PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2023/1468/2

Date: 11 April 2025

Queensland Government

Environmental Noise Assessment

Proposed Retail Development

At Stage 5 Carseldine Village

On behalf of De Luca Corporation Pty Ltd

23BRA0014 R01_2

About TTM

For 40 years, we've been at the centre of the Australian development and infrastructure industry. Our unique combination of acoustics, data, traffic and waste services is fundamental to the success of any architectural or development project.

We have over 50 staff, with an unrivalled depth of experience. Our industry knowledge, technical expertise and commercial insight allow us to deliver an exceptional and reliable service.

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Revision Record

No.	Author	Reviewed/Approved	Description	Date
A	S Yorke	I Llamas	Internal draft	10/10/2023
0	S Yorke	I Llamas	Client issue	10/10/2023
1	S Yorke		Plans update	13/12/2023
2	S Yorke		Tenancy hours update	19/11/2024

Executive Summary

TTM was engaged by De Luca Corporation Pty Ltd to undertake an environmental noise assessment of a proposed retail development located at Stage 5 Carseldine Village. The assessment was based on the Fitzgibbon Urban Development Area Development Scheme (Dec 2021). For additional noise assessment parameters, Brisbane City Council City Plan 2014 planning scheme was also referenced.

Unattended noise monitoring was undertaken to establish the existing ambient noise levels. City Plan 2014 planning scheme codes and overlays were utilised where relevant and acceptable outcomes applied. Remaining noise sources were assessed onto the nearest noise sensitive receivers for the proposed operating hours.

Compliance with the Fitzgibbon Urban Development Area Development Scheme (and relevant City Plan 2014 codes) is predicted to be achieved based on the recommendations outlined in Section 7 of this report.

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1 Introduction

1.1 Background

TTM was engaged by De Luca Corporation Pty Ltd to undertake an environmental noise assessment of a proposed retail development located at Stage 5 Carseldine Village. This report will form part of a development application for consideration by Economic Development Queensland (EDQ).

1.2 References

This report is based on the following:

- Fitzgibbon Urban Development Area Development Scheme (Dec 2021)
- Brisbane City Council *City Plan 2014*
- *Noise impact assessment planning scheme policy* - Schedule 6, City Plan 2014
- Development plans shown in Appendix A
- Site inspection, noise measurements, analysis and calculations conducted by TTM

1.3 Scope

The assessment includes the following:

- Description of the development site and proposal.
- Measurement of existing ambient noise levels and statement of assessment criteria relating to environmental noise emissions.
- Assessment of noise generated by the development onto nearby noise sensitive receivers.
- Details of noise control recommendations to be incorporated to achieve predicted compliance.

2 Site Description

2.1 Site Location

The site is described by the following:

- Stage 5 Carseldine Village

The site locality is shown in Figure 1.

Figure 1: Site Locality

2.2 Description of Surrounding Environment

The site is bound by Beams Road to the north, Plaza Place to the east, and internal road to the west and south. Future residential uses are proposed to the south and existing residential uses are located further to the east. The current acoustic environment primarily consists of local road traffic noise.

3 Proposed Development

3.1 Development Description

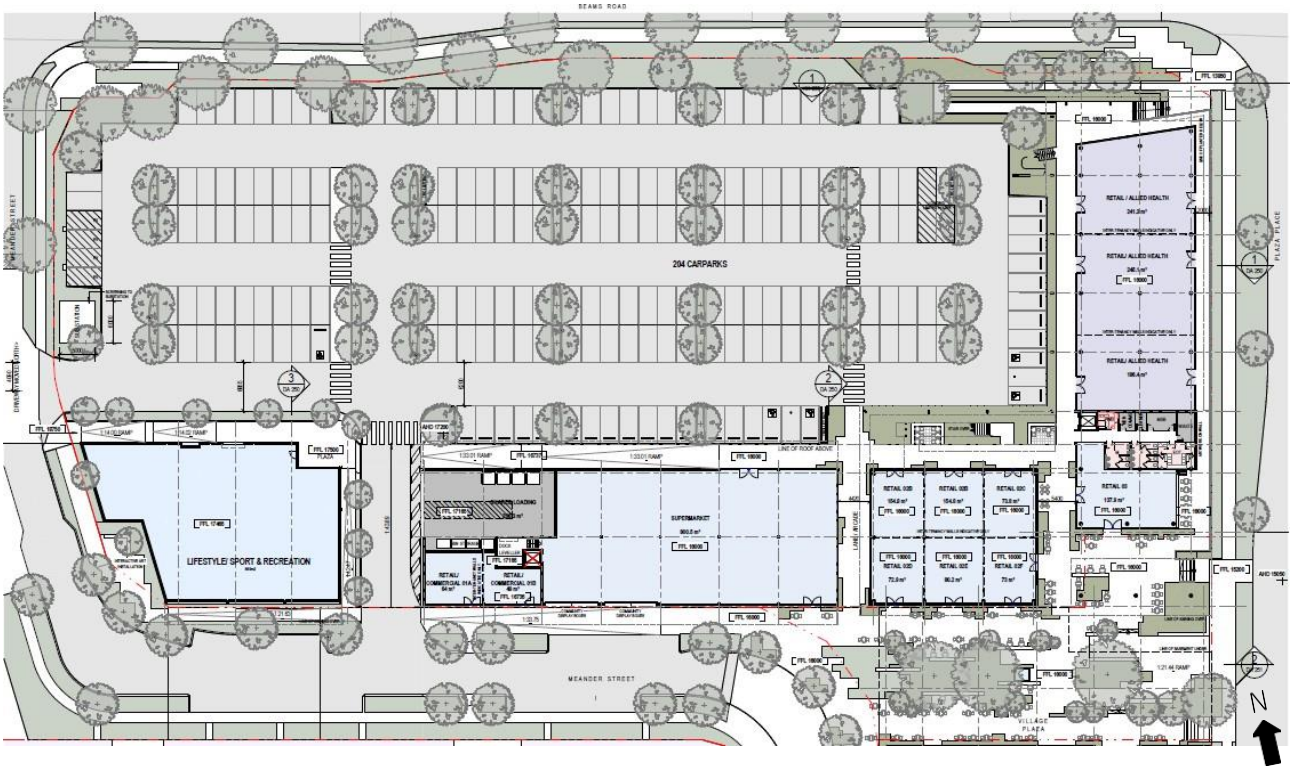
The proposal is a retail development consisting of various uses including medical tenancies, supermarket, swim school, gym and food and drink outlets including outdoor dining.

Proposed hours of operation are:

- Supermarket: 6am - 10pm
- Gym: 24/7
- Swim School: 6:30am - 9pm
- Medical: 8am - 9pm
- Food incl outdoor dining: 6am - 10:30pm

A plan of the development is shown in Figure 2. Further development plans are provided in Appendix A.

Figure 2: Proposed Development Plan – Ground Level



4 Measurements

4.1 Equipment

The following equipment was used to measure existing noise levels:

- ARL Ngara Environmental Noise Monitor (SN# 8782A5)
- Norsonic Nor131 sound level meter (SN# 1313158)
- RION NC-73 acoustical calibrator (SN# 10697023)

All equipment was calibrated by a National Association of Testing Authorities (NATA) accredited laboratory. The equipment was field calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

4.2 Unattended Noise Monitoring

Unattended noise monitoring was conducted to establish the existing ambient noise levels between Tuesday 5th September and Wednesday 13th September, 2023. The noise monitor was located on the site, as shown in Figure 3. The monitor position was considered representative of the ambient noise levels experienced by the nearby noise sensitive receivers with consideration to access and security requirements.

