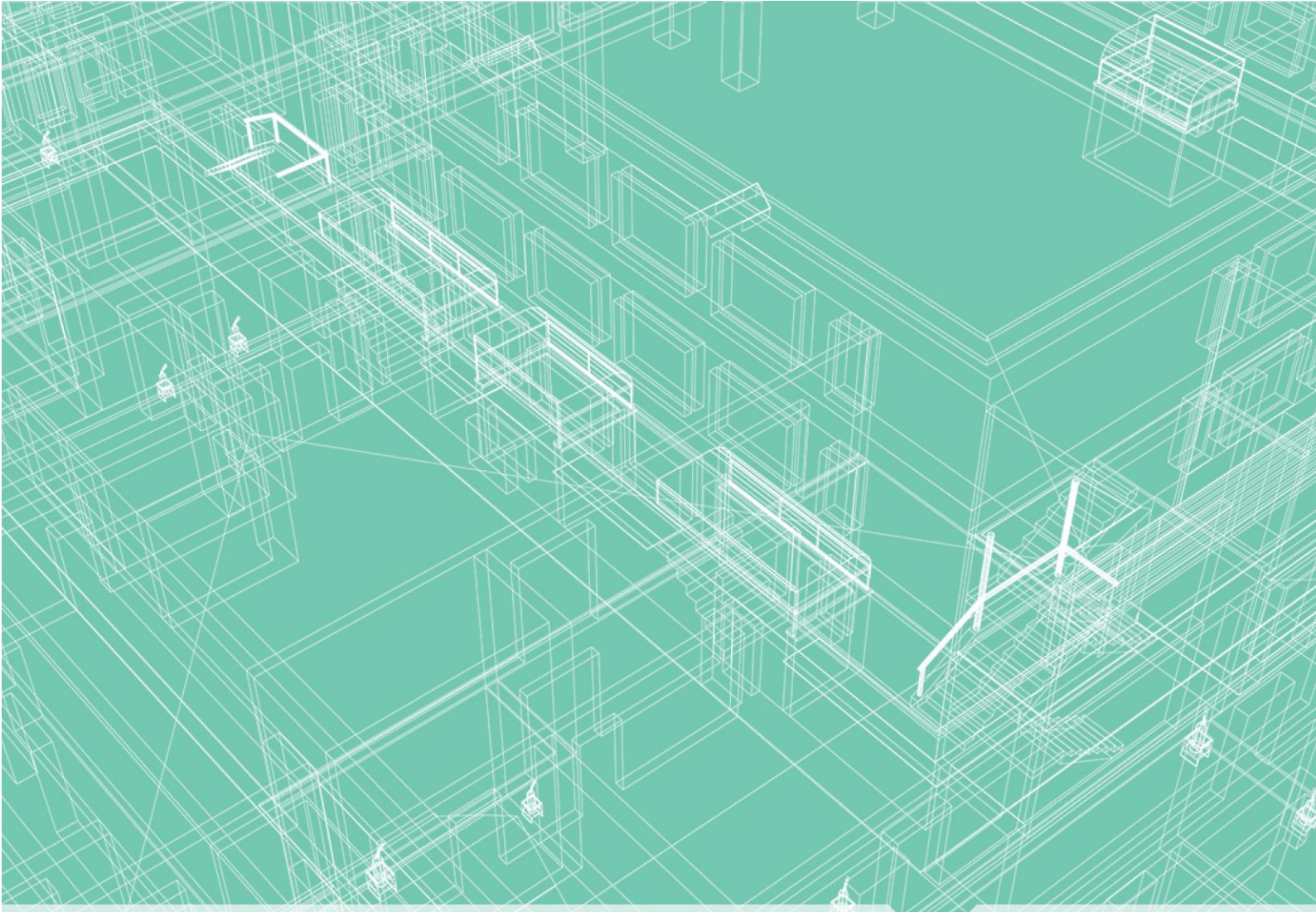

ACOUSTIC REPORT FOR DEVELOPMENT APPLICATION

UNITING ST. COLUMBA'S

LANE COVE

JHA

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DOCUMENT CONTROL SHEET

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1 INTRODUCTION

JHA Consulting Engineers has been engaged by Uniting to provide a noise impact assessment for the proposed aged care development at 15 Fig Tree Street in Lane Cove, NSW.

The proposed development involves accommodation for an additional 102 residents with associated living and care facilities plus associated car park. An acoustic assessment has been undertaken and it is detailed in this report along with the findings and recommendations. This report has been prepared as part of the Development Application to be submitted to the Lane Cove Council.

This report shall be read in conjunction with the Architectural design drawings and other consultant design reports submitted as part of the application.

The objectives of this acoustic assessment are:

- Identify noise sensitive receivers that will potentially be affected by the operation and construction of the proposed development.
- Carry out noise surveys to determine existing ambient and background noise levels on site.
- Establish appropriate noise criteria in accordance with the relevant standards, guidelines and legislation for noise emissions.
- Determine whether the relevant criteria can be achieved based on the proposed operations. Where applicable, provide recommendations for any necessary acoustic control measures that will need to be incorporated into the development or use in order to ensure with the assessment criteria.
- Carry out a traffic noise impact assessment to define the building envelope's sound insulation requirements to achieve compliance with the relevant noise level criteria within the spaces.

This report provides:

- A statement of compliance with the relevant statutory criteria for the proposed use development within the vicinity of the nearest potentially affected receivers.
- Recommendations for noise mitigation measures for the proposed development in order to meet the relevant criteria when compliance is not achieved.

The following documentation has been used for the preparation of this report:

- Site drawings of the proposed development.
- Noise data collected on site through the use of noise loggers and a hand held spectrum analyser.
- Traffic data provided by PTC Consultants.

This document and related work have been prepared following JHA Consulting Engineers Quality and Environmental Management Systems, which are based on AS/NZS ISO 9001 and ISO 14001.

2 DESCRIPTION OF THE PROPOSAL

Lane Cove is a suburb on the Lower North Shore of Sydney in the local government area of Lane Cove Council, being approximately 9km north-west of Sydney CBD. The site is located between Centennial Avenue and Fig Tree Street, in Lane Cove.

An existing residential care facility is located on the corner of Centennial Avenue and Fig Tree Street over two allotments, falling from Fig Tree Street to Centennial Avenue. The existing residential care facility is two and a half storeys from Centennial Avenue, and two storeys from Fig Tree Street.

The proposed development site incorporates the aforementioned site plus the inclusion of eight existing residential allotments containing dwelling houses. Existing single dwelling houses will be demolished and a new building will provide:

- 100 new bedrooms,
- Staff and residents amenities,
- Basement parking for 33 cars.

Figure 1 shows the footprint of the proposed new building within the site boundary as shown in the architectural drawings.

