124-128 Killeaton Street St Ives
Proposed Residential Development
Acoustic Planning Report

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Glossary

'A' Weighted	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Daytime (INP)	Between 7.00 a.m. and 6 p.m. as defined in the INP. (See INP)
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
dB(A)	'A' Weighted sound level in dB.
Evening	Between 6.00 p.m. and 10 p.m. as defined in the INP. (See INP)
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second. The human ear responds to sound in the frequency range of 20 Hertz to 20,000 Hz.
INP	New South Wales DEC Industrial Noise Policy, 2000.
Intrusive Noise	Noise emission that when assessed at a noise-sensitive receiver (principally a residential premises boundary) is greater than 5 dB above the background (L_{90}) noise level.
L_{10}	Noise level exceeded for 10 % of the measurement time. The L_{10} level is commonly referred to as the average maximum noise level.
L_{90}	Noise level exceeded for 90 % of the measurement time. The L_{90} level is commonly referred to as the background noise level.
L_{eq}	Equivalent Noise Level—Energy averaged noise level over the measurement time.
Night-time (INP)	Between 10.00 p.m. on one day and 7.00 a.m. on the following day as defined in the INP. (See INP).
Rating Background Level (RBL)	Overall single-figure A-weighted background level representing an assessment period (day/evening/night). For the short-term method, the RBL is simply the measured $L_{90,15min}$ noise level. For the long-term method it is the median value of all measured background levels during the relevant assessment period.

R_W	Weighted Sound Reduction Index—A laboratory measured value of the acoustic separation provided by a single building element (such as a partition). The higher the R_W the better the noise isolation provided by a building element.
Reverberation Time (RT)	Of a room, for a sound of a given frequency or frequency band, the time that would be required for the reverberantly decaying sound pressure level in the room to decrease by 60 decibels.

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1 Introduction

Resonate Acoustics has been engaged by Develotek to undertake a planning stage acoustic assessment of the proposed new residential development at 124-128 Killeaton Street, St Ives.

This report covers three main aspects of acoustic study:

1. **Noise intrusion**: from external road traffic noise sources - principally from Mona Vale Road into proposed residential spaces.
2. **Noise emission criteria**: for mechanical plant items and other stationary noise sources.
3. **Internal acoustic requirements**: in accordance with the Building Code of Australia

This report presents a description of the proposal, relevant noise criteria, assessment and planning stage acoustic advice.

The principal activities of this commission and report are:

- Measure and document noise intrusion from nearby road traffic on Mona Vale Road.
- Establish and document noise intrusion criteria in accordance with relevant Standards and regulations.
- Predict noise intrusion from nearby road traffic on Mona Vale Road into internal areas of a typical, road noise affected residential apartment.
- Assess predicted noise levels against the established criteria and provide mitigation recommendations where required.
- Derive and document mechanical services noise emission criteria based on existing noise levels measured at a location on the site that is shielded from road traffic noise.

The main body of this report provides a summary of relevant criteria and planning stage acoustic advice. Refer to Section 5 for a summary of advice.

Appendix A provides a full explanation of the methodologies used to establish noise emission criteria in the preparation of this report.

2 Project description

The proposed residential development is located at 124-128 Killeaton Street, St Ives, as shown in Figure 1. The proposal is comprised of two blocks of residential units situated at the junction of Killeaton Street and Mona Vale Road (southbound carriageway). Three residential houses currently at the site will be demolished to make way for the proposed development. .

The proposed development site is bounded by land uses as follows:

- North: Killeaton Street and a daycare centre at 265 Mona Vale Road
- South: Corpus Christi Catholic Primary School
- West: Mona Vale Road
- East: Residential premises

The proposed development is shown in the context of the surrounding environment, and acoustically significant site features are identified in Figure 1:

Figure 1 – Proposed development site in context

3 Acoustic criteria

3.1 Ku-ring-gai Multi-Unit Housing Development Control Plan (DCP)

The document "Ku-ring-gai Multi-Unit Housing Development Control Plan No.55 – Railway/Pacific Highway Corridor and St Ives Centre" (Amended 2006) provides some guidance with regard to acoustic amenity of residential premises. The DCP provides the following in Section 4.5.3 entitled *'Acoustic Privacy'*. The section outlines the following objectives:

Design Objectives

O-1 Minimal acoustic disturbance to occupants of the development from activities and services.

O-2 Acoustic privacy for all occupants of the development.

