

175-177 Cleveland Street, Redfern

Noise Impact Assessment

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1 INTRODUCTION

Acoustic Logic has been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed boarding house development at 175-177 Cleveland Street, Redfern.

This report addresses the following factors:

- Traffic noise intrusion, primarily from Cleveland Street.
- Rail noise intrusion and vibration impacts from railway corridor east of site.
- Noise emissions from communal areas and mechanical plant servicing development building to surrounding sensitive noise receivers.
- Construction noise and vibration.

The following documents and guidelines have been utilised in this assessment:

- NSW Environmental Protection Authority's (EPA) *Noise Policy for Industry (NPfI) 2017*.
- NSW Department of Planning's *State Environmental Planning Policy (Infrastructure) 2007*.
- NSW Department of Planning's *Developments near Rail Corridors or Busy Roads – Interim Guideline*.
- NSW Environmental Protection Authority's (EPA) *Interim Construction Noise Guideline*.
- City of Sydney Council's *Sydney Development Control Plan 2012*.

This assessment has been conducted using the architectural drawings prepared by Mark Shapiro Architects (dated 12/02/2021, issue P5).

1.1 RESPONSE TO SEARS

This report addresses the requirements detailed by the Secretary's Environment Assessment Requirements (SEARs) for SSD 10720865. Table 1 presents the relevant SEAR's requirements and relevant reference within this report.

Table 1 - SEARs and Report Reference

Item	Requirement	Report Reference
14. Noise and Vibration	Construction and operational noise impacts of the proposal on nearby sensitive receivers and outline the proposed management and mitigation measures that would be implemented	Section 6 and 7
	Noise and vibration impacts from the Sydney Trains Corridor.	Section 4 and 5

2 SITE DESCRIPTION

The proposed development, located at 175-177 Cleveland Street, Redfern, will include construction of a 6-storey co-living development, including 1 level of basement carpark. This has been listed as a State Significant Development (SSD), known as the 'Redfern Mixed Use Boarding House Development' (SSD-10720865).

Based on the architectural drawings (referred above), the proposed use of the space are as follows:

- Basement 1: carpark and management.
- Ground Floor: communal areas, including kitchen, laundry and study.
- Level 1: lobby/lounge and living units.
- Level 2-4: living units.
- Level 5: communal areas and living units.
- Level 6: communal areas, including outdoor cinema.

Based on our site survey, the surrounding sensitive noise receivers include the following:

- Receiver 1 – Residential properties situated south of the site.
- Receiver 2 – Residential properties situated west of the site, across Eveleigh Street.
- Receiver 3 – Hotel property (Nesuto Chippendale) situated north-west of the site, across Cleveland Street.
- Receiver 4 – Commercial properties situated north of the site, across Cleveland Street.
- Receiver 5 – Hotel property (Song Hotel) situated west of the site, across Woodburn Street.

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



Figure 1 – Site Survey (source: SIX Maps NSW)



3 EXISTING ACOUSTIC ENVIRONMENT

Acoustic monitoring was conducted near the site to establish the background noise levels which will be used as basis for this assessment.

3.1 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principal measurement parameters are used, namely L_{10} , L_{90} and L_{eq} .

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

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

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

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

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

3.2 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

3.2.1 Measurement Equipment

Background noise monitoring was undertaken with unattended noise monitors provided Acoustic Research Laboratories Pty Ltd. 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.

3.2.2 Measurement Location

One unattended noise monitor was installed in the rear courtyard of the building near the southern boundary of the site. This monitor was shielded from the railway corridor and Cleveland Street, which would provide a more conservative noise level for residential receivers behind the site. Another monitor was located at the eastern boundary of the project site (along Woodburn Street).

3.2.3 Measurement Period

Unattended noise monitoring in the rear courtyard was conducted from 29/07/2016 to 08/08/2016.

Unattended noise monitoring along Woodburn Street was conducted from 24/02/2021 to 03/03/2021.

3.2.4 Measured Background Noise Level

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.

Appendix A provides detailed results of the unattended noise monitoring. Adverse weather affected data was excluded from the assessment. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in the table below.

Table 2 - Measured Rating Background Noise Level

Location	Time Period	Rating Background Noise Level dB(A)L₉₀(Period)
Noise monitor towards rear / southern boundary of site (See Figure 1)	Day (7:00am-6:00pm)	48
	Evening (6:00pm-10:00pm)	47
	Night (10:00pm-7:00am)	40
Noise monitor towards eastern boundary of site (See Figure 1)	Day (7:00am-6:00pm)	57
	Evening (6:00pm-10:00pm)	53
	Night (10:00pm-7:00am)	44

4 EXTERNAL NOISE INTRUSION ASSESSMENT

Site investigation indicates that the main external noise source around project site is traffic noise from Cleveland Street and rail noise from the nearby rail corridor. Noise intrusion from this source will be assessed in accordance with criteria nominated in section 4.1 below.

4.1 CRITERIA

A noise intrusion assessment has been conducted based off the requirements of the following acoustic noise criteria/standards:

- NSW Department of Planning's *State Environmental Planning Policy (Infrastructure) 2007*.
- NSW Department of Planning's *Developments near Rail Corridors or Busy Roads – Interim Guideline*.

4.1.1 State Environmental Planning Policy (Infrastructure) 2007

Clause 102 of *SEPP (Infrastructure) 2007* is applied to residential accommodation developments adjacent to road corridors containing annual average daily traffic (AADT) volumes of more than 20,000 vehicles. According to Map 16 of the traffic volume maps for the Infrastructure SEPP prepared by the RTA, Cleveland Street is classified as containing over 40,000 vehicles AADT and hence mandatory under clause 102.

The NSW Department of Planning's *Development Near Rail Corridors and Busy Roads – Interim Guideline*, sets out internal noise level criteria adapted from the State Environmental Planning Policy (Infrastructure) 2007 (the 'Infrastructure SEPP') for developments with the potential to be impacted by traffic or rail noise and vibration.

Clause 102 states the following:

(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 pm and 7 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

Additionally, Clause 87 of *SEPP (Infrastructure) 2007* establishes requirements for residential accommodation developments which are adjacent to a rail corridor. Clause 87 states the following:

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

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

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

4.1.2 Development near Rail Corridors or Busy Roads – Interim Guideline

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

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

- *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
 - *in any bedroom in the building: 35dB(A) at any time 10pm-7am*
 - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

4.1.3 Summarised Internal Noise Criteria

Based on the above, the most stringent requirements have been adopted as the internal noise criteria for each space and are summarised below.

Table 3 – Summarised Internal Noise Criteria

Space /Activity Type	Internal Noise Criteria
Sleeping Areas	35 dB(A) _{Leq(9hour)}
Living Areas	40 dB(A) _{Leq(15hour)}

4.2 EXTERNAL NOISE MEASUREMENTS

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

4.2.1 Measurement Equipment

Attended short term measurements of traffic/train 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.

An unattended noise monitor was installed onsite using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was 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.

4.2.2 Measurement Location

The unattended noise monitor was installed in line with the proposed eastern boundary of the site as indicated in Figure 1.

Attended measurements were conducted along Woodburn Street and Cleveland Street.

4.2.3 Measurement Period

Unattended noise monitoring was conducted from 24/02/2021 to 03/03/2021.

Attended noise measurements were undertaken between the hours of 4:00pm and 5:00pm on both 27/01/2021 and 04/02/2021.

4.2.4 Measured Traffic Noise Measurements

Results of the attended and unattended noise measurements have been summarised below for all locations.

4.2.4.1 Unattended Noise Monitoring

Results of the unattended noise monitoring conducted inside the project site has been summarised below. Further detailed results can be found in Appendix A of this report.

Table 4 - Unattended Noise Monitoring (Traffic/Train Noise)

Location	Daytime (7am-10pm)		Night Time (10pm-7am)	
	dB(A) $L_{eq}(15\text{hour})$	dB(A) $L_{eq}(1\text{hour})$	dB(A) $L_{eq}(9\text{hour})$	dB(A) $L_{eq}(1\text{hour})$
Noise monitor towards eastern boundary of site (See Figure 1))	64	65	61	63

4.2.4.2 Attended Measurements

Table 5 – Attended Measurements (Traffic/Train Noise)

Location	Time of Measurement	Measured Noise Level dB(A) $L_{eq}(15\text{minute})$
Cleveland Street 12m from kerb (See Figure 1)	4:45pm to 5:00pm 27/01/2021	66

4.3 NOISE INTRUSION ANALYSIS

Train noise intrusion into the proposed development was assessed using the measured noise levels presented above.

Calculations were undertaken taking into account the location of measurements, orientation of windows, barrier effects (*where applicable*), the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

4.4 RECOMMENDED CONSTRUCTIONS

4.4.1 Glazed Windows and Doors

The recommended glazing constructions have been marked-up and presented in Appendix A.

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. (**Note: Mohair Seals are not considered acoustic seals**).

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.

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 7 for all rooms. 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 6 - Minimum R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window
12.38mm Laminated	37
10.38mm Laminated	35
6mm Float	29

4.4.2 Roof/Ceiling Construction

Roof construction of masonry systems (e.g. concrete slab) will be acoustically acceptable without additional treatment.

If any penetrations are required through any of the external lining of any of the systems above for other building services, all gaps should be filled with acoustic sealant to ensure compliance with internal noise level requirements.

4.4.3 External Wall Construction

External wall constructions of masonry systems (e.g. off-form concrete) will be acoustically acceptable without additional treatment.

If any penetrations are required through any of the external lining of any of the systems above for other building services, all gaps should be filled with acoustic sealant to ensure compliance with internal noise level requirements.

4.5 VENTILATION REQUIREMENTS

NSW Department of Planning's *Development near Busy Roads and Rail Corridors - Interim Guideline* dictates that:

If internal noise levels with windows or doors open exceed the criteria by more than 10dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

With windows open, the allowable internal noise goal is permitted to be 10dB(A) higher than when the windows are closed (i.e. – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

Based on the above, all habitable rooms with glazing only facing into the internal courtyard of the development will be able to achieve the internal noise goals with windows open.

All other habitable spaces within the development require to have their windows closed in order to meet acoustic requirements. A mechanical engineer is to confirm if supplementary ventilation (to meet Australian Standard AS1668.2 requirements) will be required to these rooms.

5 RAILWAY VIBRATION

A rail vibration assessment has been conducted based off the requirements of the following acoustic noise criteria/standards:

- British Standard BS 7385:1990 Part 2 *Evaluation and measurement for vibration in buildings – part 2*.
- Australian Standard AS2670:1990 *Vibration and Shock – Guide to the evaluation of human exposure to whole body vibration*.
- NSW Department of Environment and Conservation's *Assessing Vibration: A Technical Guideline*.
- NSW Department of Planning and Environment's *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects*.

5.1 TACTILE 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" (7am-10pm) and "Night time" (10pm-7am). The overall value is then compared to the levels in Table 10.

Table 7 - Acceptable Vibration Dose Values for Intermittent Vibration (m/s^{1.75})

Location	Daytime (7am – 10pm)		Night Time (10pm – 7am)	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residences	0.20	0.40	0.13	0.26

5.2 STRUCTURE BORNE NOISE

NSW Department of Planning and Environment's *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* stipulates the following structure borne noise trigger levels for residential developments.

Table 8 – Structure Borne Noise Trigger Levels

Location	Daytime (7am – 10pm)	Night Time (10pm – 7am)
Residences	40 dB(A) _{L_{max}(slow)}	35 dB(A) _{L_{max}(slow)}

5.3 RAIL VIBRATION MEASUREMENTS

5.3.1 Measurement Equipment

A Svantek 958 Vibration Analyser was used for the vibration measurements. The analyser was fitted with three Svantek SV80 accelerometers.

5.3.2 Measurement Location

Rail vibration measurements were conducted in line with the future proposed eastern façade (facing Woodburn Street) which is the closest façade to the rail corridor.

5.3.3 Measurement Period

Measurements were conducted between the hours of 4:00pm and 5:00pm on 04/02/2021.

5.3.4 Measurement Results

5.3.4.1 Tactile Vibration

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 – Measured Vibration Dose Values

Time Period	Calculated VDV m/s^{1.75}	Criteria VDV m/s^{1.75}	Complies (Yes/No)
Day (7am – 10pm)	<0.1	0.20 to 0.40	Yes
Night (10pm -7am)	<0.1	0.13 to 0.26	Yes

In the event the future train use increases, say by 10%, predicted eVDV will not increase significantly and will not impact any requirement for vibration isolation treatments.

5.3.4.2 Structure Borne Noise

The structure borne noise generated by the vibration has been predicted below based on the measured vibration acceleration from 1Hz to 10KHz.

Table 10 - Predicted Structure Borne Noise

Location	Predicted Structure Borne Noise Level	Criteria	Complies (Yes/No)
Level 1 Units along Eastern Façade (facing Woodburn St)	<35 dB(A) $L_{\max(\text{slow})}$	35 dB(A) $L_{\max(\text{slow})}$	Yes

5.3.5 Discussion

It is noted that the façade of proposed development facing the rail corridor is with glazing, which would result in the structure borne noise being masked by airborne noise levels when trains pass.

The 'Rail Infrastructure Noise Guideline' also states the following regarding structure borne noise:

Ground-borne noise or regenerated noise in buildings is typically noted at receiver locations where the level of ground-borne noise is likely to be greater than airborne noise (e.g. in buildings above rail tunnels where the airborne noise is masked by the tunnel).

Although structure borne noise can vary for a number of reasons, including the condition of wheels, train size and weight, etc. it is expected that airborne noise will have a masking effect over the structure borne noise for this development (when looking at an instantaneous maximum sound pressure level, dB(A) $L_{\max(\text{slow})}$) as:

- The rail corridor is on-ground with the development; and
- All living units facing the rail corridor contain glazing

Nonetheless, based on the measured train vibration levels, the predicted structure borne noise inside living units closest to the rail corridor (facing Woodburn Street) have been found to achieve satisfactory internal noise levels and in our opinion, building isolation is not required.

Furthermore, measurements above indicate that the overall vibration dose (VDV) at the proposed development for both daytime and night time period satisfy the requirements of British Standard BS 7385 Part 2 1993 or Australian Standard AS 2670.2 1990.

6 NOISE EMISSION ASSESSMENT

A noise emission assessment has been carried out to ensure noise emitted from the use of the site is in accordance with the requirements listed below.

6.1 CRITERIA

- Mechanical plant proposed to service the development shall be assessed against NSW Environmental Protection Authority's (EPA) *Noise Policy for Industry (NPfI) 2017*.
- Communal areas of the development shall be assessed against the requirements of City of Sydney Council's *Sydney Development Control Plan 2012*.

Detailed requirements from the documents above have been discussed below.

6.1.1 Mechanical Plant Noise (Noise Policy for Industry)

The EPA NPfI provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The NPfI has two requirements which must both be complied with, namely an amenity criterion and an intrusiveness criterion.

6.1.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A).

Table 11 - NPfI Intrusiveness Criteria

Receiver	Time of Day	Background Noise Level dB(A) $L_{90}(\text{Period})$	Project Intrusiveness Noise Level dB(A) $L_{eq}(15\text{minute})$
Residential	Day (7:00am-6:00pm)	48	53
	Evening (6:00pm-10:00pm)	47	52
	Night (10:00pm-7:00am)	40	45

6.1.1.2 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 (e.g. cumulative noise from project site and other developments).

The EPA's NPI sets out acceptable noise levels for different residential areas, being rural, suburban and urban. When determining types of residential receiver, the NPI considers the land zoning, existing noise levels and environmental noise characteristics of the area being assessed. Based on the measured noise levels and environmental noise characteristics, the 'Urban' classification is most appropriate and has been selected.

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

$$\text{Project Amenity Noise Level } dB(A)_{Leq(15min)} = \text{Recommended Amenity Noise Level} - 5 \text{ dB(A)} + 3 \text{ dB(A)}$$

Table 12 - NPfI Project Amenity Criteria

Type of Receiver	Time of Day	Recommended Amenity Noise Level dB(A) _{Leq(15minute)}	Project Amenity Noise Level dB(A) _{Leq(15minute)}
Residential (Urban)	Day (7:00am-6:00pm)	60	58
	Evening (6:00pm-10:00pm)	50	48
	Night (10:00pm-7:00am)	45	43
Hotel	Day (7:00am-6:00pm)	65	63
	Evening (6:00pm-10:00pm)	55	53
	Night (10:00pm-7:00am)	50	48
Commercial	When in use	65	63

6.1.1.3 Summarised NPfl Criteria

Summary for noise emission criteria for all plant associated with the development has been summarised below.

