RODNEY STEVENS ACOUSTICS
Acoustic Consultants

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Revision 0

Noise Impact Assessment

Proposed Boarding House Development

76 Hobart Street, St Marys

PREPARED FOR:
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C/o- Idraft Architects

7 April 2021

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by Idraft Architects to prepare a noise assessment for the proposed boarding house development at 76 Hobart Street, St Marys.

This report addresses noise impacts from the proposed boarding house. In addition, mechanical plant noise criteria have been established.

This assessment is to form part of the supporting documentation for the DA submission to Penrith Council. Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development is located at 76 Hobart Street, St Marys, it is bounded by residential premises to the west, east and south, with the T1 Northshore and Western line rail corridor to the north. The location of the proposed site and its surroundings is presented in Figure 2-1.

Figure 2-1 Site Location

Aerial image courtesy of Metro Map © 2021

2.2 Proposed Development

It is proposed to demolish the existing dwelling at 76 Hobart Street, St Marys and build a 2-storey boarding house with ground floor parking. The architectural plans of the proposed boarding house development are presented in Appendix D.

3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area, unattended noise monitoring was conducted between Thursday 25th March and Thursday 1st April 2021 at the logging locations shown in Figure 2-1. The ambient noise logger was located in the rear yard of the site. The noise monitoring at this location is representative of the ambient noise of the area.

The traffic noise logger was located in the front yard of the site. The noise monitoring at this location is representative traffic noise from Hobart Street and the T1 railway line.

Logger locations were selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from other landowners.

Instrumentation for the survey comprised of 2 RION NL-42EX environmental noise loggers (serial numbers 1173624 and 873126) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates. Measured data has been filtered to remove data measured during adverse weather conditions upon consultation with historical weather reports provided by the Bureau of Meteorology (BOM).

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10}, L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary for definitions in Appendix A). Detailed results at the monitoring location are presented in graphical format in Appendix B. The graphs show measured values of L_{A1}, L_{A10}, L_{A90} and L_{Aeq} for each 15-minute monitoring period.

3.2 Data Processing

3.2.1 Noise Emission (*Noise Policy for Industry*)

In order to assess noise emission from the proposed boarding house, the data obtained from the noise logger has been processed in accordance with the procedures contained in the NSW Environmental Protection Authority's (EPA) *Noise Policy for Industry* (NPfI, 2017) to establish representative noise levels that can be expected in the residential vicinity of the site. The monitored baseline noise levels are detailed in Table 3-1.

Table 3-1 Measured Baseline Noise Levels Corresponding to Defined NPfI Periods

Location	Measurement Descriptor	Measured Noise Level – dB(A) re 20 µPa		
		Daytime 7 am - 6 pm	Evening 6 pm – 10 pm	Night-time 10 pm – 7 am
Rear Yard	L_{Aeq}	53	54	53
	RBL (Background)	37	37	34

Notes: All values expressed as dB(A) and rounded to nearest 1 dB(A);

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

L_{A90} Noise level present for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

3.3 Noise Intrusion (State Environmental Planning Policy (Infrastructure) 2007)

To assess noise intrusion into the proposed residential development, the data obtained from the first logger location has been processed to establish representative ambient noise levels at the facades most exposed to Hobart Street and the railway corridor to the north.

The time periods used for this assessment are as defined in the State Environmental Planning Policy (Infrastructure) 2007 and the Development near Rail Corridors and Busy Roads Interim Guideline. Results are presented below in Table 3-2.

Table 3-2 Traffic Noise Levels Corresponding to Defined SEPP 2007 Periods

Location	Period	External Noise Levels dB(A)
Hobart Street	Day Time 7:00 am - 10:00 pm	$L_{Aeq(15hour)}$ 60
	Night Time 10:00 pm - 7:00 am	$L_{Aeq(9hour)}$ 57

4 NOISE GUIDELINES AND CRITERIA

4.1.1 State Environmental Planning Policy (Infrastructure) 2007

The NSW Government's State Environmental Planning Policy (Infrastructure) 2007 (SEPP (Infrastructure) 2007) was introduced to facilitate the delivery of infrastructure across the State by improving regulatory certainty and efficiency. In accordance with the SEPP, Table 3.1 of the NSW Department of Planning and Infrastructure's "*Development near Rail Corridors and Busy Roads - Interim Guideline"* (the DP&I Guideline) of December 2008 provides noise criteria for residential and non-residential buildings. These criteria are summarised in Table 4-1.

Table 4-1 DP&I Interim Guideline Noise Criteria

Type of occupancy	Noise Level dB(A)	Applicable time period
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time

Note 1: Airborne noise is calculated as $L_{Aeq(15hour)}$ daytime and $L_{Aeq(9hour)}$ night-time

The following guidance is also provided in the DP&I Guideline:

> *"These criteria apply to all forms of residential buildings as well as aged care and nursing home facilities. For some residential buildings, the applicants may wish to apply more stringent design goals in response to market demand for a higher quality living environment.*
>
> *The night-time "sleeping areas" criterion is 5 dB(A) more stringent than the "living areas" criteria to promote passive acoustic design principles. For example, designing the building such that sleeping areas are less exposed to road or rail noise than living areas may result in less onerous requirements for glazing, wall construction and acoustic seals. If internal noise levels with windows or doors open exceed the criteria by more than 10 dB(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."

The noise criteria presented in in Table 4-1 apply to a 'windows closed condition'. Standard window glazing of a building will typically attenuate noise ingress by 20 dB(A) with windows closed and 10 dB(A) with windows open (allowing for natural ventilation). Accordingly, the external noise threshold above which a dwelling will require mechanical ventilation is an $L_{Aeq(9hour)}$ of 55 dB(A) for bedrooms and $L_{Aeq(15hour)}$ of 60 dB(A) for other areas.

Where windows must be kept closed, the adopted ventilation systems must meet the requirements of the Building Code of Australia and Australian Standard 1668 – The use of ventilation and air conditioning in buildings.

4.2 Operational Noise Project Trigger Noise Levels

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the EPA. The EPA oversees the Noise Policy for Industry (NPfI) October 2017 which provides a framework and process for deriving project trigger noise level. The NPfI project noise levels for industrial noise sources have two (2) components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

4.2.1 Intrusiveness Noise Levels

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness noise level essentially means that the equivalent continuous noise level (LAeq) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15-minute period.

4.2.2 Amenity Noise Levels

The amenity noise level is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The noise levels relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured.

If it approaches the project trigger noise level value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the project trigger noise level.

4.2.3 Area Classification

The NPfI characterises the "Suburban" noise environment as an area with an acoustical environment that:

- has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry.
- This area often has the following characteristic: - evening ambient noise levels defined by the natural environment and human activity

The area surrounding the proposed development falls under the "Suburban" area classification.

4.2.4 Project Specific Trigger Noise Levels

Having defined the area type, the processed results of the unattended noise monitoring have been used to determine project specific project trigger noise levels. The intrusive and amenity project trigger noise levels for nearby residential premises are presented in Table 4-2. These project trigger noise levels are nominated for the purpose of assessing potential noise impacts from the proposed development.

In this case, the ambient noise environment is not controlled by industrial noise sources and therefore the project amenity noise levels are assigned as per Table 2.2 of the NPfI (Recommended Amenity Noise Levels) and standardised as per Section 2.2 of the NPfI. For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive project trigger noise levels are adopted. These are shown in bold text in Table 4-2.

Table 4-2 Operational Project Trigger Noise Levels

Receiver	Time of Day	ANL [1] L_{Aeq}	Measured		Project Trigger Noise Levels	
			RBL [2] $L_{A90(15min)}$	Existing $L_{Aeq(Period)}$	Intrusive $L_{Aeq(15min)}$	Amenity $L_{Aeq(15min)}$
Residential	Day	55	37	53	**42**	58
	Evening	45	37	54	**42**	48
	Night	40	31	53	**36**	43

Note 1: ANL = "Amenity Noise Level" for residences in Suburban Areas.

Note 2: RBL = "Rating Background Level".

5 TRAFFIC NOISE IMPACT ASSESMENT

5.1 Traffic Noise Assessment

In order to ascertain the existing traffic noise levels from the surrounding area, the measured noise logger data was processed in accordance to the NSW Department of Planning and Infrastructure's "*Development near Rail Corridors and Busy Roads - Interim Guideline"* assessment time periods as shown in Table 3-2.

The final façade noise levels were predicted for each time period considering the distance attenuation from each respective source, virtual source, façade's orientation and any barrier effects.

The required noise reduction via the building façade for each respective room for each time period will be compared to determine the appropriate design criteria levels.

It is typically accepted that an open window (fractionally open to meet ventilation requirements) results in an attenuation of external noise by 10 dB. This reduction has been used to predict the room noise level in the window open condition.

5.2 Recommended noise control treatment

The calculation procedure establishes the required noise insulation performance of each surface component such that the internal noise level is achieved whilst an equal contribution of traffic noise energy is distributed across each component. Building envelope components with a greater surface area must therefore offer increased noise insulation performance.

The recommended acoustic treatment is based on the following floor finishes:

- Bedrooms: Carpet and underlay
- Living Room Hard Flooring
- Kitchen/Wet Areas: Tiles

The acoustic requirements shown in this report will increase further where the bedroom floor finishes are tiled or timber.

All recommendations must be checked by others to ensure compliance with other non-acoustic requirements that Council or other authority may impose (e.g. Thermal requirements for BASIX compliance).

5.3 Glazing

The R_w rating required for each window will vary from room to room. Recommendations for windows also apply to any other item of glazing located on the external facade of the building in a habitable room unless otherwise stated.

Note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required R_w rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the requirements below.

The window systems must be tested in accordance with both of the following:

- Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing; and
- AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.

It is necessary to submit such Laboratory certification for the proposed glazing systems (i.e. windows and framing systems) (e.g. NAL or CSIRO) for approval by RSA prior to ordering or commitment.

The entire frame associated with the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed.

It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated above. Where this is the case the acoustic requirements must clearly be superseded by the structural or fire rating demands.

Table 5-1 presents the minimum recommended R_w (weighted noise reduction) for glazing elements.