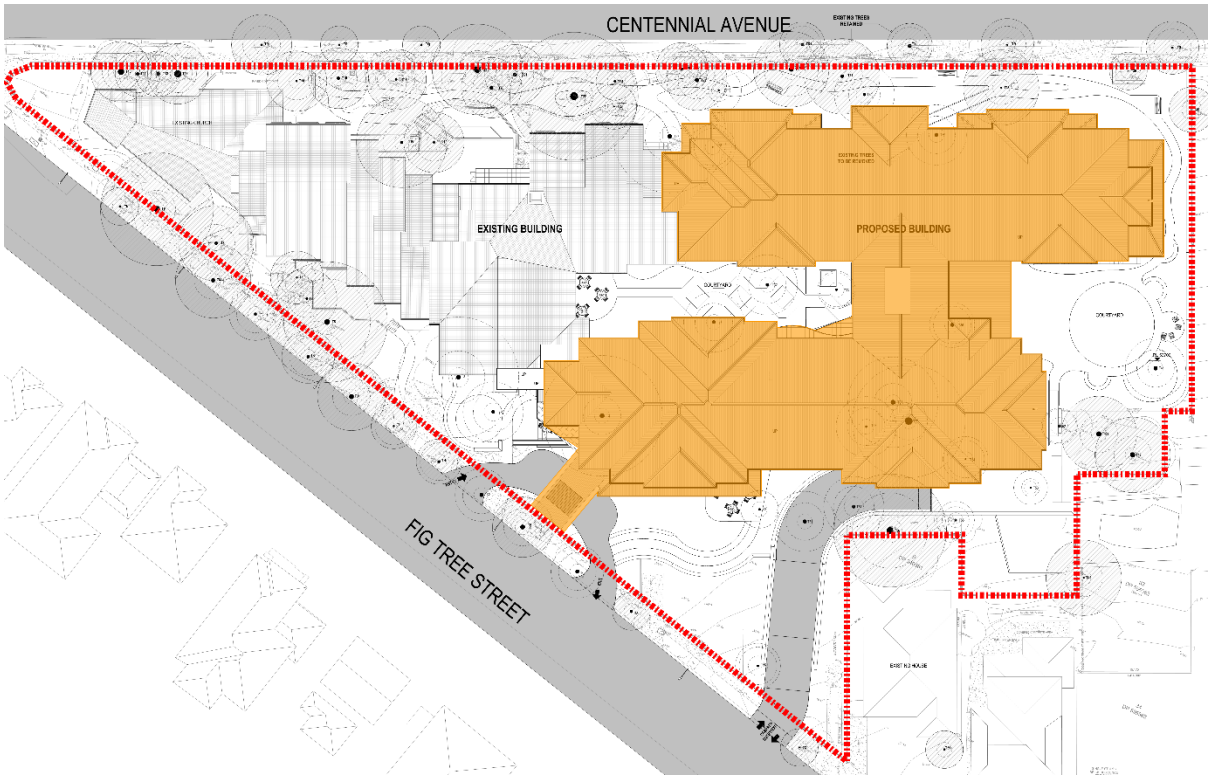


Figure 1: Site boundary plus proposed development (orange shadow).

The existing site is surrounded by residential, commercial and active recreational receivers. Figure 2 highlights the location of the site (red shadow), Residential Receivers (blue shadow), Commercial Receivers (green shadow) and Active Recreational receiver (golden shadow).

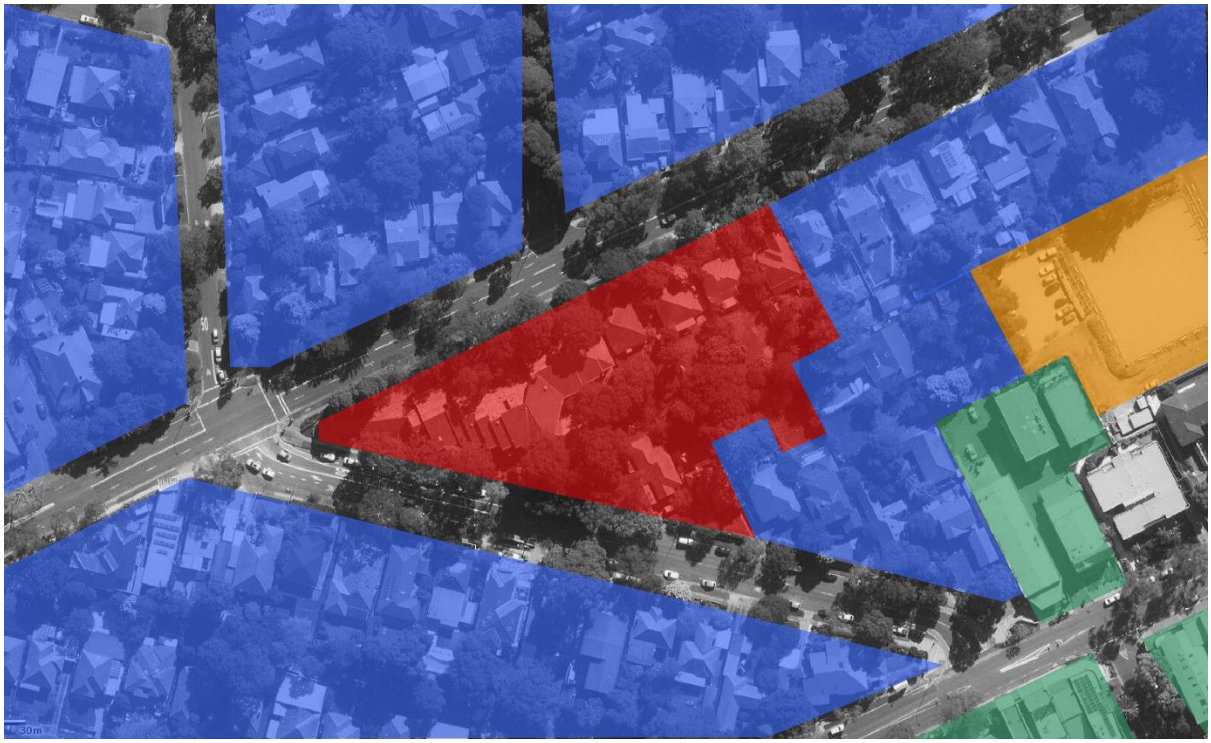


Figure 2: Site (red shadow) and surrounding noise receivers.

It is noted that if noise impacts associated with the proposed development are controlled at the nearest sensitive receivers, then compliance with the recommended criteria at all noise sensitive receivers will be achieved.

3 SITE MEASUREMENTS

3.1 GENERAL

Attended and unattended noise surveys were conducted in order to establish the ambient and background noise levels of the site and surrounds. The location at L1 was found to be representative of the nearest most affected residential receivers to the East. Noise surveys have been carried out in accordance with the method described in the AS/NZS 1055:2018 *'Acoustics – Description and measurement of environmental noise'*.

The long-term and short-term noise monitoring locations are shown in Figure 3.

Figure 3: Long-term noise monitoring location (L1) and short-term noise monitoring locations (M1 and M2).

3.2 SHORT-TERM NOISE MONITORING

Short-term noise monitoring was carried out to obtain representative octave band noise levels of the site and noise levels from the site.

Short-term noise measurements were carried out during the day-time period with a NTI XL-2 hand-held Sound Level Meter (SLM) (Serial Number A2A-13742-E0). The calibration of the SLM was checked before and after each use with a Larson Davis Cal 200 Class 1 Calibrator (Serial Number 15054) and no deviations were recorded.

The SLM microphone was mounted 1.5 metres above the ground and a windshield was used to protect the microphone. Measurement was undertaken in the free-field – i.e. more than 3.5 metres away from any building façade or vertical reflective surface. Weather conditions were calm and dry during the attended noise monitoring.

From observations during the site visit, it is noted that at location 1, the ambient and background noise levels are dominated by traffic noise from Centennial Avenue. A summary of the results of the short-term noise monitoring are shown in Table 1.