Table 13 - Summary of Noise Emission Criteria (for Mechanical Plant)

Receiver	Time of Day	Project Intrusiveness Noise Level dB(A) _{Leq(15minute)}	Project Amenity Noise Level dB(A) _{Leq(15minute)}
Residential	Day (7:00am-6:00pm)	53	58
	Evening (6:00pm-10:00pm)	52	48
	Night (10:00pm-7:00am)	45	43
Hotel	Day (7:00am-6:00pm)	-	63
	Evening (6:00pm-10:00pm)	-	53
	Night (10:00pm-7:00am)	-	48
Commercial	When in use	-	63

The established project noise trigger level is the lower (more stringent) value of the project intrusiveness and project amenity noise level. This has been bolded above.

6.1.2 Communal Areas (Sydney Development Control Plan 2012)

The NPfl applies only to activities detailed in Schedule 1 of the Protection of the Environment Operations Act, of which housing communal areas are not listed. As such, noise impacts from outdoor communal areas shall be assessed against the requirements of *Sydney Development Control Plan 2012*.

Section 4.4.1.7 (Boarding Houses) of *Sydney Development Control Plan 2012* state the following:

(d) measures to minimise unreasonable impact to the habitable areas of adjoining properties, including the management of communal open spaces. For boarding houses located within residential areas or where adjoining sites contain residential activities this use of open space should be restricted to before 10pm;

6.2 MECHANICAL PLANT NOISE

Detailed plant selection has not been undertaken at this stage, as plant selections have not been determined. Detailed acoustic review should be undertaken at CC stage to determine acoustic treatments to control noise emissions to satisfactory levels. Satisfactory levels will be achievable through appropriate plant selection and location and, if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Noise emissions from all mechanical services plant to the closest receivers are to comply with the noise emission criteria stipulated above.

6.3 COMMUNAL AREAS

The communal outdoor areas are to be operated as per the recommendations of *Sydney Development Control Plan 2012*, that is, ceasing operation at 10pm.

6.4 RECOMMENDATIONS & MANAGEMENT CONTROLS

It is recommended that the following recommendations and management controls be implemented into the design and operation of the proposed development to satisfy all noise criteria outlined in Section 6.1.

6.4.1 Communal Outdoor Areas

- Outdoor areas are not used during the night time period (10pm to 7am) as per the recommendations of Section 4.4.1.7 of *Sydney Development Control Plan 2012*.
- Headphones are to be incorporated into the usage of the outdoor cinema, rather than speakers.

6.4.2 Communal Indoor Areas

- Music played indoors are to be restricted within the hours of 7am to 10pm.
- All windows and doors openable to the outside are to be closed while communal indoor area is in use.
- All glazed windows and doors openable to the outside are to be minimum 10.38mm laminated thick (R_w no less than 35).
- All windows and doors openable to the outside are to have acoustic seals across the full perimeter.

6.4.3 General Recommendations

- Prominent notice shall be placed within and around all outdoor communal areas to remind residents to minimise noise at all times.
- A condition in the rental agreement should be included which is able to penalise residents in the event that excessive noise is caused by a resident, or repeated failure to abide the management controls of the premise.

7 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

An assessment of likely construction noise and vibration impacts for the development has been undertaken and presented in this section. This assessment includes:

- Identification of the noise and vibration standards which will be applicable to this project.
- Identification of potentially impacted nearby receivers.
- Identification of likely sources of noise and vibration generation and predicted noise levels at nearby receivers.
- Formulation of a strategy to comply with the standards identified and mitigation treatments in the event that compliance is not achievable.

7.1 SITE DESCRIPTION

This assessment applies to the works associated with the construction of the proposed 6-storey boarding house at 175-177 Cleveland Street, Redfern. Works involved will be anticipated to be over 3 primary stages, being Demolition, Excavation and Construction.

It is assumed that the recommended standard work hours (for normal construction works), as detailed in NSW EPA's *Interim Construction Noise Guideline* (ICNG), will be adopted for this project. These hours are:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- Sundays or Public Holidays: No work.

7.2 RECEIVER LOCATIONS

Nearby receivers which have potential of being affected by construction noise from the project site are as detailed in Section 2 and Figure 1.

7.3 NOISE AND VIBRATION MANAGEMENT LEVELS

7.3.1 EPA Interim Construction Noise Guideline

NSW EPA's ICNG requires:

- Determination of noise management levels (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 management levels is not possible.

For residential receivers, Section 4.1.1 of the ICNG adopts differing strategies for noise control depending on the predicted noise level:

- "Noise affected" level – When construction noise exceeds ambient levels by more than $10\text{dB(A)}_{\text{Leq}(15\text{min})}$. Where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected" level.
- "Highly noise affected" level - When construction noise exceeds $75\text{dB(A)}_{\text{Leq}(15\text{min})}$ at nearby residences. Where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered.

For commercial receivers, Section 4.1.3 of the ICNG recommends that an external noise management level of $70\text{dB(A)}_{\text{Leq}(15\text{min})}$ be applied for offices and retail outlets.

It is noted that Receiver 5 is a hotel. As the ICNG does not present external noise management levels for hotel receivers, the noise management levels for residential receivers will be adopted.

A summary of the above recommended noise levels from the ICNG are presented below.

Table 14 – Noise Management Levels at Residential Receivers

Receiver	Noise Management Level (External)	
	"Noise Affected" Level $\text{dB(A)}_{\text{Leq}(15\text{min})}$	"Highly Noise Affected" Level $\text{dB(A)}_{\text{Leq}(15\text{min})}$
1, 2, 3 and 5	58	75
4	70	

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

7.3.2 Vibration

Vibration caused by construction at any residence or structure outside the project 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.

7.3.2.1 Structure Borne Vibrations (Building Damage Criteria)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 4.

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

Table 15 – 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

7.3.2.2 Assessing Amenity

The NSW EPA's *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 16 – EPA Recommended Vibration Criteria

		RMS acceleration (m/s ²)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		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		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

7.4 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE LEVELS

With respect to construction noise, the impact on nearby receivers will be dependent on the activity in question and where on the site the activity is undertaken. It is noted that the project is not up to the stage where a construction contractor / builder is nominated. As a result, primary construction equipment has been assumed and the respective associated sound power levels are as follows:

Table 5 - Sound Power Levels of Assumed Equipment / Activity

Stage	Equipment / Activity	Sound Power Level dB(A)
Demolition	Handheld Jackhammer	115
	Excavators	105
	Mobile Crane	100
	General Trucks	100
	Powered Hand Tools	100
Excavation	Saw-cutting	114
	Rock Breaking	110
	Excavators	105
	General Trucks	100
	Powered Hand Tools	100
Construction	Concrete Pump	110
	Cement Mixing Truck	110
	Excavator	105
	General Trucks	100
	Powered Hand Tools	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).

7.5 PREDICTED NOISE LEVELS

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

- The activity undertaken.
- The distance between the activity and the receiver. For many of the work areas, 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 have been based on assumed likely location of works within and around the project site and take into account noise reduction as a result of distance only.

Table 5 – Predicted Noise Levels at Receiver 1

Stage	Equipment / Activity	Predicted Noise Level dB(A) $L_{eq}(15min)$	Comments
Demolition	Handheld Jackhammer	76-90	Generally exceeds "highly noise affected" level.
	Excavators	66-80	Generally exceeds "highly noise affected" level with activity close to southern boundary.
	Mobile Crane	66-68	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to southern boundary.
	General Trucks	61-75	
	Powered Hand Tools	61-75	
Excavation	Saw-cutting	75-89	Generally exceeds "highly noise affected" level.
	Rock Breaking	71-85	Generally exceeds "highly noise affected" level with activity close to southern boundary.
	Excavators	66-80	
	General Trucks	61-75	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to southern boundary.
	Powered Hand Tools	61-75	
Construction	Concrete Pump	71-73	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to southern boundary.
	Cement Mixing Truck	71-73	
	Excavator	66-80	Generally exceeds "highly noise affected" level with activity close to southern boundary.
	General Trucks	61-75	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to southern boundary.
	Powered Hand Tools	61-75	

Refer to recommendations in Section 7.7.

Table 5 – Predicted Noise Levels at Receiver 2

Stage	Equipment / Activity	Predicted Noise Level dB(A) _{Leq(15min)}	Comments
Demolition	Handheld Jackhammer	73-87	Generally exceeds "highly noise affected" level with activity close to western boundary.
	Excavators	63-77	
	Mobile Crane	61-66	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to western boundary.
	General Trucks	58-72	
	Powered Hand Tools	58-72	
Excavation	Saw-cutting	72-86	Generally exceeds "highly noise affected" level with activity close to western boundary.
	Rock Breaking	68-82	
	Excavators	63-77	
	General Trucks	58-72	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to western boundary.
	Powered Hand Tools	58-72	
Construction	Concrete Pump	71-76	Generally exceeds "highly noise affected" level with activity close to western boundary.
	Cement Mixing Truck	71-76	
	Excavator	63-77	
	General Trucks	58-72	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to western boundary.
	Powered Hand Tools	58-72	

Refer to recommendations in Section 7.7.

Table 5 – Predicted Noise Levels at Receiver 3

Stage	Equipment / Activity	Predicted Noise Level dB(A) _{Leq(15min)}	Comments
Demolition	Handheld Jackhammer	71-79	Generally exceeds "highly noise affected" level with activity close to northern boundary.
	Excavators	61-69	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to northern boundary.
	Mobile Crane	61-65	
	General Trucks	56-64	
	Powered Hand Tools	56-64	
Excavation	Saw-cutting	70-78	Generally exceeds "highly noise affected" level with activity close to northern boundary.
	Rock Breaking	66-74	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to northern boundary.
	Excavators	61-69	
	General Trucks	56-64	
	Powered Hand Tools	56-64	
Construction	Concrete Pump	71-75	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to northern boundary.
	Cement Mixing Truck	71-75	
	Excavator	61-69	
	General Trucks	56-64	
	Powered Hand Tools	56-64	

Refer to recommendations in Section 7.7.

Table 5 – Predicted Noise Levels at Receiver 4

Stage	Equipment / Activity	Predicted Noise Level dB(A) _{L_{eq}(15min)}	Comments
Demolition	Handheld Jackhammer	71-81	Generally exceeds noise management level with activity close to northern boundary.
	Excavators	61-71	Marginally exceeds noise management level with activity close to northern boundary.
	Mobile Crane	62-66	Satisfies noise management level.
	General Trucks	56-66	
	Powered Hand Tools	56-66	
Excavation	Saw-cutting	70-80	Generally exceeds noise management level with activity close to northern boundary.
	Rock Breaking	66-76	
	Excavators	61-71	Marginally exceeds noise management level with activity close to northern boundary.
	General Trucks	56-66	Satisfies noise management level.
	Powered Hand Tools	56-66	
Construction	Concrete Pump	72-76	Generally exceeds noise management level with activity close to northern boundary.
	Cement Mixing Truck	72-76	
	Excavator	61-71	Marginally exceeds noise management level with activity close to northern boundary.
	General Trucks	56-66	Satisfies noise management level.
	Powered Hand Tools	56-66	

Refer to recommendations in Section 7.7.

Table 5 – Predicted Noise Levels at Receiver 5

Stage	Equipment / Activity	Predicted Noise Level dB(A) _{Leq(15min)}	Comments
Demolition	Handheld Jackhammer	74-93	Generally exceeds "highly noise affected" level with activity close to eastern boundary.
	Excavators	64-83	
	Mobile Crane	62-66	Generally under "highly noise affected" level, but may exceed "noise affected" level with activity close to eastern boundary.
	General Trucks	59-78	Generally exceeds "highly noise affected" level with activity close to eastern boundary.
	Powered Hand Tools	59-78	
Excavation	Saw-cutting	73-92	Generally exceeds "highly noise affected" level with activity close to eastern boundary.
	Rock Breaking	69-88	
	Excavators	64-83	
	General Trucks	59-78	Marginally exceeds "highly noise affected" level with activity close to eastern boundary.
	Powered Hand Tools	59-78	
Construction	Concrete Pump	72-76	Marginally exceeds "highly noise affected" level with activity close to eastern boundary.
	Cement Mixing Truck	72-76	
	Excavator	64-83	Generally exceeds "highly noise affected" level with activity close to eastern boundary.
	General Trucks	59-78	Marginally exceeds "highly noise affected" level with activity close to eastern boundary.
	Powered Hand Tools	59-78	

Refer to recommendations in Section 7.7.

7.6 DISCUSSION

7.6.1 Noise

Noise levels at surrounding receivers will vary, depending on the location of activities and time duration, as this determines noise attenuation (i.e. from distance or barriers).

It is predicted that external noise levels will generally over the "noise affected" levels at surrounding residential receivers due to their close proximity to the project site. "Highly noise affected" levels will also be potentially exceeded when loud activities are occurring along the boundary of the project site closest to the respective receiver, especially when there is direct line of sight.

It has been assumed that the noisiest activities which may occur are jackhammering, saw-cutting and rock breaking. These are anticipated to be intermittent activities which will naturally create respite periods, and the overall process should be fairly short in duration when compared to other activities, such as construction.

Noise levels are expected to lower once activities move further away from the relative receiver and will diminish greatly once working under ground level or inside the building shell, once constructed (as receivers are shielded from works occurring on site).

It is also worth noting the established noise management levels are an external noise level, and the level of impact will ultimately be dependent on the noise level transmitted through the façade compared to the ambient noise level within these spaces.

Nonetheless, all feasible and reasonable practices (such as respite periods, alternative methods or machinery, etc.) should be applied. Recommendations and mitigation techniques have been made in Section 7.7, 7.8, 7.9 and 7.10 to minimise the noise impact at surrounding receivers.

7.6.2 Vibration

The main vibration inducing activities that usually occur during the demolition, excavation and construction stages are jack hammering and rock breaking. It is difficult to predict the vibrations levels experienced at receivers because vibration levels are dependent on multiple factors, which, given the unknown nature of them (e.g. terrain in the area, type of soil, impact force, angle of impact, etc.) makes it near impossible to predict.

Having said so, the receiver which would be potentially most impacted by vibration is expected to be Receiver 1, as the project site adjoins the structure of this receiver. Section 7.7.1 details recommendations for vibration monitoring and management.

7.7 RECOMMENDATIONS

7.7.1 Noise Management

In light of the above, we recommend:

- Community consultation/notification – Notification (leaflet or similar) of all surrounding noise receivers of the development is recommended prior to commencement of works. Notification should advise of anticipated date and duration of noisy activities, such as hammering or saw-cutting.
- Quiet work methods/technologies:
 - Excavation should be conducted with using excavator with buckets as much as possible, being the quietest method.
 - Use rock rippers as much as possible when rock breaking is required. Use of the loudest excavation equipment such as hydraulic hammers and rock saws should only be used when other methods are not reasonably or reasonably practical. Saw cutting is recommended over hammering, as this will induce less vibration.
 - If piling is to occur, bored piles should be used as opposed to driven or vibrated piles.
 - Mobile cranes, concrete pump trucks and mixers should be located centrally to the receivers, as much as possible (indicatively on Cleveland Street, not on Woodburn Street nor Eveleigh Street).
 - Materials handling/vehicles:
 - Trucks and bobcats to use a non-tonal reversing beacon (subject to OH&S requirements) to minimise potential disturbance of neighbours.
 - Avoid careless dropping of construction materials into empty trucks.
 - Trucks, trailers and concrete trucks (if feasible) should turn off their engines during idling to reduce noise impacts (unless truck ignition needs to remain on during concrete pumping).
- Complaints handling - In the event of a complaint, the procedures outlined in Section 7.9 should be adopted.
- Site Induction:
 - A copy of the Noise Management Plan is to be available to contractors. The location of the Noise Management Plan should be advised in any site induction.
 - Site induction should also detail who is to be contacted in the event of noise complaint.

7.7.2 Vibration Monitoring

7.7.2.1 Locations

It is recommended that vibration monitoring is conducted along the northern boundary of Receiver 1 during high vibration level inducing activities, such as hammering.

Vibration monitoring (attended or unattended) can also be conducted at other surrounding residential/commercial receivers if complaints arise.

7.7.2.2 Equipment

Vibration monitoring at receiver facades or site boundaries are to be conducted using Texcel ETM type monitors with externally mounted tri-axial geophones.

The monitors are to be set to send an SMS message when alert levels have been reached/exceeded at the location of the geophone.

