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Mount Pritchard Community Club

DA Acoustic Assessment

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Executive Summary

Acoustic considerations associated with the Mount Pritchard Community Club development, at 101 Meadows Rd, Mt Pritchard, are expected to be primarily associated with short-term construction noise and long-term operational noise from vehicle activities and mechanical plant located at the development.

Construction noise and vibration impacts from the development will be controlled by managing the construction process and following a Construction Noise and Vibration Management Plan. Guidance from relevant Council requirements, Australian and International Standards, and EPA guidelines will be followed as appropriate.

The impact of the operation of the development on surrounding receivers will need to be controlled by incorporating noise-control measures into the selection, location and design of the mechanical services systems. At this early stage of the project, indicative mitigation measures are provided in order to demonstrate that noise emission objectives will be achievable. This mitigation strategy will be refined as the development progresses.

Noise impacts from the loading dock will be controlled by enclosing the dock and ensuring any gaps or ventilation louvers are assessed for noise breakout and acoustically treated, if required. To control noise from vehicles entering and leaving the loading dock, it is recommended that a noise wall be installed on the southern boundary of the site with a total effective barrier height of 3m above ground level.

Noise impacts from outdoor dining areas will be controlled by implementation of the Club's submitted noise management plan for the outdoor terraces. Details of control measures will be determined at detail design stage further mitigation measures may be required.

Noise from the surroundings affecting the development such as general road traffic and pedestrian activities will be controlled by the selection of façade glazing, appropriate construction and ventilation system selection to meet the recommended internal background noise levels.

The acoustic considerations and impacts of this project are in line with other developments within Fairfield City and surrounds. With adequate design and careful management practices employed, this application is recommended for approval with regard to acoustics.

1 Introduction

This acoustic development application report has been prepared for the proposed Food and Functions Master Plan Expansion for the Mount Pritchard Community Club, at 101 Meadows Road, Mount Pritchard.

This report quantifies the existing acoustic environment and establishes relevant acoustic criteria and has been prepared in accordance with the NSW Industrial Noise Policy criteria.

A qualitative assessment of the following areas of potential acoustic impact is discussed herein:

- Additional vehicular and pedestrian traffic
- Noise from mechanical plant operation
- Construction noise

All items of mechanical services plant will be assessed against the operational criteria and all necessary remediation measures such as plant selection, attenuators, enclosures and suitable orientation of exhaust and inlet louvres etc. will be applied to ensure the criteria is met.

- Construction noise will be managed via a construction noise management plan and the procedures in the NSW Interim Construction Noise Guideline.
- Increased traffic noise associated with the project is expected to be negligible.
- Overall, all noise impacts will be managed to meet the relevant noise criteria.

A glossary of the acoustic terminology used in this document is presented in Appendix A.

1.1 Noise Generating Uses on Site

Operational noise from the Mount Pritchard Community Club development is expected to be generated through the following main sources:

- Mechanical plant associated with the building;
- Vehicle movements associated with operation of the building (when vehicles are not on public roads e.g. parking/loading/unloading movements);
- Noise breakout from indoor entertainment spaces;
- Patron noise from outdoor dining and smoking areas.

Noise emission from the proposed development is likely to be a mixture of steady-state noise (due to mechanical plant noise) with short-duration “noise events” due to vehicle activities.

Noise from loading dock activities and mechanical plant noise are expected to be the noise sources with potential to cause the highest noise impacts on surrounding receivers.

Noise impacts from other vehicle movements in parking areas are not expected to increase under this proposal.

In addition, the operation of the Mount Pritchard Community Club is expected to create some additional traffic on public roads surrounding the site. However, any increase in traffic noise is expected to be negligible.

1.2 Noise Sensitive Receivers

There are several residential noise sensitive receivers surrounding the proposed site at different distances.

The closest and most sensitive receivers are the residences located on the northern and southern site boundaries.

Figure 1 is a location plan showing the proximity of residential receivers to the site at Meadows Rd.

Figure 1 – Site location and surrounds

2 Existing Noise Environment

The noise environment in the vicinity of the development is predominantly nature noise and traffic noise from surrounding roads.

2.1 Ambient Noise Survey

As required for planning purposes, an ambient noise survey was conducted at the development site from Wednesday 12 February 2014 to Wednesday 19 February 2014, in general accordance with the procedures given in the NSW INP. This survey involved both unattended (logging) and attended measurements to determine representative ambient noise levels in the vicinity of the site, during the relevant hours of operation.