Location	*Date and Time*	*Parameter*	*Sound Pressure Level, dB re 20µPa*								
			Overall dB(A)	*Octave Band Centre Frequency, Hz*							
				63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
M1	13/09/2018 10.15 – 10.30	$L_{90,15min}$	**51**	53	49	48	46	48	43	33	24
		$L_{eq,15min}$	**68**	64	63	64	62	61	59	63	58
		$L_{10,15min}$	**69**	67	64	64	63	67	62	52	43
M2	21/09/2018 11.05 – 11:20	$L_{90,15min}$	**52**	52	48	48	46	49	46	37	25
		$L_{eq,15min}$	**65**	67	62	60	60	63	58	49	41
		$L_{10,15min}$	**69**	68	64	63	64	67	61	52	44

Table 1: Results of the short-term noise monitoring.

3.3 LONG-TERM NOISE MONITORING

Long-term noise monitoring was carried out from Thursday 13rd September to Friday 21st September 2018 with an ARL EL-215 noise logger (Serial Number 194696). The noise logger recorded L_{A1}, L_{A10}, L_{Aeq} and L_{A90} noise parameters at 15-minute intervals during the measurement period. The calibration of the noise logger was checked before and after use and no deviations were recorded.

This location was secure and considered to be representative of the typical ambient and background noise levels. The microphone was mounted 1.5 meters above the ground and a windshield was used to protect the microphone.

The detailed results of the long-term noise monitoring are presented graphically in Appendix A. Weather conditions were monitored for the duration of the noise survey and were typically calm and dry with some rain and wind events having been noted to occur during the measurement period. As stated in the NSW NPI, any data likely to be affected by rain, wind or other extraneous noise has been excluded from the calculations (shadowed in the Appendix A graphs).

Background noise levels (L_{A90}) are shown in Table 2, together with the ambient noise levels (L_{Aeq}) measured for each period.

Location	*L_{A90} Background Noise Levels, dB(A)*			*L_{Aeq} Ambient Noise Levels, dB(A)*		
	Day 7am-6pm	*Evening 6pm-10pm*	*Night 10pm-7am*	*Day 7am-6pm*	*Evening 6pm-10pm*	*Night 10pm-7am*
L1	49	43	38	55	54	48

Table 2: Results of the long-term noise monitoring.

4 RELEVANT NOISE STANDARDS AND GUIDELINES

4.1 STANDARDS AND GUIDELINES

The following standards and guidelines are considered relevant to the project and have been referenced in developing the project noise level criteria.

- Regulatory Framework
  - Environmental Planning and Assessment (EP&A) Act 1979.
  - Protection of the Environmental Operations (POEO) Act 1997.
  - State Environmental Planning Policy (SEPP) *'Housing for Seniors or People with a Disability'* 2004.
- Planning
  - Lane Cove Council Legislation
- Noise Emissions
  - NSW Environment Protection Authority (EPA) Noise Policy for Industry (NPI) 2017.
- Transport Noise
  - NSW Department of Planning (DoP) *'Development Near Rail Corridors or Busy Roads – Interim Guideline'* 2008.
  - Australian Standard AS3671:1989 *'Acoustics - Road traffic noise intrusion - Building siting and construction'*.
  - NSW RNP (Road Noise Policy) 2011.

4.2 REGULATORY FRAMEWORK

The Environmental Planning and Assessment Act 1979 (EP&A Act) provides the regulatory framework for the protection of the environment in NSW. The EP&A Act is relevantly about planning matters and ensuring that "environmental impact" associated with the proposed development is properly considered and reasonable before granting development consent to develop.

The assessment of "environmental impact" relies upon the identification of acceptable noise criteria which may be defined in a Development Control Plan, or derived from principles using guidelines like NSW EPA Noise Policy for Industry (NPI 2017) or Noise Guide for Local Government (NGLG 2013).

The Protection of the Environment Operations (POEO) Act 1997 has the objective of protecting, restoring and enhancing the quality of NSW environment. Abatement of noise pollution is underpinned by the definition of "offensive noise" as follows:

"...

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

..."

NGLG 2013 provides a checklist to determine an "offensive noise".

The State Environmental Planning Policy *'Housing for Seniors or People with a Disability'* establishes to ensure acceptable noise levels in bedrooms of new dwellings minimising traffic noise break-in.

4.3 LANE COVE COUNCIL LEGISLATION

Relevant Planning Documents of Lane Cove Council Legislation have been reviewed for any noise requirement or criteria.

The Lane Cove Council Local Environmental Plan (LC-LEP 2009) is the environmental planning instrument that applies to the site. The site is zoned as low density residential (R2) and the surrounding is zoned as neighbourhood centre (B1), medium density residential (R3), high density residential (R4) and public recreation (RE1). Figure 4 shows the land zoning as per information extracted from LC-LEP 2009 map 4700_COM_LZN_001_010_20151022.

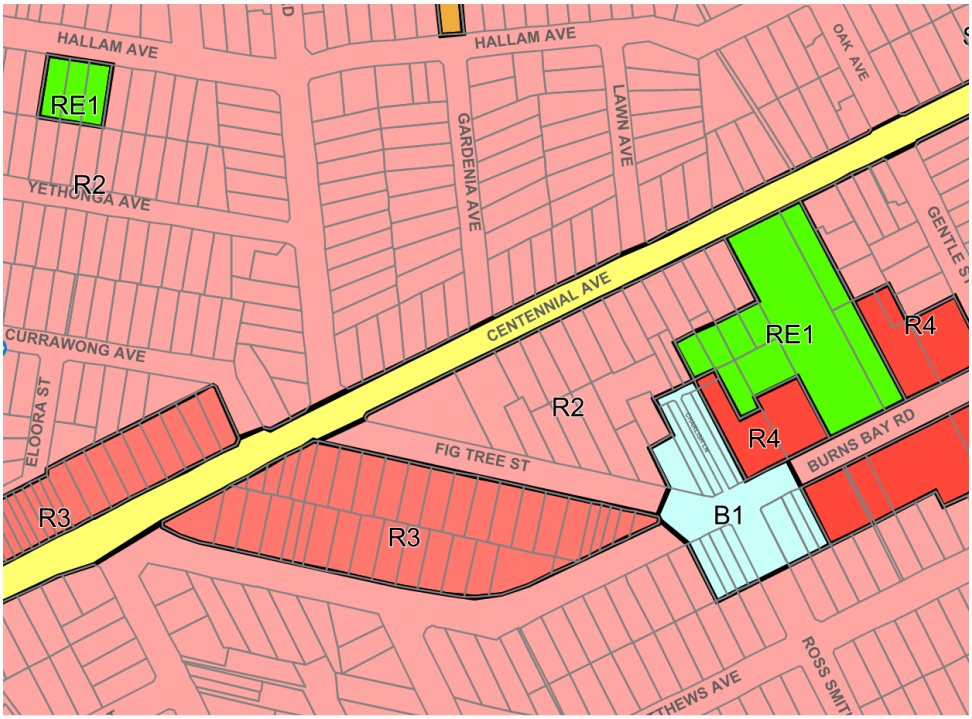


Figure 4: Land zoning of the site and surroundings.

The Lane Cove Council DCP (LC-DCP 2010) has been reviewed to determine any relevant noise information that applies to the development. Infrastructure SEPP for developments near busy roads and rail corridors shall be applied and establishes an internal noise level no greater than 50dB(A) within habitable rooms of dwellings affected by high levels of external noise.

4.4 NOISE EMISSIONS AND INTRUSIVE NOISE

4.4.1 NSW EPA NOISE POLICY FOR INDUSTRY

The NSW EPA Noise Policy for Industry 2017 assesses noise from industrial noise sources - scheduled under the POEO. Mechanical noise from the development shall be addressed following the recommendations in the NSW NPI.

