RODNEY STEVENS ACOUSTICS

REPORT R230419R1

Revision 1

Noise Impact Assessment

Proposed Child Care Centre

267 Taylor Street, Wilsonton QLD 4350

PREPARED FOR:

Cenaphora Investments PTY LTD
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5 September 2023

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Noise Impact Assessment

Proposed Child Care Centre

267 Taylor Street, Wilsonton QLD 4350

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
R230419R1	Revision 0	13 June 2023	Marc Guitart	Desmond Raymond	Rodney Stevens
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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by Cenaphora Investments PTY LTD to prepare a Noise Impact Assessment Report for the proposed Child Care Centre to be located at 267 Taylor Street, Wilsonton QLD 4350.

This report details the results of a noise survey and assesses the likely impact of noise from the proposed Child Care Centre upon nearby residential premises.

This version 1 of the report includes the following Toowoomba Regional Council further advice (Notice 22 August 2023) requirements:

- 1) Identification of all relevant sensitive receivers. Including individual dwellings within Receiver Group 4 and dwellings on the southern side of Taylor Street;
- 2) Revised noise sources within the carpark area, including service vehicles and raised voices;
- 3) Revised model runs and noise source location figures which include: (a) Morning shoulder-Day-Evening shoulder, for variable noise sources; (b) Morning shoulder-Day-Evening shoulder for continuous noise sources; and (c) Morning shoulder for sleep disturbance criteria
- 4) Include noise reflection from buildings and barrier fences in model runs; and
- 5) Revised results for all modelling which include an amended Table 5-2 and Appendix D to include all results and a contour plot for each model run.

This assessment is to form part of the supporting documentation for the DA submission to Toowoomba Regional Council. Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Development Site

The proposed childcare centre is to be located at 267 Taylor Street, Wilsonton. The development site is bounded by residential dwellings to the north, east and west and with Taylor Street to the south. The development site and its surrounding environment are mainly influenced by traffic noise from Taylor Street.

The proposal is to construct a childcare centre. The building will have 2 outdoor play area as well as a carpark.

2.2 Hours of Operation

The following hours of operation are proposed:

- Monday to Friday 6:30 am until 6:30 pm

Above hours of operation fall within the morning shoulder, day and evening shoulder time periods.

2.3 Enrolment Numbers

The proposed Child Care Centre plans to cater for up to 80 children between the ages of 0 and 5 years of age. The number of children and their age groups are as follows:

- 0-2 years old - 16 Children
- 2-3 years old - 20 Children
- 3-5 years old - 44 Children

2.4 Surrounding Receivers

There are a number of sensitive receivers surrounding the proposed development, these receivers will be affected by noise generated by the proposed development. The following table shows the most affected receivers.

Table 2-1 Sensitive Receivers

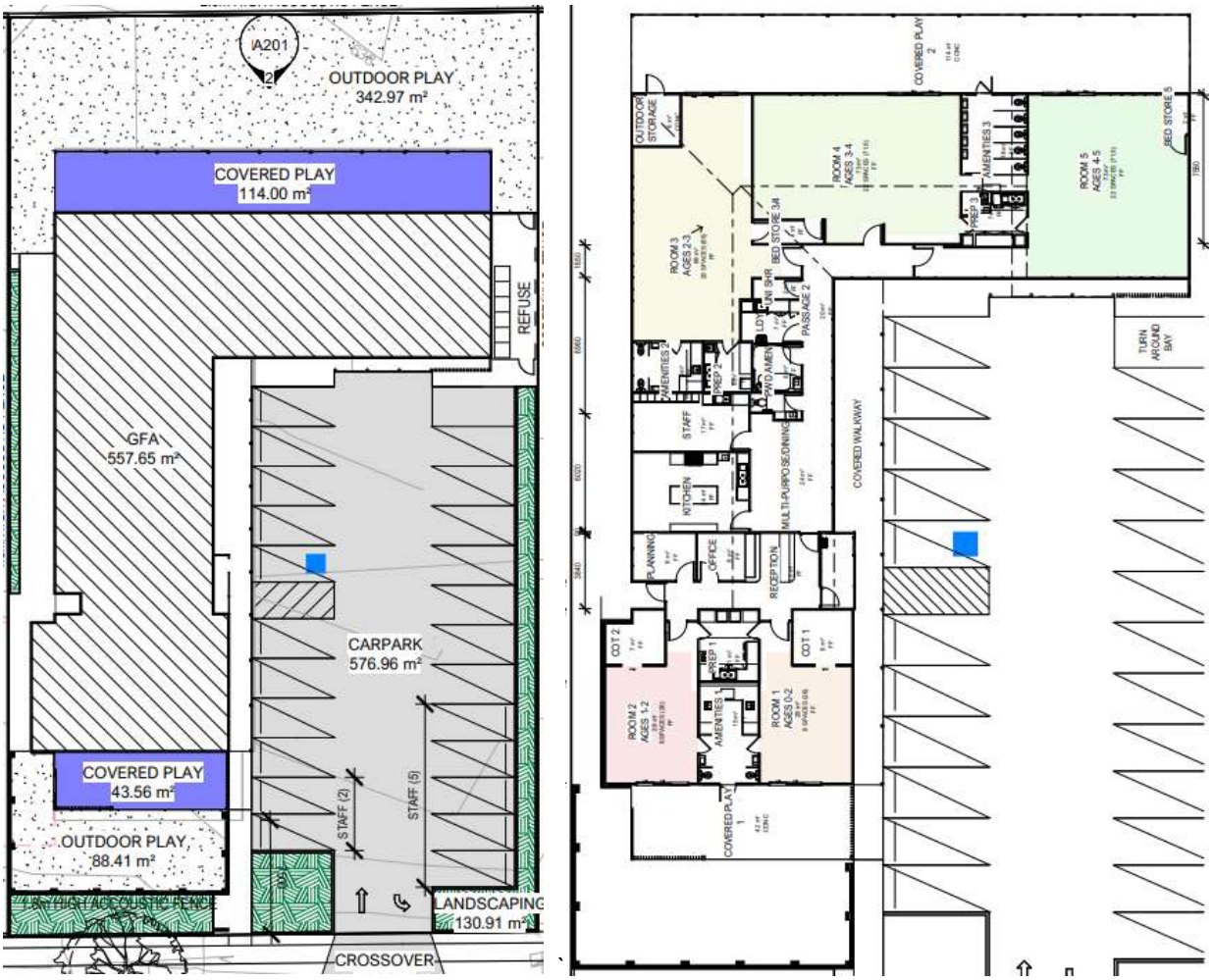
Receiver	Sensitive Receiver's Address
R1	275 Taylor Street
R2	512/2 Greenwattle Street
R3	44 Payne Street
R4.1	Potential Future Residence - 267 Taylor Street (South)
R4.2	Potential Future Residence - 267 Taylor Street (center)
R4.3	Potential Future Residence - 267 Taylor Street (North)
RT1	250 Taylor Street
RT2	252 Taylor Street
RT3	254 Taylor Street

Figure 2-1 shows an aerial image (courtesy of QLD Globe © 2023) of the site area and the surrounding environment

Figure 2-1 Site Location

The following figure presents the proposed Child Care Centre Layout:

Figure 2-2 Proposed Child Care Centre Layout – Ground Level



3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area, unattended noise monitoring was conducted between Thursday 25th May and Tuesday 30th May 2023 at the logging location shown in Figure 2-1.

The noise monitoring at this location is representative of the ambient noise of the area.

Logger location was selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from other landowners.

Noise measurements were conducted in accordance with Australian Standard AS1055 1997 *Acoustics – Description & Measurement of Environmental Noise - Part 1: General procedures* and the Queensland Department of Environment and Science (DES) Noise Measurement Manual (2020).

Instrumentation for the survey comprised of one RION NL-42EX environmental noise logger (serial number 01000374) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates. Measured data did not contain any adverse weather conditions upon consultation with historical weather reports provided by the Bureau of Meteorology.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10}, L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary for definitions in Appendix A). Detailed results at the monitoring location are presented in graphical format in Appendix B. The graphs show measured values of L_{A1}, L_{A10}, L_{A90} and L_{Aeq} for each 15-minute monitoring period.

3.2 Existing noise Environment

In order to assess noise emission from the proposed child care, the data obtained from the noise logger has been processed in accordance with the procedures contained in the Noise measurement Manual (Department of Environmental Science (DES), The State of Queensland 2020) to establish representative noise levels that can be expected in the residential vicinity of the site. The monitored baseline noise levels are detailed in Table 3-1.

Table 3-1 Measured Baseline Noise Levels Corresponding to Defined DES Periods

Location	Measurement Descriptor	Measured Noise Level – dB(A) re 20 µPa		
		Morning Shoulder 6:30 am – 7 am	Daytime 7 am - 6 pm	Evening Shoulder 6 pm – 6:30 pm
Logger position	L_{Aeq}	55	57	51
	RBL (Background)	45	47	38

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

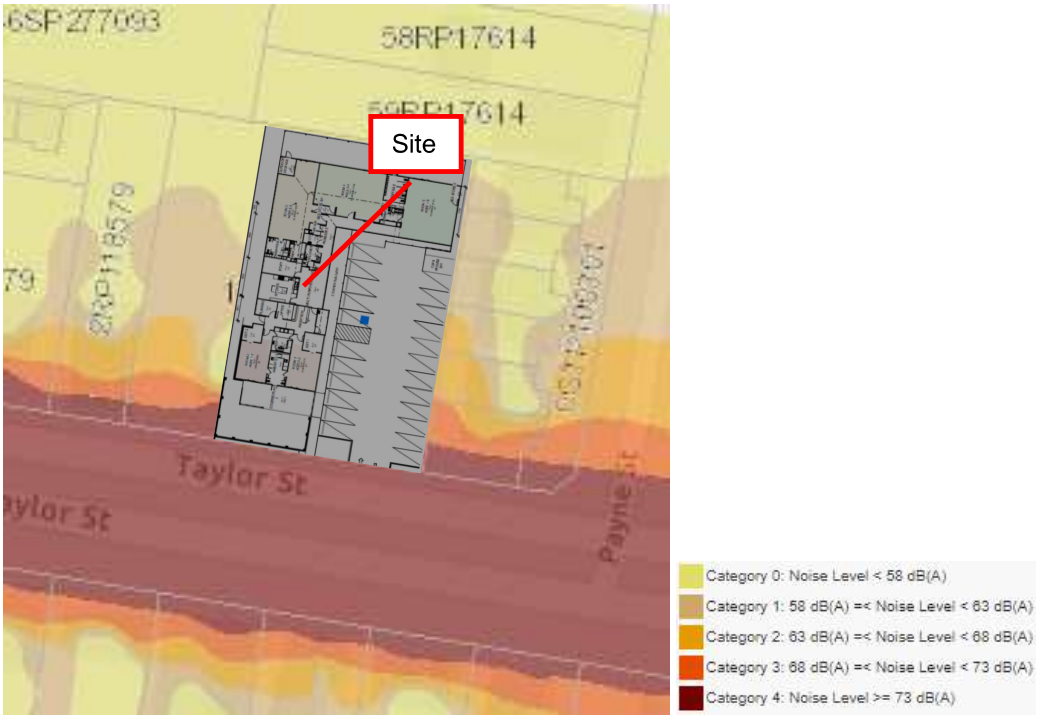
L_{A90} Noise level present for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

Local road traffic from Taylor Street and typical neighboring and far distance industrial are the main noise sources of the area.

3.2.1 Traffic Noise Intrusion (*Road Noise Policy*)

The site is within a transport (road) noise corridor. According to the State Planning Policy Interactive Mapping System, the lot is affected with noise category 0, 1 and 2 as presented in Figure 3-1.

Figure 3-1 Transport Noise Corridor – State Controlled Road – Noise Categories



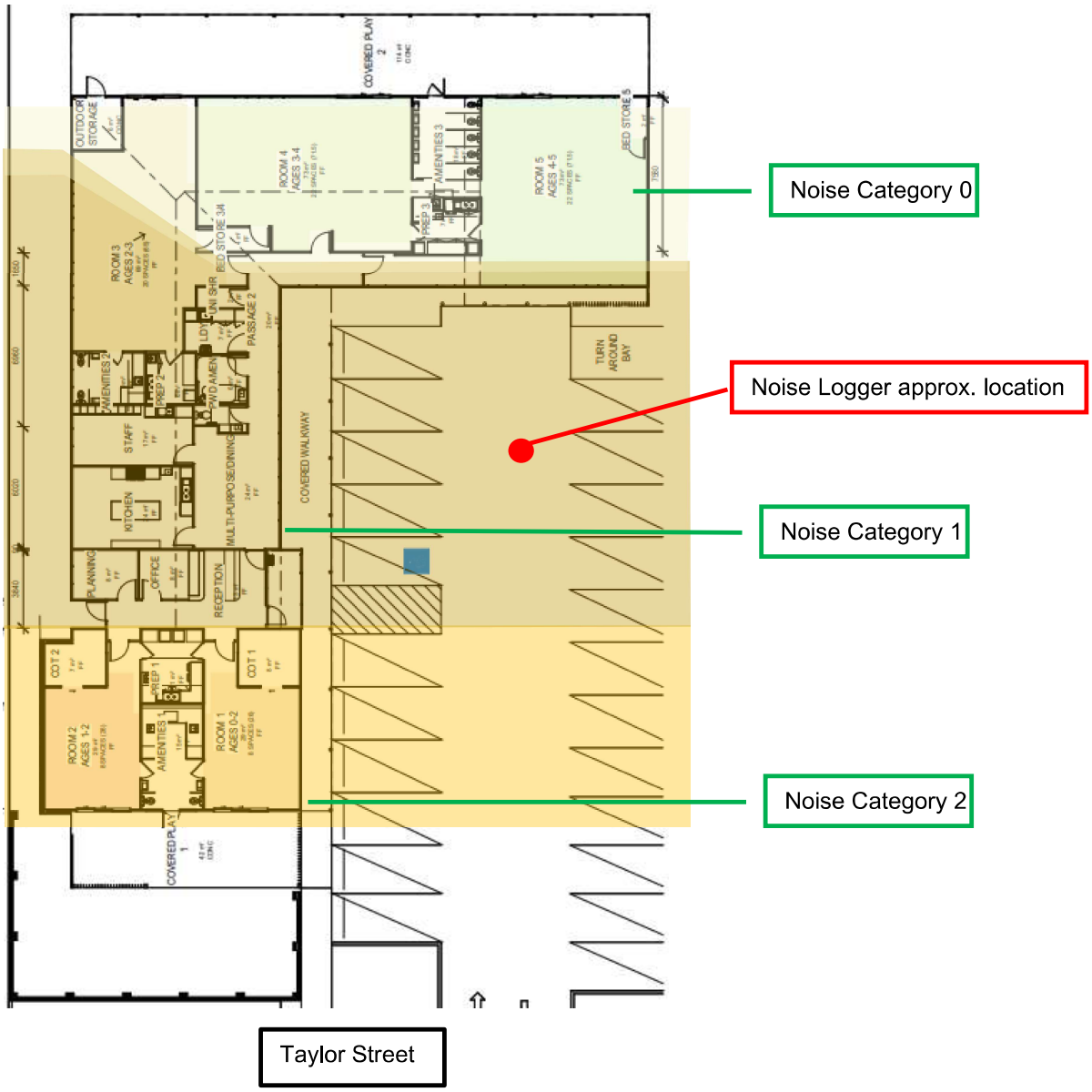
To assess noise intrusion into the outdoor play areas and internal areas of the Child Care Centre, the data obtained from the logger location (28 m from the southern boundary) has been processed to establish representative ambient noise levels from Taylor Street.