2.1.1 Equipment

The equipment used to measure the baseline noise levels is detailed in Table 1. All equipment was checked for calibration before and after each set of measurements using a Brüel & Kjær Electronic Calibrator Type 4231 with no significant drift in calibration being recorded. All equipment held a current NATA calibration certificate at the time of the survey.

Table 1 – Equipment used to conduct the noise survey

Equipment manufacturer and type	**Description of Equipment**	**Serial No.**
ARL Ngara	Sound logging meter	878107
ARL Ngara	Sound logging meter	8780D0
Brüel and Kjær 2250	Type 1 sound level meter	2449851
Brüel and Kjær 4231	Sound level meter calibrator	2445716

2.1.2 Methodology

Long term noise monitoring equipment was set up to log measurements of 15 minutes duration with a ‘fast’ time weighting, and logged the L_{Aeq}, L_{A10} and L_{A90} parameters. This equipment recorded 7 days of continuous noise data.

Meteorological conditions were monitored during the survey period. Recorded data was removed as required to account for the influence of any adverse weather conditions and extraneous noise events.

Short term 15 minute attended measurements were undertaken on Wednesday 12 February 2014 to obtain detailed noise information for typical weekday daytime activities in the area.

2.1.3 Measurement Locations

Figure 1 shows the locations of the two noise loggers on a plan of the development site. Logger locations were chosen, taking into account security and access considerations, as being representative of the conditions at the proposed development and the nearest potentially affected residential receivers.

2.1.4 Observations

At both locations, noise levels remain relatively constant throughout the day, evening and night time periods.

Noise levels at location 2 were generally lower than at location 1.

The ambient noise level does not generally fall below 40 dB(A).

Graphs of average daily noise logging data for each logger are included in Appendix B. They plot the average of all noise levels measured in the same time period over a day.

2.2 Summary of Existing Noise Environment

Table 2 – Summary of measured noise indices

Location	**Time Period**	**Rating Background Level (RBL) – dB(A)**	**$L_{Aeq\ (period)}$, dB**
Meadows Rd (Location 1)	Day (7am – 6pm)	47	55
	Evening (6pm – 10pm)	48	54
	Night (10pm – 7am)	44	53
Staff carpark (Location 2)	Day (7am – 6pm)	40	49
	Evening (6pm – 10pm)	42	48
	Night (10pm – 7am)	41	47

3 Design Criteria

3.1 External Noise Criteria

3.1.1 Fairfield City Council

A review of Fairfield City Council noise requirements was carried out. In summary, council requirements default to the NSW Industrial Noise Policy and Australian Standards for noise assessments.

3.1.2 NSW Industrial Noise Policy

The NSW Industrial Noise Policy is appropriate to consider for assessment of noise impacts from developments that may have the potential to increase existing noise levels in a locality.

3.1.2.1 Intrusive Criteria

For assessing intrusiveness, the existing ambient noise level needs to be measured. The intrusiveness criterion means that the equivalent continuous noise level (L_{Aeq}) of new industrial noise sources should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15 minute period.

3.1.2.2 Amenity Criteria

In addition to the intrusive criteria, the INP also has provision for maintaining noise level amenity for particular area types. The cumulative effect of noise from existing and proposed industrial noise sources needs to be considered in assessing this impact. The existing noise level from industry is measured. If it approaches a predefined value based on area type, then noise levels from new industrial noise sources need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion.

Area Classification

The area is characterised as a suburban area, with some commercial premises. Surrounding roads have local traffic with characteristically intermittent traffic flows.

The INP classifies the noise environment of the source area as “Suburban”. The INP characterises the “Suburban” noise environment as an area that:

- Deceasing noise levels in the evening period (1800-2200); and/or
- Evening ambient noise levels defined by the natural environment and infrequent human activity
- Has any combination of the above

3.1.2.3 Summary of INP Criteria

For continuous noise sources, the most stringent of the intrusiveness and the amenity criteria for each time period should be the limiting criterion and sets the project specific noise level (PSNL) to be met by the development. In addition, the more stringent of Location 1 and 2 has been used to ensure criteria are met at all locations. Table 3 compares the intrusiveness and the amenity criteria at the nearest noise sensitive receivers, and identifies the limiting criterion for each time period. The Intrusiveness Criterion is the limiting criterion during the day time period, and the Amenity Criterion is the limiting criterion for the evening and night time periods.

