



DA ACOUSTIC REPORT

Arthur Street (51), Forestville

ID: 11863 R01v1

30 September 2020

Prepared For:

Lloyd Ramsay

Ramsay Architects

60 Gibbes Street,
Chatswood NSW 2067

Email: lloyd@ramsayarchitects.com.au

DOCUMENT INFORMATION

Author: Sri Harsha Eati

Checked By: Raguldeep Premraj Kumar



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Date	Version	To	Email
31/08/2020	A DRAFT	Lloyd Ramsay	lloyd@ramsayarchitects.com.au
30/09/2020	1	Lloyd Ramsay	lloyd@ramsayarchitects.com.au

Prepared By:

PJ Knowland Pty. Ltd.

t/a PKA Acoustic Consulting

PO Box 345, Lane Cove NSW 1595

ABN 87 256 407 546, ACN 621 896 204

T (02) 9460 6824 · E admin@pka.com.au



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This firm is a member of the Association of Australian Acoustical Consultants.

The work reported herein has been carried out in accordance with the terms of membership. We stress that the advice given herein is for acoustic purposes only, and that the relevant authorities should be consulted with regard to compliance with regulations governing areas other than acoustics.

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1.0 INTRODUCTION

PKA Acoustic Consulting has been commissioned by Ramsay Architects to perform an acoustic assessment pertaining to the proposed mixed-use development located at 51 Arthur Street, Forestville and its impact upon the surrounding residential environment.

This report is part of the DA documentation as Northern Beaches Council requires an acoustic report to assess the environmental noise impact and to provide recommendations if required to comply with their criteria.

2.0 SUMMARY

An acoustic assessment has been conducted in accordance with the acoustic requirements of Northern Beaches Council and the NSW Noise Policy for Industry to assess acoustic compliance of the proposed mixed-use premises.

Unattended noise measurements were conducted on site to obtain the existing background noise levels. Noise goals were established for noise breakout from the use of the proposed mixed-use development to other surrounding sensitive receivers.

Based on the survey conducted and calculations performed by PKA, the proposed development will comply with the Noise Policy for Industry (2017) and Northern Beaches Council if the recommendations made in Section 7.0 are implemented.

3.0 SITE DESCRIPTION

The proposed mixed-use development is to be of multi-storey containing ground level commercial spaces and residential apartments on the upper floor. The site is bound by other residential premises on all sides which are the most sensitive acoustic receivers of the noise impact from the proposed development. The site location is shown in Figure 3-1.

Figure 3-1 Site Location



4.0 NOISE CRITERIA

4.1 NSW EPA Noise Policy for Industry (NPfI)

Noise generated from a premise is generally assessed against the requirements of the *NSW EPA Noise Policy for Industry 2017 (NPfI)*. The policy sets out two separate criteria to ensure environmental noise objectives are met. The first criterion considers intrusive noise to residential properties and the second is set to ensure the amenity of the land use is protected. The lower value of both criteria is considered to be the Project noise trigger level, which is the limit of the $L_{Aeq, 15min}$ noise level that must not be exceeded for the corresponding period of the day.

Amenity Criterion

To limit continuing increases in noise levels, the maximum ambient noise level within an area from commercial noise sources should not normally exceed the levels as specified in Table 2.2 of the policy for the specified time of the day. The NPfI recommends the following Amenity Noise Levels for various receiver premises.

Table 4-1 Noise Criteria - Amenity for Receiver Buildings

Type of receiver	Time of day	Recommended Amenity Noise Level $L_{Aeq, (period)}$
Residential (Suburban)	Day	55 dB(A)
	Evening	45 dB(A)
	Night	40 dB(A)

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level for development = recommended amenity noise level minus 5 dB(A) .
--

To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the Amenity $L_{Aeq, 15min}$ will be taken to be equal to the $L_{Aeq, period} + 3 \text{ decibels (dB)}$.

Intrusiveness Criterion

The intrusiveness of a stationary noise source may be considered acceptable if the average of the maximum A-weighted levels of noise, $L_{Aeq, 15 \text{ minute}}$ from the source do not exceed by more than 5dB the Rating Background Level (RBL) measured in the absence of the source. This applies during all times of the day and night. There also exists an adjustment factor to be applied as per the character of the noise source. This includes factors such as tonal, fluctuating, low frequency, impulsive, intermittent etc. qualities of noise. The RBL is determined in accordance with Section 2.3 of the NSW EPA NPfI. The intrusiveness criterion is $L_{Aeq, 15 \text{ minute}} < RBL + 5$.

4.2 BCA Sound Insulation Requirements for Class 2 Buildings

The BCA 2016, in Volume 1 Section F5 “Sound Transmission and Insulation” states that walls and floors separating places of occupancy “*must provide insulation against the transmission of airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants*”. The following summarises the BCA sound insulation requirements, brevity necessitates detail in the BCA taking precedence over the tables below.

Table 4-2 Walls – Deemed-to-Satisfy Provisions

Wall Description		BCA Reference	Airborne	Impact
Separating sole-occupancy units (SOUs) habitable areas		F5.5(a)(i)	$R_w + C_{tr} \geq 50$	
Separating SOUs wet to habitable areas		F5.5(a)(i) F5.5(a)(iii)	$R_w + C_{tr} \geq 50$	Discontinuous Construction
Separating SOUs with corridor, stairway, lobby or different classification		F5.5(a)(ii)	$R_w \geq 50$	
Separating SOUs with plantroom or lift shaft		F5.5(a)(ii) F5.5(a)(iii)	$R_w \geq 50$	Discontinuous Construction
Separating SOU habitable area with services from another SOU		F5.6(a)(i)	$R_w + C_{tr} \geq 40$	
Separating SOU wet area with services from another SOU		F5.6(a)(ii)	$R_w + C_{tr} \geq 25$	
Doors separating SOU with corridor, stairway, lobby		F5.5(b)	$R_w \geq 30$	
Wall Type	Reference	Discontinuous Construction Requirement		
Masonry	F5.3(c)(i)	Wall having a minimum 20mm cavity between the 2 separate leaves, with resilient wall ties if necessary		
Other than masonry	F5.3(c)(ii)	Wall having a minimum 20mm cavity with no mechanical linkage except at the periphery		

Table 4-3 Floors – Deemed-to-Satisfy Provisions

Floor Description	BCA Reference	Airborne	Impact
Separating sole-occupancy units (SOUs)	F5.4(a)(i)	$R_w + C_{tr} \geq 50$	$L_{n,w} \leq 62$
Separating SOUs with plantroom, lift shaft, corridor, stairway, lobby or different classification	F5.4(a)(ii)	$R_w + C_{tr} \geq 50$	$L_{n,w} \leq 62$
Separating SOU habitable area with services from another SOU	F5.6(a)(i)	$R_w + C_{tr} \geq 40$	
Separating SOU wet area with services from another SOU	F5.6(a)(ii)	$R_w + C_{tr} \geq 25$	