7.7.2.3 Results

The ETM vibration monitors can be downloaded remotely to actively review all monitoring data recorded at the monitoring location, including any vibration events found to exceed the trigger levels nominated in Section 7.3.2.

In the event multiple events exceeding the nominated trigger levels are recorded, all data recorded by the monitor is to be reviewed and forwarded to a nominated representative of the building contractor. It is proposed that reports are to be provided at regular intervals (e.g. fortnightly), with any exceedance in the nominated vibration criteria documented.

7.7.2.4 Vibration Monitoring Alerts

The following personnel will receive alarms in the event that the nominated vibration trigger levels are exceeded at the site:

1. Acoustic consultant/advisor.
2. Project site foreman.
3. Project Manager.

7.8 ADDITIONAL NOISE AND VIBRATION CONTROL METHODS

In the event of complaints, there are a number of noise mitigation strategies available which can be considered.

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

7.8.1 Selection of Alternate Appliance or Process

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example, the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. Undertaking this activity using bulldozers, ripping and/or milling machines will result in lower noise levels.

7.8.2 Acoustic Barrier

Given that surrounding receivers are generally more than 1-storey high, it is unlikely that noise screens will provide significant acoustic benefit but will provide noticeable improvement for those on ground level.

The placement of barriers at the source is generally only effective for static plant. Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As 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 that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

7.8.3 Material Handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

7.8.4 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.

7.8.5 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. A more detailed management plan will be developed for this project in accordance with the construction methodology outlining work procedures and methods for minimising noise.

7.8.6 Combination of Methods

In some cases, it may be necessary that two or more control measures be implemented to minimise noise.

7.9 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration criteria occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices.

If a noise complaint is received the complaint should be recorded. Any complaint form should 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;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

7.9.1 Report Requirements

The following shall 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 in this report.
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 to the construction liaison committee.

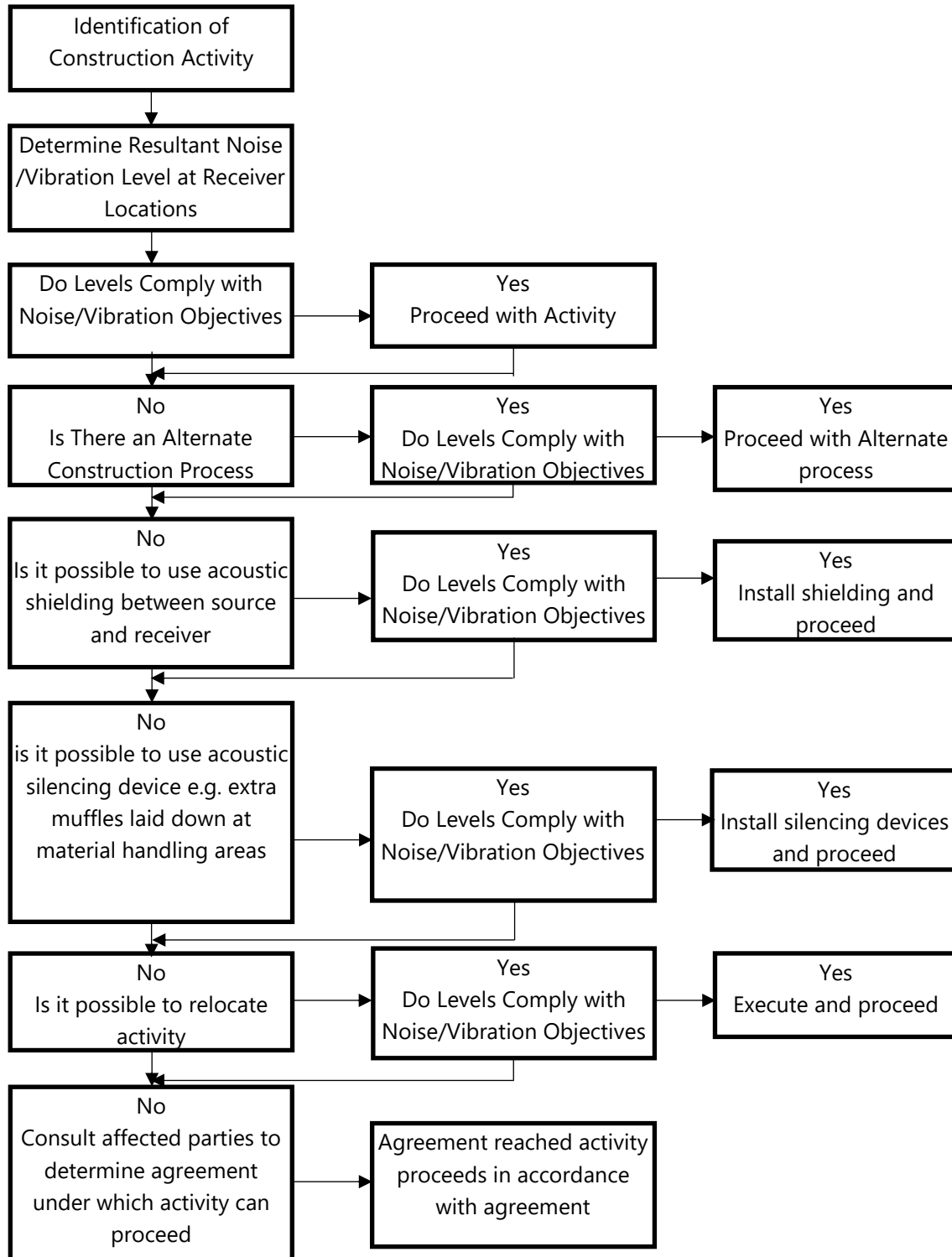
7.9.2 contingency plans

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determine the offending plant/equipment/process.
2. Locate the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implement additional acoustic treatment in the form of localised barriers, silencers etc where practical.
4. Selecting alternative equipment/processes where practical.

7.10 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PRECEDURAL STEPS

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



8 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed co-living development at 175-177 Cleveland Street, Redfern (SSD-10720865).

Based on the information provided above, we conclude the following:

Provided that the recommendations set out in Section 4.4 of this report are employed, internal noise levels are able to satisfy requirements outlined in:

- NSW Department of Planning's *State Environmental Planning Policy (Infrastructure) 2007*.
- NSW Department of Planning's *Developments near Rail Corridors or Busy Roads – Interim Guideline*.

Provided that the recommendations set out in Section 6.4 of this report are employed, noise emission levels are able to satisfy requirements outlined in:

- City of Sydney Council's *Sydney Development Control Plan 2012*.
- NSW Environmental Protection Authority's (EPA) *Noise Policy for Industry (NPfI) 2017*.

Detailed acoustic control measures for the mechanical plant servicing the proposed development are to be determined later during CC stage once the design and equipment selection have been finalised.

Construction noise and vibration impacts at surrounding receivers have been assessed against NSW Environmental Protection Authority's (EPA) *Interim Construction Noise Guideline* in Section 7 and a management plan has been presented.

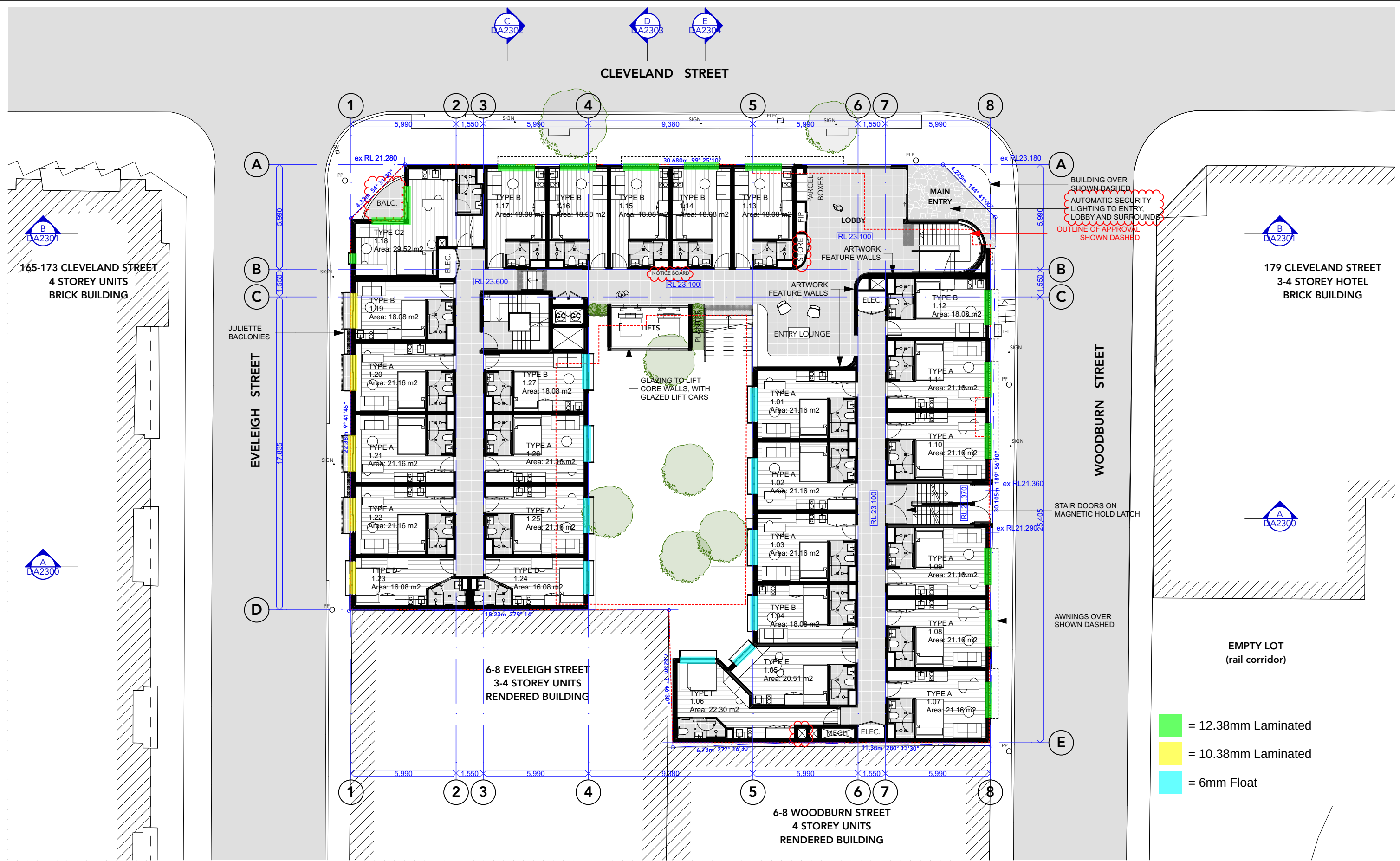
We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,



Acoustic Logic Pty Ltd
Kanin Mungkarndee

APPENDIX A – GLAZING MARKUP



1 LEVEL 1
1:200



MARK SHAPIRO ARCHITECTS
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NSW REG. 9789
ABN 646 2000 7678

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ISSUE	DATE	REVISION
P5	12/2/21	REVISED ISSUE FOR CONSULTANTS
P4	8/1/21	REVISED ISSUE FOR CONSULTANTS
P3	4/12/20	PRELIMINARY ISSUE FOR CONSULTANTS

File E: 20008 175 177 Cleveland Street Redfern DA 200210 plan

CLIENT:
EG Funds Management
Level 21, Governor Phillip Tower,
1 Farrer Place, Sydney, 2000

PROJECT:
PROPOSED CO-LIVING DEVELOPMENT
175-177 CLEVELAND STREET, REDFERN
DRAWING:
LEVEL 1 PLAN

PROJECT NO:
20008
PLOTTED: 12/2/21
DRAWING NO:
DA2003
REV:
P5



1 LEVEL 2
1:200

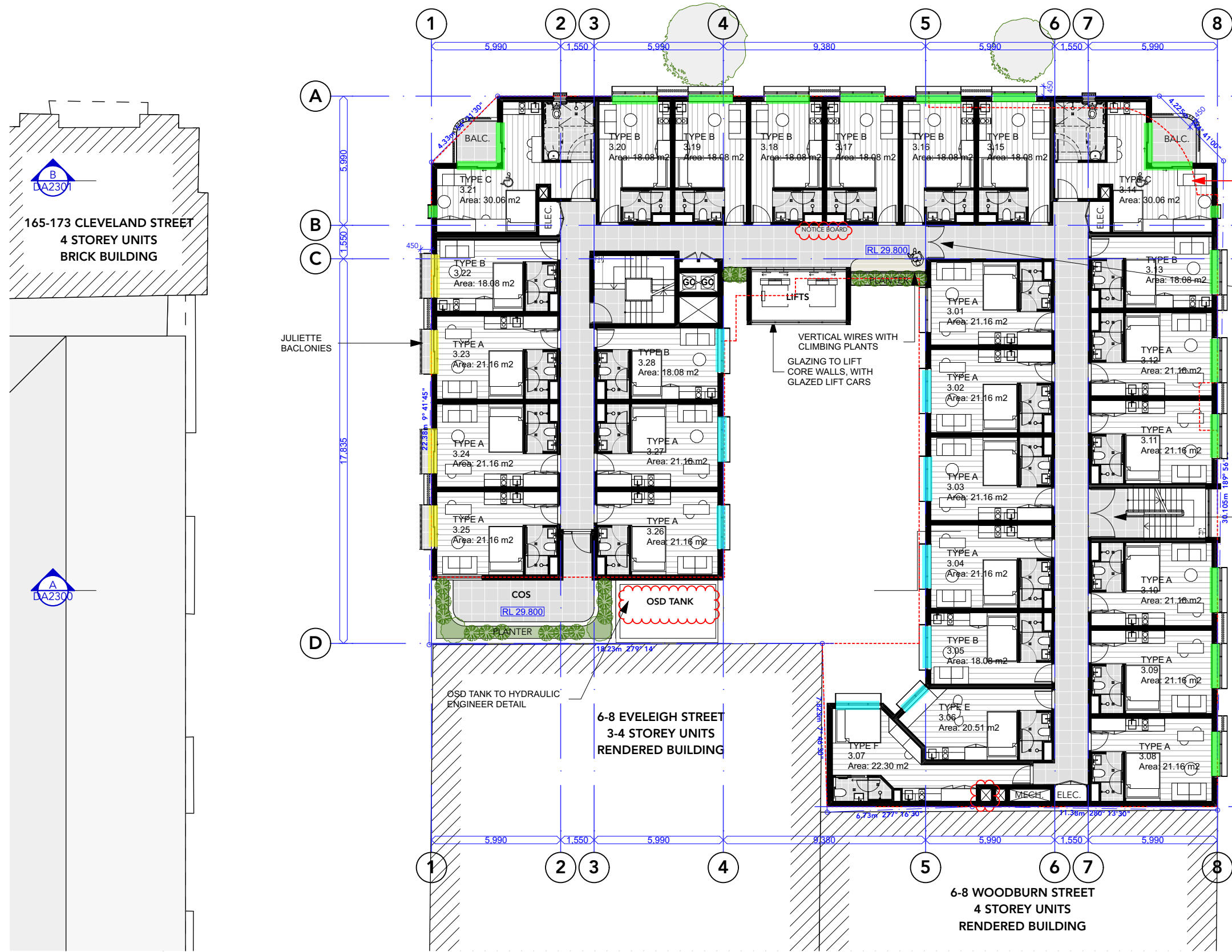
P5	12/2/21	REVISED ISSUE FOR CONSULTANTS
P4	8/1/21	REVISED ISSUE FOR CONSULTANTS
P3	4/12/20	PRELIMINARY ISSUE FOR CONSULTANTS
ISSUE	DATE	REVISION



CLIENT:
EG Funds Management
Level 21, Governor Phillip Tower,
1 Farrer Place, Sydney, 2000