O-3 Housing located next to the Pacific Highway and the Railway line is designed and constructed so as to minimize the impact of external noise and facilitate comfortable living

The above design objectives do not specifically refer to Mona Vale Road. However the document does later refer to Mona Vale Road regarding noise and the same objectives apply.

3.2 State Environmental Planning Policy (SEPP Regulation 102)

As the proposed development is located adjacent to a main road with high traffic flow (i.e. greater than 40,000 vehicles Annual Average Daily Traffic), State Environmental Planning Policy (SEPP) Regulation 102 applies. SEPP 102 reads as follows:

Regulation 102

102 Impact of road noise or vibration on non-road development

1. *This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
    a. *a building for residential use,*
2. *Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are*

issued by the Director-General for the purposes of this clause and published in the Gazette.

3. *If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
    a. *in any bedroom in the building 35 dB(A) at any time between 10 pm and 7 am,*
    b. *Anywhere else in the building (other than a garage, kitchen, bathroom or hallway) 40 dB(A) at any time.*

The term 'at any time' is subject to some interpretation. In our experience it is appropriate to assess road traffic noise intrusion using the same time periods provided by the NSW Road Noise Policy (RNP) for the relevant category of road. Mona Vale Road is an arterial road and consequently the assessment time periods are:

- Living areas – Daytime 7 am to 10 pm ($L_{Aeq\ 15\ hour}$)
- Bedrooms – Night-time 10 pm to 7 am ($L_{Aeq\ 9\ hour}$)

3.3 Australian Standard AS 2107[1]

AS 2107 provides guidance on steady-state and quasi steady-state internal noise sources fir a range of building types including residential. Relevent sources include a room's own mechanical services/air conditioning contribution and external noise intrusion, (principally, in this case from road traffic noise). A summary of the relevant recommended internal design noise levels for the proposed development are presented in Table 1:

Table 1 - Internal noise criteria summary

Type of occupancy/activity	**Recommended design sound level, dB $L_{Aeq,}$**
Residential Buildings	
Living areas	40
Sleeping areas	35
Work areas	40
Apartment common areas	50

Note: (1) Where two sources contribute, it is common to reduce each criterion by 3 dB so that the combined total noise equals the criterion.

[1] Australian/New Zealand Standard AS/NZS 2107:2000 Acoustics – recommended design sound levels and reverberation times for building interiors

3.4 Industrial Noise Policy (INP)

In this assessment, we have determined mechanical services noise emission criteria in accordance with the procedures set out in the NSW Industrial Noise Policy (INP).

The intrusive noise criterion applied by the INP is a 'background plus 5 dB(A)' assessment

The INP also provides criteria to protect the amenity of an area based upon the prevailing level of industrial noise, and other considerations. Application of the amenity criteria may result in a more stringent criterion than the intrusive criterion.

Based upon an unattended noise survey reported in Appendix A, the project specific INP mechanical services noise criteria for residential premises are provided in Table 2:

Table 2 - Mechanical services noise emission criteria – residential receivers

Location	Noise Emission Criteria (dB L_{Aeq})		
	Daytime 07:00 – 18:00	Evening 18:00 – 22:00	Night-time 22:00 – 07:00
Nearby residential premises shielded from road traffic noise	49	45	40

Notes: (1) These criteria apply to the combined contributions of both residential blocks. The individual contribution of one block should be no more than 3 dB(A) below the applicable criterion.
(2) The criteria in Table 2 should also be used in the design of noise controls within the proposed development, i.e. the contribution of industrial type noise from a block's own services to itself, and from one block to another.

The project specific INP mechanical services noise criteria for other nearby land uses are provided in Table 3:

Table 3 - Mechanical services noise emission criteria – other receivers

Location	Criterion (dB L_{Aeq})	Time period
School playground	55	When in use
School classroom (internal)	40	Noisiest one hour period when in use
Commercial premises	65	When in use

3.5 Internal acoustic separation

The residential units at 124-128 Killeaton Street are classified as Class 2/3 under the BCA/NCC. Class 2/3 buildings must achieve the objectives in Part F5 of the BCA *Sound Transmission and Insulation*. The acoustic requirements applicable to this development are outlined in Table 4.

