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REPORT 13719R1

Revision 2

Proposed Mixed Use Development
48 – 54 Court Road & 356 – 358 The Horsley Drive
Fairfield
Development Application Acoustical Assessment

PREPARED FOR:
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8 September 2014

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
13719R1	Revision 0	2 September 2014	Lee Hudson	Rodney Stevens	Rodney Stevens
13719R1	Revision 1	8 September 2014	Lee Hudson	Rodney Stevens	Rodney Stevens
13719R2	Revision 2	28 October 2014	Lee Hudson	Rodney Stevens	Rodney Stevens

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (henceforth referred to as RSA) has been commissioned by Bureau SRH Pty Ltd on behalf of Tallahon Pty Ltd to prepare an acoustical assessment required to accompany the Development Application (DA) submission for a proposed mixed use (including residential apartments) development on land located at 48 – 54 Court Road and 356 – 358 The Horsley Drive, Fairfield to Fairfield City Council.

The project site is located adjacent to The Horsley Drive and is within the Fairfield CBD and is therefore potentially affected by noise from road traffic and operational noise from nearby commercial and retail premises.

This report presents the results of acoustical measurements conducted to quantify the exposure of the site to road and other environmental noise sources. Based upon the results from ambient noise monitoring, the levels of transportation and operational noise have been predicted at and around the location of future residential apartment buildings and assessed against regulatory guidelines for residential amenity. The proposed DA concept has been compared with Fairfield City Wide Development Control Plan 2013 to evaluate the suitability of the site layout on the basis of acoustics. Where required in-principle design advice is provided to achieve the requirements for acoustical amenity within future residential apartments.

In addition to the assessment of residential acoustical amenity, environmental goals for operational noise emissions from the development (such as mechanical plant and equipment) have been determined.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Project Site

The location of the proposed residential development site is shown in Figure 2-1. The project area is bounded by The Horsley Drive along the eastern boundary and Court Road along the western boundary. The site is currently occupied by one- and two-storey retail and commercial premises. Land immediately to the north of the site is occupied by mixed use commercial/residential apartments (six- and seven-storey) and a McDonalds Restaurant (with drive – thru). To the south of the site, adjacent properties include a KFC restaurant (with drive – thru) on the corner of The Horsley Drive and Alan Street and one- and two-storey commercial buildings. The project site lies within the Fairfield CBD and properties along Court Road are all retail/commercial. The carpark entry to the Neeta City Shopping Centre is located opposite the site on the western side of Court Road.

The development site and its surrounding environment are mainly influenced by noise generated by road traffic on The Horsley Drive which runs (generally) north-south with three lanes each way. Court Road also carries considerable local traffic accessing the shopping centre and Fairfield commercial centre. The operation of mechanical plant on surrounding buildings and the drive-through operations associated with the adjacent fast food restaurants also dominate the ambient noise environment. The Horsley Drive is a road corridor where the requirements under the provisions of SEPP (Infrastructure) 2007 are recommended. Traffic volume data from the nearby Roads and Maritime Services (RMS) counting station reports a weekday annual average daily traffic volume (AADT) of 45,800 vehicles. The requirements under SEPP (Infrastructure) 2007 are therefore mandatory at this location. Construction of residences and other noise sensitive premises adjacent to such road corridors requires consideration of mitigation measures to meet specific internal noise levels within habitable rooms such as bedrooms and other living rooms.

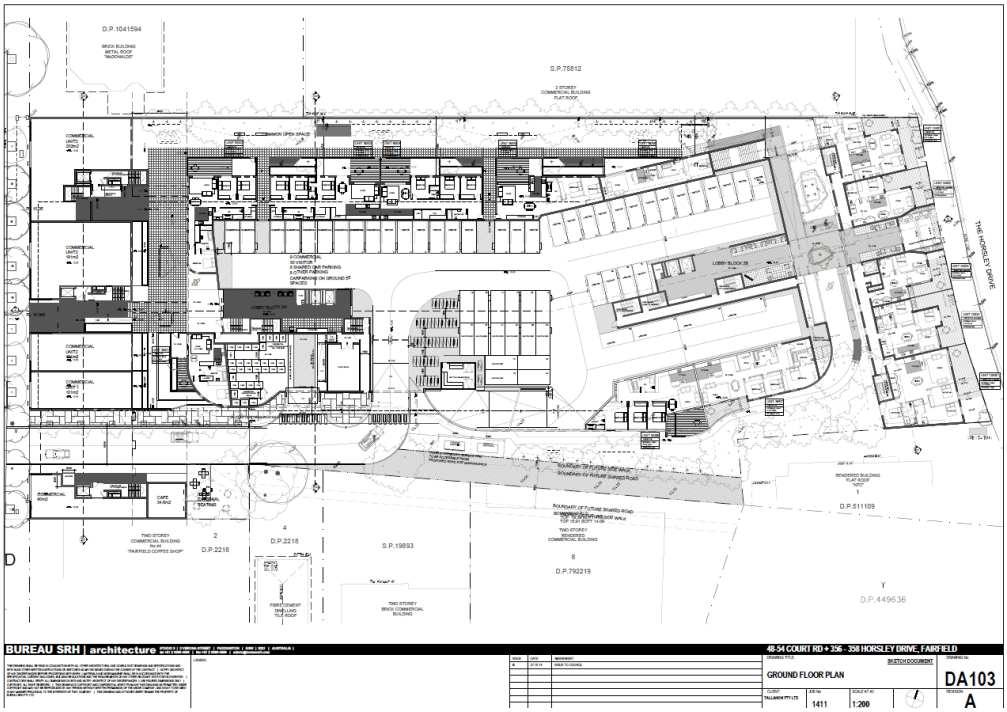
Figure 2-1 Project Area and Surrounding Environment

Aerial image courtesy of nearmap ltd ©

2.2 Project Description

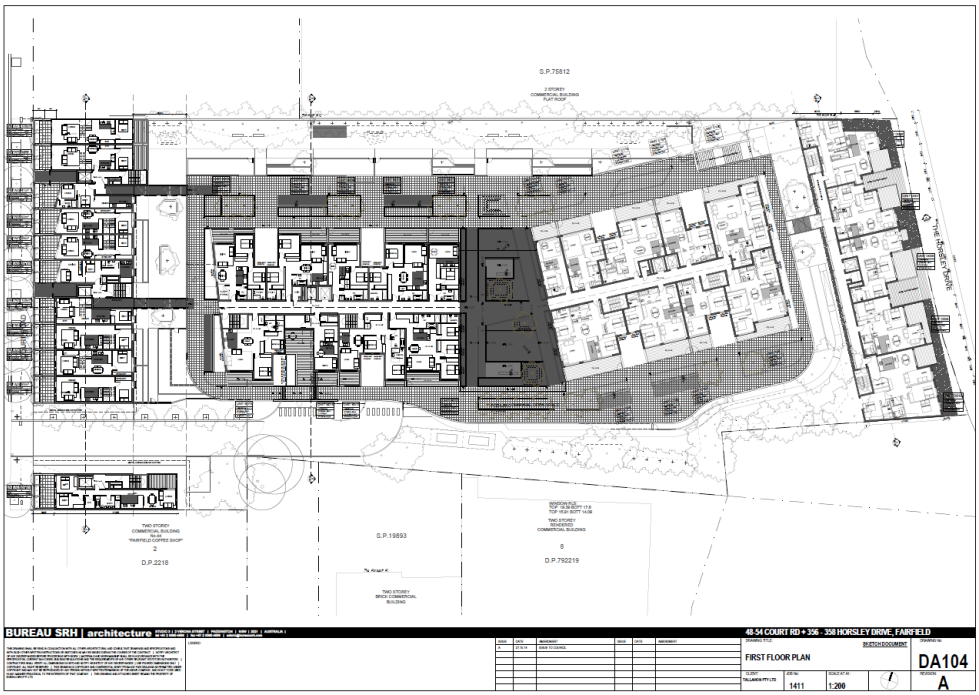
The project proposes a mixed use development including 305 residential apartments. The proposed scheme involves an eight-storey apartments building located adjacent to the eastern boundary (The Horsley Drive), an eight-storey "shop top" housing with 800 m^2 of retail tenancies along the western boundary (Court Road) and two twelve-storey apartment towers in the middle of the site. Two levels of basement carparking will connect all the blocks. The proposed ground and first to eleventh floor layouts of the mixed-use development are shown in Figure 2-2 and Figure 2-3.