Figure 3: Noise Monitoring Location

The ambient noise monitor was in a free-field location and 1.5m above ground level. The monitor was set to measure statistical noise levels in 'A'-weighting, 'Fast' response, over 15 minute intervals. Ambient noise levels were measured in accordance with Australian *Standard AS1055:2018 Acoustics – Description and Measurement of Environmental Noise* (AS1055).

Weather during the monitoring period was generally fine (source: Bureau of Meteorology).

4.3 Noise Source Measurements

Noise levels associated with typical activities which may impact noise sensitive receivers were taken from similar investigations conducted by TTM. Measurements were conducted generally in accordance with Australian Standard AS1055.

4.4 Results of Noise Measurements

4.4.1 Ambient Noise Levels

Table 1 presents the measured ambient noise levels. The Rating Background Level (RBL) was determined in accordance with the BCC *Noise Impact Assessment Planning Scheme Policy* (NIAPSP). Graphical presentation of the measured levels is shown in Appendix B. The measurement results were used to determine the assessment criteria for the development.

Table 1: Measured Ambient Noise Levels

Time Period	Measured Noise Levels, dB(A)	
	RBL L_{90}	L_{eq}
Daytime (7am – 6pm)	48	56
Evening (6pm – 10pm)	44	54
Night time (10pm – 7am)	40	51
Relevant operating hours (night)		
Night time (6am – 7am)	48	54
Night time (10pm – 10:30pm)	43	50

5 Noise Criteria

The applicable planning scheme for the site location is the Fitzgibbon Urban Development Area Development Scheme. For greater noise assessment parameters, Brisbane City Council City Plan 2014 planning scheme was also referenced.

5.1 Fitzgibbon Urban Development Area Development Scheme

The Fitzgibbon Urban Development Area Development Scheme states in relation to noise requirements:

General noise requirements

The design, siting and layout of development must address noise impacts and where necessary incorporate appropriate noise mitigation measures. Within 100m of the rail corridor boundary, noise sensitive uses must comply with best practice acoustic standards.

The scheme provides only general noise requirements. The City Plan 2014 planning scheme also applies for the Brisbane area and provides more detail for noise assessment. The applicable noise assessment aspects are potential onsite noise emissions from external retail activities such as outdoor dining and car movements. Onsite noise activities may be addressed by utilising City Plan 2014 code acceptable outcomes and noise criteria.

5.2 City Plan 2014

The Brisbane City Council City Plan 2014 details site specific planning scheme zones, overlays, and codes relevant to a site in the BCC local government area. Table 2 summarises the planning scheme requirements for the site which are relevant to the acoustic assessment.

Table 2: City Plan 2014 - Site Specific Acoustic Requirements

Location	Zone	Development Code
Site	Emerging Community	Centre or Mixed-Use Code
Noise Sensitive Receivers	Emerging Community Low Density Residential Zone	N/A

5.2.1 Centre or Mixed Use Code

The proposed development includes retail use that is applicable for assessment by the *Centre or Mixed Use Code*. Table 3 summarises the primary acoustic requirements that apply.

Table 3: Centre or Mixed-Use Code Requirements

Performance Outcomes	Acceptable Outcomes
PO1 Development: (a) has hours of operation which are controlled so that the use does not detrimentally impact on the amenity of adjoining residents; (b) where not located in a Special entertainment precinct identified in a neighbourhood plan, does not result in noise emissions that exceed the noise (planning) criteria in Table 9.3.3.3.F, low frequency noise criteria in Table 9.3.3.3.G and night-time noise criteria in Table 9.3.3.3.H in a sensitive zone or a nearby sensitive use. Note—A noise impact assessment report prepared in accordance with the Noise impact assessment planning scheme policy can assist in demonstrating achievement of this performance outcome.	AO1.1 Development: (a) for accommodation activities, dwelling unit or emergency services has unlimited hours of operation; (b) for a club, if licensed, function facility, hotel or nightclub entertainment facility does not generate noise which is clearly audible and detectable, or impacts on the amenity of a resident, in a dwelling or other sensitive use; Note-Development for a club, if licensed, function facility, hotel or nightclub entertainment facility is not expected to achieve this outcome. (c) for any other use: i. Where in the Principal centre zone or Major centre zone has unlimited hours of operation; ii. Where in District centre zone, Neighbourhood centre zone or Mixed use zone: a. Has hours of operation, including deliveries, which are limited to 6am to 10pm; or b. Does not generate noise which is clearly audible and disturbing in a dwelling or other sensitive use; iii. Where in any other zone: a. Has hours of operation, including for deliveries, which are limited to 6am to 8pm; or b. Does not generate noise which is clearly audible and disturbing in a dwelling or other sensitive use.
	A01.2 Development ensures mechanical plant or equipment is acoustically screened from an adjoining sensitive use.
PO7 Development mitigates impacts on residential amenity in or adjoining the building through: (a) providing an outdoor dining area that is appropriately located (b) ensuring external dining and entertainment areas are visually and acoustically screened from an adjoining dwelling.	AO7 Development provides for external dining or entertainment areas to be: (a) located in or directly adjacent to the public realm (b) visually and acoustically screened from an adjoining dwelling.
PO62 Development of garages, driveways and parking structures minimise impacts on the amenity of neighbouring dwellings.	AO62.1 Development for a car park: (a) provides a 2m-high acoustic fence and a landscaped area 1.5m wide where located adjacent to a neighbouring dwelling; (b) is acoustically screened where the car park is used at night and where located adjacent to a neighbouring dwelling.
	AO62.2

Performance Outcomes	Acceptable Outcomes
	(a) Development for a driveway or vehicle movement area is screened by a 2m-high acoustic fence along the side or rear boundary if located adjacent to a residential dwelling.

The site is located in an Emerging community zone and therefore *Acceptable Outcome A01.1 (c)(iii)* is applicable and allows hours of operation, including deliveries from 6am to 8pm.

Proposed retail hours of operation, including outdoor dining, are between 6am –10:30pm. Proposed gym tenancy use is 24/7. These noise activities will be assessed in accordance with the PO1 noise criteria.

It is recommended the development comply with *Acceptable Outcome AO1.2* by applying acoustic screening to exposed mechanical plant with the potential to impact adjacent sensitive receivers.

The car parking area complies with AO62.1/62.2 in relation to noise, as there are no adjacent neighbouring dwellings at the car park area.

5.2.1.1 Noise (Planning) Criteria

The noise emission criteria of Performance Outcome PO1 of the Centre or Mixed Use Code (Table 9.3.3.F) is presented in Table 4.

Table 4: Noise (Planning) Criteria (Table 9.3.3.3.F)

Criteria Location	Intrusive noise criteria, dB(A) Day, evening and night $L_{Aeq,adj,T}$ are not greater than the RBL plus the value shown in Column 1				Acoustic amenity criteria, dB(A) Day, evening and night $L_{Aeq,adj,T}$ are not greater than the values in this column for the relevant criteria location		
	Column 1	Day	Evening	Night 6am-7am / 10pm-10:30pm	Day	Evening	Night
Emerging community zone boundary	+5	53	49	53 / 48	55	50	45
Project Specific Criteria*		53	49	53 / 48			
Low density residential zone boundary	+3	51	47	51 / 46	55	45	40
Project Specific Criteria*		51	47	51 / 46			

Day: 7am – 6pm. Evening: 6pm – 10pm. Night 10pm – 7am.

*The ambient noise environment is elevated due to the proximity of road traffic noise (Beams Road). Therefore, the Intrusive noise criteria is considered to be more applicable in this case than the Amenity criteria.

5.2.1.2 Night-time Noise Criteria

The night-time noise criteria for 'impact / short duration' type noise sources are outlined in *Table 9.3.3.3.H* of the Service Station Code. This criteria is reproduced in Table 5.