Table 4 - BCA requirements for Class 2 and 3 buildings

Building element	Description	Impact noise requirements	Airborne noise criteria	Verification criteria
Floors	Separating sole-occupancy units and separating sole-occupancy units and a plant room, lift shaft, stairway, public corridor, public lobby or the like.	$L_{n,w} + C_I \leq 62$	$R_w + C_{tr} \geq 50$	Impact: $L_{n,Tw} + C_I \leq 62$ Airborne: $D_{nT,w} + C_{tr} \geq 45$
Walls	Separating sole occupancy units	—	$R_w + C_{tr} \geq 50$	$D_{nT,w} + C_{tr} \geq 45$
	Separating a habitable room of a sole occupancy unit from a bathroom, sanitary compartment, laundry or kitchen in an adjacent sole occupancy unit	Discontinuous construction[1]	$R_w + C_{tr} \geq 50$	$D_{nT,w} + C_{tr} \geq 45$
	Separating a sole occupancy unit and a stairway, public corridor, public lobby or the like[2]	—	$R_w \geq 50$	$D_{nT,w} \geq 45$
	Separating a sole occupancy unit and a plant room and lift shaft	Discontinuous construction[1]	$R_w \geq 50$	$D_{nT,w} \geq 45$
	A door between a sole occupancy unit and a stairway, public corridor, lobby or the like.	—	$R_w \geq 30$	$D_{nT,w} \geq 25$

Building element	Description	Impact noise requirements	Airborne noise criteria	Verification criteria
Services	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a habitable room (other than a kitchen)	—	$R_w + C_{tr} \geq 40$	-
	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a kitchen or any other room.	—	$R_w + C_{tr} \geq 25$	-
Pumps	The point of connection between the service pipes in a building and any circulating or other pump.	A flexible coupling at the connection	—	—

Notes: (1) Discontinuous construction is defined such that walls are to have a minimum 20 mm gap between separate leaves. Cavity masonry walls are to have resilient wall ties or no wall ties. For other walls there are to be no mechanical linkages between wall leaves except at the wall periphery. A staggered stud wall is not deemed to be discontinuous.

A wall that is required to have sound insulation is to continue to the underside of the floor or roof above. Alternatively, the ceiling adjacent the walls must be acoustically treated such that the sound isolation provided by the wall is not degraded.

It is our experience that a typical compliant inter-tenancy wall is 220 to 250 mm thick, dependant upon the construction type/materials.

The requirements in Table 4 are BCA/NC minima. Dependent upon the quality objectives for the development, the developer may wish to either meet or exceed these requirements.

4 Assessment

4.1 Road traffic noise intrusion

Unattended noise logging

Based on the results of unattended and attended noise surveys (refer Appendix A), and a computer noise modelling exercise (refer below), typical daytime and night-time road traffic noise levels at various facades of the proposed development have been determined.

The reference noise levels measured at the road traffic noise logger (at the existing Mona Vale Road boundary wall as shown in Figure 4 are:

- 69 dB $L_{Aeq\ (15\ hour)}$ daytime
- 71 dB $L_{Aeq\ (1\ hour)}$ daytime and
- 64 dB $L_{Aeq\ (9\ hour)}$ night-time
- 67 dB $L_{Aeq\ (1\ hour)}$ night-time

Actual road traffic noise levels at the proposed building facades (which are set back from the road traffic noise source relative to the noise logging location) will be lower due to increased distance and, in some cases, shielding provided by other parts of the development. A computer noise modelling exercise has been conducted in order to predict what these lower noise levels will be.

Computer noise modelling exercise

Road traffic noise modelling has been conducted using the SoundPLAN v 7.3 software package. The Calculation of Road Traffic Noise (CoRTN) algorithm implemented within this package has been used to calculate road traffic noise based on traffic flows, estimated heavy vehicle percentages, distance, ground absorption, shielding and various other detail acoustic factors. Screenshots from the SoundPLAN model are presented in Figure 2 and Figure 3.

Inputs to the computer noise model are as follows:

- Road traffic flows from RMS traffic count station 53029
- Survey data for the subject site from the project surveyor
- Site plan for the proposed development from the project architect