PROJECT:
PROPOSED CO-LIVING DEVELOPMENT
175-177 CLEVELAND STREET, REDFERN
DRAWING:
LEVEL 2 PLAN

PROJECT NO:
20008
PLOTTED: 12/2/21
DRAWING NO:
DA2004
REV:
P5



- = 12.38mm Laminated
- = 10.38mm Laminated
- = 6mm Float

1 LEVEL 3
1:200

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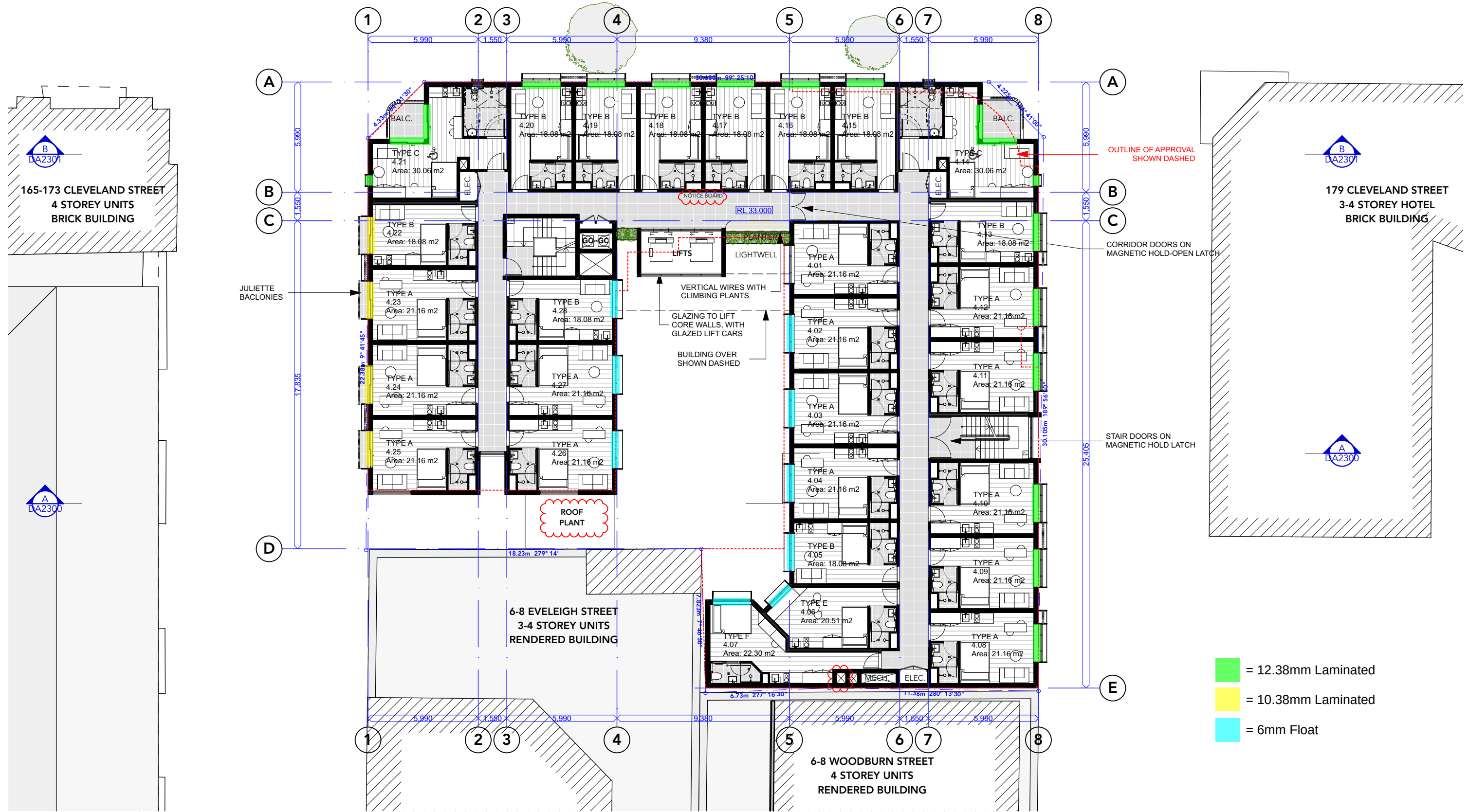
P5	12/2/21	REVISED ISSUE FOR CONSULTANTS
P4	8/1/21	REVISED ISSUE FOR CONSULTANTS
P3	4/12/20	PRELIMINARY ISSUE FOR CONSULTANTS
ISSUE	DATE	REVISION



CLIENT:
EG Funds Management
Level 21, Governor Phillip Tower,
1 Farrer Place, Sydney, 2000

PROJECT:
PROPOSED CO-LIVING DEVELOPMENT
175-177 CLEVELAND STREET, REDFERN
DRAWING:
LEVEL 3 PLAN

PROJECT NO:
20008
PLOTTED: 12/2/21
DRAWING NO:
DA2005
REV:
P5



1 LEVEL 4
1:200

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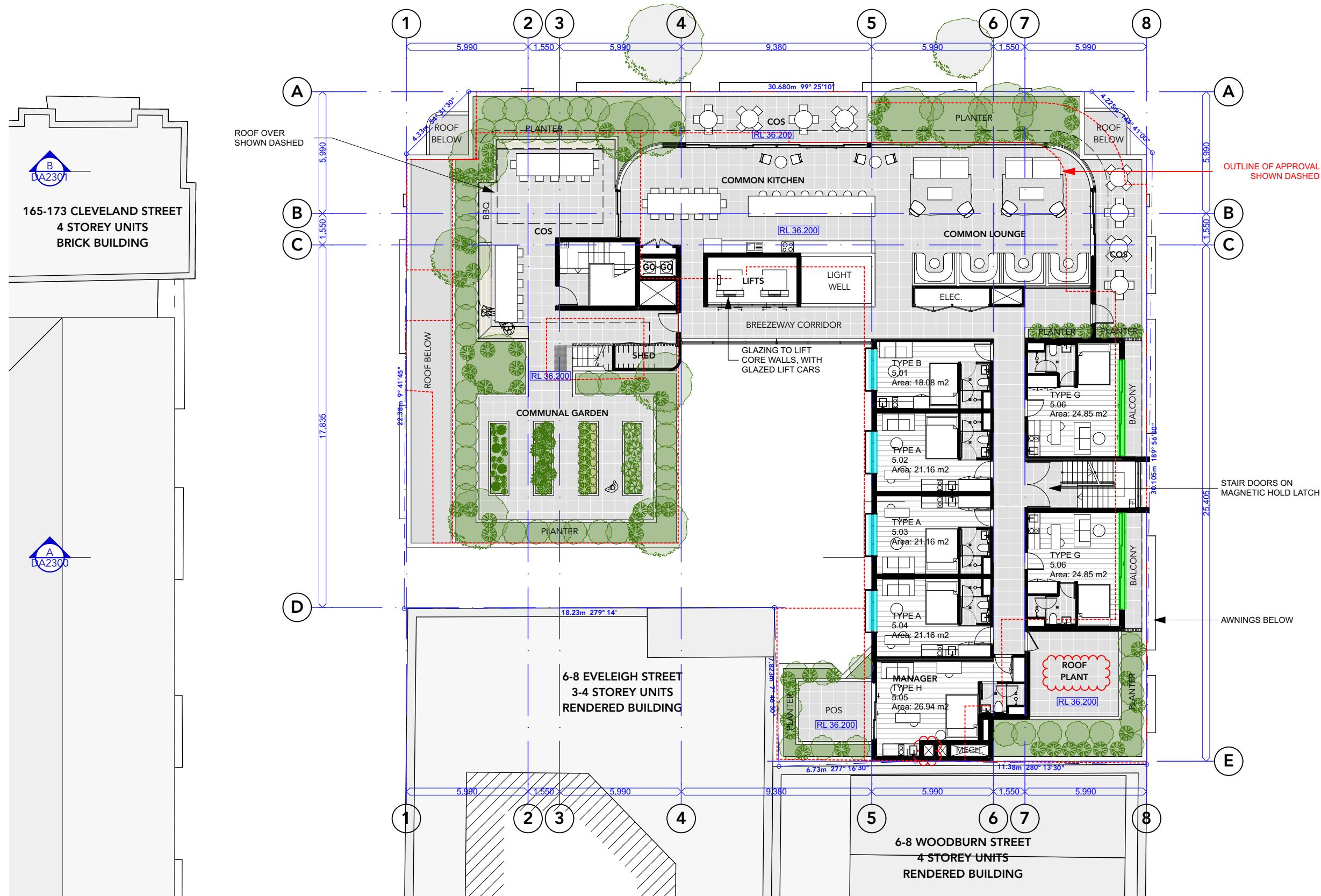
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P4	8/1/21	REVISED ISSUE FOR CONSULTANTS
P3	4/12/20	PRELIMINARY ISSUE FOR CONSULTANTS
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CLIENT:
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PROJECT:
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175-177 CLEVELAND STREET, REDFERN
DRAWING:
LEVEL 4 PLAN

PROJECT NO:
20008
PLOTTED: 12/2/21
DRAWING NO:
DA2006
REV:
P5



1 LEVEL 5
1:200

P5	12/2/21	REVISED ISSUE FOR CONSULTANTS
P4	8/1/21	REVISED ISSUE FOR CONSULTANTS
P3	4/12/20	PRELIMINARY ISSUE FOR CONSULTANTS
ISSUE	DATE	REVISION



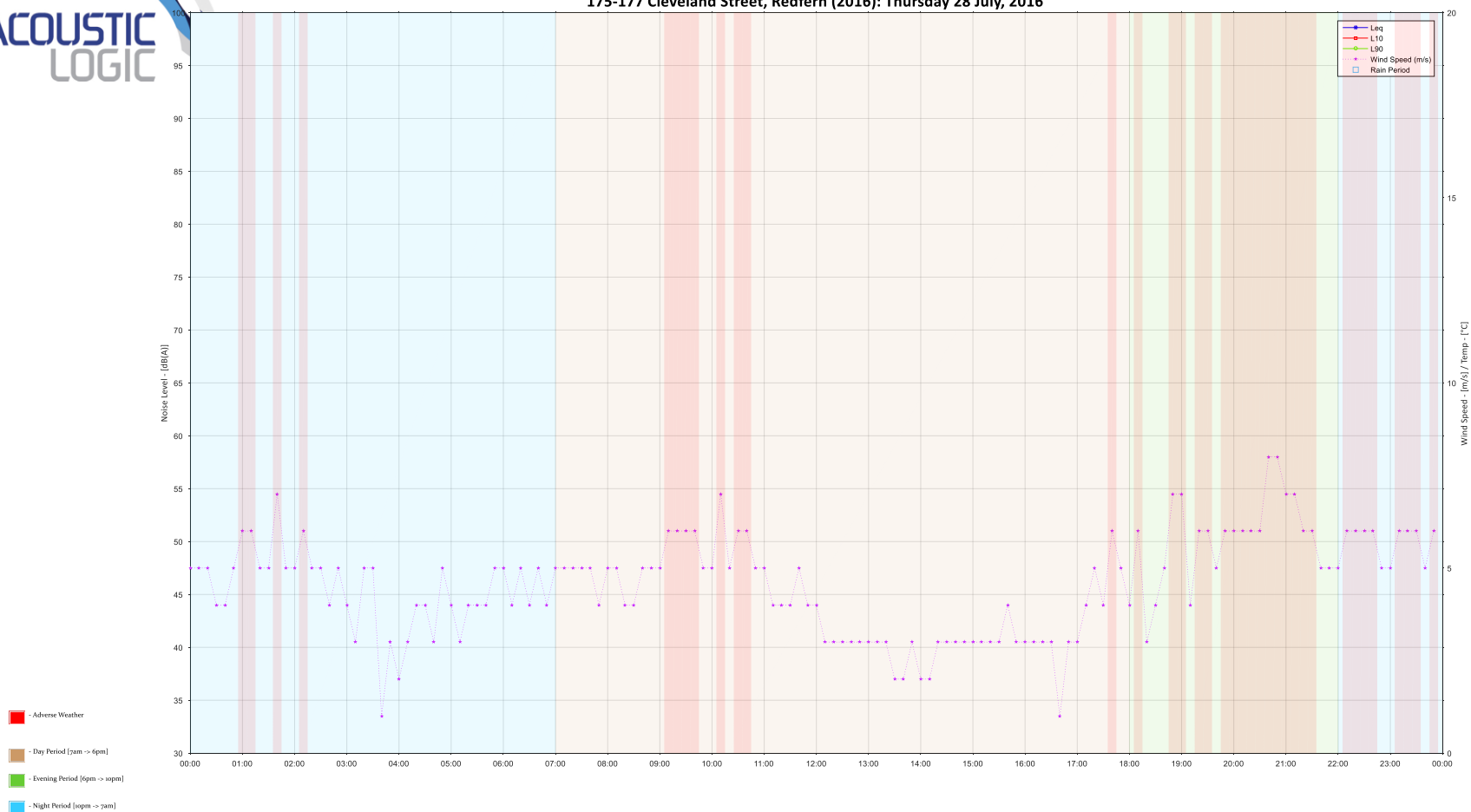
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EG Funds Management
Level 21, Governor Phillip Tower,
1 Farrer Place, Sydney, 2000

PROJECT:
PROPOSED CO-LIVING DEVELOPMENT
175-177 CLEVELAND STREET, REDFERN
DRAWING:
LEVEL 5 PLAN

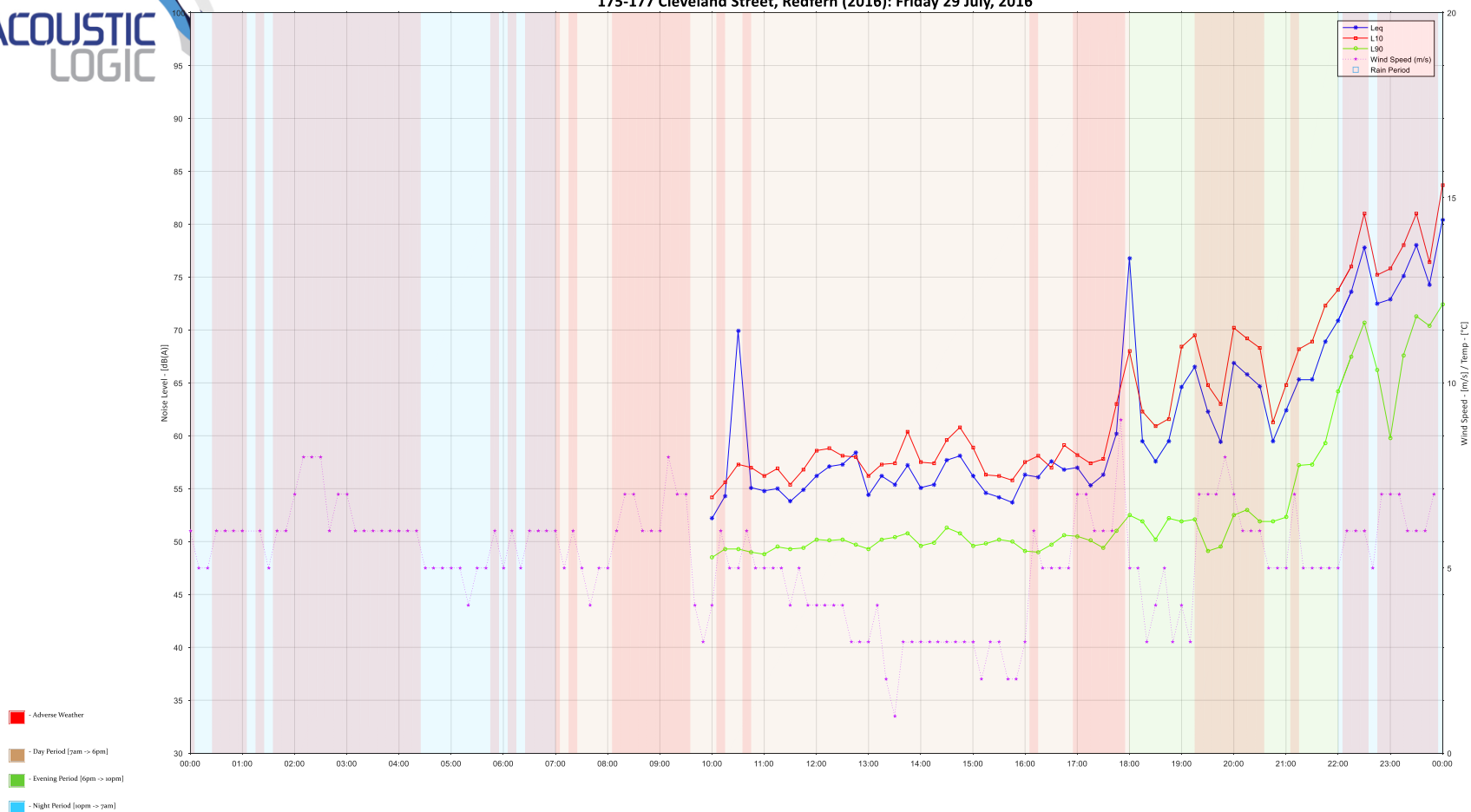
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P5