Figure 2-2 Ground Floor Plan



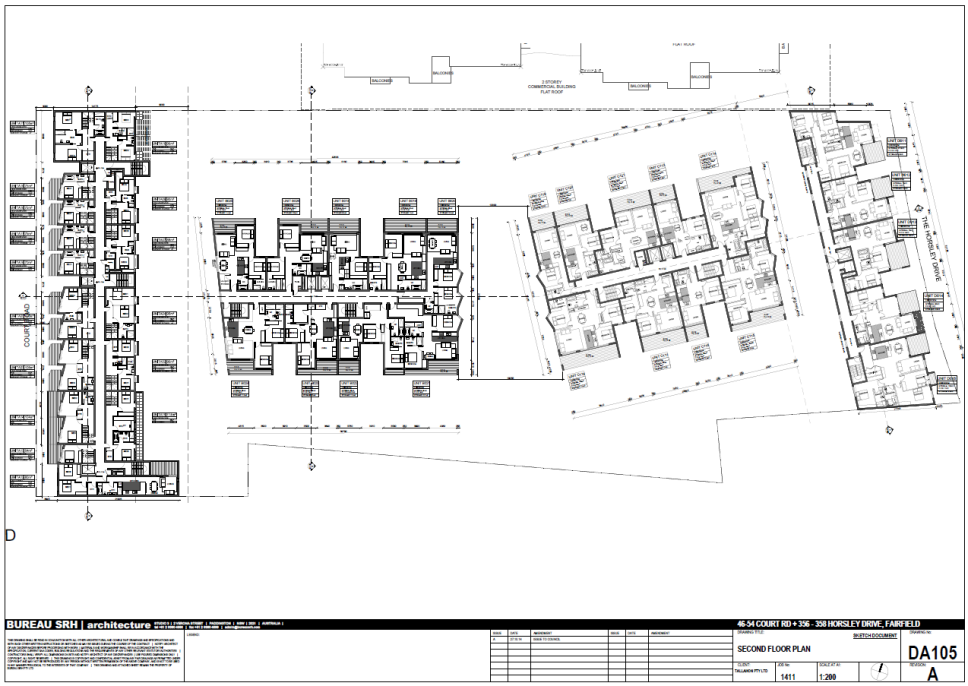
Drawing courtesy of Bureau SRH

Figure 2-3 First Floor Plan



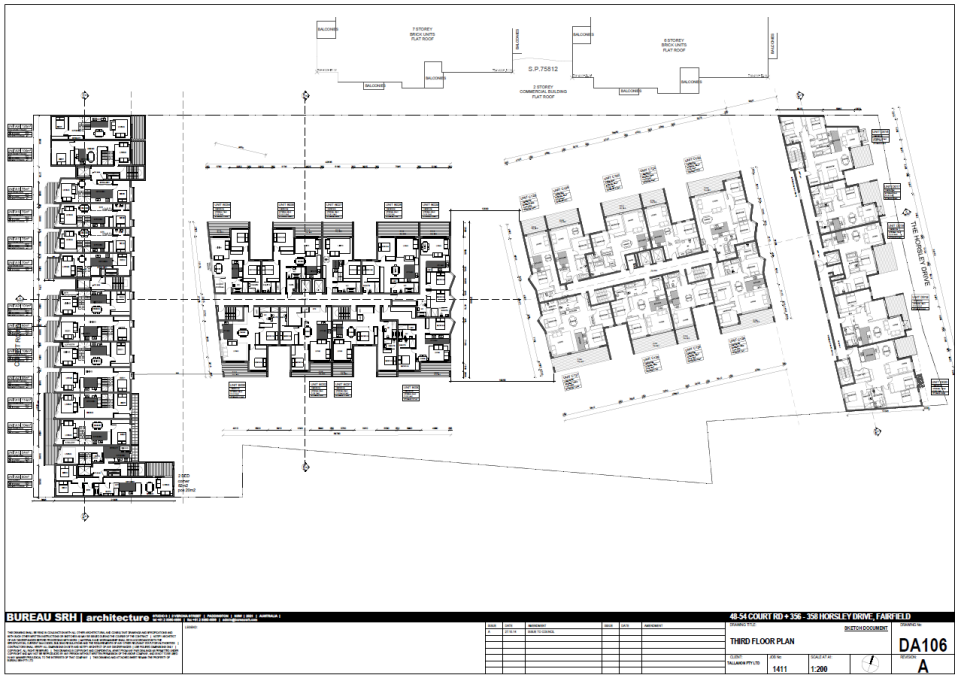
Drawing courtesy of Bureau SRH

Figure 2-4 Second Floor Plan



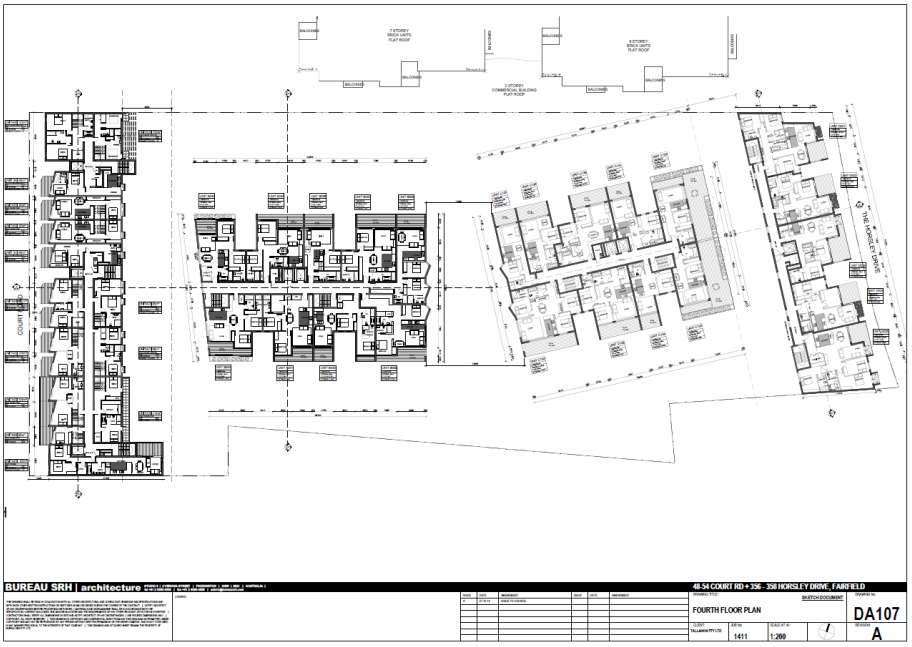
Drawing courtesy of Bureau SRH

Figure 0-1 Third Floor Plan



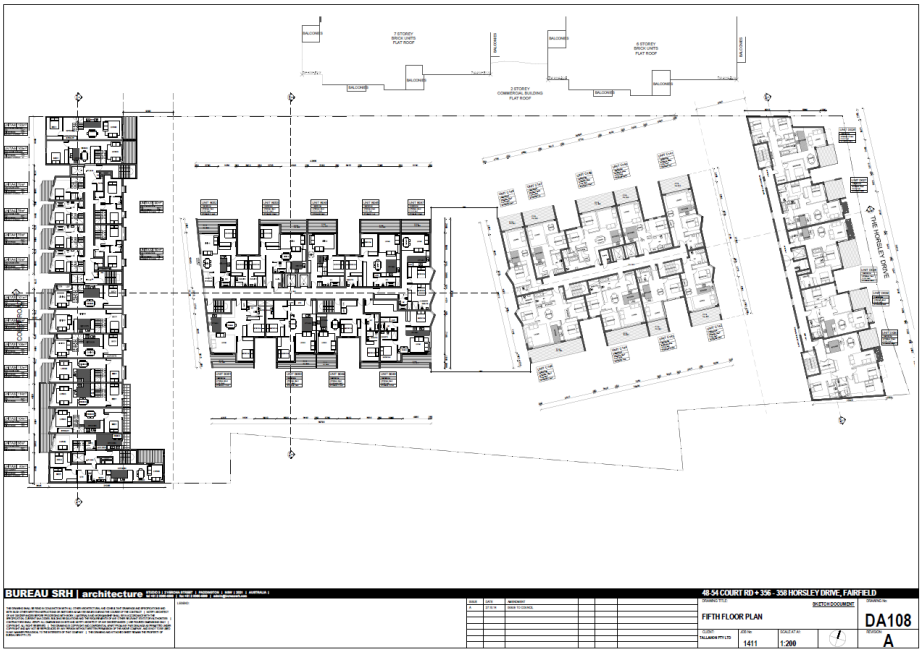
Drawing courtesy of Bureau SRH

Figure 0-2 Fourth Floor Plan



Drawing courtesy of Bureau SRH

Figure 0-3 Fifth Floor Plan



Drawing courtesy of Bureau SRH

Figure 0-4 Sixth Floor Plan

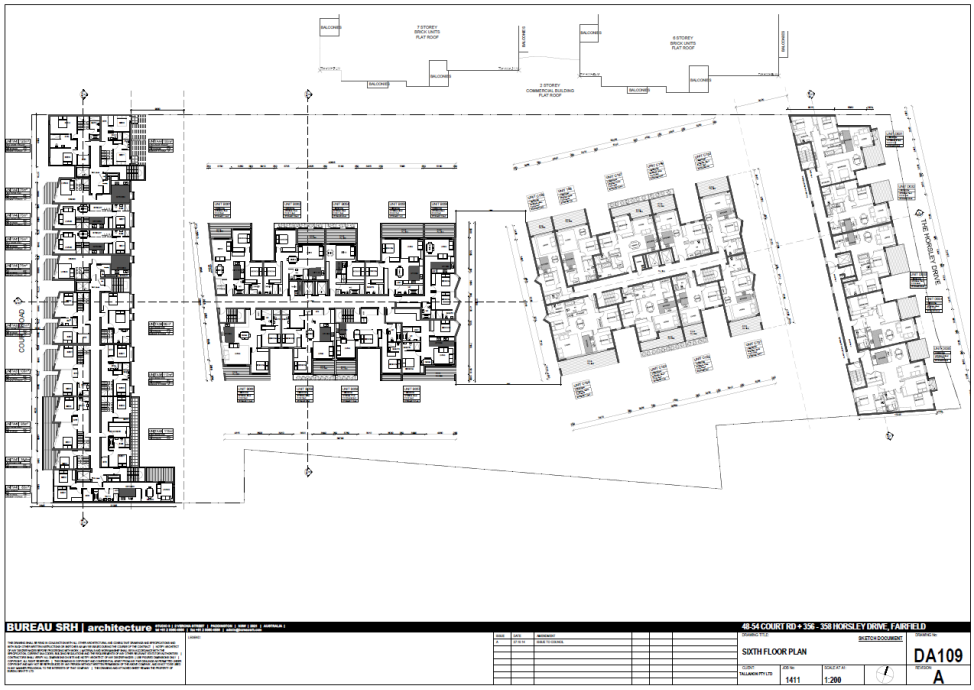


Figure 0-5 Seventh Floor Plan

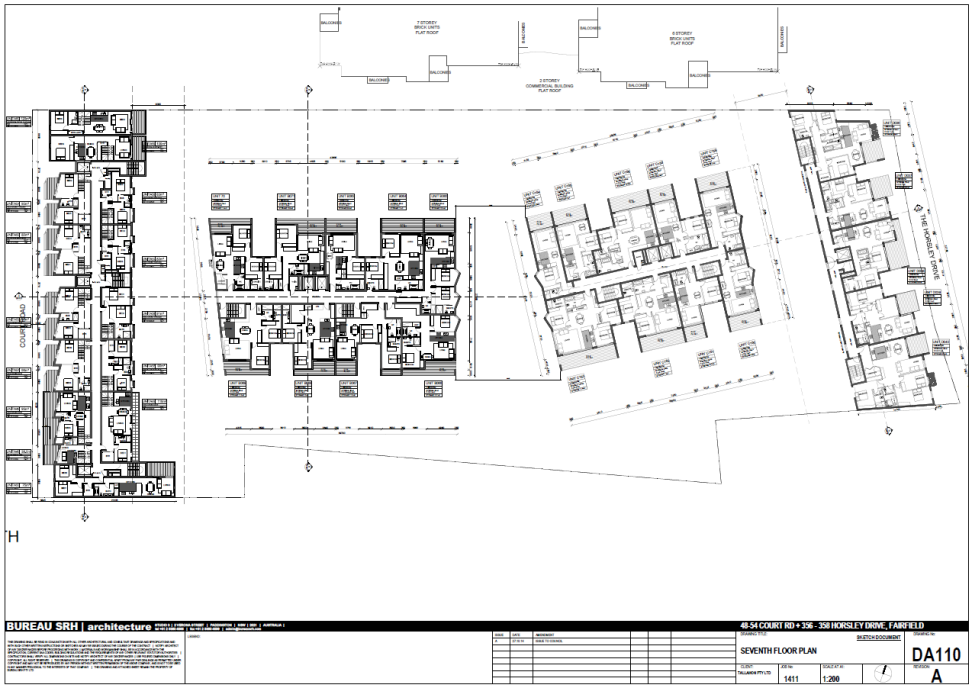


Figure 0-6 Eight Floor Plan