The time periods used for this assessment are as defined in the EPA's *Road Noise Policy* (RNP, 2011). Results are presented below in Table 3-2.

Table 3-2 Traffic Noise Levels Corresponding to Defined RNP Periods

Location	Period	External Noise Levels dB(A)
Noise logger – 28 m from Southern Facade	1 Hour (7 am – 22pm)	$L_{Aeq(1h)}$ - Average - 57dB
	15 Hour (7 am – 22pm)	$L_{Aeq(15h)}$ 56 dB

Figure 3-2 Transport Noise Corridor – Noise Categories trough the Building



4 NOISE GUIDELINES AND CRITERIA

4.1 Toowoomba Regional Council

Toowoomba Regional Council (TRC) requested the following specific requirements for this project through the Information Request letter (dated 18 May 2023):

Performance Outcome PO8 of the Environmental Standards Code requires that the development does not create a noise nuisance at these adjoining properties.

The proposed development is for a sensitive land use within a mapped transport noise corridor. The applicant has noted that the facility will be constructed in accordance with State Code 4.4. Council officers consider that the development is required to demonstrate compliance against Performance Outcome PO12 of the Environmental Standards Code. Compliance with the Acoustic Quality Objectives within the Environmental Protection (Noise) Policy 2019 must also be achieved for learning areas, play areas and sleeping areas within the Child Care Centre.

To demonstrate compliance against PO12 of the Environmental Standards Code, the applicant is requested to submit an Acoustic Impact Assessment, completed by a suitably qualified person, that assesses reverse amenity impacts from Transport Noise Corridor.

Performance Outcome 8 of the Environmental Standards Code sets the following requirements for noise impacts. Acceptable Outcome AO8.1 of the Environmental Standards Code criterion are presented in Table 4-1.

Table 4-1 Applicable Noise Limit Criterion from TRC's "environmental Standards Code'

Noise Source **Time Varying Noise (i.e car door closures)**	**Noise Limit, SPL dB(A) $L_{eq\ (15\ min)}$**
Morning Shoulder (6:30am to 7am)	Measured L90 level + 3 dB at façade (48)
Day (7am to 6pm)	Measured L90 level + 5 dB at façade (52)
Evening Shoulder (6pm to 6:30pm)	Measured L90 level + 3 dB at façade (41)
Continuous Noise (i.e mechanical plant)	**Noise Limit, SPL dB(A) $L_{eq\ (15\ min)}$**
Morning Shoulder (6:30am to 7am)	Measured L90 level + 0 dB at façade (45)
Day 7am to 6pm	Measured L90 level + 0 dB at façade (47)
Evening Shoulder (6pm to 6:30pm)	Measured L90 level + 0 dB at façade (38)

4.2 Department of Environmental Science (DES) - Environmental Protection (Noise) Policy 2019

The environmental values for the acoustic environment as specified in the Part 6 of the Environmental Protection (Noise) Policy 2019 include the following as relevant to sensitive receptors (dwellings):

6 Environmental values

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

(a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and

(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 acoustic quality objectives in Schedule 1 that are stated to be prescribed for enhancing or protecting the environmental values at sensitive receptors. The relevant acoustic quality objectives for dwellings that, if reasonable in the circumstances, are applied for the protection of environmental values relating to health and wellbeing are presented in Table 4-2.

Table 4-2 Acoustic Quality Objectives - Environmental Protection (Noise) Policy 2019

Sensitive Receptor	Time of day	Acoustic quality objectives (measured at the receptor) dB(A)			Environmental value
	L_{Aeq}	$L_{Aeq, adj, 1hr}$	$L_{A10, adj, 1hr}$	$L_{A1, adj, 1hr}$	
residence (for outdoors)	daytime and evening	**50**	**55**	**65**	health and wellbeing
residence (for indoors)	daytime and evening	**35**	**40**	**45**	health and wellbeing
	night-time	**30**	**35**	**40**	health and wellbeing, in relation to the ability to sleep

4.3 Sleep Disturbance

Following Acceptable Outcome AO8.1 of the Environmental Standards Code, TRC applies a limit of 45 dB(A) Lmax inside dwellings. This limit is based upon the sleep disturbance criteria cited by the World Health Organisation.

The WHO Guidelines for Community Noise (**WHO, 1999**) states the following:

> *'As a rule in planning for short-term or transient noise events, for good sleep over eight hours, the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45dB(A) LA_{max} more than 10-15 times per night. The corresponding external noise level, assuming partially closed windows, is 52dB(A) LA_{max}, measured in the free field.'*

4.4 Road Noise Intrusion to Outdoor Playground – Reverse Amenity

TRC compliance with the Acoustic Quality Objectives within the Environmental Protection (Noise) Policy 2019 must also be achieved for learning areas, play areas and sleeping areas within the Child Care Centre.

Table 4-3 Acoustic Quality Objectives - Environmental Protection (Noise) Policy 2019

Sensitive Receptor	Time of day	Acoustic quality objectives (measured at the receptor) dB(A)			Environmental value
	L_{Aeq}	$L_{Aeq, adj, 1hr}$	$L_{A10, adj, 1hr}$	$L_{A1, adj, 1hr}$	
childcare centre or kindergarten (for indoors)	when open for business, other than when the children usually sleep	**35**	-	-	health and wellbeing
childcare centre or kindergarten (for indoors)	when the children usually sleep	**30**	-	-	health and wellbeing, in relation to the ability to sleep

For the assessment of road traffic noise impact on the outdoor play areas, the Association of Australian Acoustical Consultants (AAAC). The document, *AAAC Technical Guideline Child Care Centre Noise Assessment V3.0* has been used to determine the appropriate noise level.

The LAeq,1hr noise level from road traffic, rail or industry at any location within the outdoor play or activity area during the hours when the Centre is operating should not exceed 55 dB(A).

In accordance with the AAAC, the noise criterion for outdoor play areas is as follow:

- Outdoor play areas – $L_{Aeq,(1hour)}$ 55 dB(A) (external).

5 NOISE IMPACT ASSESSMENT

The following Figure 5-1 shows the nearest receiver locations in relation to the proposed Child Care Centre.

Figure 5-1 Site Location

Aerial image courtesy of QLD Globe © 2023

5.1 Operational Noise from Child Care Centre

5.1.1 Outdoor Play Activities Noise Impact

Potential noise management issues occur primarily when children are engaged in outdoor play activities. Noise generated by the children in the outdoor play area will occur at limited times throughout the day, with numbers of children playing and periods of play managed by the Centre staff.

The Association of Australian Acoustical Consultants (AAAC) technical guideline for Child Care Centre Noise Assessment V3.0 provides the following sound power levels (LW) for various age groups of children.

Table 5-1 Effective Sound Power Levels ($L_{Aeq,\ 15min}$) for Groups of 10 Children Playing

Noise Descripto	Noise Level (dB) at Octave Band Centre Frequency (Hz)								
	63	125	250	500	1 k	2 k	4 k	8 k	Overall dB(A)
0 to 2 Years	54	60	66	72	74	71	67	64	78
2 to 3 Years	61	67	73	79	81	78	74	70	85
3 to 5 Years	64	70	75	81	83	80	76	72	87

Calculations have been made based on the spectra above assuming all the children will be playing outside at the one time. The levels were scaled to reflect the overall power levels presented by the AAAC to determine the likely noise levels at nearby receivers due to 80 children playing in the Outdoor Play areas of the proposed Child Care Centre.

The following assumptions have been made in the noise modelling of the Outdoor Play areas noise impacts on the neighbouring residences:

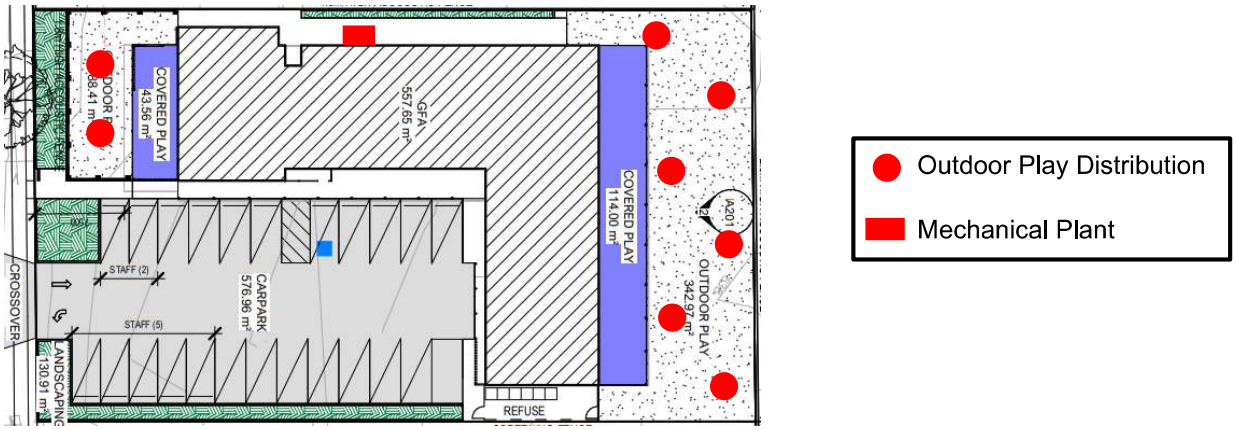
Morning and Evening Shoulder Time Period

- No children will be playing outdoors play areas;

Day Time Period

- 16 children between the ages of 0 and 2 with total sound power level of 80 dB(A), 20 children between the ages of 2 and 3 with total sound power level of 88 dB(A) and 44 children between the ages of 3 and 5 with total sound power level of 94dB(A) will be playing in the proposed outdoor play areas as per Figure 5-2;

Figure 5-2 Modelled Outdoor Play Distribution and Mech. Plant



- Note: The noise sources have been grouped into the Acoustic 3D Model to simulate worst case scenario.
- The height of the residential receivers has been assumed to be 1.5 metres for residential buildings on their respective level.
- Source height in the outdoor play area, i.e. children height, have been taken to be 1 meter from the ground;
- The proposed 2.1 and 1.8 meters high solid barriers (Refer to Figure 6-1) along the boundaries of the outdoor play areas and carpark have been taken into account in the noise model.
- Resulting noise levels have been calculated to the most affected point on the boundary of the affected receivers.

5.1.2 Indoor Play Activities Noise Impact

For this project, where each potential nearest receiver has an outdoor play area in its direction from the centre, the indoor noise impacts will be always irrelevant compared with the outdoor ones (worst case scenario).

5.2 Mechanical Plant Noise Assessment

Mechanical ventilation will be installed at the proposed childcare centre, the operation of such mechanical plant must be in accordance with the relevant regulations such as the Building Code of Australia (BCA Vol.1, Part 4.5 *Ventilation of rooms*) and AS1668.2-2002 *The use of ventilation and air conditioning in buildings* will be required.

A specific mechanical plant selection has not been supplied at this stage. It is anticipated that the building will be serviced by typical mechanical ventilation/air conditioning equipment.

3 x Air Conditioning units each generating 57 dBA at 1 m (LwA= 65 dBA each, LwA= 71 overall) distance have been assumed for this assessment.

- The location of the plant room as adjacent to the western façade as per Figure 5-2.

5.3 Carpark Emission

The proposed car park is to be located on the eastern side of the site, it has a capacity of 7 employee and 18 visitor car spaces, calculations of noise from the carpark have been based on typical noise generating events within a carpark such as, door slams (2 for each car), engine starts and cars driving.

Typical sound power levels for low-speed light vehicle activities are included as follows.

