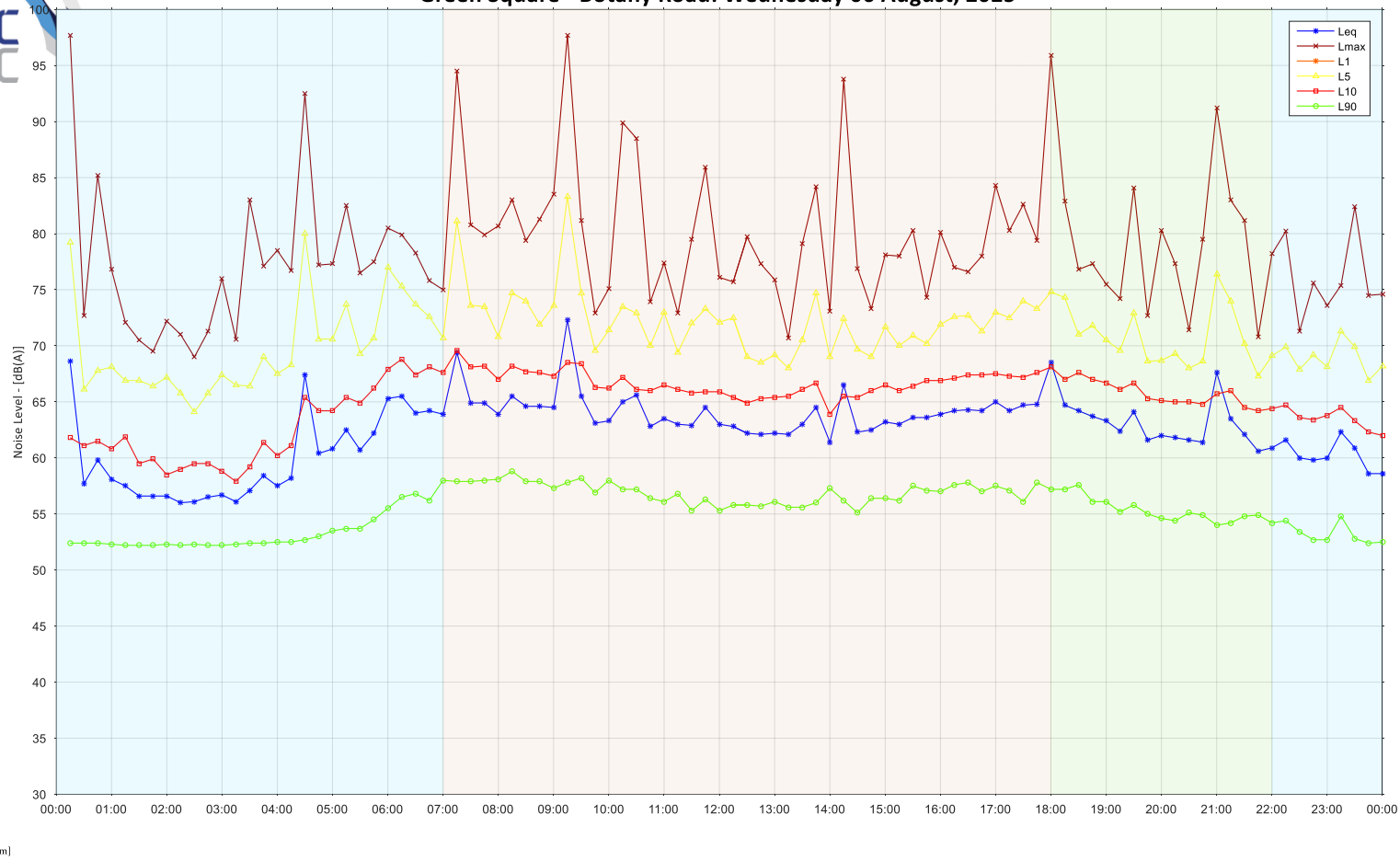
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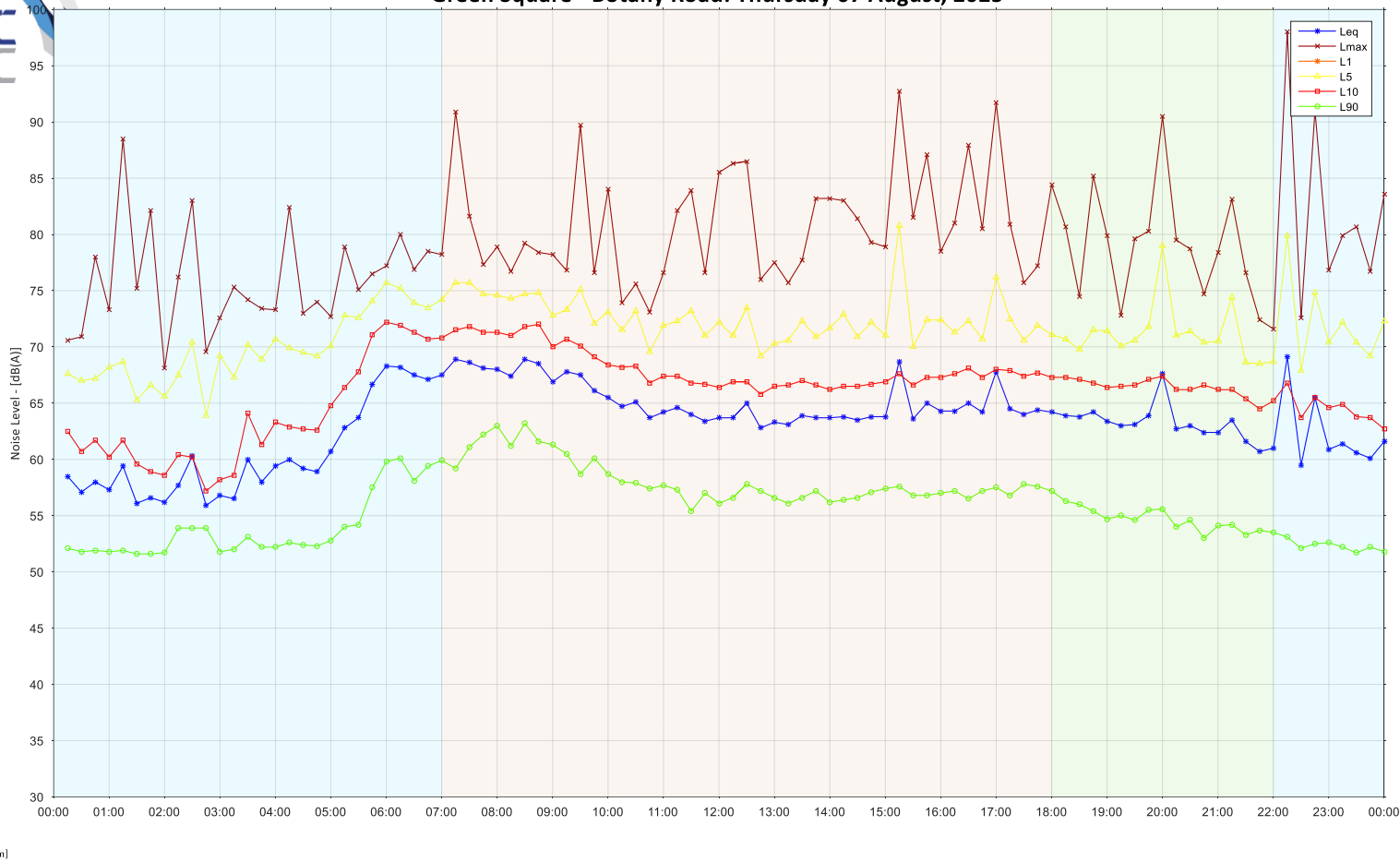
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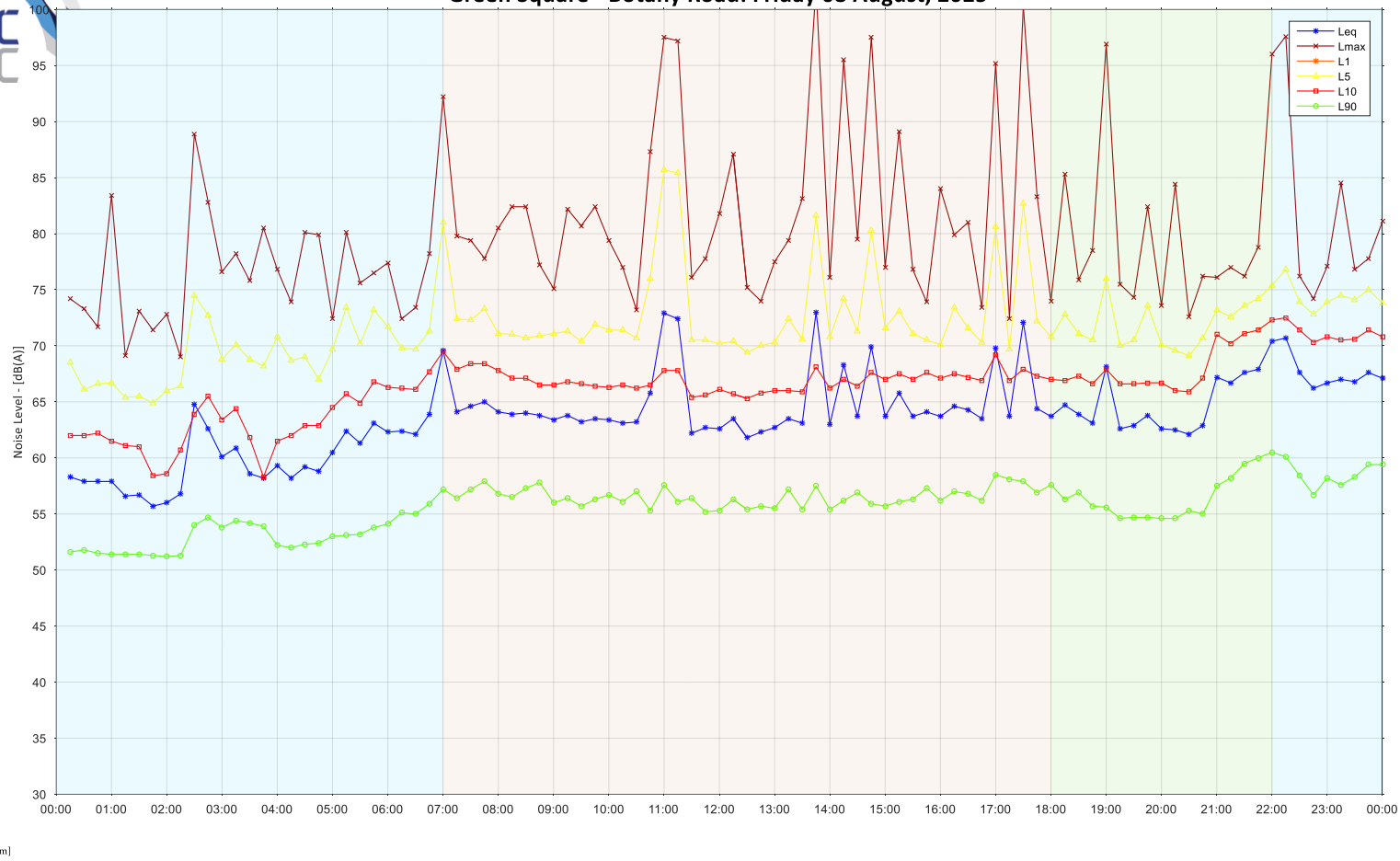
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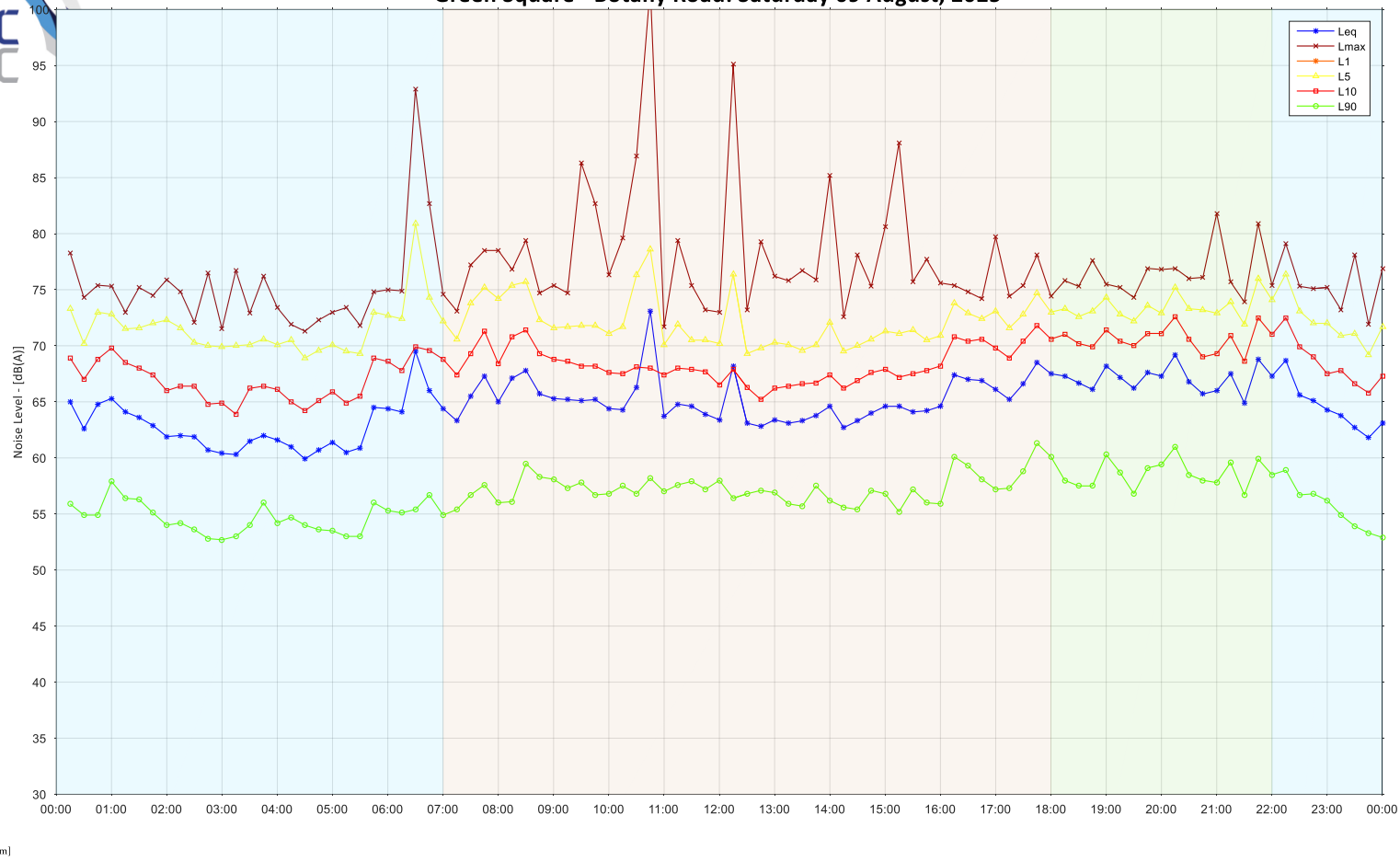
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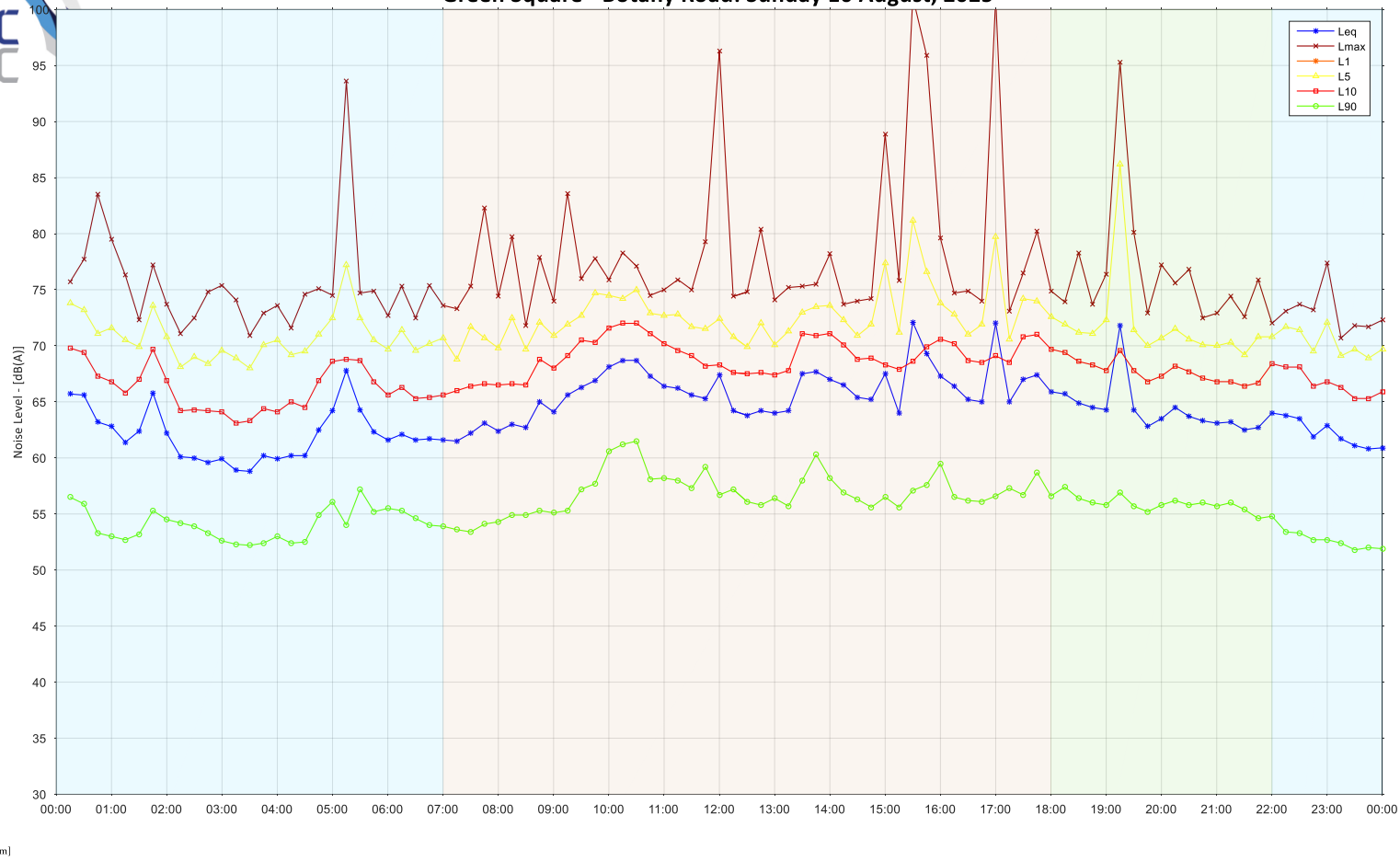
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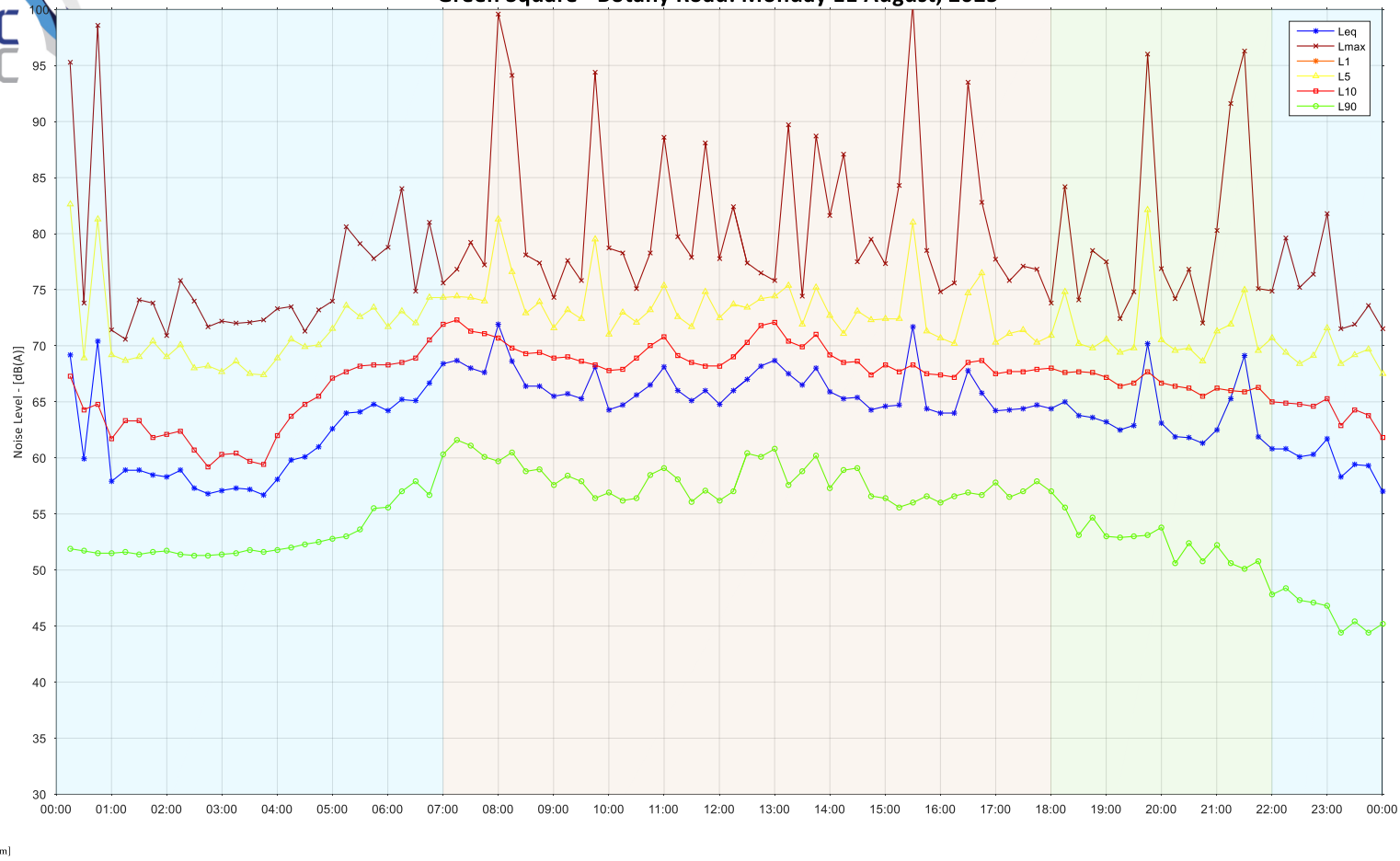
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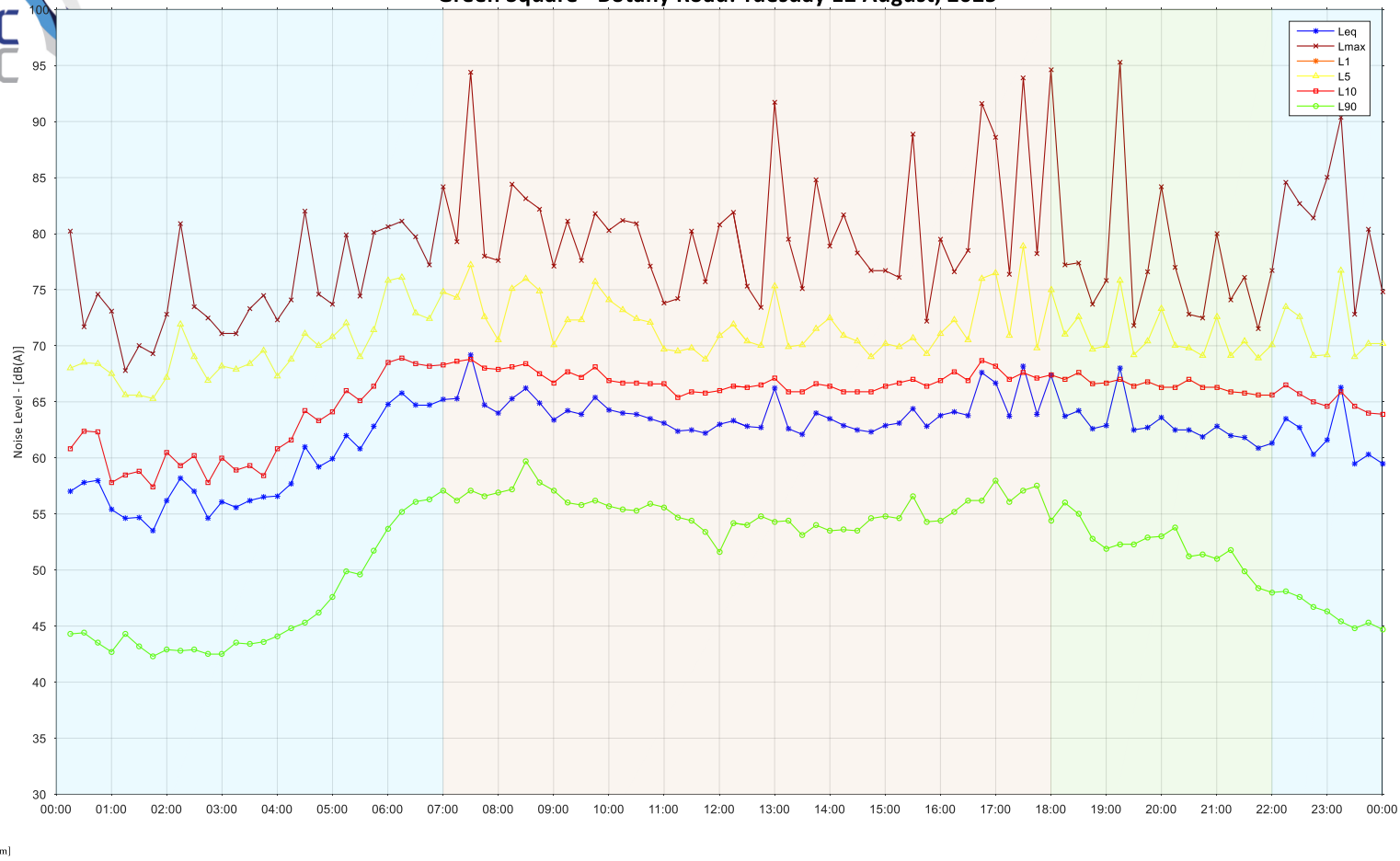
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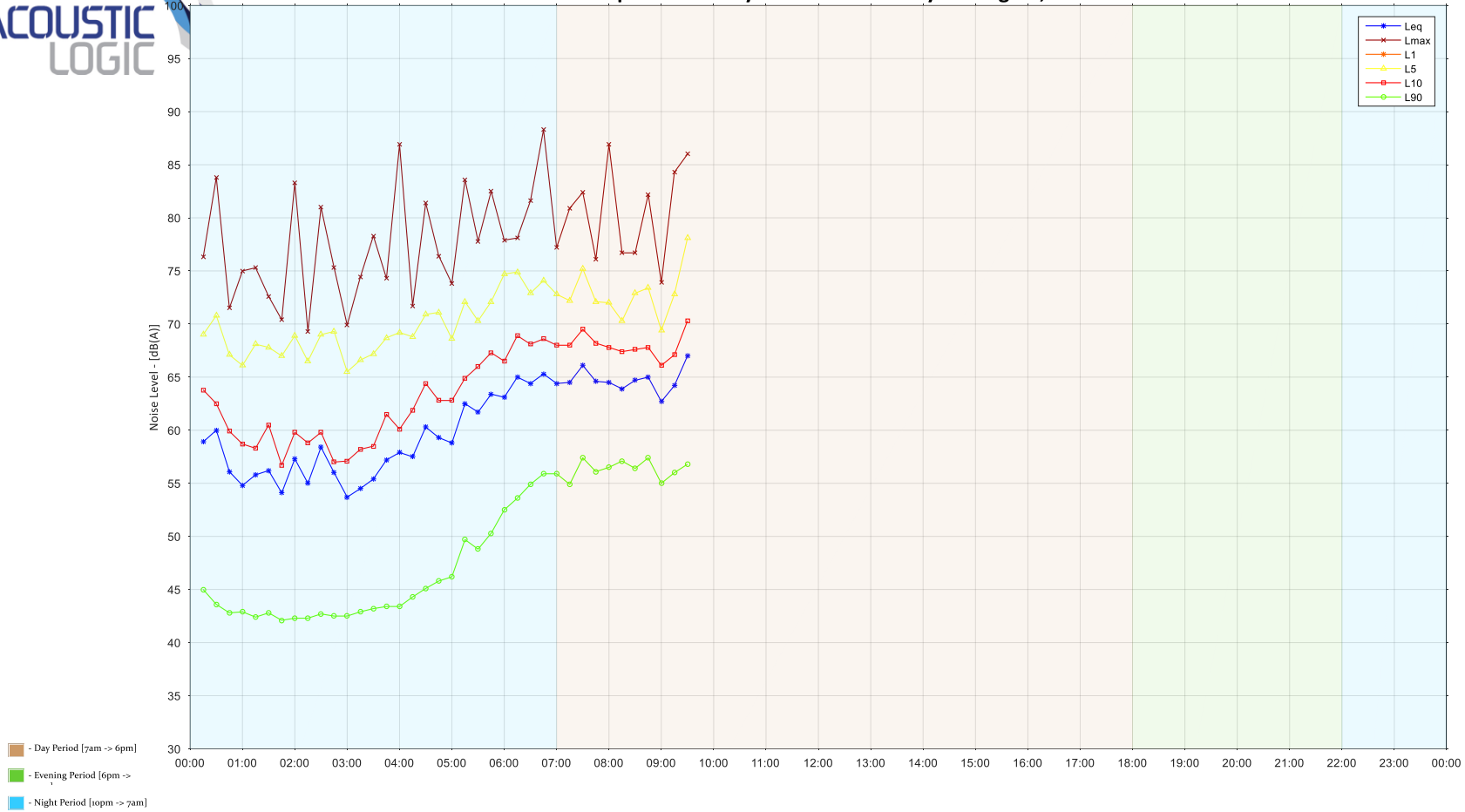
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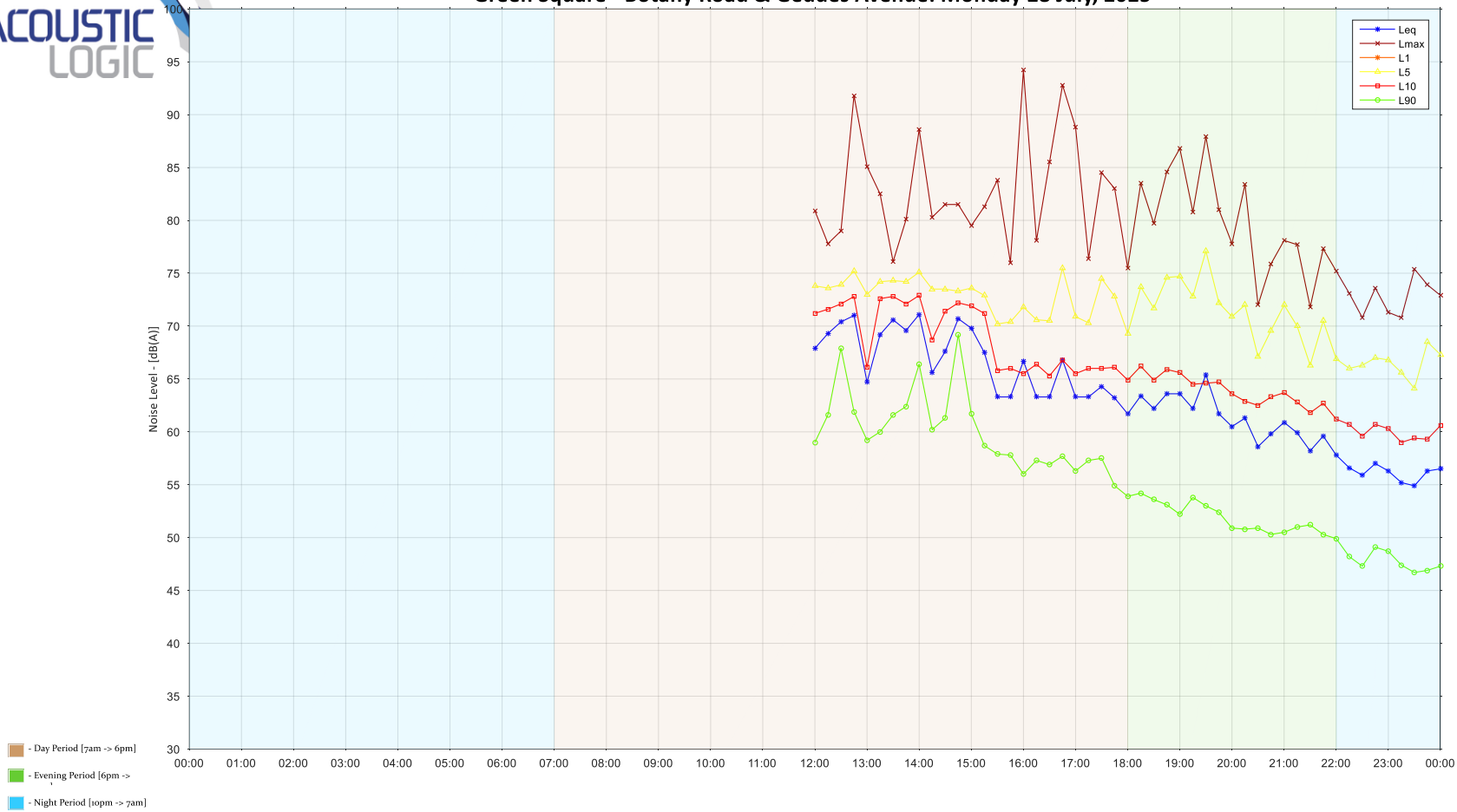