Table 5-1 Minimum Acoustic Rating (R_w) Required for Glazing Elements

Level	Room	Minimum Glazing Rw Rating	Glazing System
Ground	Communal Room	Rw 27	6.38mm Laminated
	Room 1	Rw 34	10.38mm Laminated
	Room 2	Rw 34	10.38mm Laminated

Level	Room	Minimum Glazing Rw Rating	Glazing System
Ground	Room 3	Rw 32	6.38mm Laminated
Level 1	Rooms 4 to 10 (North Façade)	Rw 34	10.38mm Laminated
	Rooms 11 to 17 (South Façade)	Rw 32	6.38mm Laminated

5.4 Detailing

Note that well-detailed construction and careful installation is needed to achieve the required R_w acoustic ratings. All gaps are to be minimised and fully sealed with an acoustic rated sealant, such as FireBan One by Bostik or Sikaflex Pro 2HP by Sika.

6 OPERATIONAL NOISE ASSESSMENT

6.1 Mechanical Plant Noise Assessment

A specific mechanical plant selection has not been supplied at this stage. It is anticipated that the building will be serviced by typical mechanical ventilation/air conditioning equipment.

It is likely that the criteria set out in Table 4-1 will be met through the use of conventional noise control methods (e.g. selection of equipment on the basis of quiet operation and, where necessary, providing enclosures, localised barriers, silencers and lined ductwork).

An appropriately qualified acoustic consultant should review the mechanical plant associated with the development at the detailed design stage when final plant selections have been made.

6.2 Typical Vocal Levels

Calculations of the amount of noise transmitted to these receivers from the proposed boarding house have been based on voice levels as referenced in the Handbook of Acoustical Measurements and Noise Control by Cyril M. Harris. This handbook provides voice spectrums for males and females as well as different vocal efforts. The spectrum is given in Table 6-1.

The spectra have been scaled based upon the overall number of patrons expected to be in the outdoor areas at any given time

Table 6-1 Speech Spectrums - Handbook of Acoustical Measurements and Noise Control.

Type	Noise Level (dB) at Octave Band Centre Frequency (Hz)							Overall dB(A)
	125	250	500	1 k	2 k	4 k	8 k	
Male (Normal)	49	55	58	51	47	43	37	58
Female (Normal)	37	51	54	49	44	43	38	55

It is generally agreed that the human voice is not capable of producing noise at 32 Hz and 63Hz octave bands at significant amplitudes

6.3 Tenant Sound Power Levels

Based on a maximum number of 18 tenants in the communal open space (assuming that 1 tenant per unit will be using the space), the following operational scenarios have also been assumed for our assessment:

- A realistic operational total of 9 people will be using the communal open space at once approx. 50% of the total tenancy. Therefore, 50 percent of the patrons will be talking (one person talks and one person listens), the operational scenario will be 4 tenants talking at any one time in the communal open space.

Table 6-2 Sound Power Levels of People talking with Raised Vocal - L_w – dB(A)

Scenario	Resultant Sound Power Level per Octave Band (dB)							
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
4 Tenants with Normal Vocal in the Outdoor Area	16	65	71	74	67	63	59	53

6.4 Noise Emissions Calculation

Calculations of the noise levels from the use of the communal open space have been carried out using the data in Table 6-2. We have used an operational scenario where 9 tenants are using the communal open space at the same time. Calculations consider factors such as distance, shielding from buildings and barriers.

The following figure presents the proposed development and all sensitive receivers

Figure 6-1 Sensitive Receiver Location

6.5 Predicted Noise Levels

6.5.1 Communal Open Space

Predictive resultant noise levels have been calculated for residents using the communal open space. Noise emissions at the nearest residential receivers are presented in the table below. The predicted noise calculations consider the following:

- Heights of receivers are assumed to be 1.5 meters above their respective floor level.
- A solid 2.1m fence on the north and east boundaries as per the figure in Appendix E.
- Up to 9 people will be using the communal open space at a time.
- Resulting noise levels have been calculated to the most affected point on the boundary of the affected receivers

Table 6-3 Predicted Noise Levels At Sensitive Receivers – Communal Areas

Receiver	Period	Calculated Noise Level L_{Aeq} – dB(A)	Criteria	Compliance
R1	Day	31	42	Yes
	Evening	31	42	Yes
	Night	31	36	Yes
R2	Day	32	42	Yes
	Evening	32	42	Yes
	Night	32	36	Yes
R3	Day	38	42	Yes
	Evening	38	42	Yes
	Night	38	36	No*

*No tenants are allowed to use the outdoor communal area from the hours of 10pm - 7am.

We note that our calculations assumed that the communal open space will only be used by the tenants and no larger social gatherings will take place.

6.5.2 Carpark Emission

The proposed car park is to be located on the lower ground level, it has a capacity of 9 cars, calculations of noise from the carpark have been based on typical noise generating events within a carpark such as, door slams, engine starts and cars driving away. We have assumed an operational scenario were 3 cars (33%) enter or leave the carpark in a span of 15 minutes.

The calculated noise levels from the activities carried out within the carpark are presented in the table below:

Table 6-4 Predicted Noise Levels at sensitive receivers - Carpark

Receiver	Period	Calculated Noise Level L_{Aeq} – dB(A)	Criteria	Compliance
R1	Day	36	42	Yes
	Evening	36	42	Yes
	Night	36	36	Yes
R2	Day	37	42	Yes
	Evening	37	42	Yes
	Night	37	36	Yes*
R3	Day	30	42	Yes
	Evening	30	42	Yes
	Night	30	36	Yes

*We note that 1dB exceedance is considered acoustically insignificant.

The operation of the carpark shows compliance to the established noise criteria. No further noise control measures are required for the carpark.

7 RECOMMENDATIONS

7.1 Outdoor Communal Area Mitigation Recommendations

To ensure the future amenity of nearby sensitive receivers, the following is recommended:

- No music is to be played in the outdoor communal area at any time.
- No tenants are allowed to use the outdoor communal area from the hours of 10pm - 7am
- A solid 2.1m no gaps construction fence must be installed as per Appendix E.

8 CONCLUSION

Rodney Stevens Acoustics has conducted a review of the proposed boarding house at 76 Hobart Street, St Marys. The review has assessed the noise generation and intrusion of the site and compared it with the noise criteria required by Penrith Council and other relevant standards.

Noise emissions criteria for mechanical plant has been established in this report, a future noise survey may be required once the mechanical plant schedules are available.

Based on the noise impact study conducted, the proposed development is assessed to comply with Penrith Council noise criteria with recommendations from this report. It is therefore recommended that planning approval be granted for the proposed development on the basis of acoustics.

Approved: -

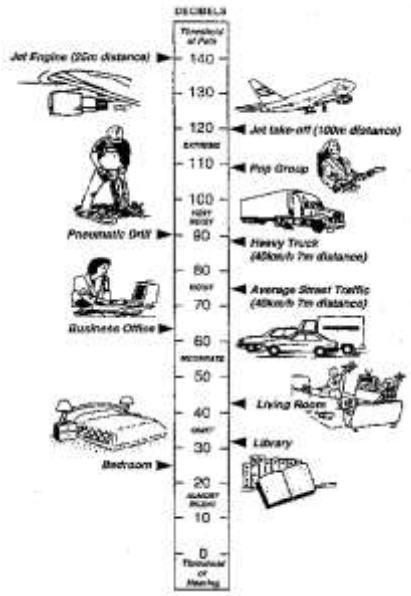
Rodney Stevens

Manager/Principal

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, considering the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.

Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10^{th} percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

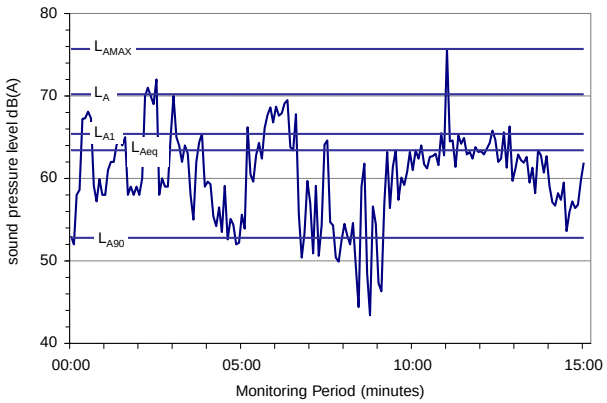
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} Noise level present for 10% of the 15-minute interval. Commonly referred to the average maximum noise level.

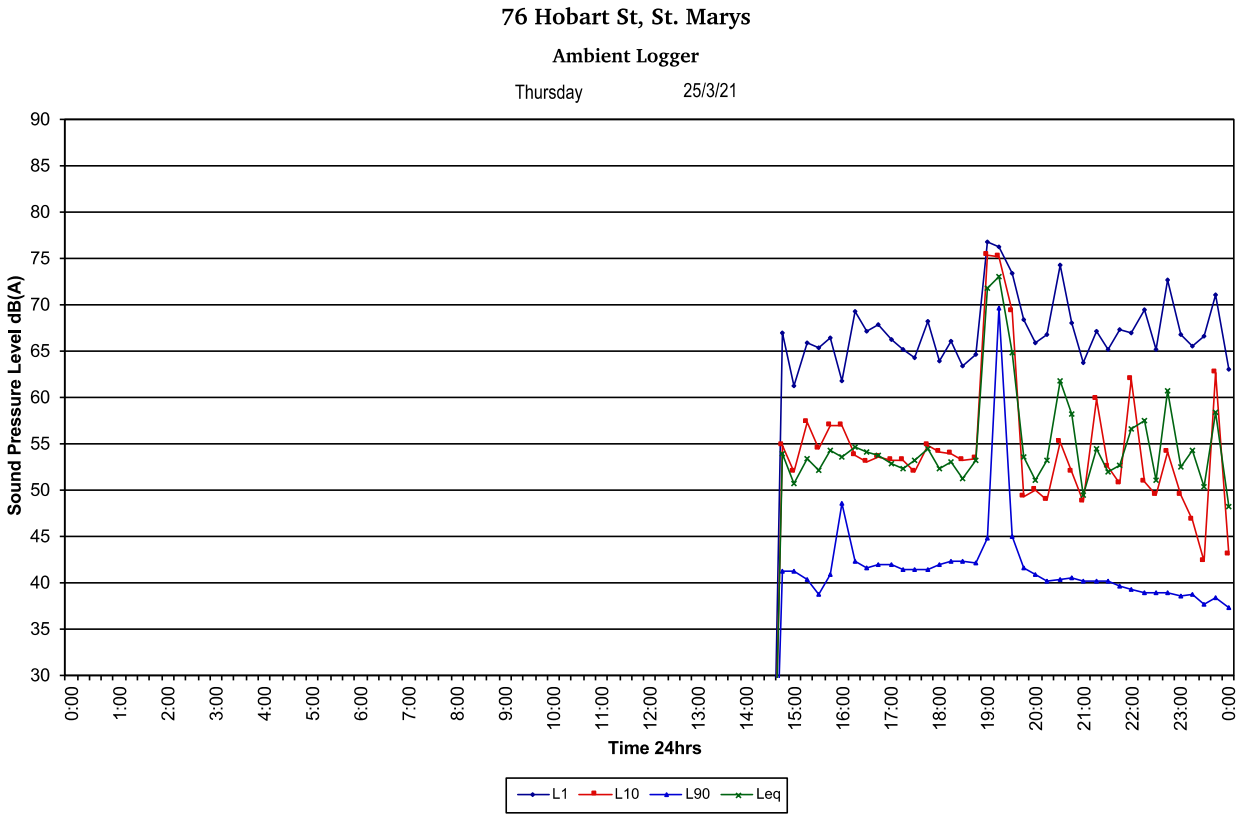
L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

