

Mohammed Dahar

190 Waterloo Road, Greenacre

Acoustic DA Assessment

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1 Introduction

The following report has been prepared by Acouras Consultancy on behalf of Mohammed Dahar to undertake a noise impact assessment for the proposed mixed use residential development located at 190 Waterloo Road, Greenacre. The development will include:

- Two (2) levels of basement carpark.
- Retail on ground floor.
- Residential apartment on ground to level 6.

The proposed residential development is surrounded by existing commercial and retail buildings. The site location is shown in Figure 1.



Figure 1 – Site Location, Nearest Residents and Noise Logger Position

2 Noise Criteria

The following standards and guidelines are applicable to this project:

- NSW Department of Planning “Development Near Rail Corridors and Busy Roads”.
- NCC/BCA Part F7.
- NSW EPA “Noise Policy for Industry” (NPfI).
- Australian standard AS/NZS 2107-2016: Acoustics – Recommended design sound levels and reverberation times for building interiors.
- Australian standard AS 1055.1-1997: Acoustics – Description and measurement of environmental noise - General procedures.

2.1 Internal Noise Levels

The Department of Planning “Development Near Rail Corridors and Busy Roads” requires the following L_{Aeq} levels given in Table 1 are not exceeded.

Table 1— Development near Rail Corridors and Busy Roads – Interim Guideline

Residential Space	Internal Noise Criteria
in any bedroom in the building	35dB(A) at any time 10pm–7am
anywhere else in the building (other than a garage, kitchen, bathroom or hallway)	40dB(A) at any time

Mitigation measures are based on having windows and external doors closed. If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, 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.

For the development, the AS/NZS 2107–2016 outlines the acceptable internal noise levels such that a satisfactory acoustic environment within residential and non-residential spaces in new and existing buildings. Table 2 presents the recommended internal design noise levels in accordance with AS 2107 – 2016.

Table 2— Recommended Internal Design Noise Levels (AS/NZS 2107)

Type of occupancy/activity	Design sound level (L _{Aeq,t}) range
Apartment common areas, corridors, lobbies (e.g. foyer, lift lobby)	45 to 50
Small retail stores (general)	< 50
General office	40 to 45
Enclosed Carparks	< 65

2.2 Sound Insulation Requirement (Part F7 NCC/BCA)

For sound transmission and insulation between sole occupancy units (SOU) within the same development, walls and floors to be constructed in accordance with requirements of Part F7 of the Building Code of Australia (BCA). Sound insulation requirements are summarised in Table 3.

Table 3 - NCC Part F7 Requirements (Class 2 or 3)

Building Element	Minimum NCC Part F7 Requirements
Sound Insulation Rating of Walls (Class 2 or 3)	
Walls between separate sole occupancy units.	Rw + Ctr 50 (airborne)
Walls between wet areas (bathrooms, sanitary compartment, laundry or kitchen) and a habitable room (other than kitchen) in adjoining apartments.	Rw + Ctr 50 (airborne) & of discontinuous construction
Walls between sole occupancy unit and stairway, public corridors, public lobby or the like or parts of a different classification.	Rw 50 (airborne)
Walls between a plant room or lift shaft and a sole occupancy unit.	Rw 50 (airborne) & of discontinuous construction
Sound Insulation Rating of Floors (Class 2 or 3)	
Floors between sole occupancy units or between a sole occupancy unit and plant room, lift shaft, stairway, public corridor, public lobby or the like.	Rw + Ctr 50 (airborne) & Ln,w + CI < 62 (impact)
Apartment Entry Doors (Class 2 or 3)	
A door incorporated in a wall that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like.	Rw 30 (airborne)
Services (Class 2, 3 or 9c)	
If a storm water pipe, a duct, soil, waste or water supply pipe including a duct or pipe that is located in a wall or floor cavity serves or passes through more than one sole occupancy unit must be separated:	
if the adjacent room is a habitable room (other than a kitchen); or	Rw + Ctr 40
if the room is a kitchen or non-habitable room	Rw + Ctr 25