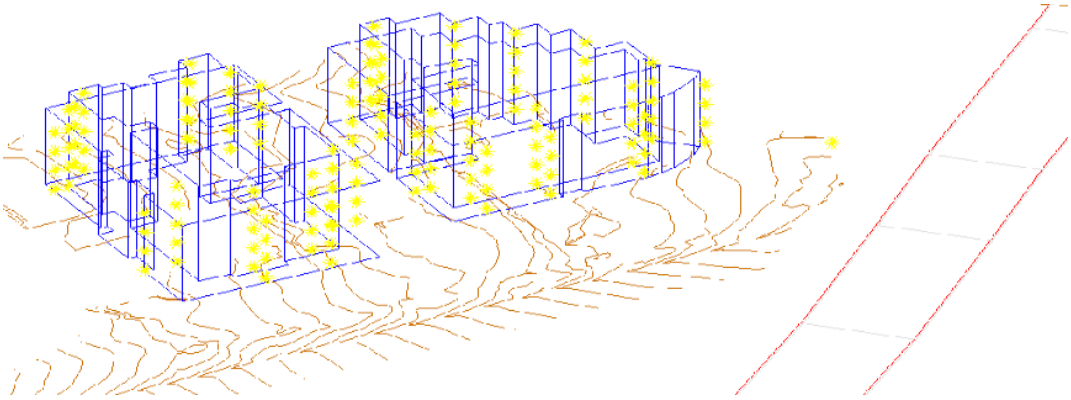

Figure 2 – SoundPLAN screenshot – 3D from north

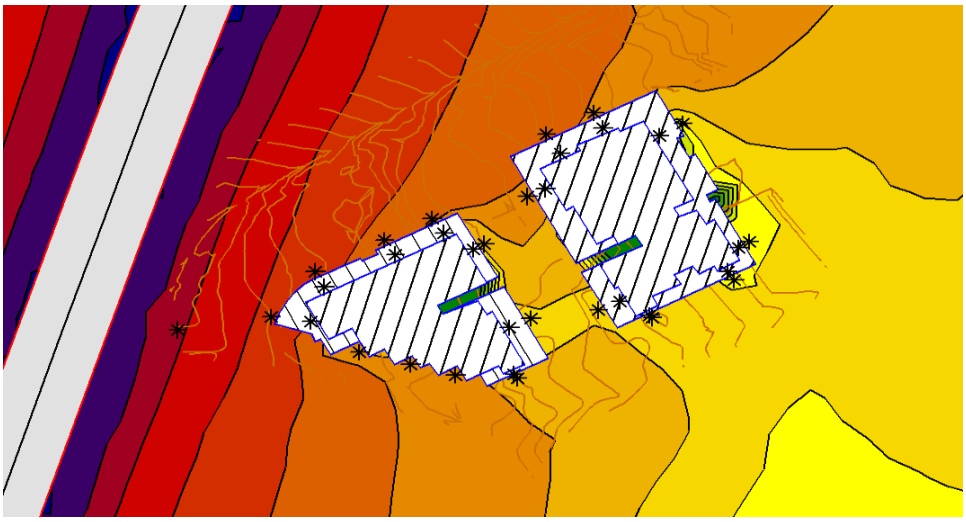

Figure 3 - SoundPLAN screenshot – Aerial image

The results provided by the model have been calibrated against actual noise levels measured at the road traffic noise logging location.

These levels have been used to:

- Determine glazing requirements
- Calculate external noise levels at a typical worst case affected location near a residential faced by adding a correction factor of +2.5 dB(A)

Attended noise measurements

Attended noise measurements were undertaken on 16 September 2014 at approximately 3.30 pm in the front garden of 128 Killeaton Street. Measurements were undertaken using a Brüel & Kjær Type 2250 sound level meter serial number 3001240.

The purpose of the measurements was to obtain spectral data of the road traffic noise (ie quantify the low, mid an high frequency noise energy in octave bands) in order to assist with glazing calculations. The measured spectra with respect to the overall measured noise levels (dB(A)) are shown in Appendix A.

It is noted that the measured road traffic noise spectra contains fairly significant low frequency energy which influences glazing design. Improved glazing (compared to that required for a more neutral spectrum of the same overall noise level) is usually required.

External noise levels

The NSW Road Noise Policy (DECCW, 2011) provides assessment criteria for road traffic noise from new roads and road redevelopment projects. Given the proposal is a new residential development at a site currently exposed to road traffic noise, application of the Policy criteria is not mandatory. However, comparison with the assessment criteria does provide some indication of acoustic amenity at proposed external spaces. Of the 90 evenly distributed receiver locations modelled around the residential facades:

- 74 receiver locations (82%) are predicted to receive a daytime façade reflected noise level of greater than 55 dB $L_{Aeq\ (15hour)}$, which exceeds the NSW Road Noise Policy criterion for residential premises affected by a ‘new arterial or sub arterial road’.
- 48 receiver locations (53%) are predicted to receive a daytime façade reflected noise level of greater than 60 dB $L_{Aeq\ (15hour)}$, which exceeds the NSW Road Noise Policy criterion for residential premises affected by a ‘redeveloped arterial or sub arterial road’.
- 13 receiver locations (14%) are predicted to receive a daytime façade reflected noise level of greater than 65 dB $L_{Aeq\ (15hour)}$, which exceeds the Roads and Maritime Services definition of ‘acutely affected’).