Table 5: Night-time Criteria (Table 9.3.3.3.H)

Criteria Location	Where the existing $L_{Aeq,9hr}$ night at the criteria location is:	Average of the highest 15 single L_{Amax} events over a given night period is not greater than the following values at the relevant criteria location	The Absolute highest single L_{Amax} event over a given night period is not greater than the following values at the relevant criteria location
At the zone boundary of: Low density residential zone	<45dB(A)	50dB(A)	55dB(A)
	45 to 60dB(A) 51	$L_{Aeq,9hr\ night}$ + 5dB(A) 56	$L_{Aeq,9hr\ night}$ + 10dB(A) 61
	>60dB(A)	65dB(A)	70dB(A)

5.3 Future Noise Sensitive Receivers

Where onsite noise emissions may impact proposed future noise sensitive receivers (residential uses) that are part of future stages of this development, these receivers can be designed and constructed with a specified façade acoustic rating so that habitable rooms achieve acceptable internal noise levels. Applicable internal noise criteria are specified in AS2107[1] and reproduced in Table 6.

Table 6: Internal Noise Limits for Residential Dwellings (AS2107)

Type of Occupancy 7. RESIDENTIAL BUILDINGS	Recommended Design Sound Level L_{Aeq} dB(A)
Houses and apartments near minor roads -	
Living areas	30-40
Sleeping areas	30-35

Operating hours are proposed within the night period (10pm – 7am). Sleep disturbance internal criteria can be sourced from the *Planning for Noise Control Guideline* (Department of Environment and Science, Qld Government), which specifies maximum noise levels for sleep disturbance based on research by the World Health Organization (WHO). An appropriate internal L_{max} criteria is 50dB(A).

[1] Australian Standard AS2107:2016 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors.

6 Assessment – Onsite Noise

The following section presents an assessment of noise associated with the development to determine the potential impacts at the nearest sensitive receivers. The relevant transient noise activities, not addressed by acceptable outcomes (Section 5.2), with the potential to adversely impact the nearest noise sensitive receivers are:

- Car park car movements: 24/7
- Outdoor dining: between 6am – 10:30pm
- Deliveries and waste collection

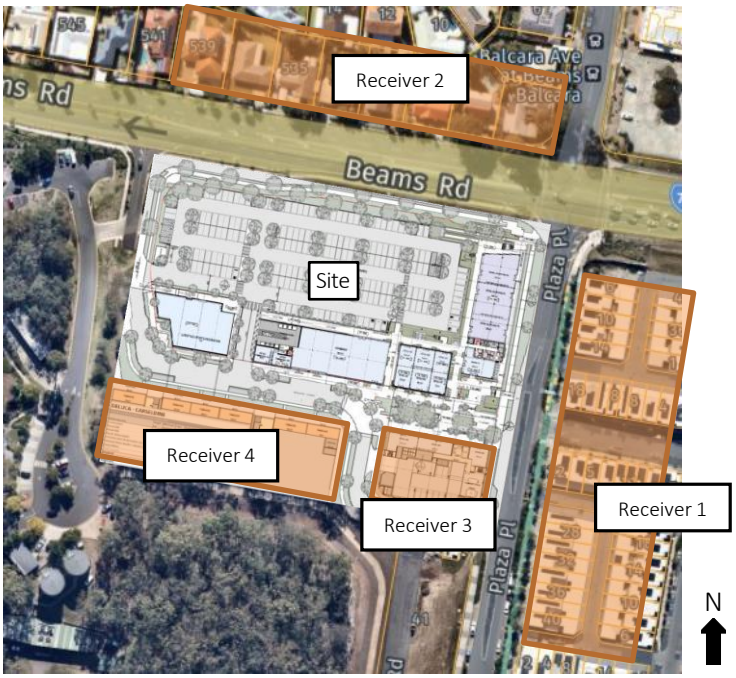
Internal gym noise is assessed in Section 6.5. Internal swim school activities are expected to be attenuated by the building façade and not adversely impact a sensitive receiver during the proposed operating hours.

6.1 Noise Sensitive Receivers

This assessment will focus on the nearest noise sensitive receivers as outlined below and shown in Figure 4. If compliance can be achieved at these nearest receivers, then all remaining noise sensitive locations are expected to comply.

- Receiver 1: Residential use in an Emerging community zone to the east of the site
- Receiver 2: Residential use in a Low density residential zone to the north of the site
- Receiver 3: Potential residential use (future) in an Emerging community zone to the south of the site
- Receiver 4: Potential residential use (future) in an Emerging community zone to the south of the site

Figure 4: Noise Sensitive Receivers



6.2 Noise Source Levels

Table 7 presents the typical external, transient noise sources with the potential to impact noise sensitive receivers. The noise source levels were calculated to one metre and include corrections for tonality and impulsiveness as per *AS1055* where applicable.

Table 7: Typical Transient Noise Source Levels

Noise Source	Prediction Location (Figure 5)	Measured Duration (sec)	Noise Level at 1m, dB(A)		'Peak' events per hour or % of period
			$L_{Aeq,T}$	L_{Amax}	
Car door closure	Nearest car park	2	75*	83*	500
Car pass-by	Nearest internal road	6	62	N/A^	500
Car engine start	Nearest car park	3	72	75	500
Outdoor dining	Outdoor dining area	60	75	N/A^	100%
Delivery (refrigerated)	Loading dock	60	85#	86#	2
Waste Collection	Loading dock	40	93*	105*	1

*Includes 2dB(A) adjustment to account for impulsiveness characteristics in accordance with AS1055
#Includes 5dB(A) adjustment to account for tonal noise characteristics in accordance with AS1055
^People and vehicle pass-by noise is excluded from L_{max} assessment in accordance with NIAPSP

6.3 Noise Assessment Methodology

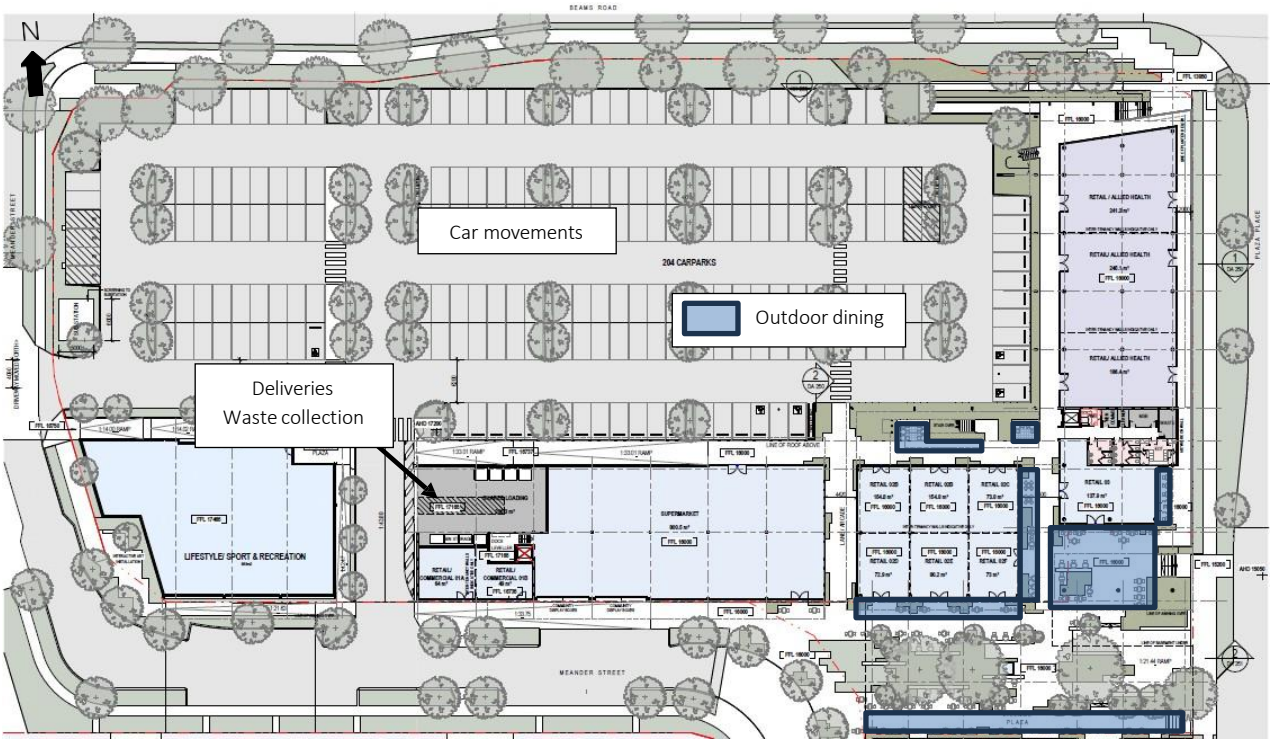
The following assumptions have been made for noise calculations:

