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1 INTRODUCTION

This report presents an analysis of the acoustic impacts associated with the proposed residential development at 134-144 Pitt Street, Redfern.

In this report we will:

- Conduct an external noise impact assessment (primarily traffic) and recommend acoustic treatments to ensure that a reasonable level of amenity is achieved for future tenants.
- Identify potential noise sources generated by the site, and determine noise emission goals for the development to meet Council acoustic requirements, ensuring that nearby developments are not adversely impacted by the subject development.

This assessment has been based on architectural drawings provided by Tony Owen Partners for detailed information please see table below.

Table 1 – Architectural Drawing List

Drawing Number	Drawing Title	Date	Revision
A091	UPPER BASEMENT PLAN	September 2016	A
A100	LOWER GROUND FLOOR PLAN		
A101	GROUND FLOOR PLAN		
A102	LEVEL 1 PLAN		
A103	LEVEL 2 PLAN		
A104	LEVEL 3 PLAN		
A105	LEVEL 4 PLAN		
A106	LEVEL 5 PLAN		
A110	ROOF PLAN		
A200	EAST ELEVATION		
A201	WEST ELEVATION		
A202	NORTH ELEVATION		
A203	SOUTH ELEVATION		
A204	NORTH & SOUTH ELEVATION		
A300	SECTION A & B		
A301	SECTION C & D		

2 SITE DESCRIPTION

The subject site is located on the corner of Pitt Street and Albert Street addressed as 134-144 Pitt Street, Redfern.

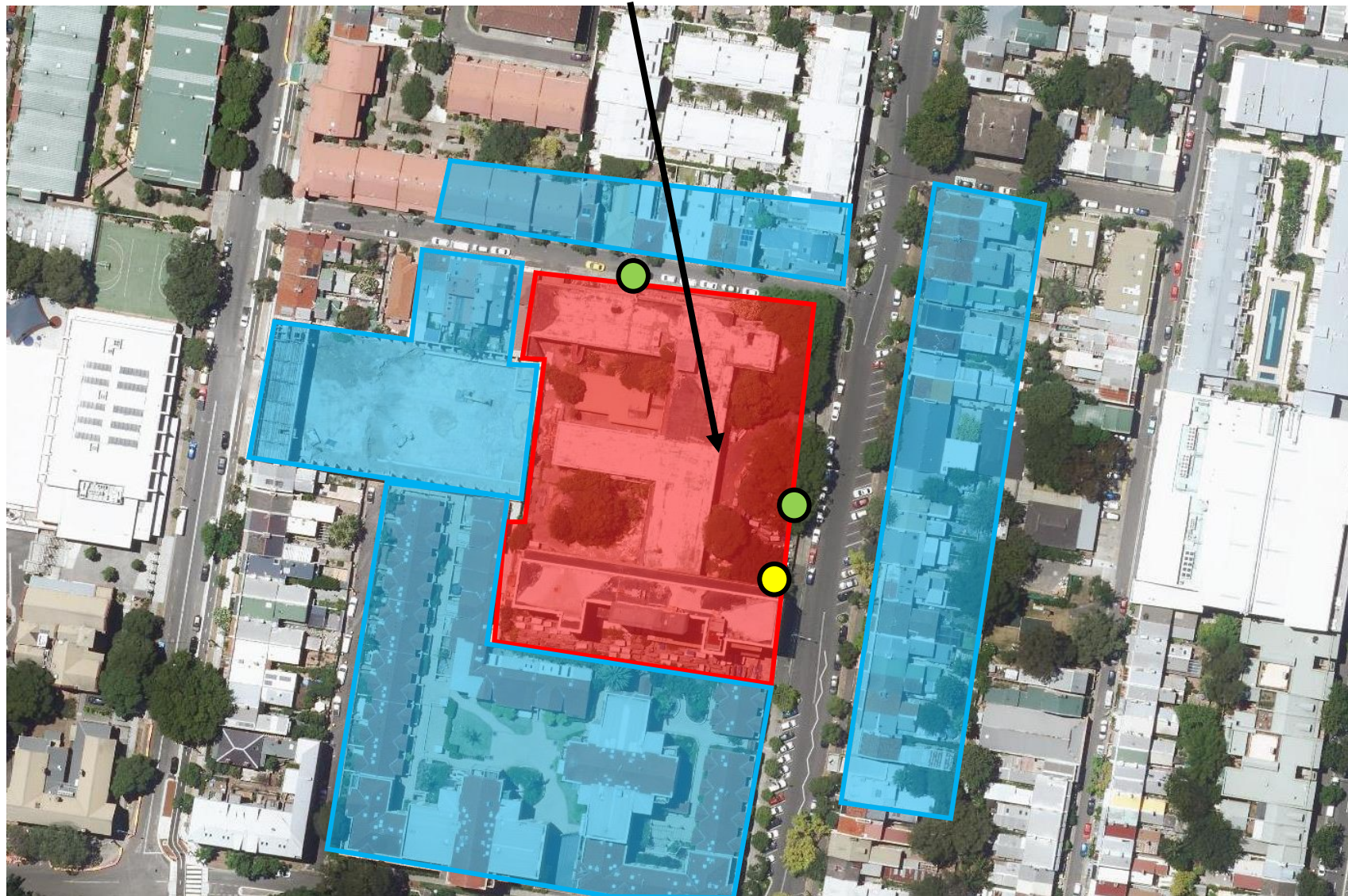
The proposed development application consists of an additional two storeys to the already Development Approved building to be located at 134-144 Pitt Street, Redfern.