It is neither mandatory to apply these criteria in this case, nor feasible to control road traffic noise to external areas of most mid and upper floor residential receivers. Consequently acoustic design at the detailed design stage should be targeted at façade glazing design to provide appropriate internal noise levels due to road traffic noise intrusion. Refer to the following report section for planning-stage advice on this aspect of the proposed development.

It is noted that some of the most road traffic noise exposed facades feature residential apartments with winter gardens and this is an appropriate response in terms of controlling road traffic noise intrusion to pseudo-external spaces.

Glazing

Glazing is the acoustic weak link in most facades. Consequently, these typical noise levels have been used to calculate required glazing types to ensure internal noise levels in residential spaces are compliant with the internal noise level criteria presented in

In order to undertake these calculations, the following assumptions have been made in the absence of detailed architectural drawings:

- Living spaces are approximately 22 m^2, bedrooms are approximately 12 m^2.
- Living spaces and bedrooms have an approximate mid-frequency reverberation time of approximately 0.5 seconds (requires a carpeted floor finish)
- Living rooms typically include up to 9.9 m^2 glazing
- Bedrooms typically include up to 7.3 m^2 glazing
- Road traffic noise should be designed to 3 dB(A) below the relevant internal noise criterion to allow a contribution from other steady-state noise sources (e.g.: air conditioning).

Based on the foregoing, the required glazing for a typical road traffic noise affected residential façade is:

- Bedrooms: 10.38 mm laminated glass with acoustic seals (Minimum R_W 36)
- Living areas: 10.38 mm laminated glass with acoustic seals (Minimum R_W 36)

Some worst-case affected apartments require consideration of improved glazing beyond that shown above, or a reduction in glazed areas. Typical improved glazing for these worst-case spaces is:

- Bedrooms: 10.5 mm laminated V-lam Hush glass with acoustic seals (Minimum R_W 39)
- Living area: 10.5 mm laminated V-lam Hush glass with acoustic seals (Minimum R_W 39)

Note that many residential apartments on more distant and/or shielded facades will require less highly specified glazing for noise control. A glazing optimisation exercise at the detailed design stage could establish the glazing acoustic specification on an apartment-by-apartment basis.

These suggested glazing types may change for non-typical room sizes or for glazed areas that are substantially different and if rooms are not carpeted as assumed.

Ventilation

It is commonly accepted that a window that is open to provide ventilation to a room provides 10 dB(A) noise reduction from outside to inside.

On this basis, internal noise levels in most of the proposed residential spaces will exceed the internal noise criteria in Section 3.2. Consequently windows must be kept closed to ensure internal noise criteria can be satisfied.

It is therefore recommended that an alternative means of ventilation be provided for habitable residential spaces. An alternative means of ventilation may take the form of:

- Air conditioning with an outside/fresh air component (not a 'split' system).
- Mechanical ventilation drawn from a 'quiet' side of the building or with an acoustically attenuated intake path.
- Proprietary acoustically treated ventilation intakes such as 'SilenceAir', http://www.silenceair.com/silenceair-products.html with air drawn through by the operation of the apartment's own toilet exhaust fan or another fan to a mechanical engineer's design.
- An open window on a 'quiet' side of the building (should single-sided ventilation be possible).

4.2 Mechanical services noise emission

Mechanical services plant has not been selected at this stage of the project and therefore no numerical assessment can be made. A full assessment of mechanical plant noise emission is recommended once the location and specification of units has been determined.

In-principle methods of controlling mechanical services noise emission, to be considered at the design stage are:

- Selecting the quietest plant for a given task
- Judicious location and orientation
- Use larger fans at a slower speed rather than smaller fans at a higher speed
- Using variable speed drives to lower fan speed in response to lower duty/load requirements
- Use of barriers, both incidental and purpose designed
- Internally lined ducts and bends, external duct and equipment wrapping, silencers.

It is important to note that the industrial noise emission criteria should be satisfied at surrounding residences and at adjacent blocks within the proposed development itself.

5 Summary

A summary of key points from our assessment and analysis is presented in this section.

5.1 Road traffic noise intrusion

Glazing types have been suggested to control road traffic noise intrusion to achieve compliant internal noise levels. It is likely that improved laminated glass and acoustic seals will be required for a number of residential apartments.

