56-60 Burns Bay Road, Lane Cove

Development Application Acoustic Report

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TABLE OF CONTENTS

1 INTRODUCTION

This report presents our development application acoustic assessment for the proposed mixed-use development at 56-60 Burns Bay Road, Lane Cove.

This report will:

- Conduct an external noise intrusion assessment (primarily traffic noise) and recommend acoustic treatments to ensure that a reasonable level of amenity is achieved for future occupants. Traffic noise at the site have been measured and assessed in accordance with Lane Cove Council requirements and Australian Standard 2107:2016.

- Present noise emission goals for future use of the development to meet council and NSW EPA acoustic requirements.

The assessment is based on architectural drawings by A+ Design Group A3-01 to A3-12 dated 16.04.2019

2 SITE DESCRIPTION

The site is located at 56-60 Burns Bay Road, Lane Cove. The site is currently occupied by a Coles Supermarket and a multi-level car park.

The proposed development is comprised of residential buildings, retail and associated parking. There is a small community space, restaurant and retail proposed.

The future northern façade faces Burns Bay Road which carries medium volumes of traffic. The southern boundary of the site abuts Sera Street which carries low volumes of traffic. The east and west of the site is bounded by existing commercial development.

Figure 1 shows the site surroundings and measurement locations.

Figure 1: Site Map and Measurement Locations

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 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 at 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.

LA_{max} refers to the maximum noise level occurring during a measurement period, and is used when assessing sleep disturbance impacts.

4 NOISE INTRUSION ASSESSMENT

4.1 PROJECT ACOUSTIC OBJECTIVES

Lane Cove Council DCP states the following with respect to noise intrusion:

> *h) Internal habitable rooms of dwellings affected by high levels of external noise are to be designed to achieve internal noise levels of no greater than 50dBA.*

4.1.1 Australian and New Zealand AS/NZS 2107:2016 *'Recommended design sound levels and reverberation times for building interiors'* (Rail and Traffic Noise Intrusion)

For non-residential spaces (retail / commercial) Australian Standard AS 2107-2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces. Table 1, in Section 5 of AS 2107-2016, gives the following maximum internal noise levels for commercial buildings near major roads.

Table 1 – Recommended Design Sound Level

Space /Activity Type	Recommended Maximum Design Sound Level dB(A) L_{eq}
Commercial	45 dB(A)L_{eq}
Retail	50dB(A) L_{eq}

4.2 NOISE MEASUREMENTS

Traffic measurements were taken along all future facades the proposed development.

Attended measurements were undertaken using a Norsonic 140 sound level analyser, set to A-weighted fast response. The sound level analyser was calibrated before and after the measurements, no significant drift was noted.

The traffic noise levels listed in the table below were determined based on the logging data and attended measurements. In determination of acoustic treatments, the measured level is adjusted for distance and orientation.

Table 2 – External Noise Level (Traffic Noise)

Location	Time Period	Traffic Noise Level
Future Northern Façade (Burns Bay Road)	Day	61dB(A)$L_{Aeq\ (15hr)}$
	Night	56dB(A)$L_{Aeq\ (9hr)}$

4.2.1 Glazing Construction

The recommended glazing assemblies are indicated in the table below. The glazing thicknesses recommended are those needed to satisfy acoustic requirements and do not take into account other requirements such as structural, safety or other considerations. These additional considerations may require the glazing thickness to be increased beyond the acoustic requirement.

Table 3 –Glazing Requirements

Façade	Room	Glazing Thickness	Acoustic Seals
Burns Bay Road	Bedroom	6.38mm laminated glass	Yes
	Living Room	6.38mm laminated glass	Yes
Eastern / Western	Bedroom	6mm glass	Yes
	Living Room	6mm glass	Yes
Southern	Bedroom	6mm glass	Yes
	Living Room	6mm glass	Yes

Table 4 –Commercial

Façade	Room	Glazing Thickness	Acoustic Seals
Burns Bay Road	Commercial	6mm toughened	Yes

Note: Glazing to be reviewed at CC stage based on construction drawings.

In addition to complying with the minimum scheduled glazing thickness, the STC/R_w rating of the glazing fitted into operable frames and fixed into the building opening should not be lower than the values listed in the table below.

Where nominated, this will require the use of acoustic seals equal to Schlegel Q-lon series *(acoustic bulb seal)* around the full perimeter of operable frames. The frame will need to be sealed into the building opening using a flexible 100% polyurethane sealant equal to Bostik Seal N' Flex. Note that mohair seals and/or mohair/plastic fin combination seals in windows and doors are **not** acceptable where acoustic seals are required.

It is recommended that only window systems have test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

Table 5 – Minimum STC/R_w of Glazing Requirements

Glazing Assembly	**Acoustic Seals**	**Minimum STC/R_w of Installed Window**
6mm toughened	Yes	29
6.38mm laminated	Yes	31

4.2.2 External Walls

For external walls of masonry construction, no acoustic upgrade is required. There should be no vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed. In the event lightweight external constructions are used, these are to be reviewed at CC stage.

4.2.3 Roof/Ceiling Construction

The proposed concrete slab roof does not require any acoustic upgrade. Penetrations in ceilings (such as for light fittings etc.) must be sealed gap free with a flexible sealant. Any ventilation openings in the ceilings would need to be acoustically treated to maintain the acoustic performance of the ceiling construction.

4.2.4 External Doors

Any glass doors should be constructed using glazing thickness set out in Table 3and 4. Full perimeter acoustic seals around the doors are required.

4.3 MECHANICAL VENTILATION

As internal levels cannot be achieved with windows open, it is required that an alternative outside air supply system or air conditioning be installed to meet AS 1668.2 requirements.