The site is bounded as follows:

- To the north is Albert Street which carries a low volume of traffic, further this is residential developments.
- To the east is Pitt Street which carries a low to medium of traffic, further this is residential developments.
- To the south is existing residential developments.
- To the west is existing residential developments.

See aerial photo below.

Proposed Site



-  Unattended Noise Monitor
-  Attended Noise Measurement

Figure 1: Site Survey and Monitoring Positions
Sourced from SixMaps NSW

 Residential Receiver

3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10} , L_{90} and L_{eq} .

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

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 measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the L_{eq} parameter as a means of measuring traffic noise, whereas the L_{10} parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the L_{90} parameter is not used to assess traffic noise intrusion.

4 EXTERNAL NOISE INTRUSION

The predominant airborne noise source affecting the site is road traffic noise from Gibbons Street and to a lesser degree from Regent Street.

4.1 NOISE INTRUSION CRITERIA

External noise impact into the proposed development will be assessed in with reference to the City of Sydney council DCP.

4.1.1 Sydney Development Control Plan

Section 4.2 of the Sydney DCP 2012 relates to objectives and provisions for residential flat developments. Part 4.2.3.11 of this section of DCP 2012 outlines the following acoustic controls for new developments affected by traffic noise:

(7) The repeatable maximum $L_{Aeq(1hour)}$ for residential buildings and serviced apartments must not exceed the following levels:

(a) for closed windows and doors:

- i) 35dB for bedrooms (10pm-7am); and*
- ii) 45dB for main living areas (24 hours).*

(b) for open windows and doors:

- i) 45dB for bedrooms (10pm-7am); and*
- ii) 55dB for main living areas (24 hours).*

(8) Where natural ventilation of a room cannot be achieved, the repeatable maximum $L_{Aeq(1hour)}$ level in a dwelling when doors and windows are shut and air conditioning is operating must not exceed:

- (a) 38dB for bedrooms (10pm-7am); and*
- (b) 48dB for main living areas (24 hours).*

*Internal noise goals with windows closed.

4.2 TRAFFIC NOISE MEASUREMENTS

As part of this investigation, traffic noise from the surrounding roadways was measured. Traffic noise measurement locations are detailed above in section 3.

4.2.1 Attended Measurements

Measurements were taken using a Norsonic-118 precision sound level analyser, set to A-weighted fast response. The sound level meter was calibrated before and after the measurements using a RION NC73 precision sound calibrator and no significant drift was recorded. Measurements were taken 17th June 2016 between 4:30pm and 5:30pm (evening peak hour). There were no periods of adverse weather during the measurement.

4.2.2 Unattended Measurements

Unattended noise measurements were conducted 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 monitor was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator. No significant drift was detected. All measurements were taken on A-weighted fast response mode. The logger was on site from the 17th June 2016 to 24th June 2016. Refer to Appendix A for unattended noise monitoring and weather data. This monitor was used in order to determine the typical difference between daytime and night time noise levels at the site.

4.2.3 Resultant Noise Levels

The following table presents the resultant noise levels at the development. The noise levels are based on both the attended and unattended noise measurement results.

Table 2 - Measured Traffic Noise Levels

Locations	Traffic Noise Levels	
	Daytime (7am-10pm)	Night-time (10pm- 7am)
Northern Façade (3m from Albert Street)	59dB(A) $L_{eq}(1 \text{ Hour})$	54dB(A) $L_{eq}(1 \text{ Hour})$
Eastern Façade (Pitt Street)	61dB(A) $L_{eq}(1 \text{ Hour})$	56dB(A) $L_{eq}(1 \text{ Hour})$

4.3 RECOMMENDED TREATMENTS

The treatments set out in this section will ensure compliance with the noise objectives for external noise sources likely to impact the potential development.

Calculations take into account the size and orientation of windows, barrier effects (from terrace areas), facade transmission losses and room sound absorption characteristics.

4.3.1 Recommended Glazing

The recommended glazing assemblies are presented below. In all cases, the selected glazing type reduces internal noise levels to within the nominated criterion for the various space types.

Treatments are indicative, and are to be finalised after final design of window sizes and room layouts.

Table 3 – Recommended Glazing Constructions

Façade	Room Type	Recommended Construction	Acoustic Seals
Northern	Sleeping Area	6.38mm Laminate	Yes
	Living Area	6mm Float	
	Bathroom/Ensuite	4mm Float	
Eastern	Sleeping Area	6.38mm Laminate	
	Living Area	6mm Float	
	Bathroom/Ensuite	4mm Float	
Southern/Western	Sleeping Area	6.38mm Laminate	
	Living Area	6mm Float	
	Bathroom/Ensuite	4mm Float	
Roof – Skylights	All	4mm Float	

In addition to meeting the minimum glazing thickness requirements given, the design of the window mullions, perimeter seals and the installation of the windows/doors in the building openings shall not reduce the STC rating of the glazing assembly below the values nominated in the table above. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. **Note that mohair of fin type seals will not be acceptable for the windows requiring acoustic seals.**

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum listed STC requirements. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

Table 4 - Minimum STC or R_w of Glazing (with Acoustic Seals)

Glazing Assembly	Minimum R_w of Installed Window (with acoustic seals)
4mm Float	27
6mm Float	29
6.38mm Laminated	31

4.3.2 External Roof/Ceiling

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

4.3.3 External Walls

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

4.3.4 Entry Doors

Entry doors will be via internal corridors and as such constructions will be formulated pursuant to the Building Code of Australia.