APPENDIX B – NOISE MONITORING DATA (REAR / SOUTHERN BOUNDARY)

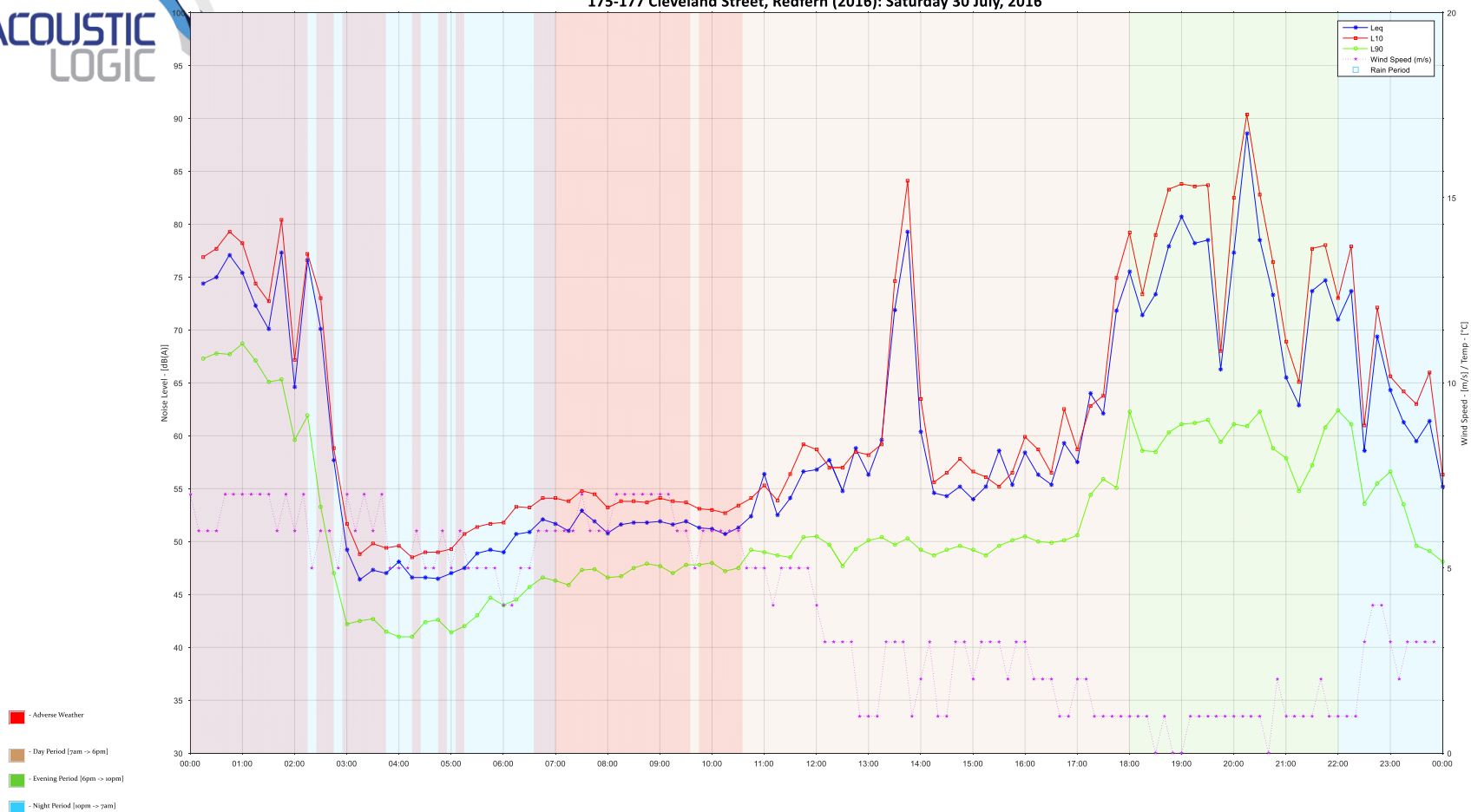
175-177 Cleveland Street, Redfern (2016): Thursday 28 July, 2016



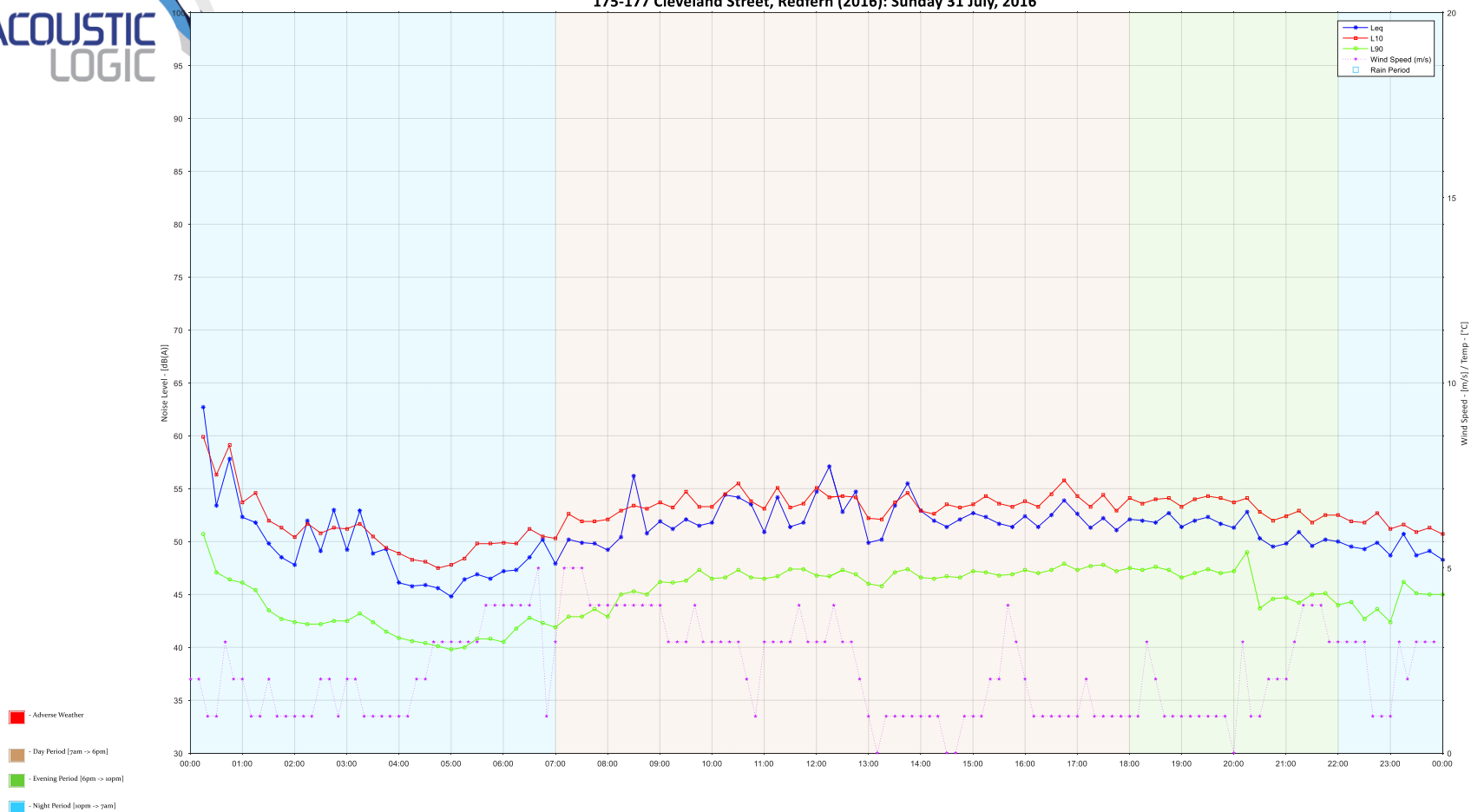
175-177 Cleveland Street, Redfern (2016): Friday 29 July, 2016



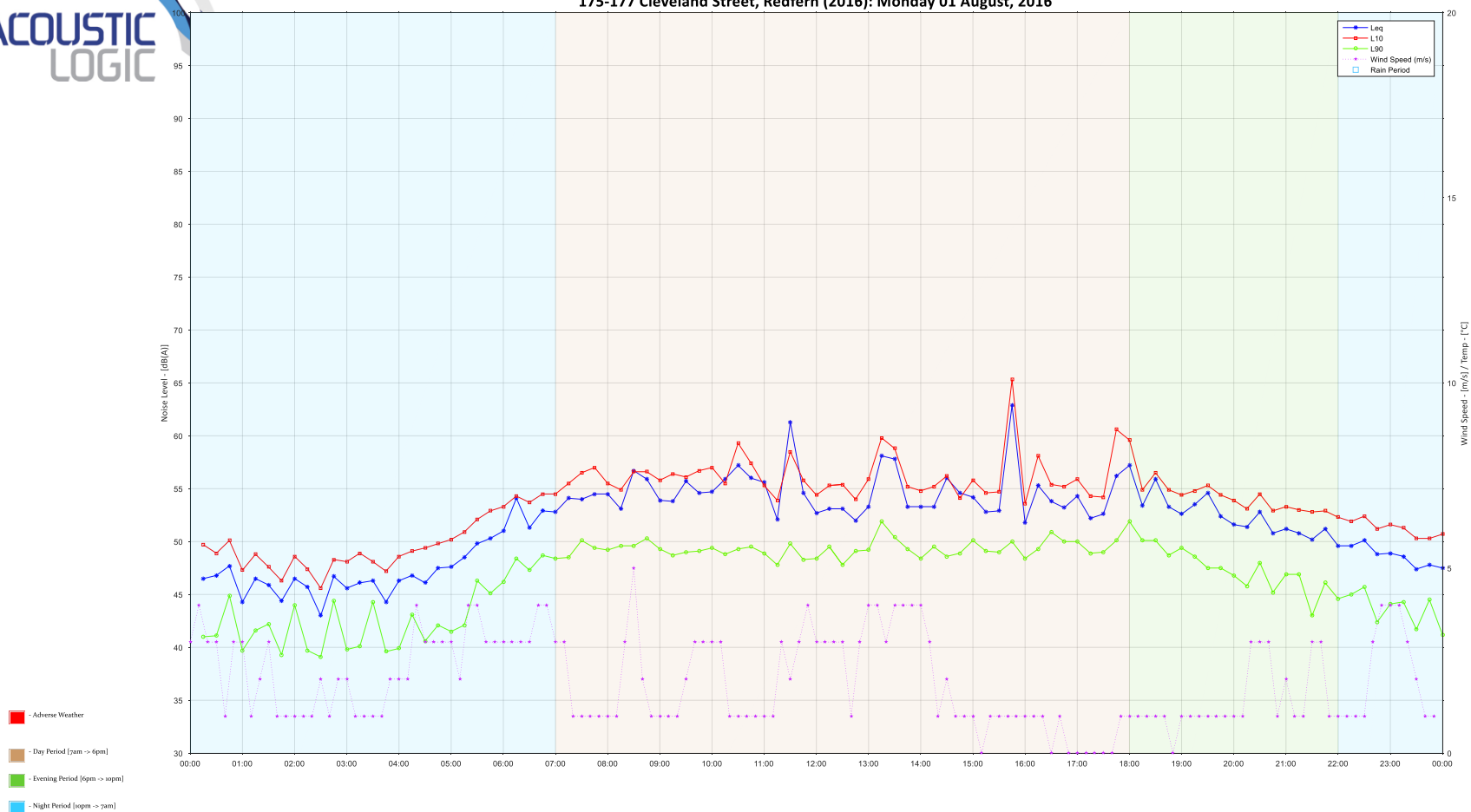
175-177 Cleveland Street, Redfern (2016): Saturday 30 July, 2016



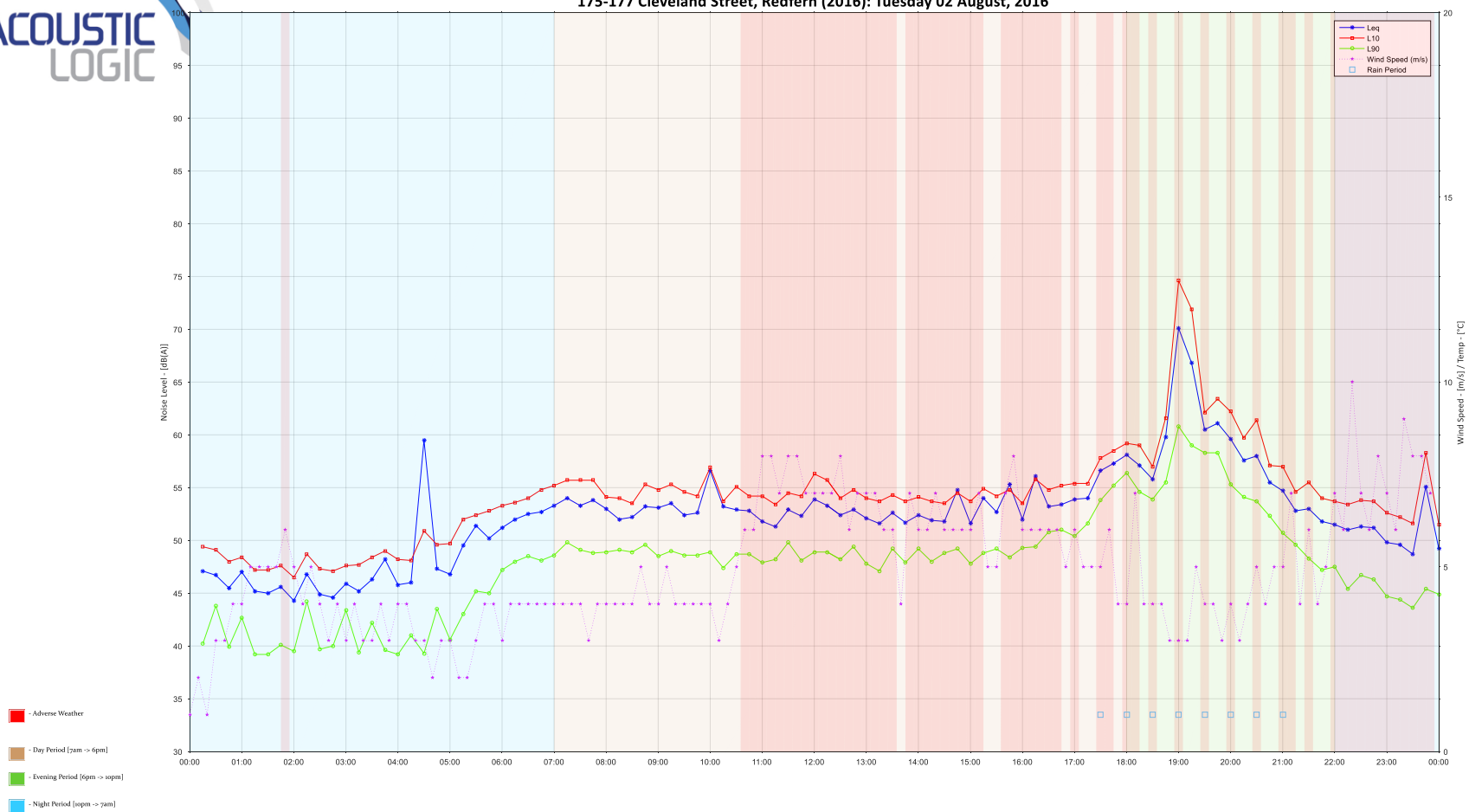
175-177 Cleveland Street, Redfern (2016): Sunday 31 July, 2016