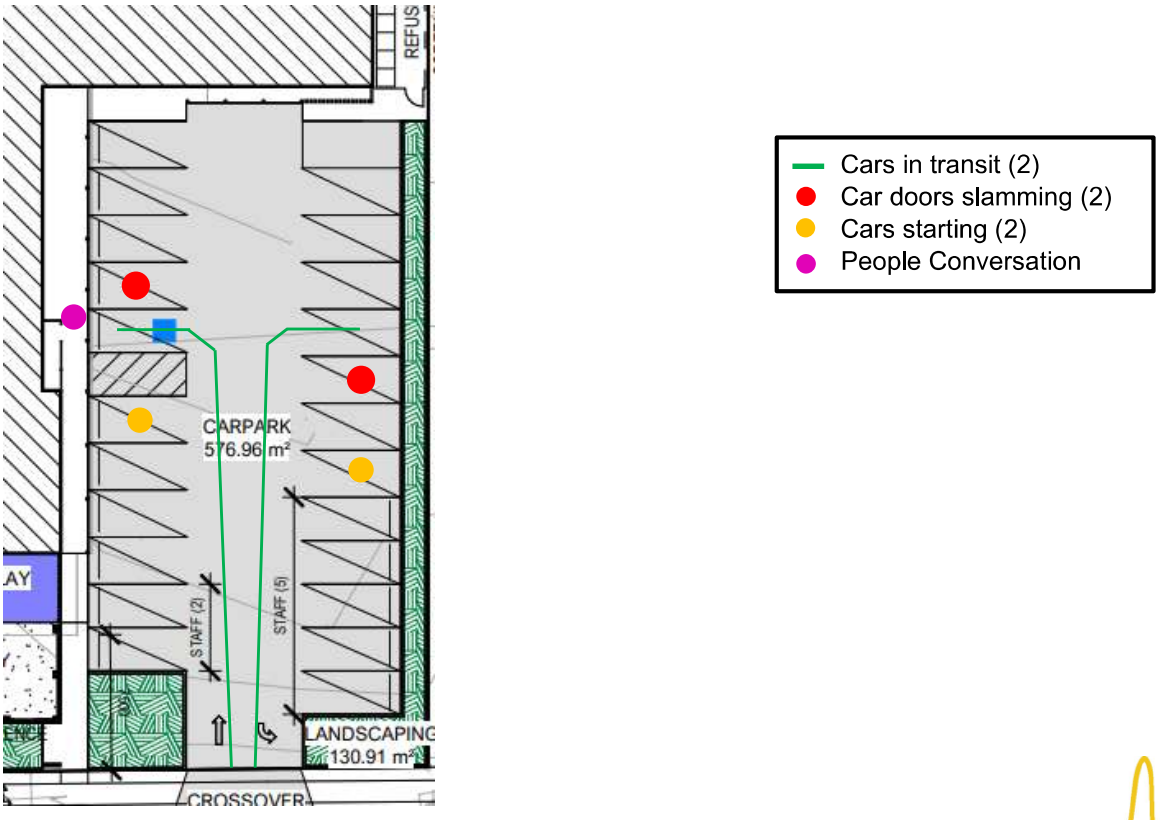
- Car transiting (<20 km/h): $L_{w/m}$ 61 dBA
- Car engine start: LA_{Max} 80 dBA
- Car door slamming: LA_{Max} 90 dBA (including 5 dB Impulsivity correction)
- People Conversation: LwA= 65 dBA; LA_{Max} 70 dBA
- Note: The noise sources have been grouped into the Acoustic 3D Model to simulate worst case scenario at the more likely locations.

5.3.1 Morning and Evening shoulder Time Period

Typical activity for similar childcares during morning and evening shoulders is 4 cars entering/leaving the carpark in a span of 15 minutes, and its associated noise events (car starts and door slamming).

Figure 5-3 presents the car park noise sources location.

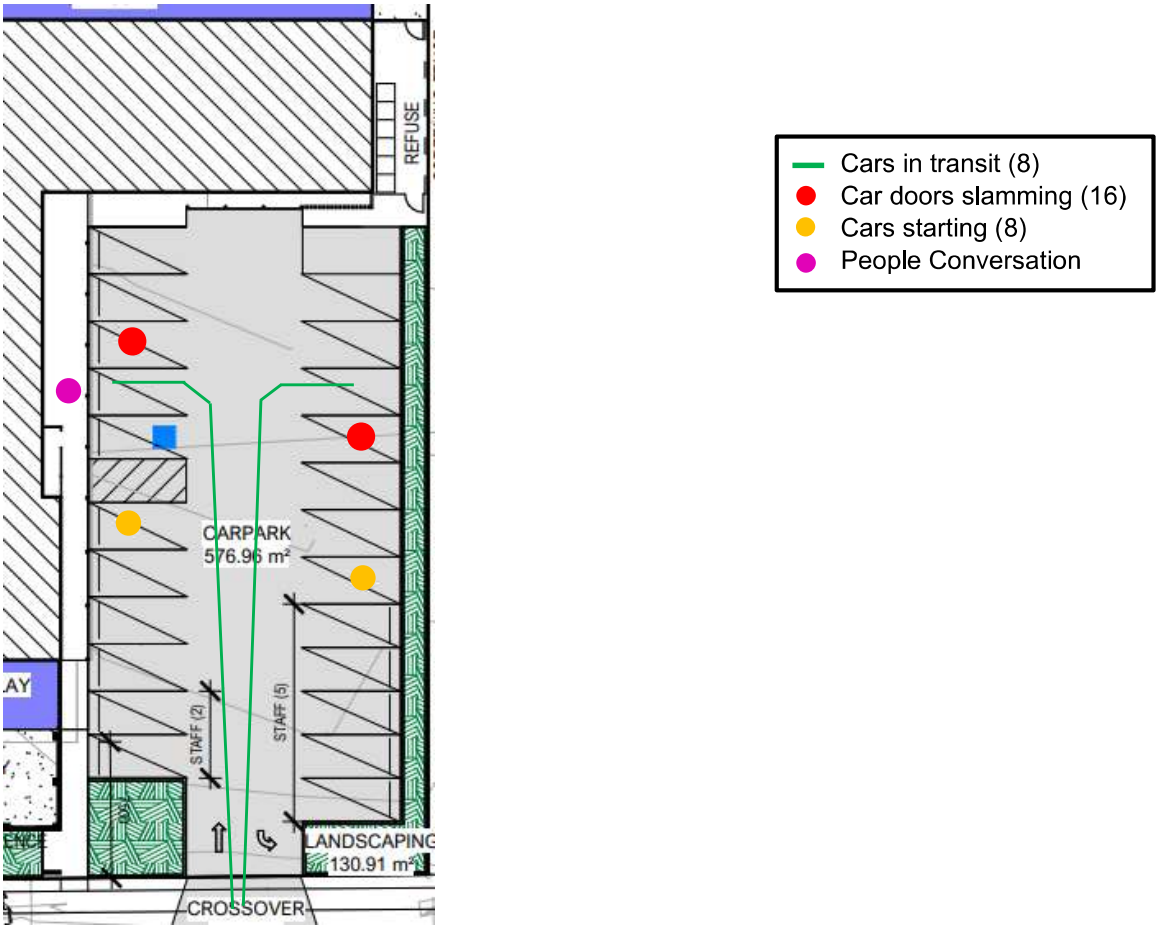
Figure 5-3 Morning and Evening Shoulder Modelled Carpark Noise Sources Location



5.3.2 Day Time Period

We have assumed a conservative scenario where 16 cars entering or leaving the carpark (and its associated noise events (car starts and door slamming) in a span of 15 minutes during day time period.

Figure 5-4 Modelled Carpark Noise Sources Location



5.3.3 Waste Collection Service

The waste collection will be at the street therefore no noise impacts from the waste collection service have been considered in this assessment.

5.4 Predicted Noise Impacts – Normal Operations

The normal operations of the childcare centre, as previously presented, are composed by:

- Outdoor/indoor Play
- Car Park Vehicle Movements/Noise and People Talking
- Mechanical Plant

A 3D Noise modelling has been undertaken using the Soundplan V8.2 acoustic modelling package that uses the ISO 9613 Acoustics – Attenuation of sound during propagation outdoors (ISO, 1996) algorism.

The predicted noise levels experienced by nearest residential receivers are presented in Table 5-2 below. Noise levels have been calculated at the most affected boundary heights. The noise levels presented below are representative of the worst case scenarios for receiver.

Note: Recommended 1.8 m and 2.0 m high noise barriers and the buildings have been included within the 3D Acoustic model.

Table 5-2 Predicted Varying Noise Impacts ($L_{eq\ (15\ min)}$) – Morning Shoulder, Day and Evening Shoulder Time Periods

Receiver	Predicted Noise Impacts / Morning Shoulder Criteria – dB(A)	Time Varying Noise Impacts Compliance?	Predicted Noise Impacts / Day Time Criteria – dB(A)	Time Varying Noise Impacts Compliance?	Predicted Noise Impacts / Evening Shoulder Time Criteria – dB(A)	Time Varying Noise Impacts Compliance?
R1.1	26/48	Yes	40/52	Yes	26/41	Yes
R1.2	24/48	Yes	42/52	Yes	24/41	Yes
R1.3	21/48	Yes	43/52	Yes	21/41	Yes
R2	23/48	Yes	50/52	Yes	23/41	Yes
R3	28/48	Yes	48/52	Yes	28/41	Yes
R4.1	40/48	Yes	47/52	Yes	40/41	Yes
R4.2	39/48	Yes	46/52	Yes	39/41	Yes
R4.3	34/48	Yes	51/52	Yes	34/41	Yes
RT1	33/48	Yes	40/52	Yes	33/41	Yes
RT2	33/48	Yes	40/52	Yes	33/41	Yes
RT3	30/48	Yes	37/52	Yes	30/41	Yes

Table 5-3 Predicted Continuous Noise Impacts ($L_{eq\ (15\ min)}$) – Morning Shoulder, Day and Evening Shoulder Time Periods

Receiver	Predicted Noise Impacts / Morning Shoulder Criteria – dB(A)	Continuous Noise Impacts Compliance?	Predicted Noise Impacts / Day Time Criteria – dB(A)	Continuous Noise Impacts Compliance?	Predicted Noise Impacts / Evening Shoulder Time Criteria – dB(A)	Continuous Noise Impacts Compliance?
R1.1	37/45	Yes	37/47	Yes	37/38	Yes
R1.2	45/45	Yes	45/47	Yes	45/38	Yes
R1.3	36/45	Yes	36/47	Yes	36/38	Yes
R2	28/45	Yes	28/47	Yes	28/38	Yes
R3	21/45	Yes	21/47	Yes	21/38	Yes
R4.1	23/45	Yes	23/47	Yes	23/38	Yes
R4.2	24/45	Yes	24/47	Yes	24/38	Yes
R4.3	23/45	Yes	23/47	Yes	23/38	Yes
RT1	19/45	Yes	19/47	Yes	19/38	Yes
RT2	21/45	Yes	21/47	Yes	21/38	Yes
RT3	24/45	Yes	24/47	Yes	24/38	Yes

Table 5-4 Predicted Sleep Disturbance (LAmax) Noise Impacts – Morning Shoulder

Receiver	Predicted Varying Noise LAmax Impacts / Criteria – dB(A)	Continuous Noise Impacts Compliance?	Predicted Continuous Noise LAmax Impacts / Criteria – dB(A)	Continuous Noise Impacts Compliance?
R1.1	34/52	Yes	37/52	Yes
R1.2	34/52	Yes	45/52	Yes
R1.3	30/52	Yes	36/52	Yes
R2	32/52	Yes	28/52	Yes
R3	43/52	Yes	21/52	Yes

Receiver	Predicted Varying Noise LAmax Impacts / Criteria – dB(A)	Continuous Noise Impacts Compliance?	Predicted Continuous Noise LAmax Impacts / Criteria – dB(A)	Continuous Noise Impacts Compliance?
R4.1	52/52	Yes	23/52	Yes
R4.2	51/52	Yes	24/52	Yes
R4.3	46/52	Yes	23/52	Yes
RT1	45/52	Yes	20/52	Yes
RT2	44/52	Yes	21/52	Yes
RT3	42/52	Yes	24/52	Yes

Noise from the outdoor play activities at the surrounding residences is predicted to comply with the Toowoomba Regional Council sleep disturbance criterion under normal operations scenario.

Appendix D presents Table 5-2, Table 5-3 and Table 5-4 noise impact contours.

5.5 Road Traffic Noise Intrusion into Centre

5.5.1 Outdoor Play Area

Based on the measured road traffic noise level of $L_{Aeq(1hour)}$ 57 dB(A) at 28 m from southern boundary (Taylor Street), the predicted traffic noise impacts at the outdoor play areas are presented in Table 5-5 below.

The following assumptions have been made in the noise modelling of the road traffic noise impacts on the outdoor play areas:

- A 1.8 meters high solid barrier are in place along the Southern outdoor play area (Refer to Figure 6-1 and Section 6.1.1)
- The northern outdoor play areas are shielded by the child care building and not affected by traffic noise (NA).
- Road traffic noise impacts have been measured, modelled and assessed as per from the centre line of the road to approximately the middle of the outdoor play areas The Queensland Development Code Part MP 4.4 - 'Buildings in a Transport Noise Corridor'.

Table 5-5 Predicted Road Traffic Noise Levels Into Outdoor Play Areas

Area	Predicted L_{Aeq} Road Traffic Noise Level – dB(A)	Noise Criterion L_{Aeq} – dB(A)	Average Traffic Noise Barrier Attenuation [dB]	Predicted L_{Aeq} Road Traffic Noise Level – dB(A)	Comply?
Southern Outdoor Play Area	62	55	10	52	Yes
Northern Outdoor Play Area	NA	NA	NA	> 55	Yes

Existing road traffic noise levels in the Outdoor Play areas are predicted to comply with the $L_{Aeq,(1hour)}$ 55 dB(A) (external) criterion stipulated in Section 4.4.