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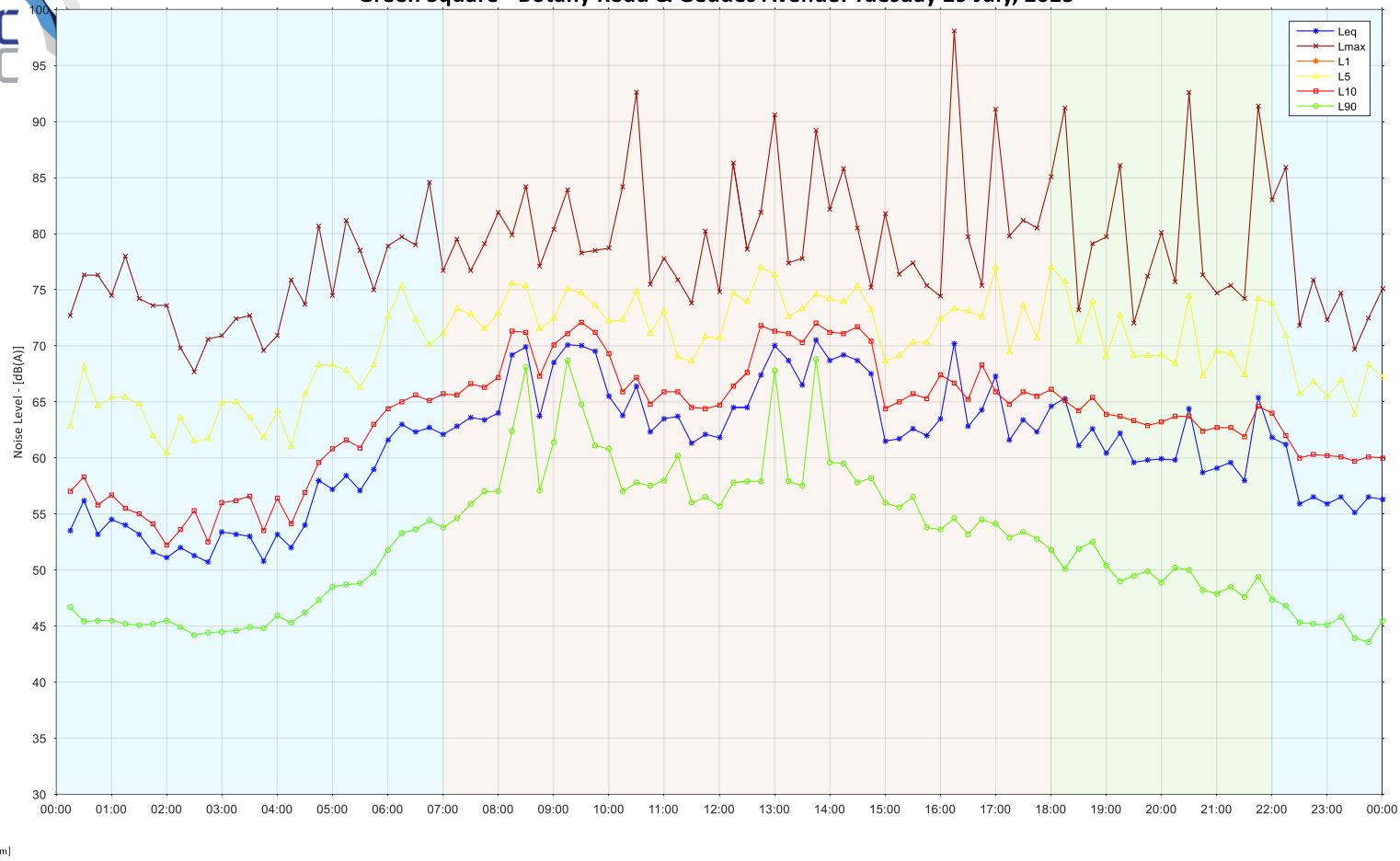