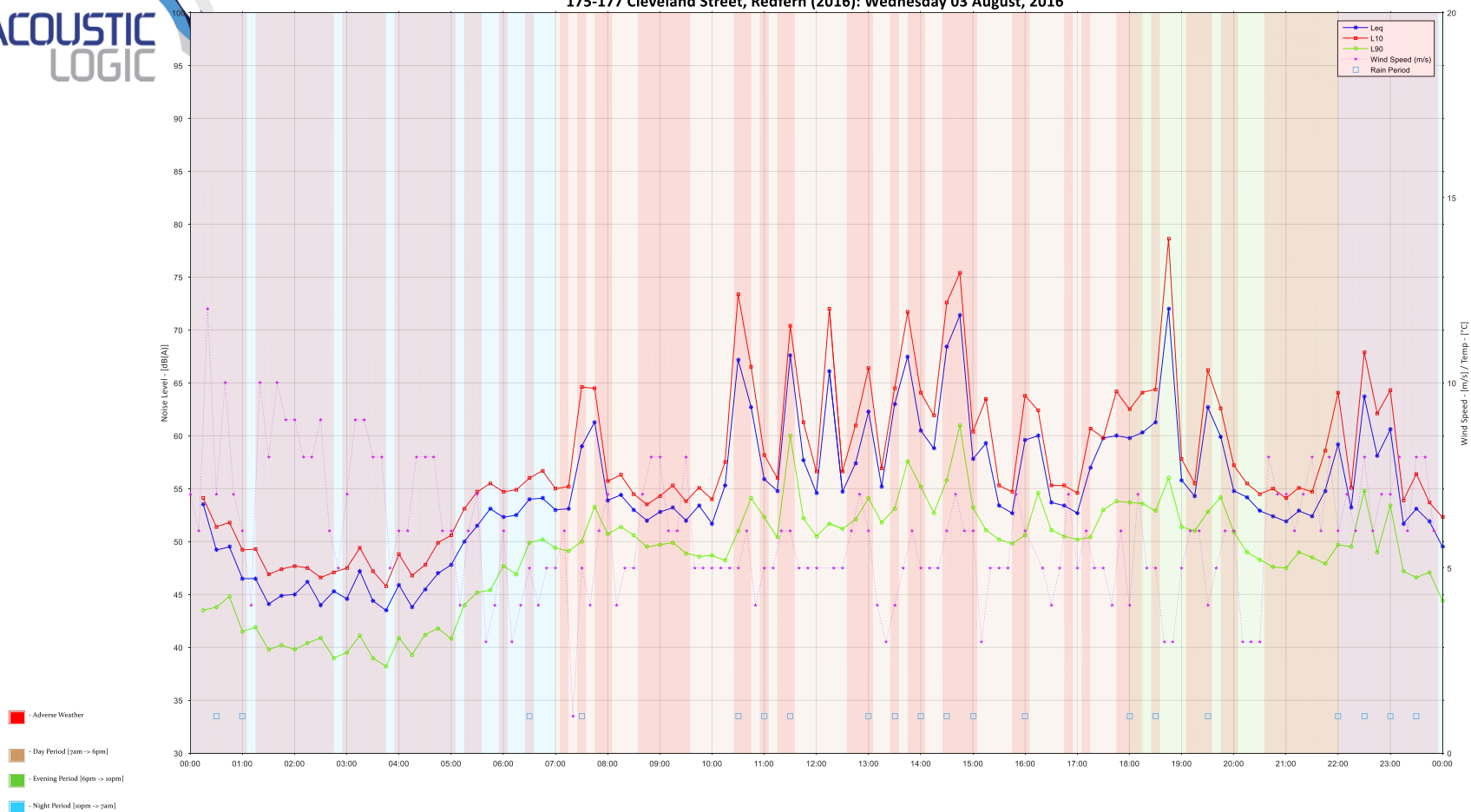
175-177 Cleveland Street, Redfern (2016): Monday 01 August, 2016



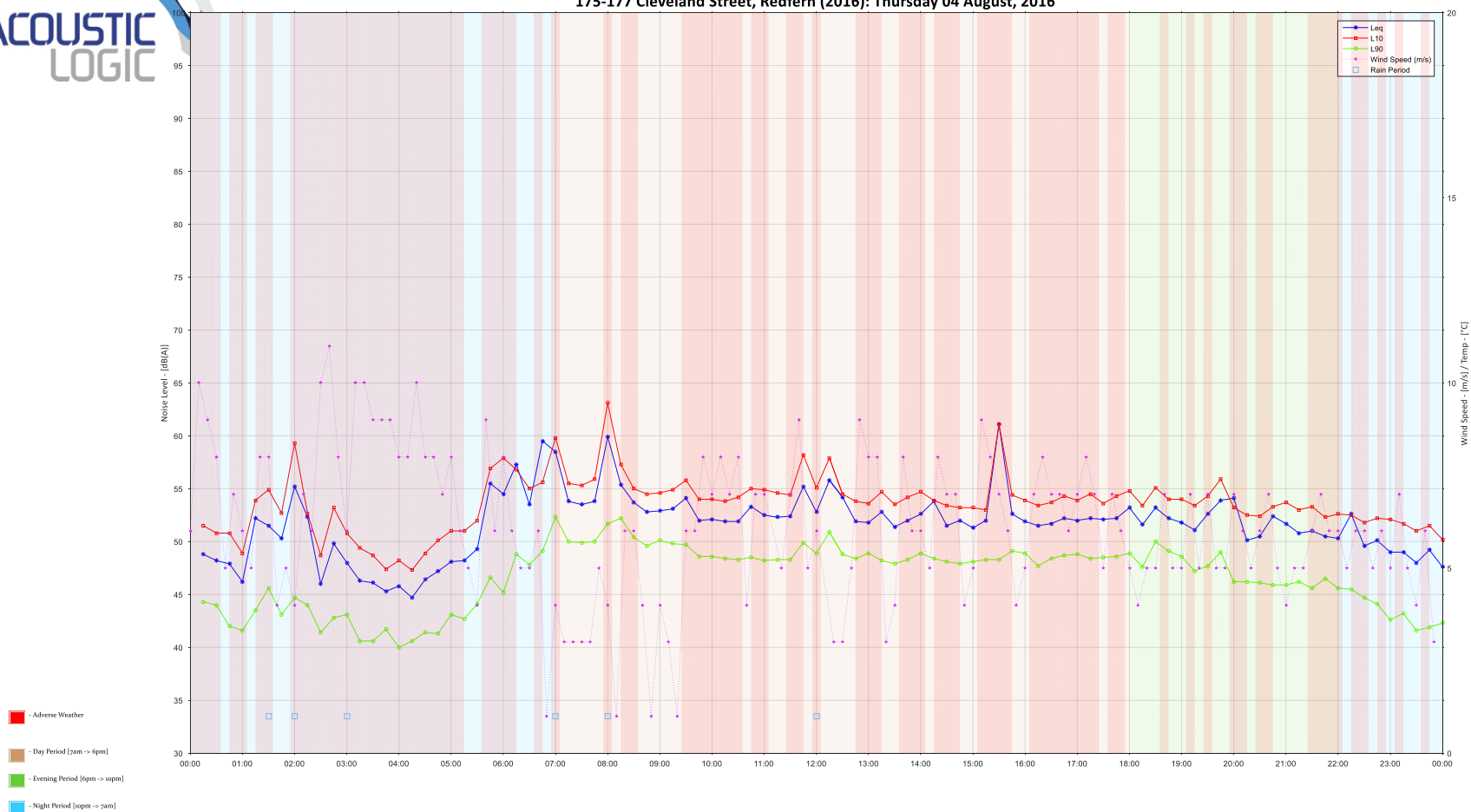
175-177 Cleveland Street, Redfern (2016): Tuesday 02 August, 2016



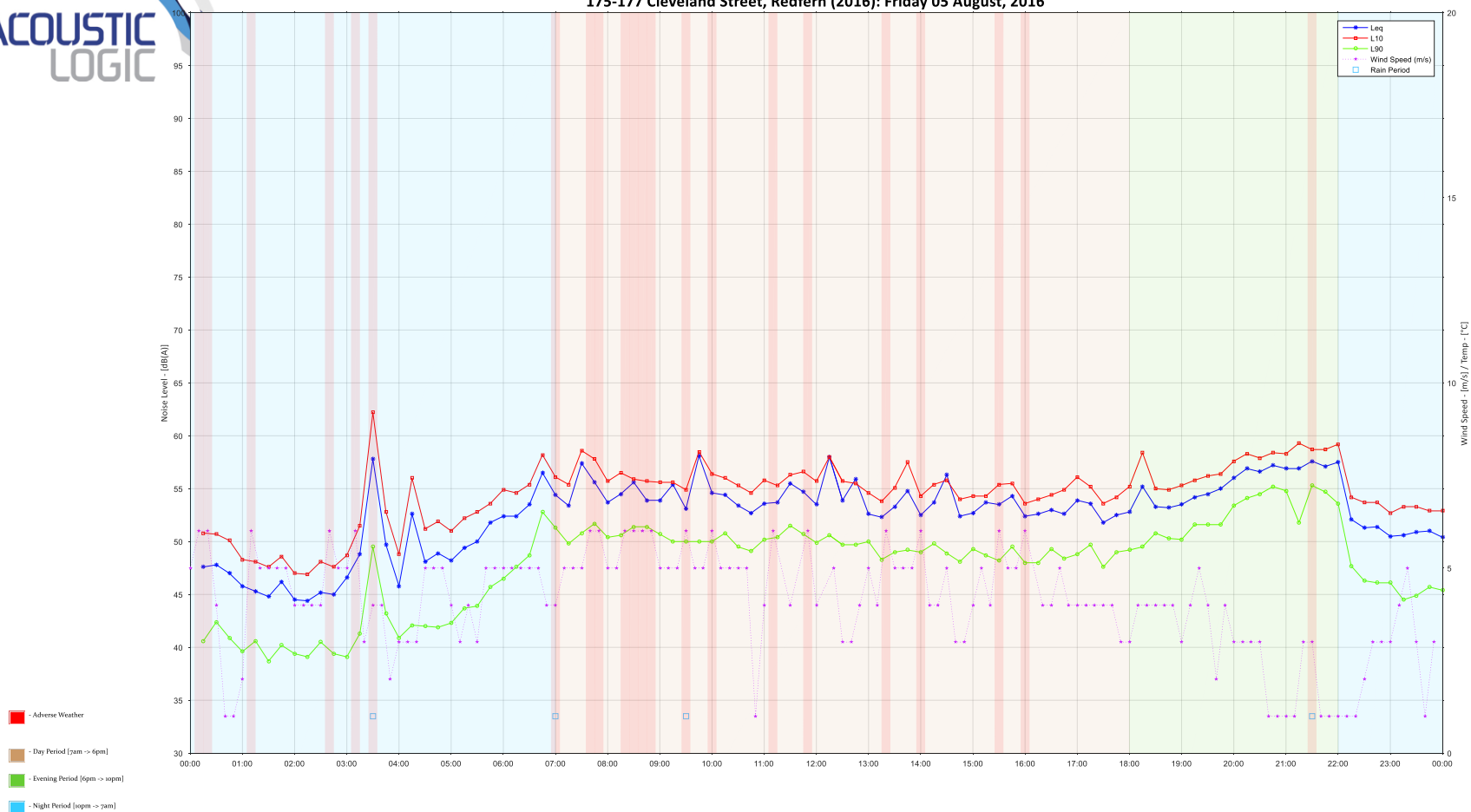
175-177 Cleveland Street, Redfern (2016): Wednesday 03 August, 2016



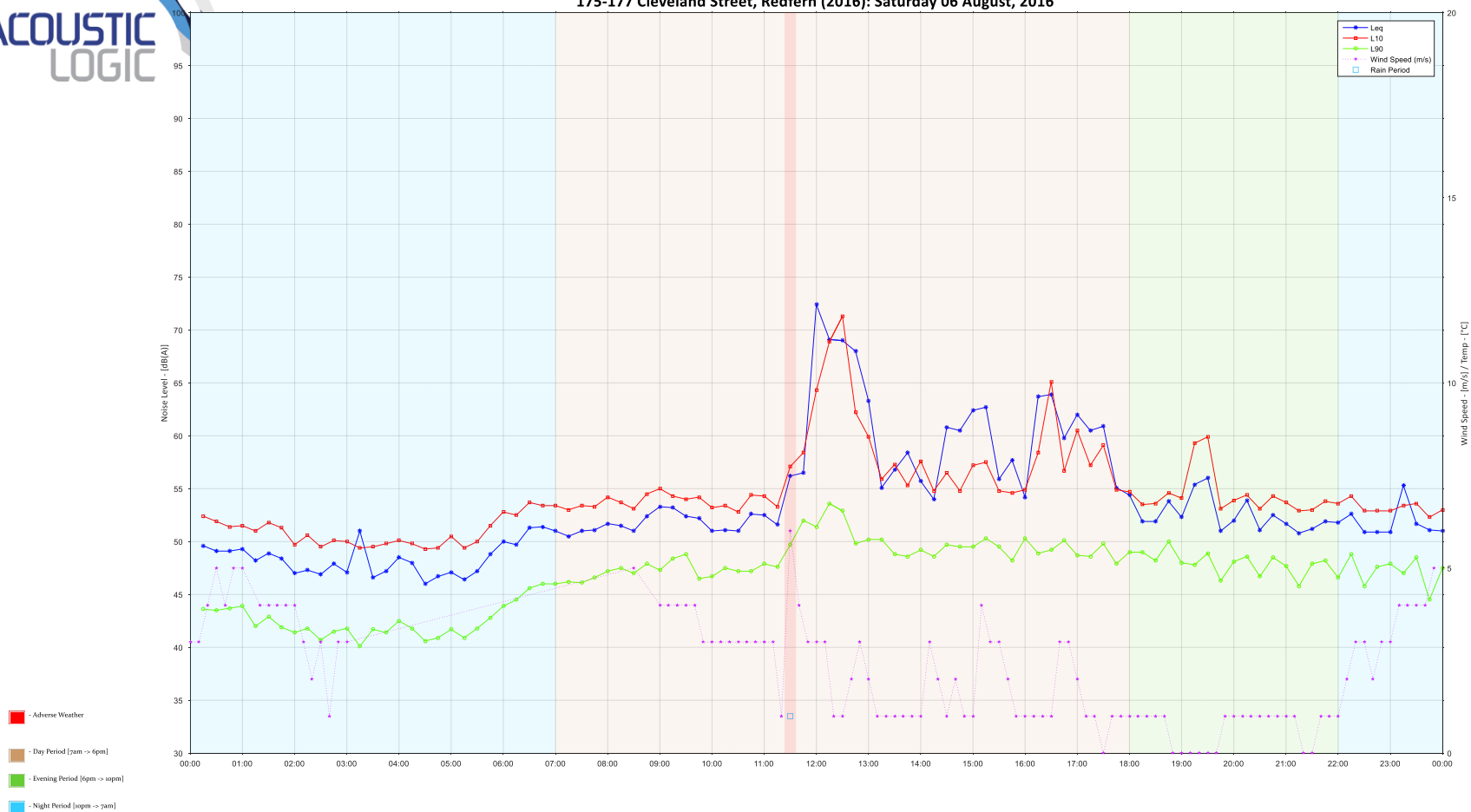
175-177 Cleveland Street, Redfern (2016): Thursday 04 August, 2016



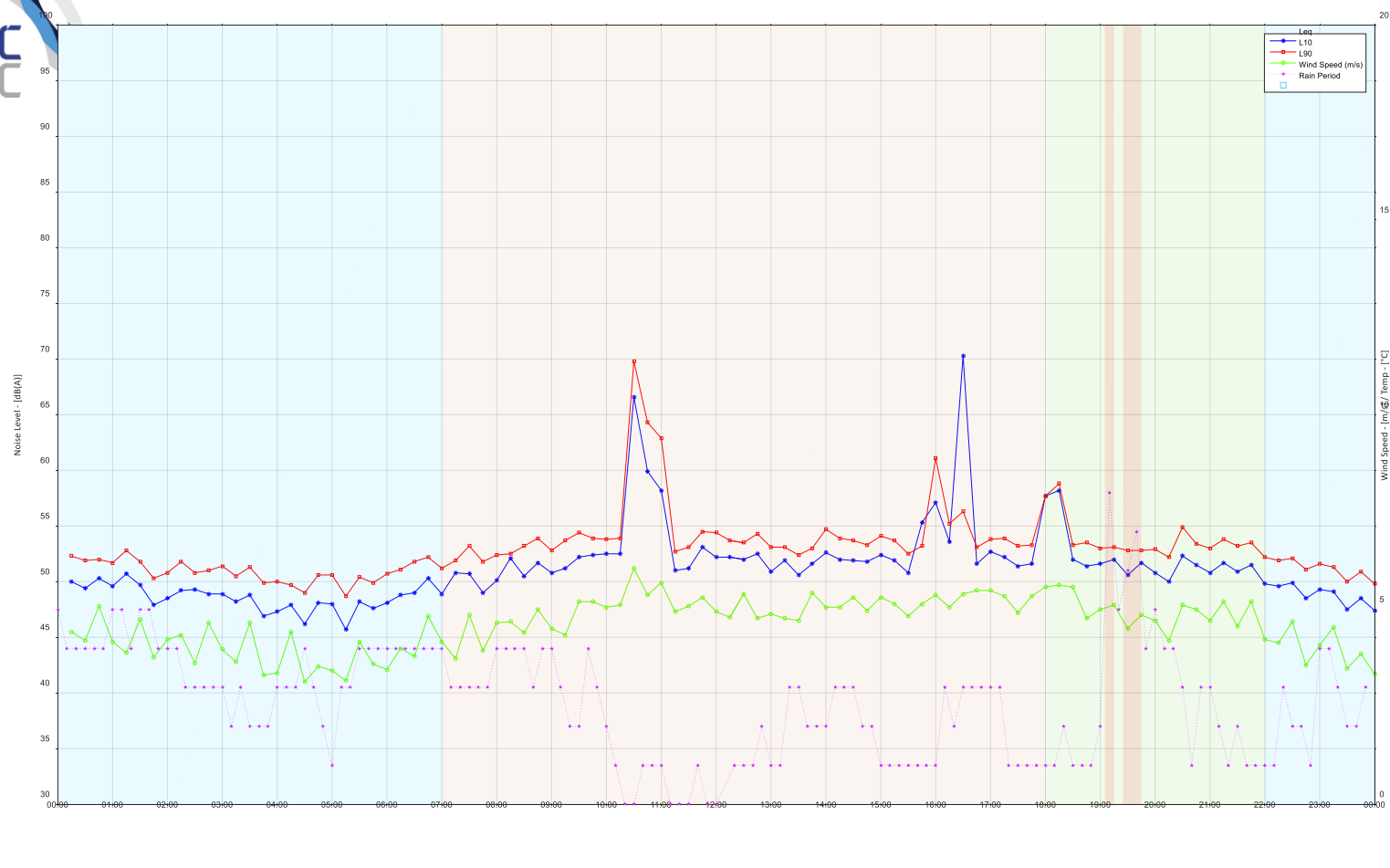
175-177 Cleveland Street, Redfern (2016): Friday 05 August, 2016