5.5.2 Indoor Areas

The following assumptions have been made in the noise modelling of the road traffic noise impacts on the indoor play areas:

- The building components for each Road Noise Category (QDC MP 4.4.) presented in Figure 3-2 are applied as per the acoustic recommendations regarding the minimum applicable Acoustic Ratings (Rw) applicable shown in section 0.
- A 1.8 meters high solid barrier are in place along the Southern outdoor play area (Refer to Figure 6-1 and Section 6.1.1)
- The rooms ages 2 – 4 are internal therefore a minimum of the external façade and internal walls are considered.

The most affected façade from road traffic noise at the proposed child care centre building (southern noise barrier corrected) is the southern one (Years 4-5) calculated to be $L_{Aeq(1hour)}$ 50 dB(A) (noise barrier corrected).

Taking into account the distance, shielding, glazing performance dimensions and acoustics of the room, the resultant indoor noise levels for opened and closed windows at the future development are as follow:

Table 5-6 Predicted Road Traffic Noise Levels Into Indoor Areas

Area	Predicted L_{Aeq} Road Traffic Noise Level – dB(A)		Normal/Sleeping Noise Criterion L_{Aeq} – dB(A)	Compliance Normal/Sleeping (Open / Closed)
	Windows Open	Windows Closed		
0-1 Years (noise barrier effect)	44	25	35/30	Closed/Closed
1-2 Years (noise barrier effect)	44	25	35/30	Closed/Closed
Cot 1-2 (internal rooms)	40	<20	35/30	Closed/Closed
2-3 Years (internal room)	45	<20	35/30	Closed/Closed

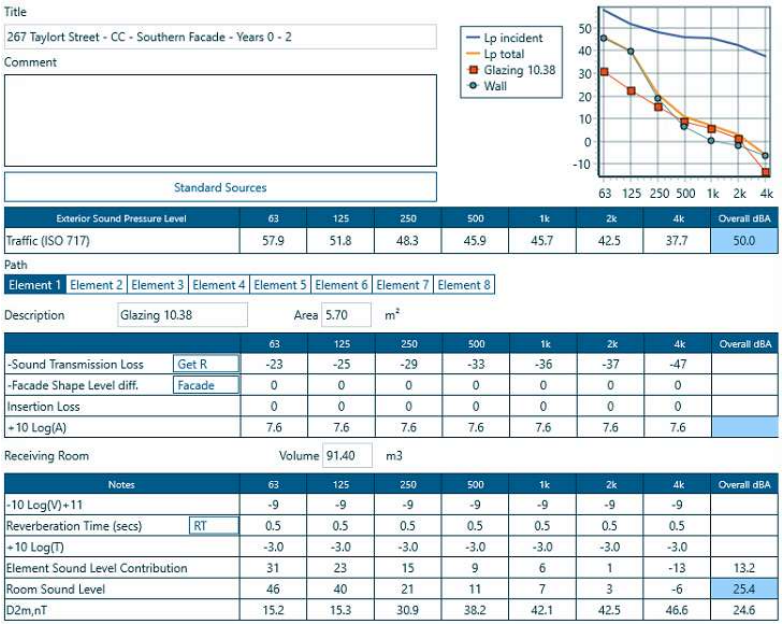
Area	Predicted L_{Aeq} Road Traffic Noise Level – dB(A)		Normal/Sleeping Noise Criterion L_{Aeq} – dB(A)	Compliance Normal/Sleeping (Open / Closed)
	Windows Open	Windows Closed		
3-4 Years (internal room)	45	<20	35/30	Closed/Closed
4-5 Years	49	32	35/30	Closed/Closed

The predicted internal noise levels are likely to exceed the 35/30 dB(A) criteria as required by TRD with windows on the rooms and passage 2 opened. Therefore, all glazing on the rooms and passage 2, as per Figure 2-1 must remain closed in order to comply with the criteria.

Section 6.2 has been considered for above calculations regarding façade and glazing systems used.

The predicted internal noise levels have been calculated using the acoustic modelling software Insul Ver. 9.0.23 from Marshall Day Acoustics. A screenshot of Room 0-2 calculations is presented in Figure 5-5.

Figure 5-5 Outdoors to Indoors Insul Noise Prediction – Room Years 0-2



Title

267 Taylort Street - CC - Southern Facade - Years 0 - 2

Comment

Standard Sources

Lp incident
Lp total
Glazing 10.38
Wall

50
40
30
20
10
0
-10

63 125 250 500 1k 2k 4k

Exterior Sound Pressure Level	63	125	250	500	1k	2k	4k	Overall dBA
Traffic (ISO 717)	57.9	51.8	48.3	45.9	45.7	42.5	37.7	50.0

Path

Element 1 | Element 2 | Element 3 | Element 4 | Element 5 | Element 6 | Element 7 | Element 8

Description Glazing 10.38 Area 5.70 m²

	63	125	250	500	1k	2k	4k	Overall dBA
-Sound Transmission Loss Get R	-23	-25	-29	-33	-36	-37	-47	
-Facade Shape Level diff. Facade	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
+10 Log(A)	7.6	7.6	7.6	7.6	7.6	7.6	7.6	

Receiving Room Volume 91.40 m3

Notes	63	125	250	500	1k	2k	4k	Overall dBA
-10 Log(V)+11	-9	-9	-9	-9	-9	-9	-9	
Reverberation Time (secs) RT	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
+10 Log(T)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Element Sound Level Contribution	31	23	15	9	6	1	-13	13.2
Room Sound Level	46	40	21	11	7	3	-6	25.4
D2m,nT	15.2	15.3	30.9	38.2	42.1	42.5	46.6	24.6

6 RECOMMENDATIONS

The following recommendations must be implemented in order to achieve compliance with the criteria requirements from Toowoomba Regional Council.

6.1 Outdoor Play Areas & Carpark

In order to achieve compliance with council's noise requirements for outdoor play and noise emissions the following must be implemented:

- All children can engage in outdoor play at a time
- No music is to be played in the outdoor areas
- Children must be supervised at all times
- 1.8 m and 2.0 m high noise barriers as per Figure 6-1
- Some windows and doors should be closed, as per Figure 6-1, during hours of operation.

6.1.1 Acoustic Barrier Details

In order to achieve compliance with council's noise requirements, three acoustic barriers (2.1 and 1.8 meters high) must be implemented as per Figure 6-1.

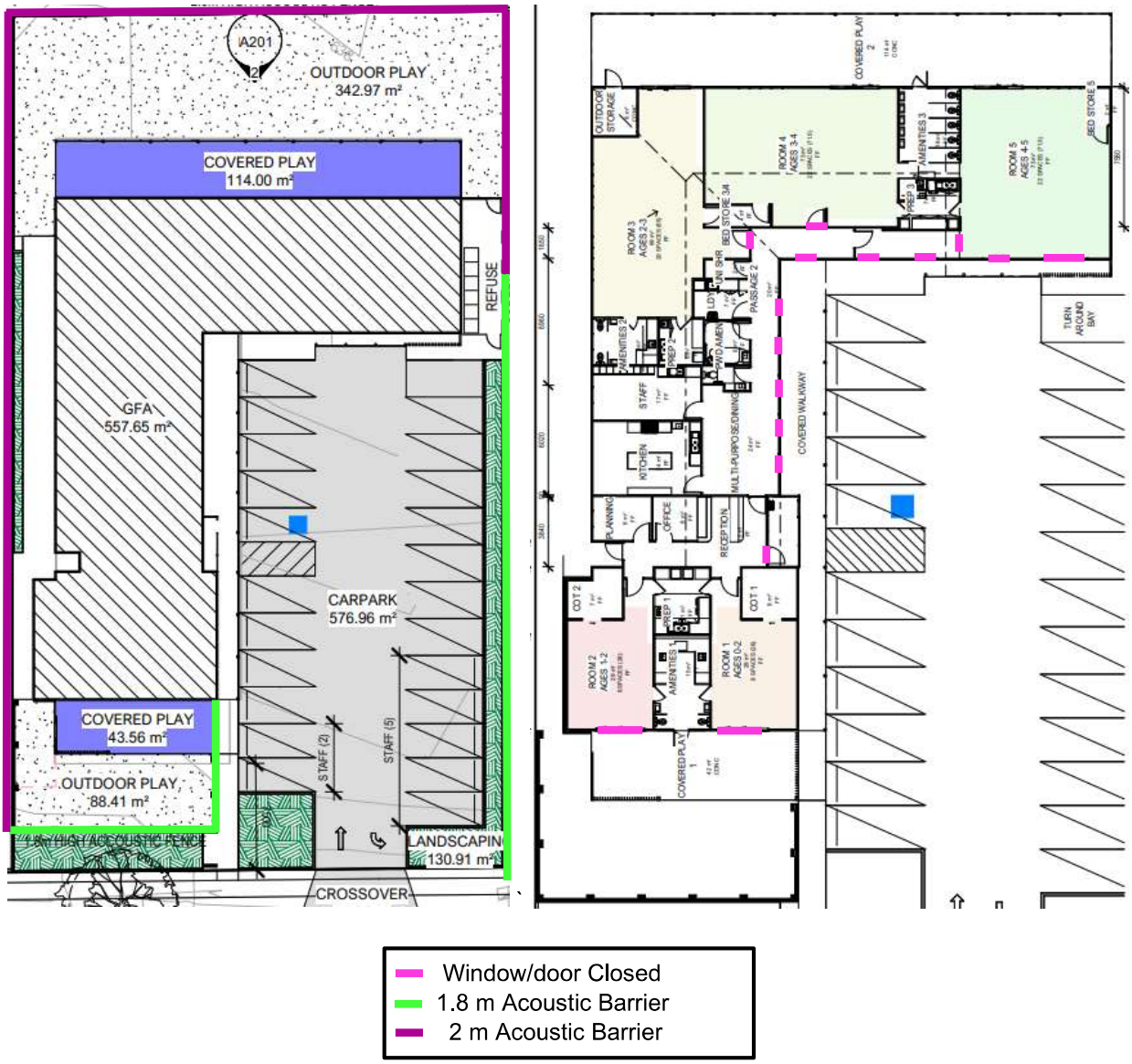
Acoustic barrier is required to provide the adequate noise attenuation, the construction material of the barriers must have a surface mass of minimum 10 kg/m^2. Some suitable materials include:

- 25 mm thick plywood timber panelling
- 9 mm thick fibre cement sheet
- 75mm thick Hebel Powerpanel
- 12 mm thick Perspex, polycarbonate or Danpalon
- 6 mm toughened laminated safety glass
- Any other approved material which meets the above surface density specification

A typical material used in childcare centres is Perspex, which is a polycarbonate material. The use of the 12 mm thick Perspex or 6 mm glass for this purpose which has a surface mass of 11 kg/m^2 will meet the mass requirements detailed above and be suitable for use as it is transparent and will not unduly restrict light or vision.

All barriers must be free of gaps and penetrations and it is particularly important to ensure that the gap at the bottom of the barrier is minimised as far as practicable. The base of the barriers should be well sealed at the junction where the barrier meets the floor, but still be designed to allow proper water drainage. The location of the acoustic barriers is presented in Figure 6-1.

Figure 6-1 Proposed Child Care Centre Layout – Noise Control Mitigation Measures Indoor Play Areas



6.2 Building Construction Systems

This section summarises the acoustic treatment required for road traffic noise to achieve compliance with the QDC MP4.4.

For the purposes of the development application, the QDC MP4.4 provides a conservative design approach to the treatment of habitable rooms within dwellings and is applied for this assessment. It also requires that habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupant's health and comfort.

To achieve the performance requirements of the QDC MP4.4, the external envelope of habitable rooms must comply with the minimum R_W for each building component specified in Schedule 1. Minimum transport noise reduction for the relevant noise category can be achieved by either one of the following:

a. Using materials specified in Schedule 2 of the QDC MP4.4;

   OR

b. Using materials with manufacturer's specifications that, in combination, achieve the minimum R_W value for the relevant building component and applicable noise category.

Table 6-1 presents the acoustic treatment requirements in accordance with the QDC MP4.4 policy. The construction systems proposed are based on the deem-to-satisfy constructions from QDC MP 4.4 and the acoustic predictions using INSUL V9.0 Sound Insulation Predictive software developed by Marshall Day Acoustics.

Refer to Figure 3-2 regarding what areas of the proposed building is affected for each Nosie Category.

Table 6-1 QDC MP4.4 Schedule 1 and 2 Construction Systems

Noise Category	Minimum Transport Noise Reduction* (dB(A)) Required for Habitable Rooms	Component of Building's External Envelope	Minimum R_W Required for Each Component
Category 2 (rest of the dwelling including the roof)	30	Glazing	35 (where total area of glazing for a habitable room is greater than 1.8 m^2)
			32 (where total area of glazing for a habitable room is less than 1.8 m^2)
		External Walls	41
		Roof	38

Noise Category	Minimum Transport Noise Reduction* (dB(A)) Required for Habitable Rooms	Component of Building's External Envelope	Minimum R_w Required for Each Component
Category 1 (rest of the dwelling including the roof)	25	Glazing	27 (where total area of glazing for a habitable room is greater than 1.8 m^2)
			24 (where total area of glazing for a habitable room is less than 1.8 m^2)
		External Walls	35
		Roof	NA
		Floors	45
		Entry Doors	28
Category 0	No additional acoustic treatment required – standard building assessment provisions apply.		

6.2.1 Glazing

Recommendations for windows also apply to any other item of glazing located on the external facade of the building in a habitable room unless otherwise stated.