Construction Deemed to Satisfy

The forms of construction must be installed as follows:

- (a) Masonry—Units must be laid with all joints filled solid, including those between the masonry and any adjoining construction.
- (b) Concrete slabs—Joints between concrete slabs or panels and any adjoining construction must be filled solid.
- (c) Sheeting materials—
 - (i) if one layer is required on both sides of a wall, it must be fastened to the studs with joints staggered on opposite sides; and
 - (ii) if two layers are required, the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer; and
 - (iii) joints between sheets or between sheets and any adjoining construction must be taped and filled solid.
- (d) Timber or steel-framed construction—perimeter framing members must be securely fixed to the adjoining structure and—
 - (i) bedded in resilient compound; or
 - (ii) the joints must be caulked so that there are no voids between the framing members and the adjoining structure.
- (e) Services—
 - (i) Services must not be chased into concrete or masonry elements.
 - (ii) A door or panel required to have a certain $R_w + C_{tr}$ that provides access to a duct, pipe or other service must—
 - (A) not open into any habitable room (other than a kitchen); and
 - (B) be firmly fixed so as to overlap the frame or rebate of the frame by not less than 10 mm, be fitted with a sealing gasket along all edges and be constructed of—
 - (aa) wood, particleboard or blockboard not less than 33 mm thick; or
 - (bb) compressed fibre reinforced cement sheeting not less than 9 mm thick; or
 - (cc) other suitable material with a mass per unit area not less than 24.4 kg/m²
 - (iii) A water supply pipe must—
 - (A) only be installed in the cavity of discontinuous construction; and
 - (B) in the case of a pipe that serves only one sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10 mm to the other wall leaf.
 - (iv) Electrical outlets must be offset from each other—
 - (A) in masonry walling, not less than 100 mm; and
 - (B) in timber or steel framed walling, not less than 300 mm.

2.2.1 Traffic Noise Levels

Table 4 presents a summary of the measured ambient noise level and traffic noise impacting the development.

Table 4 – Measured Ambient and Traffic Noise and Levels, dBA

Location	Period	Average L_{eq}	Highest L_{eq} 1hr
Waterloo Road	Day (07:00-22:00)	66	72
	Night (22:00-07:00)	65	68

2.2.2 Project Noise Limits

Table 5 presents a summary of the measured background noise level and the allowable intrusive noise limit for this project as set out in the NSW Noise Policy for Industry (NPfI). The amenity criteria is based on a urban receiver.

Table 5—Noise Survey Summary and Project Limits, dBA

Receiver	Time Period	Existing Noise Levels			NSW EPA NPfI		Project Noise Trigger Level $L_{eq}(15min)$
		L_{eq} (period)	RBL	ANL	Project ANL ¹ $L_{eq}(15min)$	Intrusiveness Criteria, $L_{eq}(15min)$	
Residential	Day	65	58	60	58	63	58
	Evening	67	58	50	48	63	48
	Night	66	50	45	43	55	43
Commercial	When in use	-	-	65	-	-	65

During detailed design stage, the design and selection of the mechanical equipment required to service the proposed development will be required to achieve the EPA noise limits as presented in the table above.

¹ 2. Project ANL is recommended ANL minus 5 dB(A) and plus 3 dB(A), to convert from a period level to a 15-minute level.

3 Assessment and Recommendations

3.1 Façade Glazing Requirements

Acoustic glazing for the apartments are given in Table 6 are required to reduce noise impact on the internal occupants and should result in noise levels within such units in accordance with SEPP and AS/NZS 2107.