LOCATION M3 – BOTANY ROAD / GEDDES AVENUE

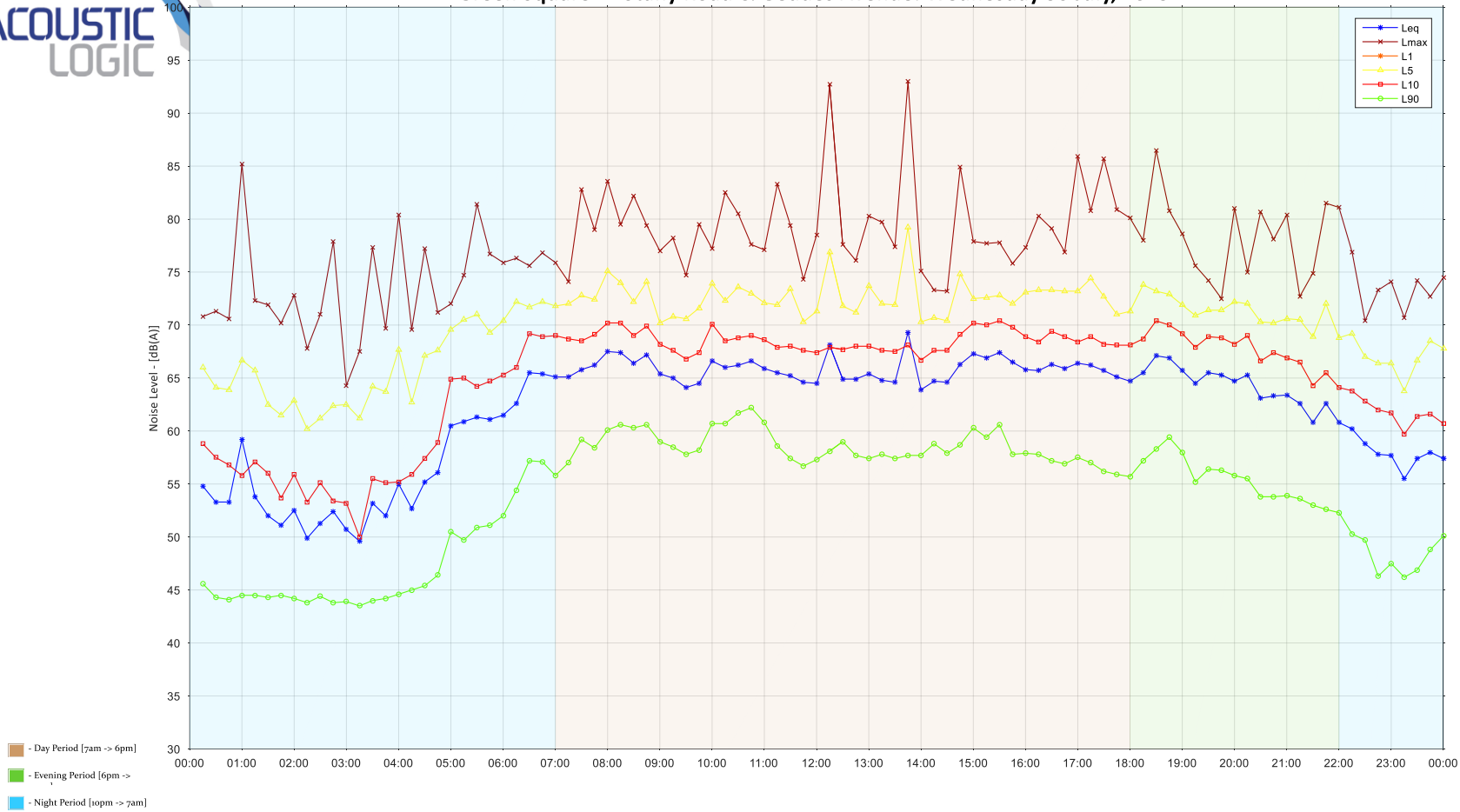
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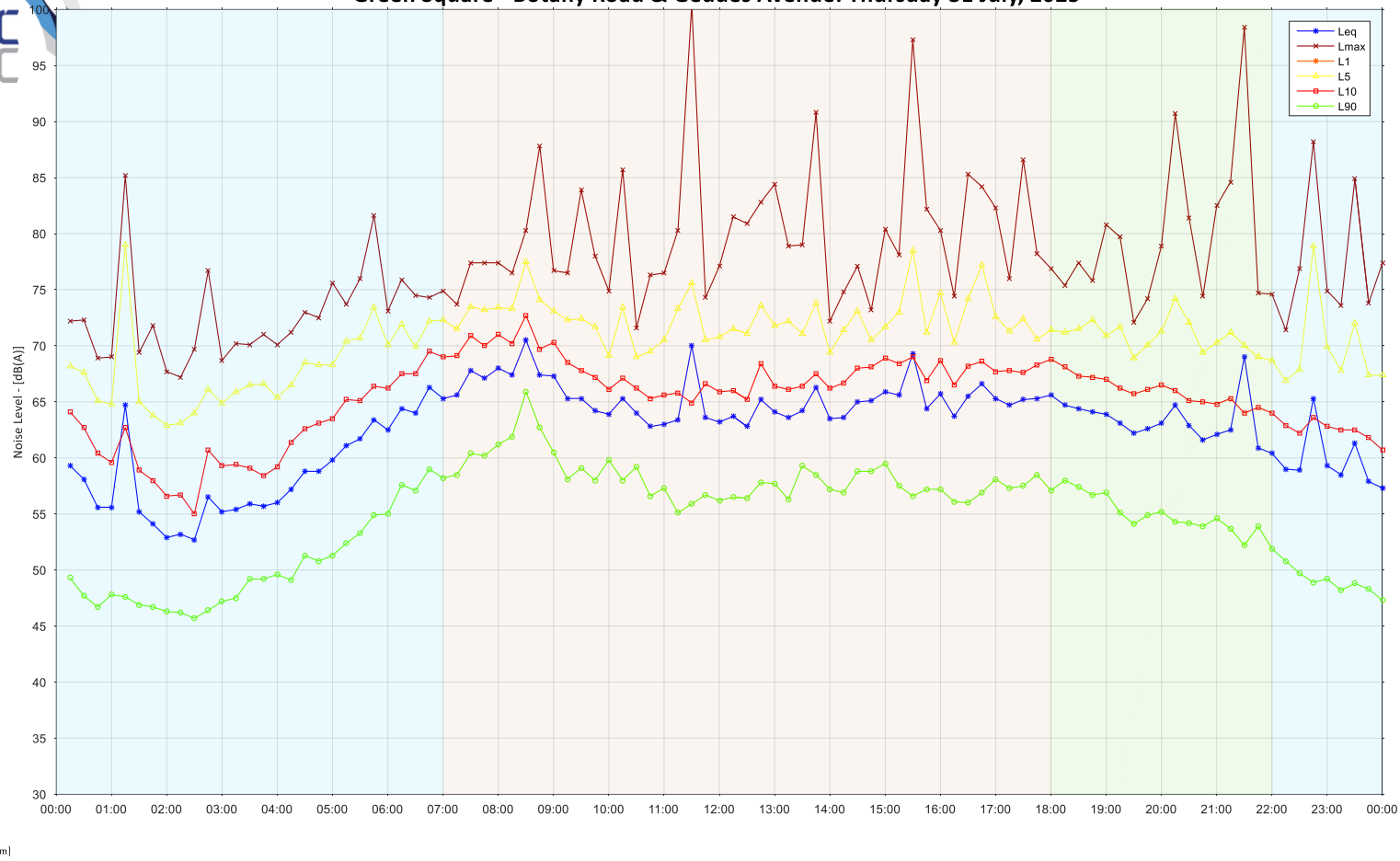
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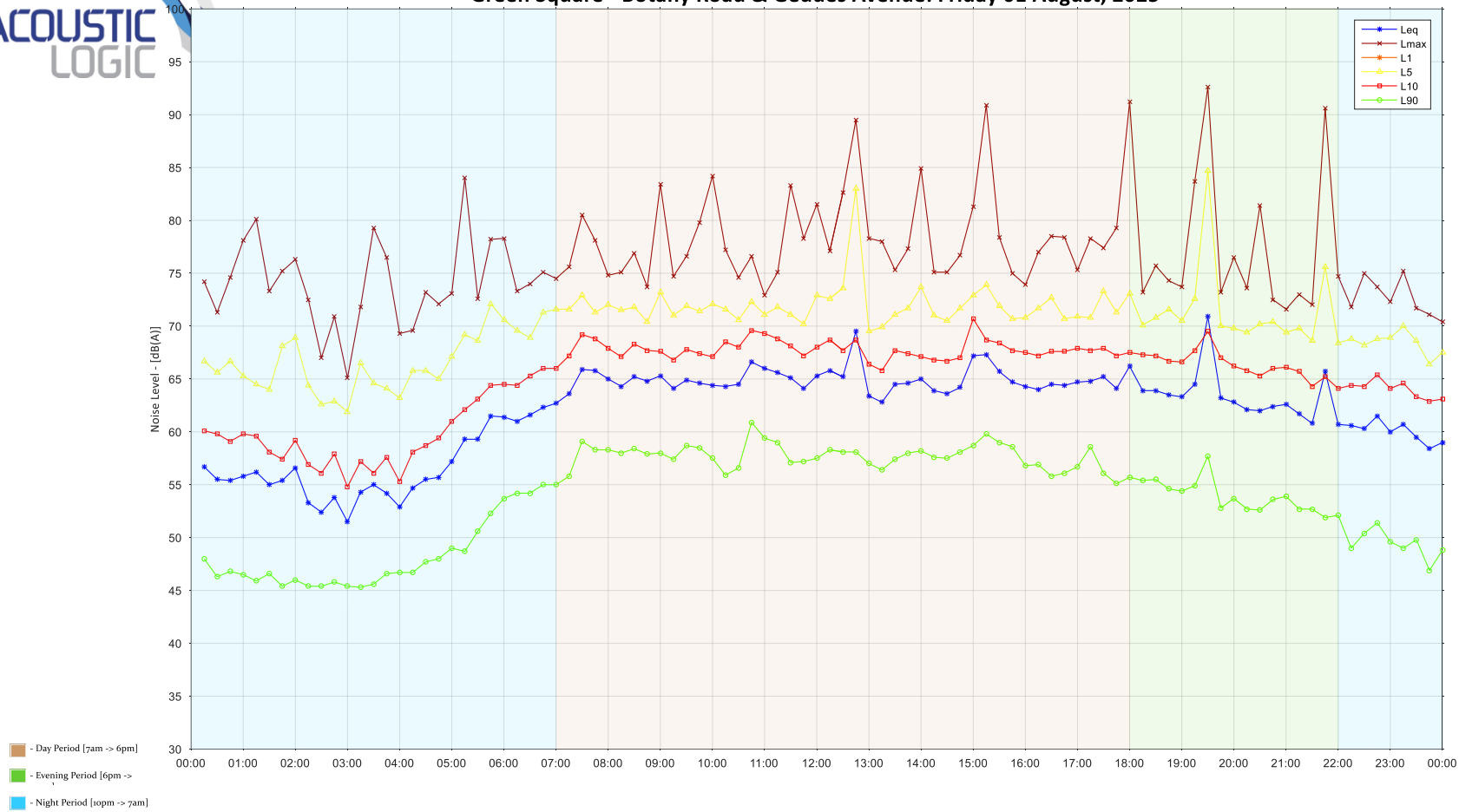
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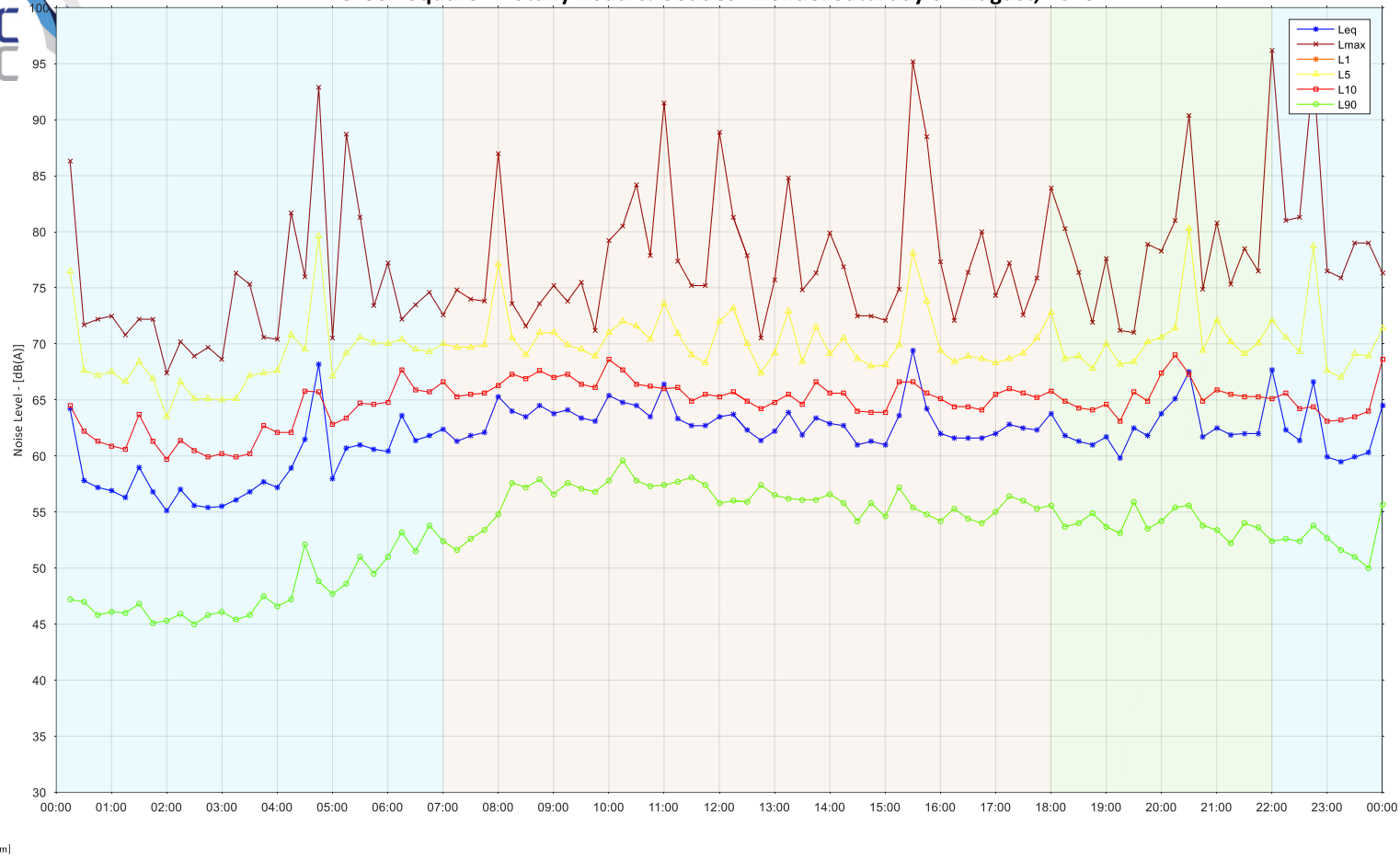
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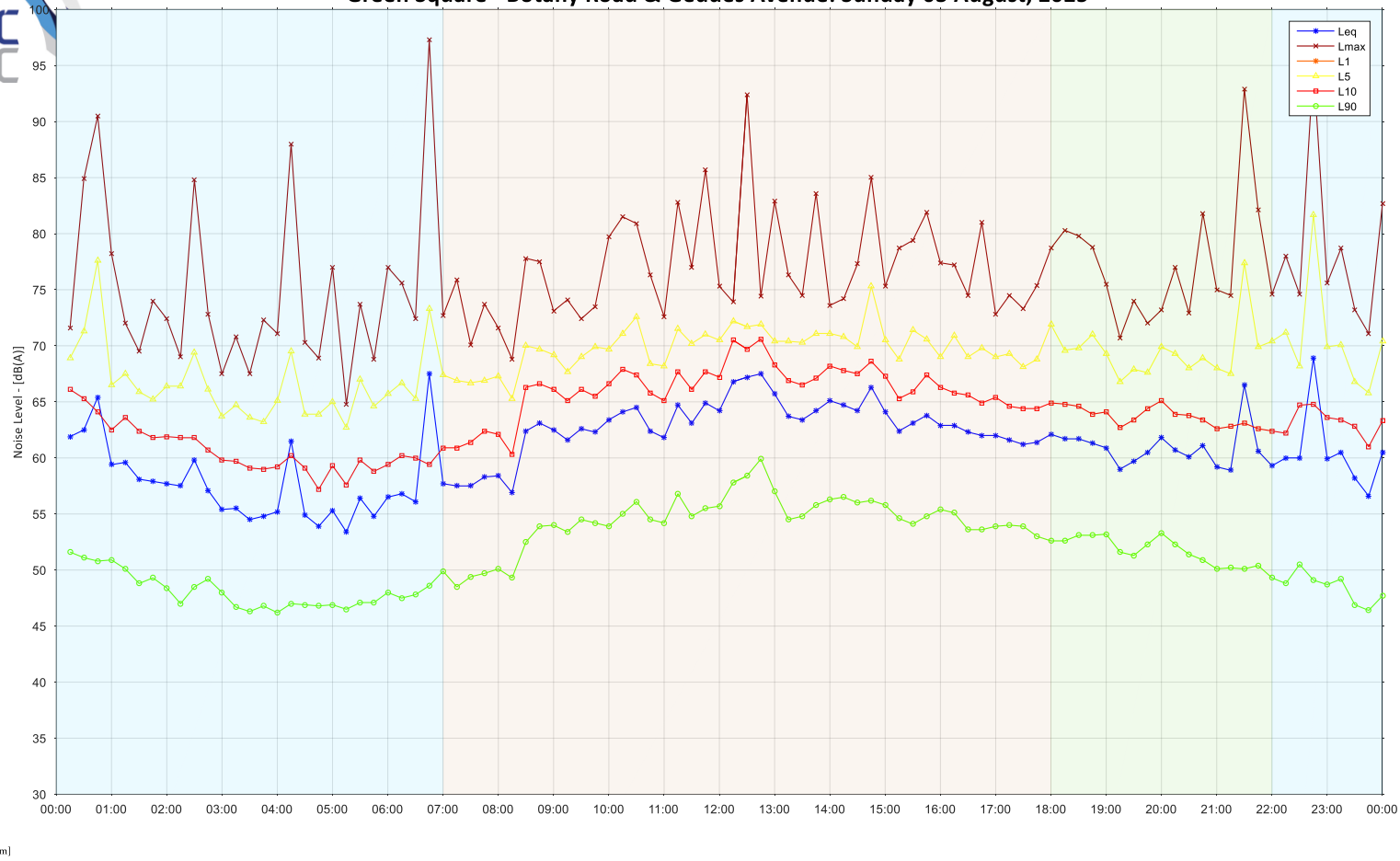
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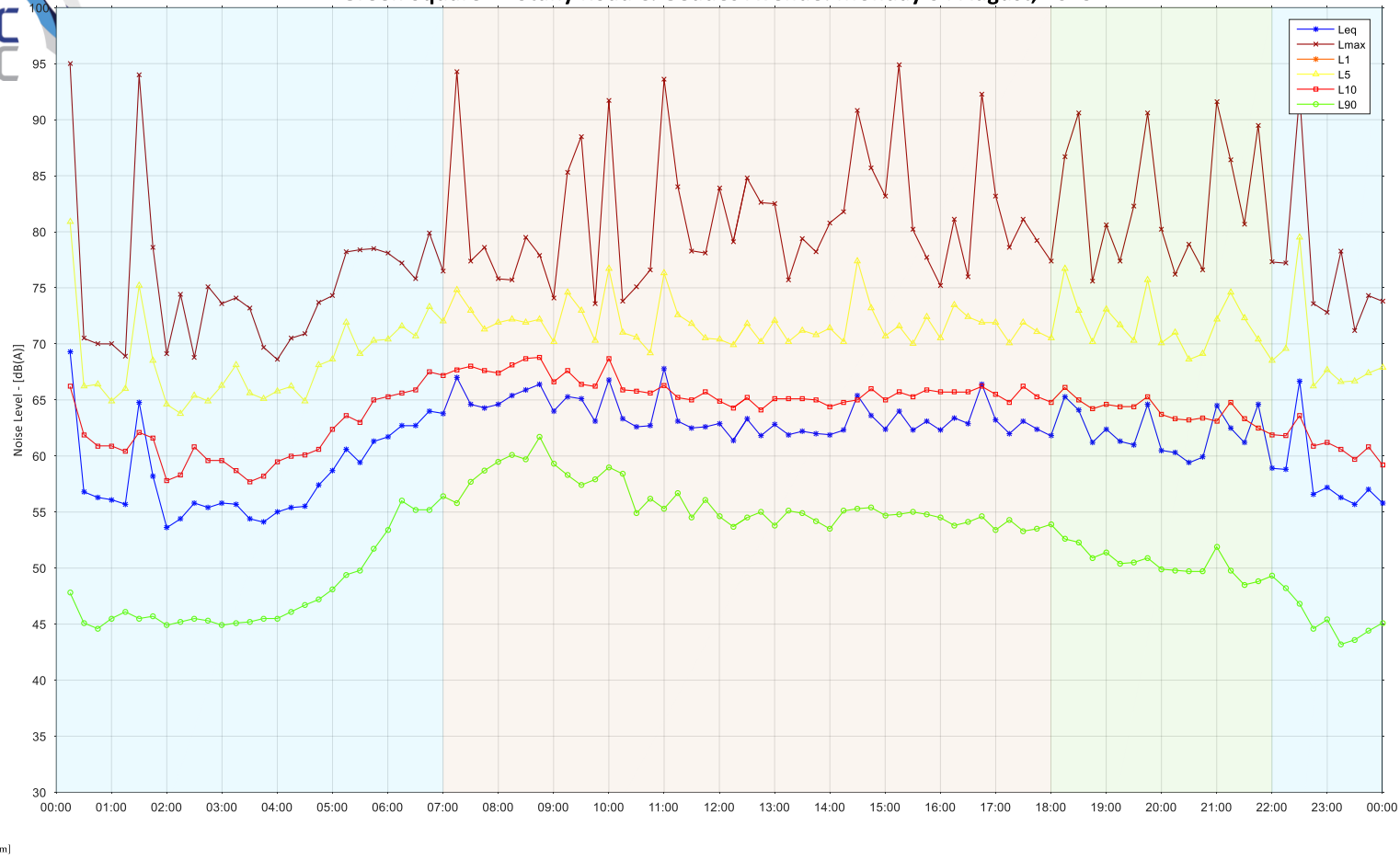