4.3.5 Mechanical Ventilation

With respect to natural ventilation of the dwelling, the NSW Department of Planning document "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 (ie – allowable level in bedrooms becomes 45dB(A), and 50dB(A) in living rooms).

All habitable spaces on all facades do not require windows to be shut in order to achieve internal noise requirements.

5 NOISE EMISSION ASSESSMENT

Noise emissions from the site should be assessed to ensure that the amenity of nearby land users is not adversely affected.

The primary potential noise sources from the site will be noise generated by mechanical plant and from use of activity/lounge areas.

The nearest potentially affected noise receivers are to the north, east, south and west of the site (either directly adjacent to the site or on the opposite side of Pitt Street or Albert Street).

Noise emissions noise will be assessed to the following criteria:

- City of Sydney Standard Conditions (for typical operational noise).
- The NSW EPA Industrial Noise Policy (for mechanical plant).

5.1 EXTERNAL BACKGROUND NOISE MEASUREMENTS

Background noise levels at the site have been measured based on the unattended noise logging undertaken by this office. Measured background noise levels are presented below. Refer to Appendix 1 for unattended noise monitoring data.

The measured background noise levels have been analysed for meteorological conditions (excessive wind and/or rain), as required by Section 3.4 of the EPA Industrial Noise Policy. Exceedances of the 5m/s average wind speed limit of the EPA were noted and corrected for in determining the background noise levels. These areas are also highlighted in the logging data in Appendix 1.

The noise levels for William Lane are based on the manned background noise measurement results adjusted by the difference with the long term noise monitor results of similar time periods.

Table 5 - Measured Background Noise Levels

Location	Background noise level dB(A) _{L90}		
	Daytime (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7 am)
134-144 Pitt Street, Redfern	51	48	38

A background noise measurement was also conducted on site during the night time period (10pm) on 17 June, 2016 to measure an ambient noise spectrum, which is presented below.

Table 6 – Measured Background Noise Spectrum

	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
134-144 Pitt Street, Redfern	46	46	43	41	37	34	29	22	16	39

5.2 NOISE EMISSION OBJECTIVES

Acoustic criteria typically adopted by the City of Sydney Council require that:

- Noise emissions (plant noise), comply with the noise emission requirements of the EPA Industrial Noise Policy.
- Noise emissions (noise generally other than plant noise) not exceed background noise levels by more than 3dB when measured in octave bands between 31.5Hz and 8,000Hz.

These requirements are outlined below.

5.2.1 Mechanical Plant Noise (EPA Industrial Noise Policy)

Noise sources covered by this code will be mechanical services noise. Both the Intrusiveness and the Amenity criteria (as set out below) must be complied with.

5.2.1.1 INP - Intrusiveness Assessment

Intrusiveness criteria permit noise generation to be no more than 5dB(A) above existing background noise levels.

Table 7 – Intrusiveness Assessment

Location	Time of Day	Background noise Level – dB(A) _{L90}	Intrusiveness Noise Objective dB(A) _{Leq(15min)} (Background + 5dB)
134-144 Pitt Street, Redfern	Day Time (7am - 6pm)	51	56
	Evening (6pm - 10pm)	48	53
	Night (10pm - 7am)	38	43

5.2.1.2 INP - Amenity Assessment

The Amenity criteria set additional criteria based on the land use of the noise sensitive receivers.

Amenity criteria are as follows:

Table 8 – Amenity Criteria

Receiver Location	Land Type	Time of Day	Amenity Noise Objective dB(A) _{Leq(Period)}
All Potentially Affected Residential Properties	Suburban	Day Time (7am – 6pm)	60
		Evening (6pm – 10pm)	50
		Night (10pm-7am)	45

5.2.2 Noise Generally (City of Sydney “Background + 3dB” requirement)

Based on the measured background noise levels and spectrums set out in section 6.1, the corresponding noise emission goals are as follows:

Table 9 – Noise Emission Goals

Time of Day	Criteria	31Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-Wt.
Day (7am-6pm)	51BG+3	51	51	48	46	42	39	34	27	21	54
Evening (6pm-10pm)	48BG+3	58	58	55	53	49	46	41	34	28	51
Night (10pm-7am)	38BG+3	48	48	45	43	39	36	31	24	18	41

5.3 NOISE EMISSION ASSESSMENT

5.3.1 Noise Emissions from External Mechanical Plant

Mechanical plant items are not typically selected at selected at DA stage.

Detailed review of these condensers and all other external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the levels set out in this section of this report.

All plant can be satisfactorily attenuated to levels complying with noise emission criteria through appropriate location and (if necessary) standard acoustic treatments such as noise screens, enclosures, in-duct treatments (silencers/lined ducting) or similar.

6 CONCLUSION

This report presents the results from the acoustic assessment of noise impacts associated with the proposed residential development at 134-144 Pitt Street, Redfern.

Noise intrusion from traffic from surrounding roadways will comply with the Sydney City Council noise criteria provided the acoustic treatments detailed in Section 4 are adopted.

External noise emission criteria have been determined in Section 6 of this report based on the requirements of NSW EPA and Sydney City Council. Recommendations are presented in section 6.4.

Please contact us should you have any further queries.