Note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required R_w rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the requirements in Table 6-2

The window systems must be tested in accordance with both of the following: Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing; and AS 1191 Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.

The entire frame associated with the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed.

It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated below. Where this is the case the acoustic requirements must clearly be superseded by the structural or fire rating demands.

Table 6-2 presents the minimum recommended R_w (weighted noise reduction) for glazing elements.

Table 6-2 Minimum Acoustic Rating (R_w) Required for Glazing Elements

Minimum R_w	Acceptable Forms of Construction
35	Minimum 10.38mm thick laminated glass, with full perimeter acoustically rated seals.
32	Minimum 6.38mm thick laminated glass with full perimeter acoustically rated seals.
27	Minimum 4mm thick glass, with full perimeter acoustically rated seals.
24	Minimum 4mm thick glass with standard weather seals.

6.2.2 External Walls

The acoustic rating required for the façade varies from Rw 41 to 35 (minimum).

An Rw 41 external wall can be achieved by the following construction:

Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves

OR

Single leaf of clay brick masonry at last 110mm thick with:

(i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and

(ii) mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m^3 positioned between studs; and

(iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs

OR

Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face

OR

Concrete brickwork at least 110mm thick

OR

In-situ concrete at least 100mm thick

OR

Precast concrete at least 100mm thick and without joints.

The acoustic rating of a façades of Rw 35 (minimum) can be achieved by the following construction:

Single leaf of clay brick masonry at least 110mm thick with:

(i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and

(ii) (ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs

OR

Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.

6.2.3 Roof/Ceiling

The overall acoustic rating required is Rw 38 (minimum). This can be achieved by the following construction:

Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m3. Floors

6.2.4 Entry Doors

The overall acoustic rating required is Rw 28 (minimum). This can be achieved by the following construction:

Fixed so as to overlap the frame or rebate of the frame constructed of –

- (i) Wood, particleboard or blockboard not less than 33mm thick; or
- (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or
- (iii) Other suitable material with a mass per unit area not less than 24.4kg/m2; or
- (iv) Solid core timber door not less than 35mm thick fitted with full perimeter acoustically rated seals.

6.2.5 Detailing

Note that well-detailed construction and careful installation is needed to achieve the required R_w acoustic ratings. All gaps are to be minimised and fully sealed with an acoustic rated sealant, such as FireBan One by Bostik or Sikaflex Pro 2HP by Sika.

7 NOISE & COMPLAINTS MANAGEMENT

7.1 Car Park Noise Management

The following noise control measures and management plan should be implemented for the carpark space:

- Parents and guardians should be informed of the importance of noise minimisation when entering or exiting the site, dropping off or picking up children. This includes avoiding raising your voice within the centre's carpark area or beeping car horn.
- Driveway and carpark areas be finished with surface coatings which prevent tyre squeal (an uncoated concrete or bitumen surface is acceptable).

7.2 Outdoors Play Noise Management

- No music is to be played in the outdoor areas
- Children must be supervised at all times
- No elevated play equipment be located directly adjacent to the recommended acoustic barriers.

7.3 Building Nosie Management

- During hours of operation some windows and doors should be closed as per Figure 6-1.

7.4 Complaints Management

7.4.1 Rationale

As members of the local community, the Childcare Center Managers and staff have an obligation to manage its impact on the local community and surrounding area. The aim of the Complaints Management Plan is to ensure complaints received are accurately recorded, investigated, and addressed where appropriate in a prompt manner.

7.4.2 Issues/Aspects/Impacts

In the event that neighbouring residences experience amenity impacts that they consider excessive, it is important that a complainant management procedure is in place so that complaints can be investigated and responded to.

7.4.3 Management Plan

Table 7-1 Management Plan

Performance Criteria	To resolve any complaints in a prompt fashion and prevent repeated complaints.
Management Procedures & Practice	A protocol for settling complaints has been prepared and sets out specific procedures and timeframes for dealing with complaints. This protocol is presented in Section 7.5, which also includes a template that can be used to generate a Complaint Logbook to maintain a record of complaints and their investigations. The Complaints Logbook is to be made available for inspection by TRC or any authorised officer from a government department or agency responsible for administering the matters involved in the complaint.
Monitoring & Reporting	If monitoring is undertaken, the Childcare Manager, or the consultant commissioned to undertake any noise investigation, will provide an objective summary of the results of the survey to the complainant. Actions resulting from the findings of a study will also be provided to the complainant. The Childcare Manager shall maintain a register of all noise complaints received in accordance with the protocol for settling complaints. Upon assessing the complaint to the best practical extent, the Childcare Manager will record the actions taken to settle the complaint in the Complaints Logbook.
Responsibility	The Childcare Manager upon consideration of the complaint, will, if possible, personally investigate the issue raised by the Complainant. The Childcare Manager may commission an investigatory study to determine whether the complaint can be substantiated. Employees receiving a complaint must record the complaint and notify the Childcare Manager as relevant that the complaint has been received.
Corrective Action	The Childcare Manager will ensure that actions to reduce the likelihood of further complaints will be undertaken.
Auditing & Review	The Childcare Managers will keep records summarising any complaints received, and review changes to activities undertaken onsite. The Childcare Manager shall review the Community Relations Management Plan as required and at least once a year. In addition, the Protocol for Settling Complaints (included in in Section 7.5) will be reviewed and modified where necessary at this time.
Reference Documents	-

7.5 Protocol for Settling Complaints

7.5.1 Objective

To ensure that there is response to all complaints, which reasonable complaints are investigated, and appropriate action is taken.

7.5.2 Complaint Recording

All complaints relating to the site must be recorded in a logbook with the following details:

i. Time, date and nature of complaint including urgency and significance.

ii. Type of communication (telephone, letter, personal etc.).

iii. Name, contact address and contact telephone number of complainant (note: if the complainant does not wish to be identified then 'not identified' is to be recorded).

iv. Response and investigation undertaken because of the complaint.

v. Names of persons responsible for receiving and/or investigating complaint.

vi. Action taken because of the complaint investigation and signature of responsible person.

7.5.3 Investigating Complaints

All complaints should be investigated. The investigations should include:

• Determining what activities (and equipment) were being carried out or operated at the time of the complaint.

• Determining whether, at the time of the complaint, normal day to day activities were conducted or whether new activities were conducted (i.e. operation of new plant and/or equipment, or operation of equipment in a new location on the site).

• Identifying whether equipment or activities onsite were the source of complaint (or whether other activities in the locality were the cause of the complaint).

• Determining what potential actions may be carried out to resolve complaint and/or minimise the likelihood of further complaint.

7.5.4 Resolving Complaints

Resolving complaints will be necessary to ensure that a good relationship with landholders in the locality is fostered.

Resolving complaints involves determining what actions are required to resolve the complaint and to reduce the likelihood of further complaints.

To ensure that a person making the complaint is satisfied with the actions taken (if actions are required) to resolve the complaint, contact should be made with the complainant following the carrying out of investigations/actions to ensure that the complaint has been satisfactorily resolved.

7.5.5 Complaint Logbook

A complaint logbook/register will be kept at in an office used for the administration of the Childcare.

7.5.6 Management Responsibility

The Childcare Manager will be responsible for ensuring all employees at the business are familiar with the procedure for complaint recording.

7.5.7 Employee Responsibility

Employees receiving a complaint are required to record the complaint and notify their supervisor that the complaint has been received. Employees are to show respect and understanding to complainants.

7.5.8 Performance Targets

Complaints are to be investigated within two working days of complaint being received.

Confirmation by the complainant within one month of completion of investigations of the complaint, that the issue has been satisfactorily resolved.

No repeated complaints.

8 CONCLUSION

Rodney Stevens Acoustics has conducted a review of the proposed childcare centre at 267 Taylor Street, Wilsonton QLD 4350. The assessment has comprised the establishment of noise criteria and assesses noise impacts with regard to relevant statutory requirements.

Noise emissions from the outdoor area play activities to the nearest residential receivers have been calculated to comply with the noise criterion, where all children are playing outside at any given time. 2.1 and 1.8 meters high solid barriers along the boundaries must be implemented to minimise the noise impact from and towards the outdoor areas and carpark vehicle movements (Refer to Section 6.1.1).

Road traffic noise intrusion from Taylor Street, into the indoor areas has been assessed to meet the noise criteria as set out in Section 4.4. Based on this assessment, some windows and doors must remain closed during hours of operation (Figure 6-1).

Criteria for noise emissions from a standard mechanical plant have been also established and assessed to meet the noise criteria.

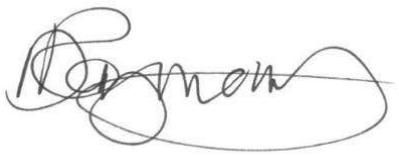
Based on our assessment the proposed Child Care Centre at 267 Taylor Street, Wilsonton is deemed to not negatively affect the amenity residences provided that the noise control measures (Figure 6-1) recommended are implemented. It is therefore recommended that planning approval be granted for the proposed development on the basis of acoustics.

Prepared by:

Marc Guitart

Senior Acoustic Engineer

Approved by:



Desmond Raymond

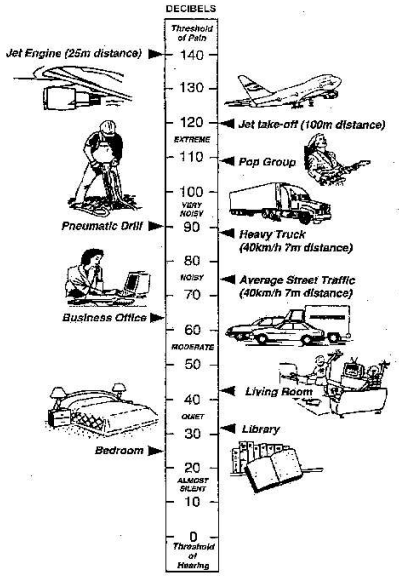
Director

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. Peo are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations second) and less sensitive to lower and higher frequency sound. During no measurement an electronic '*A-weighting*' frequency filter is applied to measured sound level *dB(A)* to account for these sensitivities. Other freque weightings (B, C and D) are less commonly used. Sound measured without a fi is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in near and far field.
Community annoyance	Includes noise annoyance due to: character of the noise (e.g. sound pressure level, tonality, impulsiveness, lo frequency content) character of the environment (e.g. very quiet suburban, suburban, urban, n industry) miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noi unpleasant associations) human activity being interrupted (e.g. sleep, communicating, reading, worki listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits i statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities m include construction, and traffic generated by holiday periods and by special eve such as concerts or sporting events. Normal daily traffic is not considered to extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to bu reasonableness relates to the application of judgement in arriving at a decisi taking into account the following factors: Noise mitigation benefits (amount of noise reduction provided, number of peo protected). Cost of mitigation (cost of mitigation versus benefit provided). Community views (aesthetic impacts and community wishes).

	Noise levels for affected land uses (existing and future levels, and changes in no levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of the peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive nc (for example, background noise plus 5 dB) and loss of amenity (e.g. noise lev for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the high acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. T noise limits are based on achievable noise levels, which the proponent h predicted can be met during the environmental assessment. Exceedance of noise limits can result in the requirement for either the development of no management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but no terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background le representing each day, evening and night time period. The rating background le is the 10th percentile min L_{A90} noise level measured over all day, evening and ni time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that detected by the human ear. The ratio between the quietest noise audible and t which should cause permanent hearing damage is a million times the change sound pressure. To simplify this range the sound pressures are logarithmic converted to decibels from a reference level of 2 x 10-5 Pa.

The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equival to 10 times the logarithm (to base 10) of the ratio of a given sound pressure t reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the sour Notated as SWL, sound power levels are typically presented in *dB(A)*.

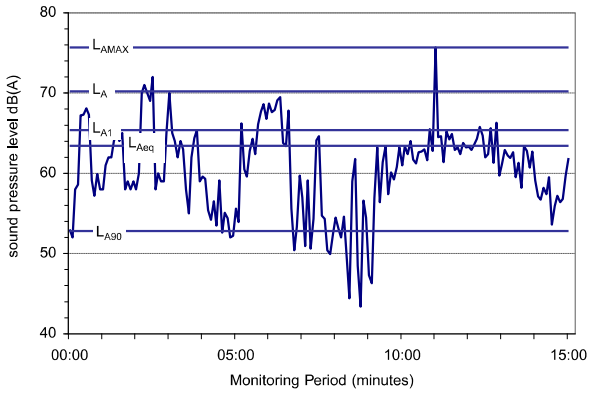
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a stand sound level meter with a pressure microphone. The sound pressure level in *dB* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construct noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurem period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} Noise level present for 10% of the 15 minute interval. Commonly refer to the average maximum noise level.

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure lev It is defined as the steady sound level that contains the same amount of acou energy as the corresponding time-varying sound.

L_{A90} Noise level exceeded for 90% of time (background level). The avera minimum background sound level (in the absence of the source un consideration).