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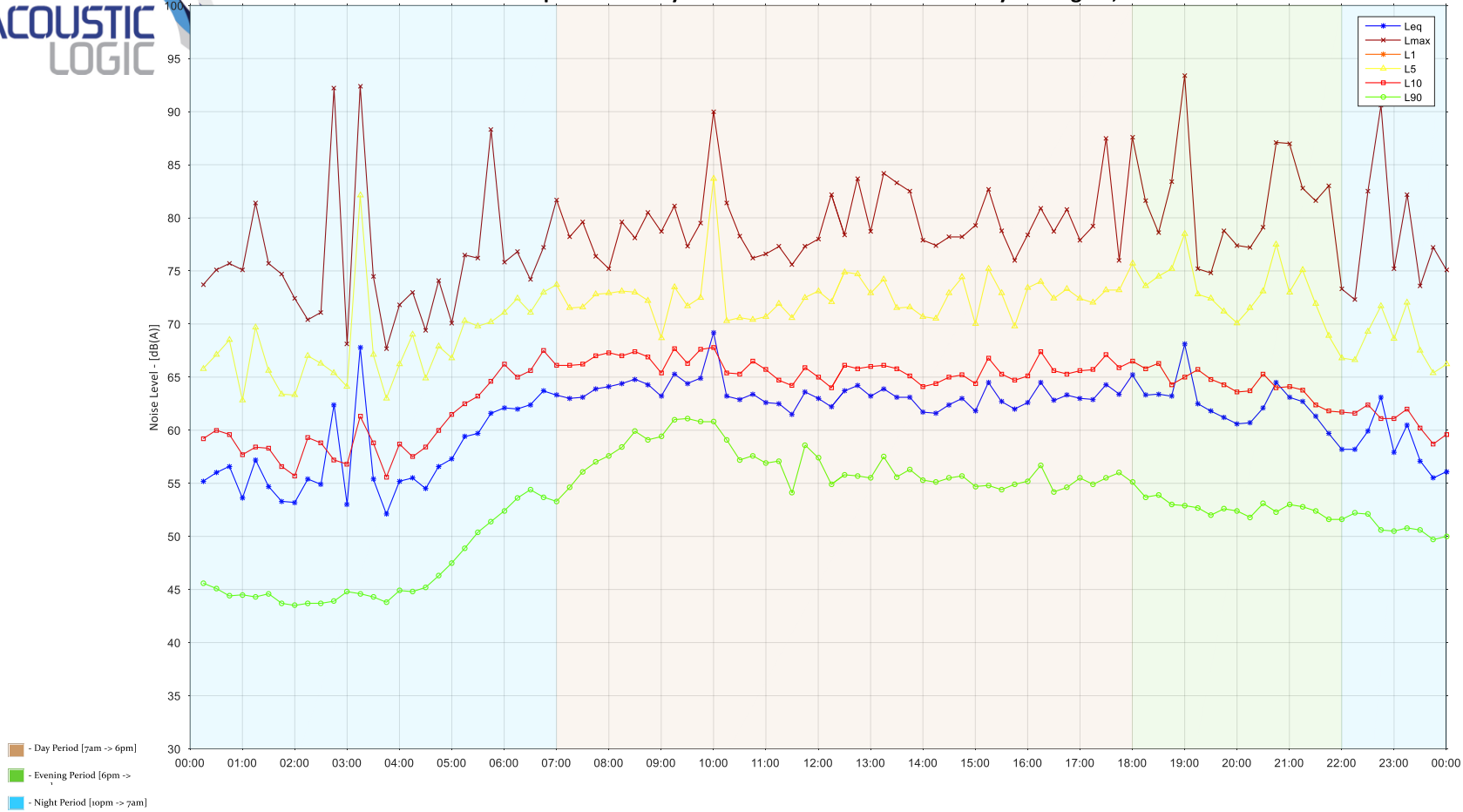
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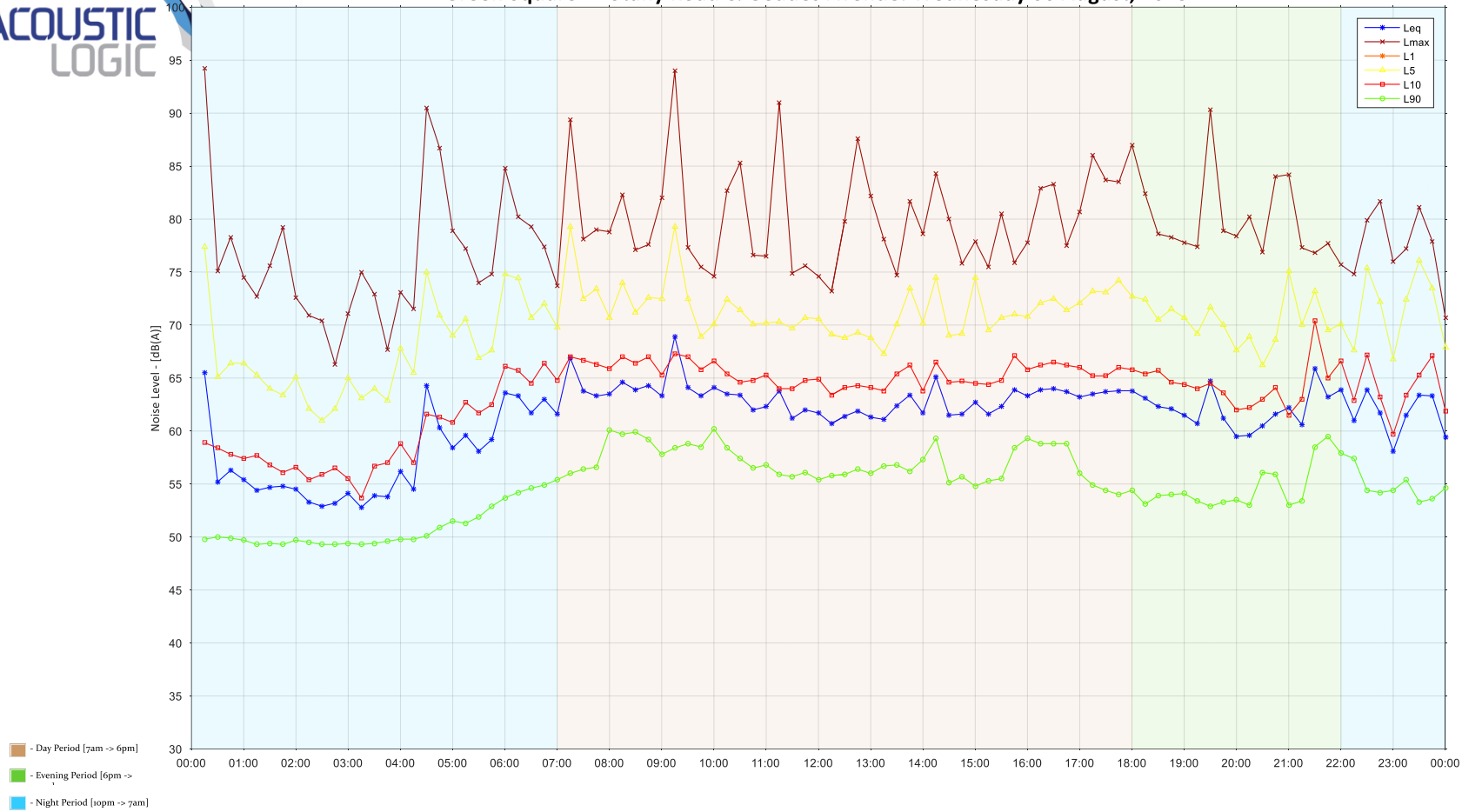
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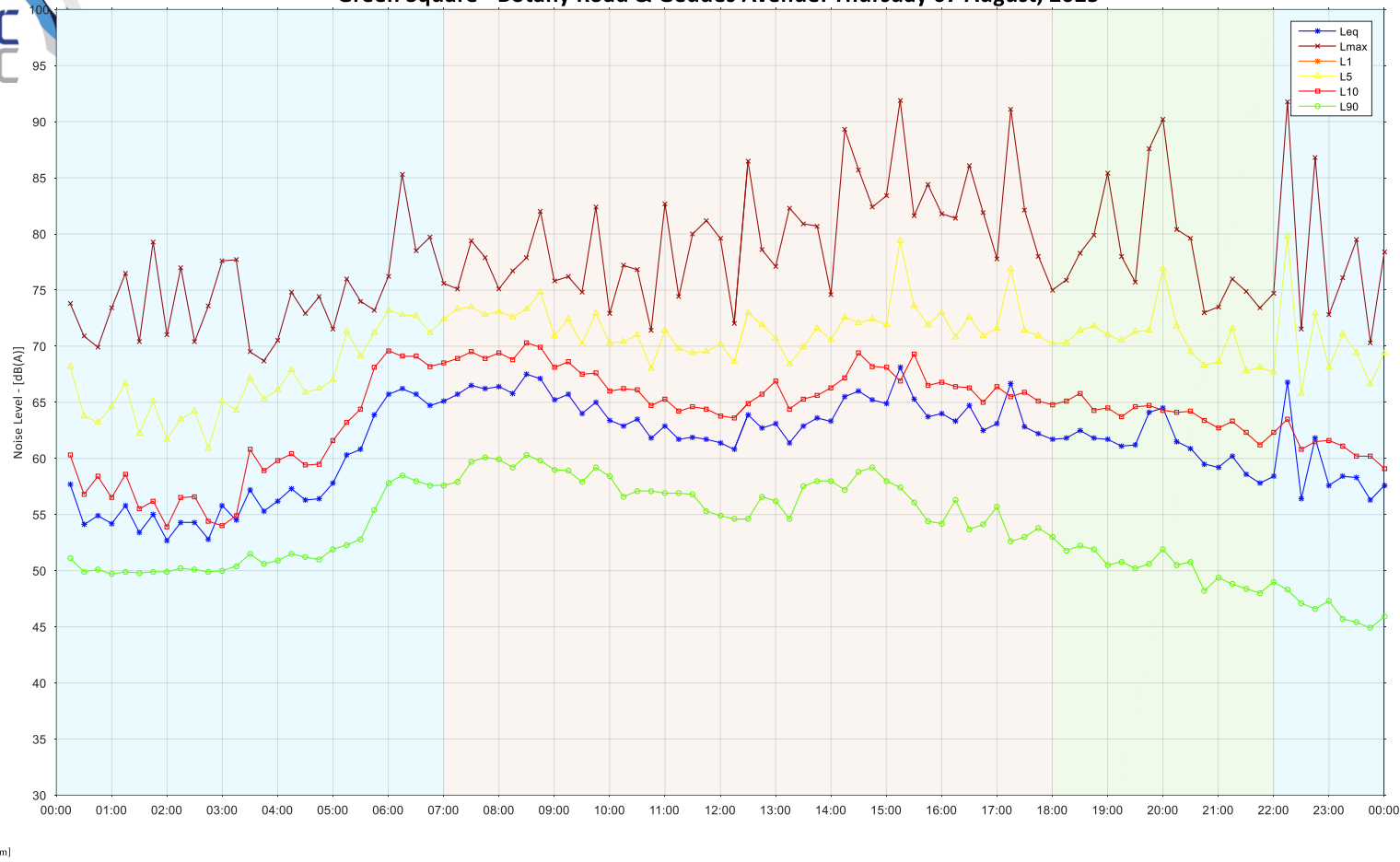
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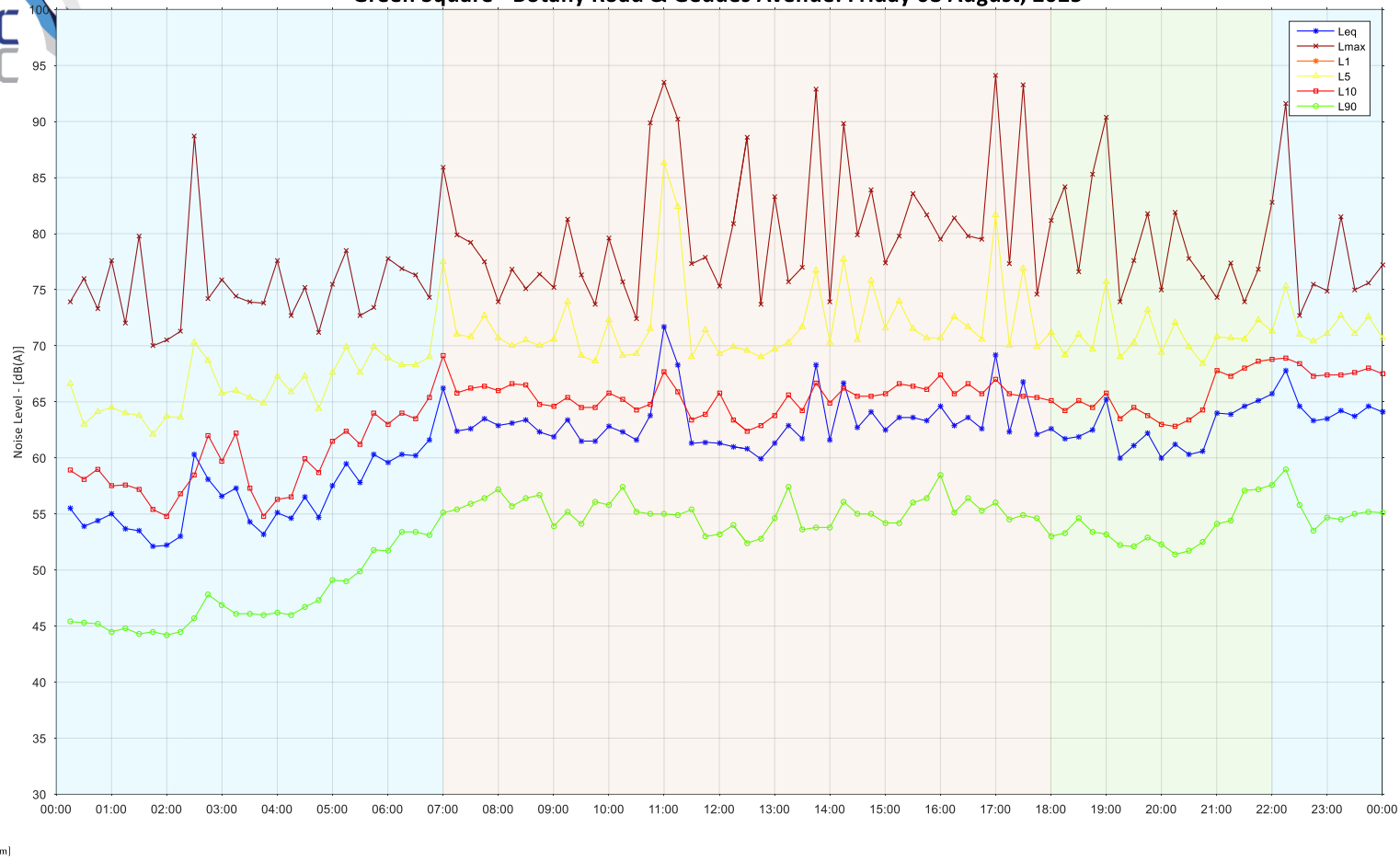
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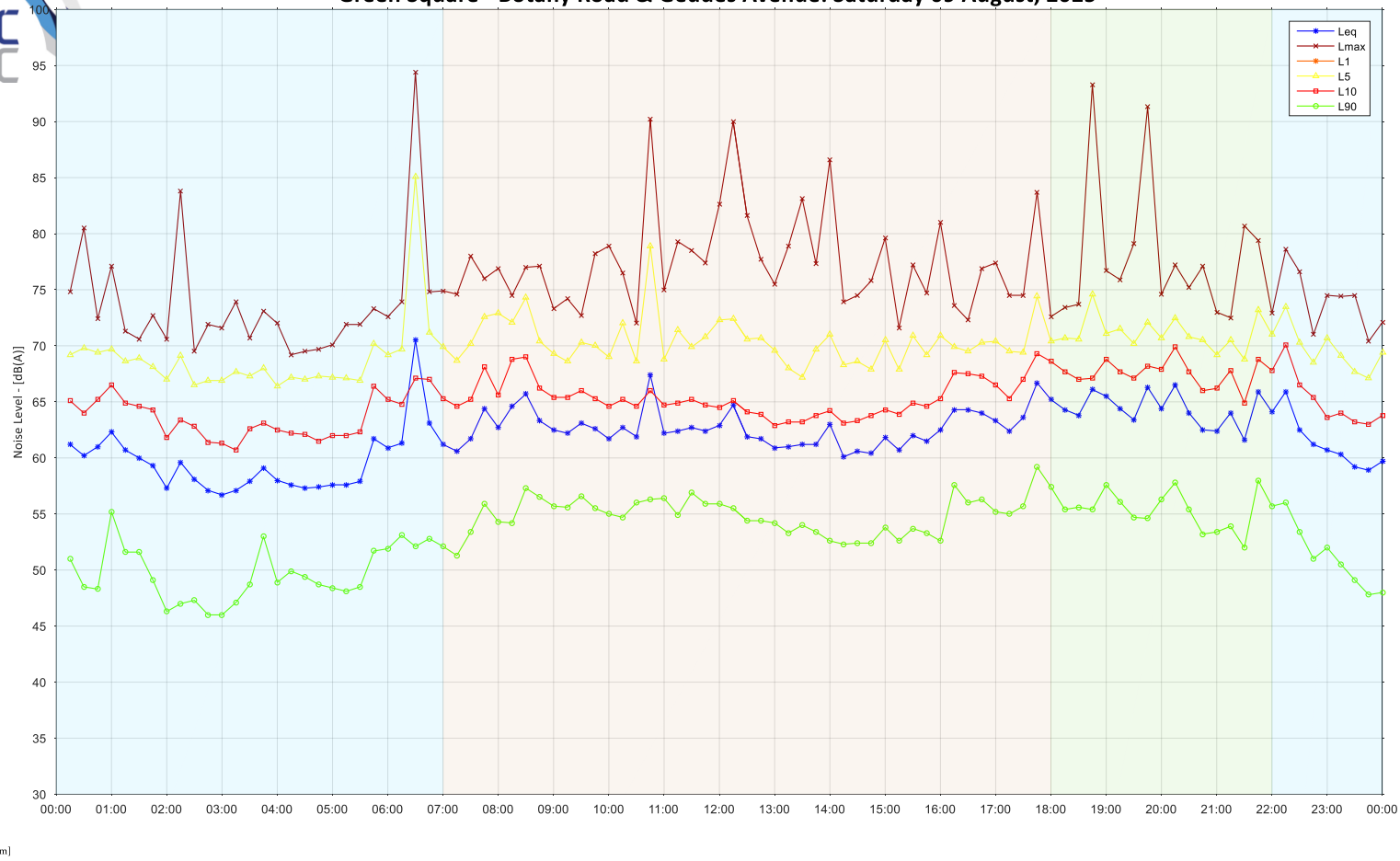
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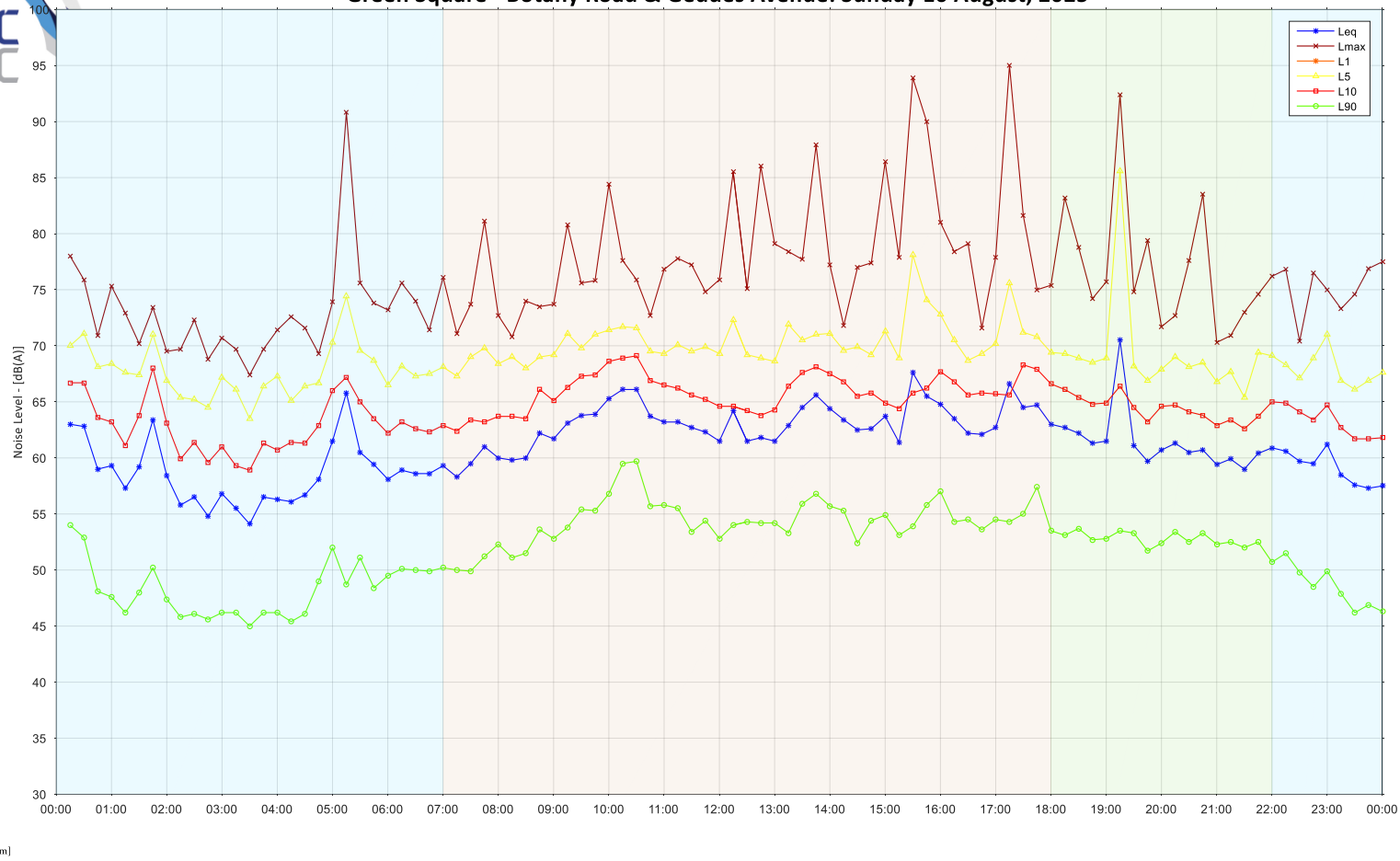
