

Yarrabilba Town Centre

DA Acoustic Report

Stockland

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Executive summary

This report presents an acoustic assessment of the proposed Yarrabilba Town Centre located at the corner of Yarrabilba Drive and Wentland Avenue, Yarrabilba, QLD 4207. It addresses the following acoustic design aspects:

- Noise emission impact assessment and control on surrounding sensitive receivers
- External noise ingress impact and control on sensitive uses within the development
- Construction noise and vibration impact and management

Potential noise impacts from and upon the proposed development have been assessed with reference to relevant requirements of the following:

- Logan Planning Scheme 2015
- Yarrabilba Priority Development Area Development Scheme
- Queensland Environment Protection Act 1994
- Queensland Environmental Protection (Noise) Policy 2019
- Relevant Australian standards and guidelines

Noise emission sources from the development were identified as:

- Mechanical plant noise
- Loading dock and deliveries
- Car park activity noise
- Childcare centre noise
- Food and Beverage / Dining tenancies
- Gymnasium noise
- Waste management

Noise ingress from the surrounding environment affecting the sensitive uses within the proposed development (namely the childcare centre) has been assessed with relevant building envelope acoustic performance requirements established to achieve appropriate internal noise amenity.

Noise emissions from each of the identified noise sources were assessed with noise control measures recommended where appropriate. Additional operational and best practice noise management measures were provided to assist with further mitigating noise emissions and impact of the proposed development on surrounding sensitive uses. Noise and vibration impact from the construction of the project were also considered with management measures recommended to assist with control of impacts during project construction.

Based on the assessment undertaken in this report, it is concluded that potential noise impacts from the development as well as external noise impacts upon the proposed development can be adequately controlled to achieve compliance with relevant noise criteria and requirements subject to incorporation of acoustic recommendations in this report.

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1.0

Introduction

1.0 Introduction

Cundall has been engaged to undertake an acoustic assessment for the proposed Yarrabilba Town Centre situated at the corner of Yarrabilba Drive and Wentland Avenue, Yarrabilba QLD 4207. The proposed development is a mixed-use neighbourhood activity and shopping centre comprised of major and specialty retail, food and beverage/dining tenancies as well as commercial/retail uses.

The development includes a total of 37,250 m² Retail, Specialty/Dining and Commercial/Retail tenancies, 1495 on-grade parking spaces and associated amenities. The retail tenancies include 20,800 m² of major and mini-major supermarkets, department store and liquor stores. The Specialty/Dining comprise of 10,600 m² of specialty food and beverage and dining tenancies. Commercial/retail tenancies include 5,850 m² of various uses including Childcare centre, Gymnasium, Medical tenancies and possibly a tavern. The development carpark is located at the southern and centre portion of the site surrounded by tenancies at the perimeter.

Potential noise impacts from and upon the proposed development have been assessed in this report with reference to relevant requirements of the following:

- Logan Planning Scheme 2015
- Yarrabilba Priority Development Area Development Scheme
- Queensland Environment Protection Act 1994
- Queensland Environmental Protection (Noise) Policy 2019
- Relevant Australian standards and guidelines

1.1 Purpose of report

This report outlines an acoustic assessment of the proposed Yarrabilba Town Centre located at the corner of Yarrabilba Drive and Wentland Avenue, Yarrabilba QLD 4207. The report has been requested as part of the project submission for Development Application approval.

1.2 Key assumptions

The acoustic assessment in this report is based on the following key assumptions:

- Project concept design dated 19 December 2025
- Precinct master plan and Town Centre use intent as of 26 February 2026
- Noise modelling assumptions and inputs outlined throughout the report
- Assumptions and information in relation to the operation of the facility presented throughout the report

2.0

Proposed Development

2.0 Proposed development

2.1 Site location

The Yarrabilba Town Centre is proposed to be located at the corner of Yarrabilba Drive and Wentland Avenue, Yarrabilba QLD 4207. The development is located within the Yarrabilba Priority Development Area (PDA) shown in Figure 2-1 which is situated within Logan City, 20km south of Logan Central.

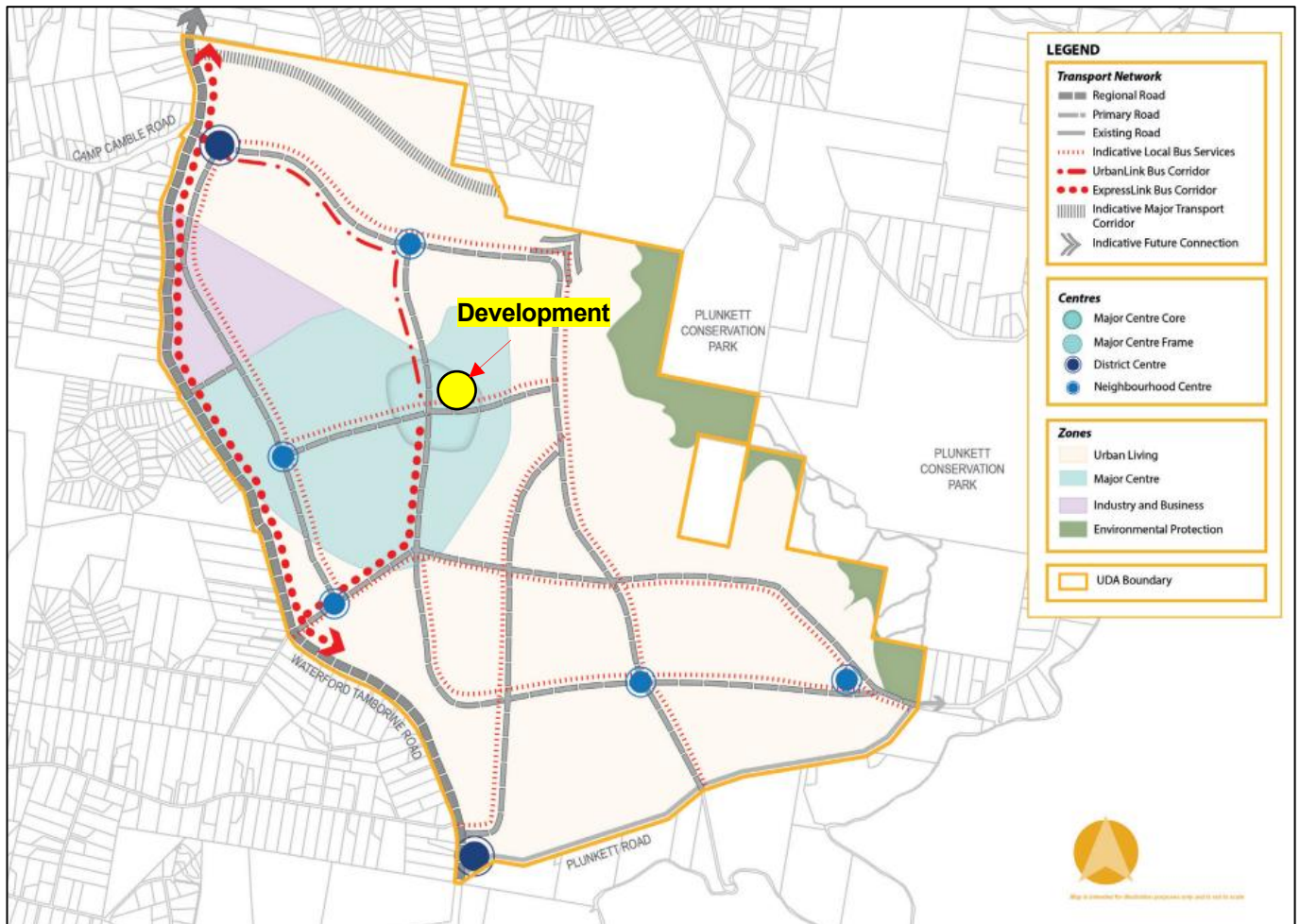


Figure 2-1 Yarrabilba Priority Development Area

The development is located within the Major Centre Zone of the PDA and forms part of the wider Stockland Yarrabilba Precinct Master Plan enabling a Town Centre that will bring shopping, dining and lifestyle experiences to the community. The development site is surrounded by future mixed-use commercial, retail and community land uses forming the wider Town Centre shown in Figure 2-2 (highlighted as Pink). Existing residential land uses are located surrounding the development to the north and east of the site. Future residential land uses are located to the south and southeast of the site shown in light yellow in Figure 2-2.



Figure 2-2 Site locality – overlaid on Stockland Yarrabilba Precinct Master

Other closer future noise sensitive land uses including residential, hotel, educational, health/hospitals and senior living are also expected as part of the wider Town Centre masterplan and land use intent to the west and south of the site as well as parkland immediately to the south as shown in Figure 2-3.