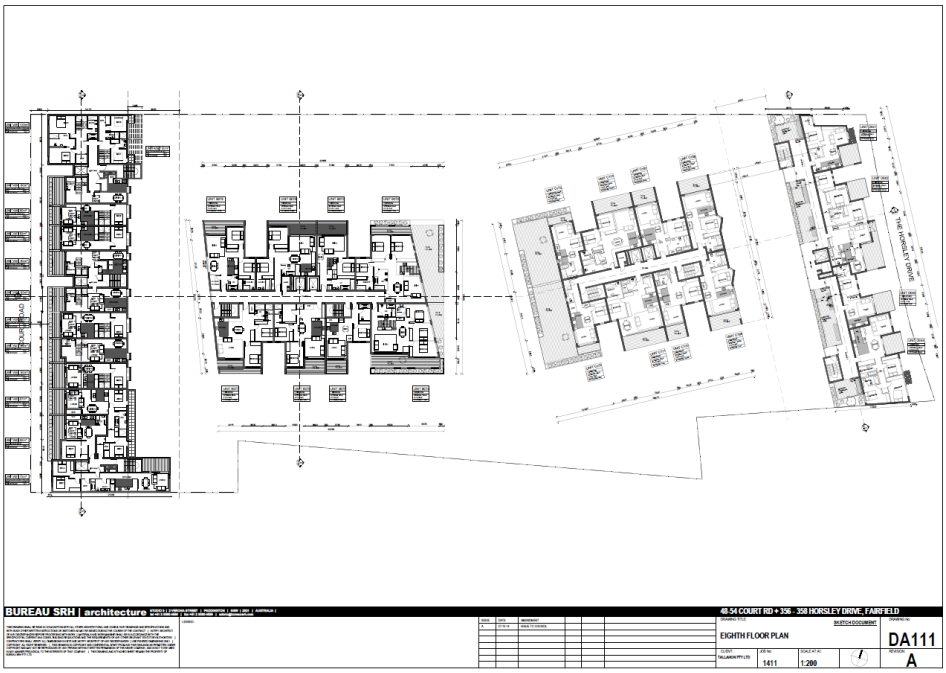


Figure 0-7 Ninth Floor Plan

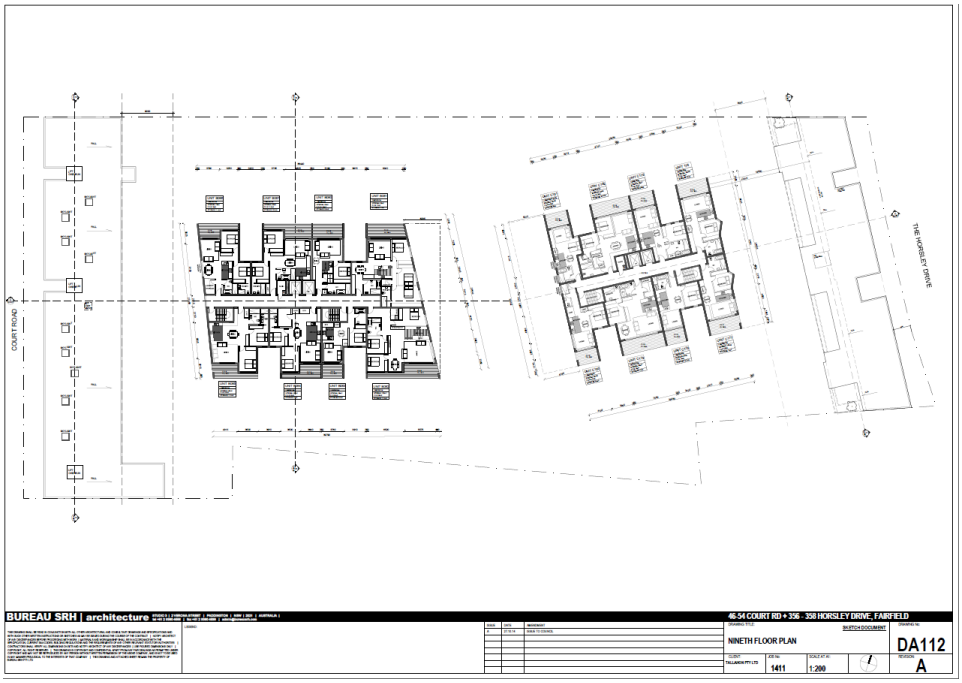


Figure 0-8 Tenth Floor Plan

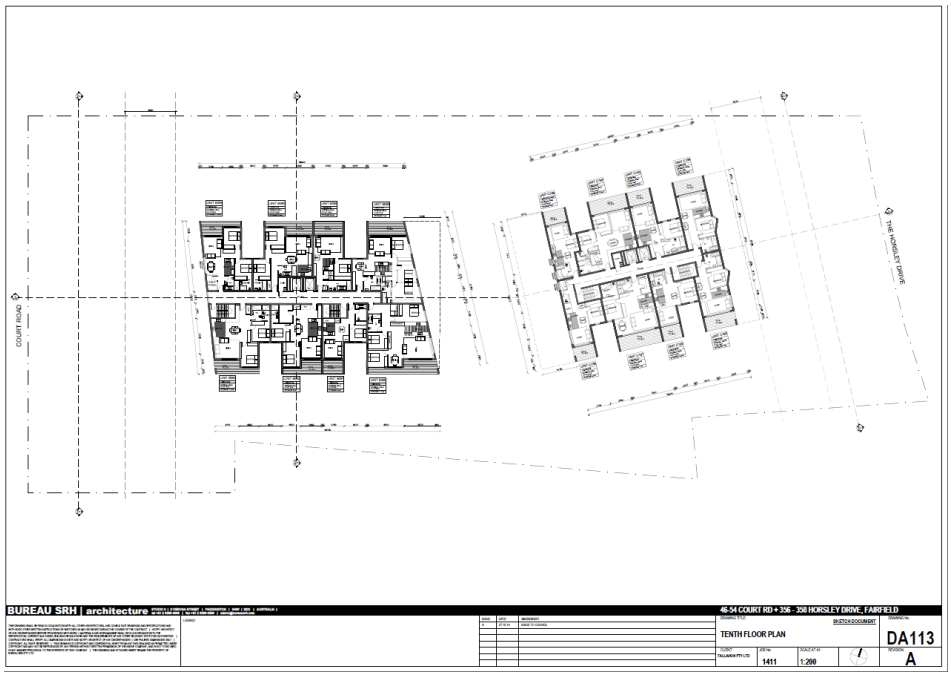
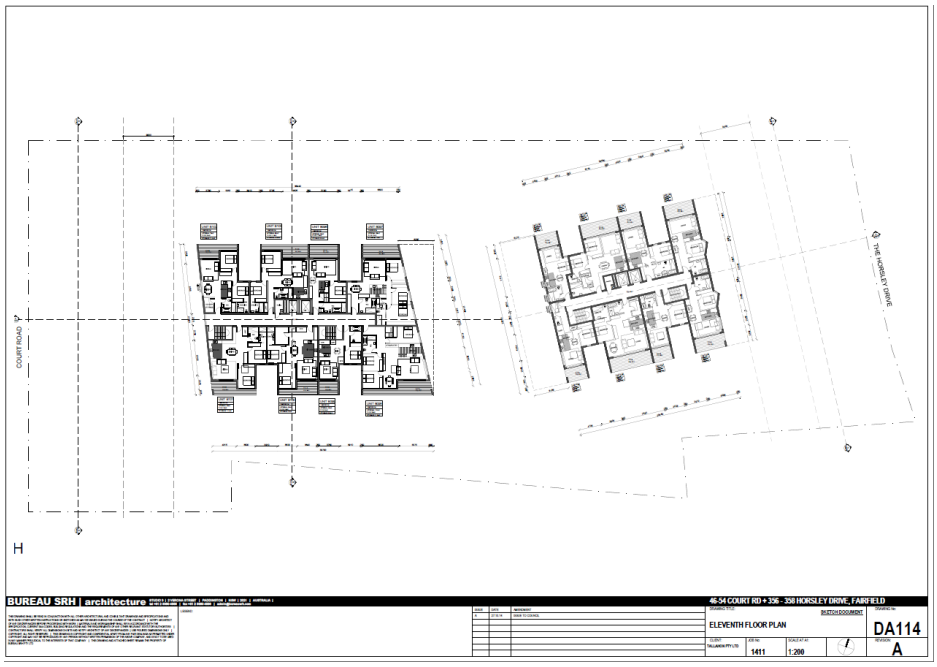


Figure 0-9 Eleventh Floor Plan



3 EXISTING NOISE ENVIRONMENT

3.1 Ambient Noise Monitoring

In order to characterise the existing acoustical environment experienced at the project site, ambient noise monitoring was carried out at two locations representative of the potentially most noise-exposed facades of the proposed future buildings. The unattended environmental noise monitoring survey was conducted between Monday 25 August 2014 and Sunday 31 August 2014.