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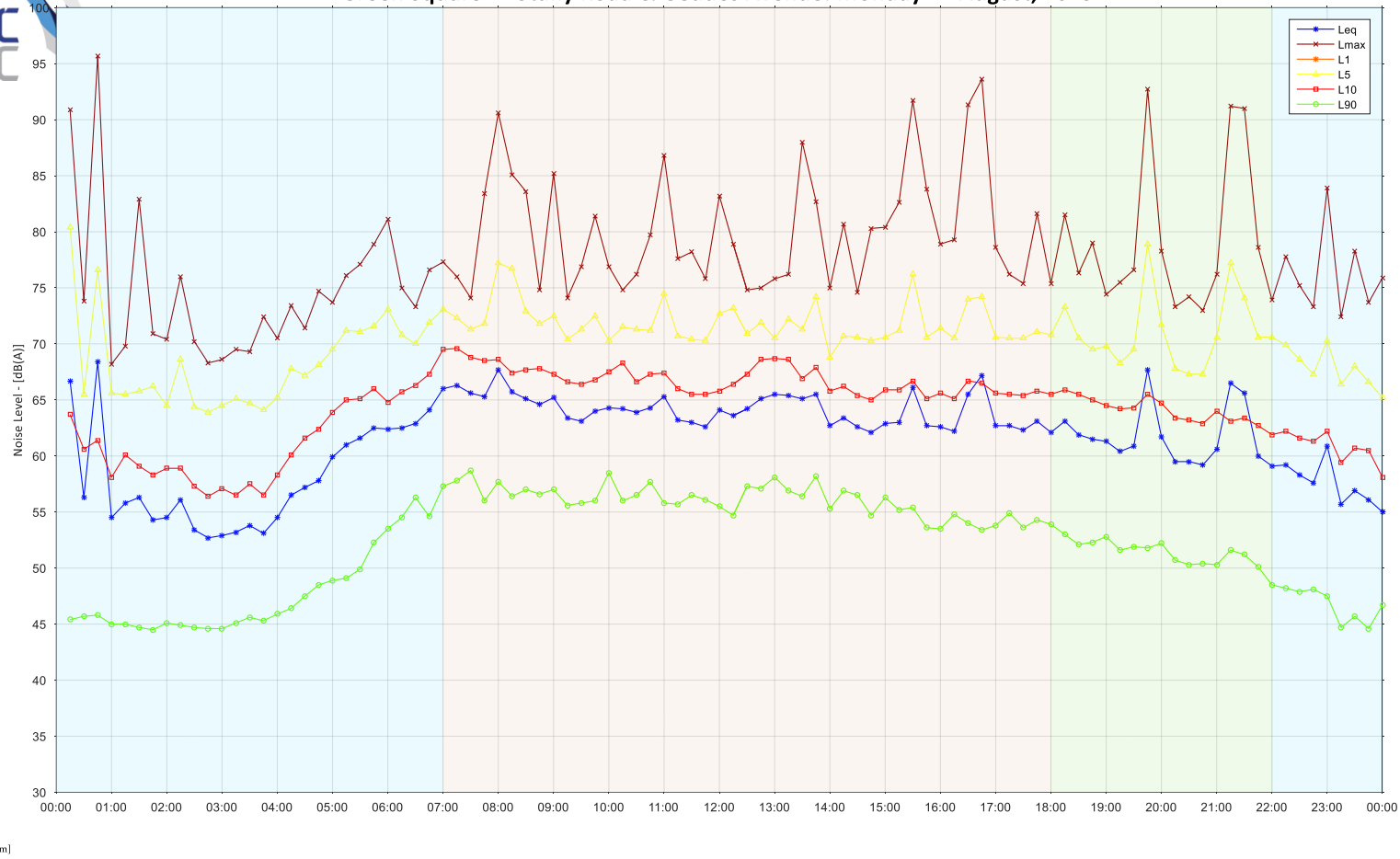
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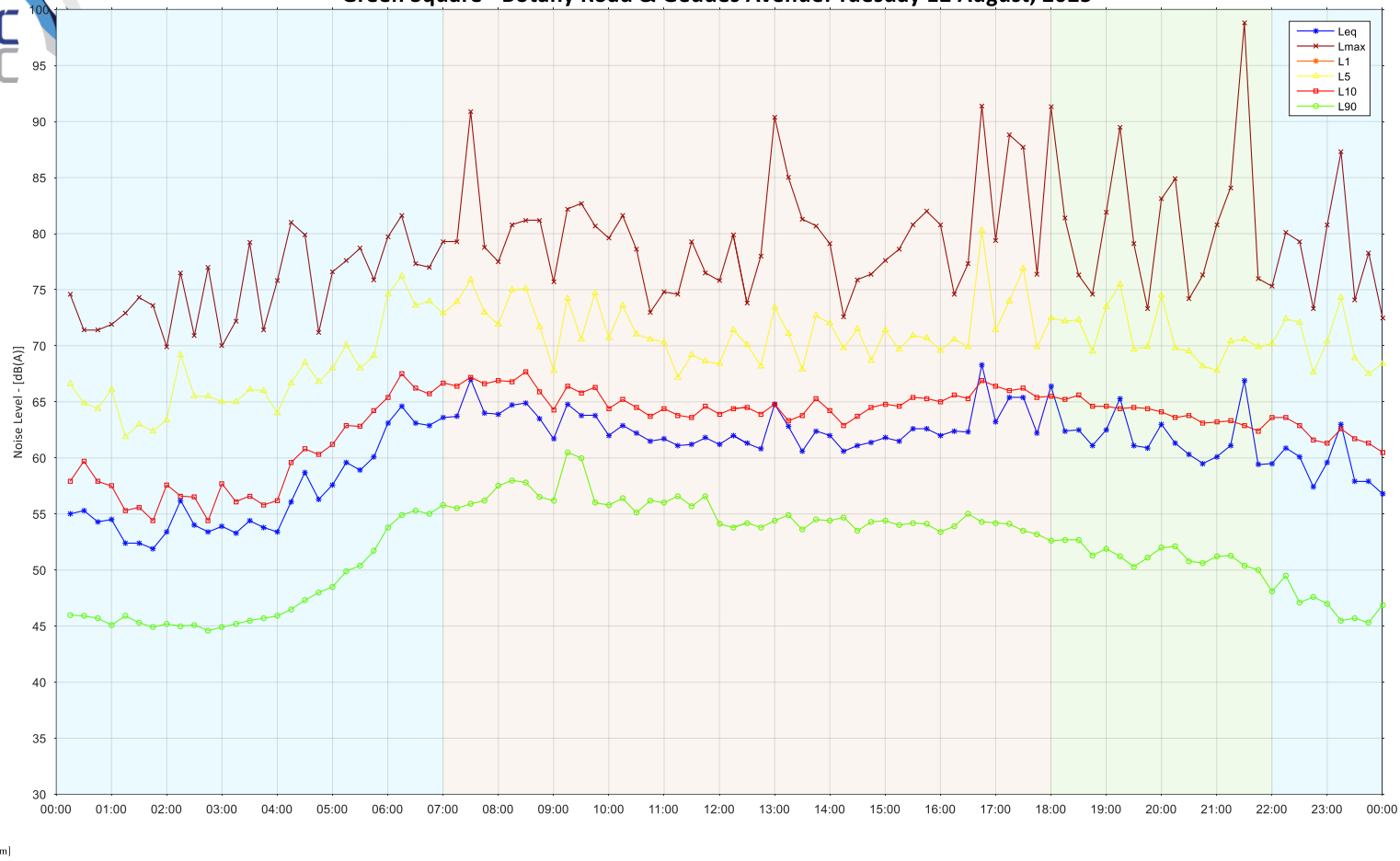
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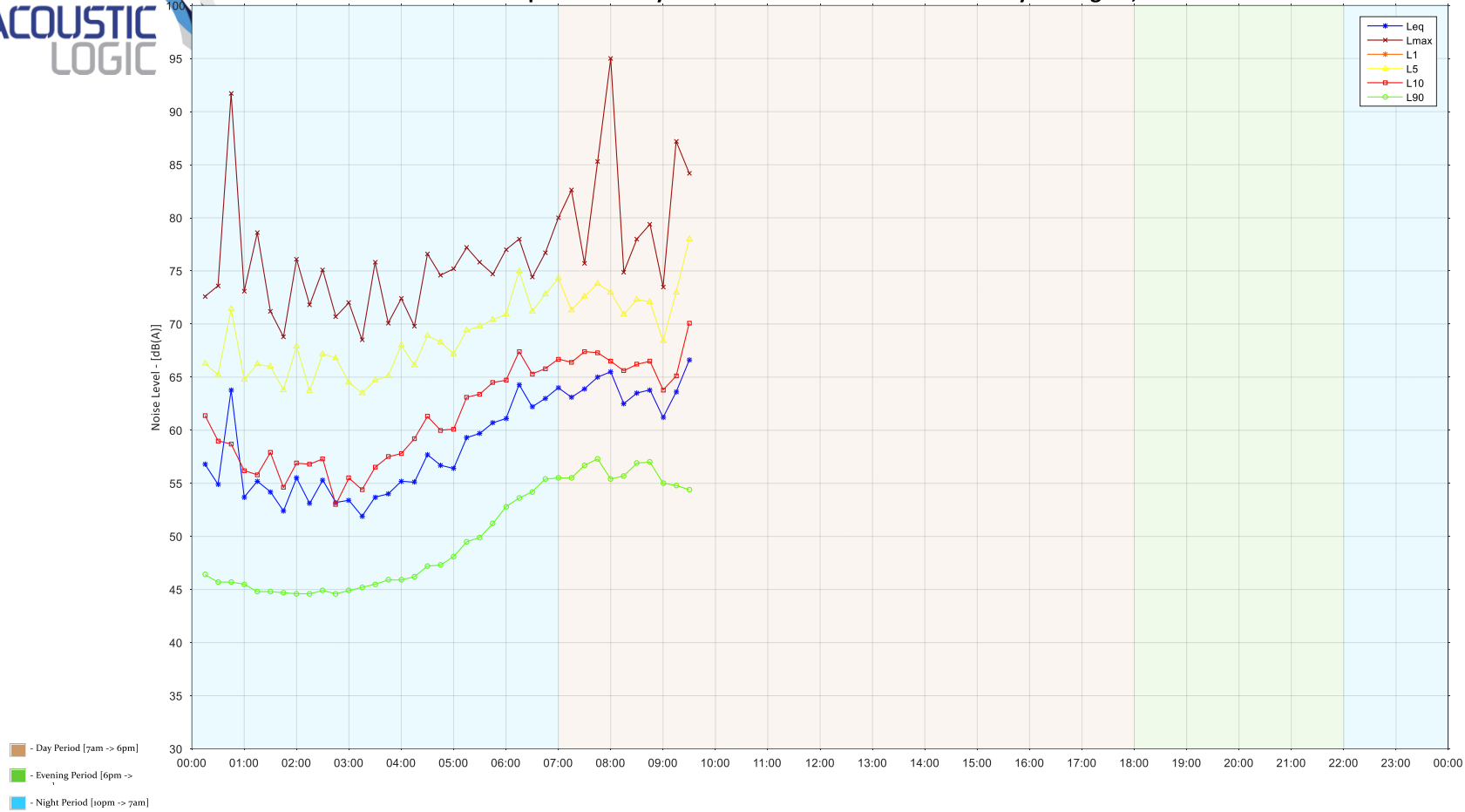
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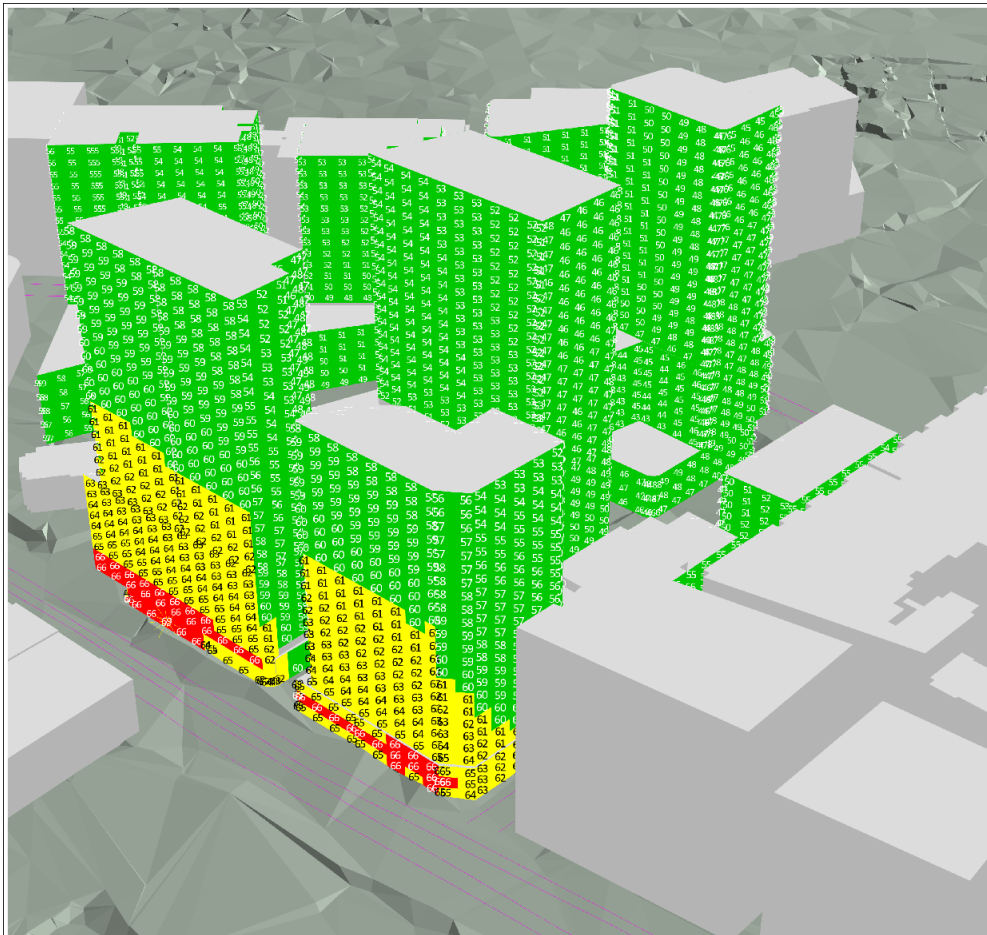
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Green Square - Botany Road & Geddes Avenue: Wednesday 13 August, 2025