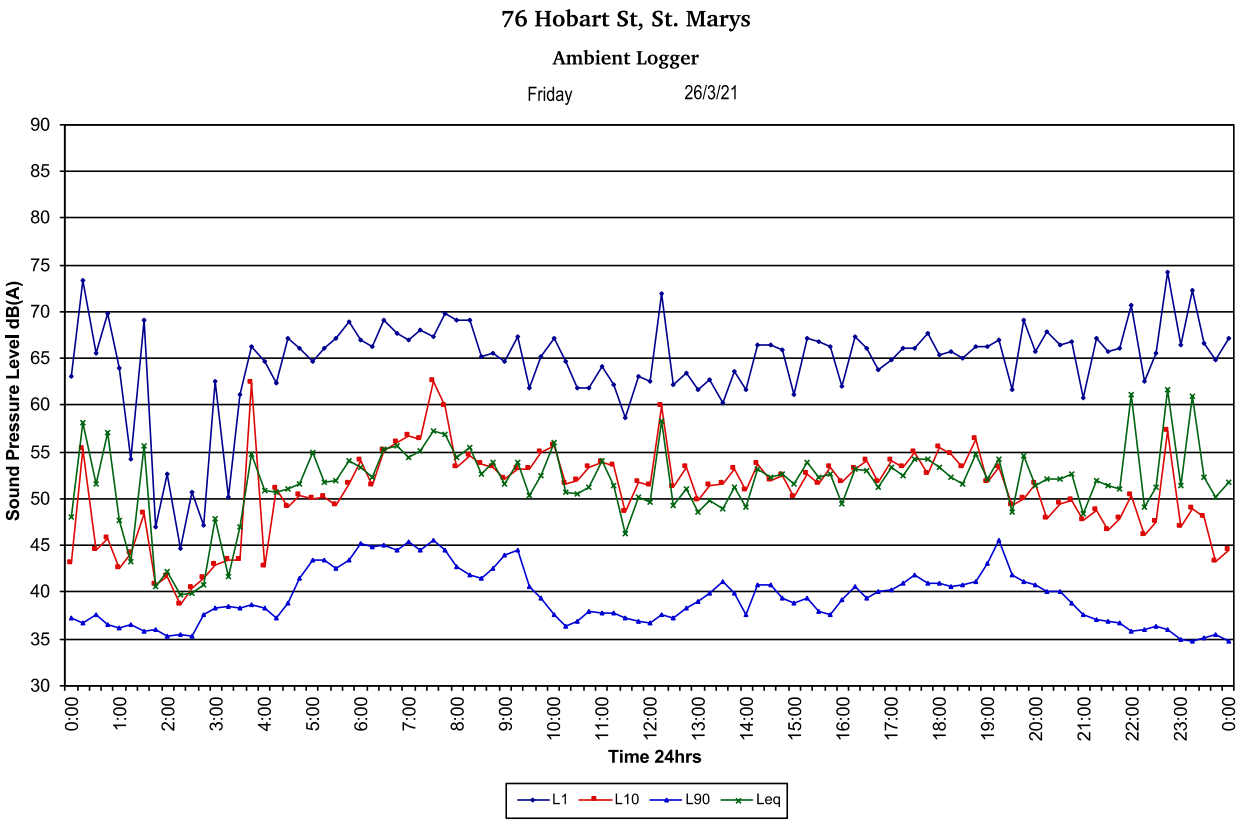
L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

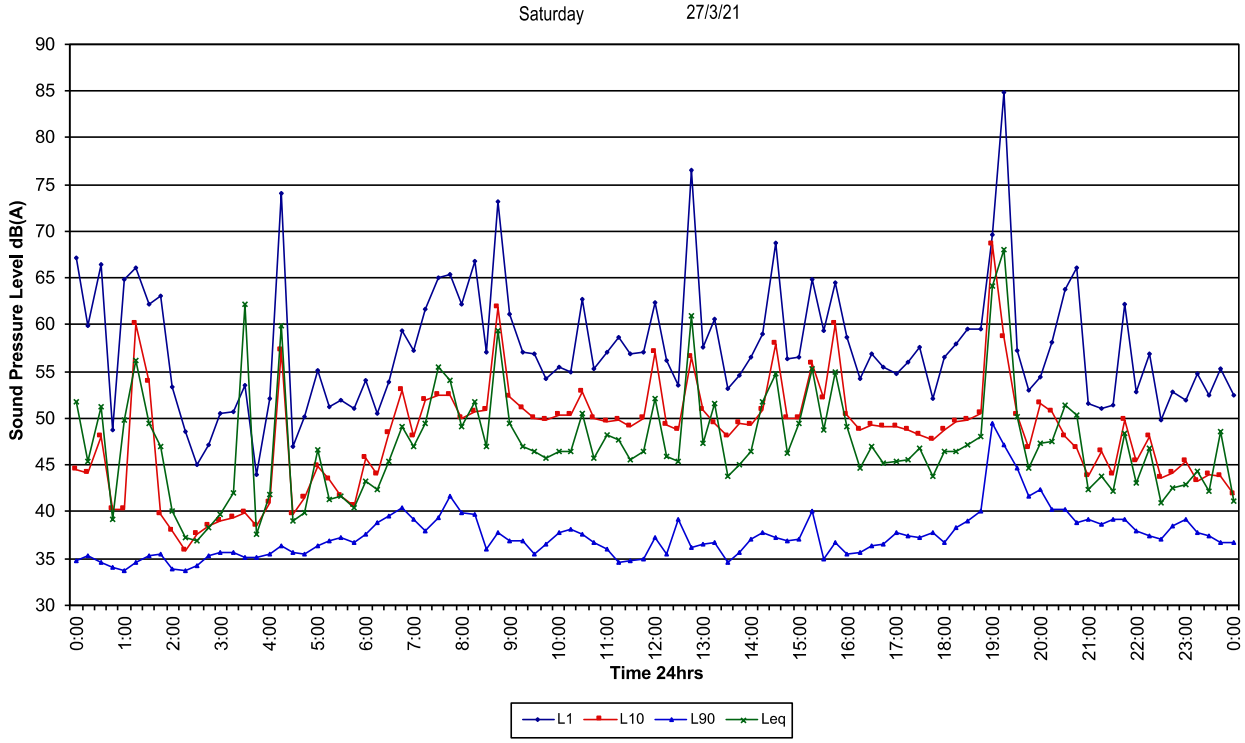
Threshold The lowest sound pressure level that produces a detectable response (in an instrument/person).

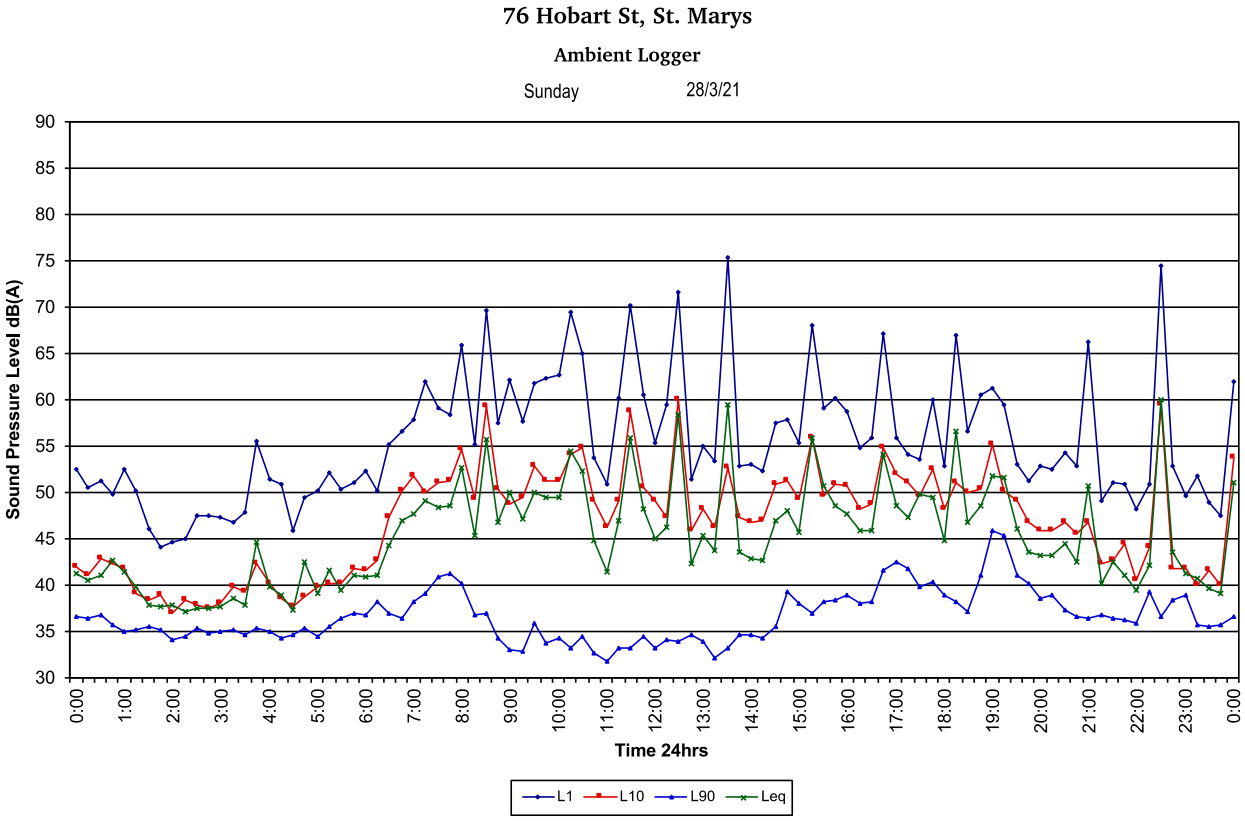
Tonality Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