It has also been suggested that an alternative means of ventilation should be considered for habitable residential spaces, as windows must be closed in order to control noise intrusion. Refer to Section 4.1.

5.2 Mechanical services noise emission

Mechanical services noise from equipment servicing the proposed development shall be designed to comply with the criteria summarised in Section 3.4.

In-principle noise controls have been recommended.

5.3 Building Code of Australia

Table 4 shall be referred to during the detailed design phase in order to ensure compliance with the Building Code of Australia internal acoustic separation requirements.

Appendix A –Noise surveys

Unattended noise logging

Unattended noise measurements ('logging') have been conducted during the period Tuesday 9th September to Tuesday 16th September 2014.

The logging was conducted at two locations as follows:

- Road traffic noise logging at the Mona Vale Road (west) boundary at 124 Killeaton Street
- Background 'ambient' noise logging near the rear of 128 Killeaton Street

The logging location identified as 'Background noise logging location' in Figure 4 is of relevance to the establishment of (industrial) noise emission criteria.

The location identified as 'Road Traffic Noise Logging Location' is used to establish road traffic noise levels incident upon the nearest noise-affected residential facades.

Figure 4 – Unattended noise logging locations

Equipment

The equipment used for the unattended noise measurements is as follows:

- Road traffic noise logging: ARL Type EL-316 noise logger (serial number: 16-707-005).
- Background noise logging: ARL Type EL-316 noise logger (serial number: 16-707-006).

The noise loggers were configured to record all relevant noise indices including background noise (L_{A90}) and equivalent continuous noise levels (L_{Aeq}). Samples were accumulated at 15-minute intervals. The time response of the loggers was set to 'fast'.

Noise logging weather conditions

In order to provide an indication that noise data was obtained during suitable meteorological conditions, half-hourly weather data was obtained from the Bureau of Meteorology (BOM) Automatic Weather Station (AWS) 066059 at Terrey Hills.

Noise data has been excluded from the processed results if:

1) Rain was observed during a measurement period and/or
2) Wind speed exceeded 5 m/s (18 km/h) at the measurement height of 1.5 m above ground. Wind data obtained from the BOM is presented as the value at 10 m above ground, and these values are halved for the purpose of estimating wind speed at 1.5 m above ground.

Data processing – noise emission

In order to determine mechanical services noise emission criteria, data from the 'background' logger was processed according to the procedures and time periods in the NSW Industrial Noise Policy (INP) time periods as follows:

- INP Daytime: 07:00 to 18:00
- INP Evening: 8:00 to 22:00
- INP Night-time: 22:00 to 07:00

It is necessary to establish a representative noise level for each of these time periods. We have used the procedures in the NSW INP to derive a representative background noise level (a Rating Background Level or RBL) for the daytime, evening and night-time periods. An RBL is the median of the lowest 10^{th} percentile of the background L_{A90} samples in each daytime, evening and night-time measurement period.

The ambient noise environment at the rear of 124 Killeaton Street is considered to be a mixture of typical suburban noise (including school activity), natural sounds and some limited road traffic noise contribution from Mona Vale road. Noise levels during defined time periods are presented in Table 5:

Table 5 - Measured noise levels at background noise logging location

Metric	Noise Level (dB re 20 µPa) during Period		
	INP Daytime 07:00 – 18:00	**INP Evening 18:00 – 22:00**	**INP Night-time 22:00 – 07:00**
L_{A90} / RBL / Background noise level	44	42	42
Measured L_{Aeq} / Energy Average Total Noise Level	53	49	48

Derivation of noise emission criteria

In consideration of the above, project specific criteria have been established in accordance with the NSW Industrial Noise Policy.

Criteria for continuously operational mechanical services and other stationary noise sources at the proposed development site are shown in bold in Table 6.

For the purpose of determining amenity criteria at this site, the nearby residential receivers that are mostly shielded from road traffic noise are considered to be a 'suburban' noise environment as defined in the NSW INP.

Table 6 - INP Noise emission criteria – residential receivers

Location	Noise Emission (L_{Aeq}) criteria (dB re 20 µPa)		
Residential receivers, e.g.: East Street Granville	**Daytime 07:00 – 18:00**	**Evening 18:00 – 22:00**	**Night-time 22:00 – 07:00**
Rating Background Level (RBL)	44	42	42
Intrusive criterion (RBL + 5 dB)	49	47	47
Amenity Criterion (Suburban)	55	45	40
INP Project specific criteria	**49**	**45**	**40**

Unattended noise logging – Road traffic noise

The location identified as 'Road traffic noise logger' in Figure 4 has been used to establish road traffic noise levels incident upon the residential facades.