Any mechanical ventilation system that is installed should be acoustically designed such that the acoustic performance of the recommended constructions is not reduced by any duct or pipe penetrating the wall/ceiling/roof.

Noise emitted to the property boundaries by any ventilation system shall comply with EPA or Local Council guidelines.

5 NOISE EMISSION ASSESSMENT

The external noise emission criteria are formulated in this section of the report to ensure that the amenity of nearby land users are not adversely affected.

5.1 BACKGROUND NOISE MONITORING

A long-term unattended monitor was used for background noise measurements supplemented with attended measurements at the boundaries of the site. The monitor was place on Sera Street from 16 – 22 April 2018.

Table 6 – Measured Background Noise Levels

Location	Period/Time	Background Noise Level dB(A) $L_{90(period)}$
Surrounding Residential Receivers	Day (7am-6pm)	51
	Evening(6pm-10pm)	47
	Night(10pm-7am)	40

5.2 NOISE EMISSION OBJECTIVES – GENERAL OPERATION AND MECHANICAL PLANT

The following documents are used to establish the noise emission criteria for the development site:

- Lane Cove Council Development Control Plan;
- EPA Noise Policy for Industry; and
- Protection of Environmental Operation Act Regulation

5.2.1 Lance Cove Council

Lane Cove Council DCP states the following with respect to noise emissions.

> *Provisions a) Noise generated by residents, visitors, retail or commercial part and mechanical plant and equipment should not exceed the following repeatable maximum L Aeq (1 hour) level, on weekdays:*
>
> *Day 7am-6pm: 55dB(A)*
>
> *Evening 6pm- 10pm: 45dB(A)*
>
> *Night 10pm-7am: 40dB(A)*
>
> *and on weekends*
>
> *Day 8am-7pm: 50dB(A)*
>
> *Evening 7pm-10pm: 45dB(A)*
>
> *Night 10pm-8am: 40dB(A)*

or in any case not more than 5 dB(A) above the background level during the day and evening and not exceeding the background level at night when measured at the boundary of the property

5.3 EPA - NOISE POLICY FOR INDUSTRY (NPfI)

Noise sources covered by this code include mechanical services noise (the identified potential noise emission source from the site). Both the Intrusiveness and the Project Amenity criteria (as set out below) must be complied with.

5.3.1 NPfI - Intrusiveness Noise Goals

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

Table 7 - EPA Intrusiveness Criteria

Location	Time of Day	Background noise Level - dB(A)L_{90}	Intrusiveness Noise Objective dB(A)$L_{eq(15min)}$ (Background + 5dB)
Residences Surrounding the Site	Day Time (7am - 6pm)	51	56
	Evening (6pm - 10pm)	47	52
	Night (10pm - 7am)	40	45

5.3.2 INP – Project Amenity Goals

Project amenity criteria are determined based on the land use in the area (residential /commercial /industrial). The residential land use is then further categorised into rural, sub-urban and urban areas. For the purpose of this assessment the existing residential dwellings will be considered suburban.

Table 8 -EPA Project Amenity Criteria

Noise Receiver	Amenity Noise Level – dB(A)$L_{Aeq(15min)}$		
	Daytime	Evening	Night
Existing Residential (Suburban)	53	43	38
Commercial	65		

5.4 SLEEP AROUSAL ASSESSMENT

Potential sleep arousal impacts should be considered for noise generated after 10pm.

Sleep arousal is a function of both the noise level and the duration of the noise.

As recommended in the NPfI, to assess potential sleep arousal impacts, a two-stage test is carried out:

- Step 1 – Section 2.5 *Maximum noise level event assessment* from the NPfI states the following:

  Where the subject development/premises night-time noise levels at a residential location exceed:

  - $L_{Aeq,15min}$ *40dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
  - L_{AFmax} *52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater,*

  a detailed maximum noise level event assessment should be undertaken.

Based on the above the following noise objectives apply:

Table 9– Sleep Arousal Criteria (Maximum/L_{Max} Noise Events)

Location	Rating Background Level dB(A)L_{90}	Rating Background Level + 15dB(A)	Governing Criteria dB(A)$L_{(Max)}$
Surrounding Residential Receivers	40	55	55

- Step 2 - If there are noise events that could exceed the average/maximum criteria detailed in the tables above, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy. Most relevantly, the Road Noise Policy states:

  For the research on sleep disturbance to date it can be concluded that:

  - *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
  - *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

5.5 ASSESSMENT OF NOISE EMISSIONS

5.5.1 Mechanical plant

Detailed review of all 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 section 5 of this report.

While compliance with noise emission requirements will be achievable with appropriate acoustic treatment, it is highly likely that any roof top equipment which operates 24 hours per day (such as refrigeration plant) will require either enclosure in plant rooms or acoustic screens to provide a line of sight break between the equipment and any future residences.

Other equipment external items (fans) would be expected to be capable of compliance through use of internal duct lining and/or in-duct attenuators.

5.5.2 Community space

The community space will be part of a separate development application where detailed review of operating times and patron numbers (and the associated noise generated) would be assessed with reference to Council and (if necessary) Office of Liquor Gaming and Racing acoustic criteria (ie when a community space operator is engaged).

Indicatively the following construction would be required between the community space and residential building:

(community space side) 3 x 16mm plasterboard / with 2 x 100mm glass wool insulation in a 150mm stud or steel structural element / min 20mm cavity / 200mm concrete (residential side).

Additionally a construction joint will be required between the community space and residential building.

All treatments to control noise emissions will be required to be determined upon engagement of a community space operator.

5.5.3 Retail Loading Dock

The loading dock is located within the basement. In order to prevent structure borne transmission of noise to the apartments above the following is indicatively recommended:

- Vibration isolation of the loading area slab where loaded pallet jacks will be manoeuvred. Install an acoustically isolated topping slab on the loading dock structural slab. The isolated slab should cover any area where there will be extensive use of pallet jacks.