Table 4-4 Walls – Verification Methods

Wall Description	BCA Reference	Airborne
Separating sole-occupancy units (SOUs)	FV5.2(a)	$D_{nT,w} + C_{tr} \geq 45$
Separating SOUs with plantroom, lift shaft, corridor, stairway, lobby or different classification	FV5.2(b)	$D_{nT,w} \geq 45$
Doors separating SOUs with corridor, stairway, lobby	FV5.2(c)	$D_{nT,w} \geq 25$

Table 4-5 Floors – Verification Methods

Floor Description	BCA Reference	Airborne	Impact
Separating sole-occupancy units (SOUs)	FV5.1(a) FV5.1(b)	$D_{nT,w} + C_{tr} \geq 45$	$L_{nT,w} \leq 62$

Other BCA Acoustic Issues

The builder must also ensure that the project complies with following BCA acoustic requirements:

Chasing of Masonry Elements

The BCA specifically precludes chasing of services into concrete or masonry elements. (Clause 2. (e)(i)).

Fixing of Water Supply Pipework

Note Clause 2. (iii) (A) and (B).

A water supply pipe must:

- (A) Only be installed in the cavity of discontinuous construction; and
 - (B) In the case of a pipe that serves only one sole occupancy unit, not be fixed to the wall leaf.
 - (C) on the side adjoining any other sole-occupancy unit and have a clearance not less than 10mm to the other wall leaf.
- (i.e. the cavity must not be bridged by any pipework)

Electrical Outlets

The BCA requires that any electrical outlets must be offset from each other:

- (A) in masonry walling, not less than 100mm; and
- (B) in timber or steel framed walling, not less than 300mm

Ducts

Ducts serving or passing through more than one SOU per F5.6(a) must be separated from another SOU by masonry or plasterboard construction having a minimum $R_w + C_{tr}$ of 40 for habitable rooms and $R_w + C_{tr}$ of 25 for non-habitable rooms.

4.3 EPA NSW Interim Construction Noise Guidelines (ICNG)

Based on the above council conditions, the NSW EPA *Interim Construction Noise Guideline* (ICNG) is being used in performing this assessment.

The document aims at managing noise from construction works regulated by the EPA. Details of noise limits are presented in the following Table 4-6.

Table 4-6: Noise Levels Residential Receivers (Extract from EPA ICNG)

Time of day	Management level L_{Aeq} (15 min)	Application
Recommended standard hours: Monday to Friday 7 am to 6 pm	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Saturday 8 am to 1 pm No work on Sundays or public holidays	Highly noise affected 75 dB	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

4.4 General Vibration Criteria

During demolition and excavation there is the potential for vibration impact on the neighbouring buildings' amenity and on structures. The EPA ICNG states that human comfort (amenity) vibration is to be measured and assessed in accordance with *Assessing Vibration – a technical guideline* (DECC 2006).

In general, structural damage due to vibration can be of concern when hammering, blasting, vibration rolling, crushing, piling and other vibration inducing construction works are carried out.

The EPA ICNG does not have specific structural vibration damage criteria however the RTA *Environmental Noise Management Manual* (2001) recommends the use of the following Standards:

- British Standard BS 7385: Part 2: *Evaluation and Measurement for Vibrations in Buildings – Part 2 Guide to Damage Levels from Ground-Borne Vibration*
- AS 2187.2 *Explosives-Storage, transport and use, Part 2: Use of Explosives*
- German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures.

5.0 NOISE SURVEY AND PROJECT NOISE GOALS

Unattended noise monitoring was conducted on site between the 17th and 24th August 2020 to record the existing background noise levels. The noise monitor was programmed to store the L_n percentile noise levels for each 15-minute sampling period. Measurements were made of L_{min} , L_{max} , L_{90} , and L_{eq} and were later retrieved for analysis.

The position of the noise monitor is shown in Figure 3-1. The results and summary of the noise monitoring are listed in graphical form in Appendix B of this report.

5.1 Instrumentation

Noise measurements were conducted using the following equipment:

- Sound Analyser NTI XL2 Type Approved, Serial number A2A-15268-E0.
- Larson Davis Calibrator CAL200, Serial number 11419.

The instruments were calibrated before and after the noise measurements and there were no adverse deviations between the two. The analysers are type 1 and comply with AS IEC 61672.2-2004. The instruments carry traceable calibration certificates.

5.2 Project Noise Criteria

Data from the noise monitors were processed to obtain the ambient levels and the noise goals.

5.2.1 Ambient Noise Measurements and Noise Breakout Goals

Table 5-1 below presents the ambient noise and NPfI criteria based on the measurement results of the ambient noise monitor deployed on site. The assessment periods are defined by the NSW NPfI as Daytime 7am to 6pm, Evening 6pm to 10pm and Night 10pm to 7am.

Table 5-1 Project Noise Trigger Levels at Residential Receiver Boundaries

All values in dB(A)

Receiver Type	Period	Measured RBL (L_{A90})	Acceptable Noise Levels $L_{Aeq(Period)}$	NSW Noise Policy for Industry Criteria		Project Noise Trigger Levels $L_{Aeq15min}$
				Amenity $L_{Aeq15min}$	Intrusiveness $L_{Aeq15min}$	
Residential (Sub-urban)	Day	43	55	53	48	48
	Evening	34*	50	48	40	40
	Night	28*	40	38	35	35

*The RBL has been considered based on the "A1.2 Definitions to support mythologies" section of the Noise Policy for Industry 2017, which states that "where this level (measured background noise) is found to be less than 30dB(A) for the evening and night periods, the rating background noise level is set to 30dB(A); and where it is found to be less than 35dB(A) for daytime period, it is set to 35dB(A)."

5.2.2 Construction Noise Goals

Table 5-2 below presents the values of ambient, background noise levels and the noise affected level (criterion). The following is assuming that the project management intends to do the construction during normal daytime working hours 7 am to 6 pm.

Table 5-2 Construction Noise Goals

Location	Period	Background RBL dB(A)	Noise affected level (Criterion), dB(A)
At residential boundary	Day	43	53

The “*Highly Noise Affected*” criterion has a set level of 75 dB(A).