The measured data has been processed to determine energy average noise levels during each of the following periods:

- Daytime (7 am to 10 pm),
- Night-time (10 pm to 7 am) and
- The highest one hour in each of these periods

These time periods are consistent with usual practice in NSW and the time periods in State Environmental Planning Policy (SEPP) Regulation 10. Refer to Table 7:

Table 7 - Measured noise levels – train noise logging location

Location	Energy-average noise level (L_{Aeq}) (dB re 20 µPa)			
	Daytime (15 hour) 07:00 – 22:00	Daytime (1 hour) 07:00 – 22:00	Night-time (9 hour) 22:00 – 07:00	Night-time (1 hour) 22:00 – 07:00
Mona Vale Road boundary, 128 Killeaton Street	69	71	64	67

Road Traffic noise measurements - spectra

In order to perform road traffic noise intrusion calculations, actual measured spectra obtained from attended measurements undertaken on 16 September 2014 have been applied to the overall dB(A) sound pressure levels obtained during the unattended noise survey. Results, scaled to a noise level of 0 dB(A) are presented in Table 8:

Table 8 – Mona Vale Road Traffic Noise

Measurement	Sound pressure level (dB L_{Aeq}) at Octave Band Centre Frequency (Hz)							dB(A)
	63	125	250	500	1000	2000	4000	
Road traffic Mona Vale Road	-15	-10	-13	-8	-4	-6	-14	0

It is noted that this noise spectra contains fairly significant low frequency energy which influences glazing design. Improved glazing (compared to that required for a more neutral spectrum of the same overall noise level) is usually required.

Unattended noise logging - graphed results

For reference, weekly charts showing the graphed noise logging results from the road traffic noise logger and the background noise logger are shown in Figure 5 and Figure **6**.