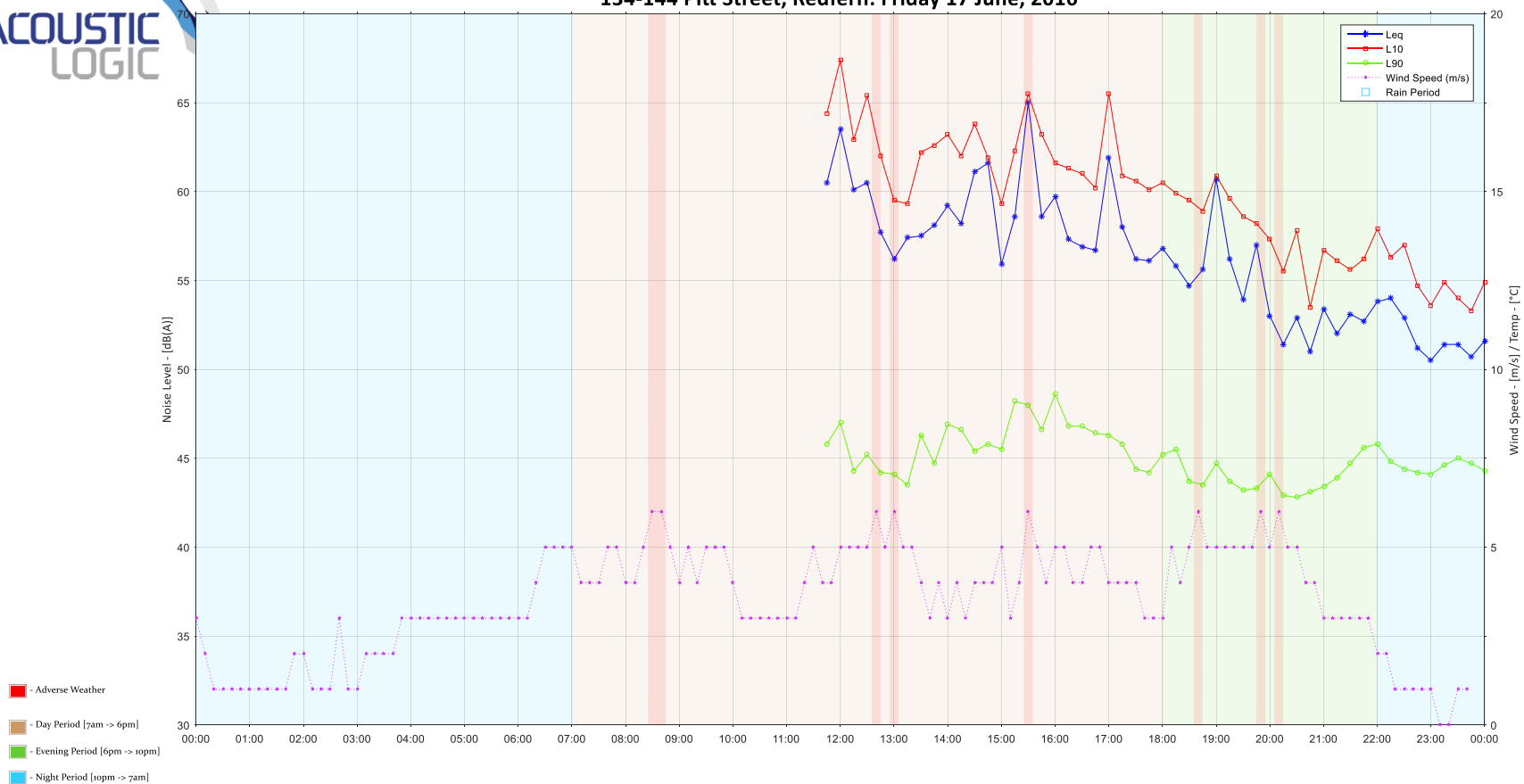
Yours faithfully,

A handwritten signature in black ink, appearing to read 'M Furlong', with a large, sweeping loop at the end.