Table 3 – Project Specific Noise Level

Location	**Time Period**	**Intrusiveness Criterion $L_{Aeq,15min}$, dB**	**Amenity Criterion $L_{Aeq,period}$, dB**	**Project Specific Criterion**
Residential receivers	Day	45	47	45 dB $L_{Aeq, 15min}$
	Evening	47	38	38 dB $L_{Aeq, period}$
	Night	46	37	37 dB $L_{Aeq, period}$

3.2 Internal Noise Criteria

Design levels for steady-state internal noise levels within the building are given in Australian Standard AS2107:2000 Recommended Design Sound Levels and Reverberations Times for Building Interiors.

These recommended noise levels apply to all steady-state noise sources within the development. Based on the noise logger surveys, traffic noise at the development was found to be approximately steady during daytime hours.

Accordingly, the internal noise levels from the following sources should be controlled to meet the AS2107 noise levels:

- Noise from the ventilation system (expected to be present in all areas of the development).
- Break-in noise from mechanical plant within the development.
- Traffic noise break-in through the façade.
- Noise from rooftop and adjacent outdoor mechanical plant, along with that from the adjacent shopping centre building breaking-in through the façade.

AS2107 gives both ‘satisfactory’ and ‘maximum’ noise levels for different areas within building interiors. Generally, Arup recommends designing to the “maximum” noise levels to provide some noise masking but this may not be appropriate for all room types, such as in focused lecture/presentation spaces.

Criteria for the type of occupancies in the Mount Pritchard Community Club will be developed during detailed design.

3.3 Internal Sound Insulation

Internal sound insulation refers to acoustic separation between adjacent spaces. It is important to ensure that noise sensitive spaces such as lecture/presentation spaces and offices are not unduly disturbed by noise generating spaces such as toilets, plant rooms and occupational noise levels in adjacent spaces.

Internal sound insulation requirements for the type of occupancies in the Mount Pritchard Community Club will be developed during detailed design.

3.4 Room Acoustics

AS2107 also provides recommended mid-frequency reverberation times for various areas of buildings. It is recommended that the room acoustics be designed to meet these targets during the detailed design of the development.

3.5 Vibration Criteria

Vibration levels caused by activities on the site (including plant) should not exceed the levels specified in the DEC Assessing Vibration guideline at any place of different occupancy at and around the site. The Assessing Vibration guideline provides operational vibration criteria for maintaining human comfort for different space uses.

The vibration limits recommended for maintaining human comfort in office areas and residences are shown in Table 4.

Table 4 – Vibration limits for offices and educational areas

Location category	**Recommended z-axis weighted rms vibration acceleration (m/s²)**		**Maximum z-axis weighted rms vibration acceleration (m/s²)**	
	Continuous	Impulsive	Continuous	Impulsive
Offices, schools, educational institutions and places of worship	0.020	0.64	0.040	1.28
Residences	0.010 (day) 0.007 (night)	0.30 (day) 0.10 (night)	0.020 (day) 0.014 (night)	0.60 (day) 0.20 (night)

4 Environmental Noise Impact Assessment

4.1 General

The proposal for this project is to expand the existing Mount Pritchard Community Club building to include additional entertainment and loading dock facilities.

The main changes to the existing site in terms of noise impact to the community will be construction noise, mechanical plant, vehicle movements on-site and patron noise.

There is an existing masonry wall on the southern boundary, and this provides some mitigation for receivers.

The sections below take consideration of these noise generating activities.

4.2 Construction Noise

Construction noise is an inevitable part of any new construction project and as always in a commercial/residential area there is likely to be some degree of impact.

However, construction noise will be managed in accordance with the NSW Interim Construction Noise Guideline (2009) which is aimed at managing noise from construction works regulated by the NSW Environment Protection Authority (EPA).

A detailed construction noise and vibration management plan will need to be developed following a construction noise assessment once more precise construction activity information becomes available. The management plan will be developed to minimise the impact to the neighbourhood.

It is also recommended that the noise control measures in Australian Standard AS2436 (1981) Guide to noise control on construction, maintenance and demolition sites be followed.

4.3 Vehicle Movements

An overall increase in road traffic flows by a factor of approximately 1.6 is required in order to correspond to a barely perceptible increase in road traffic noise of 2 dB. This is considered negligible acoustically and will have no adverse noise impact.