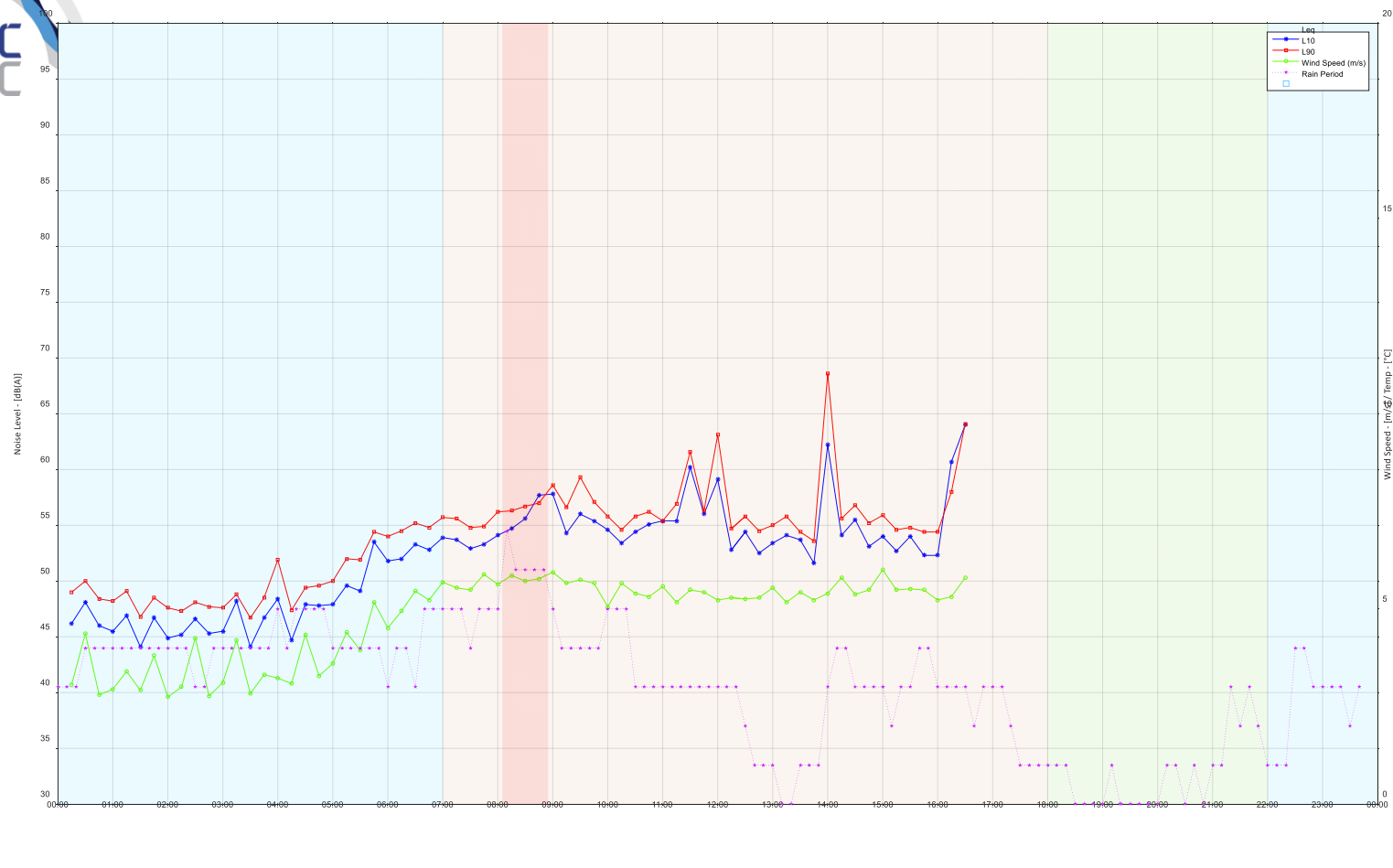
175-177 Cleveland Street, Redfern (2016): Saturday 06 August, 2016



175-177 Cleveland Street, Redfern (2016): Sunday 07 August, 2016

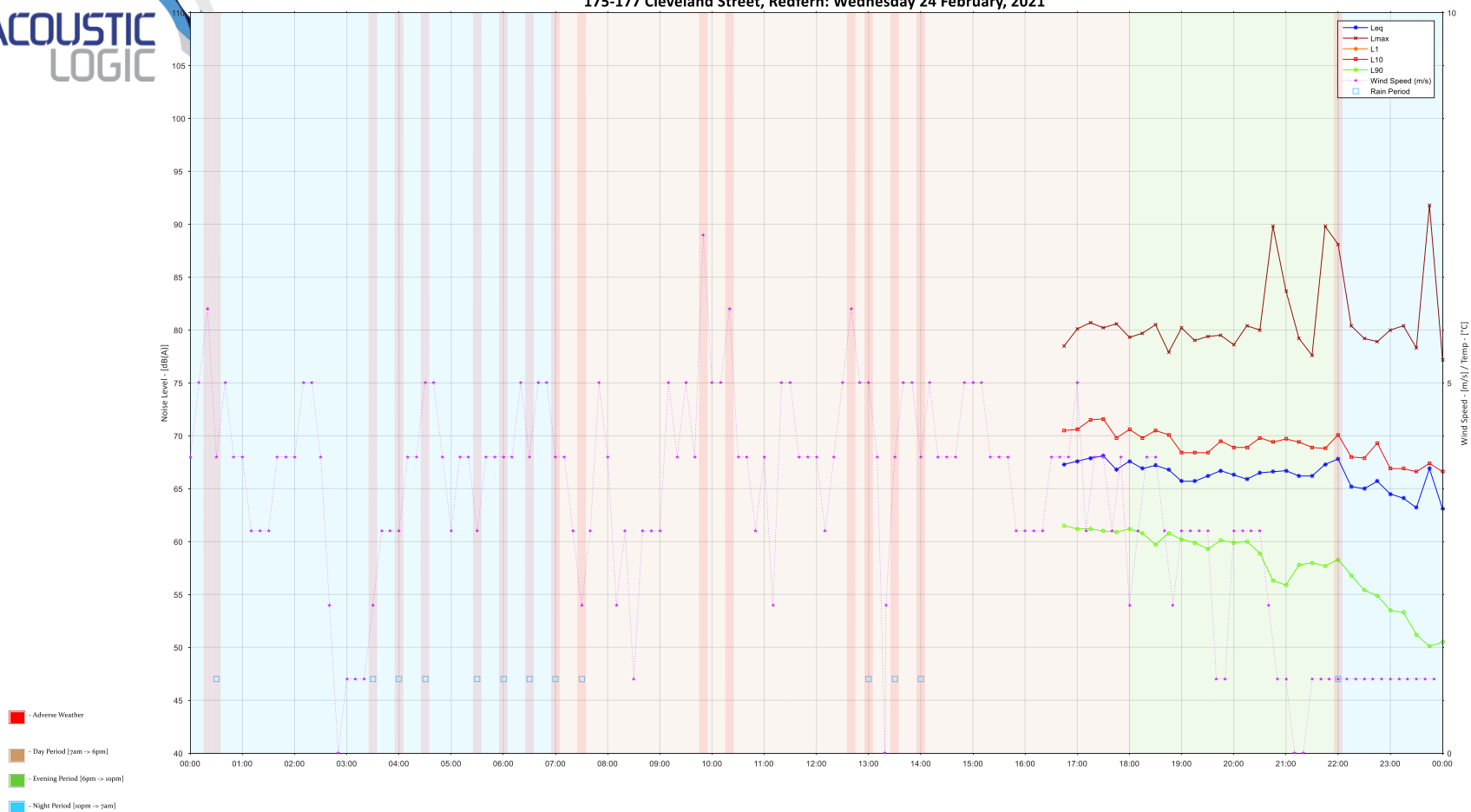


175-177 Cleveland Street, Redfern (2016): Monday 08 August, 2016

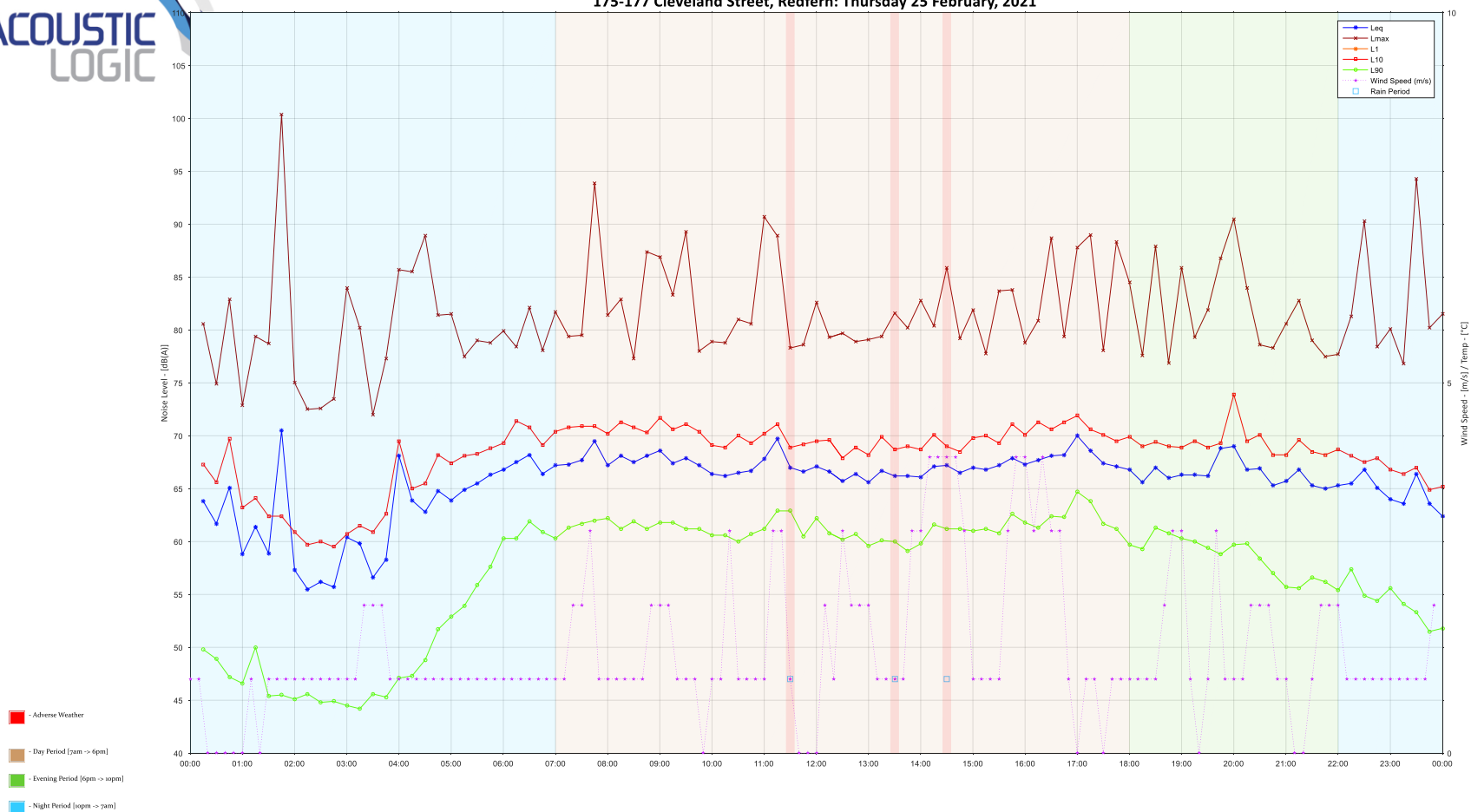


APPENDIX C – NOISE MONITORING DATA (EASTERN BOUNDARY)

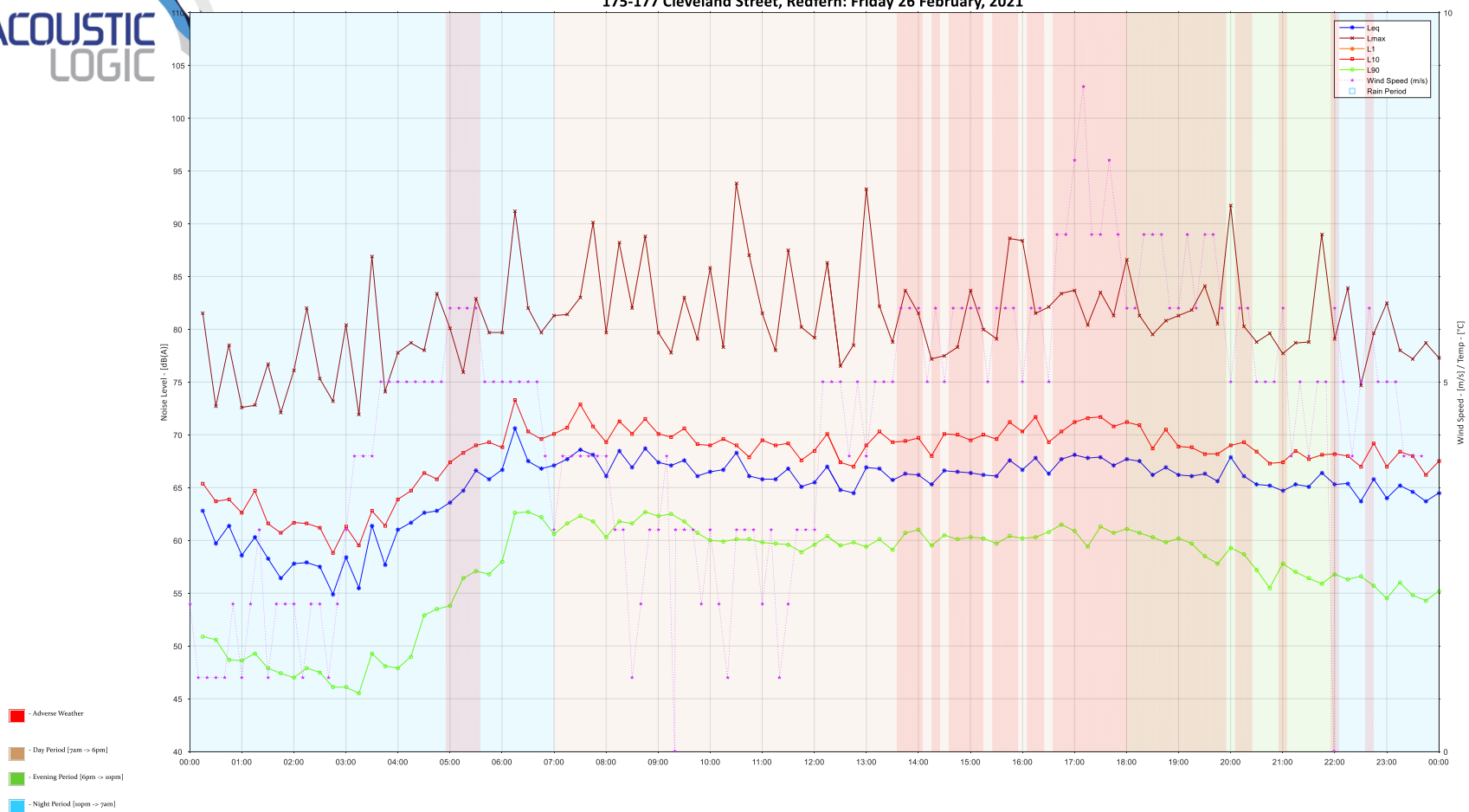
175-177 Cleveland Street, Redfern: Wednesday 24 February, 2021