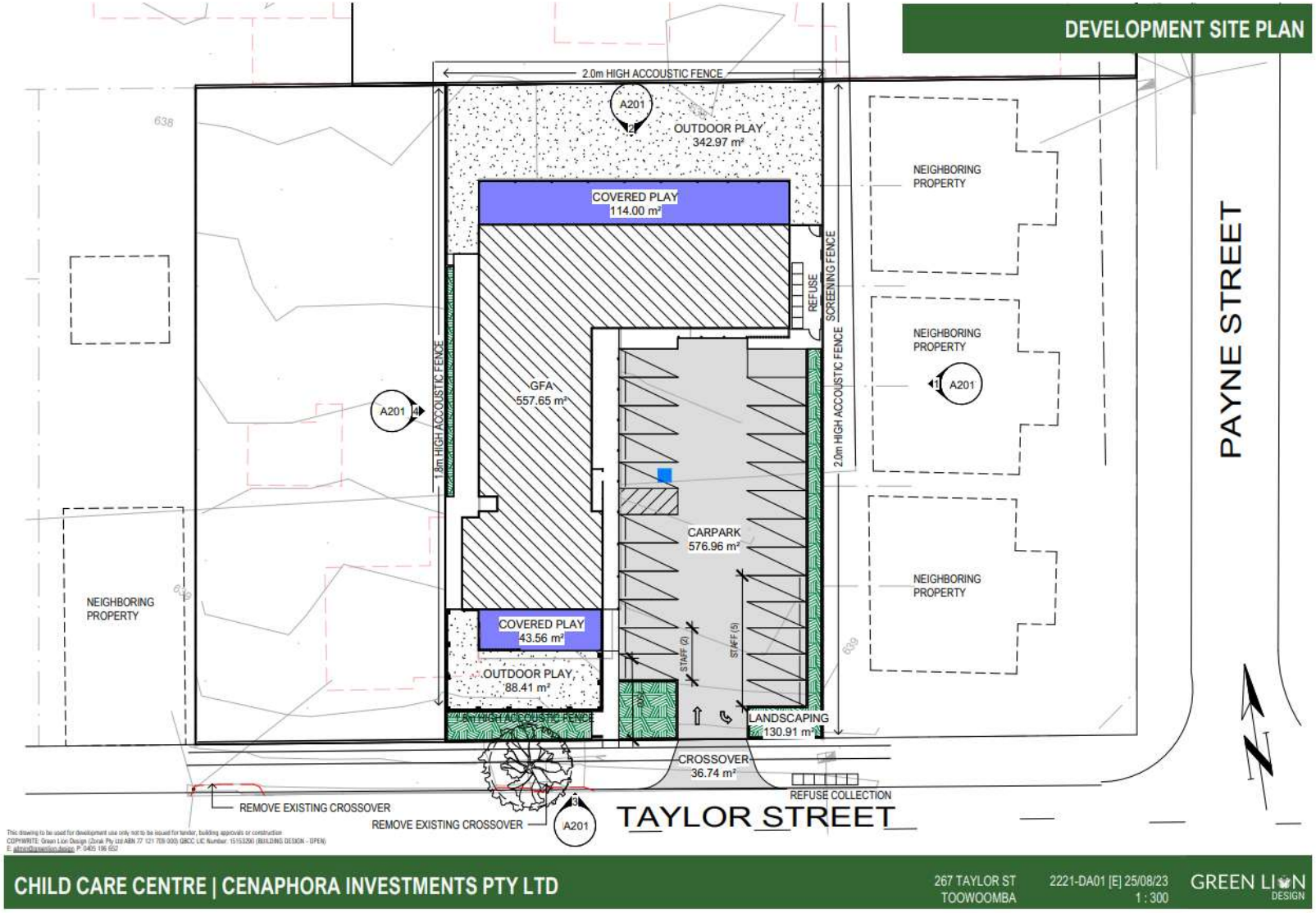
Threshold

The lowest sound pressure level that produces a detectable response (in instrument/person).