Given the urban setting and the existing traffic flows on road networks in the area (e.g. Meadows Rd), the additional traffic noise impacts due to the predicted increased traffic flows associated with the Mounties development are less than 1 dB and therefore not significant.

As such, increased road traffic noise is not considered to be significant.

4.3.1 Car Parking

It is understood that the number of additional parking spaces created as part of this development will be insufficient to cause significant increased noise impacts on residences.

4.3.2 Loading Dock

Loading dock noise is generally associated with vehicles entering and leaving the dock, reversing, loading and unloading.

The proposed loading dock is located adjacent to the southern boundary of the site, and is approximately 15m from the nearest noise sensitive receiver. Since the loading dock is enclosed, noise impacts from activities within the enclosed dock area are not expected to cause significant impacts at receivers. Any gaps or ventilation louvers in the loading dock enclosure should be assessed for noise breakout, and may require acoustic treatment.

The proposed loading dock is situated below ground level, with a ramp providing access for vehicles from the parking area. Noise from trucks using this ramp is not mitigated by the loading dock enclosure. As a result, it is recommended that a noise wall be installed on the southern boundary of the site with a total effective barrier height of 3m (1.8 m masonry + 1.2 m clear acrylic as shown in the project drawings) above ground level.

4.3.3 Waste Collection

Waste collection will carried out inside the enclosed dock area and is therefore not expected to cause any noise impacts.

4.4 Mechanical Services Plant

All items of mechanical services plant will be assessed against the operational criteria and all necessary remediation measures such as plant selection, attenuators, acoustic louvres, barriers / screens, enclosures and suitable orientation of exhaust and inlet louvres etc. will be applied to ensure the noise criteria is met.

At this stage, it is likely that a 2m barrier around plant deck areas will be required, with a minimum surface mass of 15kg/m^2. Further detailed design of the barrier with respect to plant equipment selections will be undertaken at the detailed design stage.

4.5 Outdoor Dining Areas and Terraces

Music and entertainment noise levels, hours of operation and patron numbers in outdoor dining areas and terraces will be controlled by implementation of the Club’s submitted noise management plan for the outdoor terraces. Details of control measures will be determined at detail design stage.

4.6 Noise break-out from entertainment spaces

Noise break-out from the indoor entertainment spaces will be controlled with the design of internal partitions and façade during the detailed design stage, and should have no impact on the nearest sensitive receivers.

At this stage, a preliminary build-up for the roof construction to control noise breakout from the multipurpose auditorium is as follows:

- Steel roof
- Thermal insulation to underside of steel
- 200mm airgap with 75mm rockwool (minimum 33kg/m3 density)
- 2x 13mm fire rated plasterboard

The total depth of this build-up is approximately 250mm.

Full acoustic calculations and design will be needed in the design stages to verify the exact buildup and required performance.

5 Noise impacts on the development

5.1 Mechanical Services Plant

At the current stage of the project, the mechanical services scheme has not been developed to the point where specific acoustic design advice can be provided. However, general advice for controlling mechanical services noise to noise-sensitive spaces is given below:

- Fan noise should be controlled through a combination of expansion plenums (most effective for low-frequency noise), lined duct and duct attenuators (most effective for mid-frequency and high-frequency noise).
- Aerodynamic noise should be controlled by sizing ducts so that duct velocity is not too high, careful attention to the aerodynamic efficiency of ductwork and selection of terminal units (VAV boxes, if used, and diffusers).
- Fan coil units serving meeting rooms and teaching spaces should not be located in the ceiling void above the room. Locate these units above a less-noise-sensitive space (e.g. circulation or storage areas).
- Flexible ductwork can cause high levels of aerodynamic noise if the duct routing is convoluted. For noise sensitive spaces, try to avoid flexible ductwork where possible and minimise the length of duct where unavoidable (taking care that the flexible ductwork is routed as directly as possible between the spigot and the terminal unit).

Detailed design guidance for the control of noise in mechanical services for noise-critical spaces will be provided by the project acoustic consultant as detailed design of the project progresses.

5.2 Traffic Noise Break-in

Noise generated by existing traffic on Meadows Road is the dominant source of noise throughout the day on the site. The heaviest traffic flows during the week occur during the AM peak period, typically between 0800 and 1000 hours and during the PM peak period, typically between 1600 and 1800.

During the detailed design stage, close attention will be given to design the necessary noise insulation performance of the façade and glazing to ensure there is no adverse impact from traffic noise on the Mounties building occupants. The façade will be designed to comply with the internal noise criteria developed based on those defined in AS2107 during detailed design.