Instrumentation for the survey consisted of two RION NL-42 Environmental Noise Loggers (Serial number 221356 – Location 1 and Serial number 410151 – Location 2) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The selected monitoring locations, which are shown in Figure 2-1, were:

- **Location 1 354 The Horsley Drive** (**Eastern Boundary):** The logger was located approximately 10 m from the nearside carriageway to measure the levels of road traffic noise that are likely to be experienced at the proposed eastern facade and to determine minimum background noise levels for the purposes of establishing emissions criteria.
- **Location 2 56 Court Road (Western Boundary):** The logger was located approximately 7 m from the edge of the nearside carriageway to measure the levels of road traffic noise that are likely to be experienced at the proposed western building facade and to determine minimum background noise levels for the purposes of establishing emissions criteria.

3.2 Noise Monitoring Results

The results of the unattended noise logging, have been processed in accordance with the NSW SEPP (Infrastructure) 2007 time periods to determine the daytime and night-time levels of road noise. Data obtained during periods of adverse weather conditions has been excluded from processing.

Table 3-1 details the $L_{Aeq(15hour)}$ daytime and the $L_{Aeq(9hour)}$ night-time road traffic noise levels recorded during the survey.

Table 3-1 Measured Road Traffic Noise Levels

Measurement Location	Noise Level - dBA re 20 µPa	
	$L_{Aeq(15hour)}$	$L_{Aeq(9hour)}$
Location 1 354 The Horsley Drive (eastern boundary)	68	64
Location 2 56 Court Road (western boundary)	65	62

Calculations of the level of road traffic noise likely to be experienced at the eastern boundary of the site due to contributions from The Horsley Drive have been carried out using the Calculation of Road Traffic Noise (CoRTN 1988) prediction method and the NSW Roads and Maritime Service's (RMS) traffic volume figures for the counting station 66240 The Horsley Drive, Fairfield Railway Line, Fairfield. The 2012 AADT volume at this location was 45,800 (weekdays) vehicles.

The predicted noise levels at the eastern boundary of the site are presented in Table 3-2**.**

Table 3-2 Calculated Road Traffic Noise Levels (CoRTN 1988 method)

Receiver Location	Noise Level - dBA re 20 µPa	
	$L_{Aeq(15hour)}$	$L_{Aeq(9hour)}$
Eastern Boundary	69	64

The predicted results shown in Table 3-2 correlate closely with the measured daytime and night-time road traffic noise levels.

To determine the project specific criteria for operational noise emissions from any future mechanical plant associated with the development, the measured data was processed according to the NSW Environment Protection Authority's (EPA) *Industrial Noise Policy* (INP) assessment time periods. Table 3-3 details the RBL (background) noise levels and the L_{Aeq} noise levels recorded during the daytime, evening and night-time periods.

Table 3-3 Measured Ambient Noise Levels Corresponding to NSW INP Assessment Time Periods

Location	Measurement Descriptor	Measured Noise Level - dBA re 20 µPa		
		Daytime 7:00 am – 6:00 pm	Evening 6:00 pm – 10:00 pm	Night-time 10:00 pm – 7:00 am
Logger 1 (East)	L_{Aeq}[1]	67	66	63
	RBL[2]	61	56	41
Logger 2 (West)	L_{Aeq}[1]	65	65	62
	RBL[2]	59	51	51

Note 1: The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Note 2: The RBL noise level is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

4 ASSESSMENT CRITERIA

4.1 Acoustical Amenity – Noise Intrusion

4.1.1 Fairfield City Wide Development Control Plan 2013

Fairfield City Wide Development Control Plan 2013 (DCP 2013) Chapter 7 contains guidance in relation to acoustical amenity within residential flat buildings. No specific controls in relation to noise are documented however general guidance in terms of planning arrangements is included and residential developments adjacent to busy roads (and rail lines) are required to consider the provisions of *SEPP (Infrastructure) 2007.*

In addition, the design of mixed-use developments is required to minimise noise intrusion into residential apartments from activities associated with business and commercial activities.

4.1.2 NSW SEPP (Infrastructure) 2007

SEPP (Infrastructure) 2007 was introduced to assist the delivery of necessary infrastructure by improving regulatory certainty and efficiency. The Infrastructure SEPP has specific planning provisions and development controls for various types of infrastructure and to development adjacent to infrastructure.

Clause 102 includes provisions to ensure that noise sensitive development proposed adjacent to road corridors which carry considerable traffic volumes are not adversely affected by road noise or vibration.

The clause applies to development adjacent to roads with an annual average daily traffic volume (AADT) of more than 40,000 vehicles (based on the traffic volume data published on the website of the Roads and Maritime Services), and that the consent authority considers likely to be adversely affected by road noise or vibration.

Where residential development is proposed, appropriate measures must be taken to ensure that the following internal noise levels are met:

- The L_{Aeq} noise level between the hours of 10:00 pm and 7:00 am shall not exceed 35 dBA within a bedroom, and

- The L_{Aeq} noise level within any other habitable room (excluding a garage, kitchen, bathroom or hallway) shall not exceed 40 dBA at any time.

The Horsley Drive is identified as a road corridor where the requirements under the provisions of SEPP (Infrastructure) 2007 are recommended. However, since 2012 AADT volume at the nearest permanent counting location to the site was 45,800 (weekdays), the requirements under SEPP (Infrastructure) 2007 become mandatory.

The NSW Department of Planning & Infrastructure's *"Development Near Rail Corridors and Busy Roads – Interim Guideline"* provides guidance for the acceptable internal noise levels due to external noise intrusion with windows or doors open as follows:

> *"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 required under SEPP (Infrastructure) 2007 apply to a 'windows closed condition'. Standard window glazing of a building will typically attenuate noise ingress by 20 dBA with windows closed and 10 dBA with windows open (allowing for natural ventilation). Accordingly, the external noise threshold above which an apartment would generally require mechanical/alternative ventilation is an $L_{Aeq(9hour)}$ of 55 dBA for bedrooms and $L_{Aeq(15hour)}$ of 60 dB(A) for other areas.

4.2 Acoustical Amenity – Sound Insulation

The Fairfield City Wide DCP 2013 requires development to comply with the noise transmission provisions of the Building Code of Australia. The 2004 version is nominated however development is required to comply with the issue of the BCA currently in force.

Criteria for airborne (and impact) sound transmission between sole occupancy residential units is documented in the National Construction Code Series Building Code of Australia (NCC 2014).

Residential apartments are required to comply with the provisions relating to sound transmission and insulation under Part F5 of the BCA.

4.3 Operational Noise Emissions

Noise criteria relating to operational noise emissions from the development to surrounding potentially sensitive receivers are contained in the NSW *Industrial Noise Policy* (INP). The Policy is applicable to noise emission from mechanical and other sources of continuous noise-generation at the subject site and has the following broad objectives:

- Controlling **intrusive** noise impacts (to residences only)
- Maintaining noise level **amenity** for residential and other land uses over the medium to long-term.

Where an intrusive and an amenity criterion are established for a receiver, the more stringent (lower) of the two criteria applies.

Intrusiveness Criterion

For assessing intrusiveness, the background noise level of the area needs to be established. The intrusiveness criterion essentially requires the equivalent continuous noise level (L_{Aeq}) of a noise source to not exceed the measured RBL by more than 5 dBA, over any 15 minute period.

Amenity Criterion

The amenity assessment is based on noise criteria specific to land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to continuous industrial noise sources and do not apply to road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the Policy sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

Fairfield City Wide DCP 2013 requires operational noise emissions from development, including mechanical equipment (such as extraction fans and air conditioners) and any operational activities that may conflict with residential living, to be assessed and measures to be implemented to adequately minimise noise transmission.

Project Specific Noise Levels

The INP classifies the noise environment of the subject area as "Urban". An "Urban" noise environment is an area that:

- Is dominated by "urban hum" or industrial source noise.
- Has through traffic with characteristically heavy and continuous traffic flows during peak periods.
- Is near commercial districts or industrial districts.
- Has any combination of the above.

Having defined the area type, the data obtained from ambient noise monitoring, analysed in accordance with INP procedures (refer to Table 3-3), has been used to generate project specific noise criteria for the assessment of continuous operational noise emissions from the development. The lowest of the levels measured at each of the two locations have been adopted for the purposes of establishing the design limits.

In accordance with INP guidelines, the project specific noise levels for residential receivers to the north of the site and within the subject development itself, which are shown in bold in Table 4-1**,** are the lower of the amenity and intrusive criteria. For commercial receivers, the $L_{Aeq\ (period)}$ design limit is 65 dBA at anytime.

Table 4-1 Assessment Criteria for Continuous Operational Noise Emissions

Location	Area Classification	Period [1]	ANL [2] LAeq (period) dBA	RBL [3] LA90(15min) dBA	LAeq(period) Noise Level dBA	Criteria for New Sources[4]	
						Intrusive LAeq(15min)	Amenity LAeq(period)
Residence	Urban	Day	60	59	65	64	**55**
		Evening	50	51	65	56	**55**
		Night	45	41	62	46	**43**

Note 1: INP Governing Periods are Day: 7.00 am to 6.00 pm, Evening: 6.00 pm to 10.00 pm, Night: 10.00 pm to 7.00 am.

Note 2: Recommended - ANL Acceptable Noise Level.

Note 3: RBL Rating Background Level.

Note 4: Assuming existing noise levels unlikely to decrease in the future.

Note 5: Intrusive criterion only applicable to residential receivers.