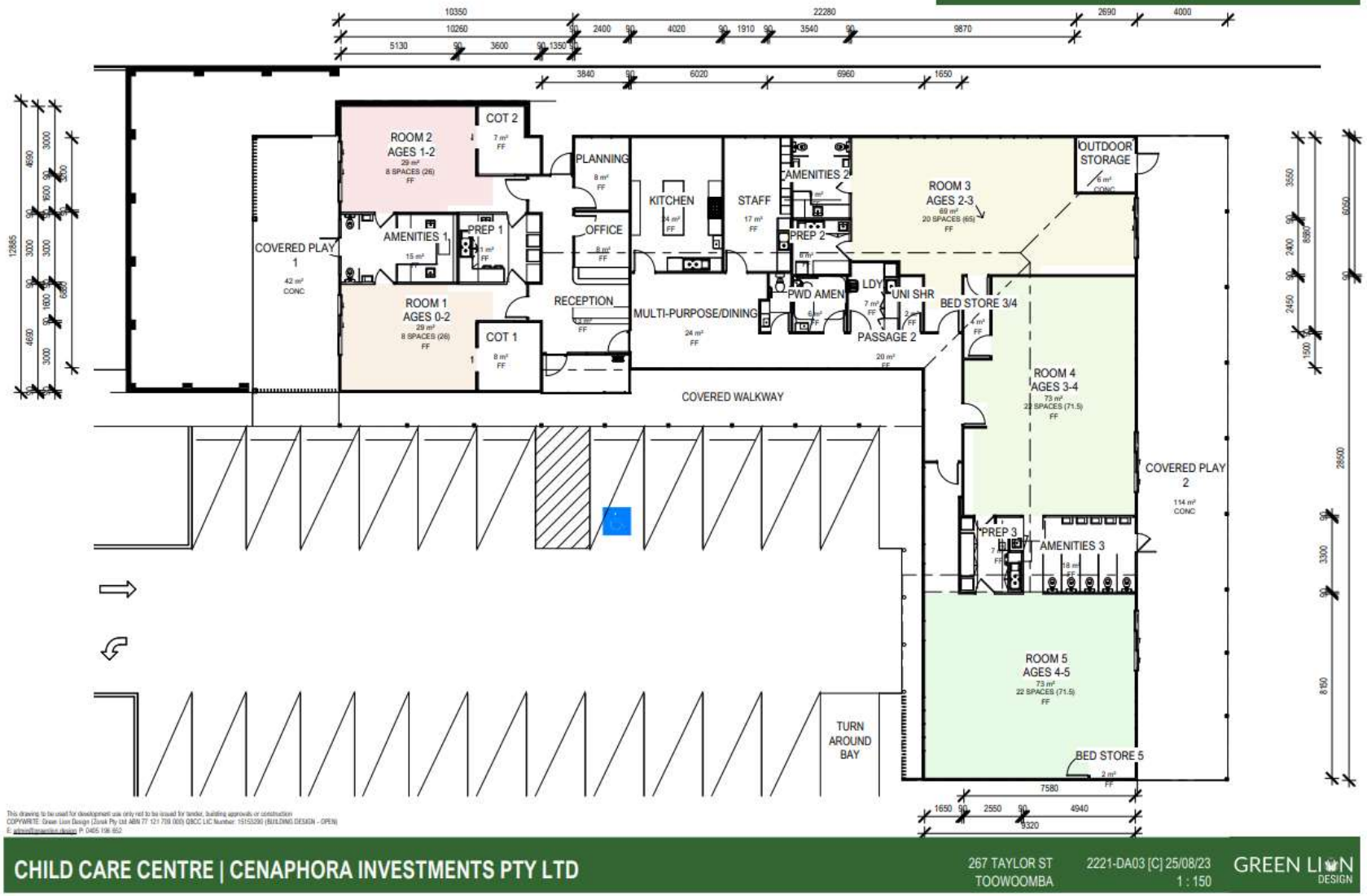
Tonality

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

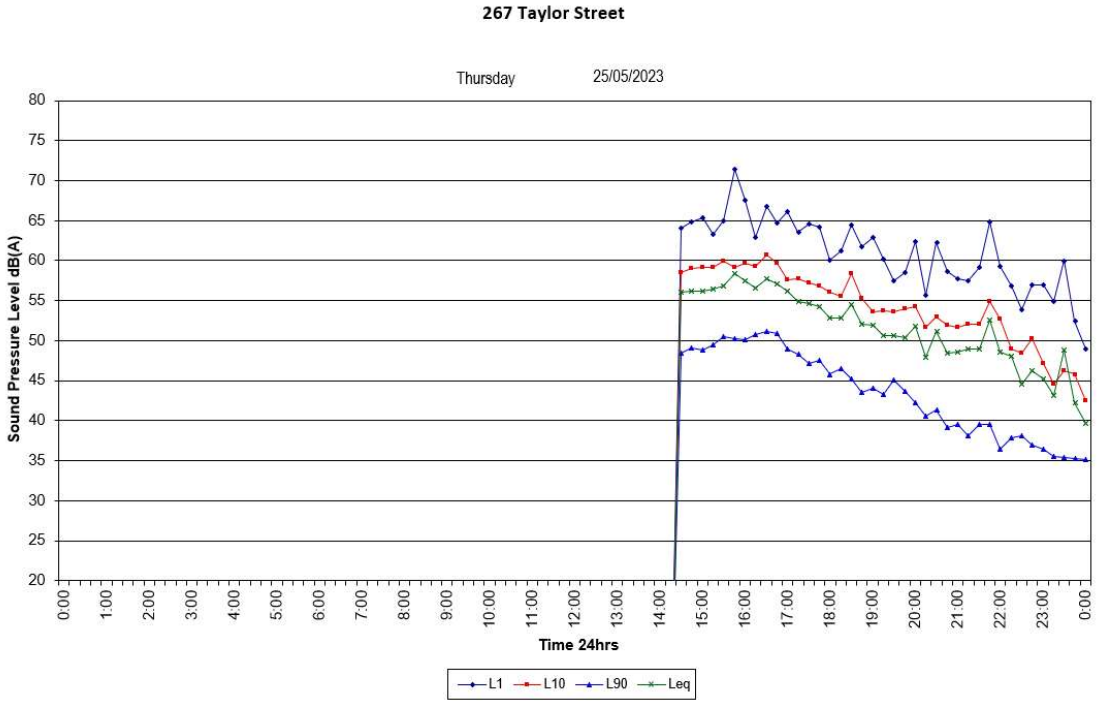
Appendix B – Architectural Plans

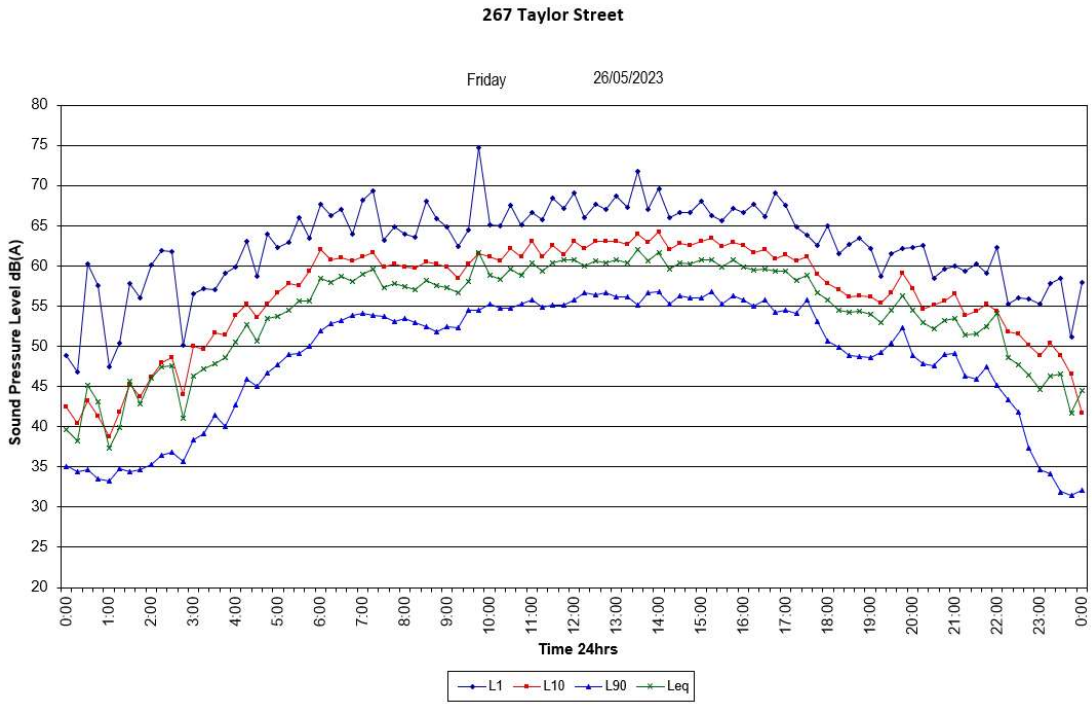


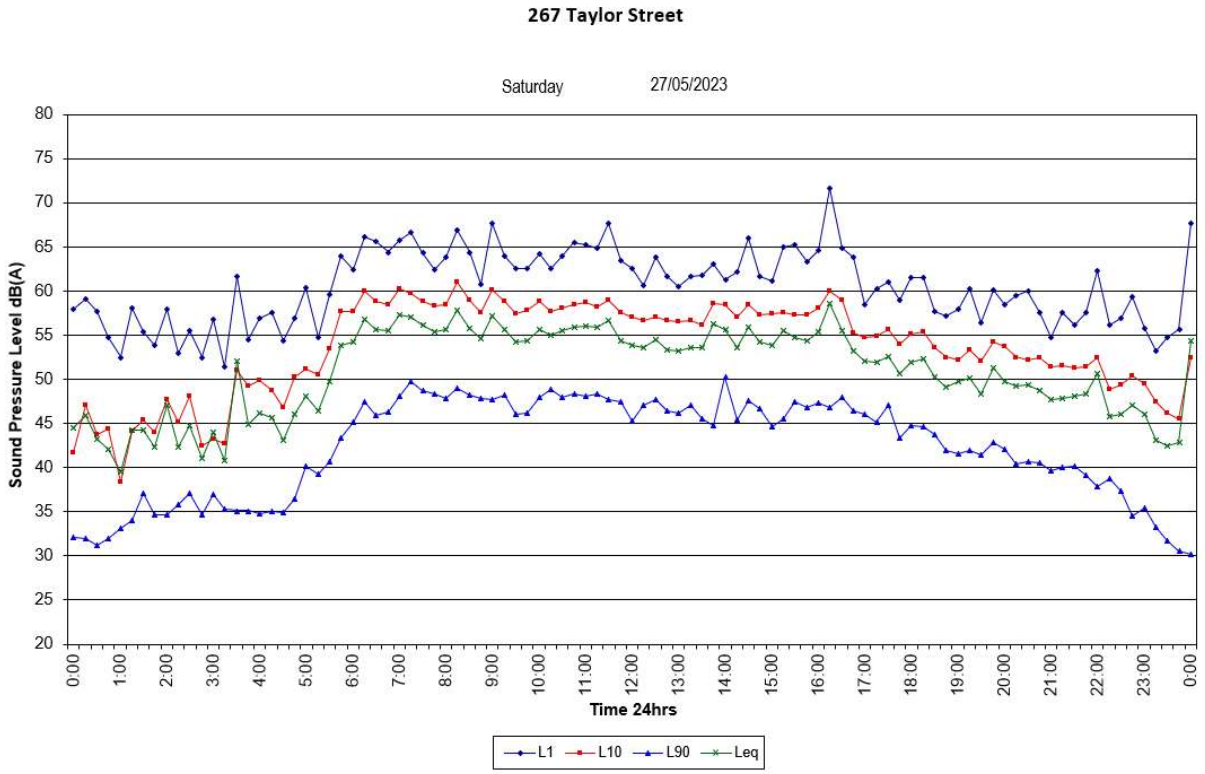
FLOOR PLAN

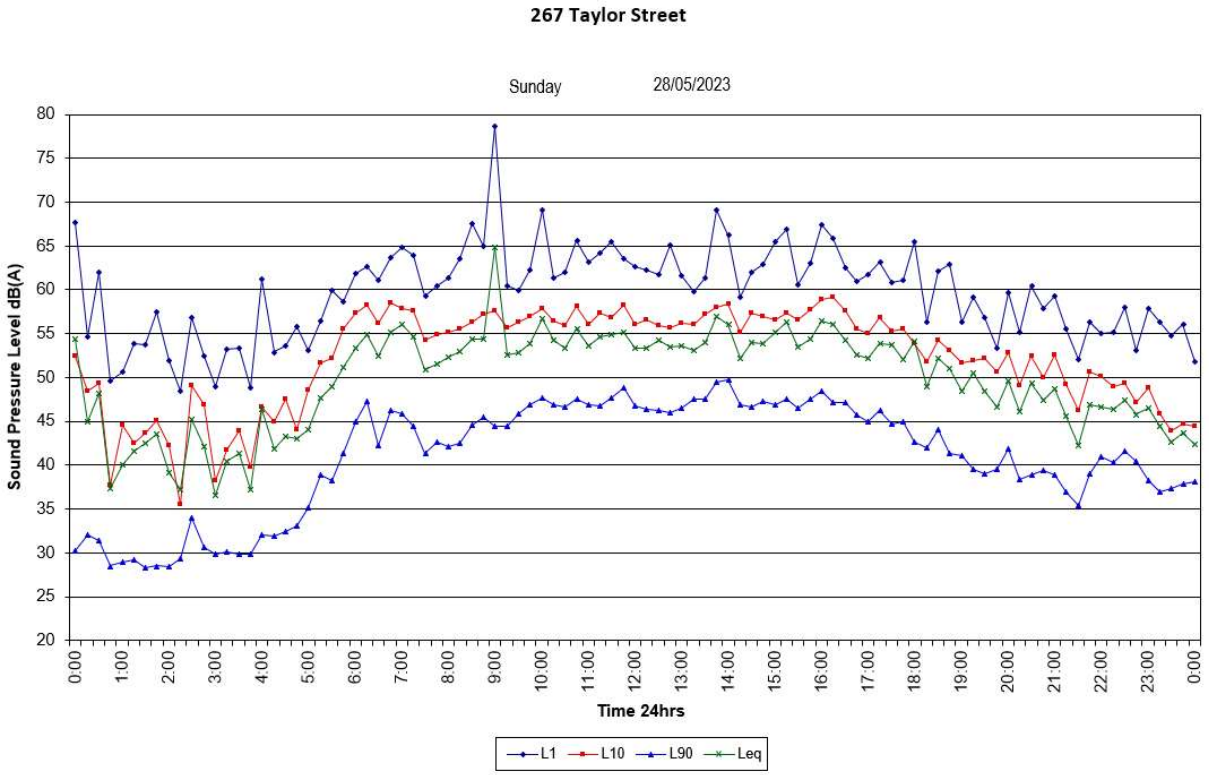

ROOM 2
AGES 1-2
COT 2
PLANNING
KITCHEN
STAFF
AMENITIES 2
OUTDOOR STORAGE
ROOM 3
AGES 2-3
COVERED PLAY 1
AMENITIES 1
PREP 1
OFFICE
PREP 2
ROOM 1
AGES 0-2
COT 1
RECEPTION
MULTI-PURPOSE/DINING
PWD AMEN
LDY
UNI SHR
BED STORE 3/4
PASSAGE 2
COVERED WALKWAY
ROOM 4
AGES 3-4
COVERED PLAY 2
PREP 3
AMENITIES 3
ROOM 5
AGES 4-5
TURN AROUND BAY
BED STORE 5
CHILD CARE CENTRE | CENAPHORA INVESTMENTS PTY LTD
267 TAYLOR ST TOOWOOMBA
2221-DA03 [C] 25/08/23
1 : 150
GREEN LION DESIGN

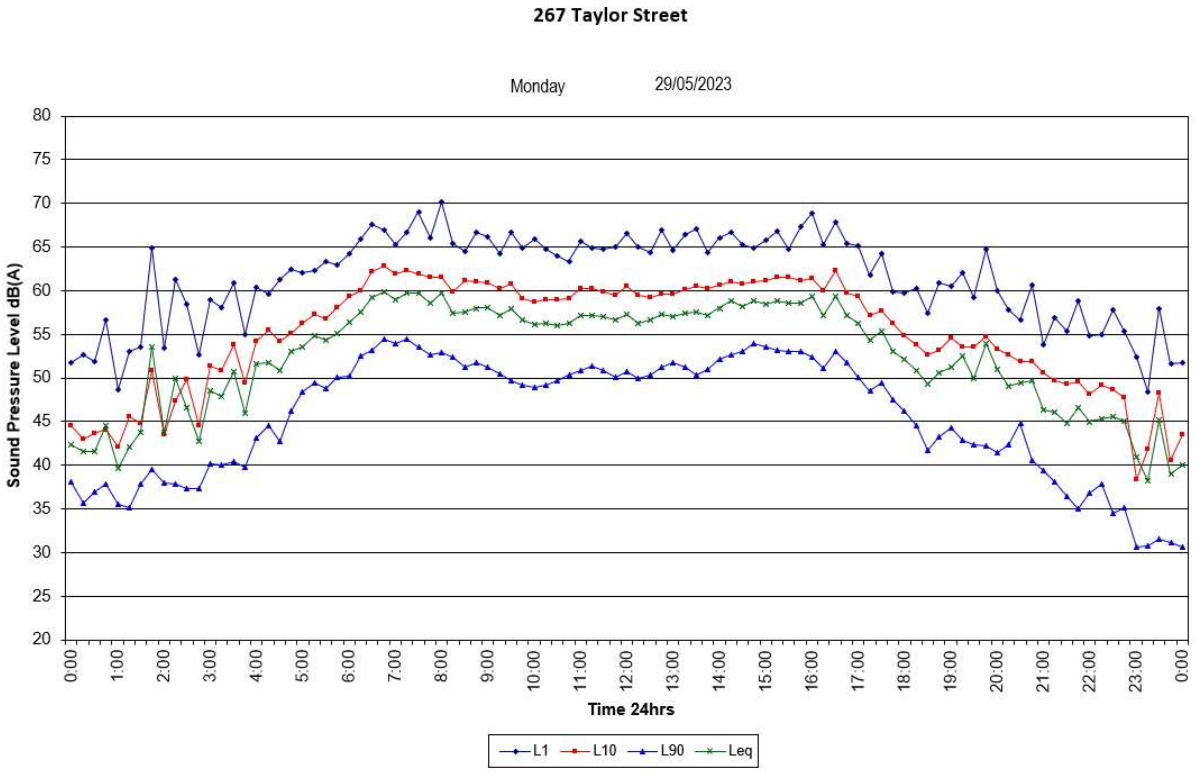
Appendix C – Logger Graphs

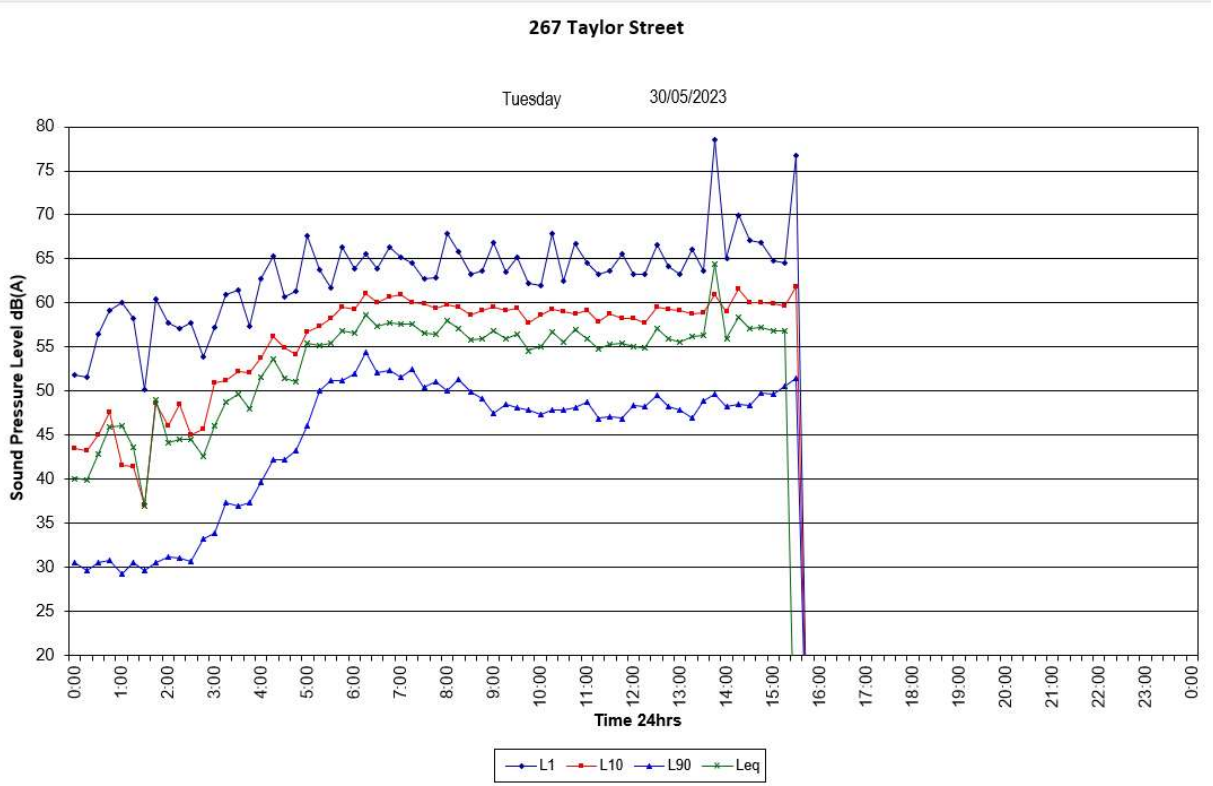



267 Taylor Street
Friday
26/05/2023
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
25
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


267 Taylor Street
Saturday
27/05/2023
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
25
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq

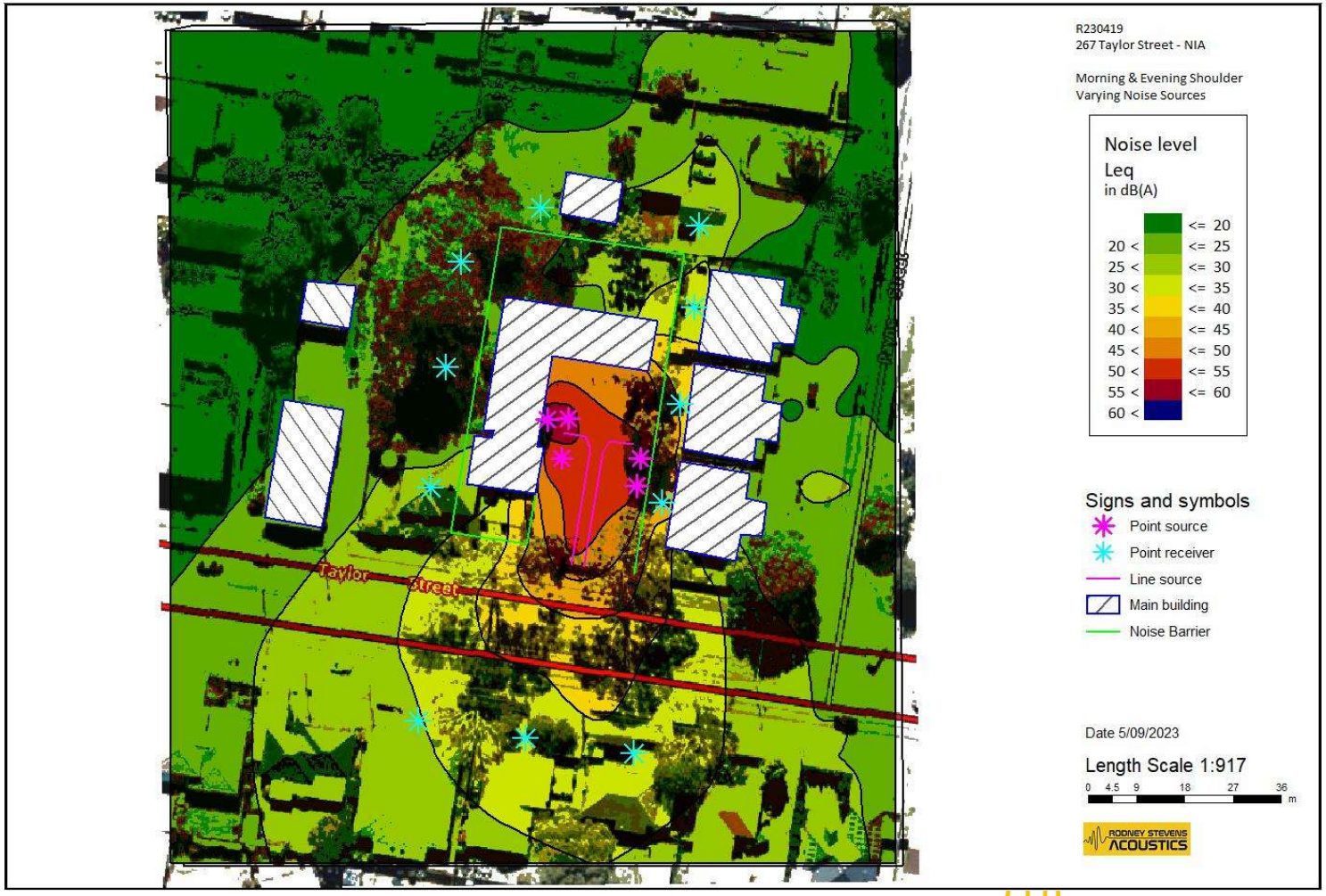

267 Taylor Street
Sunday
28/05/2023
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
25
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