6.0 ASSESSMENT

6.1 Noise from Traffic Activity and Parking – Commercial Premises

The $L_{Aeq\ 15\text{-minute}}$ value from carpark activity was calculated including activity of entry/exit of vehicles in and out of the car park, cars idling and then accelerating away. Typical time frames for events and their corresponding sound pressure levels were considered. The assumptions made for the events are listed in table below. The values are based on extensive measurements conducted by PKA.

Table 6-1 Time Frames and Typical Sound Pressure Levels – Carpark activity

Event Description	Sound Pressure Levels (10m)	Duration of each Event
Car Entering and driving into the car park	61 dB(A)	10 seconds
Cars stopping and parking	55 dB(A)	5 seconds
Door slams (assuming 2 per car)	56 dB(A)	1 second
Cars starting – Engine Activity	78 dB(A)	1 seconds
Cars driving out of the car park	61 dB(A)	10 seconds

Based on the commercial car park spots in the basement, PKA is assuming that 2 cars enter, and 2 cars leave every 15-minutes. This is unlikely as the spaces are meant to be used for the business owners and not customers but has been considered as a stringent criterion.

The results of the traffic noise impact from the proposed peak car park activity is shown below in Table 6-2. The calculations consider acoustic effects of distance loss and any potential shielding.

Table 6-2 Traffic Noise Impact from Car Park Operation

Calculated noise at sensitive receivers	Period of Day	Amenity Noise Criteria $L_{Aeq\ 15\text{min}}$	Complies?
$L_{eq\ 15\text{min}} < 45\text{ dB(A) at receiver}$	Day	48 dB(A)	Yes

6.2 Noise from Indoor Commercial Activity

PKA has been advised that the ground floor commercial spaces will be general neighbourhood shops or small office premises where no high noise activity is expected and therefore, standard external glazing and doors will be acoustically sufficient.

7.0 RECOMMENDATIONS

The following recommendations are required to ensure that acoustic compliance is achieved with the recommended acoustic criteria. The recommendations have been based on data provided to PKA for the preparation of this report and assumptions made in the calculations.

1. BCA requirements

All walls and floors must be designed to comply with the design requirements listed in Section 4.2 of this report.

2. Car Park Activity

We recommend the following management policies be in place:

- The car park drive in area and parking should be limited to 10km/hr for compliance to be maintained.
- Signage be displayed clearly to ensure people in the carpark are sensitive to their noise impact.

3. Outdoor Plant and equipment

PKA recommends the location of any future outdoor mechanical and plant equipment be positioned away from boundaries adjoining proposed residential receivers. Additionally, the equipment must be selected so that the rated sound power/pressure levels will comply at the boundary of the adjoining residences with the Project Trigger Levels listed in Table 5-1. This must be checked by a qualified acoustic consultant prior to installation. The selection of this equipment must be checked during the CC stage prior to the installation of the mechanical plant to ensure day, evening and night-time compliance.

4. Construction Noise and Vibration

The noise goals from Table 5-2 and vibration guidelines from Sections 4.3 and 4.4 can be used to assist in the preparation of the Construction Noise & Vibration Management Plan at the later approval stages of the development (usually required by council prior to the issue of a Construction Certificate).

APPENDIX A DRAWINGS USED TO PREPARE REPORT

This report was prepared using drawings provided by Ramsay Architects, Project Number A089.

No.	Rev.	Title	Date
A01	K	Cover Page	30/09/2020
A10	K	Basement Floor Plan	30/09/2020
A11	K	Ground Floor Plan	30/09/2020
A12	K	First Floor Plan	30/09/2020
A13	K	Second Floor Plan	30/09/2020
A14	K	North Elevation	30/09/2020
A15	K	South Elevation	30/09/2020
A16	K	East Elevation	30/09/2020
A17	K	West Elevation	30/09/2020
A18	K	Section Shop 2/ Unit 2	30/09/2020
A19	K	Section BB Apartment Internal	30/09/2020
A52	K	Material Board	30/09/2020
A53	K	Liveable Apartment	30/09/2020
A089	K	Perspective	30/09/2020

APPENDIX B NOISE MEASUREMENTS (GRAPHICAL)

11863 Arthur Street (51), Forestville

Project Address: 51 Arthur Street, Forestville

Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

		Background Noise Levels L _{A90} dB					
		Daytime 07:00 - 18:00		Evening 18:00 - 22:00		Nighttime 22:00 - 07:00	
		Measured	Corrected	Measured	Corrected	Measured	Corrected
Monday	17/08/2020					25.9	25.9
Tuesday	18/08/2020	40.5	40.5	34.3	34.3	25.9	25.9
Wednesday	19/08/2020	43.4	43.4	34.2	34.2	32.7	32.7
Thursday	20/08/2020	43.7	43.7	33.6	33.6	26.9	26.9
Friday	21/08/2020	43.1	43.1	32.1	32.1	28.2	28.2
Saturday	22/08/2020	43.7	43.7	35.3	35.3	33.1	33.1
Sunday	23/08/2020	41.3	41.3	34.7	34.7	27.7	27.7
Monday	24/08/2020						
Rating Background Level (RBL)		43	43	34	34	28	28

		Existing Noise Levels L _{Aeq} dB						Sunday or Public Holiday?
		Daytime 07:00 - 18:00		Evening 18:00 - 22:00		Nighttime 22:00 - 07:00		
		Measured	Corrected	Measured	Corrected	Measured	Corrected	
Monday	17/08/2020					47.6	47.6	Y
Tuesday	18/08/2020	54.7	54.7	51.4	51.4	48.1	48.1	
Wednesday	19/08/2020	55.5	55.5	53.4	53.4	48.0	48.0	
Thursday	20/08/2020	55.3	55.3	51.6	51.6	48.1	48.1	
Friday	21/08/2020	55.6	55.6	53.3	53.3	47.3	47.3	
Saturday	22/08/2020	55.9	55.9	53.4	53.4	47.8	47.8	
Sunday	23/08/2020	55.2	55.2	48.8	48.8	49.4	49.4	
Monday	24/08/2020							
Average Noise Level (L _{Aeq})		55	55	52	52	48	48	