- Goods hoist motor, loading dock turntable and any motor associated with the garage entry door to be isolated from structure.

- Retail floor finish where pallet jacks may be used to be reviewed at CC stage. Tiled floor finish not recommended.

6 CONSTRUCTION NOISE AND VIBRATION

We have been asked to provide comment on potential noise and vibration impacts on nearby development arising during construction of the subject development.

We note that a detailed construction program for the demolition, excavation and construction of the development is not available at present (this is not typically undertaken prior to project approval) and as such, a detailed construction noise assessment cannot be undertaken at this stage.

We recommend that a detailed assessment of noise emissions from construction activities be undertaken at Construction Certificate Stage, once a construction programme has been determined. As such, only an indicative analysis is possible, as outlined below.

6.1 ACOUSTIC CRITERIA

Both noise and vibration criteria will be outlined below.

6.1.1 Construction Noise

Relevant guidelines are:

- The EPA Interim Construction Noise Guidelines and
- Australian Standard 2436.

6.1.2 EPA Interim Construction Noise Guideline

This guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours the guideline recommends a noise level of 10dB(A) above the background – this level is referred to as the "noise affected level". The noise emission goals for nearby development is as follows:

Table 10 – Noise Emission Goals – Sera Street

TIME OF DAY	MEASURED BACKGROUND LEVELS – dB(A)L_{90}	NOISE AFFECTED LEVEL BACKGROUND + 10dB(A)$L_{eq(15min)}$
Day (7am-6pm)	51	61

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "highly noise affected". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended.

6.1.3 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site".

Where compliance with EPA cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established (ie – adopt EPA/Council guidelines).
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

6.2 VIBRATION

Vibration caused by construction should 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 (amenity), 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

The criteria and the application of this standard are discussed in separate sections below.

6.2.1 Structure Borne Vibrations

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 1.

It is noted that the peak velocity is the absolute 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 11 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

6.2.2

6.2.3 Assessing Amenity

EPA NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and regulate vibration within the construction site.

Table 12- 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
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0

6.3 COMMENT / ASSESSMENT

Potential noise and vibration impacts are reviewed below.

6.4 NOISE IMPACTS

Noise impacts on nearby development will be dependent on the activity and where on the site the activity is undertaken. Excavation and piling works tend to be the loudest typical activity. Work close to the southern boundary will have greatest impact on the residents on Sera Street while work in the northern portions will have greatest impact on the commercial properties .

Initial analysis indicates:

- Excavation/soil retention phase - Primary noise emissions occur during excavation and earth retention (piling), with equipment items typically having sound power levels of approximately 115dB(A)$L_{eq(15min)}$. Excavators (dozers with bucket, saws or hammers) and piling works are typically the loudest activity during construction. Noise levels of 60-75dB(A) at the nearest residents will potentially be generated, indicating that EPA acoustic criteria may be exceeded from time to time, with higher noise levels generated when working near the southern boundary of the site.

- During erection of structure, it is the use of hand tools (angle grinders etc) and concrete pumps which are the loudest typical activity (sound power levels of approximately 105dB(A)$L_{eq(15min)}$). Noise levels of 50-65dB(A) will likely be received at the nearest residents, indicating that a minor exceedance of EPA acoustic criteria (refer to table 10) is possible from time to time, with higher noise levels generated when working near the southern boundary of the site.

- Once construction of the building shell is complete, noise from hand tools will be relatively low, as the new building façade will provide considerable noise attenuation. Once the building shell

is largely complete, use of hand tools in internal areas is unlikely to exceed EPA recommended levels.

Noise impacts can be minimised using the following:

- Selection of equipment and process.
- Location of static plant (particularly concrete pumps).
- Use of screens or enclosures (typically only feasible for static plant).
- Scheduling of noisy activities and provision of respite periods.

Detailed construction noise planning is typically undertaken after engagement of a builder and a construction program is prepared (ie – after DA stage) and therefore, detailed planning is not possible at this stage.

In light of the above, we recommend:

- On completion of the construction program, acoustic review of proposed construction activities and plant/methods should be undertaken to identify work items likely to exceed EPA guidelines.
- For those activities likely to generate high noise levels, the analysis should Identify where on the site are the areas likely to result in high noise levels. This will then assist in determining the likely time period for which high noise levels will occur.
- Identify feasible acoustic controls or management techniques (use of screens, scheduling of noisy works, notification of adjoining land users, respite periods) when excessive levels may occur.
- For activities where acoustic controls and management techniques still cannot guarantee compliant noise levels, implement a notification process whereby nearby development is made aware of the time and duration of noise intensive construction processes.

Through adoption of the above, noise impacts on nearby development can be suitably managed to prevent excessive impact.

6.5 VIBRATION IMPACTS

Demolition, excavation and earth retention works (piling) are the primary vibration generating activities.

Vibration impacts on the residential properties to the west are unlikely to exceed the criteria outlined in section 6.2

We recommend:

- Where practicable, excavation in rock should be done using rock saws as opposed to pneumatic hammers.
- If piling is required, use of augured piling should be used rather than impact piling.

7 CONCLUSION

This report presents our acoustic assessment for the proposed mixed-use development to be located at 56-60 Burns Bay Road, Lane Cove.