The assessment is carried out based on the existing ambient and background noise levels addressing the following:

- Intrusiveness Criteria, to control intrusive noise into nearby sensitive receivers.
- Amenity Criteria, to maintain the noise level amenity for particular land uses.

These criteria are established for each assessment period (day, evening and night) and the more stringent of the two criteria sets the Project Noise Trigger Level (PNTL).

4.4.2 INTRUSIVENESS CRITERIA

The NSW NPI defines the intrusiveness criteria as follows:

"The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15 minute period, and does not exceed the background noise level by more than 5 dB when beyond a minimum threshold."

Based on the intrusiveness criteria definition and the estimated background noise levels on site, Table 3 shows the intrusiveness criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Rating Background Level $L_{A90,period}$ dB(A)*	*Intrusiveness Criterion dB(A)*
Residential	Day	49	54
	Evening	43	48
	Night	38	43

Table 3: Determination of the intrusiveness criterion.

4.4.3 AMENITY CRITERIA

The NSW NPI states the following to define the amenity criteria:

"To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance."

Based on the amenity criteria definition and the land zoning, Table 4 shows the amenity criteria for the noise sensitive receivers.

Indicative Noise Amenity Area	*Period*	*Amenity Noise Level $L_{Aeq,period}$ dB(A)*	*Adjusted Amenity Criterion dB(A)*
Residential (R2, R3)	Day	55	53 $L_{Aeq,15min}$ (55-5+3)
	Evening	45	43 $L_{Aeq,15min}$ (45-5+3)
	Night	40	38 $L_{Aeq,15min}$ (40-5+3)
Commercial	When in use	65	63 $L_{Aeq,15min}$ (65-5+3)
Active Recreational	When In Use	55	53 $L_{Aeq,15min}$ (55-5+3)

Table 4: Determination of amenity criterion.

4.4.4 PROJECT NOISE TRIGGER LEVELS

The PNTL's are shown in Table 5 and have been obtained in accordance with the requirements of the NSW NPI. These shall be assessed to the most affected point on or within the noise sensitive receiver boundary.

Indicative Noise Amenity Area	*Period*	*Intrusiveness Criterion dB(A)*	*Amenity Criterion, dB(A)*
Residential (R2, R3)	Day	54	53
	Evening	48	43
	Night	43	38
Commercial	When in use	--	63
Active Recreational	When In Use	--	53

Table 5: Determination of PNTL's (light grey highlight) for noise sensitive receivers.

4.5 TRANSPORT NOISE

4.5.1 DEVELOPMENT NEAR RAIL CORRIDORS OR BUSY ROADS – INTERIM GUIDELINE

The guideline details the application of clauses 85, 86, 87, 102 and 103 of the Infrastructure State Environmental Planning Policy (SEPP) which is required to be used when a development is adjacent to a rail corridor, a freeway, a toll-way, a transit-way or a road with an annual average daily traffic volume (AADT) of more than 40,000 vehicles.

Centennial Avenue has an AADT greater than 40,000 based on the traffic volume data provided on the website of the NSW RMS. Therefore, there are requirements to assess and include mitigation against road traffic noise for the proposed development and noise mitigation measures are advisable.

The internal noise level criteria as per SEPP's Clause 102 requirements are summarised below in Table 6.

Type of Receiver	*Noise Assessment Criteria* L_{Aeq} *dB(A)*
Bedroom (between 10pm and 7am)	35
Non habitable rooms	40

Table 6: Internal Design Noise Level Criteria due to traffic noise.

Guidance on internal noise levels for roads may be obtained from Australian Standard AS3671:1989 *'Acoustics - Road Traffic Noise Intrusion - Building siting and construction'*.

4.5.2 NSW ROAD NOISE POLICY

The NSW Road Noise Policy (RNP) establishes criteria for traffic noise from:

- Existing roads,
- New road projects,
- Road development projects,
- New traffic generated by developments.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited up to 2.0dB above the existing noise levels. An increase of up to 2.0dB represents a minor impact that is considered barely perceptible to the average person.

5 NOISE ASSESSMENTS

5.1 EXTERNAL MECHANICAL PLANT

Noise from proposed development mechanical plant should be controlled to ensure external noise emissions are not intrusive and do not impact on the amenity of the noise sensitive receivers.

At this stage, mechanical plant selections have not been made; therefore, it is not possible to undertake a detailed assessment of the mechanical plant noise emissions.

Noise controls will need to be incorporated with the design of the mechanical plant rooms to ensure that the cumulative noise levels from plant to the nearest noise sensitive receivers meets the NSW NPI noise level criteria – refer to Table 5.

Usual design noise controls that may need to be implemented will typically include, but are not limited to:

- Strategic location and selection of mechanical plant to ensure the cumulative noise levels at the receiver boundaries is met.
- Selection of appropriate quiet plant.
- Acoustic noise control measures to be put in place to minimise noise impacts such as:
  - In-duct attenuation
  - Noise enclosures as required
  - Sound absorptive panels
  - Acoustic louvres as required
  - Noise barriers as required

Acoustic assessment of all mechanical plant shall continue during the detailed design phase of the project in order to confirm any noise control measures to achieve the relevant noise criteria at the nearest noise sensitive receivers.

5.2 TRAFFIC NOISE IMPACT

Centennial Avenue can be categorised as an arterial road as per NSW RNP. Information retrieved from the website of the NSW RMS shows that Centennial Avenue AADT is above 40,000 vehicles/day. Therefore, Section 4.5.1 criteria and requirements apply to the current project.

5.2.1 METHODOLOGY

As per Section 2.2.4 of the Australian Standard AS3671:1989, the traffic noise level exposure of the site has been calculated in accordance with the Calculation of Road Traffic Noise (CoRTN). This methodology provides an accurate traffic noise level prediction based on traffic flow and site/road characteristics.

A façade analysis was conducted using Australian Standard AS3671:1989. This façade analysis was based on the following:

- Predicted noise levels at façade based on CoRTN and noise survey conducted by JHA.
- Habitable areas based on architectural drawings provided by Morrison Design Partnership Architects.

5.2.2 ROAD TRAFFIC NOISE LEVELS

For the exposed façades, external road traffic noise has been modelled at 1m from the façade and the external noise modelling assumptions are set out below:

- Based on the short-term attended noise measurements at locations M1 and M2, the traffic noise spectra will be adapted for the predicted noise level at façade.
- Flat ground between the road and the receiver point.
- Receiver height at 1.5m above ground.
- No barriers or shielding between the road and the receiver point.

Based on the noise level measurements at Location L1 and the predicted traffic noise, the traffic noise spectra and overall level are shown in Table 7 and they will be used to obtain the required Traffic Noise Attenuation (TNA).

Location	*Sound Pressure Level, dB re 20μPa*								
	Overall dB(A)	*Octave Band Centre Frequency, Hz*							
		63	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
At 1 m of façade	64	62	59	59	58	62	57	47	38

Table 7: Predicted traffic noise spectra corected with short-term measurements.

5.2.3 TRAFFIC NOISE ATTENUATION

AS 3671:1989 is used to determine the construction of the building envelope to attenuate traffic noise impact within building spaces and meet the internal noise levels required by the SEPP – refer to Table 6.

The procedure described in Section 3 of the AS3671:1989 has been followed to establish the octave band TNA required for each of the most exposed spaces to Centennial Avenue.

In determining the TNAc for each of the external elements of these rooms, allowances have been made for the number or components (C), the ceiling height (h) of the spaces, the ratio of areas of each component (Sc/Sf) and the reverberation time (RT) of the spaces. These allowances are based on the information extracted from the architectural drawings.