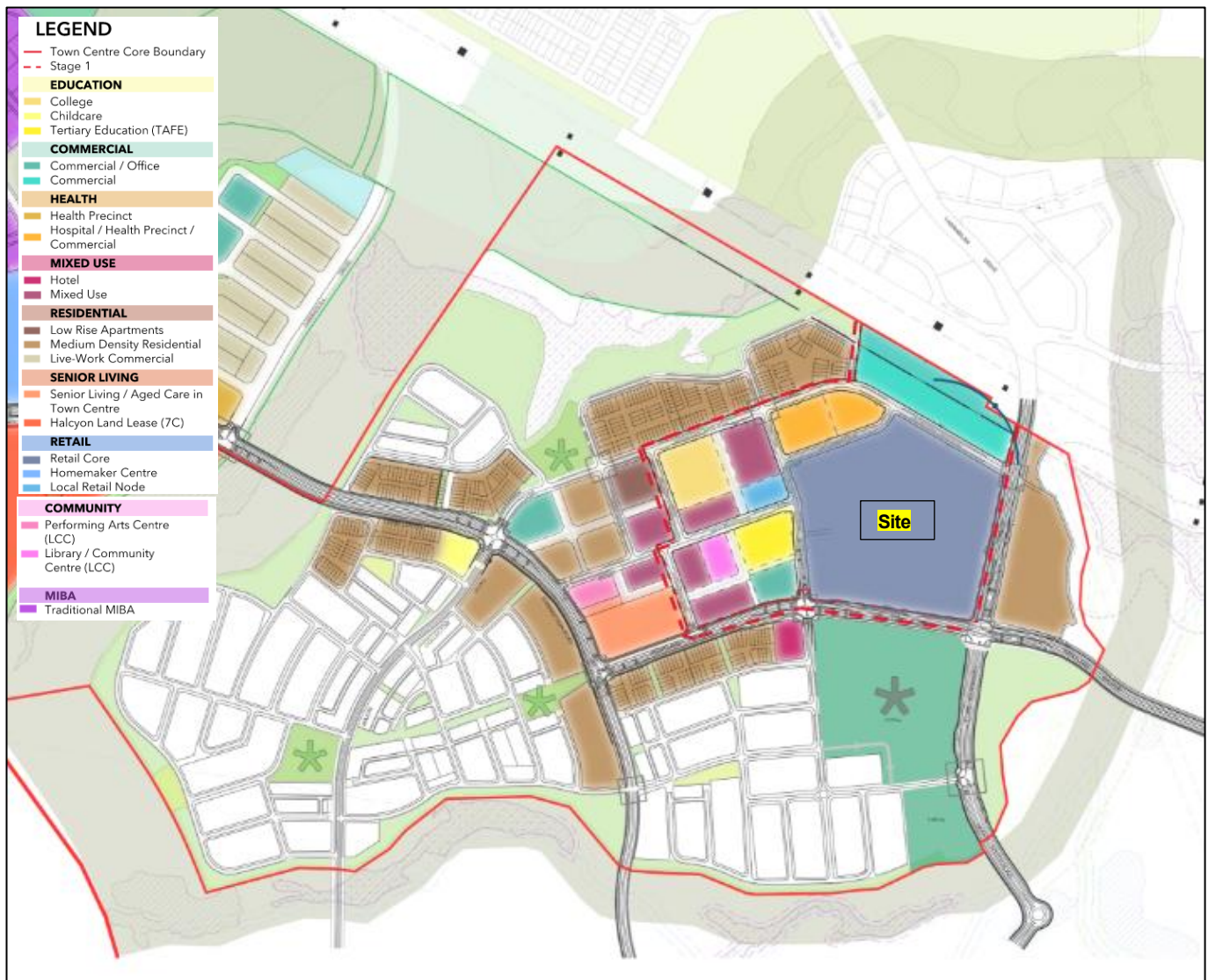


Figure 2-3 Expected land uses within Town Centre

2.2 Proposal description

The proposed development is a mixed-use neighbourhood activity and shopping centre comprised of:

- Supermarkets, Mini-majors retail, Liquor, and Department stores, 20,800 m²
- Specialty / Dining, 10,600 m² comprised of specialty food and beverage and dining tenancies
- Commercial / Retail, 5,850 m² tenancies including Childcare centre, Gymnasium, Medical tenancies and possibly a tavern
- A total of 1495 on-grade car parking spaces

The shopping centre (supermarket and retail shops area) are intended to provide the flexibility to operate 24/7 where required (excluding deliveries/ servicing/ refuse collection). The commercial tenancies (e.g. Childcare, Medical) however, are generally expected to operate between 6 am – 7 pm during business hours. The gymnasium is also expected to operate on a 24/7 as required. Dining and Tavern tenancies may have extended operating hours through nighttime period (typically mid-night – 1 am) as required.

The project proposed development plan is shown in Figure 2-4.



Figure 2-4 Development Plan

2.3 Noise sensitive receivers

The proposed development is surrounded by various uses including commercial, educational, health, residential and future parkland. The nearest residential receivers to the site are the future eastern and southwestern residential uses within the town centre boundary as shown in Figure 2-3.

The identified noise sensitive receivers are listed in Table 2-1 and shown in Figure 2-5 below. Note the future residential uses (R1 – R5) are located within the stipulated Major Centre Zone while the other residential uses (R6 – R9) are located within the stipulated Urban Living as per the Yarrabilba PDA shown in Figure 2-1.

Table 2-1 Identified noise sensitive receivers

Receiver ID	Address/Receptor	Type/ use	Approx. distance to site boundary (m)
R1	Eastern medium density residential	Residential	40 m
R2	Southwestern medium density residential and senior living	Residential	40 m

Receiver ID	Address/Receptor	Type/ use	Approx. distance to site boundary (m)
R3	Southwestern medium and village density residential	Residential	470 m
R4	Western medium and village density residential	Residential	510 m
R5	Western and northwestern medium density residential	Residential	120 m
R6	Existing northwestern residential dwellings along Maynor Court and Sommer Street	Residential	770 m
R7	Existing northern residential along McKenny Bvd. and McKinnon Drive (Mallee Pocket)	Residential	970 m
R8	Existing northeastern residential along McKenny Bvd. (Neuman Park area)	Residential	500 m
R9	Southeastern residential and existing dwellings (The Parks)	Residential	455 m
H1	Northwestern health precinct/hospital	Health/Hospital	20 m
E1	Western educational (College/Tafe)	Educational	25 m
C1	Western mixed use commercial, retail and community uses	Commercial	20 m
C2	Northern mixed use commercial, retail and community uses	Commercial	15 – 240 m
P1	Future district park and community centre	Parkland/Commercial	35 m



Figure 2-5 Noise sensitive uses surrounding the facility

3.0

Acoustic environment

3.0 Acoustic environment

The area is currently under development, as shown in Aerial imagery in Figure 2-5, with construction works underway within various precincts. The area will serve as the multifunctional, social and commercial hub for residents in adjoining neighbourhoods within the Yarrabilba Precinct.

Noise monitoring was carried out at a location along Yarrabilba Drive and close to Wentland Avenue between Thursday 5 February 2026 to Thursday 12 February 2026. The purpose of the noise survey was primarily to:

- Identify sources of noise that are likely to affect the development and assess their expected noise levels.
- Quantify existing ambient and background noise levels, to assist in setting appropriate noise criteria in order to assess the impact of the proposed development on the surroundings.
- Identify potential noise sensitive receivers in the vicinity of the site.

3.1 Instrumentation and Methodology

Continuous unattended noise monitoring was carried out at the location shown in Figure 3-1. The background noise at this location is considered representative of the surrounding uses adjacent to the proposed development.

A Rion NL 42 Class 2 environmental noise logger and sound level meter was used for the noise survey. The sound level meter was field calibrated both before and after the measurement period using a 01dB-Stell Acoustic Calibrator. No drift of more than 0.5 dB was observed for reference level before and after measurements. Both the sound level meter and calibrator held current NATA certified calibration certificate at the time of testing which can be provided upon request.

The noise logger recorded various noise parameters at 15-minute intervals continuously between about 7 pm on Thursday 5 February 2026 and 8 am on Thursday 12 February 2026, including the A-weighted equivalent continuous noise level (L_{Aeq}) and background noise level (L_{A90}).



Figure 3-1 Noise monitoring location¹

¹ Aerial imagery courtesy of MetroMap ©2023, imagery date 25/08/2023

3.2 Weather conditions

Weather conditions at the nearest Bureau of Meteorology (BOM) Automatic Weather Station (AWS) to the development, being the Greenbank (Defence) Station AWS located about 18.7 km north-west of the site, have been monitored throughout the logging period.

The weather conditions were observed to be acceptable for noise monitoring over the logging period and any periods affected by adverse weather conditions (rain and excessive wind) have been excluded from the measurement. Adverse weather conditions corresponding to periods of rain or where wind speed recorded by the AWS was above 7 m/s were excluded. Wind speeds of 7 m/s at a mast height of 10 m are taken to equate to wind speeds of about 5 m/s at microphone height of about 1.5 m based on typical expected logarithmic wind profile.

3.3 Unattended monitoring results

The unattended noise monitoring results are shown in Figure 3-2 and summarised in Table 3-1 below with the background noise level established following procedures set in the Department of Environment and Science (DES) *Noise Measurement Manual*.

Table 3-1 Summary of unattended noise monitoring

Date	Rating Background Level (RBL), dB			Period Background Level, $L_{A90,T}$, dB			Ambient noise level, $L_{Aeq,T}$, dB		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
05 – 12 February 2026	40	34	24	44	39	31	62	59	57

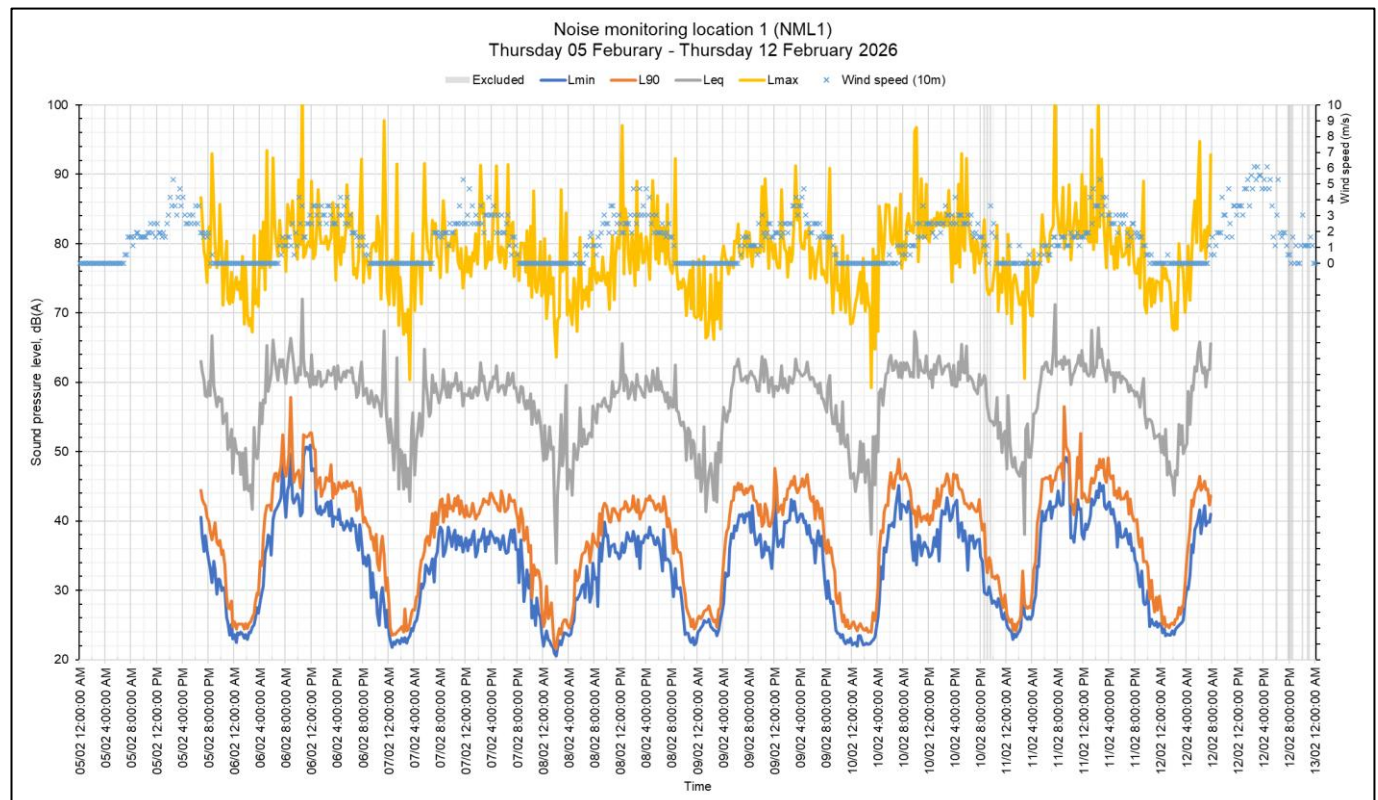


Figure 3-2 Noise monitoring results

The existing background noise environment was noted to be notably lower than typically expected for a suburban area of similar nature due to the undeveloped nature of the area. The current ambient acoustic environment is more consistent with the rural nature of the area prior to the urban development with little or no traffic.