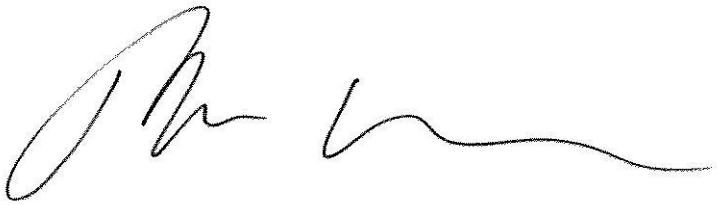
Noise intrusion impact from traffic noise onto the future occupants of the development has been assessed in accordance with Lane Cove Council DCP. The acoustic treatments in principle necessary to achieve these guidelines have been set presented within this report.

Noise emission criteria for the development site have been determined based on the site noise logging and NSW EPA Noise Policy for Industry and Lane Cove Council DCP requirements. These requirements have been presented in Section 5.

An assessment of noise as a result of demolition, excavation and construction is presented in Section 6 of this report.

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

Yours faithfully,

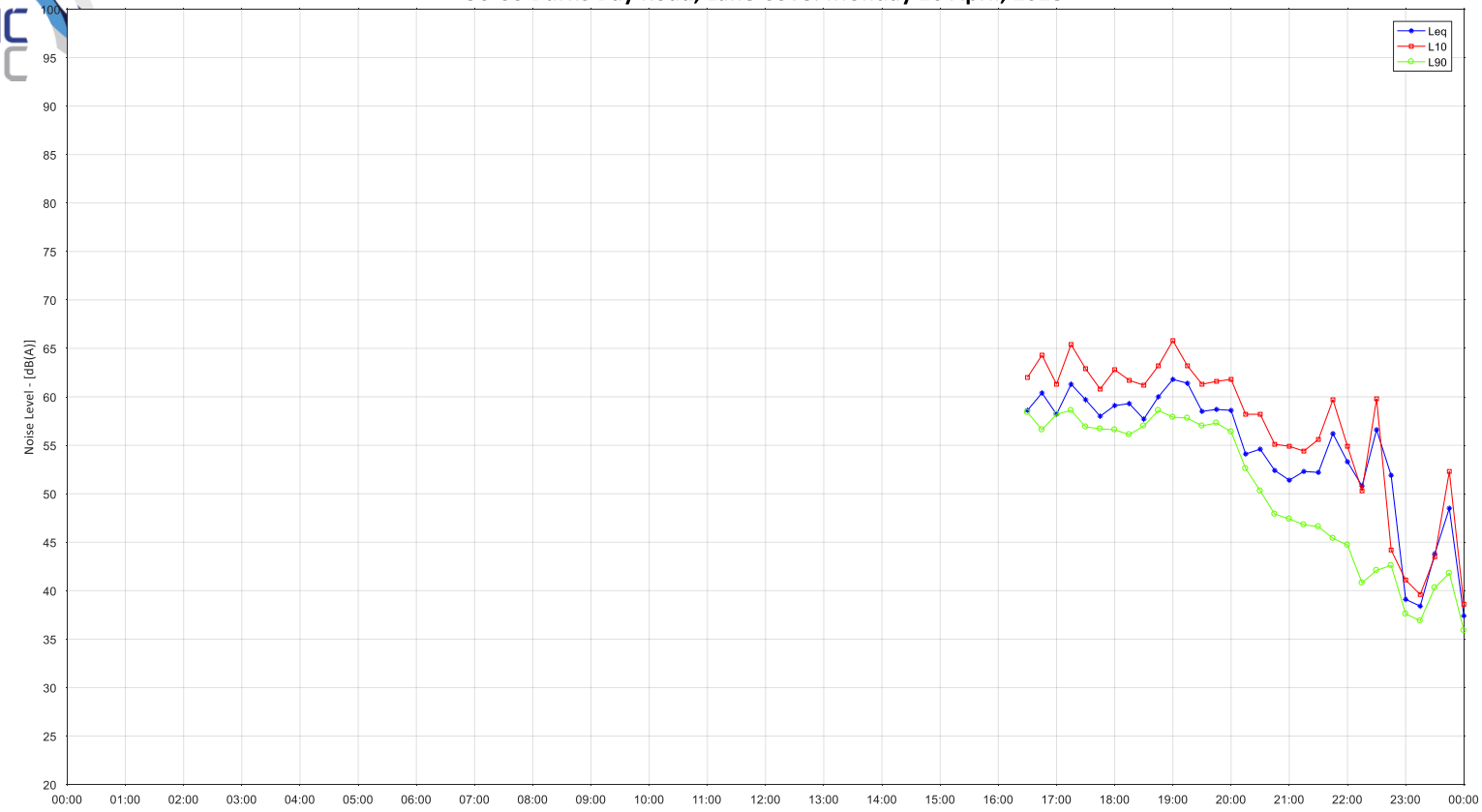


Tom Aubusson MAAS

Appendix 1

Noise Logging Data

56-60 Burns Bay Road, Lane Cove: Monday 16 April, 2018



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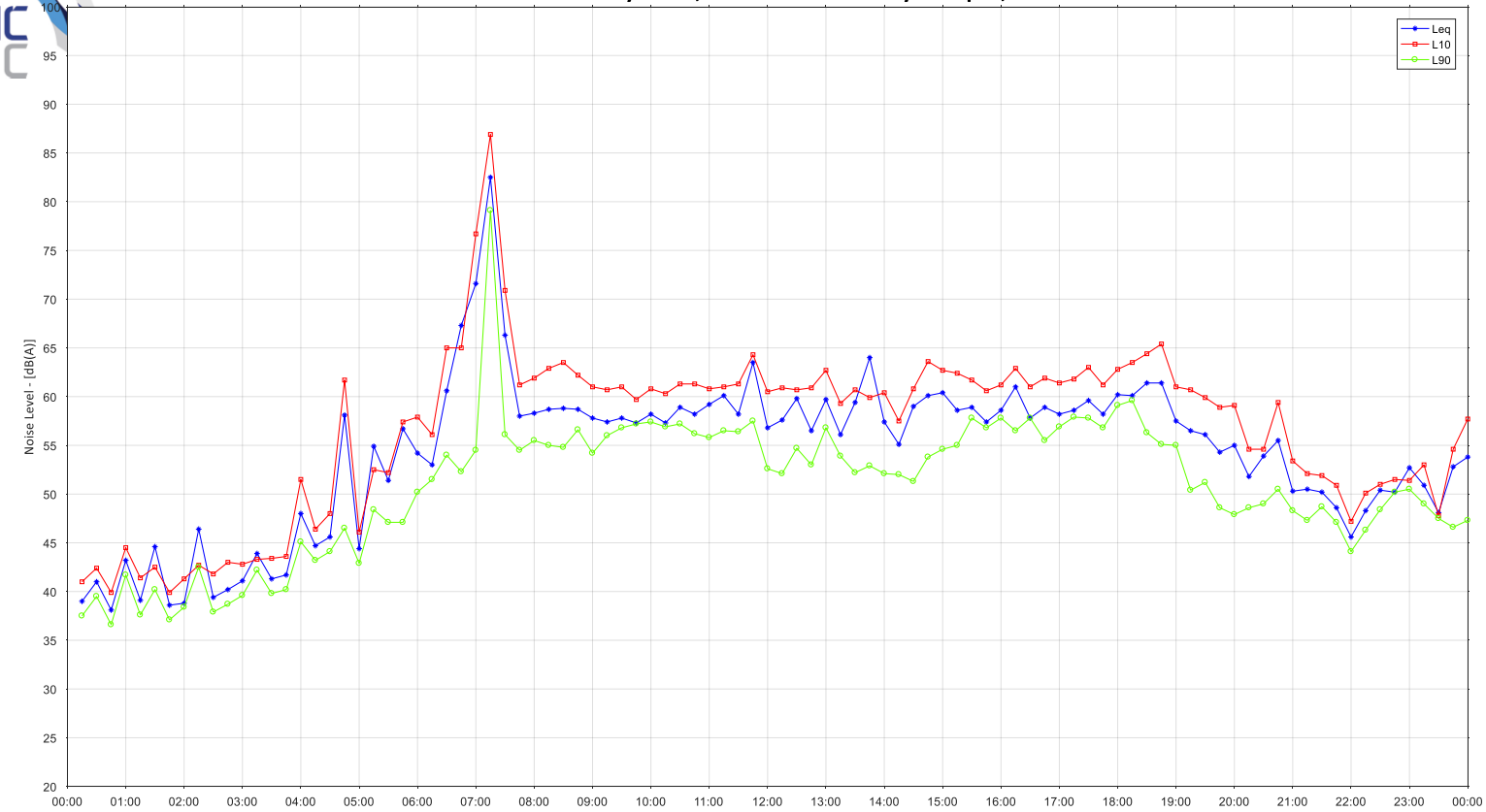

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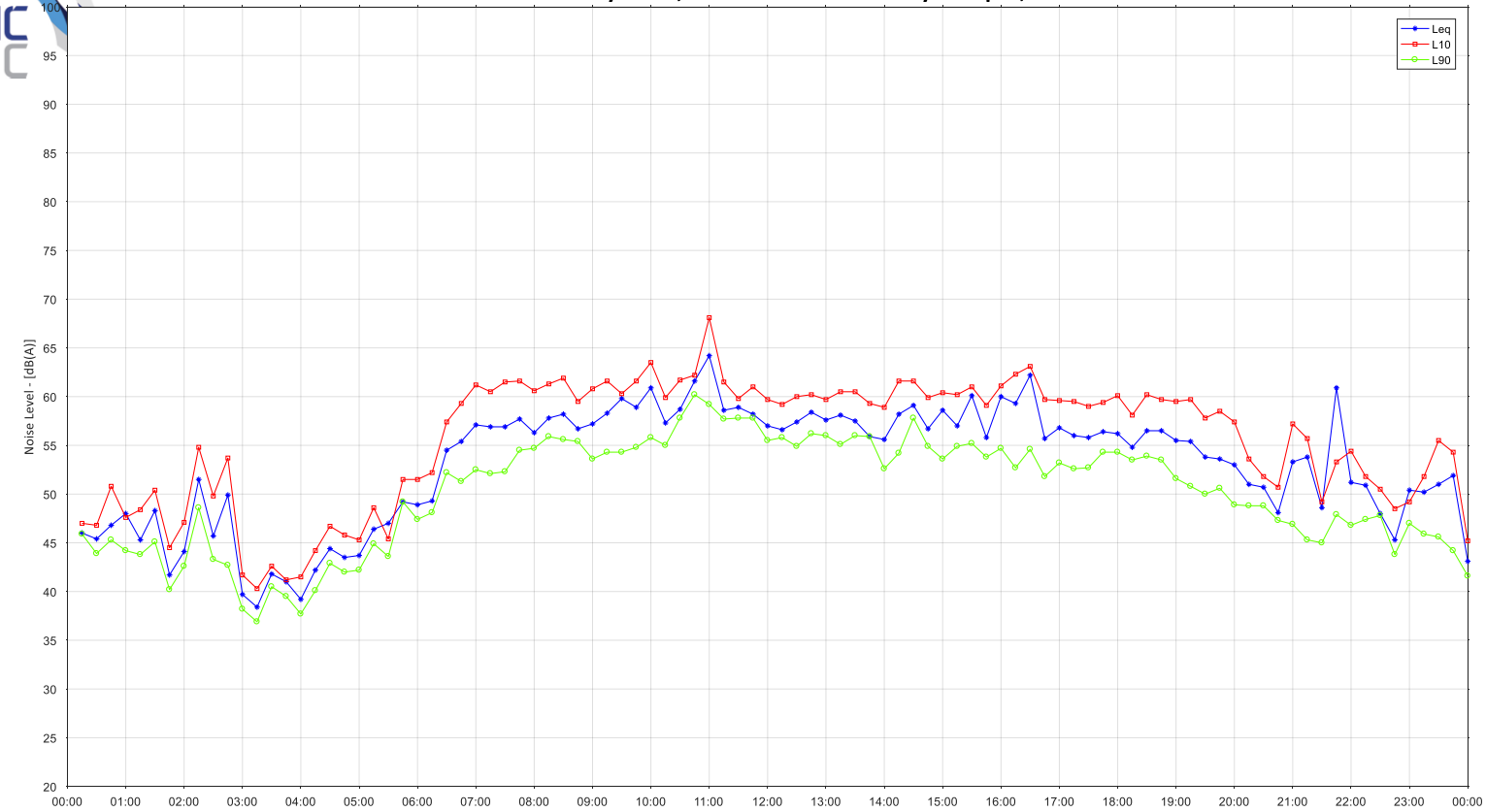