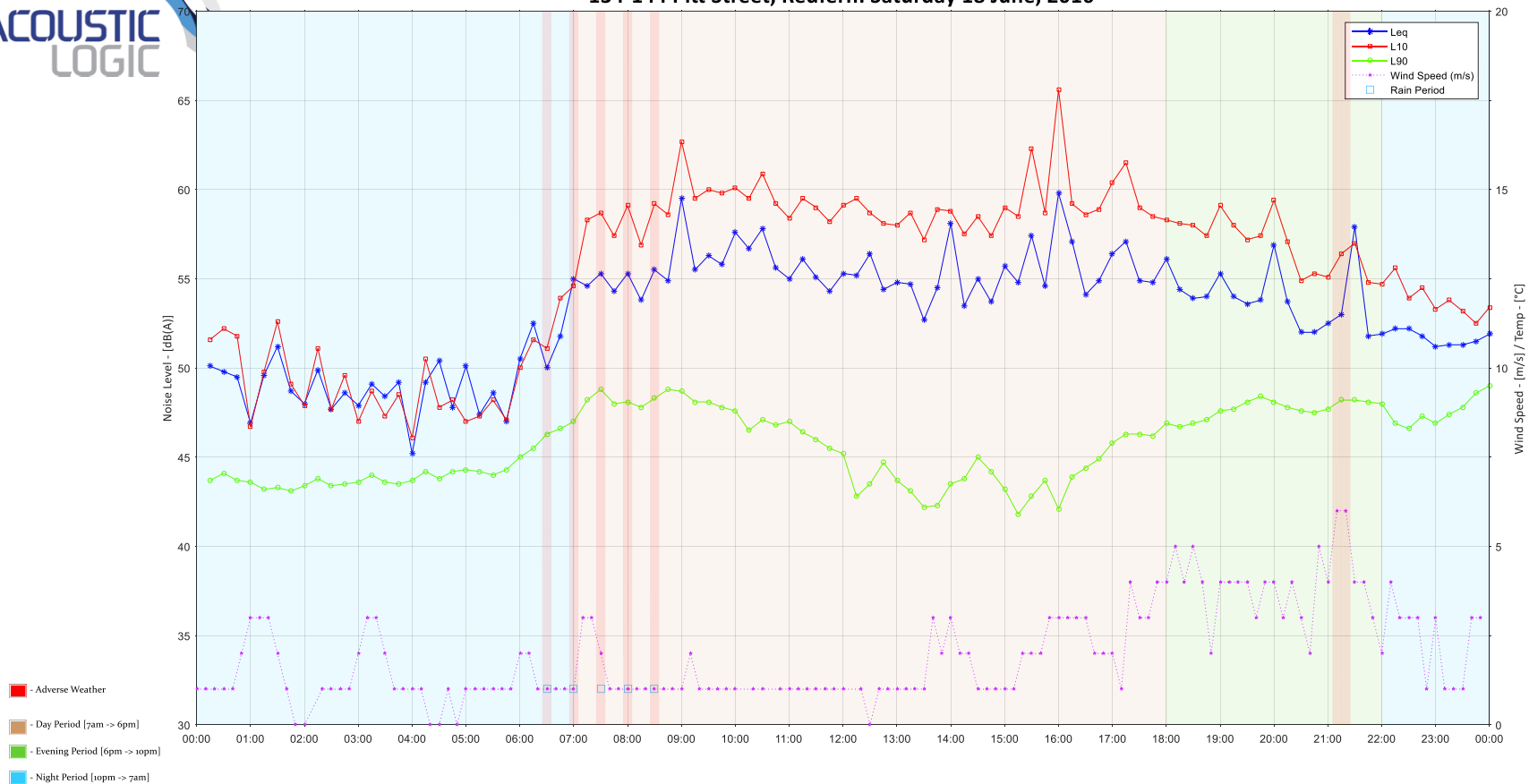
Matthew Furlong
Acoustic Logic Consultancy

APPENDIX A – UNATTENDED NOISE MONITOR DATA

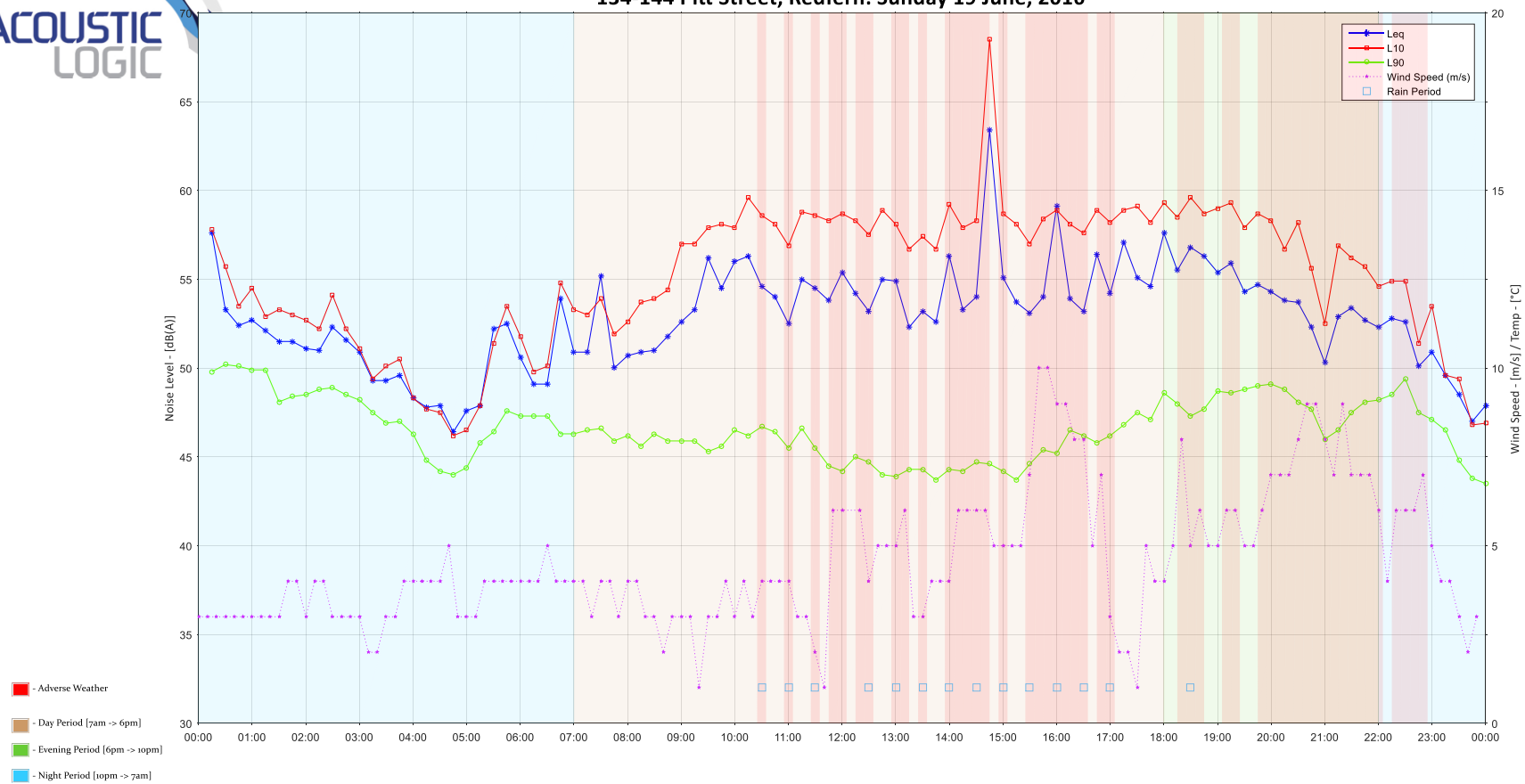
134-144 Pitt Street, Redfern: Friday 17 June, 2016