To provide further context, reference is made to the guidance provided in Australian Standard AS1055.3 - 1997² *Acoustics – Description and measurement of environmental noise – Part 3 Acquisition of data pertinent to land use* estimated average background sound pressure levels for different areas.

Table 3-2 AS 1055.3 – 1997 Estimated background sound pressure levels

Description	Average background, $L_{A90,T}$, dB		
	7 am – 6 pm	6 pm – 10 pm	10 pm – 7 am
Areas with negligible transportation	40	35	30
Areas with low density transportation	45	40	35
Areas with medium density transportation or some commerce or industry	50	45	40

Accordingly, the existing background noise considered to be very conservative and is not expected to be representative of future background noise levels with the proposed development in place. In particular the established night-time rating and period background noise levels of 24 and 31 dBA respectively are considered very low for a suburban and town centre environment.

Following development of the urban precinct and surrounding centre and residential areas, ambient and background noise levels are expected to increase due to additional local traffic and town centre hub activities (surrounding schools, community centre etc). The general ambient acoustic environment however is expected to still be consistent with that of a suburban residential area with low – medium transportation characteristics with intermittent local traffic flows and consistent with the strategic masterplan vision for the area. Accordingly, for nighttime, a period background noise level of 35 dBA is adopted for establishment of noise limits following guidance from AS 1055.3. A period background noise level of 35 – 40 dBA for nighttime is also considered typical and representative based on previous Cundall monitoring carried out in similar developed suburban areas with low level of transportation.

² It is noted that AS 1055:1997 is now superseded by AS 1055:2018 in which the estimated average background levels are removed. However, these background noise levels are also utilised as guides in other legislative documents such as NSW Noise Policy for Industry 2017. Therefore, use of above estimated background noise levels is considered a reasonable approach given absence of other guidance.

4.0

Acoustic criteria

4.0 Acoustic criteria

4.1 Yarrabilba Priority Development Area Development Scheme

No specific noise criteria are stipulated within the Yarrabilba Priority Development Area Development Scheme. The PDA wide principles however require that:

3.3.8 Natural and cultural values

Development responds to the constraints of the land and delivers:

- Manage air quality, noise and hazardous material according to current standards

3.3.9 Community safety and development constraints

Residences and other sensitive uses are protected from the impacts of noise and dust from regional transport corridors.

The zone intends such as the Urban Living also requires that any impacts associated with use (e.g. noise) to be managed so that it will not affect residential or other sensitive uses.

4.2 Logan City Council Planning Scheme 2015

Development is located within the Logan City Council and should have regards to the provisions of the Logan Planning Scheme 2015 (Logan PS 2015). The following outlines the acoustic criteria relevant to the development with respect to the provisions of the Logan PS 2015.

4.2.1 Environmental management

Schedule SC6.2.3 *Environmental Management* of the Logan PS 2015 sets out the noise emission and immission standards applicable.

4.2.1.1 Noise emission

Applicable Logan PS 2015 noise emission standards for protection of residential and general amenity are re-produced in Table 4-1 and Table 4-2 respectively.

Table 4-1 Noise emission standards for the protection of residential amenity

Noise type	Time period	Monday to Saturday	Sunday and public holidays
Non-steady sound	Day 7:00am – 6:00pm	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB}$	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB}$
	Evening 6:00pm – 10:00pm	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB}$	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB}$
	Night 10:00 – 7:00am	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 0 \text{ dB and } L_{Amax} \leq 60 \text{ dB}$	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 0 \text{ dB and } L_{Amax} \leq 60 \text{ dB}$
Continuous noise	Anytime	$L_{A90,T} \text{ plus } 0 \text{ dB}$	$L_{A90,T} \text{ plus } 0 \text{ dB}$

Table 4-2 Noise emission standards for the protection of general amenity

Noise type	Time period	Monday to Saturday	Sunday and public holidays
Non-steady sound	Day 7:00am – 6:00pm	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 10 \text{ dB}$	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB}$
	Evening 6:00pm – 10:00pm	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 10 \text{ dB}$	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB}$

Noise type	Time period	Monday to Saturday	Sunday and public holidays
	Night 10:00 – 7:00am	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB and}$ $L_{Amax} \leq 80\text{dB}$	$L_{Aeq,adj,T} \leq L_{A90} \text{ plus } 5 \text{ dB and}$ $L_{Amax} \leq 80\text{dB}$
Continuous noise	Anytime	$L_{A90,T} \text{ plus } 5 \text{ dB}$	$L_{A90,T} \text{ plus } 5 \text{ dB}$

Noise emission standards outlined in Table 4-1 for protection of residential amenity apply to the following:

- Community facilities zone
- Emerging community zone
- Environmental management and conservation zone
- Low density residential zone
- Low-medium density residential zone
- Medium density residential zone
- Private sport and recreation precinct of the Recreation and open space zone
- Rural residential zone other than the Cottage rural precinct

Noise emission standards outlined in Table 4-2 for protection of general amenity apply to the following:

- Centre zone
- Low impact industry zone
- Medium impact industry zone
- Mixed use zone
- Specialised centre zone

4.2.1.2 Noise immission

Noise immission standards of the Logan Planning Scheme 2015 requires that the noise levels measured at a sensitive land use achieve the indoor acoustic quality objectives as outlined in Schedule 1 of the Environmental Protection (Noise) Policy 2008.

Note the Environmental Protection (Noise) Policy 2008 has been superseded with the Environmental Protection (Noise) Policy 2019 (EPP (Noise) 2019). Accordingly for satisfaction of the Logan PS 2015 noise immission standards, consideration has been given to relevant indoor acoustic quality objectives as per the EPP (Noise) 2019.

4.2.2 Childcare centre code

Part 9.3.1 of the Logan PS 2015 set outs the Performance and Acceptable Outcomes for childcare centre developments. The following acoustic related Performance Outcome is considered applicable in relation to Amenity of the development and surrounding uses:

Table 4-3 Performance and Acceptable Outcomes for childcare centre developments

Performance outcome	Acceptable outcome
PO8 Development ensures adjoining amenity and privacy are maintained by minimising the potential for overlooking between premises through appropriate building layout, location and the design of windows and screening devices.	AO8 No acceptable outcome provided.

Performance outcome	Acceptable outcome
PO9 A Childcare centre is of a design and operation to protect amenity expectations of the zone and surrounding premises.	AO9.1 Development provides an acoustic fence along a boundary shared with land in the residential zone category. Note - A noise impact assessment report prepared by a suitably qualified professional will determine the appropriate height for acoustic fencing. AO9.2 Development ensures mechanical plant or equipment is acoustically screened from an adjoining premises in the residential zone category.

4.3 Environmental Protection Act 1994

The Environmental Protection Act 1994 (EP Act) protects Queensland's environment while allowing for development that improves the quality of life and maintains ecological processes. Chapter 8 Part 3B Division 3 of the EP Act provides default noise standards that apply for a number of specific noise sources and activities. Default noise standards under the provisions of the EP Act apply to local government areas where no other specific local law in relation to these are in force. The relevant noise standards under the provisions of the EP Act are shown in Table 4-4.

Table 4-4 Allowable noise limits

EP Act Ch.8 Part 3B Div. 3 Clause	Equipment or Activity	Description	Time	Allowable Noise Limits
440R	Building and Construction	Construction work such as drilling, cutting etc.	Monday to Saturday, 6.30am – 6.30pm	Noise permitted
			Monday to Saturday, 6.30pm – 6.30am Sundays and Public Holidays	No audible noise permitted
440S	Machinery and power tools (Regulated Devices)	Includes compressors and generators, ducted vacuuming systems, grass cutters (such as lawn mowers and edge cutters), impacting tools (such as hammers and nail guns), leaf blowers and mulchers, oxyacetylene burners and electrical, mechanical or pneumatic power tools (such as chainsaws, drills and sanders).	Monday to Saturday, 7 am – 7 pm Sundays and Public Holidays, 8 am – 7pm	Regulated device can be used.
			Monday to Saturday, 7 pm – 7 am Sundays and Public Holidays, 7 pm – 8am	No audible noise permitted
440U	Air conditioning Unit Equipment	Noise from air-conditioning equipment.	Any day, 7am – 10pm	5 dB above background level
			Any day, 10pm – 7am	3 dB above background level
440V	Refrigeration Equipment	Includes refrigeration equipment on properties such as cold rooms and truck-mounted units.	Any day, 7am – 10pm	5 dB above background level
			Any day, 10pm – 7am	3 dB above background level
440W	Indoor venues	Indoor venues for commercial purposes	Any day, 7am – 10pm	5 dB above background level
			Any day, 10pm – midnight	3 dB above background level
			Any day, midnight – 7am	No audible noise permitted

4.4 Environmental Protection (Noise) Policy 2019

Queensland Environmental Protection (Noise) Policy 2019 sets out the state-wide development principals and requirements under the provisions of the Environmental Protection Act 1994. The environmental values specified in Section 6 of the Environmental Protection (Noise) Policy 2019 are as follows:

6 Environmental values

The environmental values to be enhanced or protected under this policy are--

(b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—

- (i) sleep;*
- (ii) study or learn;*
- (iii) be involved in recreation, including relaxation and conversation;*

The Environmental Protection (Noise) Policy 2019 specifies the acoustic quality objectives for different types of sensitive receivers. The noise criteria for relevant receivers within proposed development premises are shown in Table 4-5.