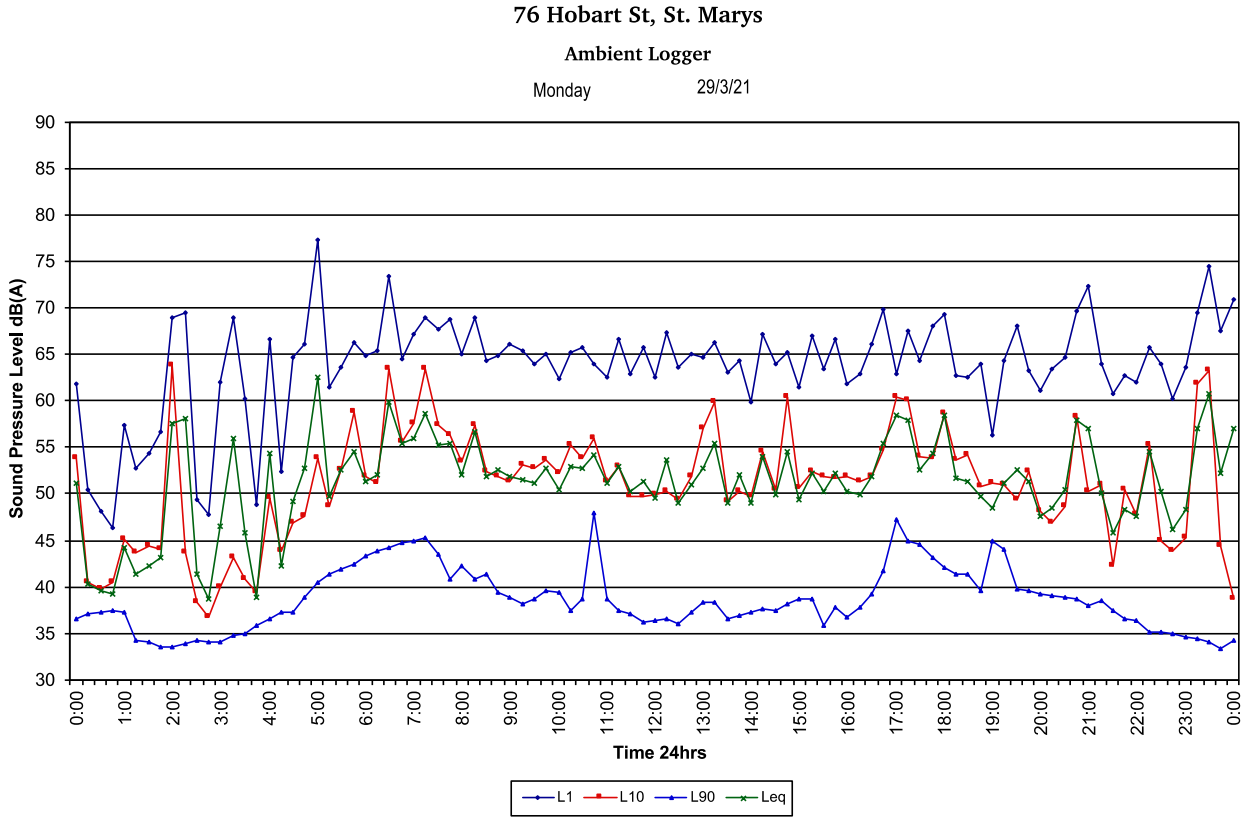
Appendix B – Logger Graphs

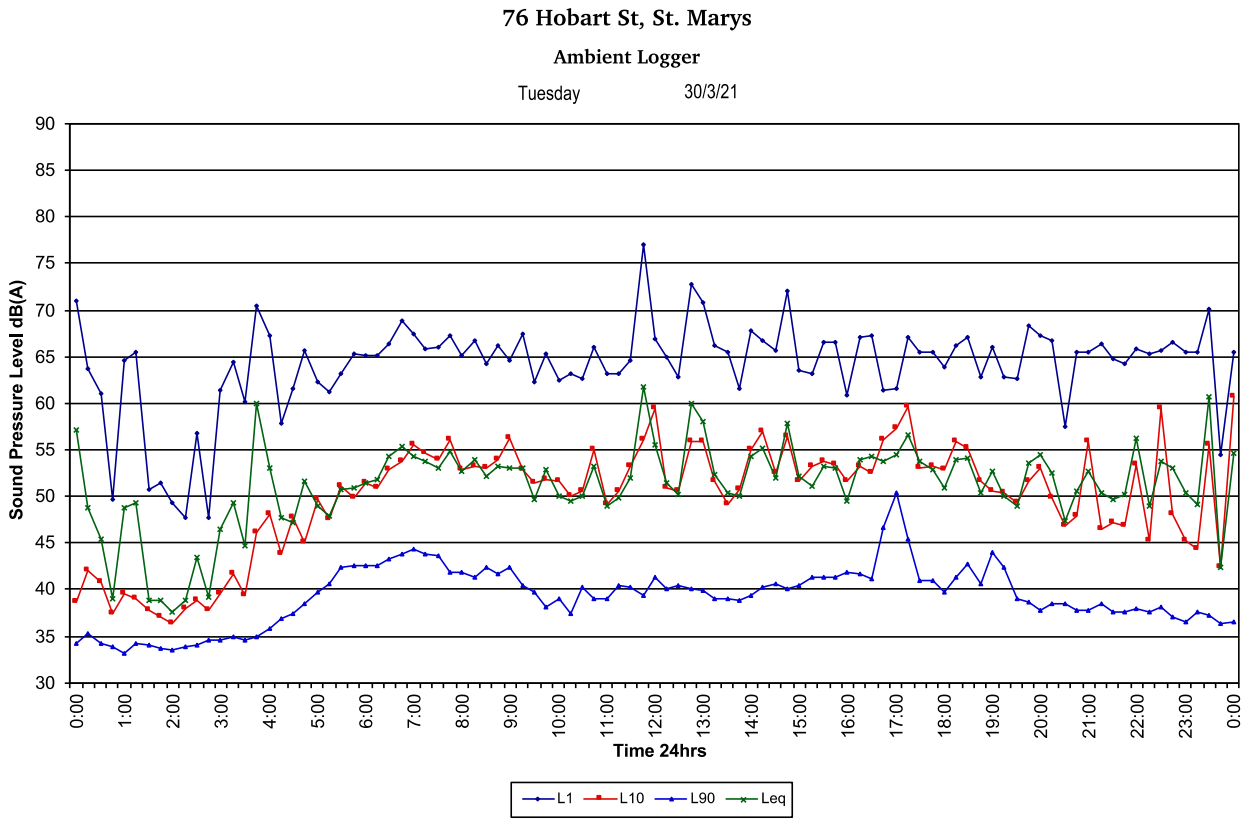


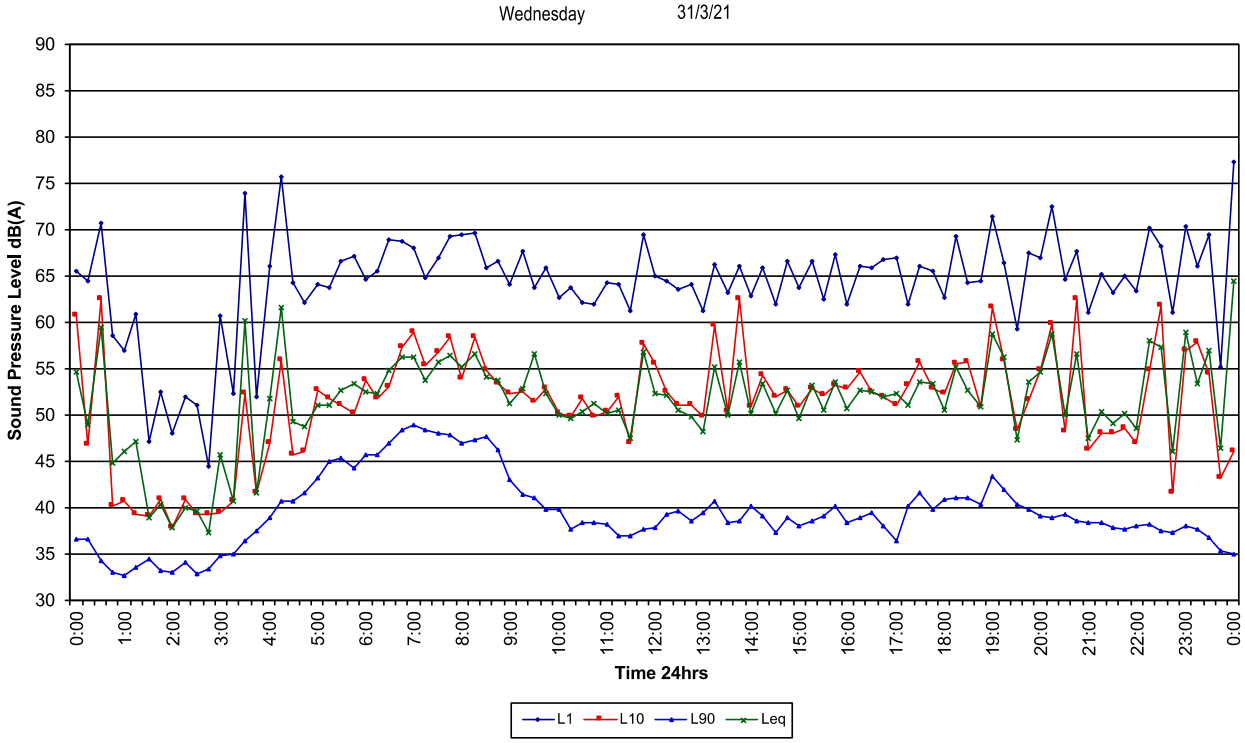


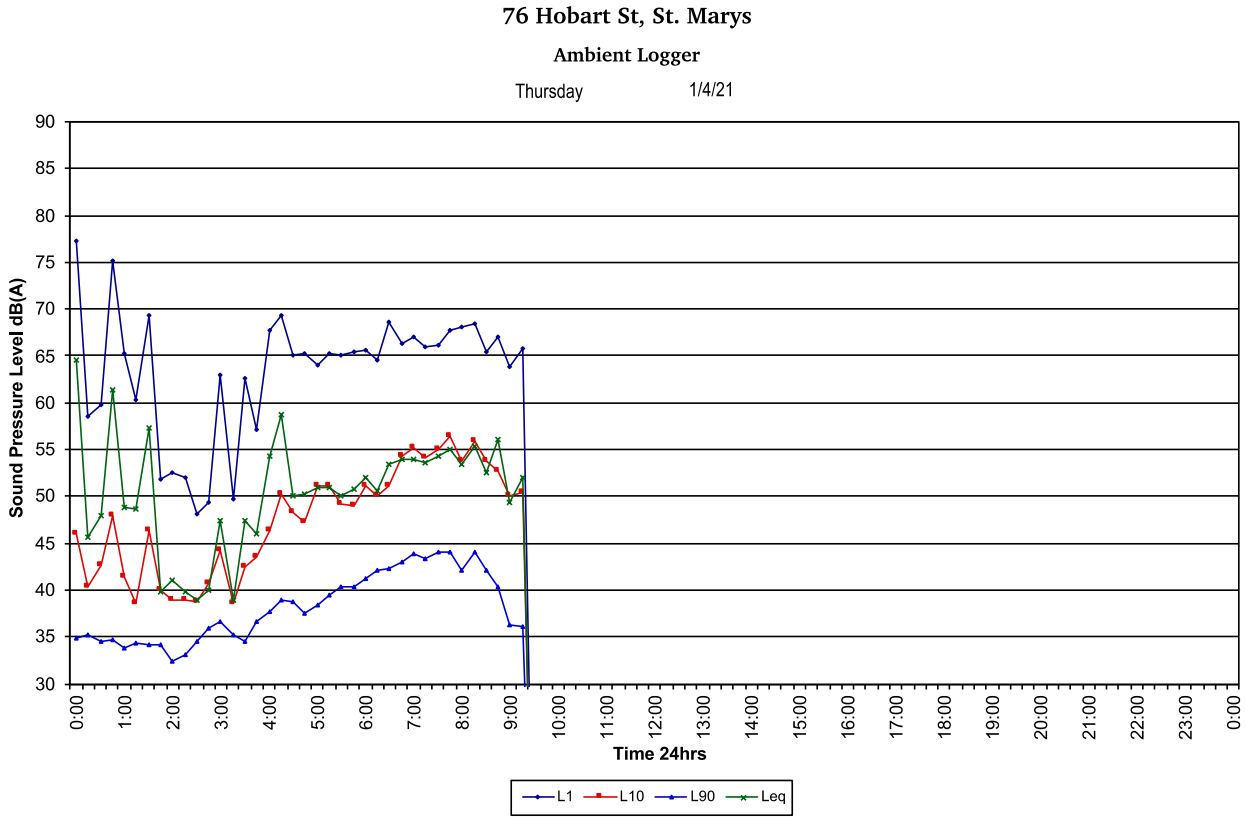


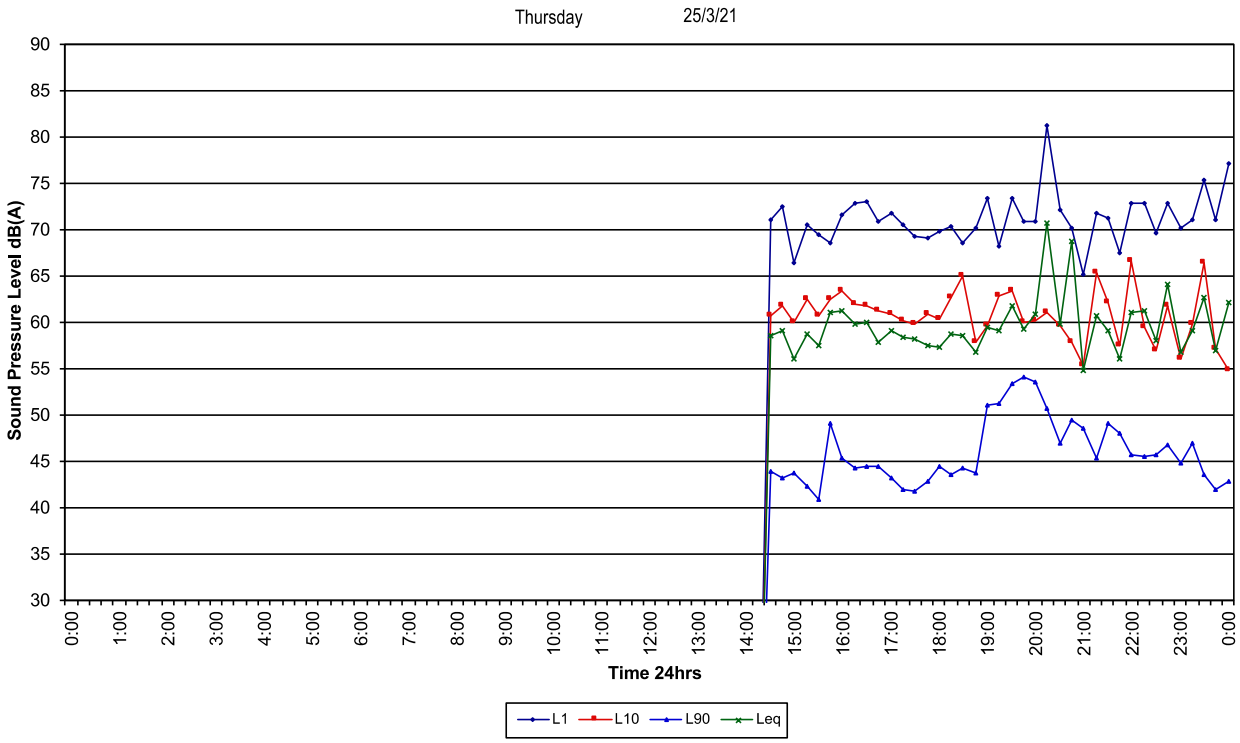


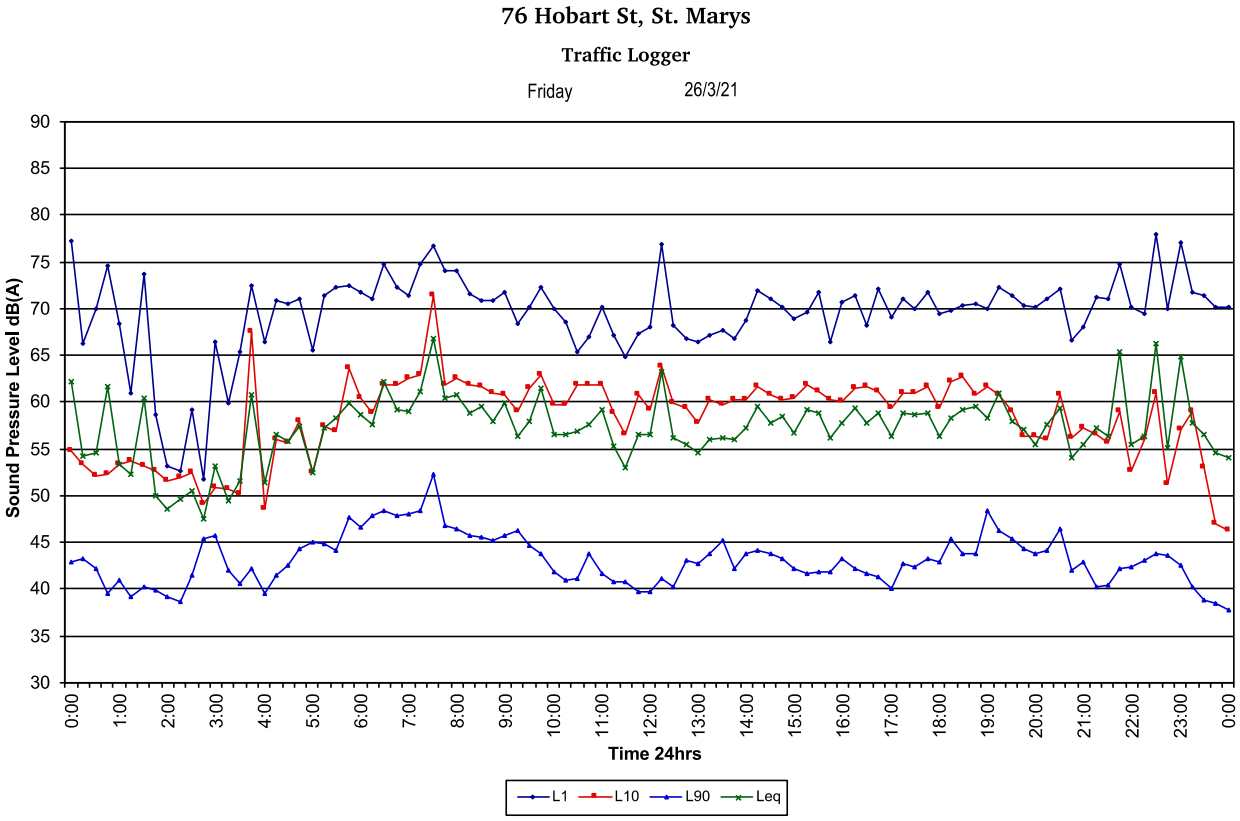


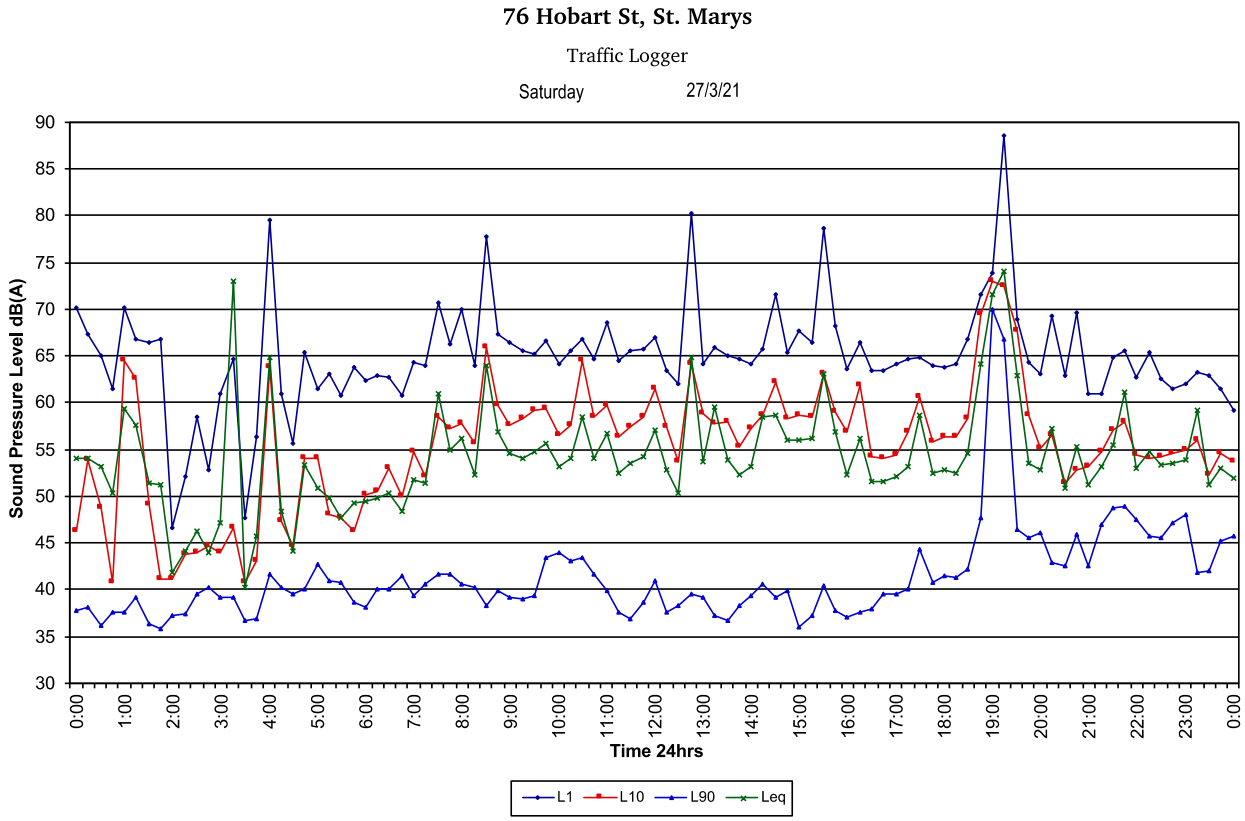


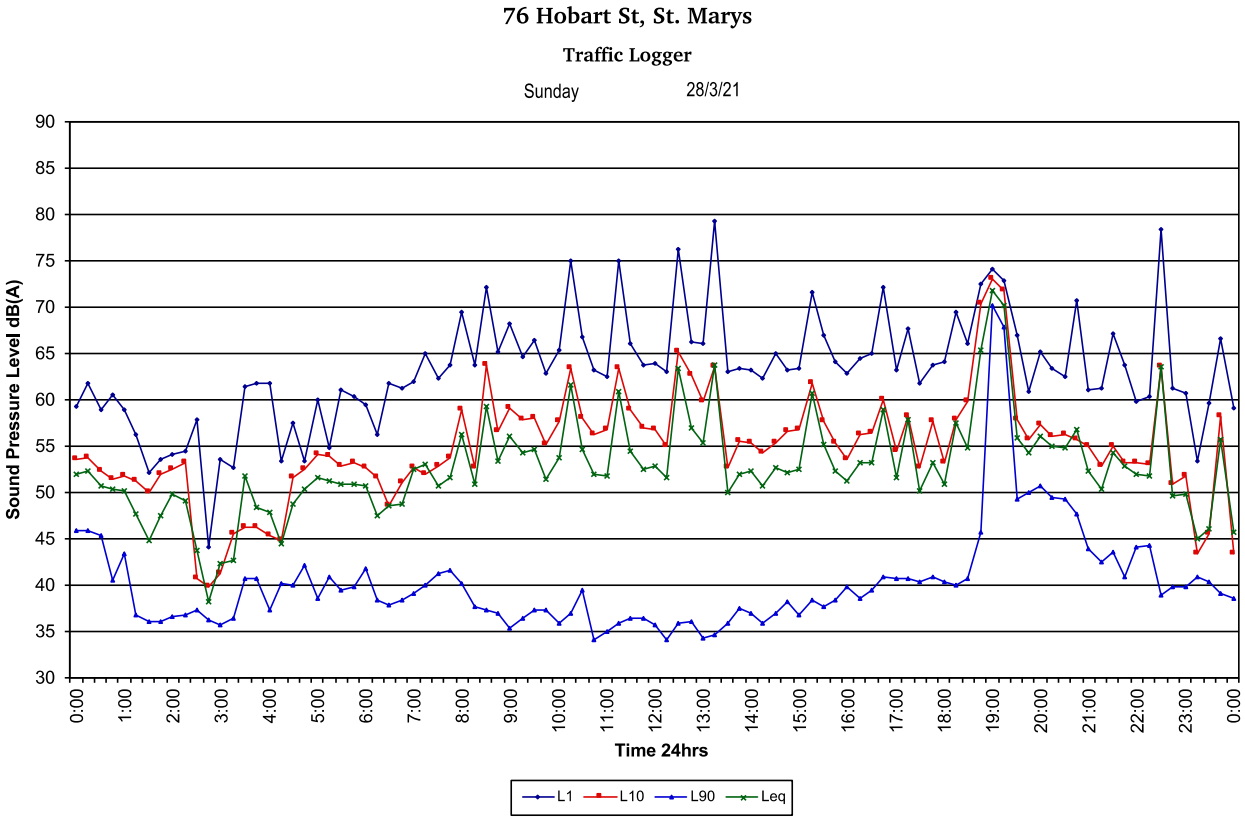


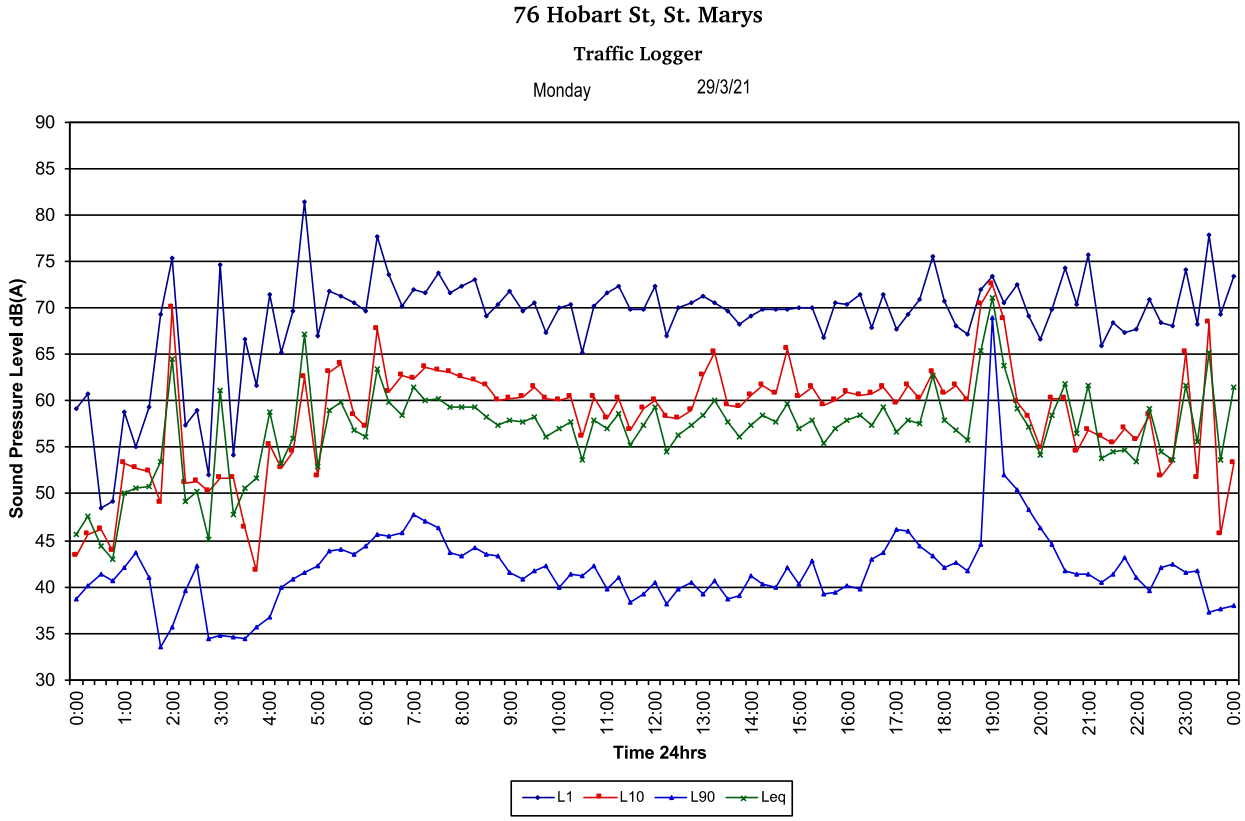


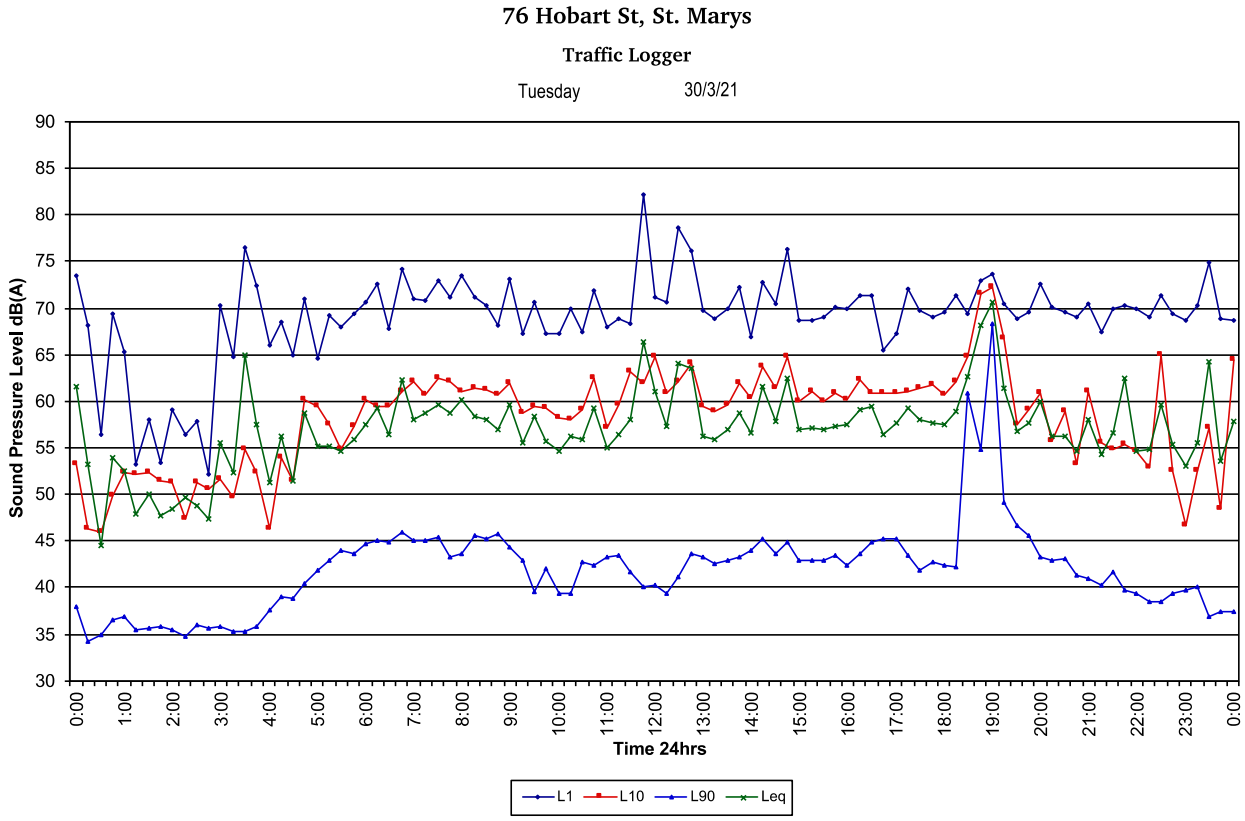


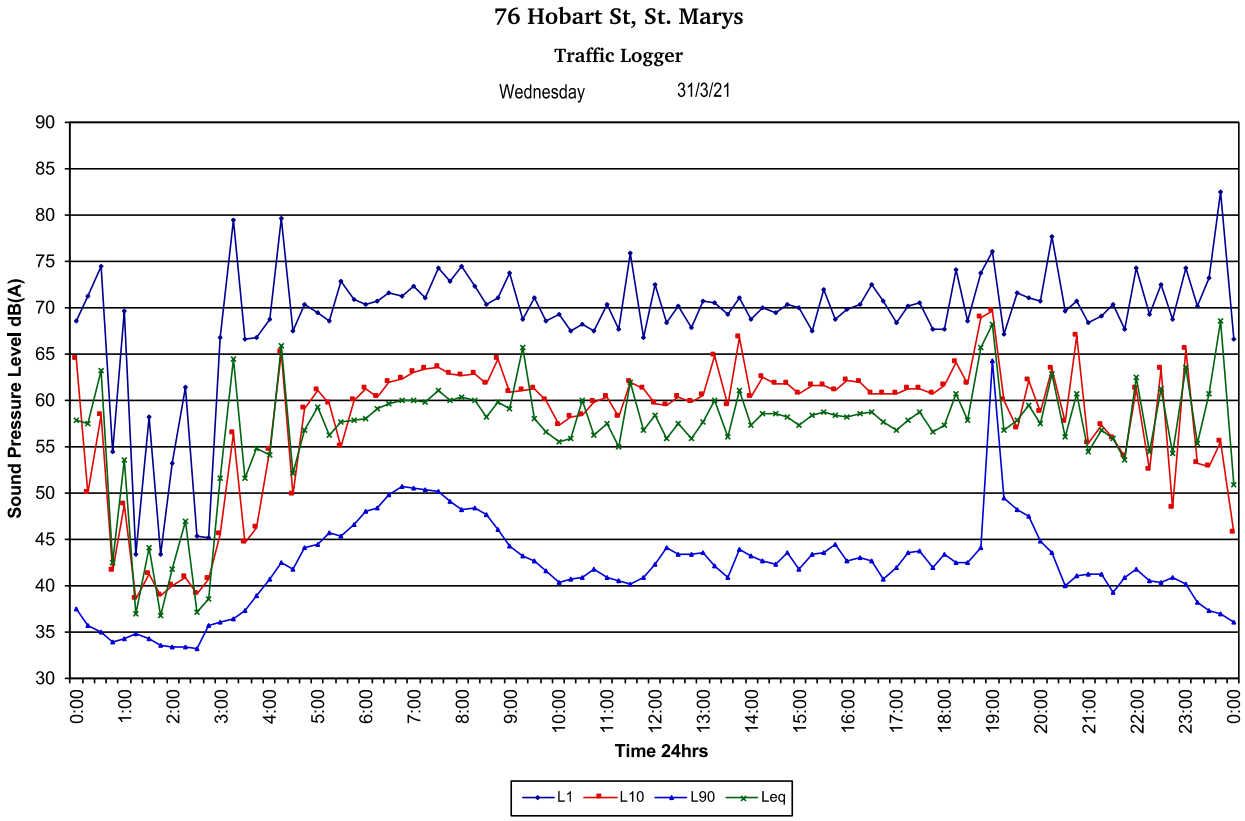