5 ACOUSTICAL ASSESSMENT & DESIGN RECOMMENDATIONS

5.1 Road Traffic Noise Intrusion

Future residential apartments will be exposed to noise from road traffic, chiefly on the facades facing onto The Horsley Drive. The western facades (facing Court Road) are exposed to road traffic noise and operational noise emissions associated with the surrounding commercial (and residential) development.

A review of the results of measurements carried out at the site to determine the levels of road traffic and environmental noise received at the proposed location of the nearest future residential apartment building facades is summarised as follows:

The Horsley Drive Eastern Facade

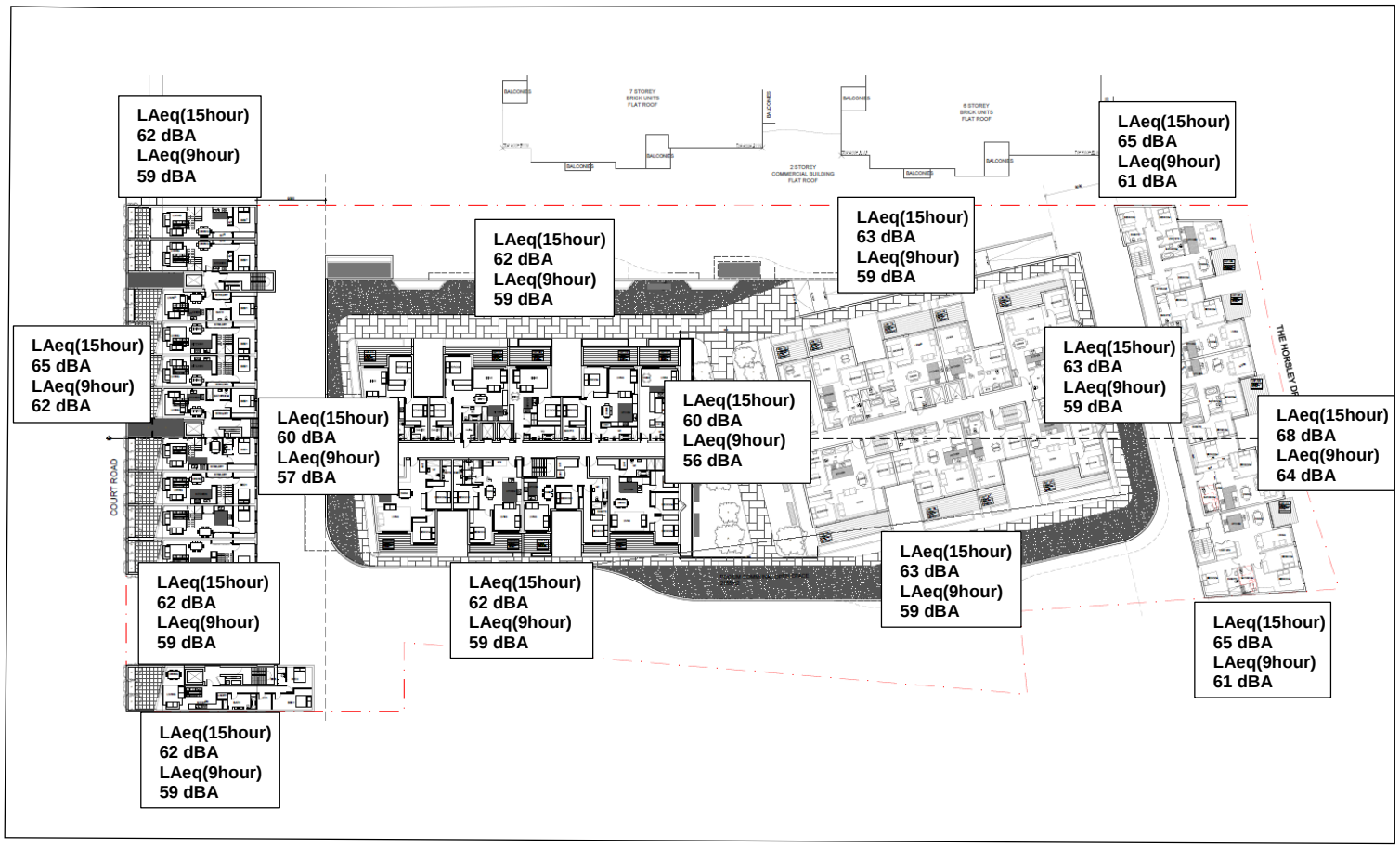
- Daytime (7.00 am - 10.00 pm) $L_{Aeq(15hr)}$ 68 dBA
- Night-time (10.00 pm - 7.00 am) $L_{Aeq(9hr)}$ 64 dBA

Court Road Western Facade

- Daytime (7.00 am - 10.00 pm) $L_{Aeq(15hr)}$ 65 dBA
- Night-time (10.00 pm - 7.00 am) $L_{Aeq(9hr)}$ 62 dBA

The expected daytime and night-time noise levels impinging upon the facades of the future apartment buildings have been predicted based on the results of measurements of existing noise exposure and predictions of road traffic noise presented in Table 3-1 and Table 3-2 and are shown in Figure 5-1.

Figure 5-1 Predicted Daytime and Night-time Noise Levels at Future Residential Apartments



Standard window glazing of a building will typically attenuate external noise ingress by 20 dBA with windows closed and 10 dBA with windows open (allowing for natural ventilation). The expected range of internal noise levels for standard facade glazing is presented in Table 5-1 for the windows open and windows closed scenarios and the predicted future levels of environmental noise impinging on the future facades of apartments.

Table 5-1 Acoustic Performance Requirements of Glazing

Building/Facade	**Space**	**Descriptor**	**Internal Noise Level**		**Criterion**	
			Windows Open	**Windows Closed**	**Windows Open**	**Windows Closed**
The Horsley Drive Building						
East Facade	Habitable	LAeq(15hr)	58	48	50	40
	Bedrooms	LAeq(9hr)	54	44	45	35
West Facade	Habitable	LAeq(15hr)	53	43	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
North Facade	Habitable	LAeq(15hr)	55	45	50	40
	Bedrooms	LAeq(9hr)	51	41	45	35
South Facade	Habitable	LAeq(15hr)	55	45	50	40
	Bedrooms	LAeq(9hr)	51	41	45	35
Court Road Building						
West Facade	Habitable	LAeq(15hr)	55	45	50	40
	Bedrooms	LAeq(9hr)	52	42	45	35
East Facade	**Habitable**	LAeq(15hr)	**50**	**40**	50	40
	Bedrooms	LAeq(9hr)	47	37	45	35
North Facade	Habitable	LAeq(15hr)	52	42	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
South Facade	Habitable	LAeq(15hr)	52	42	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
Eastern Tower						
North Facade	Habitable	LAeq(15hr)	53	43	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
South Facade	Habitable	LAeq(15hr)	53	43	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
East Facade	Habitable	LAeq(15hr)	53	43	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
West Facade	**Habitable**	LAeq(15hr)	**50**	**40**	50	40
	Bedrooms	LAeq(9hr)	46	36	45	35
Western Tower						
North Facade	Habitable	LAeq(15hr)	52	42	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
South Facade	Habitable	LAeq(15hr)	52	42	50	40
	Bedrooms	LAeq(9hr)	49	39	45	35
East Facade	**Habitable**	LAeq(15hr)	**50**	**40**	50	40
	Bedrooms	LAeq(9hr)	46	36	45	35
West Facade	**Habitable**	LAeq(15hr)	**50**	**40**	50	40
	Bedrooms	LAeq(9hr)	47	37	45	35

The predicted internal noise levels indicate that the regulatory internal noise criteria for open and closed windows will generally be exceeded in habitable rooms and bedrooms throughout the development, with the following exceptions as indicated in **bold** in Table 5-1:

- Court Road Building – East facade habitable rooms
- Eastern Tower – West facade habitable rooms
- Western Tower – East and west facade habitable rooms.

Upgraded glazing will be required for the rooms as nominated in Table 5-1 (ie that are not shown in **bold**) in order to achieve acceptable internal noise levels with the windows closed. In-principle, windows and doors with a laboratory-tested minimum acoustical performance of **R_w 33** will provide the required additional attenuation of external noise levels. This acoustical performance can typically be achieved with 6.38 mm laminated glazing in well-sealed frames of heavy-duty construction. Full perimeter acoustical seals (eg Q-Lon seals) will be required, felt weather seals are inappropriate.

In addition, where windows and doors are required to be closed to meet internal noise levels as nominated in Table 5-1, alternative means of achieving the requirement for "comfort ventilation" will need to be considered to enable openings in the external facade to remain fully closed during noisy periods. The ventilation requirements of the BCA should be satisfied and design input should be sought from an appropriately qualified mechanical consultant. It is likely that an alternative means of comfort ventilation will need to be provided for all habitable spaces in the development.

5.2 Sound Insulation Between Apartments

Residential apartments will be required to comply with the NCC 2014 (BCA) provisions under Part F5 *Sound Transmission and Insulation*. Table 5-2 details the minimum acoustic performance required for the project.

Table 5-2 NCC 2014 Sound Insulation Requirements

Construction	2014 BCA	
	Laboratory Rating	**Verification**
Walls between sole occupancy units	$R_w + C_{tr}$ not < 50	$D_{nT,w} + C_{tr}$ not < 45
Walls between a bathroom, sanitary compartment, laundry or kitchen in one sole occupancy unit and a habitable room (other than a kitchen) in an adjoining unit	$R_w + C_{tr}$ not < 50 and **Must have a minimum 20 mm cavity between two separate leaves**	$D_{nT,w} + C_{tr}$ not < 45 "Expert Judgment" Comparison to the "Deemed to satisfy" Provisions
Walls between sole occupancy units and a plant room or lift shaft	R_w not < 50 and **Must have a minimum 20 mm cavity between two separate leaves[1]**	$D_{nT,w}$ not < 45
Walls between sole occupancy units and a stairway, public corridor, public lobby or the like, or parts of a different classification	R_w not < 50	$D_{nT,w}$ not < 45
Door assemblies located in a wall between a sole-occupancy unit and a stairway, public corridor, public lobby or the like	R_w not < 30 [2]	$D_{nT,w}$ not < 25

Floors between sole-occupancy units or between a sole-occupancy unit and a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification	$R_w + C_{tr}$ not < 50 $L_{n,w} + C_I$ not > 62	$D_{nT,w} + C_{tr}$ not < 45 $L'_{nT,w} + C_I$ not > 62
Soil, waste, water supply and stormwater pipes and ductwork to habitable rooms	$R_w + C_{tr}$ not < 40	n/a
Soil, waste, water supply and stormwater pipes and ductwork to kitchens and other rooms	$R_w + C_{tr}$ not < 25	n/a
Intra-tenancy Walls	There is no statutory requirement for airborne isolation via intra-tenancy walls.	