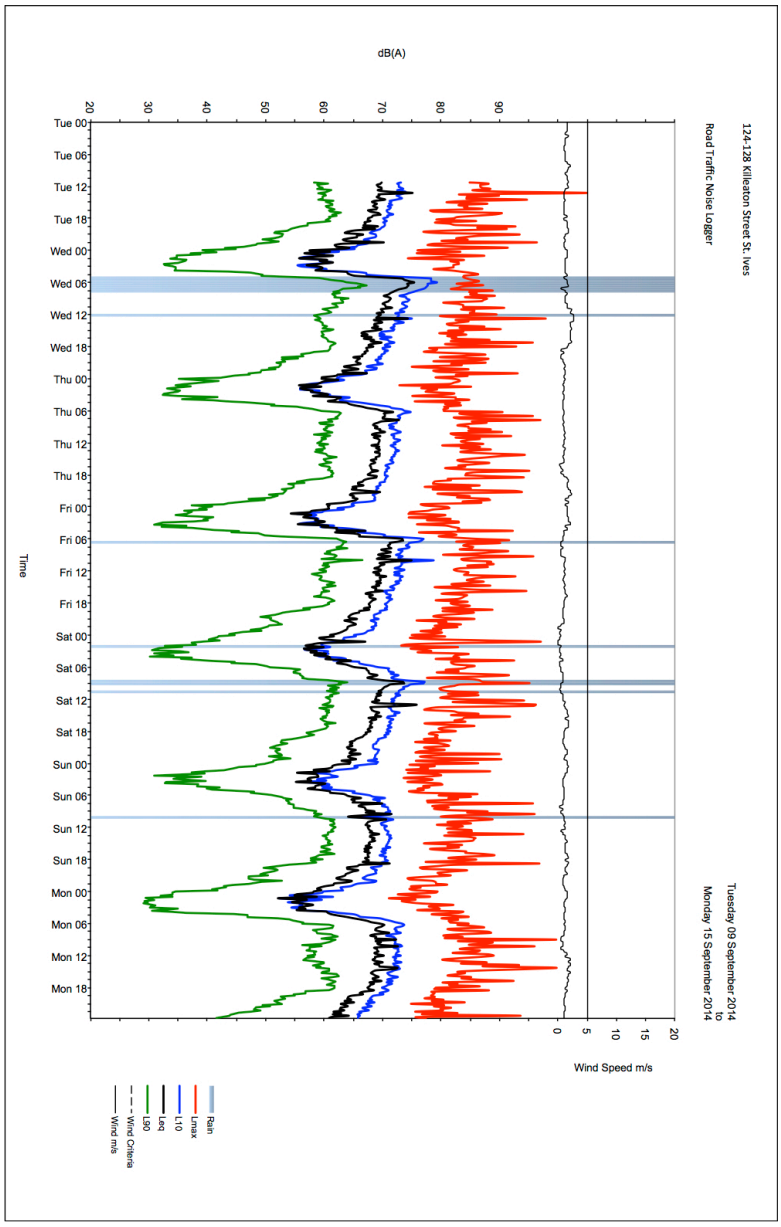

Figure 5 - Graphed noise logging data – road traffic noise logger

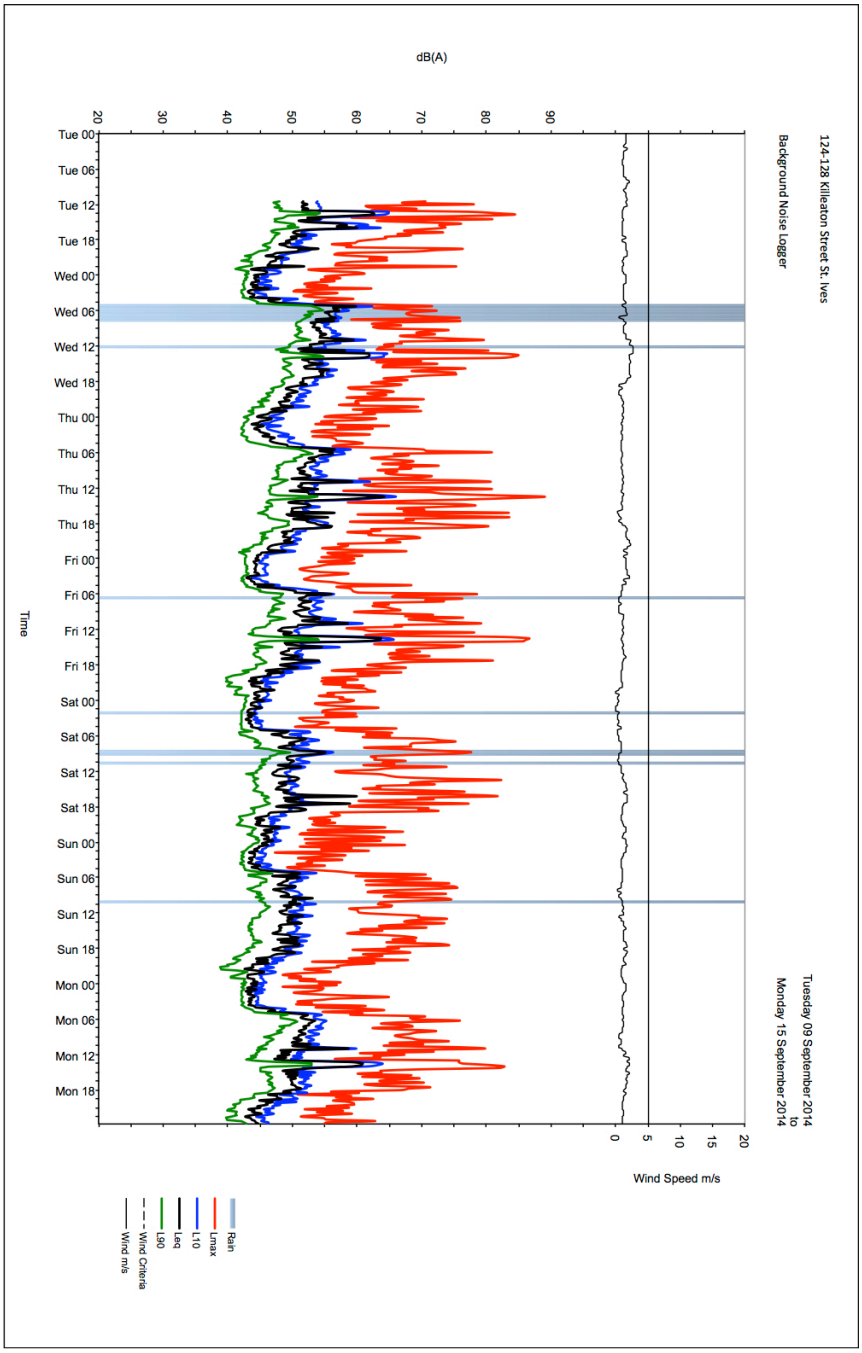

Figure 6 – Graphed noise logging data – background noise logger