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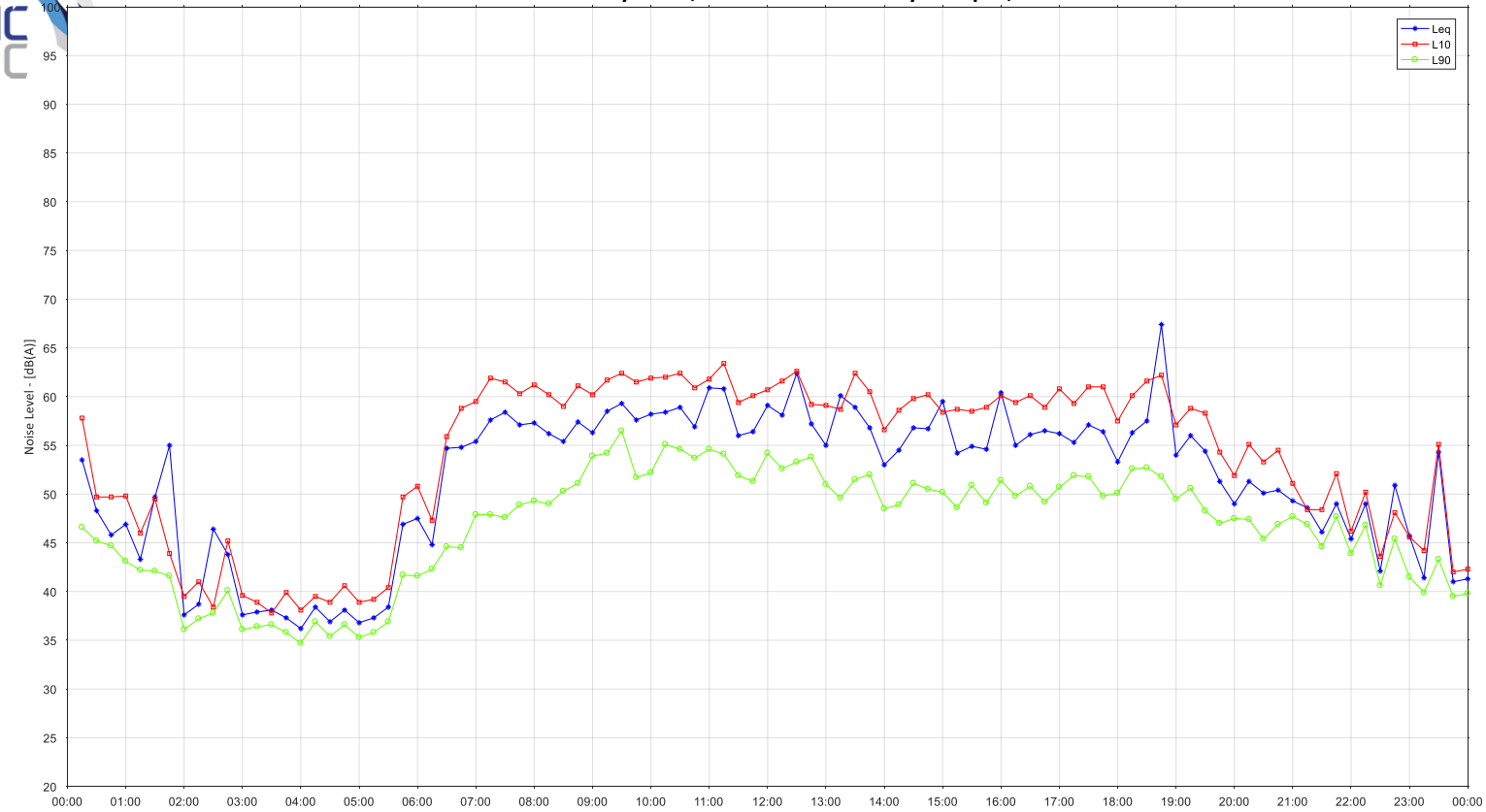