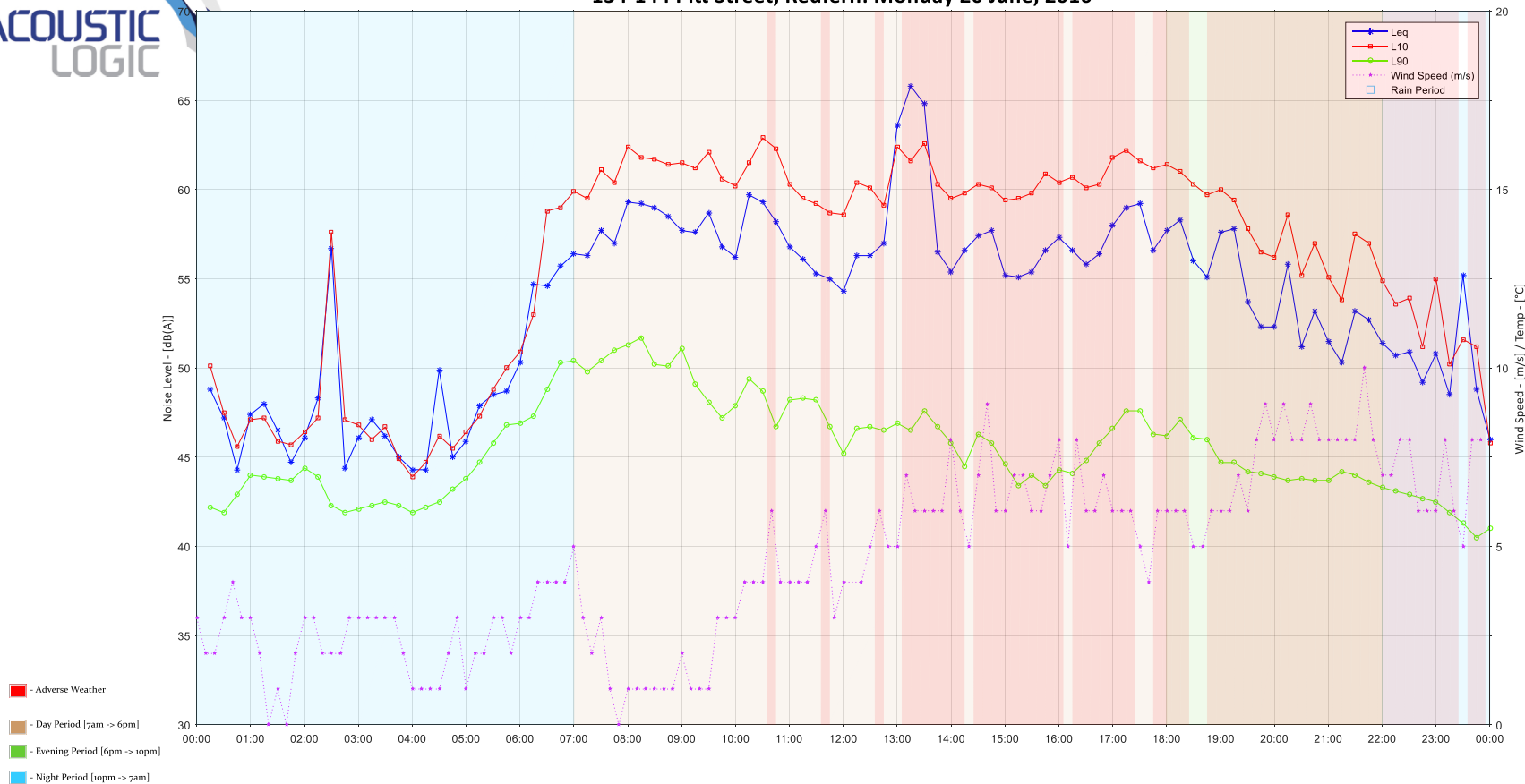
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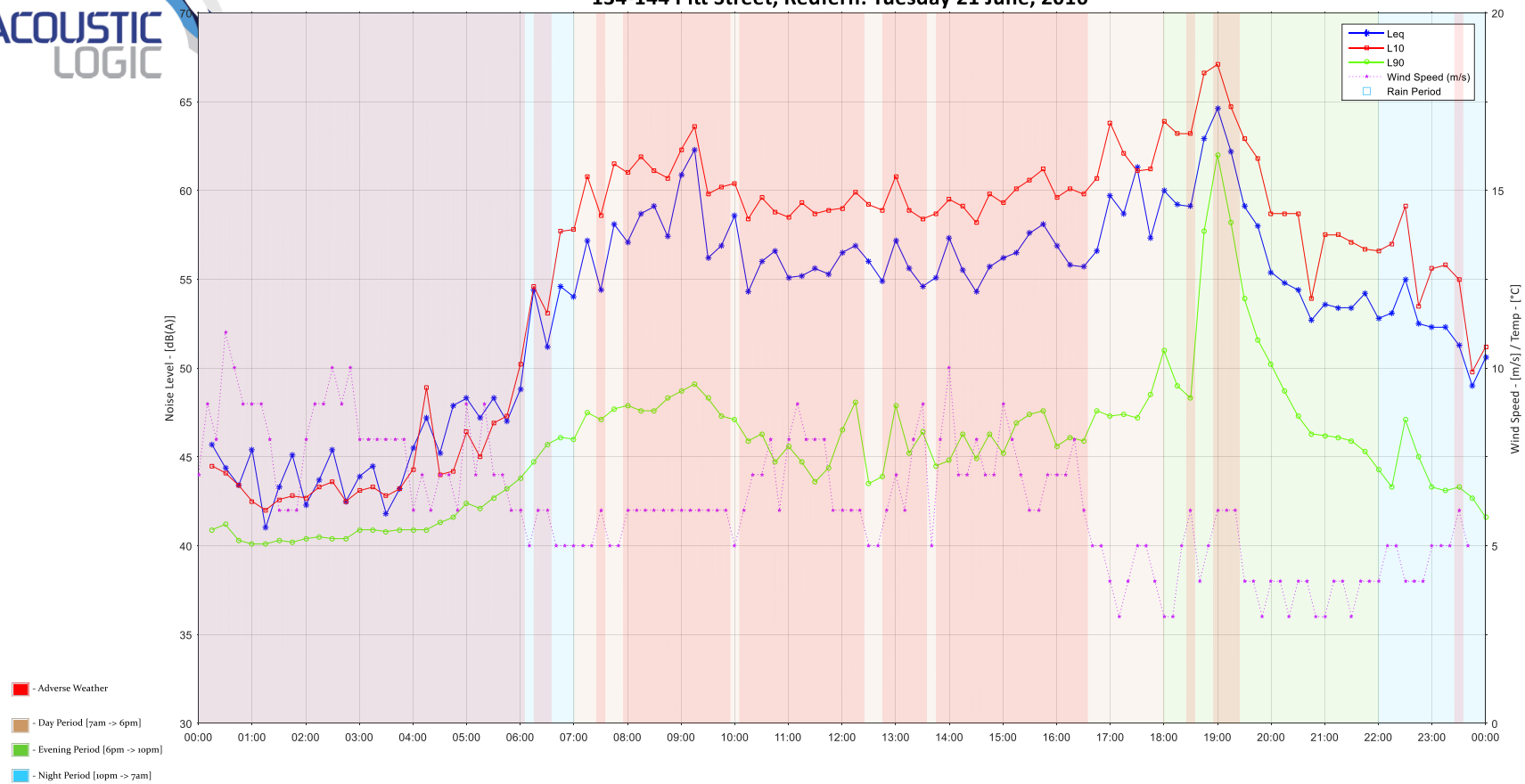
134-144 Pitt Street, Redfern: Sunday 19 June, 2016