Note 1: A wall must be of "discontinuous construction" if it separates a sole occupancy unit from a plant room or lift shaft. Clause F5.3(c) defines "discontinuous construction" as a wall having a minimum 20 mm cavity between two separate leaves with no mechanical linkage except at the periphery.

Note 2: Clause FP5.3(b) in the 2014 BCA states that the required insulation of a floor or wall must not be compromised by a door assembly.

It should be noted that open-plan kitchen/dining/living areas are considered to be a "habitable room".

5.3 External Acoustical Amenity

There are no criteria specifically relating to outdoor acoustical amenity for residential receivers. The INP recommends L_{Aeq} levels of between 50 dBA and 60 dBA for recreation areas although this criteria relates to noise from industrial sources and is not intended to apply to transportation noise sources. However, in the absence of specifically applicable criteria, these levels are considered an acceptable basis upon which to assess outdoor acoustical amenity.

Based upon the measured levels of noise exposure at the site, the predicted daytime $L_{Aeq(15hour)}$ levels around the interior ground level landscaped common usage open-space areas are likely to be around 60 dBA.

When compared with the INP recommended levels, outdoor acoustical amenity appears to be acceptable.

5.4 Operational Noise Emissions

Precise mechanical plant selection is unknown at this stage, as plant selection will take place during the detailed design phase of the project.

It is anticipated that the development will be serviced by typical mechanical ventilation/air -conditioning equipment involving individual low-noise split systems. Basement carparking will likely be served by an exhaust system, with the fans possibly housed either on the roof or in basement plantrooms. The plant is expected to operate during daytime hours only (that is, not beyond 10:00 pm).

It is likely that the criteria set out in Section 4.3 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 full enclosures, localised barriers, silencers and lined ductwork).

The mechanical plant associated with the development must be reviewed by an appropriately qualified acoustic consultant at the construction certificate and tender stage when preliminary, and final plant selections have been made.

All mechanical plant and equipment with the potential to operate continuously would need to be selected, positioned, and, if necessary, treated, to ensure compliance with the limiting noise criterion of **42 dBA** during the night-time period and with the daytime/evening **50 dBA** criterion (for operations unitl 10:00 pm) for nearby residential receivers to satisfy Fairfield City Council requirements.

All mechanical plant and equipment with the potential to operate continuously would need to be selected, positioned, and, if necessary, treated, to ensure compliance with the limiting noise criterion of **43 dBA** during the night-time period for nearby residential receivers to satisfy INP requirements. Plant operating between 7:00 am and 10:00 pm will need to achieve a limiting criterion of **55 dBA**.

6 CONCLUSION

Rodney Stevens Acoustics Pty Ltd has conducted an assessment to review the requirements of the proposed mixed use development at 48 – 54 Court Road & 356 – 358 The Horsley Drive, Fairfield in regard to noise intrusion from road traffic and commercial activity noise, operational noise emissions and the sound insulation of the future residential apartments. The assessment involved a survey of the existing noise environment, derivation and establishment of assessment criteria for noise emissions in accordance with Fairfield City Council, EPA and DOP guidelines, a noise impact assessment relative to appropriate criteria, and, where required, recommendations for noise control measures. This assessment has been carried out in accordance with NSW regulatory requirements and this report is to form part of a Development Application in support of the proposed development.

Noise levels within living spaces and bedrooms of future residential apartments have been estimated and compared with regulatory requirements for internal acoustical amenity. Upgraded glazing will generally be required throughout the development to achieve the required internal noise levels within habitable rooms and bedrooms. In addition, a system of comfort ventilation is recommended to enable any window or door openings in these rooms to be closed during noisy periods.

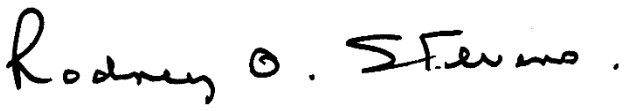
Building construction is required to be in accordance with the BCA Part F5 in relation to sound insulation between sole occupancy units. The requirements of the BCA have been documented within this report.

Outdoor acoustical amenity has been reviewed and given the shielding of the site achieved through the building layout proposed, outdoor noise levels will be within acceptable limits.

Mechanical design is not sufficiently developed at this stage to enable a comprehensive assessment of noise emissions associated with the operation of mechanical plant and equipment. Design limits have been included for the future assessment purposes.

In conclusion, based upon review of the Development Application proposal, the mixed-use development can achieve the relevant criteria for noise and can therefore be supported on the basis of acoustics.

Approved:-

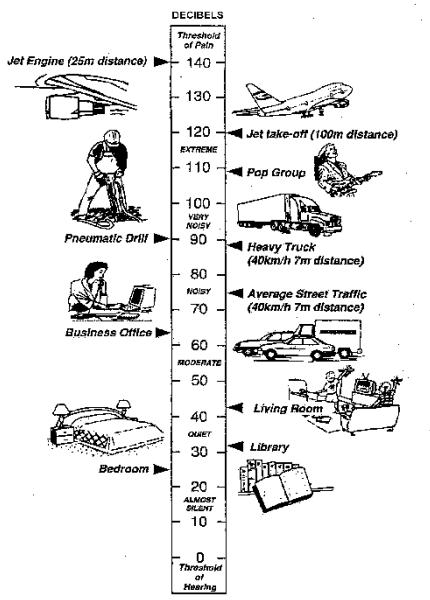


Rodney Stevens – MAAS
Principal

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, taking into account 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 10th 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)*.

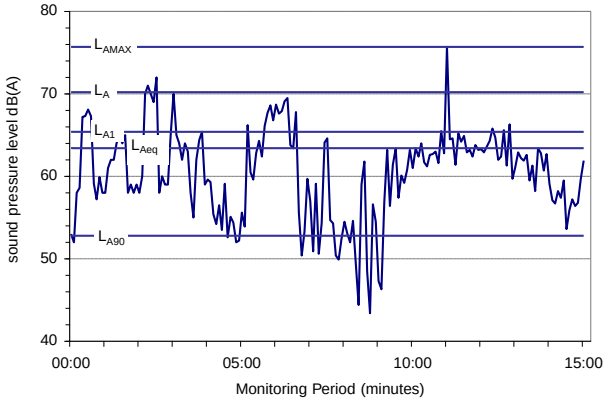
Sound pressure level (SPL)

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.

Statistical 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.

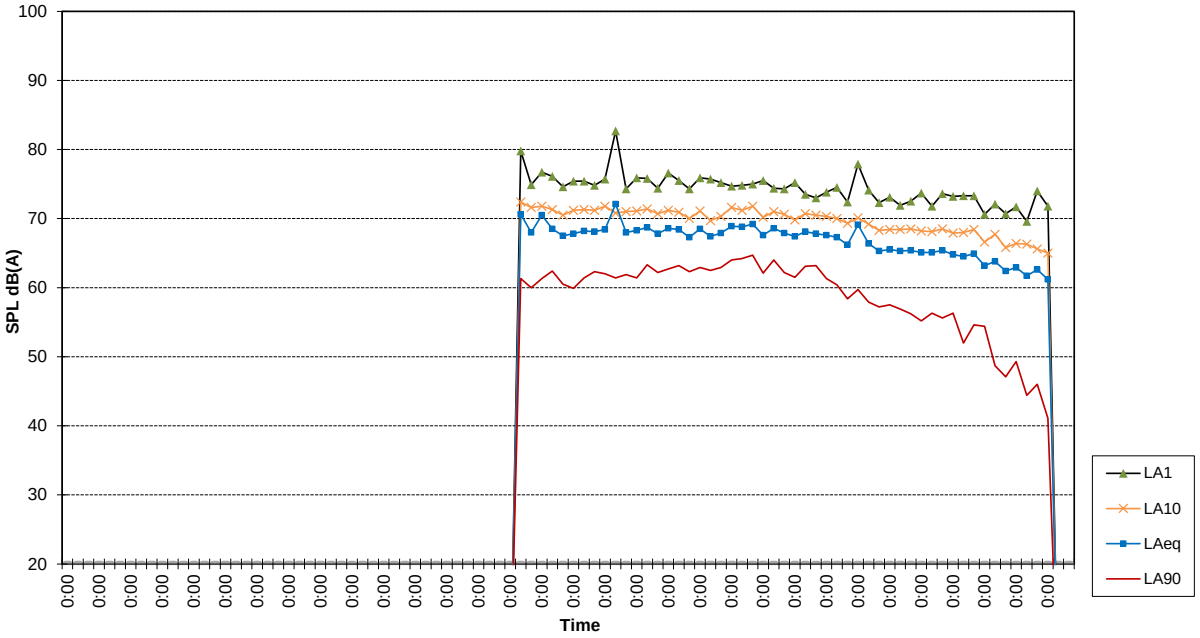
L_{A10}	Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.
L_{Aeq}	Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding 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).