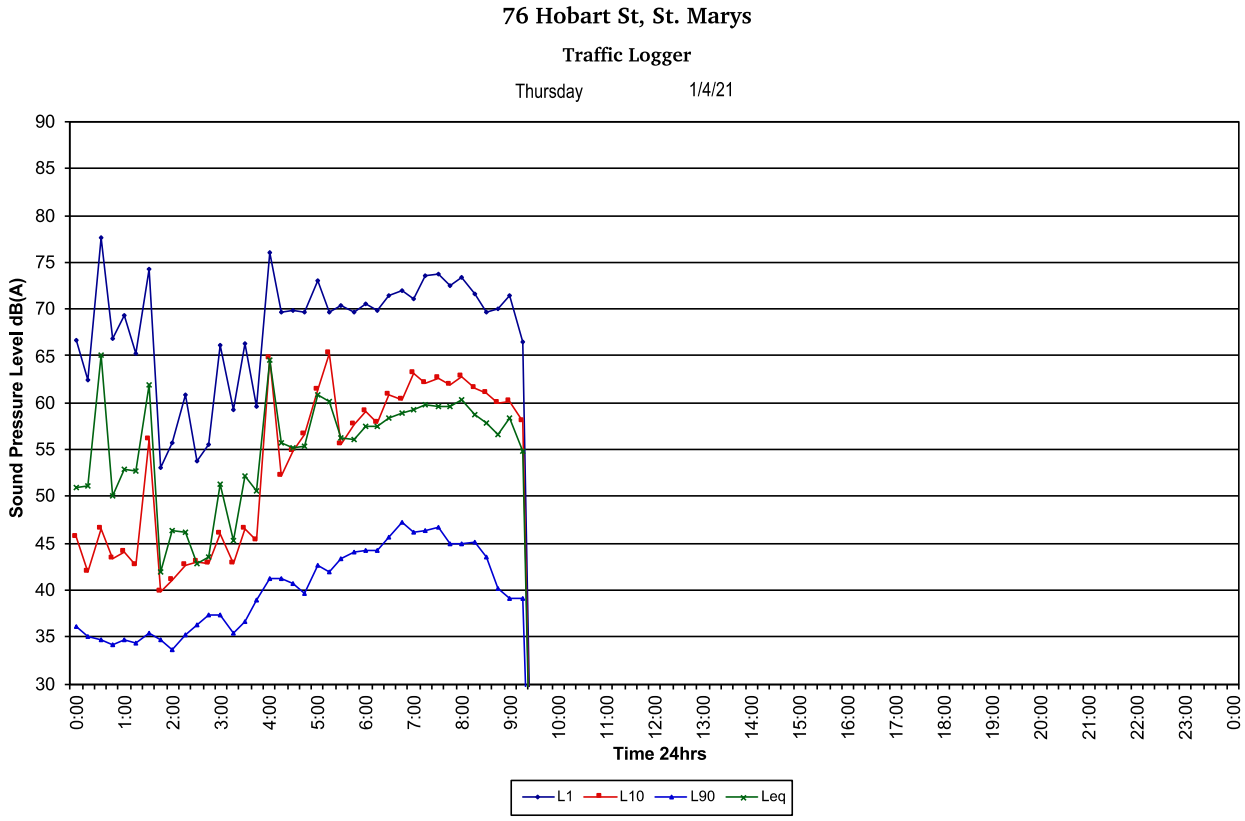












Appendix C – Calibration Certificate

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate
Calibration Number C19551

Client Details	Acoustic Research Labs Pty Ltd 36/14 Loyalty Road North Rocks NSW 2151
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	01173624
Microphone Serial Number :	172186
Pre-amplifier Serial Number :	74036

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	24.4°C	**Ambient Temperature :**	24.4°C
Relative Humidity :	31.3%	**Relative Humidity :**	35.4%
Barometric Pressure :	101.55kPa	**Barometric Pressure :**	101.93kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 11 Sep 2019

Secondary Check: James Jepsen
[redacted]ep 2019

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Res	[illegible]ested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.18dB*	*Temperature*	*±0.2°C*
12.5kHz	*±0.19dB*	*Relative Humidity*	*±2.4%*
16kHz	*±0.29dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.11dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Accredited for compliance with ISO/IEC 17025 - calibration.
Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Acoustic Research Labs Pty Ltd
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Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C20393

Client Details	Acoustic Research Labs Pty Ltd Unit 36, 14 Loyalty Road North Rocks NSW 2151
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	00873126
Microphone Serial Number :	172453
Pre-amplifier Serial Number :	73502