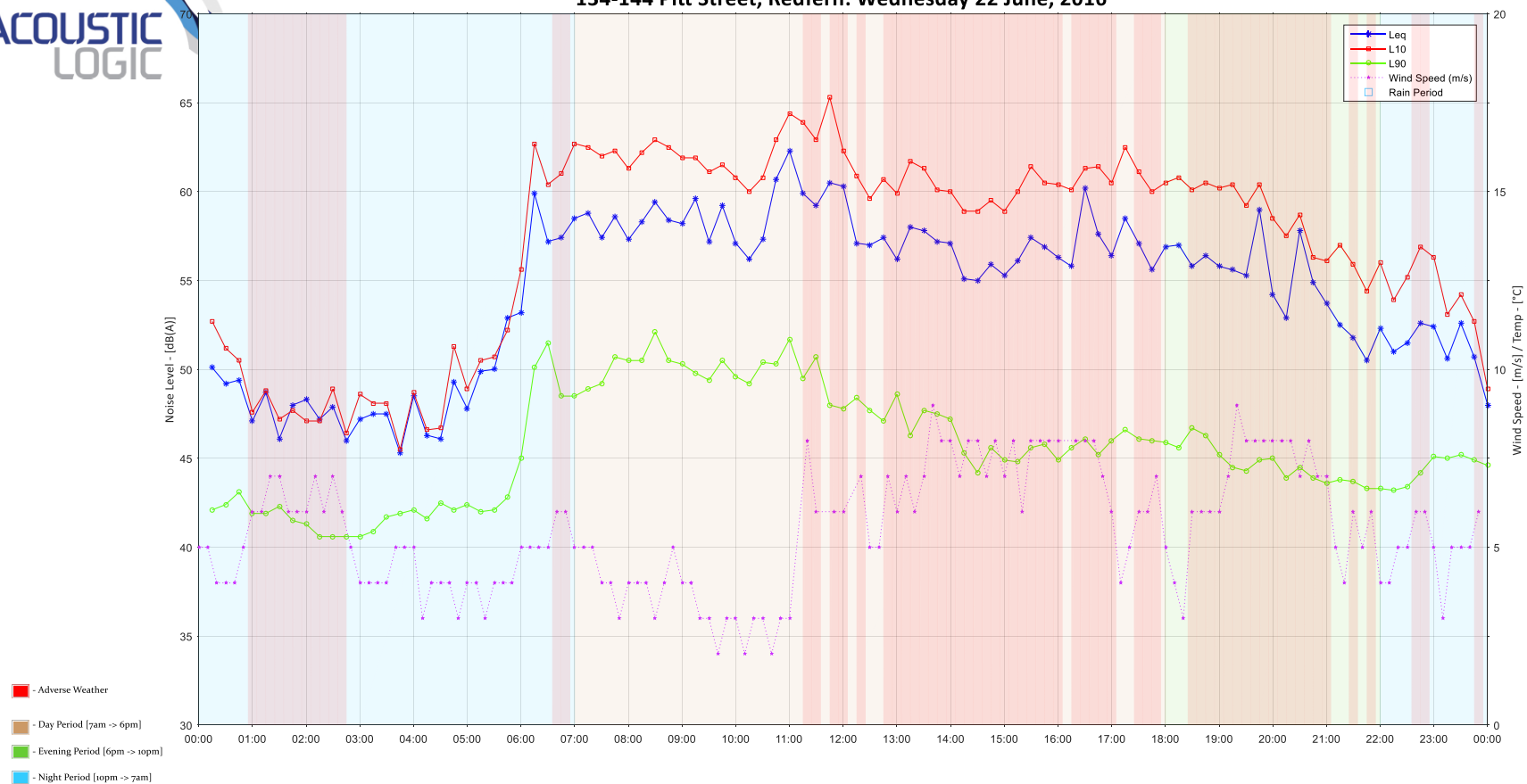
134-144 Pitt Street, Redfern: Monday 20 June, 2016