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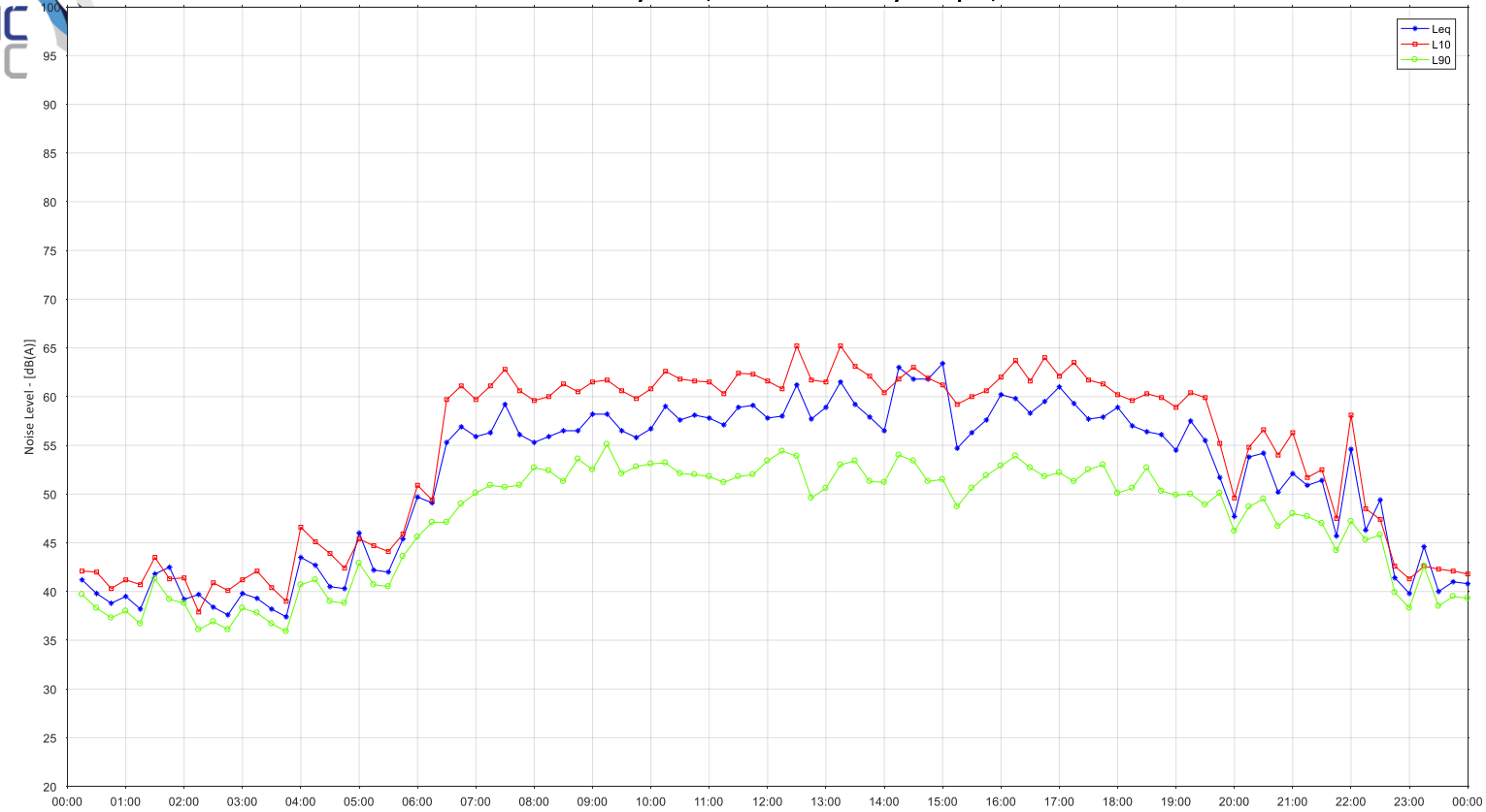