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	22.3°C	**Ambient Temperature :**	23.4°C
Relative Humidity :	47.8%	**Relative Humidity :**	46.7%
Barometric Pressure :	100.8kPa	**Barometric Pressure :**	100.71kPa

Calibration Technician : Jeff Yu
Calibration Date : 13 Jul 2020

Secondary Check: Max Moore
Rep [redacted] Jul 2020

Approved Signatory : [redacted] Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13dB*	*Temperature*	*±0.2°C*
1kHz	*±0.13dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.14dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests	*±0.10dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

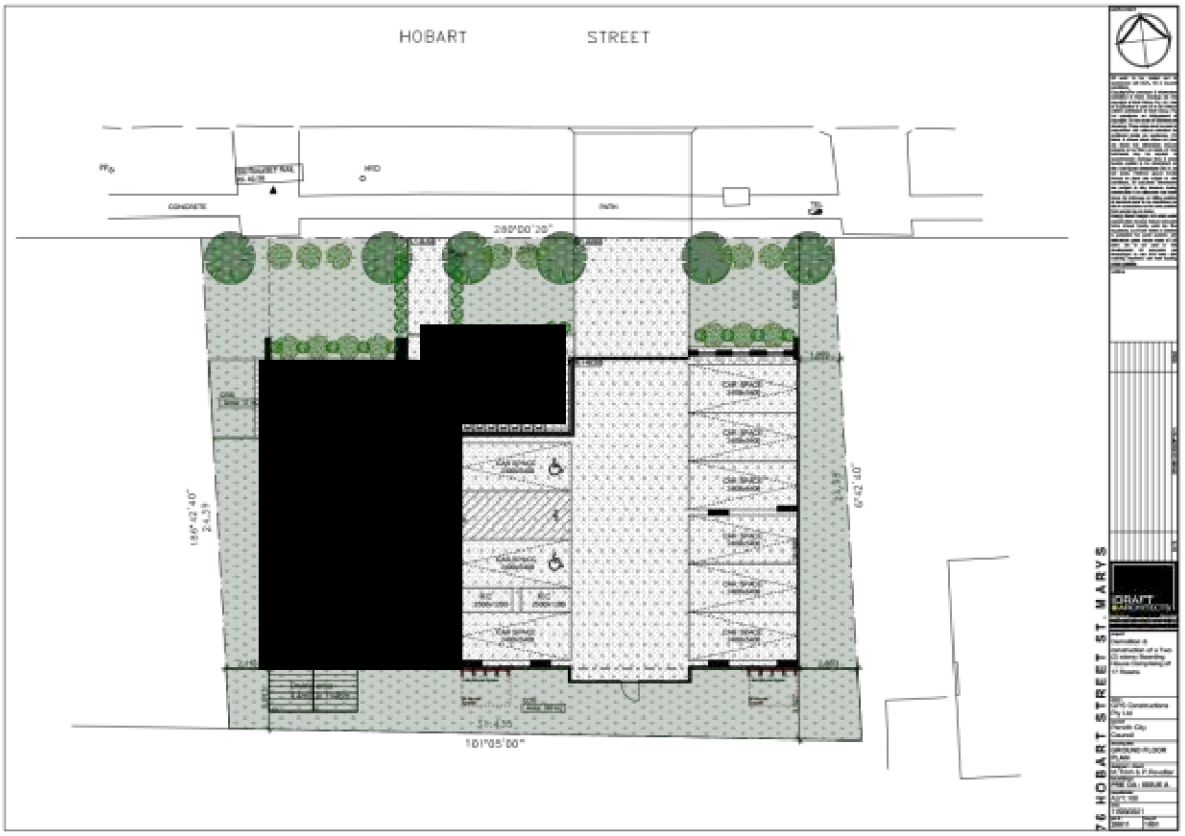
This calibration certificate is to be read in conjunction with the calibration test report.

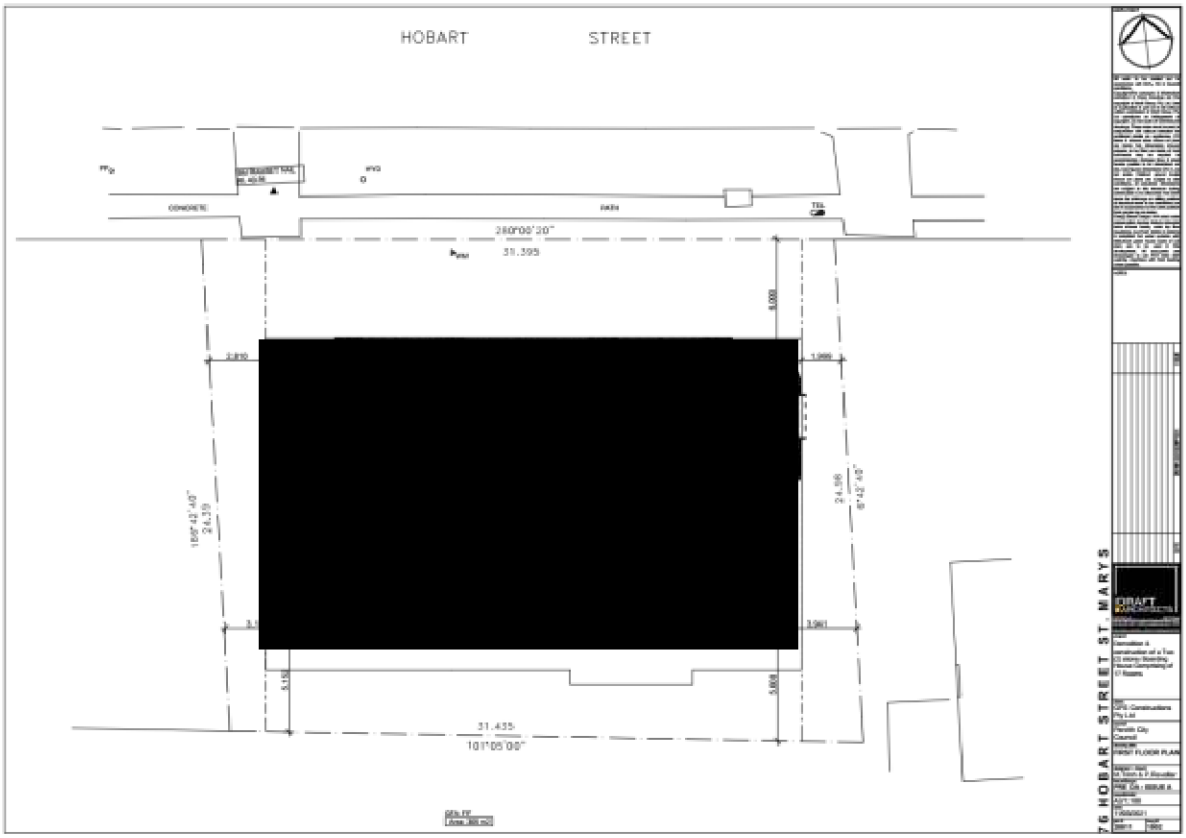
Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

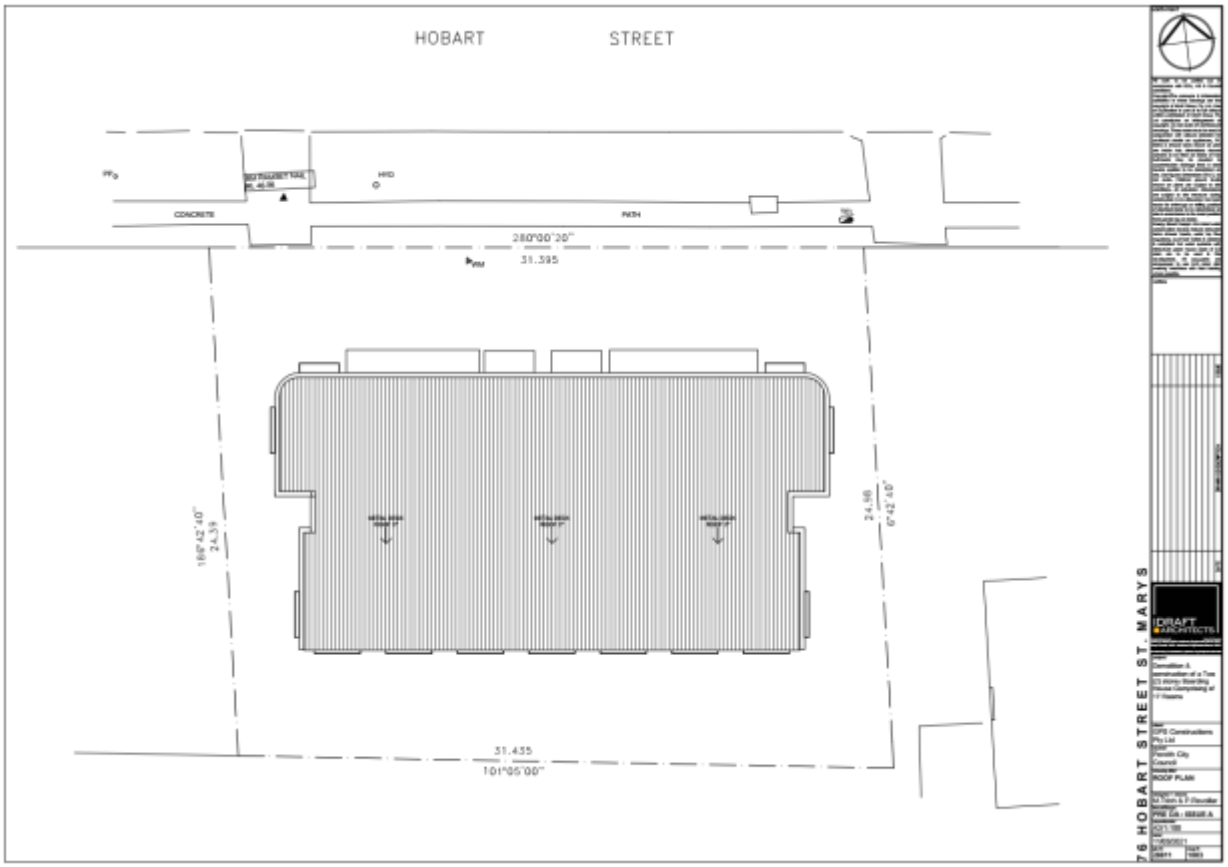
The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Appendix D – Architectural Plans







Appendix E – Barrier Layout