11863 Arthur Street (51), Forestville

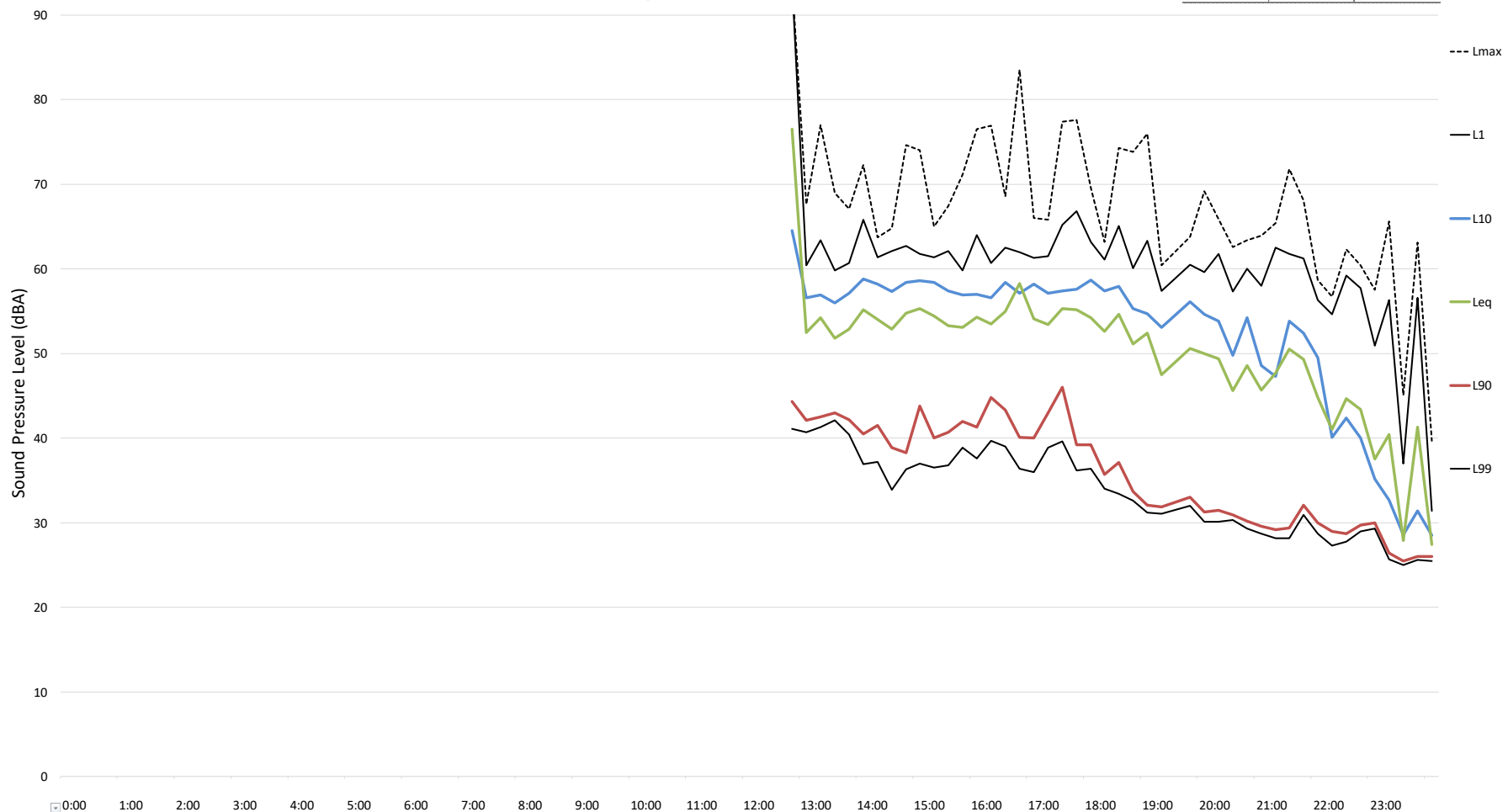
Project Address: 51 Arthur Street, Forestville

Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

17/08/2020  Monday
Existing Ambient Noise Levels (dBA)

Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB		47.6
L _{A90} dB		25.9



11863 Arthur Street (51), Forestville

Project Address: 51 Arthur Street, Forestville

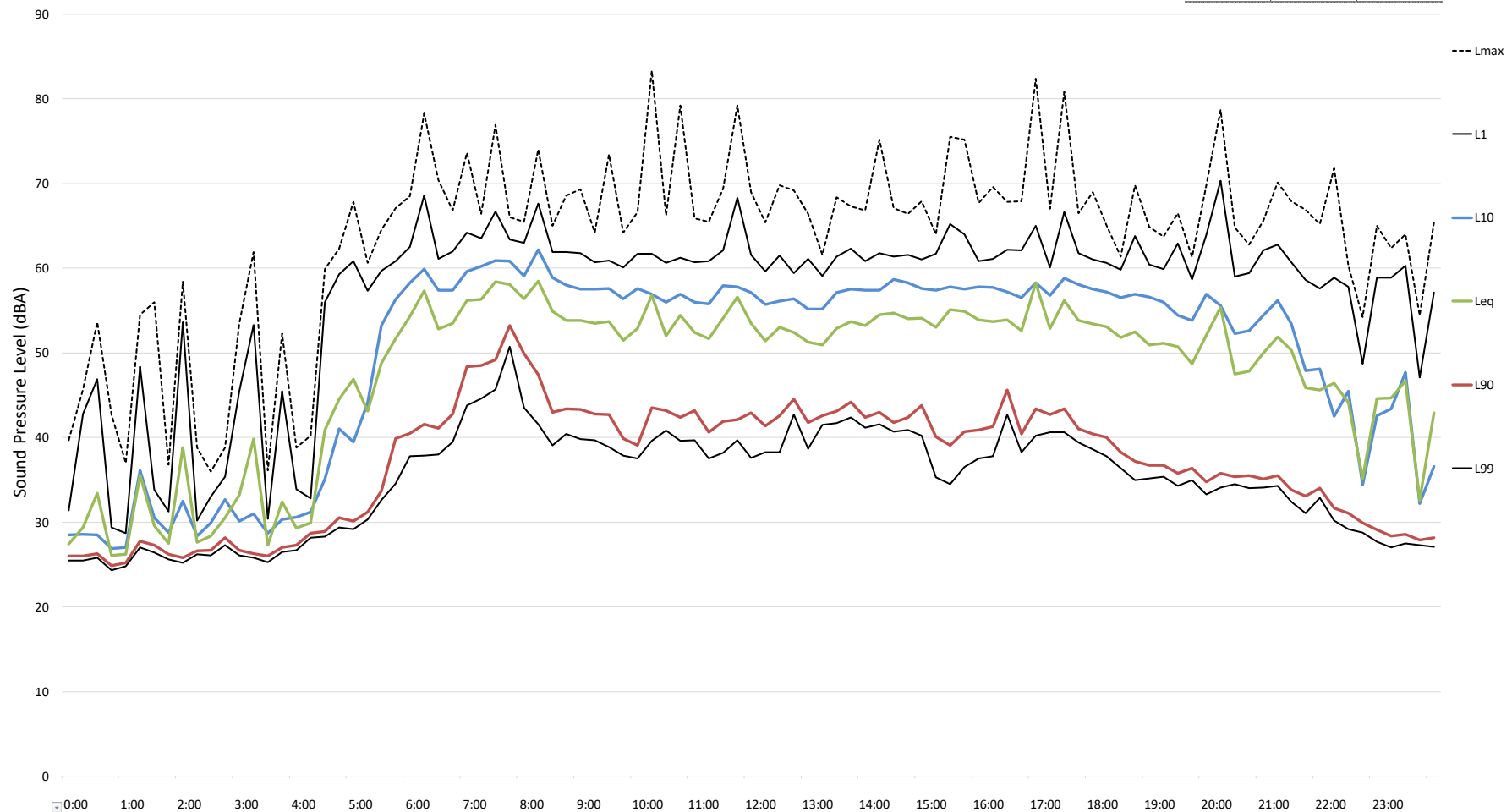
Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