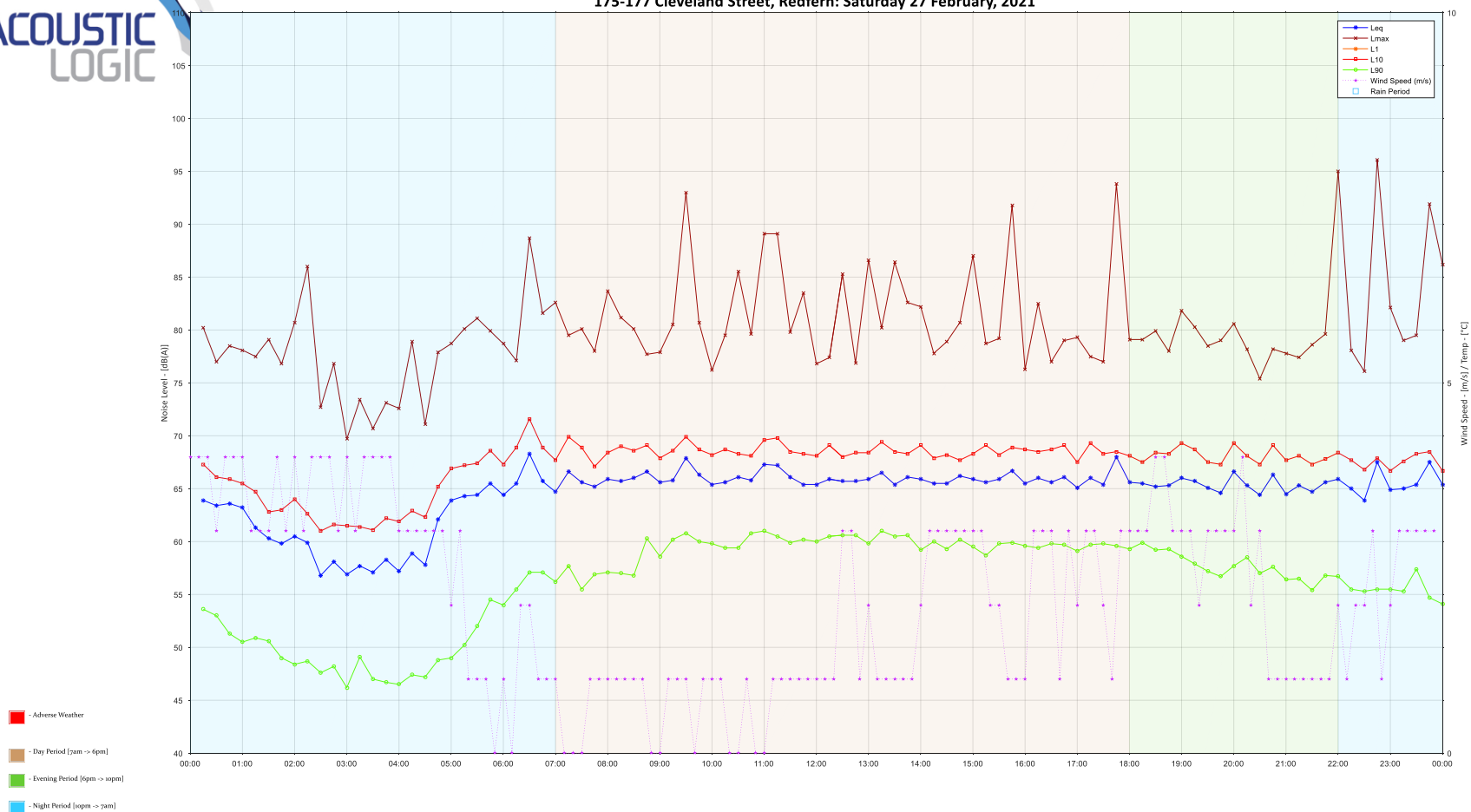
175-177 Cleveland Street, Redfern: Thursday 25 February, 2021



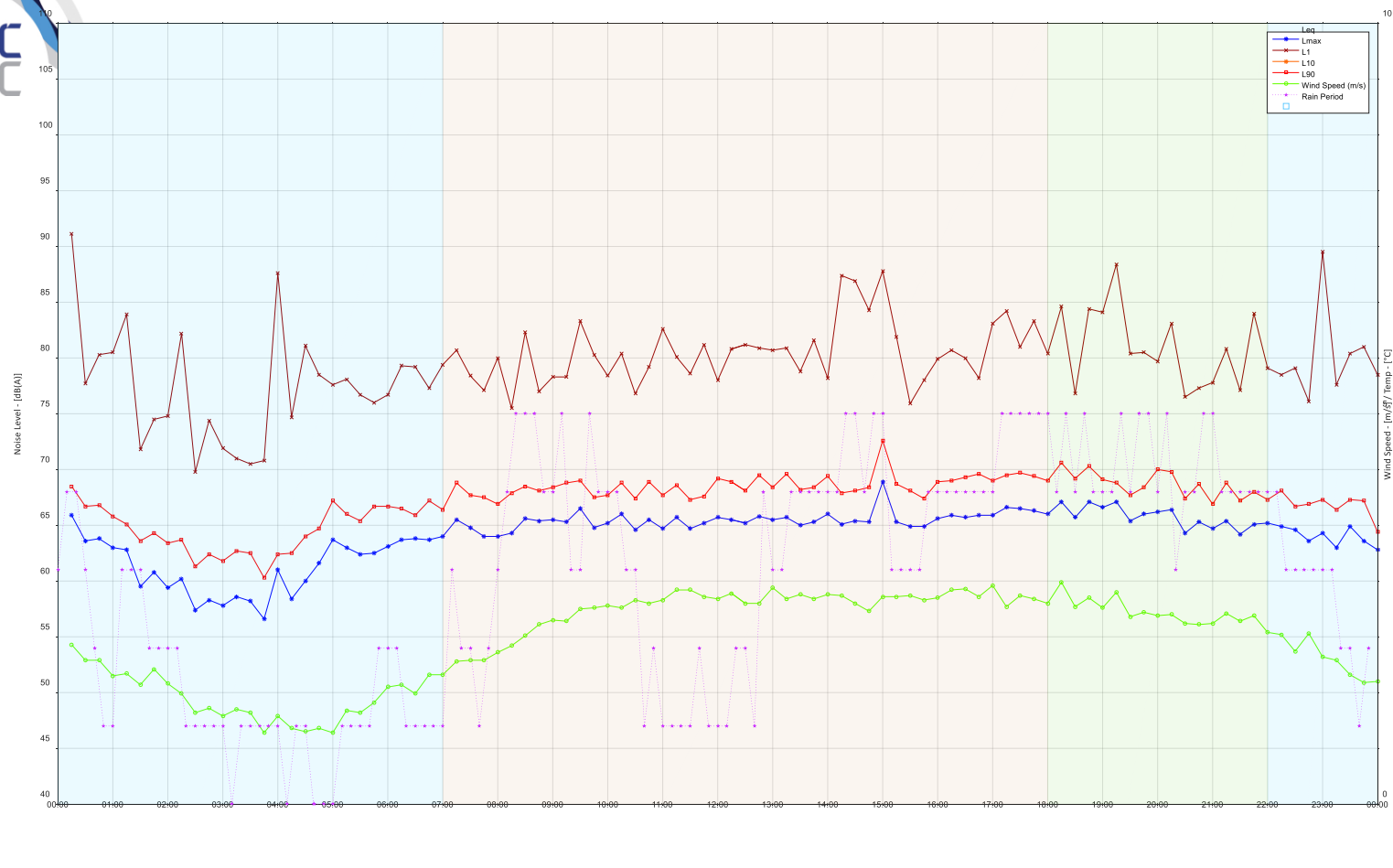
175-177 Cleveland Street, Redfern: Friday 26 February, 2021



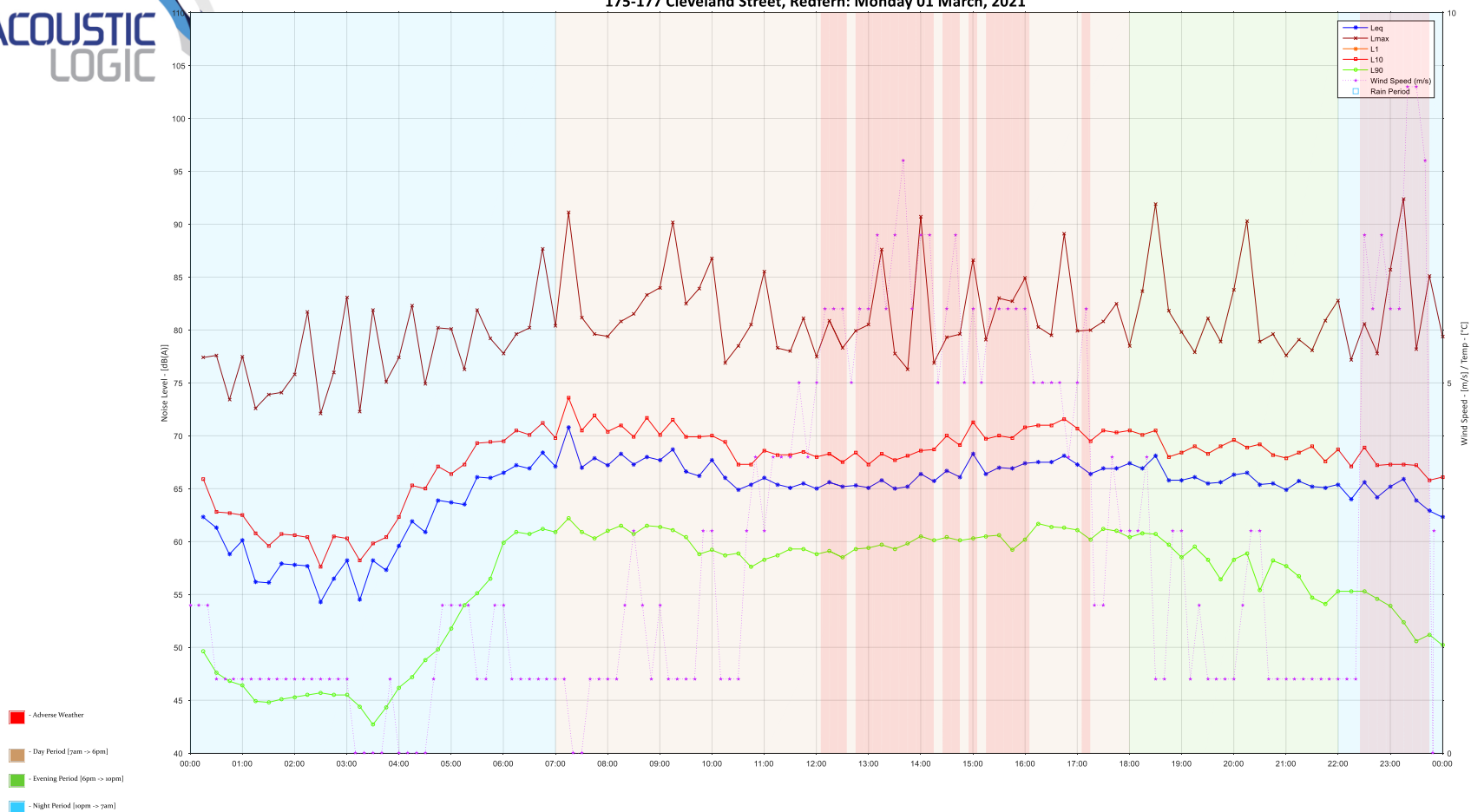
175-177 Cleveland Street, Redfern: Saturday 27 February, 2021



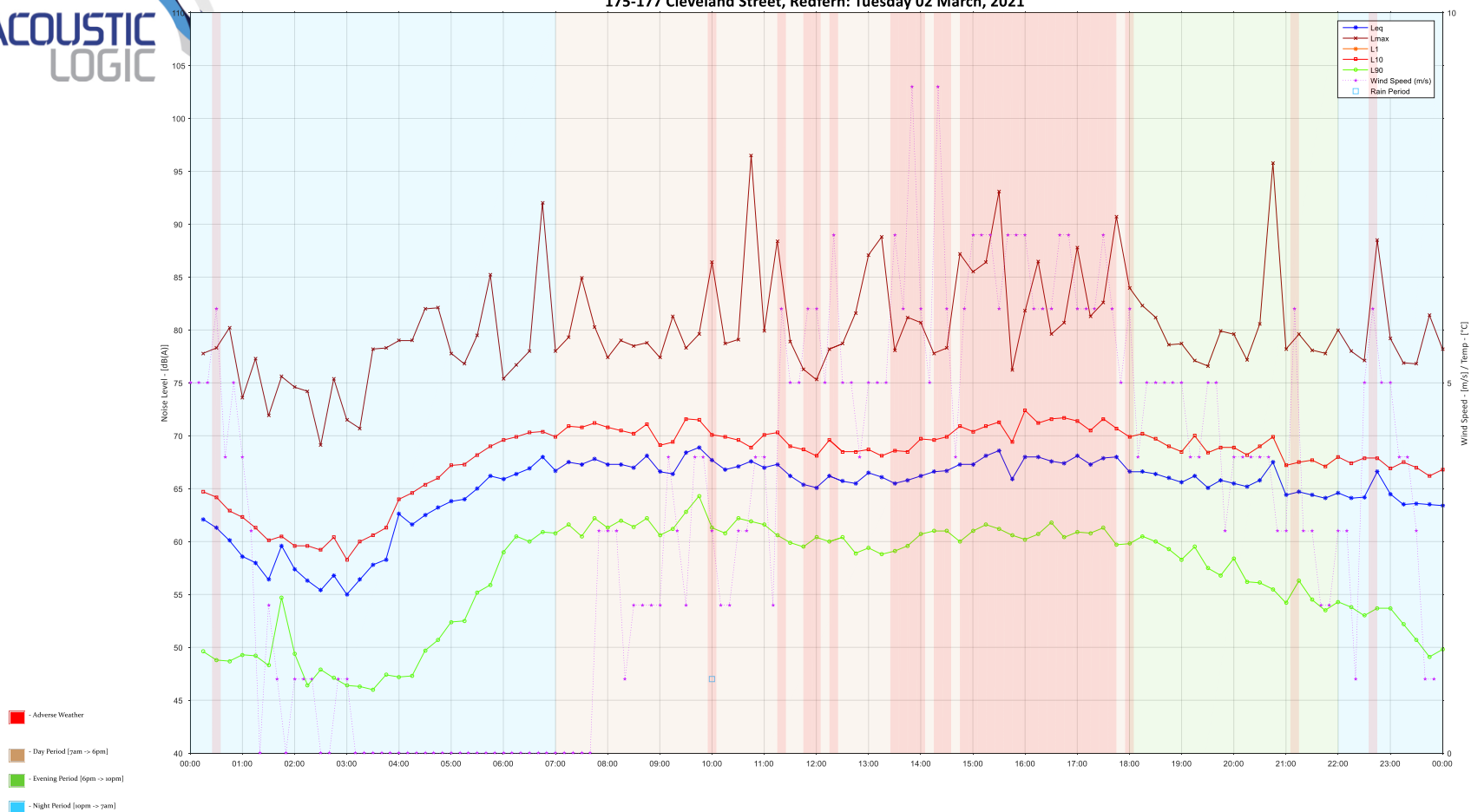
175-177 Cleveland Street, Redfern: Sunday 28 February, 2021



175-177 Cleveland Street, Redfern: Monday 01 March, 2021



175-177 Cleveland Street, Redfern: Tuesday 02 March, 2021



175-177 Cleveland Street, Redfern: Wednesday 03 March, 2021