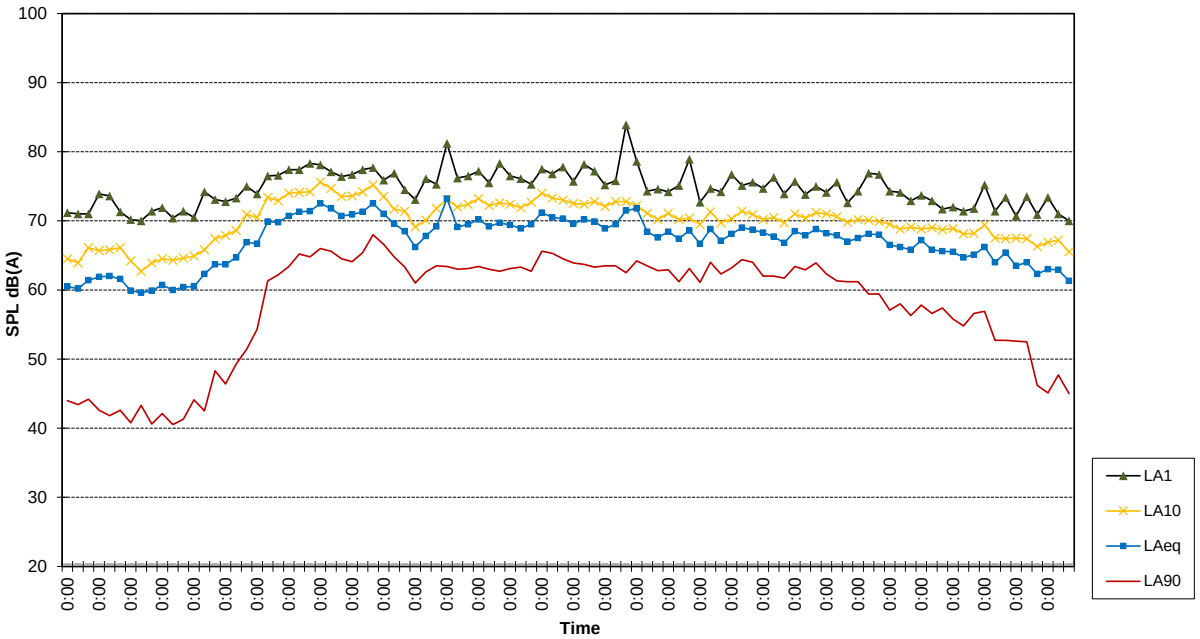
Tonality Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

Appendix B – Ambient Noise Survey Results

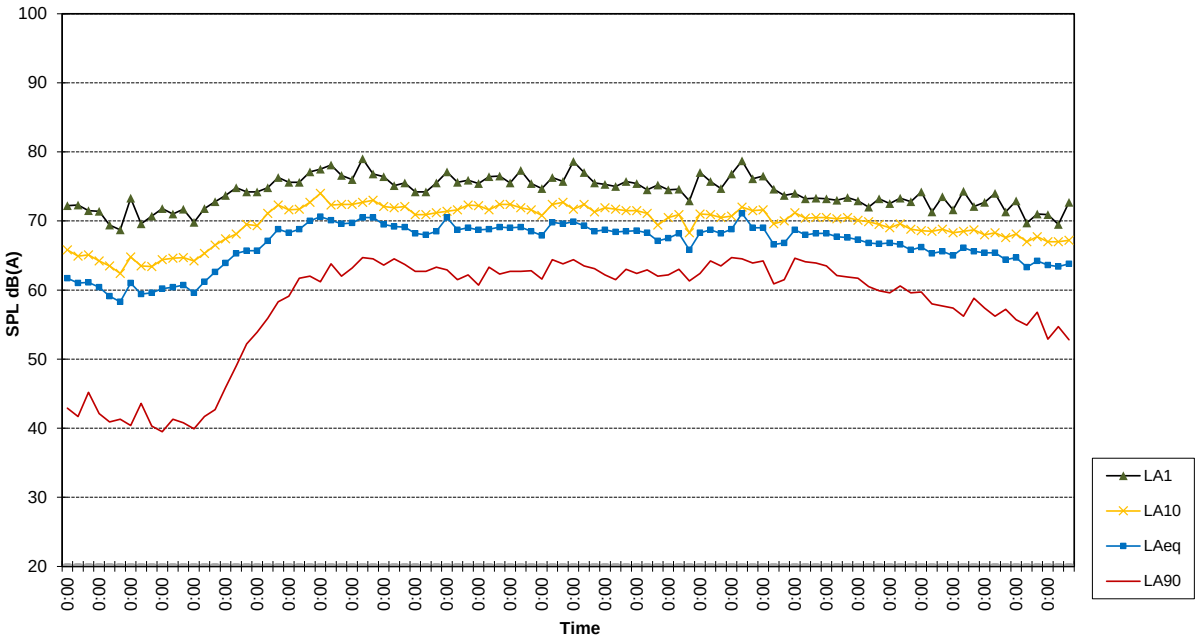
Location - 358The Horsley Drive Fairfield
Measured Noise Levels - Monday 25/08/2014



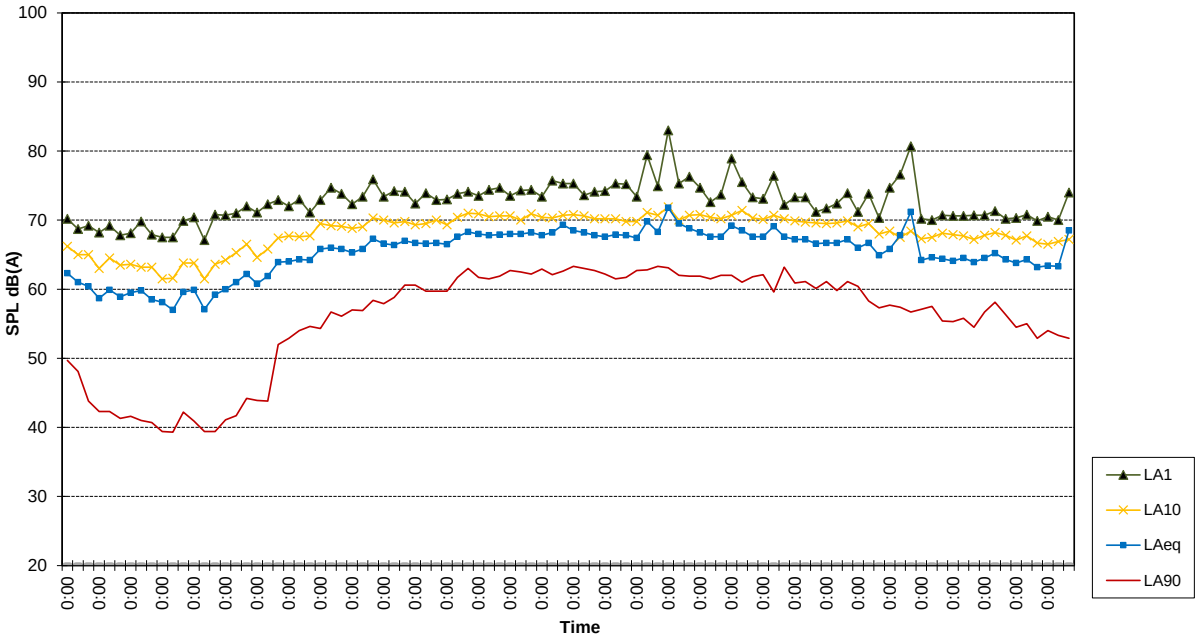
Location - 358The Horsley Drive Fairfield
Measured Noise Levels - Thursday 28/08/2014



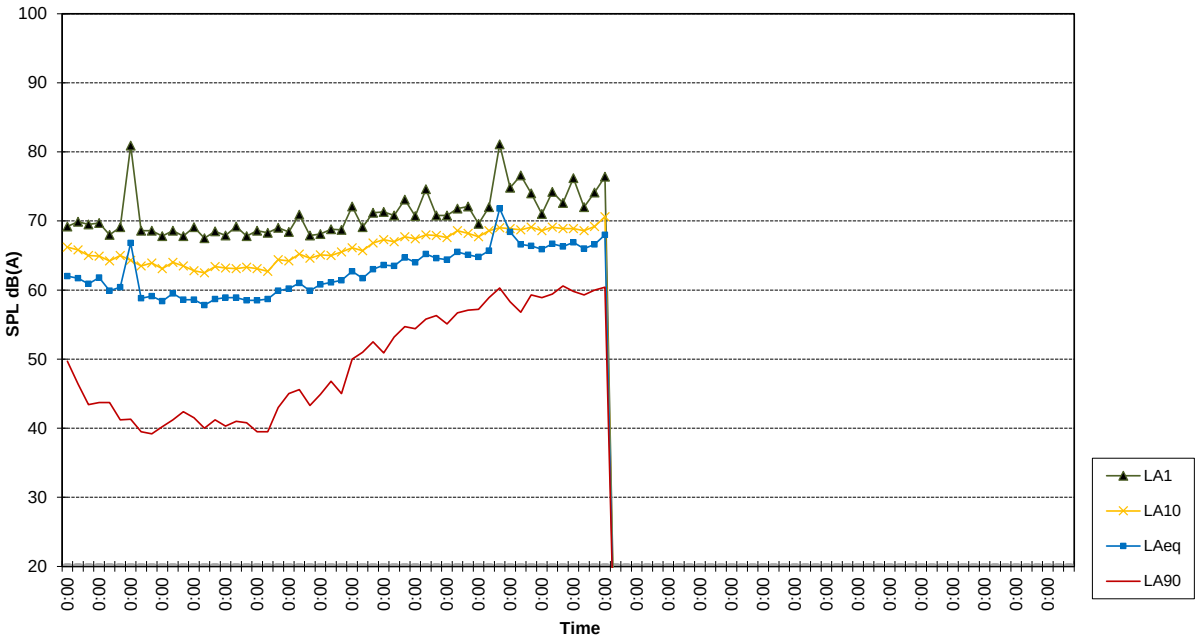
Location - 358The Horsley Drive Fairfield
Measured Noise Levels - Friday 29/08/2014