18/08/2020 Tuesday

Existing Ambient Noise Levels (dBA)

Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB		47.6
L _{A90} dB		25.9



11863 Arthur Street (51), Forestville

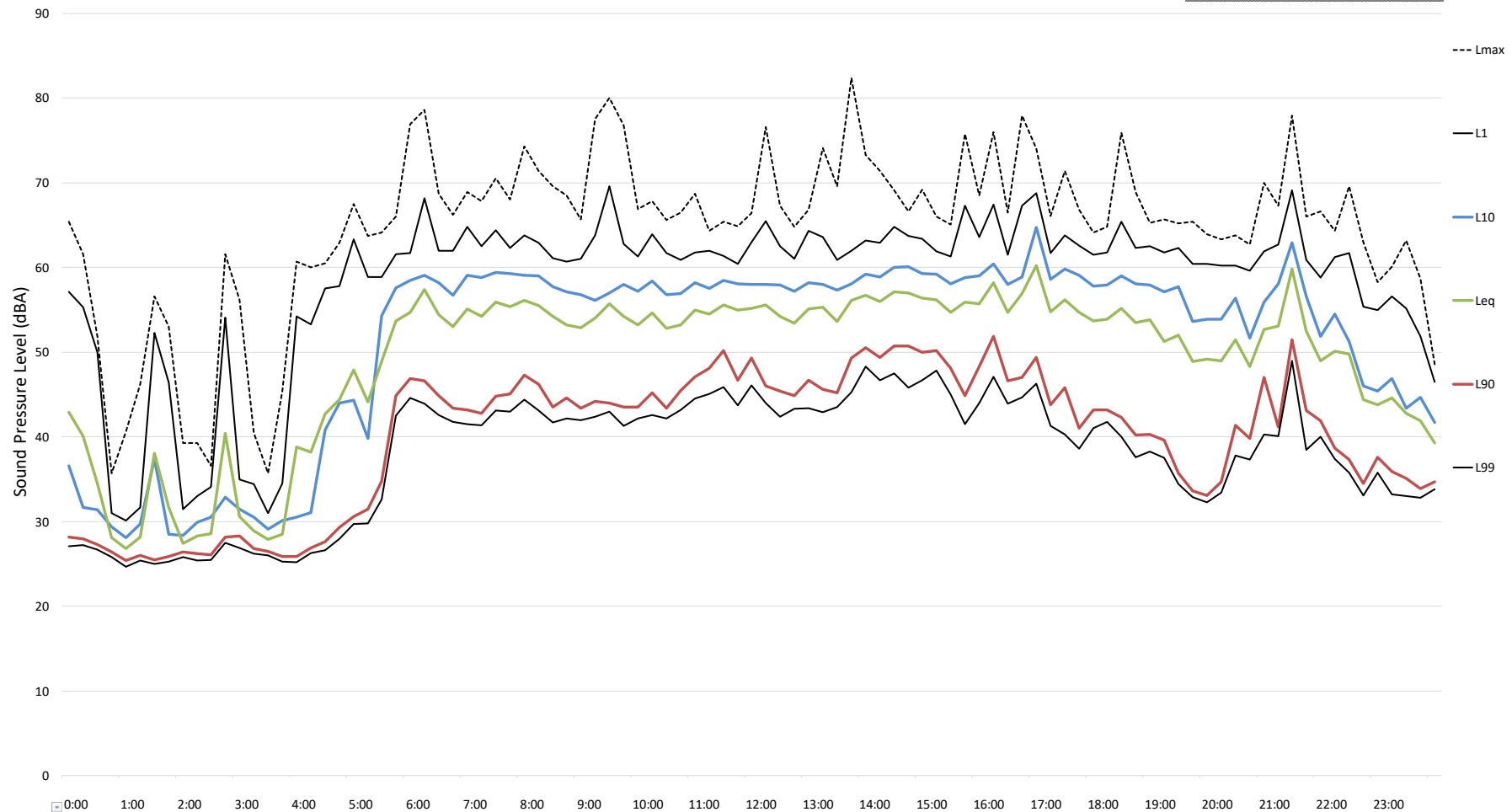
Project Address: 51 Arthur Street, Forestville

Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

19/08/2020 Wednesday
Existing Ambient Noise Levels (dBA)

Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB		47.6
L _{A90} dB		25.9



11863 Arthur Street (51), Forestville

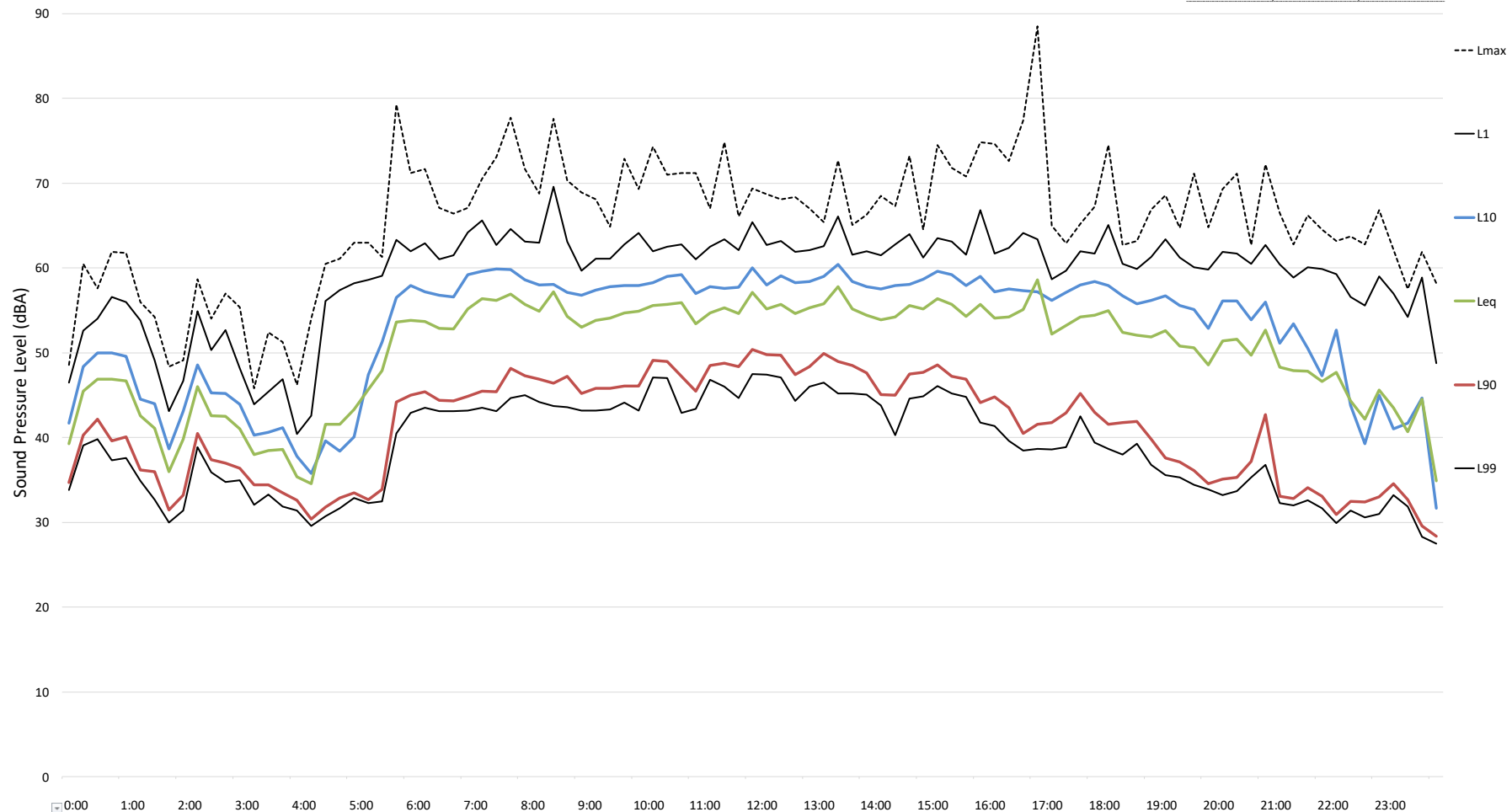
Project Address: 51 Arthur Street, Forestville

Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

20/08/2020 Thursday
Existing Ambient Noise Levels (dBA)

Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB		47.6
L _{A90} dB		25.9



11863 Arthur Street (51), Forestville

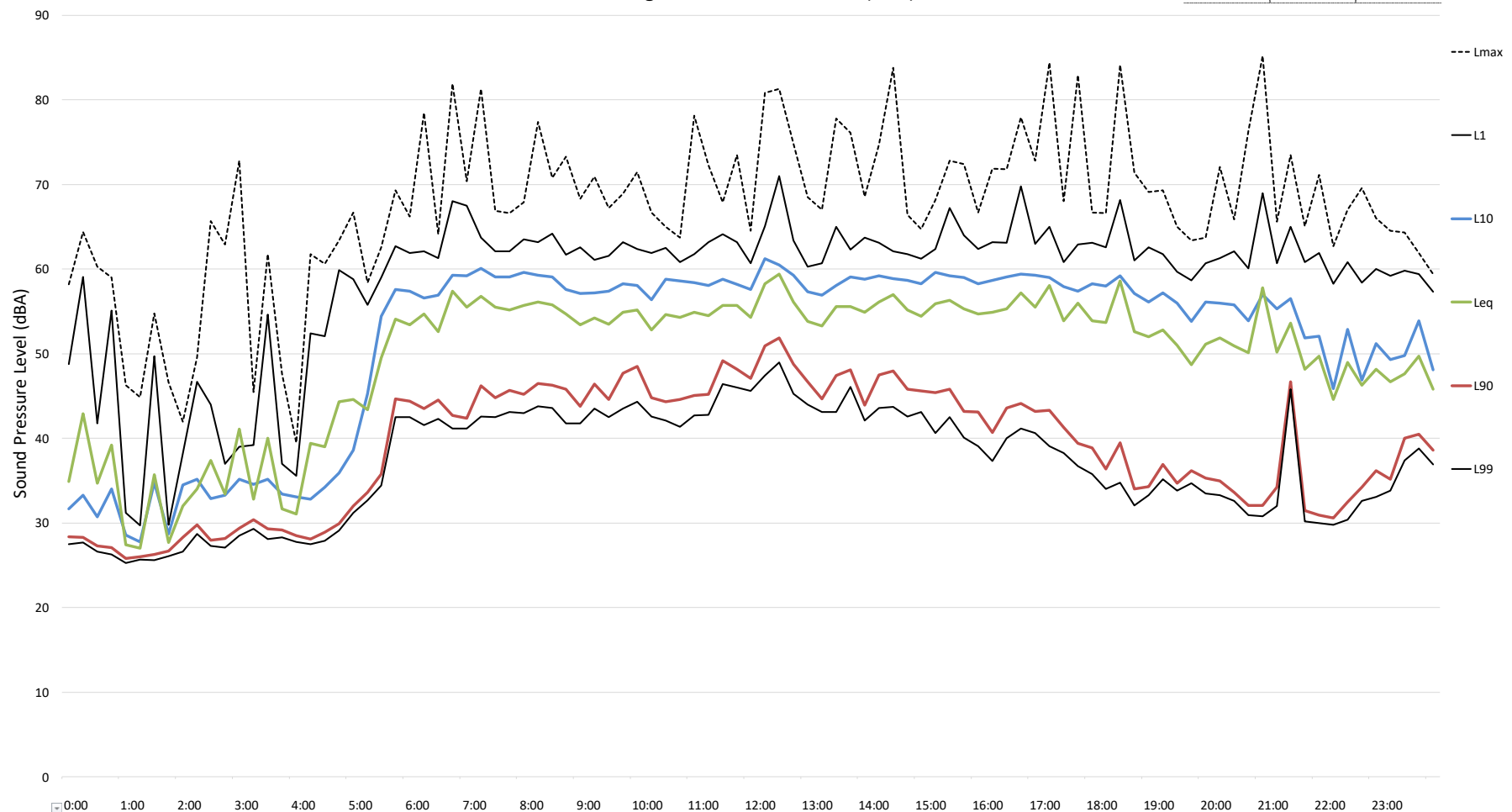
Project Address: 51 Arthur Street, Forestville

Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

21/08/2020 Friday
Existing Ambient Noise Levels (dBA)

Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB		47.6
L _{A90} dB		25.9



11863 Arthur Street (51), Forestville

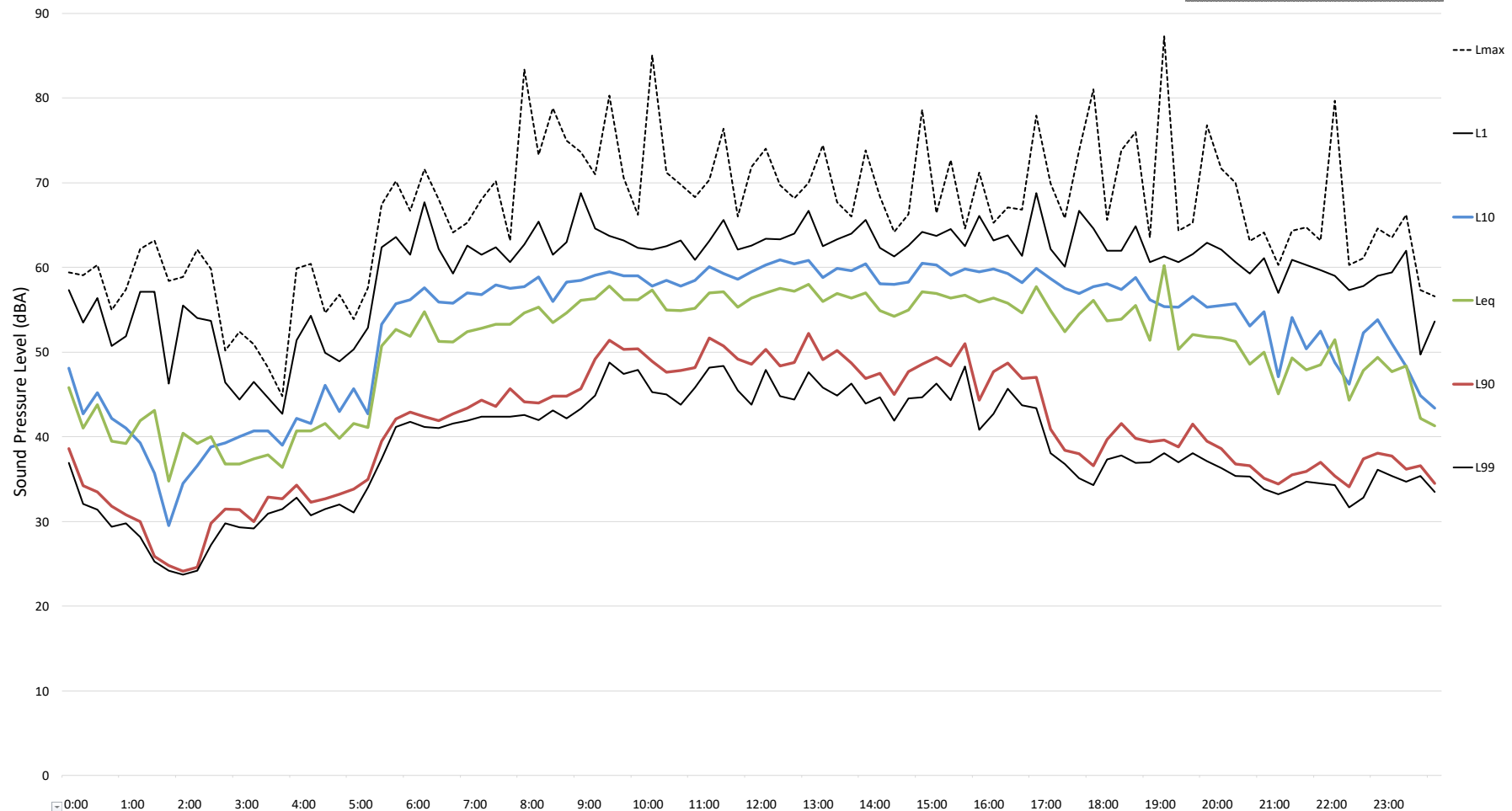
Project Address: 51 Arthur Street, Forestville

Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

22/08/2020 Saturday
Existing Ambient Noise Levels (dBA)

Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB		47.6
L _{A90} dB		25.9



11863 Arthur Street (51), Forestville

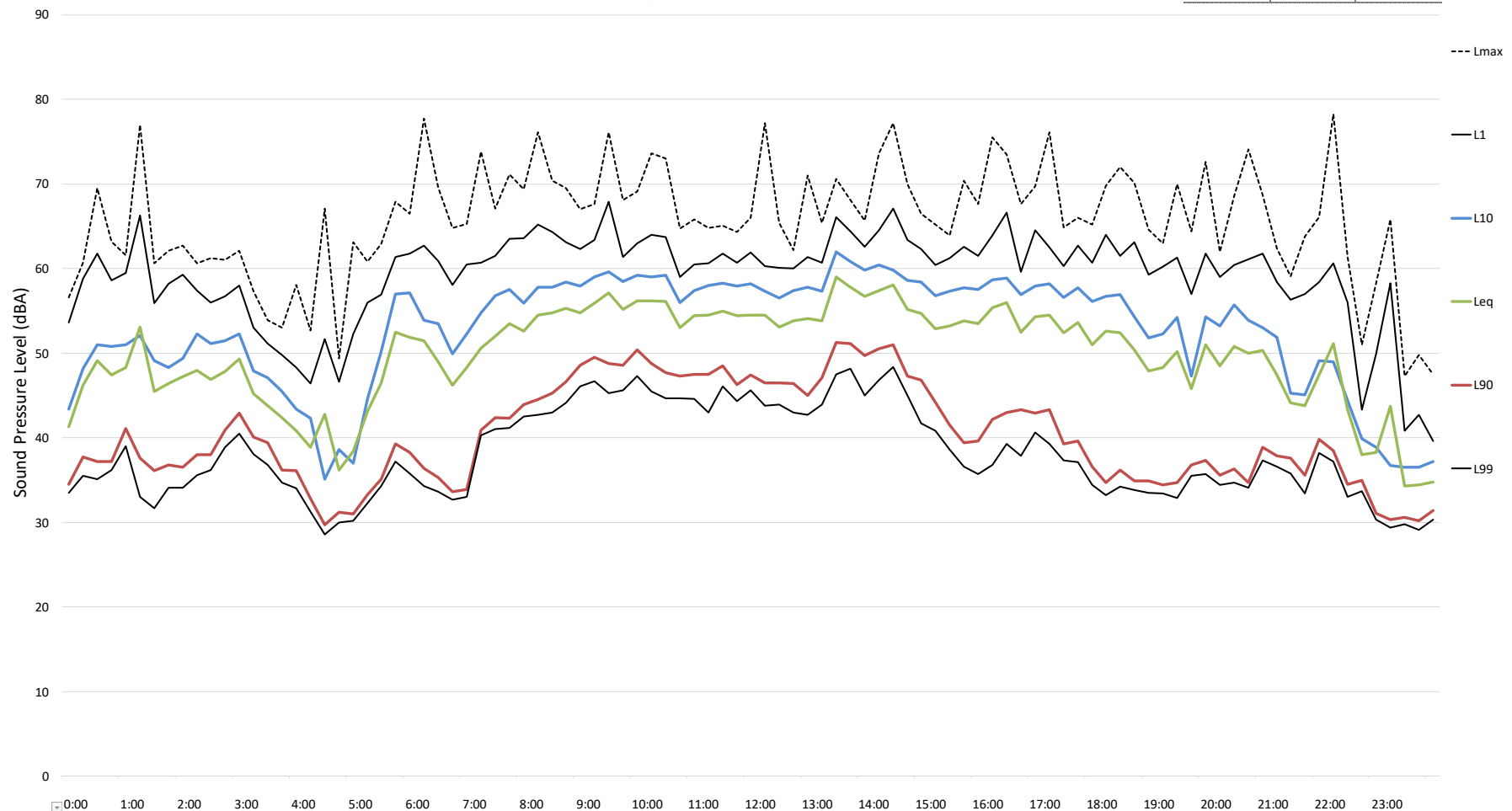
Project Address: 51 Arthur Street, Forestville

Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

23/08/2020 Sunday
Existing Ambient Noise Levels (dBA)

Daytime 07:00 - 18:00	Evening 18:00 - 22:00	Nighttime 22:00 - 07:00
Measured	Measured	Measured
L _{Aeq} dB		47.6
L _{A90} dB		25.9



11863 Arthur Street (51), Forestville

Project Address: 51 Arthur Street, Forestville

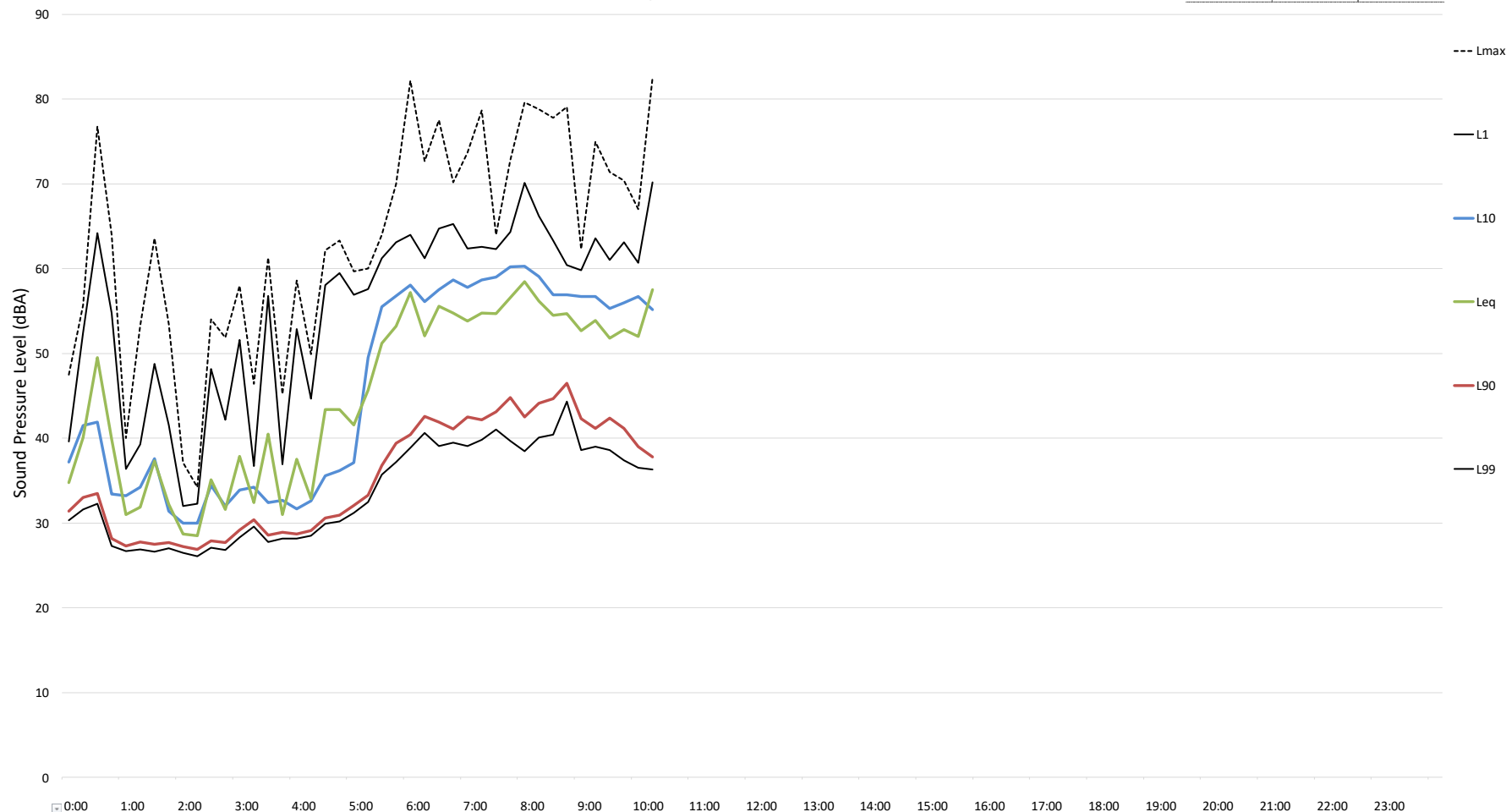
Logger Location: Located at residential boundary measuring existing ambient noise

PKA Acoustic Consulting

24/08/2020 Monday

Existing Ambient Noise Levels (dBA)

	Daytime 07:00 - 18:00 Measured	Evening 18:00 - 22:00 Measured	Nighttime 22:00 - 07:00 Measured
L _{Aeq} dB			47.6
L _{A90} dB			25.9





PO Box 345, Lane Cove 1595

+612 9460 6824 — admin@pka.com.au