Table 4-5 Acoustic quality objectives

Sensitive receptor	Time of day	Acoustic quality objectives (measured at the receptor) dB		
		L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}
Residence (for outdoors)	Daytime and evening	50	55	65
Residence (for indoors)	Daytime and evening	35	40	45
	Night-time	30	35	40
Educational institution	When open for business or when classes are being offered	35	--	--
Childcare centre or kindergarten (for indoors)	When open for business, other than when the children usually sleep	35	--	--
	When the children usually sleep	30	--	--
School or playground (for outdoors)	When the children usually play outside	55	--	--
Hospital, surgery or other medical institution (for indoors)	Visiting hours	35	--	--
	Anytime, other than visiting hours	30	--	--
Commercial and retail activity (for indoors)	when the activity is open for business	45	--	--
Park or garden that is open to the public (whether or not on payment of an amount) for use other than for sport or organised entertainment	Anytime	The level of noise that preserves the amenity of the existing park or garden		

In addition, the Policy also addresses the noise impact on the cumulative ambient noise levels from the existing condition. Section 9 of the policy stated that:

9 Management intent for noise

- (1) *This section states the management intent for an activity involving noise that affects, or may affect, an environmental value to be enhanced or protected under this policy.*
- (2) *To the extent it is reasonable to do so, noise must be dealt with in a way that ensures—*
 - (a) *the noise does not have any adverse effect, or potential adverse effect, on an environmental value under this policy; and*
 - (b) *background creep in an area or place is prevented or minimised.*

The Noise and Vibration EIS information guideline from Queensland Government specifies the requirement for maintaining the background creep noise limits of the area depending on the noise source:

Section 9 of the EPP(Noise) also stipulates how background creep must be controlled. Specifically, the EPP(Noise) states that to the extent that it is reasonable to do so, noise from an activity must not be:

- (a) *for noise that is continuous noise measured by $L_{A90,T}$ —more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or*
- (b) *for noise that varies over time measured by $L_{Aeq,adj,T}$ —more than 5 dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.*

4.5 Australian Standard AS 2107 – 2016

In addressing the provisions of the Logan PS 2015, consideration is also given to the recommended internal noise level targets outlined in Australian Standard AS2107 – 2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* sensitive uses within the development namely the childcare centre. The recommended AS2107:2016 internal design noise targets for relevant spaces within the childcare facility are presented in Table 4-6.

Table 4-6 AS2107 recommended internal noise level design criteria

Room	Internal design noise level, $L_{Aeq,1hr}$, dB
Corridors and lobbies	≤ 50
Kitchens	≤ 50
Office areas	40 to 45
COTs (sleeping areas)	30 – 35
Indoor play area	35 to 45
Professional and Administrative offices	35 to 40
Staff common rooms	40 to 45
Toilet/change/showers	≤ 55

4.6 Summary of project noise limits

4.6.1 Environmental noise emissions

With reference to the identified noise sensitive receivers, requirements of the EP Act, EPP (Noise) 2019 and Logan PS 2015, project environmental noise limits are summarised in Table 4-7 below. The adopted noise criteria presented in Table 4-7 are the lowest of the limits in accordance with Logan PS 2015 as well as provisions of the EPP (Noise) 2019.

Table 4-7 Summary of environmental noise criteria

ID	Receivers	Days	Noise criteria, L_{Aeq} , dB					
			Non-steady sound			Continuous		
			Day	Evening	Night	Day	Evening	Night
R1 – R5	Future residential within Centre Zone ⁽¹⁾	Monday to Saturday	50	49	40	49	44	40
		Sunday and Public Holiday	49	44	40			
R6 – R9	Future and existing residential within Urban Living Zone ⁽²⁾	Any day	49	44	35	44	39	35
H1	Health/Hospital	Any day	50 ⁽⁴⁾	50 ⁽⁴⁾	45 ⁽⁴⁾	50 ⁽⁴⁾	50 ⁽⁴⁾	45 ⁽⁴⁾
E1	Educational institutions	Any day	50 ⁽⁴⁾	50 ⁽⁴⁾	---	50 ⁽⁴⁾	50 ⁽⁴⁾	---
P1	Future district park and community centre	Any day	50 ⁽³⁾	---	---	50	---	---
C1 – C2	Surrounding mixed use commercial, retail and community uses	Any day	60 (when occupied and in use)					

Notes:

1. Receivers in Centre Zone for which noise emission standards for the protection of general amenity are applicable.
2. Receivers in Residential/Urban Living Zone for which noise emission standards for the protection of residential amenity are applicable.
3. A criterion of no more than 5 – 10 dB above expected background noise within the area with similar character and equivalent to that of a residential area is considered to preserve the amenity of the parkland as per the requirements.
4. Equivalent external noise criteria based on a 15 dB outdoor to indoor correction in line with the adopted approach by EPP (Noise) 2019 for residences.

4.6.2 Noise immission (internal amenity)

Noise immission standards apply to sensitive uses within the development namely the childcare centre only. Table 4-8 outlines the internal noise targets for the childcare centre in accordance with provisions of Logan PS 2015 and that recommended by Australian Standard AS 2107.

Table 4-8 Childcare centre internal noise limits

Room	Internal design noise level, $L_{eq,1hr}$, dB
Indoor play and learning areas	35
COT (sleeping areas)	30
Admin areas, staff rooms	40 – 45

5.0

Noise emission assessment

5.0 Noise emission assessment

The potential noise emission sources associated with the development are expected to be:

- Mechanical plant noise
- Loading dock and deliveries
- Car park activity noise
- Childcare centre noise
- Gymnasium noise
- Food and Beverage / Dining tenancies noise (patron and music)
- Waste management

5.1 Computational noise model

A 3D computational noise model of facility and surrounding has been developed for assessment of noise emissions from the facility using SoundPLAN Version 9.1 and adopting ISO 9613 -2:2014 *Acoustics – Attenuation of sound during propagation outdoors* algorithm.

Computational noise model has been utilised to calculate outdoor noise propagation from different noise sources taking into consideration the building and facility design, surrounding building, receiver locations and height and terrain as well as environmental factors affecting the noise propagation.

The noise predictions utilise ISO 9613 algorithm which takes into account a moderately favourable weather conditions to the noise propagation (i.e. increasing noise levels).

The following modelling assumptions have been considered:

- Terrain information based on publicly available elevation data from QSpatial (Queensland Spatial Catalogue).
- The receivers were modelled at 1.5 m above local ground level.
- All noise sources have been conservatively assumed to be operating simultaneously and continuously over the assessment period.
- Ground absorption value of 0 (hard surface) has been considered for site, road and parking areas and 0.5 is surrounding areas representing the suburban nature of area and surrounding landscape. A ground absorption of zero (0) represents acoustically reflective ground (i.e. no sound absorption) while a value of one (1) represent an acoustically absorptive ground.

5.2 Mechanical plant noise

The mechanical design strategy for the project at this stage likely involves air conditioning and ventilation provided by central systems including packaged units, packaged condensers, chiller and the like located at dedicated rooftop plant areas for each relevant use within the development.

Details and information on the mechanical plant is not available at this stage. If necessary, appropriate noise control measures are to be designed and incorporated during later design stages of the project for compliance with the noise limits outlined in Section 4.6.1.

A preliminary screening assessment of likely noise emissions has been carried out based on typical expected mechanical plant and a typical range of sound power levels for mechanical plant as outlined below in Table 5-1.

Table 5-1 Preliminary mechanical plant and sound power level, per unit

Proposed use	Equipment	Expected no.	Location	Sound power level, L _w
Supermarket 1	Chiller	1 x unit	Rooftop plant	86 dBA
	Large, air-cooled condenser/AHU	1 x units	Rooftop plant	90 dBA
	Water pump	2 x units	Rooftop plant	80 dBA
	AHU/Dehumidification system	1 x units	Rooftop plant	80 dBA
	Water heaters	2 x units	Rooftop plant	82 dBA
	Condenser units	4 x units	Rooftop plant	75 – 85 dBA
	Fans	16 x units	Rooftop plant	60 – 85 dBA
Supermarket 2 / Mini Major	Air cooled condenser	1 x units	Rooftop plant	85 dBA
	Refrigeration plant	1 x units	Rooftop plant	85 dBA
	Condenser units	3 x units	Rooftop plant	75 – 85 dBA
	Fans	7 x units	Rooftop plant	60 – 85 dBA
Supermarket 3	Chiller	1 x units	Rooftop plant	90 dBA
	Refrigeration plant (Large)	1 x units	Rooftop plant	85 dBA
	Refrigeration units	3 x units	Rooftop plant	80 dBA
	Condenser units	6 x units	Rooftop plant	75 dBA
	Fans	12 x units	Rooftop plant	70 – 85 dBA
Department	Packaged Unit	6 x units	Rooftop plant	78 – 90 dBA
	Fans	12 x units	Rooftop plant	75 – 85 dBA
	Condenser units	6 x units	Rooftop plant	75 dBA
Commercial/Retail/ Specialty	Condenser units	3 x units	Rooftop plant	70 – 80 dBA
	Fans	3 x units	Rooftop plant	65 – 75 dBA
	FCU intakes	3 x units	Rooftop plant	70 dBA
Liquor	Condenser units	2 x units	Rooftop plant	75 dBA
	Fans	3 x units	Rooftop plant	65 – 75 dBA
FNB/Dining	Condenser units	3 x units	Rooftop plant	70 – 80 dBA
	Fans	5 x units	Rooftop plant	65 – 85 dBA
	FCU intakes	3 x units	Rooftop plant	70 dBA
Childcare	Condenser units	10 x units	Rooftop plant	70 – 75 dBA
	Fans	12 x units	Rooftop plant	60 – 85 dBA
Gymnasium	Condenser units	3 x units	Rooftop plant	85 dBA
	Fans	3 x units	Rooftop plant	70 – 85 dBA

Noise emissions from the external plant have been predicted at the identified noise sensitive receivers for typical day/evening operations as well as nighttime. For nighttime predictions, the mini-major tenancies, commercial/retail, specialty shops and childcare are not expected to be operating. However, supermarkets and departments store as well as FNB/Dining tenancies are assumed to potentially be operating through nighttime hours or on a 24 hour basis. For nighttime

operations, mechanical plant are expected to be operating at lower capacity due to reduced load for which a 3 – 5 dB reduction is typically expected and considered in the predictions.

Table 5-2 below presents the predicted mechanical plant levels at each of the relevant noise sensitive receivers for day/evening and nighttime operations. Assessment of mechanical plant noise has been carried out with respect to the relevant noise emission limits for “*Continuous*” sources.