- The onsite traffic generation rate, advised by TTM Traffic, in the peak (1 hour) period was applied. Car movements were considered at the nearest car parking or driveway area to the receiver. Car door closures and engine starts were predicted from the nearest group of car parking spaces relative to the receiver.
- The method of predicting vehicle noise from the nearest single location is conservative as the noise sources would be spread out across the car park at varying distances from the receiver.
- Outdoor dining was predicted from the nearest outdoor dining area. The noise duration was assumed to be continuous during the assessment time period.
- Deliveries and waste collection were predicted from the loading bay and include all activities associated with loading and unloading the vehicle.
- Attenuation from building screening was included where applicable.
- As outlined in Section 5.3, future receivers (receivers 3 and 4) can be designed with facades with required noise attenuation to achieve acceptable internal noise levels. Façade attenuation amounts used are:

- Receiver 3 façade attenuation: 30dB
- Receiver 4 façade attenuation: 18dB (standard façade construction)

- Figure 5 presents the relevant noise activity locations.

Figure 5: Noise Activity Locations



6.4 Predicted Noise Levels at Receivers

The predicted noise levels from typical onsite activities are based on the noise sources presented in Table 7 and the assumptions outlined in Section 6.3. Calculations are included in Appendix C.

6.4.1 Noise Planning Criteria – L_{eq}

Table 8 presents the predicted noise emission levels at existing noise sensitive receivers.

Table 8: Predicted Noise Planning Impacts – Existing Receivers

Receiver	Noise Source	Predicted External Noise Level L_{Aeq} dB(A)	Complies with Criteria?		
			Day 7am-6pm 53dB(A)	Evening 6pm-10pm 49dB(A)	Night 6am-7am / 10pm-10:30pm 53 / 48 dB(A)
1	Car door closure	15	✓	✓	✓
	Car pass-by	<10	✓	✓	✓

Receiver	Noise Source	Predicted External Noise Level L_{Aeq} dB(A)	Complies with Criteria?		
			Day 7am-6pm 53dB(A)	Evening 6pm-10pm 49dB(A)	Night 6am-7am / 10pm-10:30pm 53 / 48 dB(A)
	Car engine start	11	✓	✓	✓
	Outdoor dining	47	✓	✓	✓
	Delivery (refrigerated)	<10	✓	✓	✓
	Waste Collection	12	✓	✓	✓
	Cumulative	47	✓	✓	✓
			Day 7am-6pm 51dB(A)	Evening 6pm-10pm 47dB(A)	Night 6am-7am / 10pm-10:30pm 51 / 46 dB(A)
2	Car door closure	39	✓	✓	✓
	Car pass-by	29	✓	✓	✓
	Car engine start	34	✓	✓	✓
	Outdoor dining	36	✓	✓	✓
	Delivery (refrigerated)	10	✓	✓	✓
	Waste Collection	13	✓	✓	✓
	Cumulative	42	✓	✓	✓

As outlined in Section 5.3, future receivers can be designed with facades with required noise attenuation to achieve acceptable internal noise levels. Table 9 presents the predicted noise emission levels at future noise sensitive receivers.

Table 9: Predicted Noise Planning Impacts – Future Receivers

Receiver	Noise Source	Predicted Internal Noise Level L_{Aeq} dB(A)	Complies with Criteria?
			Internal (AS2107) Day/Evening/Night 35dB(A)
3	Car door closure	<10	✓
	Car pass-by	<10	✓
	Car engine start	<10	✓
	Outdoor dining	31	✓
	Delivery (refrigerated)	<10	✓
	Waste Collection	<10	✓
	Cumulative	31	✓
4	Car door closure	19	✓
	Car pass-by	11	✓
	Car engine start	15	✓

Receiver	Noise Source	Predicted Internal Noise Level L_{Aeq} dB(A)	Complies with Criteria? Internal (AS2107) Day/Evening/Night 35dB(A)
	Outdoor dining	31	✓
	Delivery (refrigerated)	13	✓
	Waste Collection	17	✓
	Cumulative	32	✓

Noise activities are predicted to comply with the relevant noise criteria at all receivers with the inclusion of recommended noise attenuation measures (see Section 7).

6.4.2 Night Time Noise Criteria - L_{max}

Table 10 presents the predicted night time noise emission levels at the nearest existing noise sensitive receivers.

Table 10: Predicted Night Time Noise Impacts - Existing Receivers

Receiver	Noise Source	Predicted External Level L_{max} dB(A)	Complies with Criteria? Night 56 / 61 dB(A)
1	Car door closure	29	✓
	Car pass-by	N/A*	✓
	Car engine start	21	✓
	Outdoor dining	N/A*	✓
	Delivery (Refrigerated)	24	✓
	Waste Collection	43	✓
2	Car door closure	52	✓
	Car pass-by	N/A*	✓
	Car engine start	44	✓
	Outdoor dining	N/A*	✓
	Delivery (Refrigerated)	26	✓
	Waste Collection	45	✓

*People noise and vehicle pass-by noise is excluded from L_{max} assessment in accordance with NIAPSP.

As outlined in Section 5.3, future receivers can be designed with facades with required noise attenuation to achieve acceptable internal noise levels. Table 11 presents the predicted noise emission levels at future noise sensitive receivers.

Table 11: Predicted Night Time Noise Impacts – Future Receivers

Receiver	Noise Source	Predicted Internal Level L_{max} dB(A)	Complies with Criteria?
			Internal Night 50dB(A)
3	Car door closure	21	✓
	Car pass-by	N/A*	✓
	Car engine start	13	✓
	Outdoor dining	N/A*	✓
	Delivery (Refrigerated)	<10	✓
	Waste Collection	25	✓
4	Car door closure	33	✓
	Car pass-by	N/A*	✓
	Car engine start	25	✓
	Outdoor dining	N/A*	✓
	Delivery (Refrigerated)	24	✓
	Waste Collection	43	✓

*People noise and vehicle pass-by noise is excluded from L_{max} assessment in accordance with NIAPSP.

Noise sources are predicted to comply with the night criteria with the inclusion of recommended noise attenuation measures (Section 7).

6.5 Indoor Gym Noise

The gym use has the potential to include gym class rooms involving amplified voice/music. An internal layout of the gym is not known at this stage. If gym class rooms are located adjacent to the building façade, a noise assessment was conducted to determine a predicted maximum allowable indoor sound level which was based on the following assumptions:

- The façade of the building is glazing with a minimum sound reduction rating of Rw35.
- Noise attenuation from distance loss to the nearest sensitive receiver (Receiver 3).
- Worst-case noise criteria for each time period (Table 4).

Based on the above assumptions, Table 12 presents the predicted maximum allowable internal sound levels.