Table 6 – Schedule of Window and Glazing (R_w)

Level	Apartment	Space	Glazing Thickness	Minimum R_w (Glazing+Frame)
G	Retail	Retail	10.38mm laminated	32
	G01 to G04 (2 Storey)	Living & Bed	6.38mm laminated	30
1	101	Living & Bed	6.38mm laminated	30
	102	Living	6.38mm laminated	30
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46
	103 & 104	Living	12.5mm VLam	37
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46
	105	Living	12.5mm VLam	37
		Bed 1 & 3	10.5mm VLam/100mm/10.5mmVLam	46
		Bed 2	12.5mm VLam	37
	106 & 107	Living	12.5mm VLam	37
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46
	108	Living	6.38mm laminated	30
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46
2-6	X01, X02 & X10	Living & Bed	6.38mm laminated	30
	X03	Living	6.38mm laminated	30
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46

Level	Apartment	Space	Glazing Thickness	Minimum R_w (Glazing+Frame)
2-6	X04 & 105	Living	12.5mm VLam	37
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46
	X06	Living	12.5mm VLam	37
		Bed 1 & 3	10.5mm VLam/100mm/10.5mmVLam	46
		Bed 2	12.5mm VLam	37
	X07 & 108	Living	12.5mm VLam	37
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46
	X09	Living	6.38mm laminated	30
		Bed 1 & 2	10.5mm VLam/100mm/10.5mmVLam	46

All other non-habitable spaces, such as bathrooms and laundries require minimum 6mm monolithic glass (R_w 28). All Windows/doors should be well sealed (air tight) when closed with good acoustic seals around the top and bottom sliders. Mohair seals are not considered to be acoustic seals.

3.2 Building Façade Construction

To provide sufficient acoustic attention of noise, the general external construction of the proposed building would need to be constructed as detailed in Table 7.

Table 7 – External Façade Construction (R_w)

Building Element	Proposed Construction	Minimum R_w
External Wall	Masonry or cavity brick	45
Roof and ceiling	Concrete with a plasterboard cavity ceiling	45

3.3 Mechanical Services

At this stage, the design and selection of mechanical equipment has not been selected or finalised. Typically, based on the current documentation, list of equipment and similar sized residential projects we would expect the following noise control measures to be implemented:

- Carpark exhaust/supply fans located in the basement or rooftop plantroom.
 - Exhaust and supply fans operate with a VSD and CO sensor.
 - The fans operate on variable speed and are unlikely to operate at full speed during the night period of between 10pm and 7am.
 - Provide acoustic attenuators to the supply and discharge of the fans.
- Apartment exhaust fans (toilet, laundry, kitchen):
 - Electrically inter-locked with the light switch or have manual switch for the room served.
 - Internally lined ducts and acoustic flex ducts to be fitted to the fans.
 - These units would be inaudible at the boundary and at the nearest affected receivers.
- Outdoor A/C condenser can be located on apartment balconies. Typical, the noise level of is approximately SPL 52-56dBA at 1m, the predicted noise level at the boundary would be 30-33dBA.
- Vibration isolation mounts are to be selected in accordance with manufacturer's recommendations. Where required, incorporate restraining devices to prevent excessive movement of plant, equipment and piping systems.

During the Construction Certification stage review, a detail assessment of all mechanical plant and equipment will be conducted to ensure compliance with the EAP noise criteria.

3.4 Apartment Ventilation

For apartments that are exposed to high noise levels and if internal noise levels with windows or doors open exceed the criteria by more than 10dBA, alternate ventilation systems maybe be required to meet the BCA requirements as indicated in Table 6. All occupants have the option of having the window to be open for natural cross ventilation, or to close the window and achieve a quieter internal environment.

Section 4J “Noise and Pollution” in the Apartment Design Guide nominates provides guidance appropriate techniques to mitigate noise transmission as stated below:

Objective 4J-2: Design solutions to mitigate noise include:

- *limiting the number and size of openings facing noise sources*
- *providing seals to prevent noise transfer through gaps*
- *using double or acoustic glazing, acoustic louvres or enclosed balconies (wintergardens)*
- *using materials with mass and/or sound insulation or absorption properties e.g. solid balcony balustrades, external screens and soffits.*

Ventilation solutions can be either passive or mechanically assisted, the options (not limited to) are as follows:

- Passive solutions, such as acoustic lined plenum/duct, Silenceair or similar.
- Mechanically assisted, internal fan coil unit (FCU) or split system with fresh air intake, such as centralised fresh air, fresh air (with fan) for each apartment connected to the façade, or similar.