Table 5-2 Mechanical plant predictions

ID	Receivers	Day/evening operation			Nighttime operation		
		Predicted	Limit ⁽¹⁾	Comply	Predicted	Limit ⁽¹⁾	Comply
R1	Eastern residential in Centre Zone	42	44	Yes	34	40	Yes
R2	Southwestern residential in Centre Zone	42	44	Yes	35	40	Yes
R3	Southwestern residential in Centre Zone	35	44	Yes	29	40	Yes
R4	Western residential in Centre Zone	35	44	Yes	30	40	Yes
R5	Western & northwestern residential in Centre Zone	44	44	Yes	39	40	Yes
R6	Existing northwestern residential	35	39	Yes	30	35	Yes
R7	Existing northern residential	31	39	Yes	25	35	Yes
R8	Existing northeastern residential	35	39	Yes	30	35	Yes
R9	Future southeastern residential and existing dwellings	35	39	Yes	30	35	Yes
H1	Northwestern health precinct/hospital	47	50	Yes	43	45	Yes
E1	Western educational (College/Tafe)	48	50	Yes	--- (2)	--- (2)	--- (2)
C1	Western future commercial/retail	46	60	Yes	--- (2)	--- (2)	--- (2)
C2	Northern future commercial/retail	47	60	Yes	--- (2)	--- (2)	--- (2)
P1	Future district park	44	50	Yes	--- (2)	--- (2)	--- (2)
Notes:							
1. Lowest of applicable period noise limit in any day.							
2. Receiver not expected to be used or in operation during nighttime.							

Predicted noise levels from mechanical plant during all periods including day/evening and nighttime with typical expected plant operating are found to meet the relevant noise limits indicating that compliance is expected to be achieved at all the receivers with no further mitigation measures expected. However, mechanical plant should be selected as to not exceed the sound power levels adopted in this assessment as summarised in Table 5-1, or alternatively further acoustic measures will be required to compensate for any increase in noise levels and/or additional plant installations.

Further review of the mechanical design will be undertaken at later project design stages when detailed selections are available with appropriate further mitigation measures established and incorporated into the project as necessary to comply with the noise limiting criteria.

5.3 Loading dock noise emissions

Noise emissions from loading dock activities should be managed to avoid adverse noise impacts on surrounding sensitive receivers. The proposed development includes multiple main loading docks servicing the facility as shown in Figure 5-1.



Figure 5-1 Location of Loading docks

The loading dock activities are expected to be undertaken between 6am – 10pm. Potential noise emissions from the loading dock and deliveries have been predicted using the developed computational noise model of the facility with the following inputs and assumptions representative of typical delivery activities in the relevant assessment hour:

- A noise sources representing general loading activities (e.g. loading/unloading, electrical/handheld lifter, people talking, compactor) with sound power level of 85 dBA.
- One (1 x) large delivery truck per loading, average sound power level of 96 dBA (total of 8 x sources)
- Large truck with maximum noise sound power level of 112 dBA (L_{WMax})
- One (1 x) refrigerated medium size delivery truck (9m) per loading, sound power level of 93 dBA (total of 8 x sources).
- Delivery vehicles/truck idling for about 10 minutes.
- Truck manoeuvre including reversing beeper noise emissions. Reversing beeper sound power level of 107 dBA for approximately 20 seconds during reversing manoeuvre.
- Loading dock speed of 10 km/hr.

Table 5-3 below presents the predicted loading dock noise emissions including the average and maximum noise levels at each of the relevant receivers. The day/evening operations conservatively is assumed to include all the sources presented above operating simultaneously in the assessment period of 1 hour. The nighttime operations however are expected to only associate with early morning deliveries before 7am (i.e. 6am - 7am) and include one large truck delivery for each of the loading areas. The assessment of loading dock noise emissions have been carried out with respect to non-steady source noise emission standards.

Table 5-3 Loading dock noise levels

ID	Receivers	Loading dock day/evening average noise L_{eq} , dB			Loading dock night time average noise L_{eq} , dB			Loading dock maximum noise L_{max} , dB		
		Predicted	Limit ⁽¹⁾	Comply	Predicted	Limit ⁽¹⁾	Comply	Predicted	Limit ⁽¹⁾	Comply
R1	Eastern residential	42	44	Yes	40	40	Yes	67	80	Yes
R2	Southwestern residential	19	44	Yes	16	40	Yes	45	80	Yes
R3	Southwestern residential	21	44	Yes	20	40	Yes	45	80	Yes
R4	Western residential	25	44	Yes	20	40	Yes	46	80	Yes
R5	Western & northwestern residential	43	44	Yes	39	40	Yes	62	80	Yes
R6	Existing northwestern residential	31	44	Yes	27	35	Yes	48	60	Yes
R7	Existing northern residential	29	44	Yes	27	35	Yes	44	60	Yes
R8	Existing northeastern residential	35	44	Yes	33	35	Yes	52	60	Yes
R9	Southeastern residential and existing dwellings	33	44	Yes	30	35	Yes	50	60	Yes
H1	Northwestern health precinct/hospital	50	50	Yes	47	45	No (2)	70	80	Yes
E1	Western educational	24	50	Yes	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)
C1	Western commercial/retail	28	60	Yes	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)
C2	Northern commercial/retail	53	60	Yes	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)
P1	Future district park	20	50	Yes	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)	--- (2)
Notes:										
1. Lowest of applicable day/evening noise limits in any day.										
2. Maximum noise level limit not relevant to non-residential receivers.										

The predicted noise levels presented in Table 5-3 indicate that compliance with relevant noise limits with the adopted conservative loading dock operations is expected to be achieved at day/evening periods. Predicted early morning operations (between 6am – 7am) are also found to meet the nighttime noise limits at all residential receivers. A marginal exceedance of 2 dB is however found at the future health/hospital precinct immediately north of the development due to large truck movements in close proximity to the boundary. This minor residual exceedance is however not expected to adversely impact the amenity of future health/hospital development considering the following factors:

- A 1 – 2 dB noise level difference is typically not perceptible by average listener and hence considered negligible impact.
- Large truck deliveries are typically for major tenancies and are only expected to occur few times in any week and unlikely to occur concurrently during early morning hours with typical loading dock activities and smaller van/truck deliveries expected to produce lower noise emissions. General loading dock activities are predicted to meet the night time noise target at all receivers.
- This minor residual exceedance is expected to be adequately mitigated through design and construction of future hospital/health precinct. Generally, a 20 dB reduction is considered readily achievable with standard building constructions with windows/door closed which is expected to result in indoor noise levels below that required for sensitive spaces within hospital/health development.
- This residual noise exceedance can also be further mitigated by implementation of the recommended operational noise management measures outlined in Section 8.0.

5.4 Car park noise emissions

The proposed facility has a total of 1495 car parking spaces servicing the entire development including the retail, commercial, childcare and gymnasium. An assessment of proposed development car parking noise emissions is undertaken and considers the following:

- Peak hour car park activity noise emissions
- Nighttime car park activity noise emissions
- Maximum noise events associated with car parking

Potential noise emissions from the car park have been predicted using the developed computational model for the facility adopting the Bavarian State Agency for the Environment 2007, *Parking Area Noise*, 6th Edition, Bavarian State Ministry for the Environment, Germany, parking noise algorithm. This is an industry standard assessment tool for prediction of car park noise. The noise model considers the following inputs:

- Peak hour, 1800 cars/trips distributed evenly across all parking spaces
- Nighttime, 150 cars/trips in an hour distributed evenly across all parking spaces.
- Parking type lot set as *Department Store* with Asphalt driving lanes and using typical vehicle noise spectra.
- For maximum noise level events, a sound power level of L_{max} 92 dBA for cars short term events including door closing, engine start and movements.
- Parking sources at a height of 0.5 m above the ground.

The predicted noise emissions from the car parking activities during peak hour as well as nighttime period with consideration of maximum noise events are presented in Table 5-4. Predicted car parking activity noise levels meet the relevant noise limits at all receivers and at all times with current design and layout with no further acoustic mitigation is considered necessary.

Table 5-4 Carpark noise emission levels

ID	Receivers	Peak hour activity noise levels L_{eq} , dB			Nighttime activity noise levels L_{eq} , dB			Maximum noise level L_{max} , dB		
		Predicted	Limit ⁽¹⁾	Comply	Predicted	Limit ⁽²⁾	Comply	Predicted	Limit ⁽¹⁾	Comply
R1	Eastern residential	44	44	Yes	33	40	Yes	42	80	Yes
R2	Southwestern residential	43	44	Yes	32	40	Yes	40	80	Yes
R3	Southwestern residential	34	44	Yes	23	40	Yes	29	80	Yes
R4	Western residential	32	44	Yes	21	40	Yes	29	80	Yes
R5	Western & northwestern residential	39	44	Yes	29	40	Yes	42	80	Yes
R6	Existing northwestern residential	32	44	Yes	21	35	Yes	28	60	Yes
R7	Existing northern residential	27	44	Yes	16	35	Yes	23	60	Yes
R8	Existing northeastern residential	31	44	Yes	20	35	Yes	26	60	Yes
R9	Southeastern residential and existing dwellings	34	44	Yes	24	35	Yes	29	60	Yes
H1	Northwestern health precinct/hospital	46	50	Yes	35	45	Yes	49	80	Yes
E1	Western educational	46	50	Yes	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)
C1	Western commercial/retail	44	60	Yes	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)
C2	Northern commercial/retail	47	60	Yes	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)

ID	Receivers	Peak hour activity noise levels L_{eq} , dB			Nighttime activity noise levels L_{eq} , dB			Maximum noise level L_{max} , dB		
		Predicted	Limit ⁽¹⁾	Comply	Predicted	Limit ⁽²⁾	Comply	Predicted	Limit ⁽¹⁾	Comply
P1	Future district park	48	50	Yes	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)	--- (3)

Notes:

- Lowest of applicable day and evening noise limits in any day for non-steady sources.
- Lowest of applicable nighttime noise limits in any day for non-steady sources.
- Maximum noise level limit not relevant to non-residential receivers.

5.5 Childcare noise emissions

Childcare noise emissions are mainly associated with mechanical plant, carparking noise as well as the children outdoor play activities. Childcare opening hours are expected to be between 6 am – 7 pm. For the assessment of childcare facility, up to 150 children are assumed that are likely divided into separate classrooms with different age groups.

The expected mechanical plant and car parking activity noise emissions associated with the childcare have been incorporated and addressed in Sections 5.2 and 5.4 respectively. This section addresses the potential noise emissions from the children's outdoor activities likely to impact the sensitive receivers surrounding the facility. The children outdoor play is typically only expected after 9 am and before 6 pm, however as a conservative approach assessment against daytime/evening and night time hours are considered reflecting the centre operating hours.

Noise emissions from the outdoor play area are assessed with reference to the AAAC *Guideline for Child Care Centre Acoustic Assessment* estimates of children activity noise emissions with the following inputs:

- About 20% children between ages of 0 – 2 years (baby)
- About 30% children between ages of 2 – 3 years (toddler)
- About 50% children between ages of 3 – 5 years (pre-school)
- Outdoor play areas expected to be soft ground.
- According to the guidelines provided by the AAAC the average sound power level for outdoor play areas is calculated as 97 dBA distributed evenly across the outdoor area corresponding to a conservative scenario with up to 150 children playing outside which is not likely to occur.