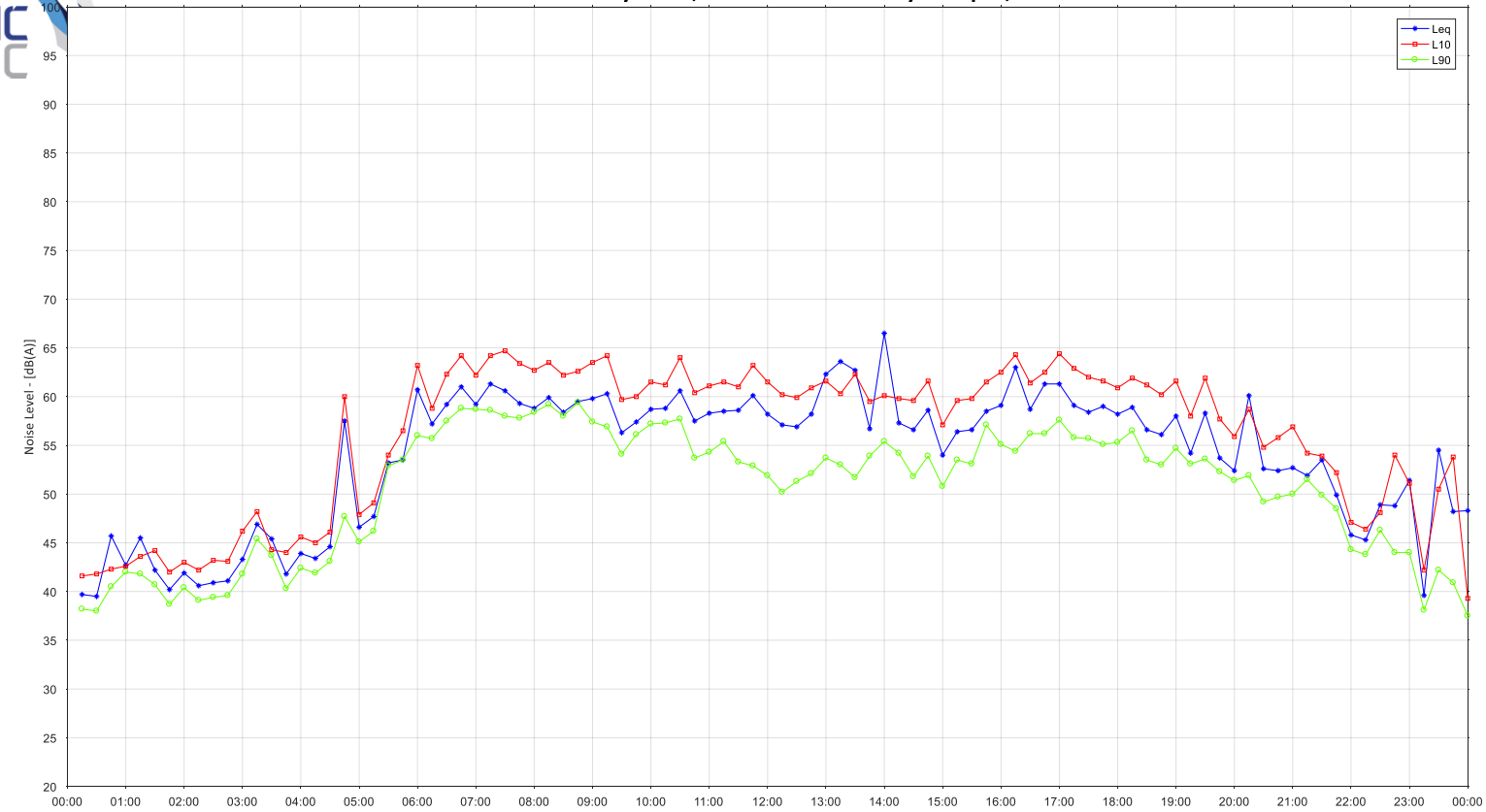
56-60 Burns Bay Road, Lane Cove: Saturday 21 April, 2018
Leq
L10
L90
Noise Level - [dB(A)]
100
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80
75
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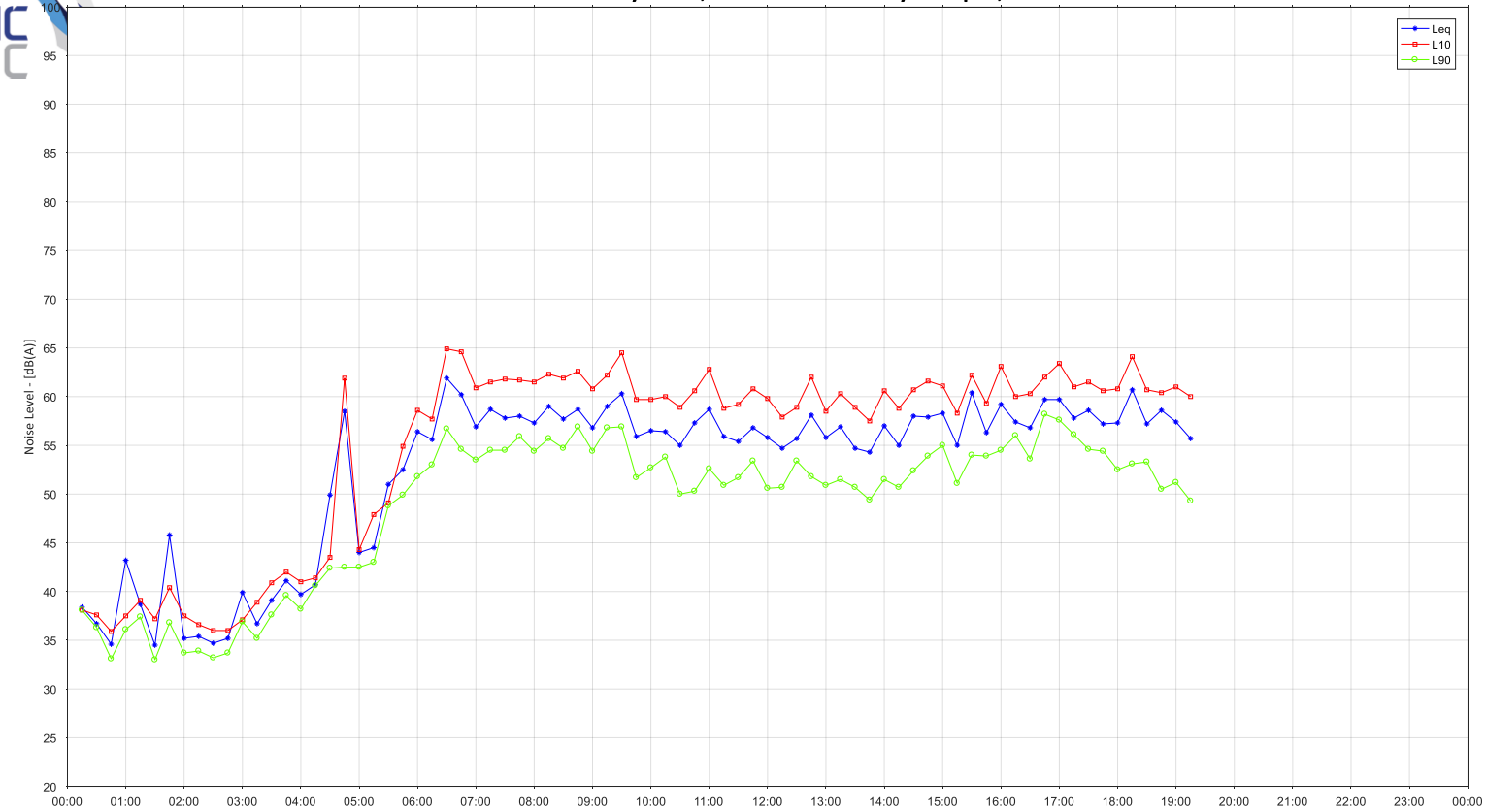
56-60 Burns Bay Road, Lane Cove: Sunday 22 April, 2018
Noise Level - [dB(A)]
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L90
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