5.3 Loading Dock

Break-in noise to sensitive spaces from parking areas and loading docks should be controlled. Acoustic design of the façade and other building elements for break-in noise from the loading dock will be undertaken at detailed design stage.

5.4 Patrons

The acoustic design of the building façade to control the break-in of parking, loading dock and general road traffic noise will be sufficient to control the break-in of noise caused by pedestrian activities outside the building (i.e. raised voices).

5.5 Room Acoustics

As detailed design progresses, the project shall develop appropriate absorptive and diffusive acoustic surface treatments to comply with the reverberation time targets.

These treatments may include use of:

- absorptive ceiling tiles
- absorptive finishes to the underside of exposed slabs or where perforated ceiling tiles are used below
- carpeted flooring
- absorptive wall panels
- soft furnishings

5.6 Vibration

Items of mechanical plant should be treated for vibration isolation in order to achieve the criteria specified in Section 3.5.

The recommended vibration isolation methods and minimum deflections will be based on Table 47 of Chapter 48 of ASHRAE[1] and developed further during detailed design where relevant to this project.

[1] American Society of Heating Refrigerating and Air-Conditioning Engineers

Appendix A

Acoustic Glossary

Assessment Background Level (ABL)

A single-number figure used to characterise the background noise levels from a single day of a noise survey. ABL is derived from the measured noise levels for the day, evening or night time period of a single day of background measurements. The ABL is calculated to be the tenth percentile of the background LA90 noise levels – i.e. the measured background noise is above the ABL 90% of the time.

Ambient Noise Level

The noise level in a space measured in the absence of the noise being investigated. For example, if a fan located on a city building is being investigated, the ambient noise level is the noise level without the fan running. This would include sources such as traffic, birds, people talking and other nearby fans.

Decibel

The decibel scale is a logarithmic scale which is used to measure sound and vibration levels. Human hearing is not linear, which allows hearing over a large range of sound pressure levels. Therefore a logarithmic scale, the decibel (dB) scale, is used to describe sound levels.

dB(A)

dB(A) is a single-number sound pressure level that includes a frequency weighting to reflect the subjective loudness level.

The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).

An increase of approximately 10 dB corresponds to a subjective doubling of the loudness of a noise. The minimum increase or decrease in noise level that can be noticed is typically 2 to 3 dB. Some typical dB(A) levels are shown below.

Noise Level dB(A)	Example
130	Human threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside nightclub
90	Heavy trucks at 5 m
80	Kerbside of busy street
70	Loud stereo in living room
60	Office or restaurant with people present
50	Domestic fan heater at 1m

Noise Level dB(A)	Example
40	Living room (without TV, stereo, etc)
30	Background noise in a theatre
20	Remote rural area on still night
10	Acoustic laboratory test chamber
0	Threshold of hearing

L_1

The L1 statistical level is often used to represent the maximum level of a sound level that varies with time.

Mathematically, the L1 level is the sound level exceeded for 1% of the measurement duration. As an example, 87 dB LA1,15min is a sound level of 87 dB(A) or higher for 1% of the 15 minute measurement period.

L_{10}

The L10 statistical level is often used as the “average maximum” level of a sound level that varies with time.

Mathematically, the L10 level is the sound level exceeded for 10% of the measurement duration. L10 is often used for road traffic noise assessment. As an example, 63 dB LA10,18hr is a sound level of 63 dB(A) or higher for 10% of the 18 hour measurement period.

L_{90}

The L90 statistical level is often used as the “average minimum” or “background” level of a sound level that varies with time.

Mathematically, L90 is the sound level exceeded for 90% of the measurement duration. As an example, 45 dB LA90,15min is a sound level of 45 dB(A) or higher for 90% of the 15 minute measurement period.

L_{eq}

The ‘equivalent continuous sound level’, Leq, is used to describe the level of a time-varying sound or vibration measurement.

Leq is often used as the “average” level for a measurement where the level is fluctuating over time. Mathematically, it is the energy-average level over a period of time. When the dB(A) weighting is applied, the level is denoted dB LAeq. Often the measurement duration is quoted, thus LAeq,15 min represents the dB(A) weighted energy-average level of a 15 minute measurement.

L_{max}

The Lmax statistical level can be used to describe the “absolute maximum” level of a sound or vibration level that varies with time.