As per Section 3.4.3.1 of the AS3671:1989, we recommend a component weighted sound reduction index (R_W) 6 dB higher than the TNAc. Table 8 shows the minimum weighted sound reduction index (R_W) obtained from the TNAc for each element of the spaces facing Centennial Avenue.

Room	*Weighted Sound Reduction Index (R_W), dB*		
	Wall	*Window*	*Door*
Bedroom	44	36	37
Living / Dining Room	41	41	35

Table 8: Required Sond Reduction Index for components of the building envelope.

Based on the analysis, any proposed masonry external wall construction will achieve the required sound reduction index.

Windows and glazed doors for the bedrooms are required to achieve a sound insulation performance of R_W36 and R_W37 respectively. It is proposed to use a 12.38mm laminated glazing to meet the internal noise level criteria.

Façade glazing in the dining rooms require a sound insulation performance of R_W41. It is proposed to use a DGU 12mm/12mm airgap/6mm laminated. The glazing doors require a sound insulation performance of R_W35. It is proposed to use a 10.38mm laminated.

6 CONCLUSION

A noise & vibration impact assessment has been carried out for the proposed aged care development at 15 Fig Tree Street in Lane Cove, NSW. This report forms part of the documentation package submitted to council as part of the Development Application.

This report establishes relevant noise level criteria, details the acoustic assessment and provides comments and recommendations for the proposed development.

Ambient and background noise surveys have been undertaken at the existing site to establish the appropriate noise criteria in accordance with the relevant guidelines.

The noise assessment has adopted methodology from relevant guidelines, standards and legislation to assess noise impact. The noise impacts have been predicted at the nearest noise sensitive receiver boundaries.

At this stage, mechanical plant selections have not been made. Therefore, recommendations have been provided to minimise the impact of external noise emissions associated with the mechanical plant of the proposed development to the nearest sensitive receivers.

The noise impact on the development from Centennial Avenue traffic has been assessed in accordance with recommendations of AS3671:1989 *'Acoustics – Road Traffic Noise Intrusion – Building siting and construction'*. AS 3671:1989 is used to determine the construction of the building envelope to attenuate traffic noise impacts within building spaces and meet the internal noise levels recommended in AS2107:2016.

Windows and glazed doors for the bedrooms facing Centennial Avenue are required to achieve a sound insulation performance of R_W36 and R_W37 respectively. It is proposed to use a 12.38mm laminated glazing to meet the internal noise level criteria. Façade glazing in the dining rooms require a sound insulation performance of R_W41. It is proposed to use a DGU 12mm/12mm airgap/6mm laminated. The glazing doors require a sound insulation performance of R_W35. It is proposed to use a 10.38mm laminated.

Based on the information presented in this report, relevant objectives will be satisfied and therefore approval is recommended to be granted.