Predicted noise emission levels from children outdoor play are presented in Table 5-5 and assessed against the daytime noise limits for each of the relevant noise receiver. The children play noise levels are assessed against non-steady source noise limits. Results presented in Table 5-5, demonstrate that the predicted noise levels at all noise sensitive receivers from children outdoor play meet the relevant daytime noise limits with no further acoustic mitigation measures considered necessary.

Table 5-5 Children outdoor play noise emission levels

ID	Receivers	Children outdoor play noise levels L_{Aeq} , dB		
		Predicted	Limit ⁽¹⁾	Comply
R1	Eastern residential	29	40	Yes
R2	Southwestern residential	36	40	Yes
R3	Southwestern residential	19	40	Yes
R4	Western residential	16	40	Yes
R5	Western & northwestern residential	20	40	Yes
R6	Existing northwestern residential	20	35	Yes
R7	Existing northern residential	22	35	Yes
R8	Existing northeastern residential	29	35	Yes

ID	Receivers	Children outdoor play noise levels L_{Aeq} , dB		
		Predicted	Limit ⁽¹⁾	Comply
R9	Southeastern residential and existing dwellings	32	35	Yes
H1	Northwestern health precinct/hospital	25	45	Yes
E1	Western educational	36	50	Yes
C1	Western commercial/retail	39	60	Yes
C2	Northern commercial/retail	42	60	Yes
P1	Future district park	45	50	Yes
Notes:				
1. Lowest of applicable noise limits in any period (i.e. nighttime) and any day.				

5.6 Food and Beverage

Noise emission sources associated with Food and Beverage (FNB) and Dining tenancies are expected to be:

- Mechanical plant
- Car park activity
- Outdoor dining area (patron noise)
- Music noise

The expected mechanical plant and car parking activity noise emissions associated with FNB and Dining tenancies have been incorporated and addressed in Sections 5.2 and 5.4.

Where amplified music/entertainment noise (e.g. live performance) is expected to be played within these tenancies, an assessment of music noise emissions may be required in accordance with the requirements of the Logan City Council and Queensland Liquor Licensing. Assessment of music noise is not undertaken at this stage as the details and design of the facility are not available.

Standard background music that may be played within the tenancies however, is expected to be adequately controlled with standard constructions with no additional acoustic treatments required. A screening assessment of background music that is likely to be played within the FNB and Dining tenancies is undertaken with the following inputs:

- Typical background music level L_{Aeq} 67 – 74 dB (based on guidance provided by AAAC *Licensed Premises Noise Assessment Technical Guideline*)
- Standard façade/roof construction achieving 40 dB R_w and minimum 6 mm safety glazing (32 dB R_w).
- A double door or equivalent window area left open on frontage façade facing into the outdoor dining representing people movements in/out.

The screening assessment also includes consideration of patron noise emissions associated with the outdoor dining area. Patron noise sound power levels are estimated based on the empirical data available in literature with reference to research paper 'Prediction of Noise from Small to Medium Sized Crowds' (Hayne et al., Nov 2011, Proceedings of Acoustics, Conference Gold Coast Australia, pp. 133-140). An additional +3 dB correction is applied for the potential impact of alcohol consumption.

Table 5-6 presents the predicted noise emissions from the FNB and Dining tenancies with consideration to outdoor dining as well as background music noise egress at relevant noise receivers. Results presented in Table 5-6 demonstrate that the patron and music noise egress from the FNB and Dining tenancies are compliant with most stringent nighttime noise limits at all receivers with standard construction of the facility and proposed layout with no further mitigation measures necessary.

Table 5-6 FNB and Dining noise emission levels

ID	Receivers	FNB and Dining noise levels L_{eq} , dB		
		Predicted	Limit ⁽¹⁾	Comply
R1	Eastern residential	26	40	Yes
R2	Southwestern residential	34	40	Yes
R3	Southwestern residential	33	40	Yes
R4	Western residential	34	40	Yes
R5	Western & northwestern residential	40	40	Yes
R6	Existing northwestern residential	28	35	Yes
R7	Existing northern residential	19	35	Yes
R8	Existing northeastern residential	23	35	Yes
R9	Southeastern residential and existing dwellings	23	35	Yes
H1	Northwestern health precinct/hospital	45	45	Yes
E1	Western educational	48	50	Yes
C1	Western commercial/retail	50	60	Yes
C2	Northern commercial/retail	51	60	Yes
P1	Future district park	32	50	Yes
Notes:				
1. Lowest of applicable noise limits in any period (i.e. nighttime) and any day.				

5.7 Gymnasium noise

Noise emission sources associated with the gymnasium are expected to be mechanical plant, car parking, group class & background music noise egress. The gymnasium is expected to operate on a 24/7 basis with potential early morning group classes and training that may likely involve background music.

The expected mechanical plant and car parking activity noise emissions associated with gymnasium have been incorporated and addressed in Sections 5.2 and 5.4. Detail design of the gymnasium is not available at this stage. However, a screening assessment of likely noise emissions due to typical gym environments taking into consideration likely background music and group class activities is undertaken with the following inputs:

- Internal gym reverberant noise of up to L_{Aeq} 86 dB (including background music and group class with instructor noise) based on Cundall measurements of similar facilities.
- Standard façade/roof construction achieving 40 dB R_w and minimum 6 mm safety glazing (32 dB R_w).
- Frontage façade and entrance assumed to be fully glazed up to 4 m height.
- Standard entrance sliding or hinged glazed door with weather seals (estimated dB 20 R_w)

Resultant noise levels from the gymnasium noise egress associated with training and group classes including background music with the modelling inputs outlined above are predicted to be less than 25 dBA at residential receivers and less than 35 dBA at future health/hospital, commercial and southern parkland comfortably meeting the relevant most stringent nighttime noise limits. Accordingly, the standard construction of the gymnasium is expected to achieve adequate control of noise emissions with no further noise mitigation measures required.

5.8 Waste management

Noise generated by waste collection services should be controlled by management of the collection/delivery times where practical to minimise disturbance to nearby residents and neighbouring uses. Main facility refuse/waste collection for

supermarkets and shops is located within the dedicated loading dock area. Noise emissions from the waste collection services are not expected to cause any adverse amenity at nearest residential uses given the notable distance.

However to minimise the impacts to surrounding uses, where practical and safe to do so, waste collections are recommended to be during daytime hours between 7am – 6 pm. Additionally, general noise management measures as recommended in Section 8.0 should also be considered by the relevant tenant where practical to minimise noise impacts during waste collection at all times.

6.0

External noise control

6.0 External noise control

Control of external ambient noise within development sensitive uses namely the Childcare centre has been considered. Childcare centre would typically include sensitive spaces such as the indoor play and learning areas as well as sleeping cots for infants and toddlers. External ambient noise sources that may potentially be impacting on the sensitive uses within the development are the general community noise and local road traffic noise.

External ambient noise sources are not expected to be high at the location of the proposed development given the suburban nature and expected locality following the development of the precinct. However, community and shopping centre activities are still expected to result in some levels of noise impacting upon the childcare facility.

An assessment of likely external noise intrusion has been undertaken based on the developed noise model and predictions made for the project as well as expected ambient noise levels within the area taken from Cundall's database with similar facilities and area. An external ambient noise level of 55 to 60 dBA is generally expected and predicted at the childcare façade from the centre operation and adopted in this assessment.

The building envelope should incorporate adequate noise attenuation measures to achieve the internal noise levels outlined in Section 4.6.2 with doors and windows closed. With reference to the established external noise levels, adequate control of external noise is predicted to be met with typical constructions and requirements presented in Table 6-1.

Table 6-1 External noise control requirements

Envelope element	Acoustic performance requirement	Example constructions
Facade	$R_w + C_{tr}$ 40 dB	- Double brick masonry walls with cavity and insulation - Lightweight metal cladding element: - Metal cladding with 9 mm compressed fibre cement (CFC) backing - Minimum 150 mm wall cavity with steel stud and framing - Minimum 75 mm thick acoustic insulation, density of 14 kg/m³ cavity 13 mm plasterboard internal lining - Lightweight FC cladding: 9 mm CFC cladding - Minimum 150 mm wall cavity with steel stud and framing - Minimum 75 mm thick acoustic insulation, density of 14 kg/m³ cavity 13 mm plasterboard internal lining
Roof	$R_w + C_{tr}$ 35 dB	- Minimum 0.48 mm thick metal deck roof 75 mm thick, minimum 14 kg/m³ acoustic cavity insulation sandwiched between roof metal and purlins - Minimum 200 mm airgap (purling/joist depth), with additional layer of 50 mm thick minimum 14 kg/m³ acoustic cavity insulation 13 mm thick plasterboard, mineral fibre tile with minimum CAC of 35 - Ceiling recommended to be acoustically absorptive with minimum NRC 0.6.
External glazing	R_w 35 dB	- Single 10.38 laminated glass or - DGU system 10 mm glass /12 air gap/ 6 mm glass

Envelope element	Acoustic performance requirement	Example constructions
External doors	R _w 30 dB	40 mm solid core door (minimum surface density of 28 kg/m²) or 10 mm glazed doors with acoustic perimeter and bottom seals. - Sliding glazed door with minimum 10 mm glass in aluminium door frame. Sliding door should have rubber fin or sweeping seals on both sides of the head, bottom, leading edge and the trailing edge. Door should have bottom and head track as well as mullion for the sliding door to fully lock when closed and sealed airtight.
Ventilation system	R _w 35 dB	Ventilation system provided in addition to operable windows should achieve minimum R_w 35 dB

7.0

Construction noise and vibration

7.0 Construction noise and vibration

Application of the noise standard for building work (Section 440R of the Environmental Protection Act 1994) as well as Logan City Council provisions, requires construction activities to be limited to the hours between 6.30am – 6.30pm Monday to Saturday as outlined in Section 4.3. Use of regulated devices as defined in EP Act and described in Section 4.3 should also be limited to hours between 7 am – 7 pm Monday to Saturday, and 8 am – 7pm Sundays and Public Holidays. No building works are generally permitted on Sundays and Public Holidays.

Construction works outside these hours will need to be inaudible at the noise sensitive receivers and seek appropriate approvals from relevant authorities. No specific construction noise targets are specified by the Council or the legislative documents.

The proposed works are expected to be undertaken during standard construction hours as required by the Section 440R of the EP Act and Logan City Council with implementation of best practice measures to control and minimise noise and vibration as far as reasonably practicable.

Project construction noise and vibration impact will be addressed via implementation of a construction noise and vibration management plan for the works. The following section provides guidance on noise and vibration management measures that should be considered to minimise any likely impacts as far as reasonably practical.