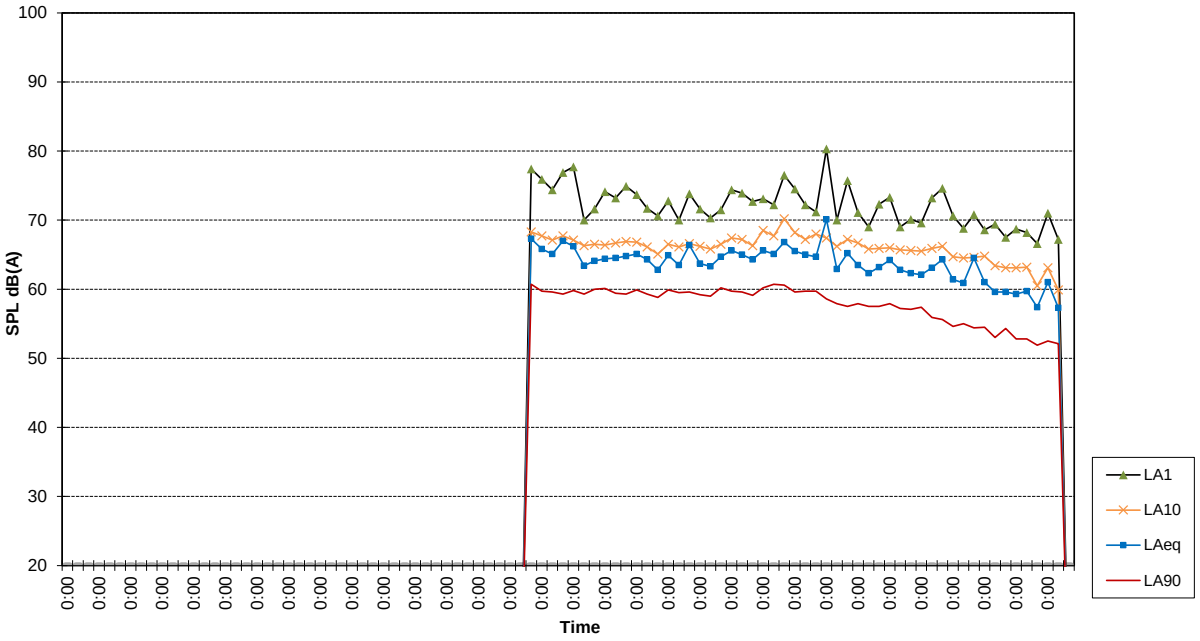
Location - 358The Horsley Drive Fairfield
Measured Noise Levels - Saturday 30/08/2014



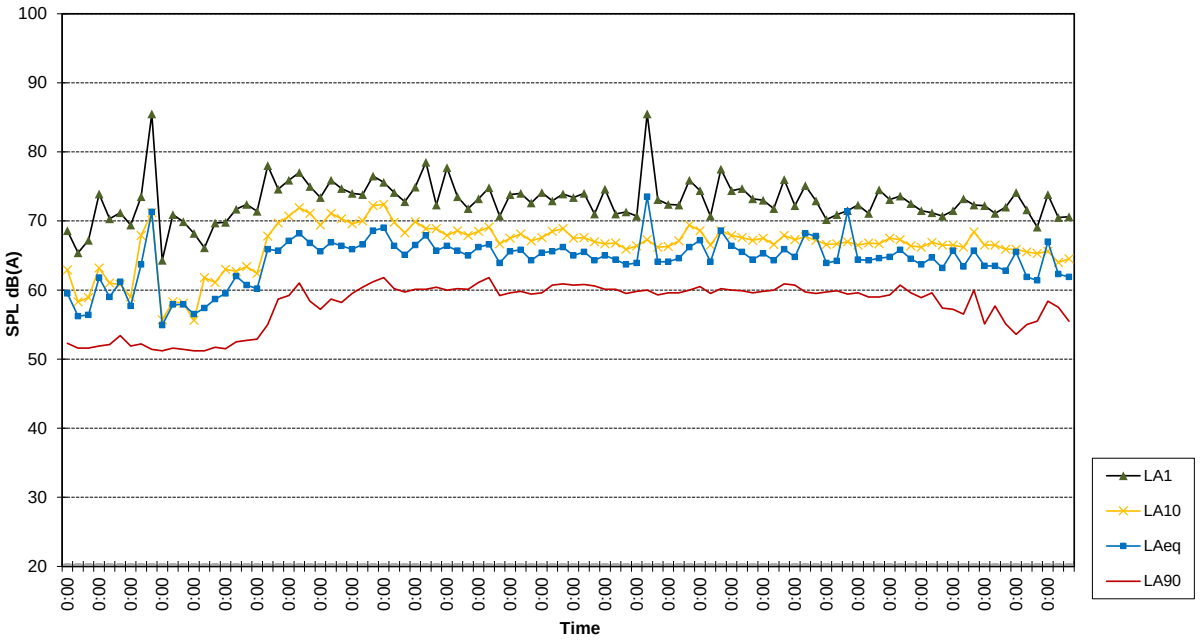
Location - 358The Horsley Drive Fairfield
Measured Noise Levels - Sunday 31/08/2014



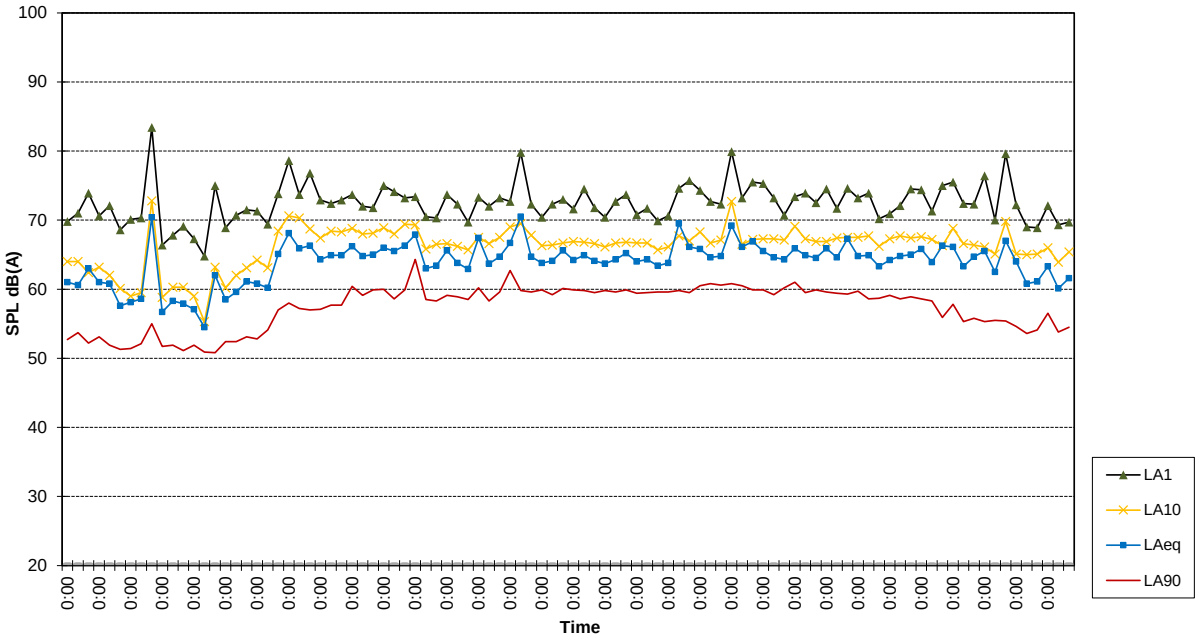
Location - 56 Court Road, Fairfield
Measured Noise Levels - Monday 25/08/2014



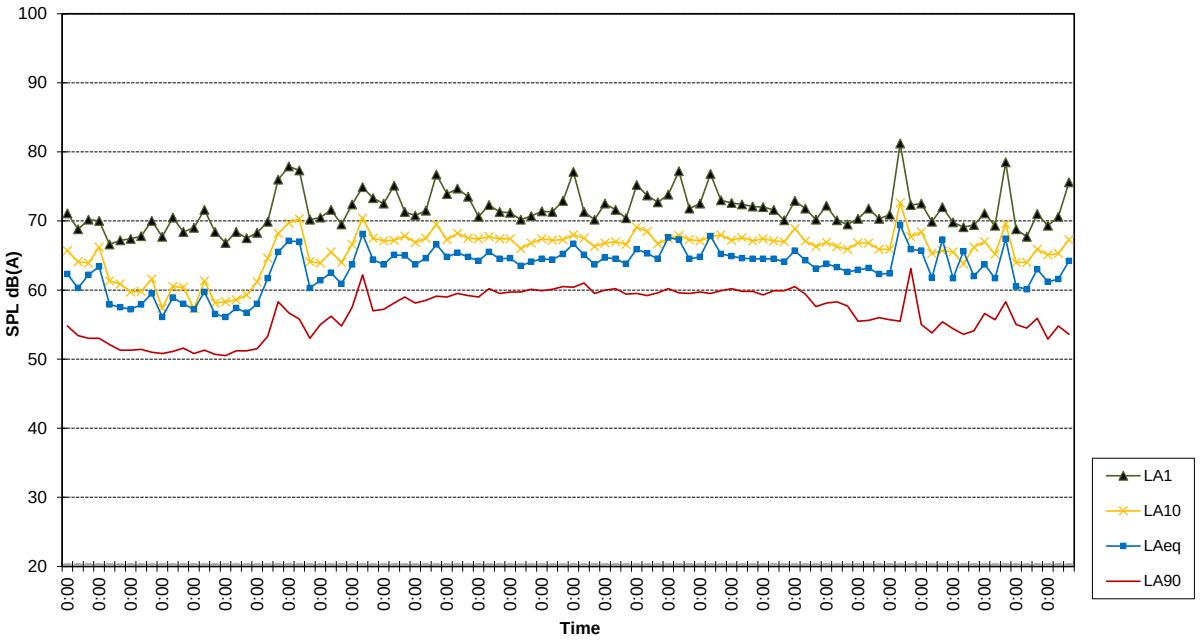
Location - 56 Court Road, Fairfield
Measured Noise Levels - Thursday 28/08/2014



Location - 56 Court Road, Fairfield
Measured Noise Levels - Friday 29/08/2014



Location - 56 Court Road, Fairfield
Measured Noise Levels - Saturday 30/08/2014



Location - 56 Court Road, Fairfield
Measured Noise Levels - Sunday 31/08/2014