APPENDIX B: SOUNDPLAN FAÇADE AND GRID NOISE MAP



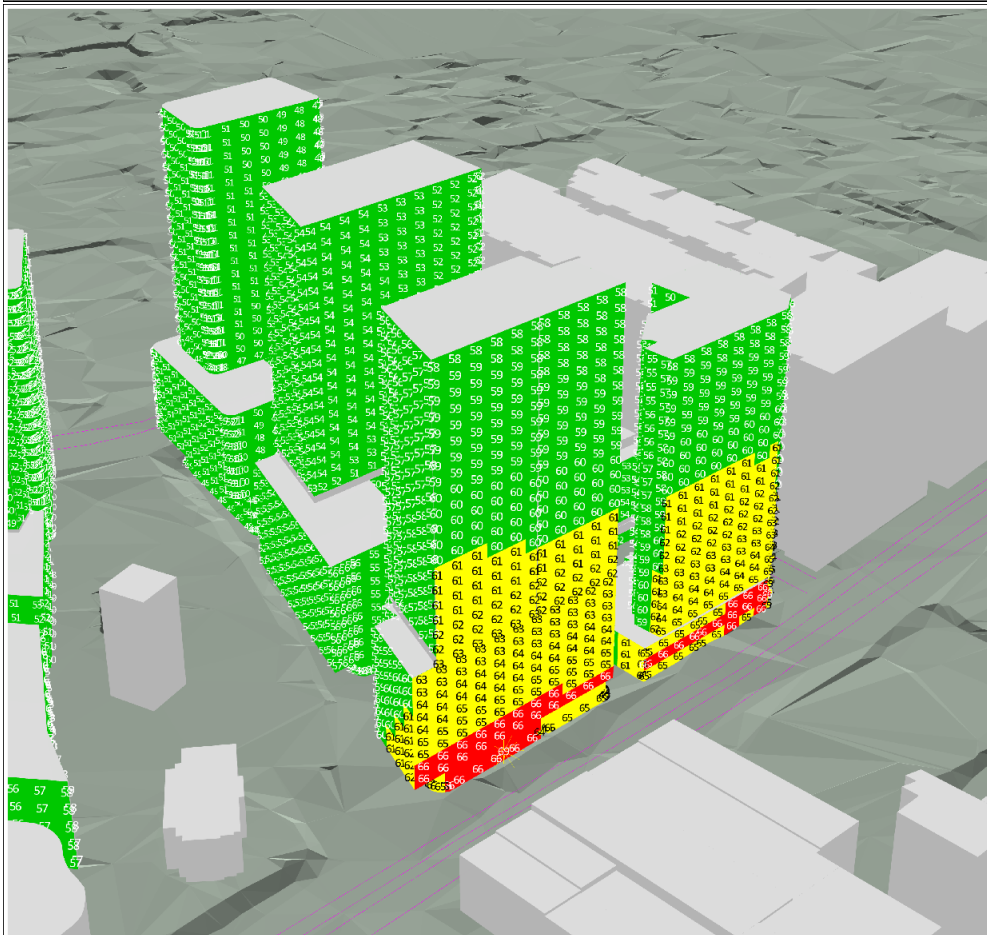
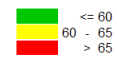
Greensquare