Mathematically, Lmax is the highest value recorded during the measurement period. As an example, 94 dB LAmax is a highest value of 94 dB(A) during the measurement period.

Since Lmax is often caused by an instantaneous event, Lmax levels often vary significantly between measurements.

Frequency

Frequency is the number of cycles per second of a sound or vibration wave. In musical terms, frequency is described as “pitch”. Sounds towards the lower end of the human hearing frequency range are perceived as “bass” and sounds with a higher frequency are perceived as “high pitched”.

Rating Background Level (RBL)

A single-number figure used to characterise the background noise levels from a complete noise survey. The RBL for a day, evening or night time period for the overall survey is calculated from the individual Assessment Background Levels (ABL) for each day of the measurement period, and is numerically equal to the median (middle value) of the ABL values for the days in the noise survey.

Sound Power and Sound Pressure

The sound power level (Lw) of a source is a measure of the total acoustic power radiated by a source. The sound pressure level (Lp) varies as a function of distance from a source. However, the sound power level is an intrinsic characteristic of a source (analogous to its mass), which is not affected by the environment within which the source is located.

Structureborne Noise

The transmission of noise energy as vibration of building elements. The energy may then be re-radiated as airborne noise. Structureborne noise is controlled by structural discontinuities, i.e. expansion joints and floating floors.

Vibration

Waves in a solid material are called “vibration”, as opposed to similar waves in air, which are called “sound” or “noise”. If vibration levels are high enough, they can be felt; usually vibration levels must be much higher to cause structural damage.

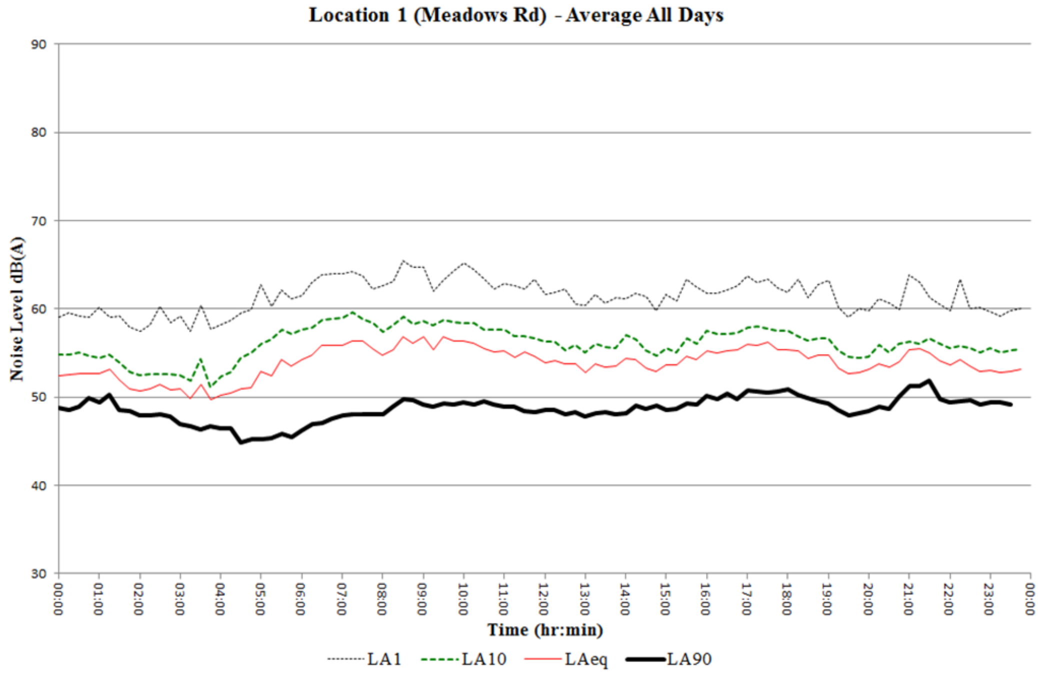
A vibrating structure (e.g. a wall) can cause airborne noise to be radiated. Structureborne vibration limits are sometimes set to control the noise level in a space.

Vibration levels can be described using measurements of displacement, velocity and acceleration. Velocity and acceleration are commonly used for structureborne noise and human comfort. Either metric units (such as mm, mm/s and mm/s2) or using a decibel scale are used to describe vibration

Appendix B

Ambient Noise Survey Results

B1 Location 1 - Meadows Road



B2 Location 2 - Staff Carpark