Table 12: Indicative Maximum Allowable Sound Level – Indoor Gym Class Room

Description	Indicative Maximum Allowable Internal Reverberant Sound Level Leq dB(A)		
	Day 7am – 6pm	Evening 6pm – 10pm	Night 10pm – 7am
Gym – internal amplified sound	106	102	98

The predicted maximum allowable indoor gym class room sound levels are expected to be adequate for operation and not expected to be exceeded.

See Section 7 for recommended attenuation measures.

7 Recommendations

Recommended noise mitigation measures are presented in this section to achieve predicted compliance with the relevant assessment criteria.

7.1 Management Strategies

The following management strategies are recommended to achieve predicted compliance and minimise noise annoyance:

a. Recommended acoustic treatment for future dwellings:

   i. Receiver 3:

      (1) Minimum façade noise reduction: 30dB (min. Rw35) for north facing façade (Levels 1-7)

   ii. Receiver 4:

      (1) Minimum façade noise reduction: standard façade construction is adequate

b. Gym:

   i. All façades to achieve a sound reduction rating of minimum Rw35 (to allow gym class rooms adjacent to facades).

   ii. Amplified music at background sound levels can be utilised in any internal space.

   iii. Entrance door recommended to be in closed position (except for momentary opening when in use) between 10pm – 7am.

   iv. Gym tenancies to include impact floor systems for weight drop areas as part of the future tenancy fit out design.

c. Any speed humps should be bitumen, concrete (as part of the slab), or rubber, and not metal.

d. Any grates or other protective covers in the car park and access driveways must be rigidly fixed in position to eliminate movement and be maintained.

7.2 Mechanical Plant

As detailed mechanical plant selections are not available at this stage, it is not possible to carry out a detailed examination of any attenuation measures that may be required to achieve the noise criteria.

To comply with planning scheme acceptable outcomes for mechanical plant (City Plan 2014), we recommend the following for plant with the potential to adversely impact nearby sensitive receivers:

> *Development ensures mechanical plant is acoustically screened from nearby sensitive uses.*

The definition of 'acoustically screened' is provided in Table SC1.2.3.B of Brisbane City Plan 2014, Schedule 1 Definitions:

> *The source of noise is completely screened from view of habitable rooms (including balconies, patios, decks and verandas) of an adjoining sensitive use by solid, gap free material and construction e.g. acoustic fence, building, or enclosure.*
>
> *Acoustic barrier: Solid, gap free barrier with minimum surface density of 12.5kg/m^2*

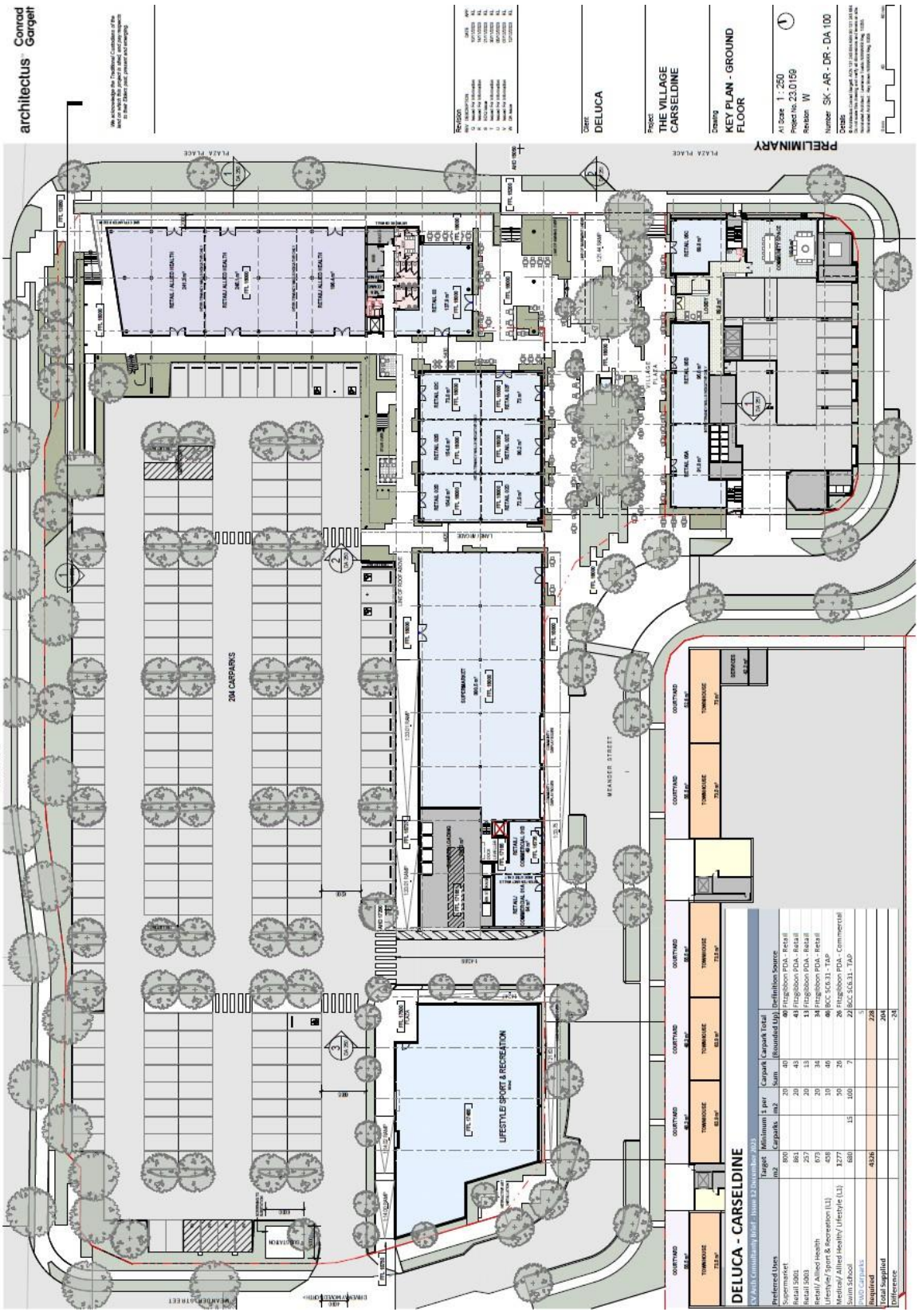
Furthermore, it is also recommended that a mechanical plant noise assessment is conducted once plant selections are finalised to ensure noise emissions comply with criteria.