Day - South

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)



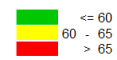
Greensquare

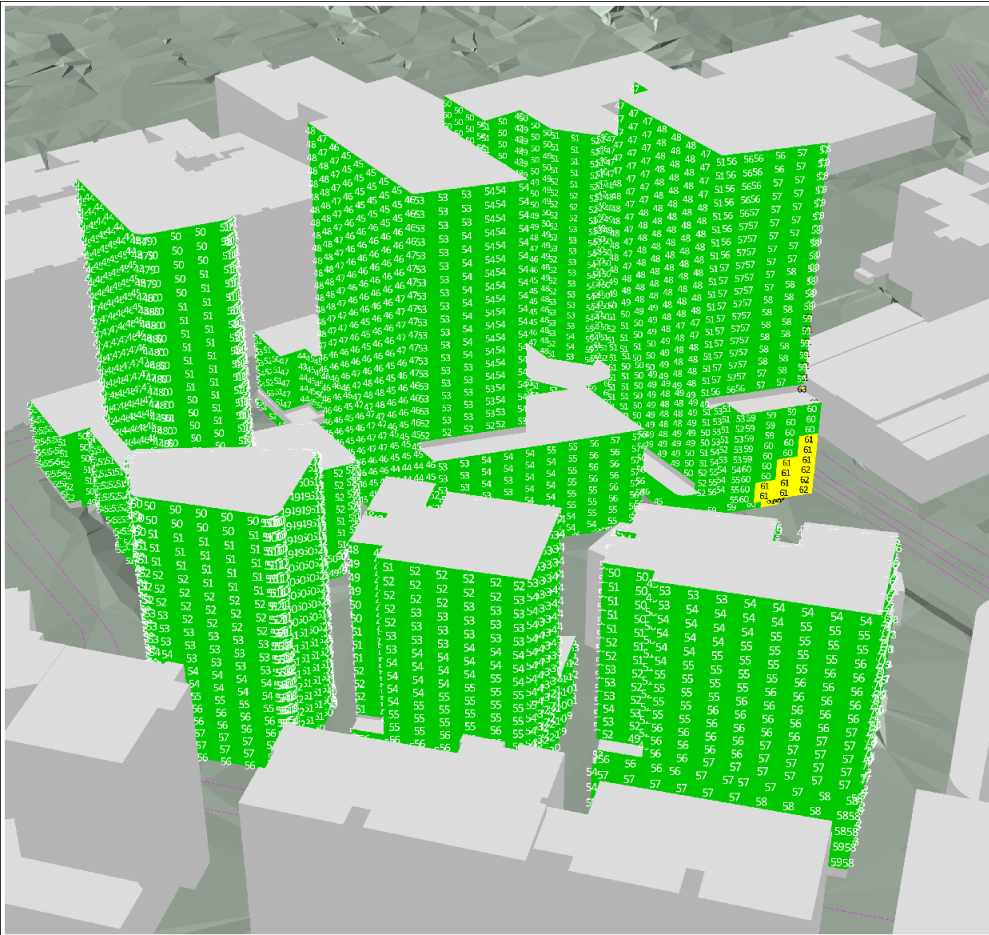
Day - South

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)





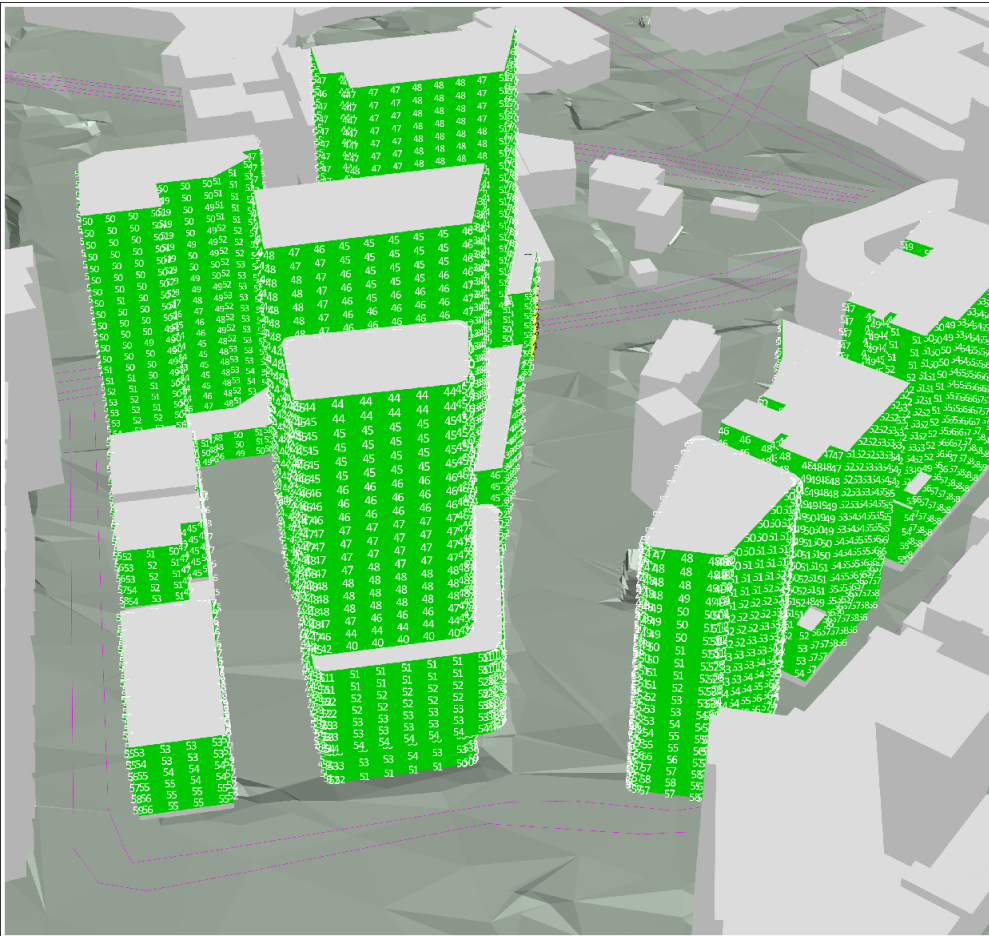
Greensquare

Day - South

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

L_{eq}
in dB(A)



Greensquare

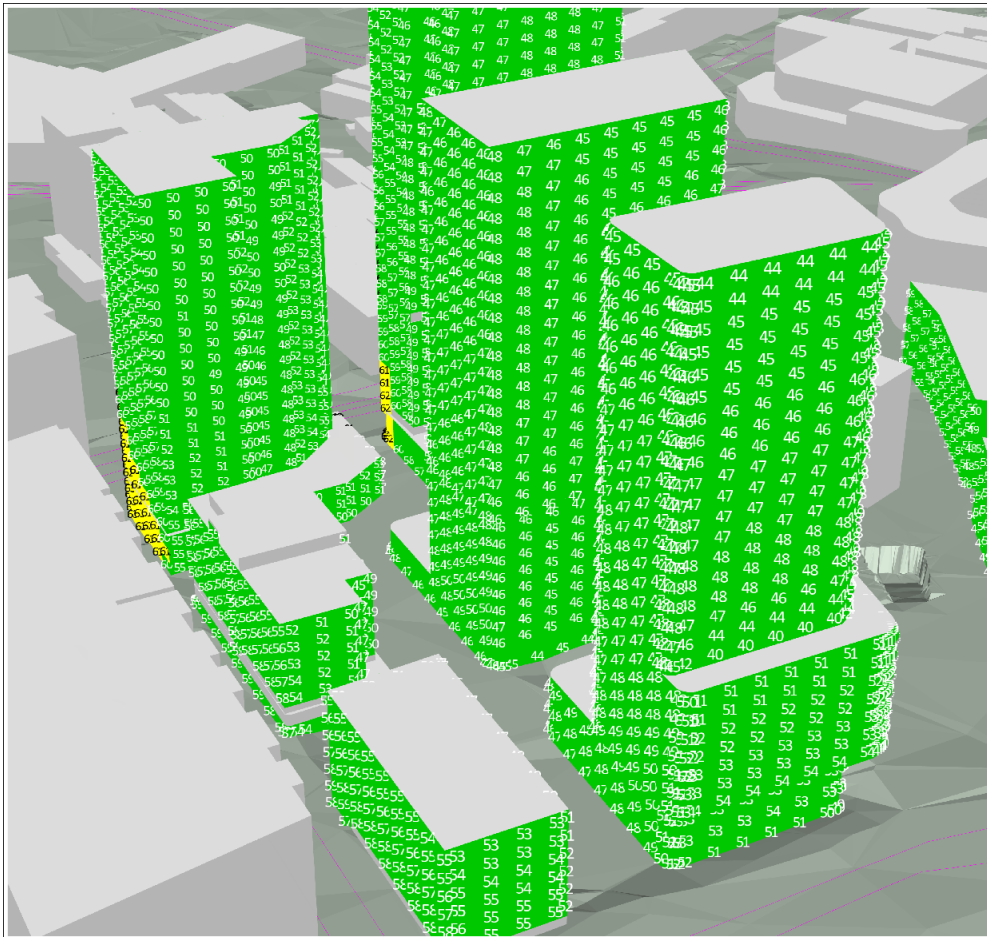
Day - South

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

L_{eq}
in dB(A)





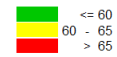
Greensquare

Day - South

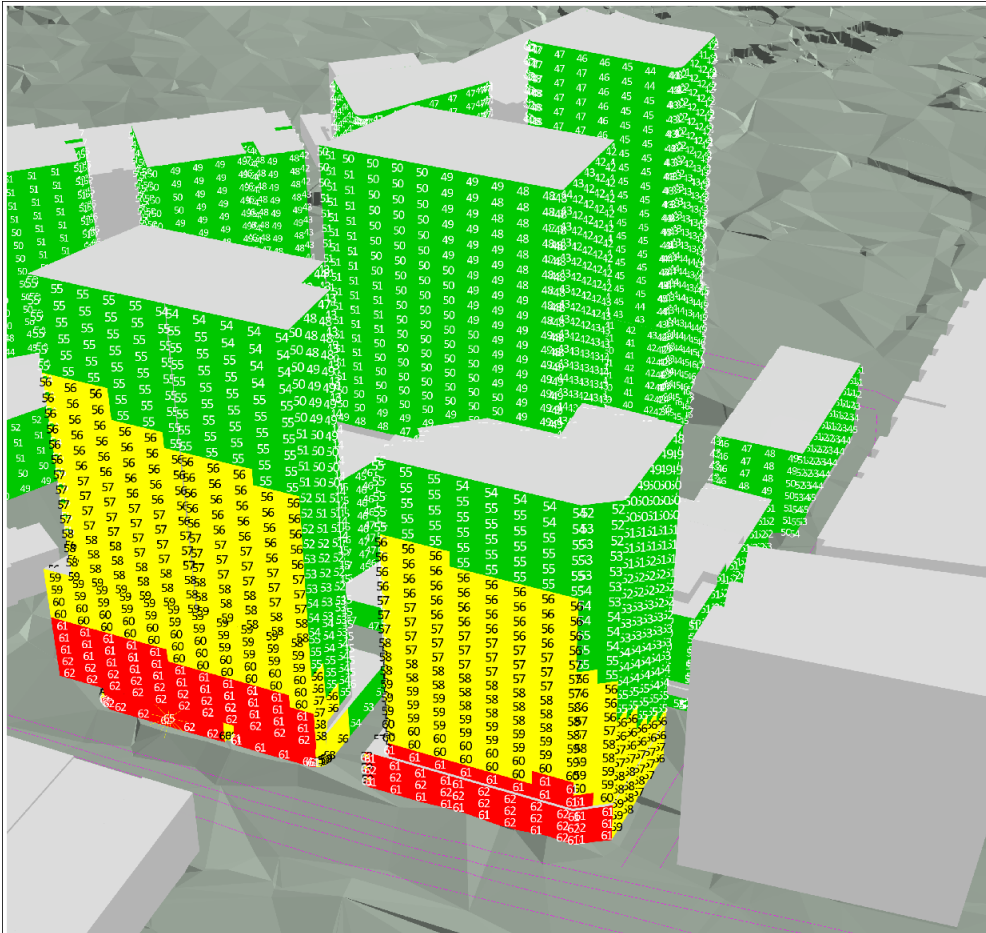
Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)



**ACOUSTIC
LOGIC**



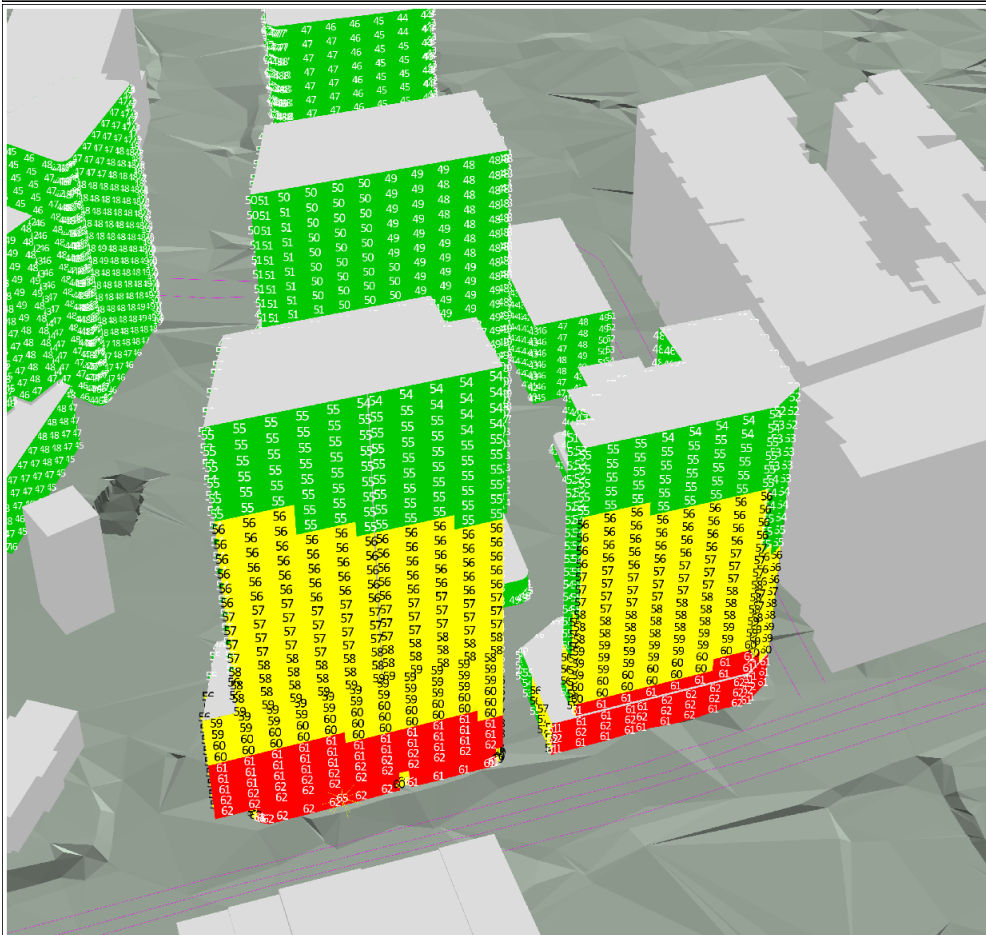
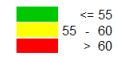
Greensquare