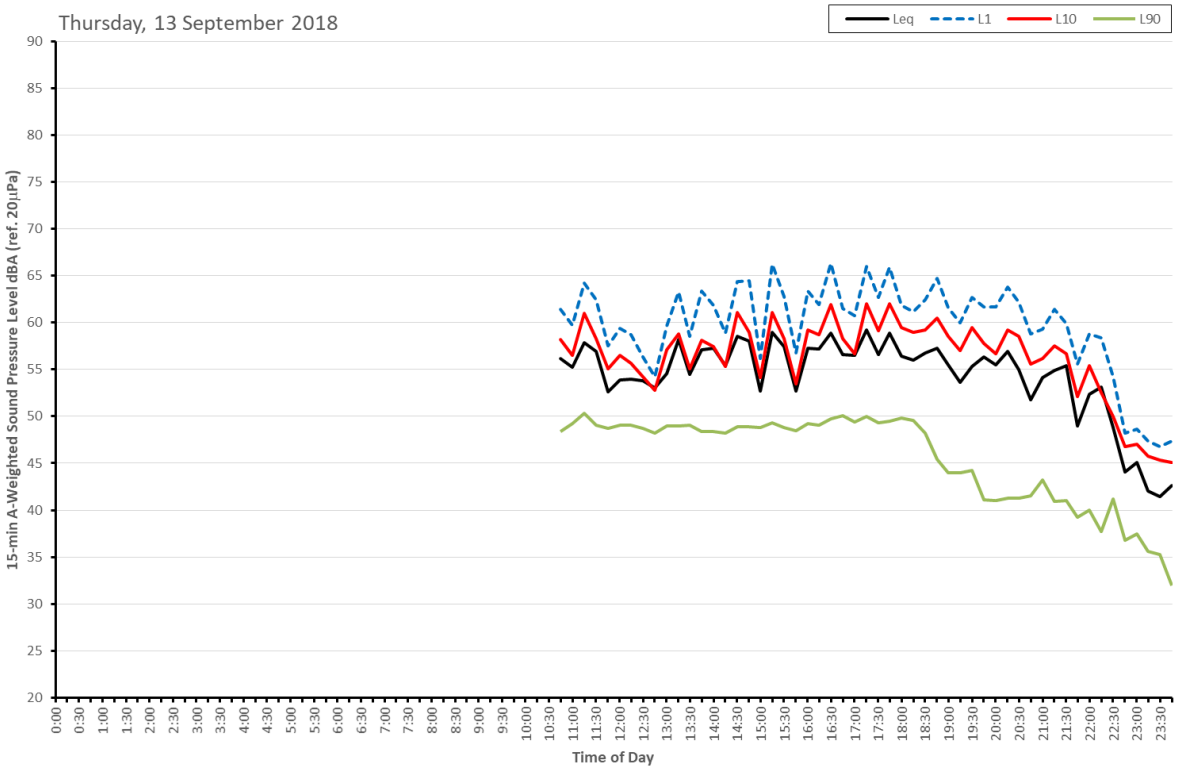
APPENDIX A: LONG-TERM NOISE MONITORING RESULTS

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.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L1
L10
L90
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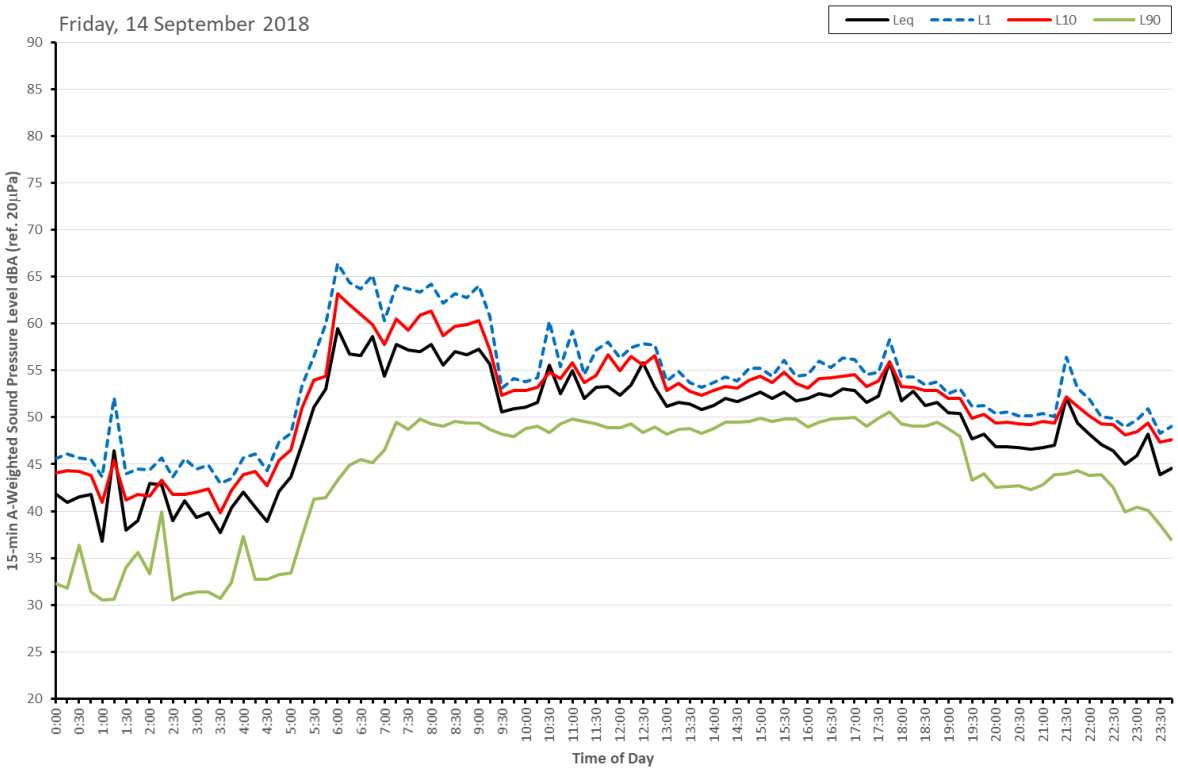
Time of Day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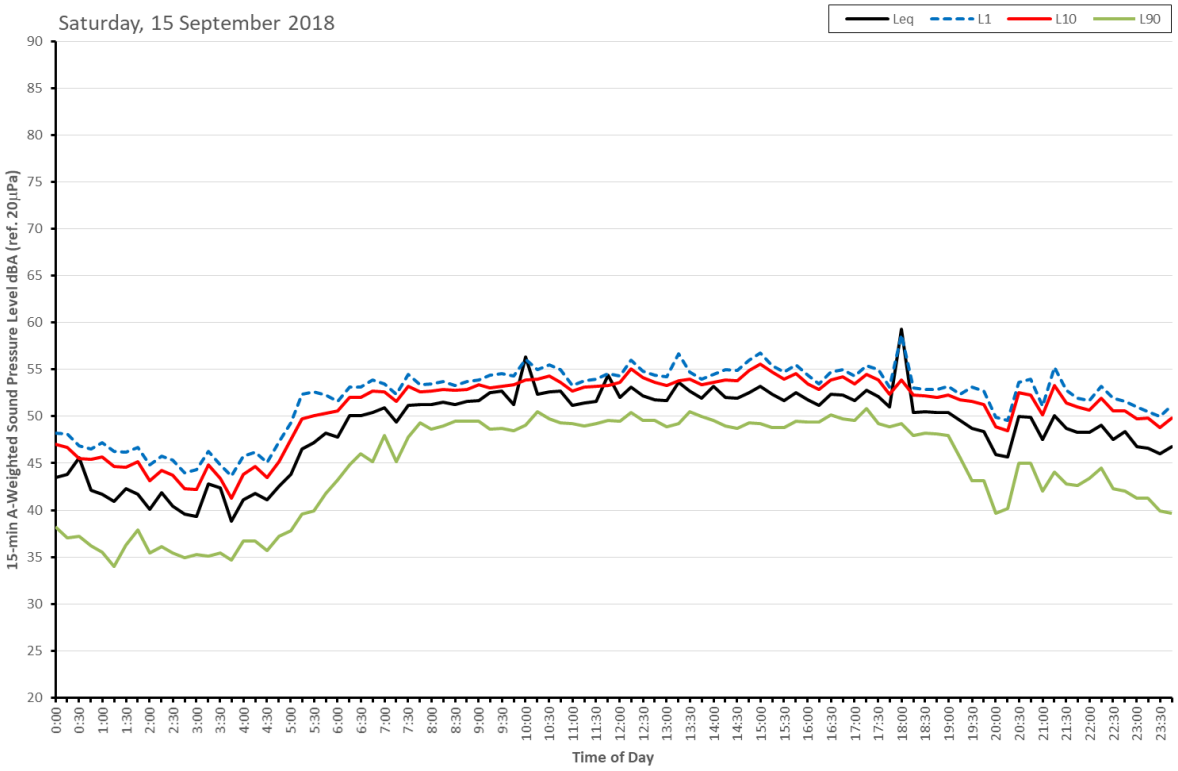
Time of Day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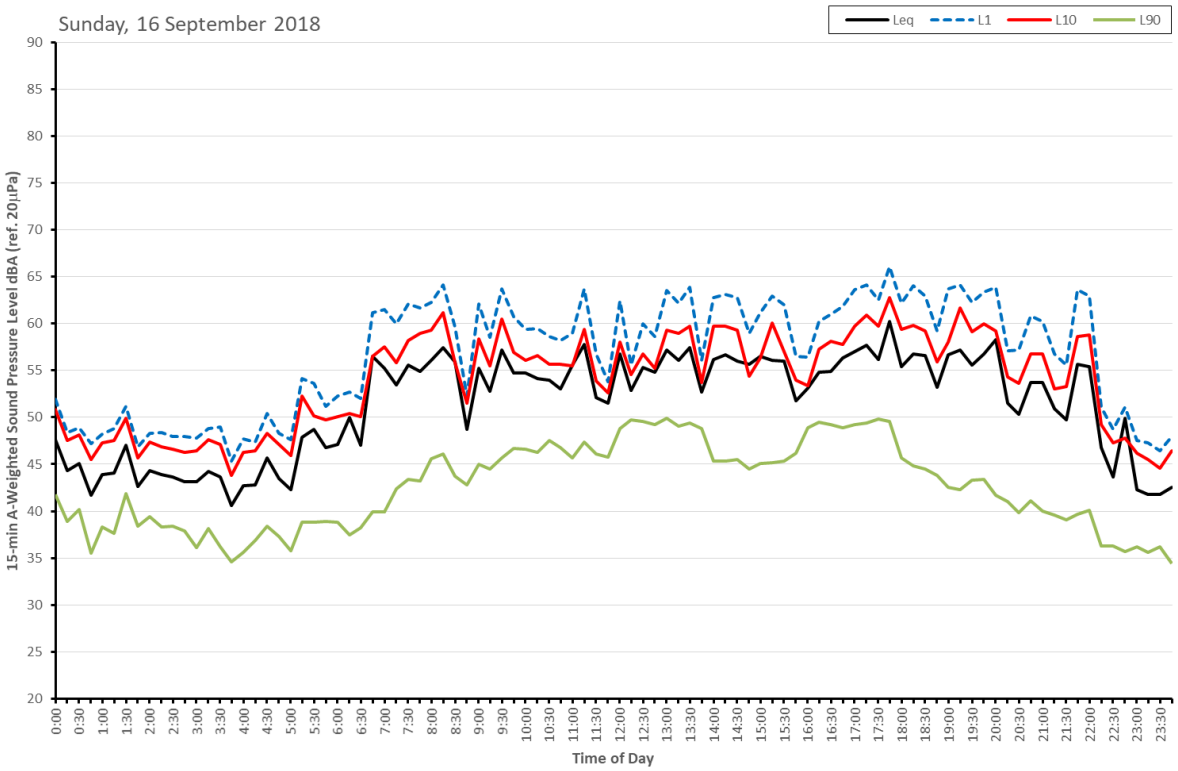