8 Conclusion

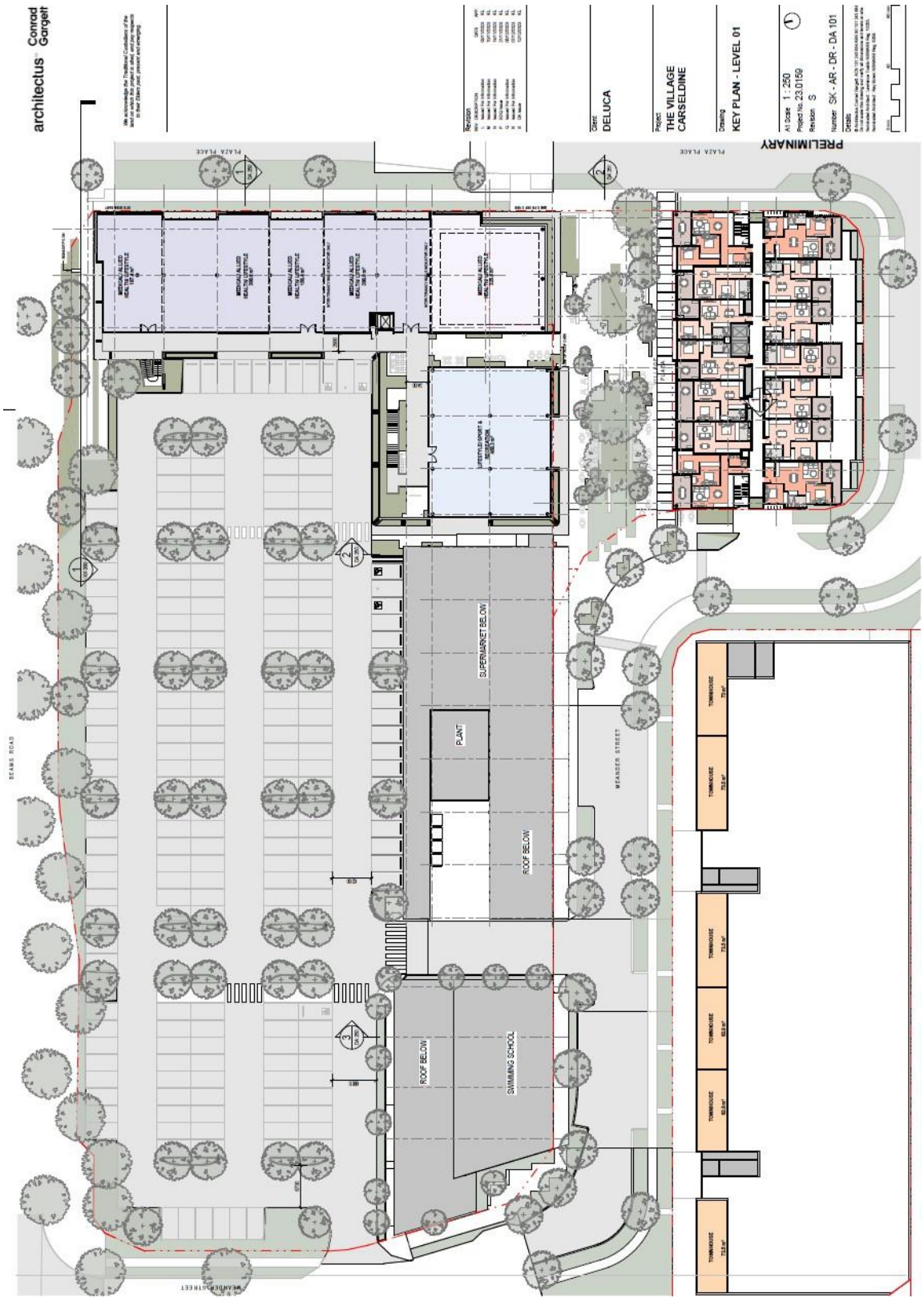
An environmental noise assessment was conducted of a proposed retail development located at Stage 5 Carseldine Village.

Compliance with the Fitzgibbon Urban Development Area Development Scheme (Dec 2021) (and relevant City Plan 2014 codes) is predicted to be achieved based on the recommendations outlined in Section 7 of this report.

Appendix A Development Plans



Preferred Uses	Target m2	Carparks	Minimum 1 per m2	Carpark Sum	Carpark (Rounded Up)	Carpark Total	Bethlehon Source
Supermarket	800		20	40	40		Fitzgibbon PDA - Retail
Retail 5001	861		20	43	43		Fitzgibbon PDA - Retail
Retail 5003	257		20	13	13		Fitzgibbon PDA - Retail
Retail/ Allied Health	673		20	34	34		Fitzgibbon PDA - Retail
Lifestyle/ Sport & Recreation (L1)	438		10	44	44		BCC 5.6.31 - Tab
Medical/ Allied Health/ Lifestyle (L1)	3277		50	66	66		BCC 5.6.31 - Tab
Swim School	680	15	100	7	22		BCC 5.6.31 - Tab
1500 Carparks					5		
Required		4326			228		
Total Supplied					204		
Difference					-24		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THE VILLAGE
CARSELDINE
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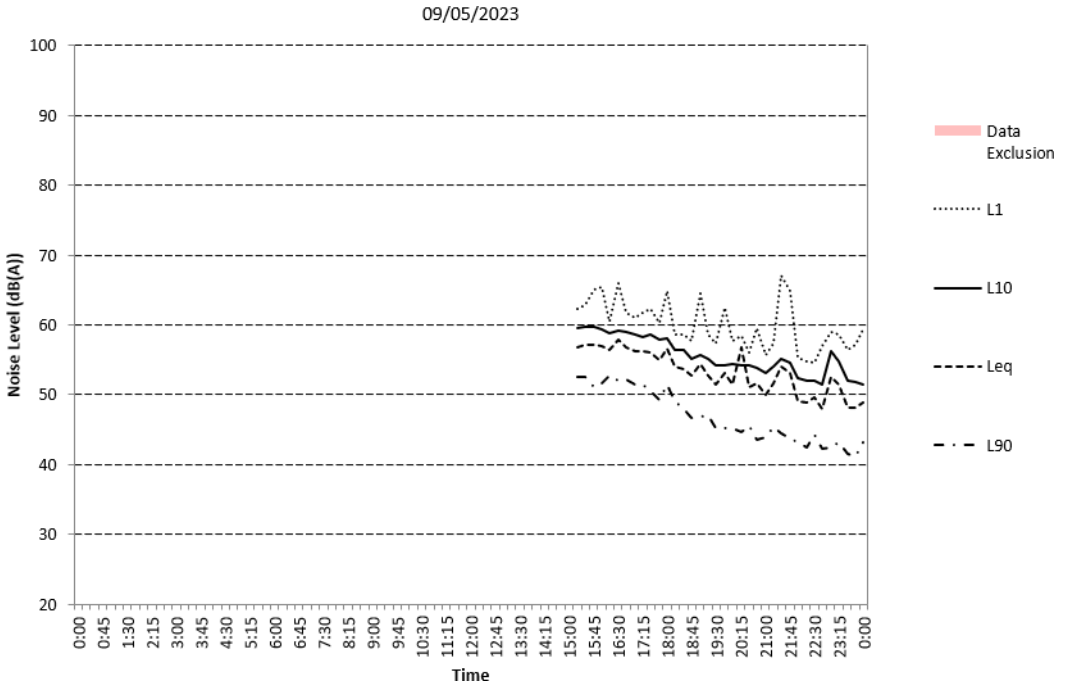
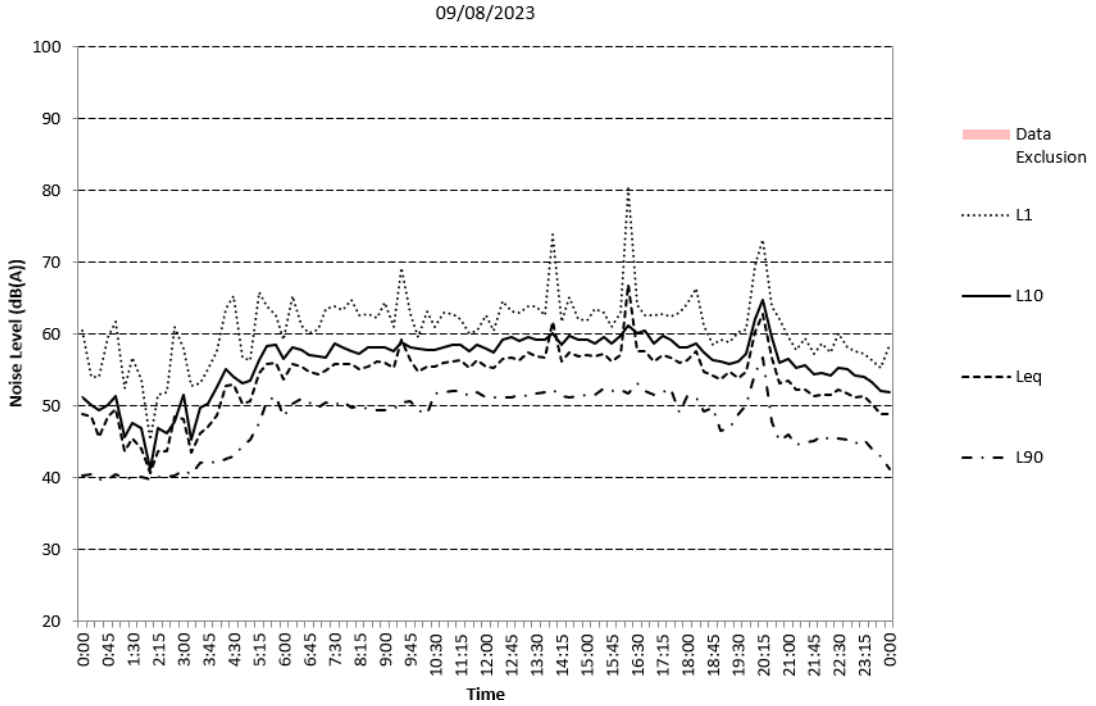
Number SK - AR - DR - DA 101
SUPERMARKET BELOW
PLANT
ROOF BELOW
SWIMMING SCHOOL
ROOF BELOW
MEANDER STREET
BEAMS ROAD
PLAZA PLACE