Recommendations on appropriate ventilation systems are to be designed and implemented during the Construction Certificate and detailed design phase of the project and in consultation with the mechanical consultant. The Dept of Planning also recommends that mechanical ventilation air inlet ports should be sited to maximise the distance from the road to reduce inflows of air pollutants.

3.5 Delivery and Waste Collection Vehicles

For all delivery vehicles and privately operated waste collection vehicles used for the retail, commercial and hotel tenancies, Part 4.3.3 of EPA Noise Guide for Local Government it is recommends the following time restrictions:

- Before 8.00 am or after 8.00 pm on any Saturday, Sunday or public holiday.
- Before 7.00 am or after 8.00 pm on any other day.

This excludes residential motor vehicles entering of existing the premises.

Additional management controls of the delivery and rubbish collection vehicles to minimise noise impact to the units on ground floor could include:

- Using up-to-date equipment that uses ‘quieter’ technology such as low-noise bin lifters.
- Maintaining rubbish trucks and braking materials to minimise or eliminate noise such as squeaky brakes.
- Educating drivers and collectors to be careful and to implement quiet work practices.
- Setting more appropriate times for the rubbish collection.

4 Conclusion

An acoustic assessment of the proposed development has been carried out in accordance with the requirements of NSW Department of Planning (SEPP), EPA and the Australian Standards.

An environmental noise survey of the site has been conducted and the noise limiting criteria for mechanical plant/equipment noise emission has been determined based on the EPA noise policy. During the Construction Certification Stage, once all mechanical plant has been selected, a detail assessment will be conducted to ensure compliance with the EPA NPfI noise criteria. The limits are presented in Table 5.

Construction for glazing, external walls and the roof/ceiling systems have been provided to achieve the internal noise criteria and are detailed in Section 3.1 and Section 3.2 based on the impact of surrounding traffic noise.

Providing the recommendations in this report are implemented, the noise from the proposed development would comply with acoustic requirements of the NSW Department of Planning (SEPP), EPA and the Australian Standards.

Appendix A – Acoustic Terminology

Decibel, dB: A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 micro Pascals.

A-WEIGHTING: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA). The A-weighted sound level is also called the noise level.

Sound Pressure Level, L_p (dB), of a sound: 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Ambient Noise/Sound: All noise level present in a given environment, usually being a composite of sounds from many sources far and near. Traffic, HVAC, masking sound or even low-level background music can contribute to ambient level of noise or sound.

Percentile Level - L_{90} , L_{10} , etc: A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. L_{90} is the level which is exceeded for 90% of a measurement period. L_{90} is commonly referred to as the "background" sound level.

Background Noise (L_{90}): The sum total of all unwanted residual noise generated from all direct and reflected sound sources in a space that can represent an interface to, or interfere with good listening and speech intelligibility.

Rating Background Level – RBL: Method for determining the existing background noise level which involves calculating the tenth percentile from the L_{A90} measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

$L_{AEQ,T}$: Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

Appendix B – Architectural Drawings

This assessment was based on the following architectural drawings provided by Ghazi Al Ali Architect Pty Ltd.

Drawing	Issue	Date	Description
A1000	A	28/02/2025	Site Analysis
A1010	A	28/02/2025	Site Plan
A1201	A	28/02/2025	Basement 02 Plan
A1202	A	28/02/2025	Basement 01 Plan
A1203	A	28/02/2025	Ground Floor Plan
A1204	A	28/02/2025	Level 01 Plan
A1205	A	28/02/2025	Level 02 Plan
A1206	A	28/02/2025	Level 03 Plan
A1207	A	28/02/2025	Level 04 Plan
A1208	A	28/02/2025	Level 05 Plan
A1209	A	28/02/2025	Level 06 Plan
A1210	A	28/02/2025	Roof Plan
A1301	A	28/02/2025	North Elevation
A1302	A	28/02/2025	East Elevation
A1303	A	28/02/2025	South Elevation
A1304	A	28/02/2025	West Elevation

Appendix C – Noise Logger Results