7.1 Construction noise

Construction noise should be minimised as reasonably practical during standard hours (6.30am and 6:30pm on Monday to Saturday excluding public holidays). The contractor shall use all reasonable and feasible noise mitigation and management measures to reduce noise generation and impacts. Recommended construction noise mitigation measures are provided in Section 7.3.

7.1.1 Equipment sound power levels

Construction equipment should be quietest reasonably possible. The recommended maximum allowable noise levels for construction plant expected to be used are provided in Table 7-1. All plant and equipment used for construction must have operating Sound power level or Sound pressure levels below or equal to the allowable noise levels listed in Table 7-1. For other equipment where not listed in Table 7-1, reference should be made to the recommended maximum sound power and pressure levels listed in the following documents:

- Australian Standard AS 2436-2010 *Guide to noise and vibration control on demolition, demolition and maintenance sites*;
- Transport for NSW *Demolition Noise and Vibration Strategy* (CNVS, 2018);
- UK's Department of Environment, Food and Rural Affairs *Noise Database for Prediction of Noise on Demolition and Open Sites* (DEFRA, 2006);
- British Standard BS 5228-1 *Code of practice for noise and vibration control on demolition and open sites*.

Table 7-1 Recommended maximum allowable noise levels for construction equipment

Plant item	Sound power level L_w , dB	Sound pressure level L_p , dB at 10 m
Dump truck	110	82
Front end loaders	112	84
Excavator 35t + hydraulic hammer ¹	122	94
Hand tools/ Power tools	102	74
Scissor Lift	98	70
Bobcat ¹	110	82

Plant item	Sound power level L_w , dB	Sound pressure level L_p , dB at 10 m
Jackhammer	121	93
Concrete truck	109	81
Angle Grinder	109	81
Concrete pump	112	84
Concrete saw	116	88
Mobile crane	98	70
Tower crane	104	76
Compressor	100	72

Note 1: Equipment with special audible characteristics.

7.1.2 Noise management levels

Noise from all construction activities is expected to be managed and minimised as far as reasonably practicable. In the absence of specific guidance, reference can be made to the guidance provided by NSW *Interim Construction Noise Guidelines* 2009 (ICNG 2009) with the following requirements outlined in Table 7-2.

Table 7-2 NSW ICNG 2009 guidance for standard working hours

Indicative impact	Managed impact	Noise affected	Highly affected
Construction noise level	< background + 10 dBA	Above background + 10 dBA but below 75 dBA	Above 75 dBA
Reaction to noise	Generally acceptable with prior notification although would be clearly noticeable	Point above which maybe some community reaction to noise	Point above which maybe strong community reaction to noise

Based on above guidance and recommended background noise levels presented in Section 3.0, the following construction noise management targets as presented in Table 7-3 are recommended. It is noted that below construction noise targets are not mandatory and are provided as guidance for the management of construction noise.

Table 7-3 Construction noise level guidance

Indicative impact	Managed impact	Noise affected	Highly affected
Construction noise level	54 dBA	54 – 75 dBA	Above 75 dBA
Reaction to noise	Generally acceptable with prior notification although would be clearly noticeable	Point above which maybe some community reaction to noise	Point above which maybe strong community reaction to noise

7.2 Construction vibration

The construction contractor will be required to comply with the nominated site control vibration targets outlined in Table 7-8. Disturbance to building occupants can potentially occur at much lower vibration levels than the safe limits relating to cosmetic or structural damage of the building. The risk of exceeding the recommended building damage criteria should be managed by the contractor by carrying out vibration measurements during vibration intensive activities such as piling, excavation, demolition and compaction works, in order to establish satisfactory buffer zones.

7.2.1 Vibration management levels

7.2.1.1 Structural damage

Most commonly specified “safe” structural vibration limits are designed to minimise the risk of threshold or cosmetic surface cracks and are set well below the levels that have potential to cause damage to the main structure. Example of these vibration level limits are nominated within the BBS7385: Part 2.

The vibration criteria specified within the DIN 4150: Part 3 have been recommended for structures surrounding the project site. The criteria specified within DIN 4150 are designed for controls of continuous long-term vibration or repetitive vibration with the potential to cause fatigue effects to structure.

The following Peak Particle Velocity (PPV) values are specified within DIN 4150 as safe limits, below which even superficial cosmetic damage is not to be expected:

- 10 mm/s for commercial buildings and buildings of similar design.
- 5 mm/s for dwellings and buildings of similar design.
- 2.5 mm/s for buildings of great intrinsic value (e.g. heritage listed buildings).

For short-term vibration events (i.e. those unlikely to cause resonance or fatigue), DIN 4150 offers the criteria shown in Table 7-4. These are maximum levels measured in any direction at the foundation or in the horizontal axes in the plane of the uppermost floor.

Table 7-4 DIN 4150 Structural Damage - Safe Limits for Short-term Building Vibration

Group	Type of Structure	Peak Particle Velocity, (mm/s) ¹		
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz ²
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 at 10 Hz increasing to 40 at 50 Hz	40 at 50 Hz increasing to 50 at 100 Hz
2	Dwellings and buildings of similar design and/or use	5	5 at 10 Hz increasing to 15 at 50 Hz	15 at 50 Hz increasing to 20 at 100 Hz
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 at 10 Hz increasing to 8 at 50 Hz	8 at 50 Hz increasing to 10 at 100 Hz

Note 1: Unless specified, vibration levels are measured at foundation of the structure

Note 2: For frequencies above 100 Hz the upper value in this column should be used

7.2.1.2 Human comfort

For most construction activities that generate perceptible vibration by occupants in nearby buildings (e.g. earth works and excavation works), the character of the vibration emissions is considered to be intermittent in nature. As a guide, the BS5228-2:2009 provide effects of perceived vibration level in terms of peak particle velocity (PPV, mm/s).

Table 7-5 Guidance on effects of vibration levels (BS 5228-2: 2009)

Peak Particle Velocity (mm/s)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with demolition. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environment will cause complaint, but can be tolerated if prior warning and explaining has been given to residents.
10.0	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Table 7-5 suggests that people will be able to detect vibration at levels of about 0.15 mm/s and that the motion becomes “noticeable” at a level of approximately 1 mm/s.

The EPA *Assessing Vibration: a technical guideline* nominates preferred and maximum vibration goals for critical areas, residences and other sensitive receivers (related to the Project) are shown in Table 7-6 for intermittent vibration and Table 7-7 for continuous vibration. The guideline advises a low probability of adverse comment or disturbance to building occupants would be expected at or below the preferred values.

The applicable human comfort vibration goal for intermittent vibration source is defined in terms of Vibration Dose Values (VDVs) where the permissible vibration level corresponding to the VDV varies according to the duration of exposure.

Table 7-6 Preferred and Maximum Vibration Dose Values for Intermittent Vibration (EPA, 2006)

Building Type	Preferred Vibration Dose Value (m/s ^{1.75})	Maximum Vibration Dose Value (m/s ^{1.75})
Residential Daytime	0.20	0.40
Residential Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80

Note: Daytime is 7:00 am to 10:00 pm and Night-time is 10:00 pm to 7:00 am

Table 7-7 Preferred and Maximum Vibration Dose Values for Continuous Vibration (EPA, 2006)

Building Type	Preferred Vibration Dose Value (m/s ^{1.75})	Maximum Vibration Dose Value (m/s ^{1.75})
Residential Daytime	0.20	0.40
Residential Night-time	0.14	0.28
Offices, schools, educational institutions and places of worship	0.40	0.80

Note: Daytime is 7:00 am to 10:00 pm and Night-time is 10:00 pm to 7:00 am

In applying the preferred and maximum VDV the guidelines states that:

“Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short-term duration. An example is a demolition or excavation Project.”

The guideline also advises that:

“Where all feasible and reasonable measures have been applied to control potential ground vibration levels the maximum values may be used. For values above the maximum value the proponent should negotiate directly with the affected community.”

When short-term works such as piling, demolition or compaction give rise to impulsive vibrations, it should be noted that undue restriction on vibration levels can significantly prolong the demolition process and may result in greater annoyance overall.

7.2.1.3 Vibration control targets

Based on the vibration criteria detailed above, the site-specific controls to reduce risk of cosmetic damage as per DIN 4150 are outlined below in Table 7-8.

Table 7-8 Nominated site control vibration targets (warning and stop levels)

Structure	Site Control vibration Criteria ¹ (Peak Particle Velocity, PPV) in any Orthogonal Direction	
	Warning Level	Stop Level
Residential buildings	4 mm/s	5 mm/s
Commercial buildings	10 mm/s	20 mm/s

Note 1: Vibration levels measured at the base of the building

7.2.2 Minimum working distances

Guidance is provided in Table 7-9 below for the minimum working distances for typical vibration intensive equipment corresponding “Cosmetic damage” and “Human Comfort” vibration limits. The minimum working distances for cosmetic damage must be complied with at all times, unless otherwise approved by the relevant authority.

Table 7-9 Minimum vibration working distances

Equipment	Load/Weight/Description	Minimum distance – Cosmetic damage (BS 7385)	Minimum distance – Human response (OE&H Vibration Guideline)
Vibratory Roller	1 - 2 tonne	5 m	15 m – 20 m
	2 - 4 tonne	6 m	20 m
	4 – 6 tonne	12 m	40 m
	7 - 13 tonne	15 m	100 m
	13 - 18 tonne	20 m	100 m
	> 18 tonne	25 m	100 m
Excavator with hydraulic hammer	300 kg (5 to 12t excavator)	2 m	7 m
	900 kg (12 to 18t excavator)	7 m	23 m
	1600 kg (18 to 34t excavator)	22 m	73 m
Pile Driver – Vibratory	Sheet piles	2 m to 20 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	N/A
Piling Rig – Hammer	12 t down force	15 m	50 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

7.3 Recommended mitigation measures and work practices

The following general mitigation measures are provided to assist with management of construction noise and vibration during project construction. Typical noise and vibration management procedures are provided below.

It is recommended that finalised works methodologies and equipment selections are carefully considered prior to commencing works. Principal Contractor will carry out a site-specific risk assessment of the proposed activities prior to works commencing and identify appropriate additional mitigation measures to manage noise and vibration emissions.

7.3.1 General

- Where feasible and reasonable, construction should be carried out during the approved standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
- Avoiding the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers (both noise and vibration generating activity).
- The contractor will take all reasonable and feasible measures to mitigate noise effects.
- The contractor will take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include efficient silencers and low noise mufflers.
- Minimise plant and vehicles idling when not in use.
- All plant and equipment should be maintained in a proper and efficient manner to minimise noise emissions, including the replacement of engine covers, repair of defective silencing equipment, tightening of rattling components and the repair of leakages in air lines.
- Notification of occupant's adjacent to the site of when these activities occur.
- Implementing an effective community consultation and complaints management.