Time of Day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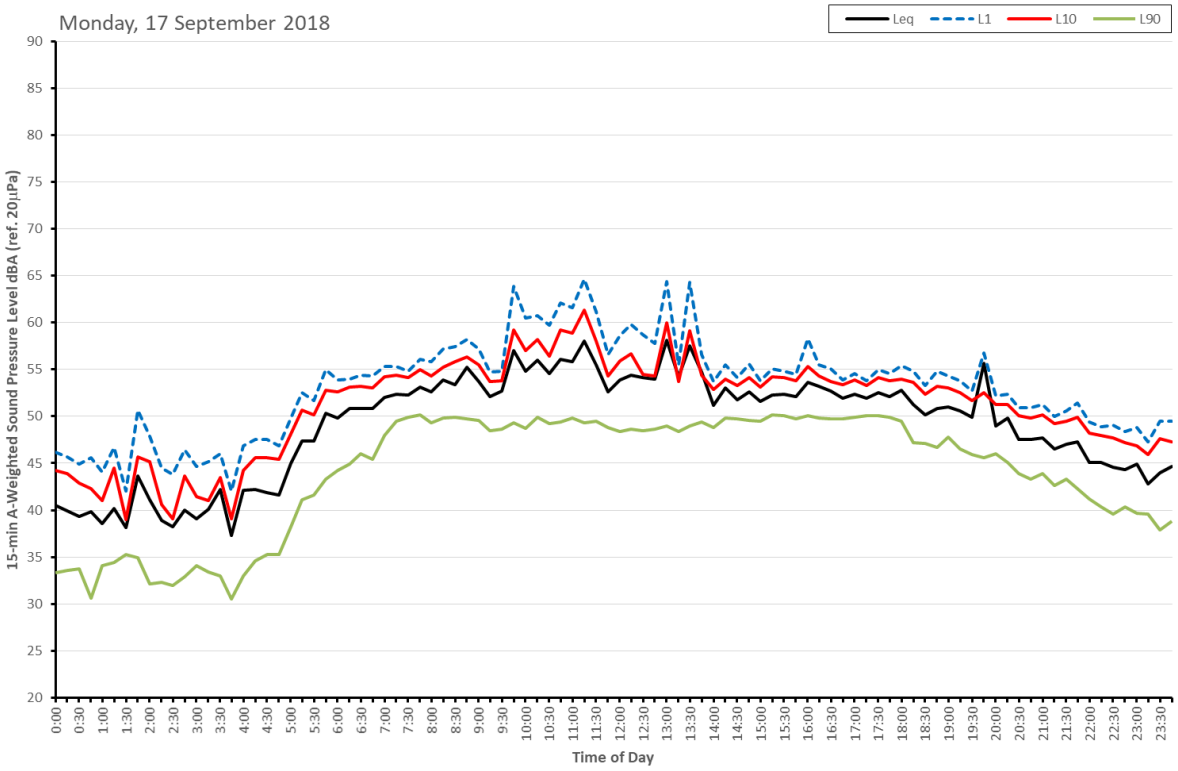
Time of Day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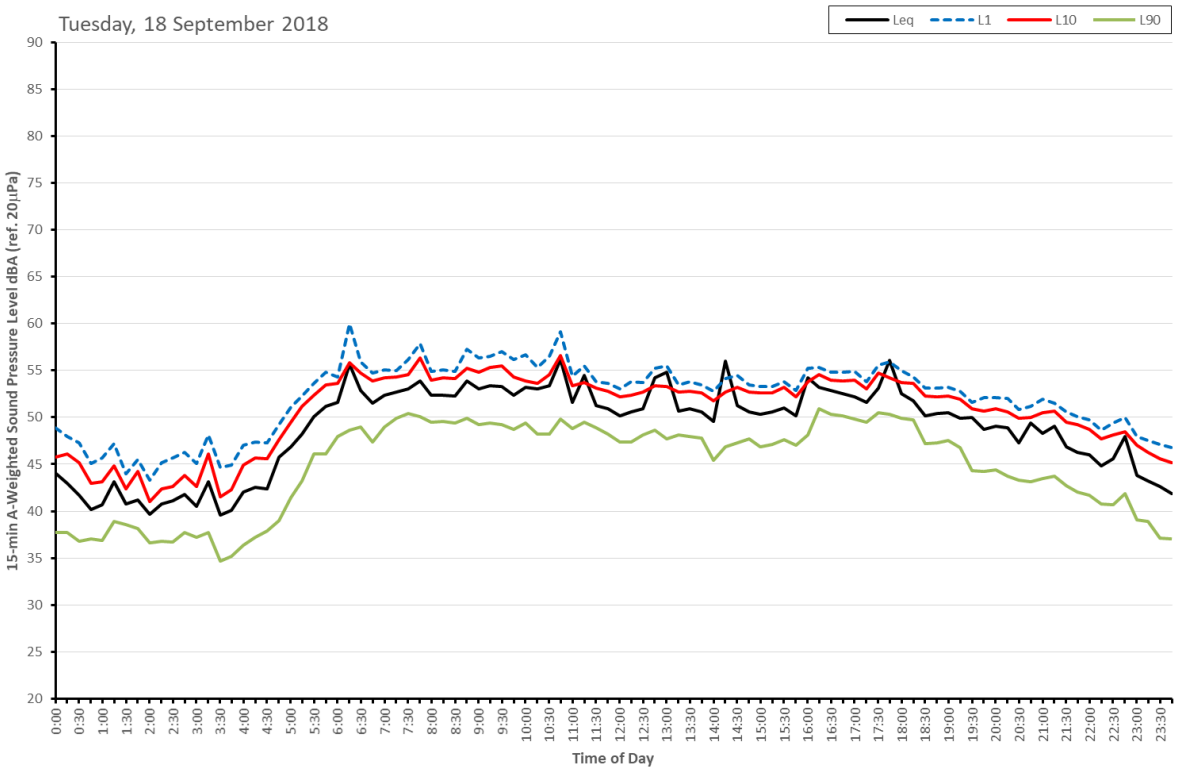
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L10
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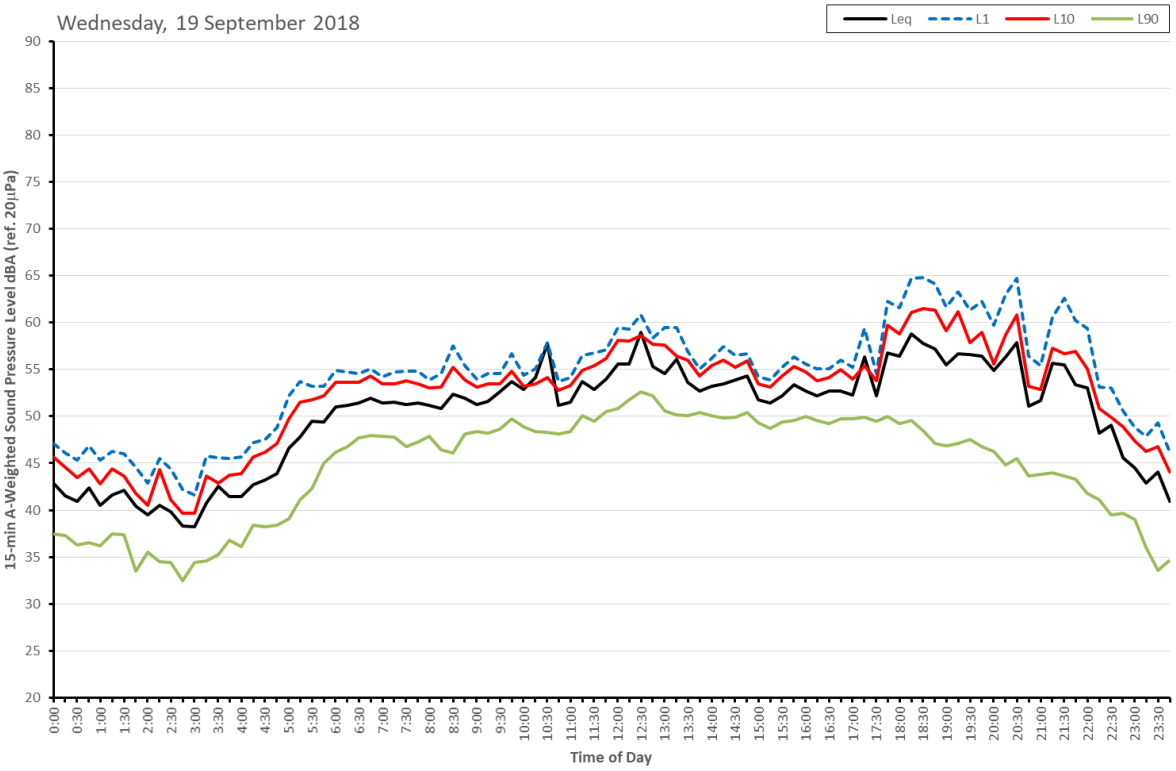
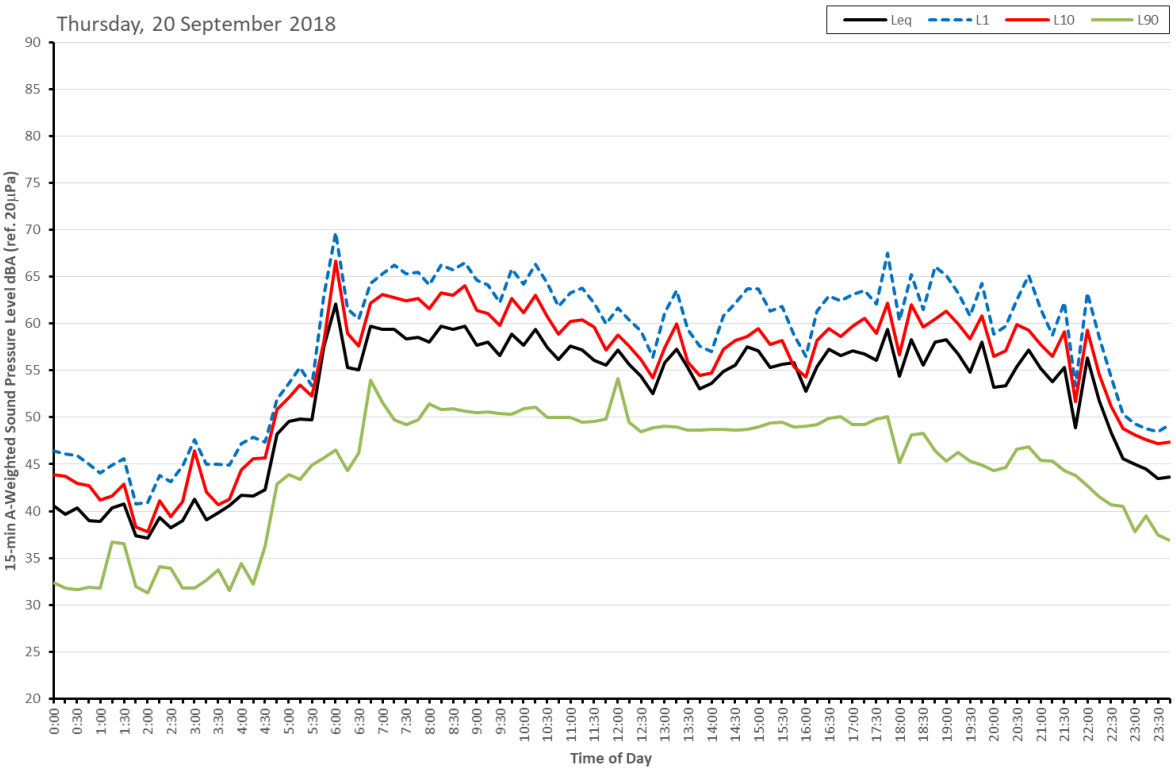
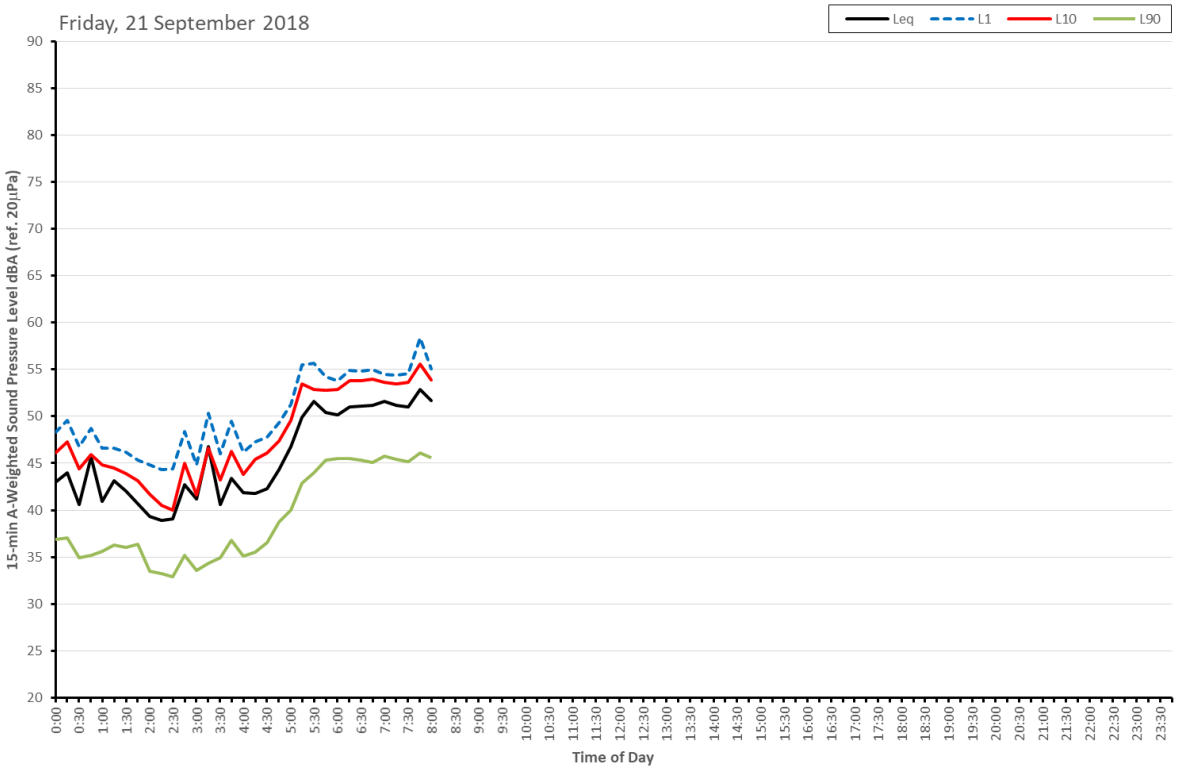
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Wednesday, 19 September 2018
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Thursday, 20 September 2018
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
Time of Day


Friday, 21 September 2018
Leq
L1
L10
L90
15-min A-Weighted Sound Pressure Level dBA (ref. 20µPa)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
0:00
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
Time of Day