Appendix B Unattended Noise Monitoring Graphs

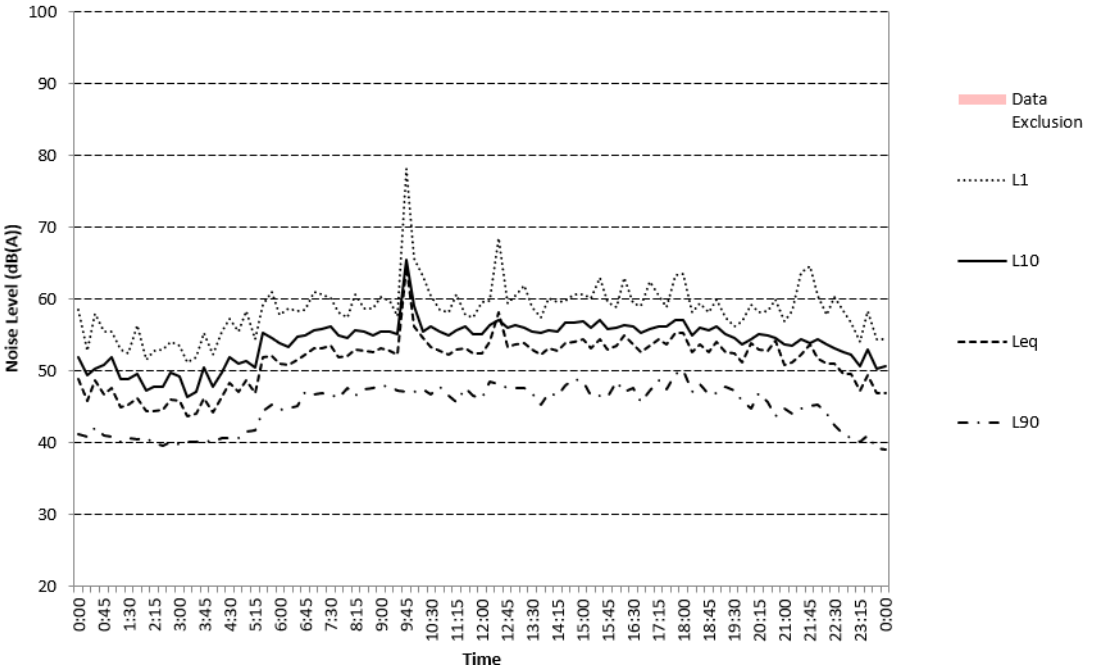

09/05/2023
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90


09/06/2023
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90


09/07/2023
Noise Level (dB(A))
100
90
80
70
60
50
40
30
20
0:00
0:45
1:30
2:15
3:00
3:45
4:30
5:15
6:00
6:45
7:30
8:15
9:00
9:45
10:30
11:15
12:00
12:45
13:30
14:15
15:00
15:45
16:30
17:15
18:00
18:45
19:30
20:15
21:00
21:45
22:30
23:15
0:00
Time
Data Exclusion
L1
L10
Leq
L90


09/08/2023
Noise Level (dB(A))
100
90
80
70
60
50
40
30
20
0:00
0:45
1:30
2:15
3:00
3:45
4:30
5:15
6:00
6:45
7:30
8:15
9:00
9:45
10:30
11:15
12:00
12:45
13:30
14:15
15:00
15:45
16:30
17:15
18:00
18:45
19:30
20:15
21:00
21:45
22:30
23:15
0:00
Time
Data Exclusion
L1
L10
Leq
L90