7.3.2 Noise

- Provision of localised treatment such as temporary barriers, shrouds and the like around fixed plant such as pumps, generators and groundwater extraction plant during use and by "stepping down" the plant settings out of demolition hours or turned off completely where able. The detailed design of acoustic treatments will be undertaken during the detailed design phase.
- Maximising the offset distance between noisy plant items and nearby noise sensitive receivers.
- Where practicable, provision of additional respite from noise producing activities during extended hours operations.
- Use of broadband alarm in place of tonal alarm where practicable.
- Selection and maintenance of "quiet" type equipment where practicable.
- Minimise consecutive works in the same locality (if applicable).
- Minimising consecutive works in the same locality.
- Silenced air compressors, fitted with noise labels indicating a maximum (L_{Amax}) sound pressure level of not more than 75 dBA at 7 m is to be used on site. The sound pressure level of noise emitted from a compressor used is to comply with noise label requirements.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.

7.3.3 Vibration

- Selection and maintenance of low vibration equipment where practicable.
- Use only dampened rockbreakers and/or "city" rockbreakers to minimise the impacts associated with rockbreaking works.

- Trial testing of vibration levels is to be conducted where equipment identified as having the potential to exceed the human comfort criteria or where the vibration intensive plant or equipment is required to operate in close proximity to sensitive structure exceeding the nominated minimum working distances.
- Trial vibration monitoring to determine appropriate work distances of proposed demolition activities.
- Utilise the smallest practicable size of plant equipment when in close proximity to the sensitive structure (e.g. small vibratory roller).

7.3.4 Construction traffic

- Where practicable, site should be arranged to provide one-way traffic movement minimise reversing of vehicles onsite.
- Utilising main road networks to access site and where practicable, heavy vehicles should enter site roads furthest from residential receivers.
- Provide instructions for heavy vehicles operators regarding minimising noise when entering and leaving the demolition sites.
- If required, planned truck queues to be located away from residences and operating school buildings in order to reduce noise impacts due to trucks idling.
- Where practicable, heavy vehicles should be switched off while or during loading of debris queuing.

7.4 Monitoring of construction noise and vibration

Where required in response to complaints, noise monitoring should be conducted at the nearest residential receiver to the works being undertaken, once differentiation between site related noise sources and other sources has been established.

Vibration monitoring and/or audits should be conducted at the nearest affected receiver or relevant structure where risk of exceedance of vibration management levels is expected for prevention of structural damage, and in response to complaints (human comfort).

7.5 Community consultation

Community consultation will, if required, be undertaken via the contractor, including:

- Advising the community of work to be undertaken.
- Recording and managing any complaints.

These and other elements of the community consultation will be addressed under the relevant procedures for the subject works.

7.6 Complaints handling

This protocol is intended to provide framework relating to complaint as a result of the proposed work, and application of appropriate corrective action is identified and implemented as necessary:

- All complaints (verbal, telephone or in writing) are to be recorded and forwarded to the Project Manager, together with details of the circumstance leading to the complaint, work activity at relating to the complaint and all subsequent actions taken.
- The Project Manager shall investigate the complaint in order to determine whether work practices have been carried out with reasonable and feasible to minimise noise.
- Where excessive noise has been caused and identified as related to the work corrective action will be planned and implemented by the demolition contractor
- Project Manager shall inform the complainants regarding their complaints including:
 - Outcome of the investigation; and
 - Corrective action taken (if applicable).

- Follow up monitoring or other investigations will be carried out by the Project Manager and the demolition contractor to confirm the effectiveness of the corrective action.
- All stakeholders must be provided with a complaint response form, with the following details:
 - Name and mobile phone number of a nominated contact for the Contractor, available during all demolition operations;
 - Details of the relevant Council Authority for noise complaint;
 - Facility to record time, source, and duration of disturbance;
 - A postal address for issuing written complaint.

The following steps and procedure are also recommended where a complaint is received:

- **Step 1:** Noise sources should be identified, such as movement of material using a bobcat, cutting of wood using electric saws, short-term foundation works using a rock breaker, loader and truck, and deliveries of building materials with utilities and trucks.
- **Step 2:** Answer the following questions regarding each noise source:
 - Is the noise from the source loud either in an absolute sense or relative to other noise sources in the area?
 - Does the noise include any tones or impulses?
 - Does the noise occur at times when interference with sleep or comfort is likely – for example, at night?
- **Step 3:** Implement feasible and reasonable work practices to minimise or avoid noise.

8.0

Operational noise management

8.0 Operational noise management

On the basis of the acoustic assessment undertaken in this report, the following operational and good practice noise management measures are recommended to minimise the noise impact on surrounding uses. Note the following operational noise management measures are in addition to recommendations made throughout the report.

It is recommended that finalised operational activities and associated building services / external plant selections are carefully considered prior to occupation. The relevant incoming tenants and operators will carry out a site-specific risk assessment of the proposed operational activities prior to occupation and identify appropriate additional mitigation measures to manage noise emissions.

8.1 Loading dock

- Where practical and safe to do so plan and schedule deliveries during less sensitive hours.
- Instruct drivers to avoid using horns or excessive breaking and/or revving up vehicles when arriving or leaving the dock area.
- Regular maintenance and inspection of the loading dock equipment and facilities (such as doors, lifts, etc) should be carried out to prevent unnecessary noise caused by faulty equipment.
- Use of rubber bumpers and cushions is recommended on dock levellers, ramps and equipment where practical and safe to do so to minimise noise during loading and unloading activities.
- Appropriate signage is recommended to be incorporated in loading dock area require all staff and drivers to be considerate to surrounding neighbours with respect to noise, minimise and avoid slamming doors, dropping loads and the like.
- Use adequate signage and marking to mark designated areas for parking and loading/unloading to minimise time for unnecessary manoeuvring and associated noise.
- Drivers should turn off engine during loading and unloading unless otherwise not practical or not safe to do so.
- Train loading dock personnel on noise reduction techniques and efficient loading practices. Properly trained employees can help minimise noisy movements of equipment and materials.
- Instruct and encourage loading dock operators to avoid generating impact noise such as dropping pallets from excessive heights. All loading and unloading activities should be controlled with steady lowering to avoid excessive noise.
- Encourage use of broadband reversing beepers or where possible volume control reversing beepers that can adjust based on the ambient noise in surrounding area.

8.2 Mechanical services

- Ensure the services are operating between 7 am – 10 pm with appropriate automatic control using BMS system to enable reduced load for evening/night hours as necessary.
- External mechanical plant should be regularly maintained.

8.3 Parking

- Staff parking for early arrivals (prior to 7 am) should utilise the bays as far as reasonably practical from the noise sensitive receives.
- Appropriate signage is recommended to be incorporated in parking space to require all visitors and staff to be considerate to surrounding neighbours with respect to noise, minimise and avoid slamming doors and the like.

8.4 Childcare

- Children should be fully supervised at all times so that excessive noise is dealt with promptly.
- Use of Public Announcement systems (PA), amplified music or music instruments externally should be avoided wherever possible and should not be a regular occurrence.
- A separate daily program for both the warmer and cooler months should be established in order to regulate the total time spent outdoors and indoors.
- The program should be made publicly available to parents and neighbours where there is concern for noise impacts.
- If requested, a contact phone number for the Centre's director should be made available to neighbours to facilitate communication and to resolve any neighbourhood issues that may arise due to operation of the Centre.
- Crying children should be taken inside the Centre and comforted.
- The behaviour of children should be monitored and modified as required by adequately trained childcare workers.
- A sign to be installed to advise parents and guardians of the importance of noise minimisation when entering the site, dropping off or picking up children.
- Where music or entertainment is played, such activities should be undertaken during less sensitive hours.

8.5 Waste Management

- Where practical schedule collection/delivery times during less sensitive times to minimise disturbance to nearby residents.
- Bin bays are to be adjacent to a street frontage, or if not possible then at a designated point adjacent to the common access driveway.
- The bin bay should be positioned to minimise noise impacts on residents from the usage of bins and waste or recycling collection.
- Avoid breaking glass and compaction on site during early morning hours. Generally, these should be carried out off-site where practical and safe to do so.
- Where required, compaction should be carried out when vehicle is moving.

9.0

Conclusion

9.0 Conclusions

An acoustic assessment for the proposed Yarrabilba Town Centre located at the corner of Yarrabilba Drive and Wentland Avenue, Yarrabilba has been undertaken with respect to the provisions of:

- Logan Planning Scheme 2015
- Yarrabilba Priority Development Area Development Scheme
- Queensland Environment Protection Act 1994
- Queensland Environmental Protection (Noise) Policy 2019
- Relevant Australian standards and guidelines

This acoustic assessment considered environmental noise impacts on surrounding sensitive receivers as well as control of external noise upon sensitive uses within the development. The potential noise emission sources associated with the development assessed include:

- Mechanical plant noise
- Loading dock and deliveries
- Car park activity noise
- Childcare centre noise
- Food and Beverage/Dining tenancies
- Gymnasium activities
- Waste management noise

Noise sensitive receivers surrounding the development including relevant residential, commercial/retail and parklands were identified and appropriate noise limits established in accordance with provisions of the EP Act, EPP (Noise) 2019 and Logan Planning Scheme 2015.

Noise emissions from each of the identified noise sources were assessed against the relevant project assessment noise criteria. Assessment of noise emissions indicated compliance of relevant noise limits based on the nominated layout and standard construction for all identified noise sources within the development except for loading dock where marginal exceedance was predicted for early morning large truck deliveries at northern future health/hospital land use. The marginal exceedance was however considered negligible and adequately manageable through consideration of best practice operational measures outlined in this report as well as standard construction of the future health/hospital development.

Noise ingress from the surrounding environment affecting the sensitive uses within the proposed development namely the childcare has been assessed with relevant building envelope acoustic performance requirements established to achieve appropriate internal noise amenity.

Noise and vibration impact from the construction of the project were also considered with management measures recommended to assist with control of impacts during project construction.

Based on the assessment undertaken in this report, it is concluded that potential noise impacts from the development as well as external noise impacts upon the proposed development can be adequately controlled to achieve compliance with relevant noise criteria and requirements subject to incorporation of acoustic recommendations in this report summarised below:

- Incorporation of operational noise management measures as outlined in Section 8.0 where practical and safe to do so to assist with minimising noise emissions as far as reasonably practical.
- Mechanical plant design and selections achieve the maximum sound power levels adopted in this assessment as outlined in Section 5.2 or alternatively further acoustic measures incorporated to compensate for any increase in noise levels.
- For adequate control of external noise, construction of the childcare to meet the typical constructions and acoustic requirements as provided in Section 6.0.

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