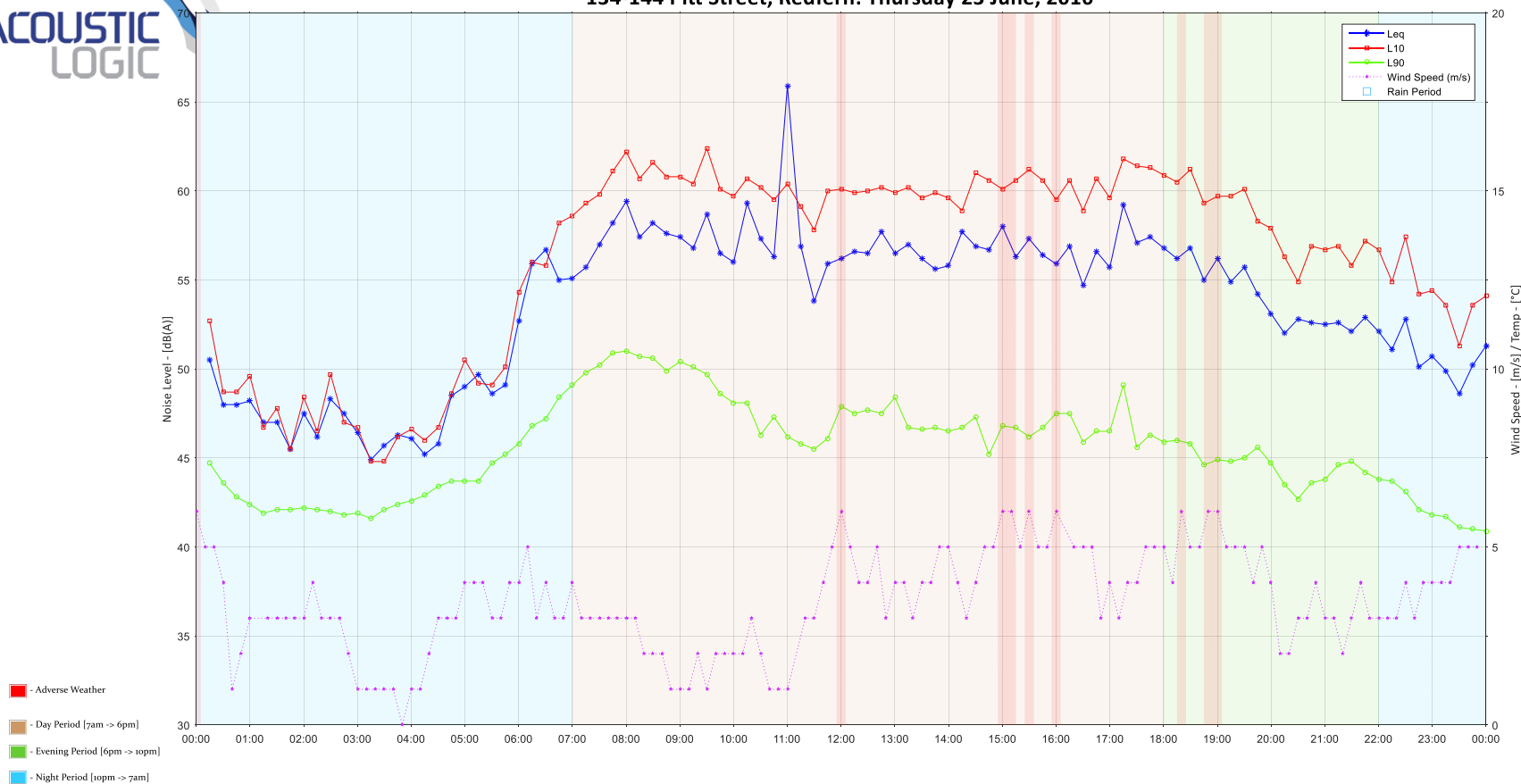
134-144 Pitt Street, Redfern: Tuesday 21 June, 2016



134-144 Pitt Street, Redfern: Wednesday 22 June, 2016



134-144 Pitt Street, Redfern: Thursday 23 June, 2016



134-144 Pitt Street, Redfern: Friday 24 June, 2016