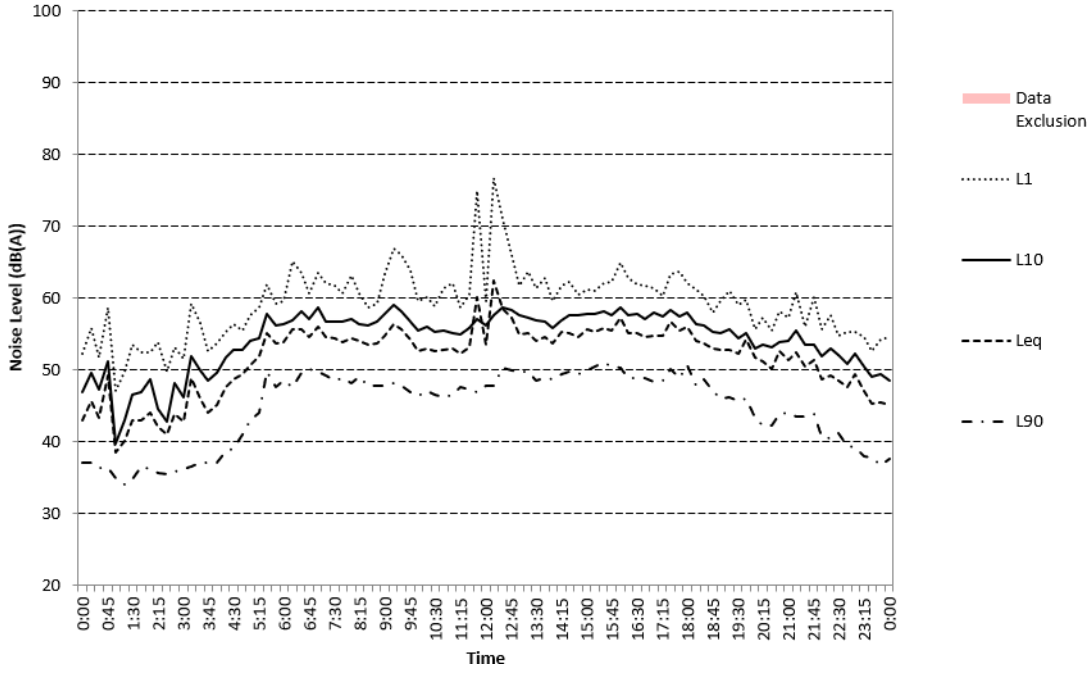
09/09/2023

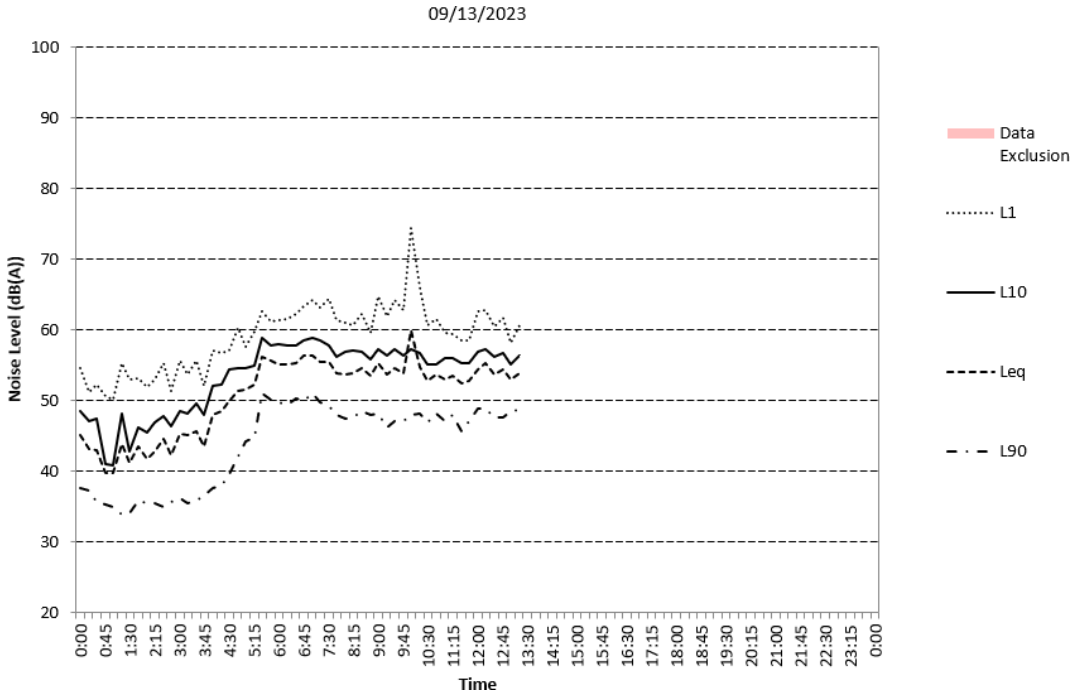


09/10/2023

09/11/2023

09/12/2023




09/13/2023
Noise Level (dB(A))
100
90
80
70
60
50
40
30
20
0:00
0:45
1:30
2:15
3:00
3:45
4:30
5:15
6:00
6:45
7:30
8:15
9:00
9:45
10:30
11:15
12:00
12:45
13:30
14:15
15:00
15:45
16:30
17:15
18:00
18:45
19:30
20:15
21:00
21:45
22:30
23:15
0:00
Time
Data Exclusion
L1
L10
Leq
L90

Appendix C Calculations

PROJECT #: **Activity Noise**

Noise Source	Duration (sec)	Leq	1 Hour Period (sec)	Events	Leq Level	Distance to Receivers R1	R2	R3	R4
Car door	2	75	3600	500	69	50	35	42	40
Car bypass	6	62	3600	500	61	55	40	47	40
Car engine	3	72	3600	250	65	50	35	42	40
Outdoor dining	60	75	3600	60	75	25	85	5	20
Delivery (refrigerated)	60	85	3600	2	70	120	100	55	28
Waste collection	40	93	3600	1	73	120	100	55	28

Noise level due to Distance loss									
Car door						35	39	37	37
Car bypass						26	29	28	29
Car engine						31	34	33	33
Outdoor dining						47	36	61	49
Delivery (refrigerated)						29	30	35	41
Waste collection						32	33	39	45

Shielding (building, barrier)						**R1**	**R2**	**R3**	**R4**
Car door						20	0	0	0
Car bypass						20	0	0	0
Car engine						20	0	0	0
Outdoor dining						0	0	0	0
Delivery (refrigerated)						20	20	15	10
Waste collection						20	20	15	10

Noise Level at Receiver - External						**R1**	**R2**	**R3**	**R4**
Car door						15	39		
Car bypass						6	29		
Car engine						11	34		
Outdoor dining						47	36		
Delivery (refrigerated)						9	10		
Waste collection						12	13		
Cumulative						**47**	**42**		

Noise Level at Receiver - Internal						**Façade attenuation (dB):**		**30**	**18**
Car door								7	19
Car bypass								-2	11
Car engine								3	15
Outdoor dining								31	31
Delivery (refrigerated)								-10	13
Waste collection								-6	17
Cumulative								**31**	**32**

PROJECT #: **Night Time Sleep Disturbance** 10pm - 7am

0

			Distance to Receivers			
Noise Source	**Lmax**	**Lmax Level**	**R1**	**R2**	**R3**	**R4**
Car door	83	83	50	35	42	40
Car bypass		N/A	55	40	47	40
Car engine	75	75	50	35	42	40
Outdoor dining		N/A	25	85	5	20
Delivery (refrigerated)	86	86	120	100	55	28
Waste collection	105	105	120	100	55	28
			0	0	0	0
			0	0	0	0

Noise level due to Distance loss						
Car door			49	52	51	51
Car bypass						
Car engine			41	44	43	43
Outdoor dining						
Delivery (refrigerated)			44	46	51	57
Waste collection			63	65	70	76

Shielding (building, barrier etc)						
Car door			20	0	0	0
Car bypass			20	0	0	0
Car engine			20	0	0	0
Outdoor dining			0	0	0	0
Delivery (refrigerated)			20	20	15	15
Waste collection			20	20	15	15

Noise Level at Receiver - External				**R1**	**R2**	**R3**	**R4**
Car door				29	52		
Car bypass							
Car engine				21	44		
Outdoor dining							
Delivery (refrigerated)				24	26		
Waste collection				43	45		
Noise Level at Receiver - Internal				**Façade attenuation (dB):**		**30**	**18**
Car door						21	33
Car bypass							
Car engine						13	25
Outdoor dining							
Delivery (refrigerated)						6	24
Waste collection						25	43

Job No.	Job Title			
Date Created	By	Date Revised	Rev	Sheet
	SY			1
Date Reviewed	By	Review Type	Review Status	

Façade inside to outside breakout - Gym

Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	31.5	Octave Band Centre Frequency, Hz 63	125	250	500	1k	2k	4k	8k
Inside to outside attenuation													
Library - Type: Noise Level, Source: Loc	Music - Frequency spectrum			121		116	117	119	116	118	115	109	102
adjust		-24.0											
Reverberant internal sound level				**98 (A)**		**92**	**93**	**95**	**92**	**94**	**91**	**85**	**78**
Façade Area		60.0	m2										
Attenuation	**Receiver 1**												
Transmission Loss Single Leaf: 1x150mm Concrete		Rw 54	0 m²			-43	-43	-42	-51	-59	-67	-74	-80
Transmission Loss Single Leaf: 1x10.78mm Glass (Lam.)		Rw 33	60 m²			-20	-25	-29	-33	-32	-33	-46	-56
Composite Transmission Loss		**Rw 33**	**60 m²**			-20	-25	-29	-33	-32	-33	-46	-56
Adjusted Rw (optional)	2.0	**Rw 35**				**-22**	**-27**	**-31**	**-35**	**-34**	**-35**	**-48**	**-58**
Area Correction	10LOG(S)		60.0 m²	18		18	18	18	18	18	18	18	18
Directivity 10LOG(Q) Q=	2			3		3	3	3	3	3	3	3	3
Inside to outside -6dB				-6.0		-6	-6	-6	-6	-6	-6	-6	-6
Plane Source Propagation Loss - Line Source Region		**17.0 m**	3.0 m	20.0 m		-33	-33	-33	-33	-33	-33	-33	-33
SPL at Receiver				**45 (A)**		51	48	46	38	41	38	18	1
Criteria w orst-case		**Day**	**Evening**	**Night**									
		53	49	45									
Difference		-8.1	-4.1	0									
Max allow able internal reverberant sound level		**106**	**102**	**98**									