Night - North West

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)



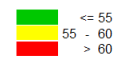
Greensquare

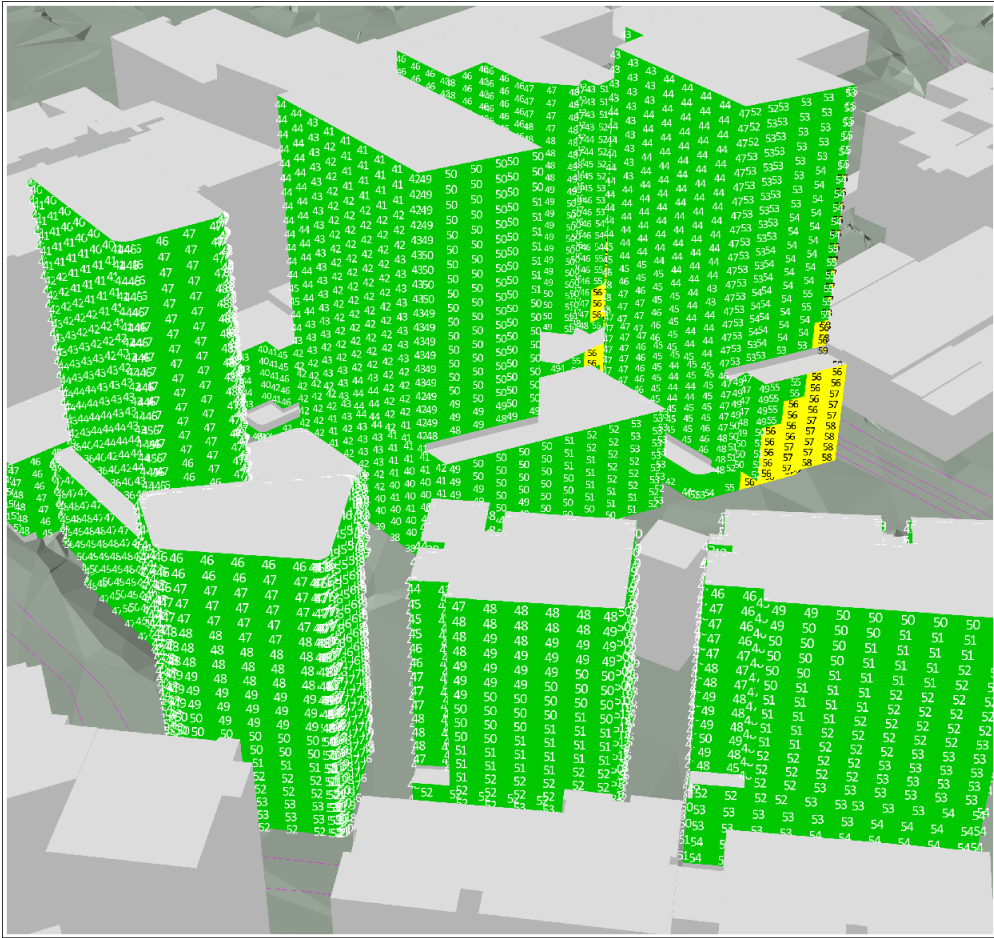
Night - North West

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)





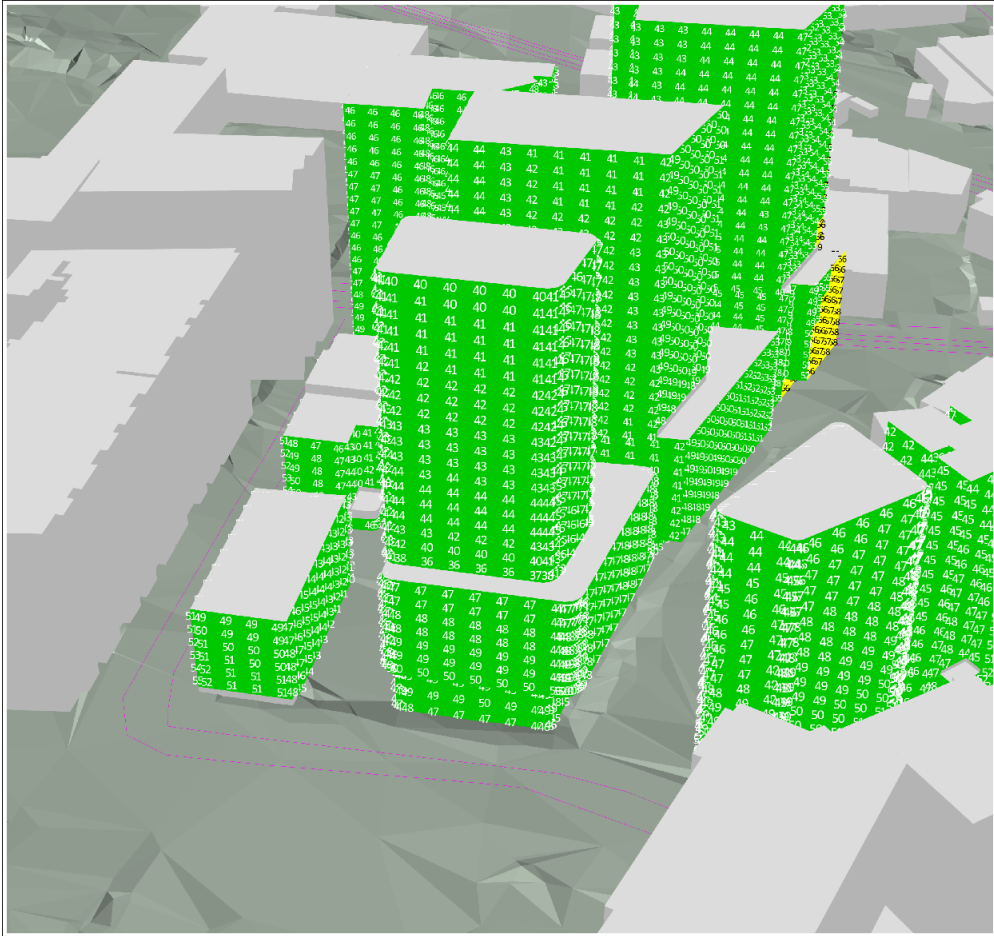
Greensquare

Night - North West

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)



Greensquare

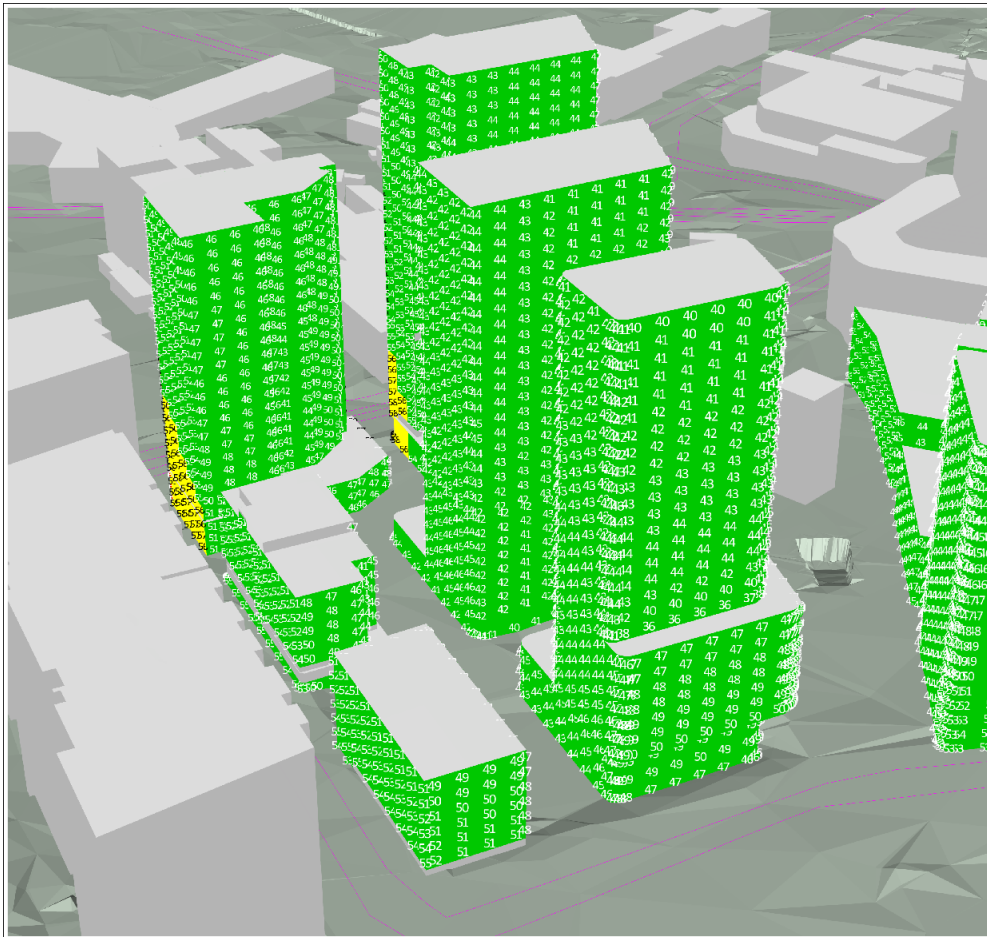
Night - North West

Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)





Greensquare

Night - North West

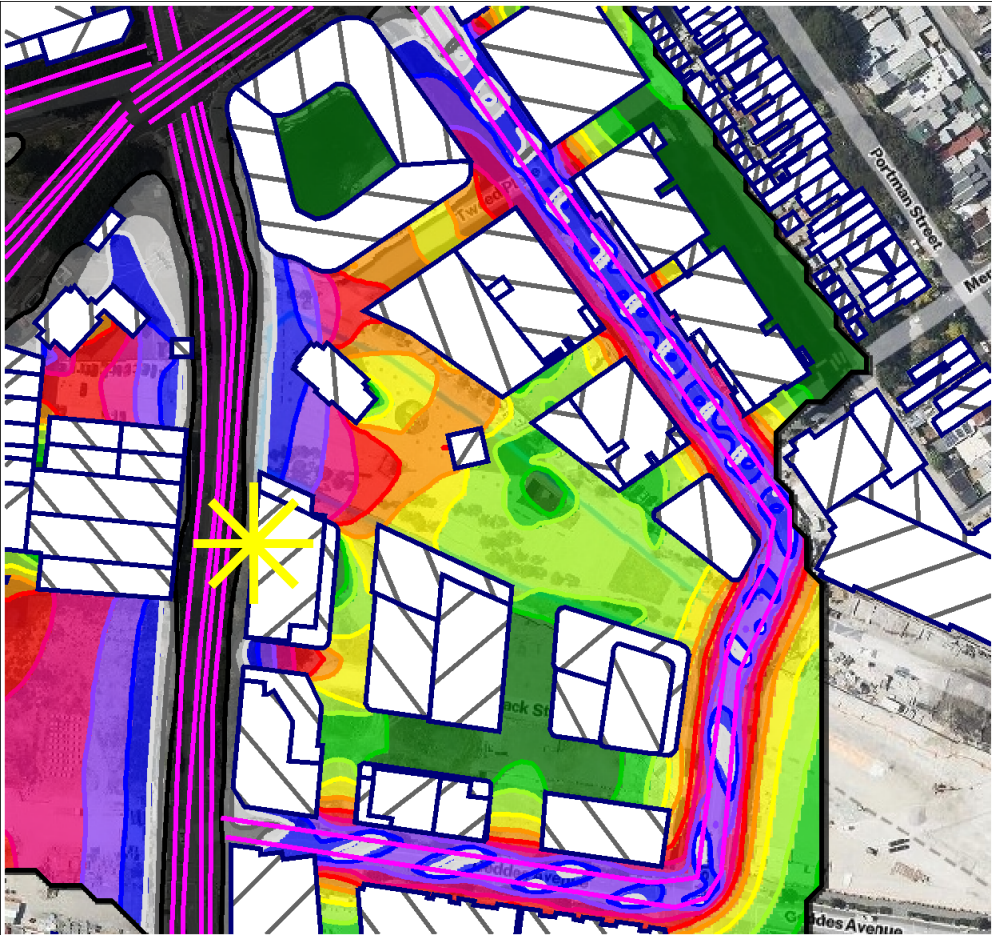
Prepared by: S. Jacobs
Date: 2/02/2026

Noise Level

Leq
in dB(A)

	≤ 55
	55 - 60
	> 60





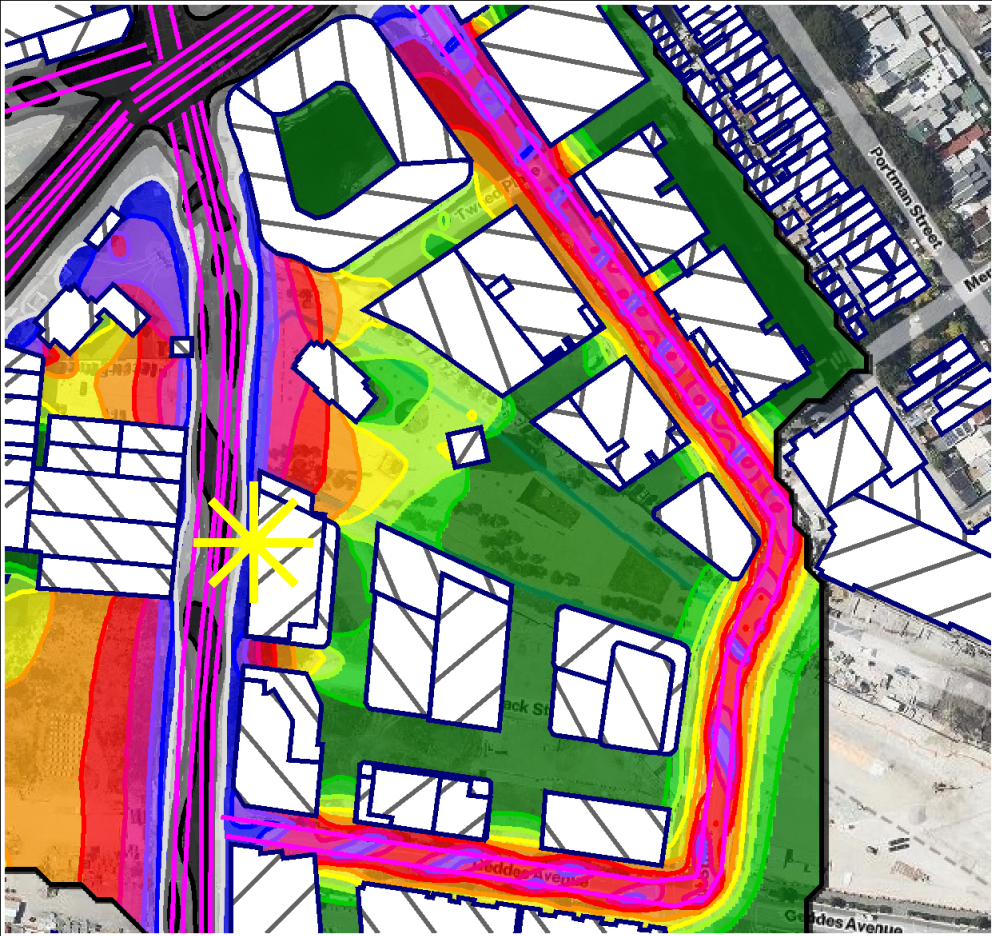
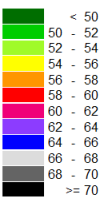
Sites 7, 8, 17, 18 & 19

Grid Noise Map - Day

Prepared by: S. Jacobs
Date: 15/12/2025

Noise Level

Leq
in dB(A)



Sites 7, 8, 17, 18 & 19

Grid Noise Map - Night

Prepared by: S. Jacobs
Date: 15/12/2025

Noise Level

Leq
in dB(A)