267 Taylor Street
Monday
29/05/2023
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
25
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq

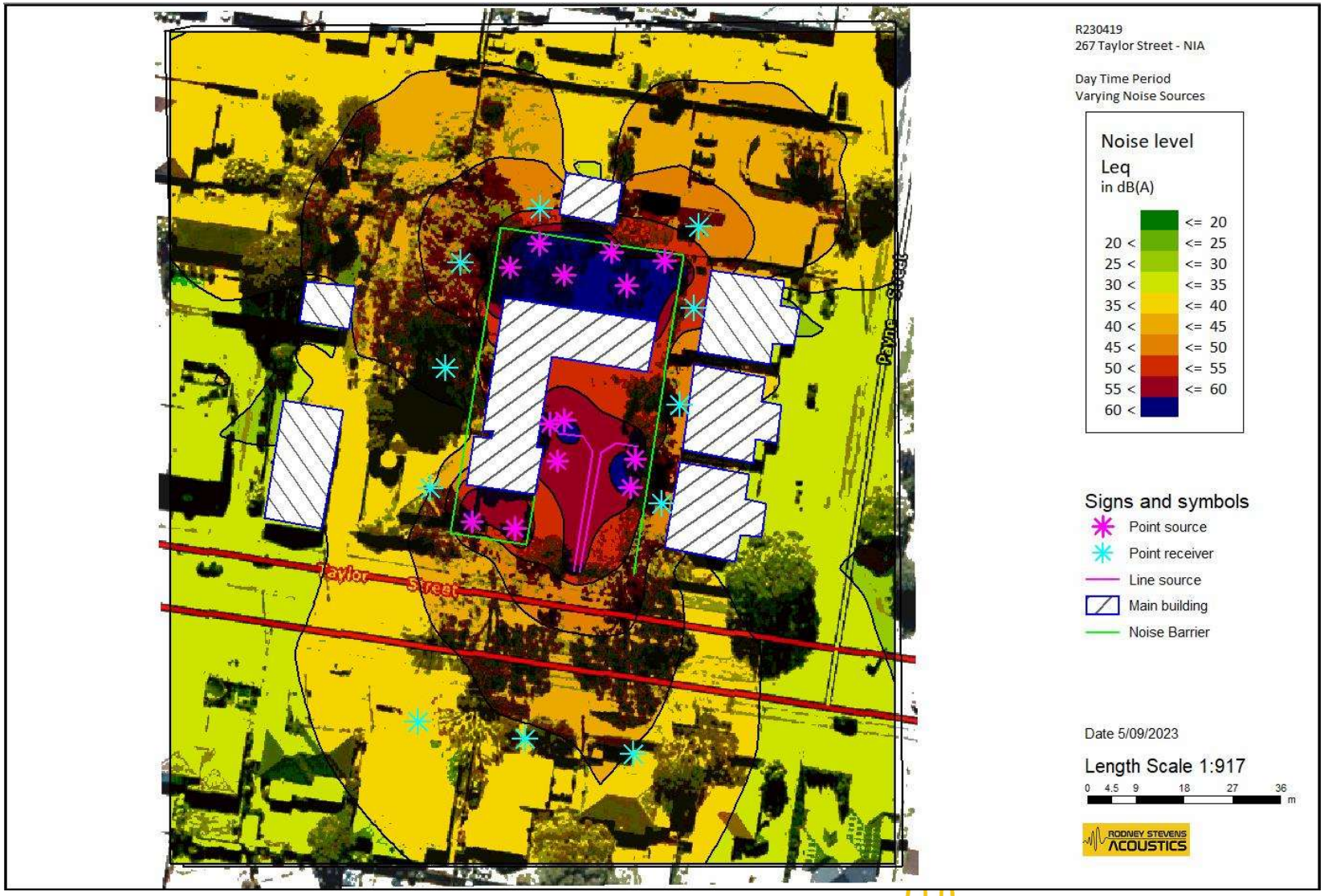

267 Taylor Street
Tuesday
30/05/2023
Sound Pressure Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
25
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq

Appendix D – Noise Impacts Contours

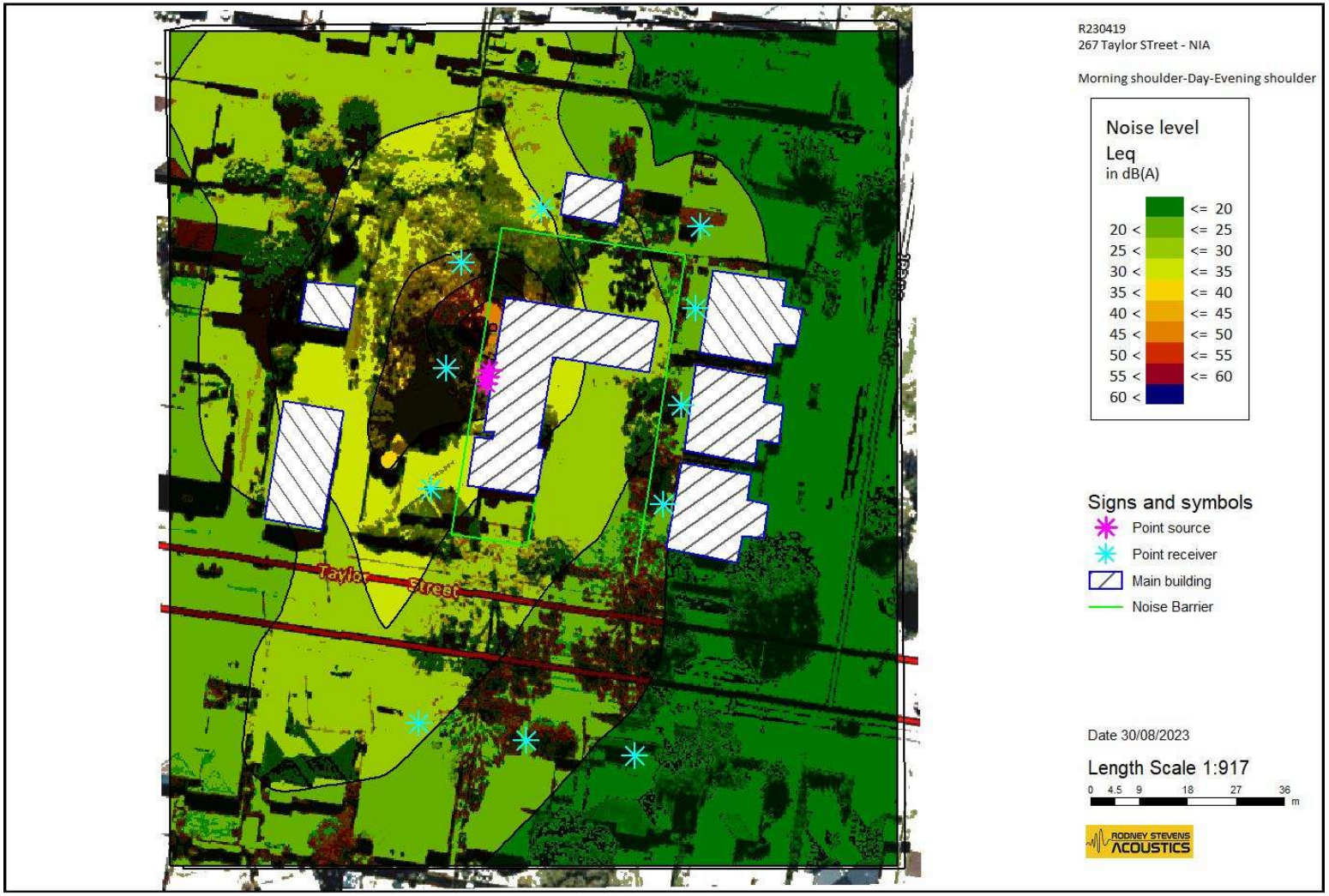
Varying Noise Sources → Morning and Evening Shoulder Time Period Noise Impacts Contours



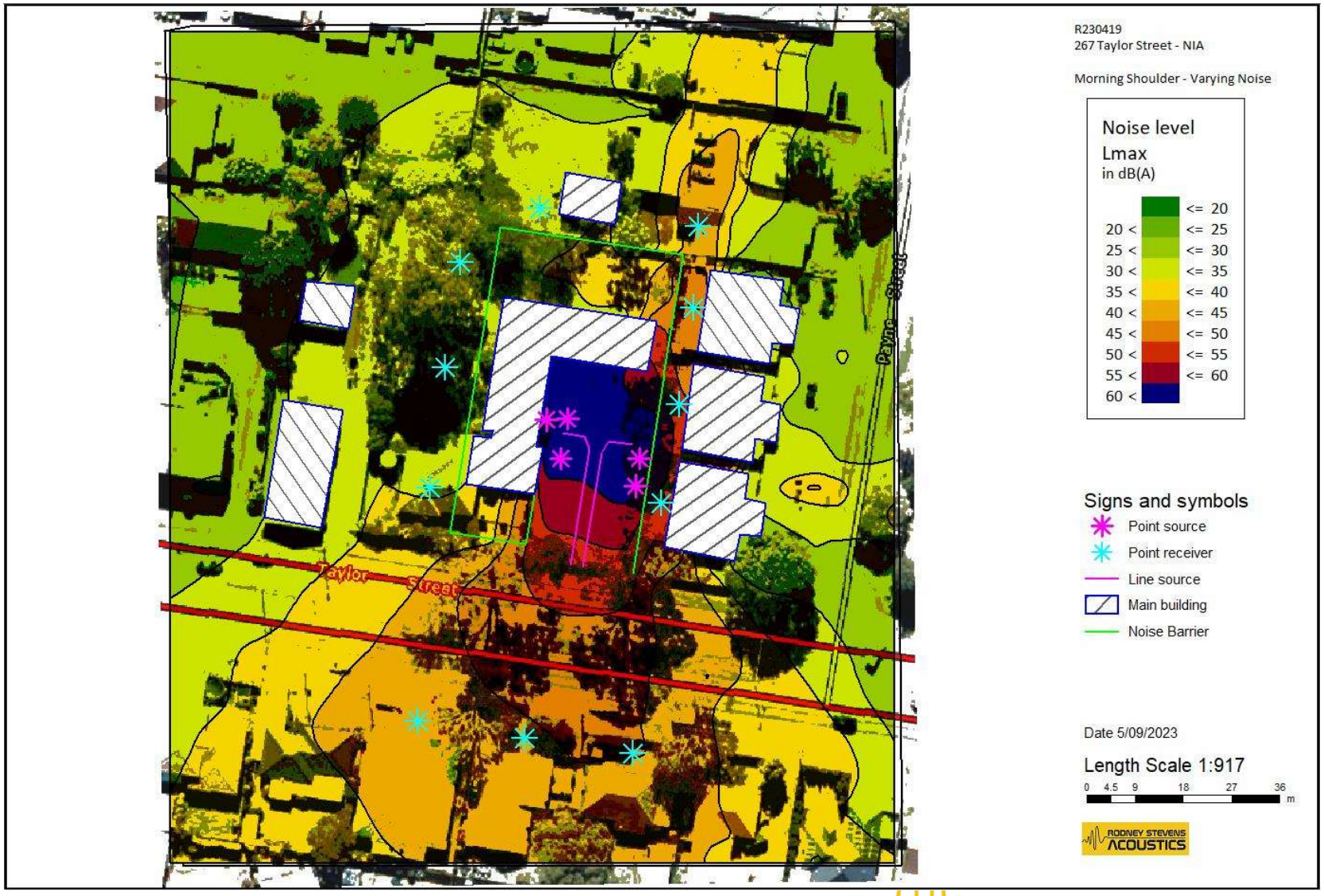
Varying Noise Sources → Day Time Period Noise Impacts Contours



Continuous Noise Sources → Morning Shoulder – Day – Evening Shoulder Noise Impacts Contours



Sleep Disturbance – Morning Shoulder Time Period Varying Noise Sources



Sleep Disturbance – Morning Shoulder Time Period Continuous Noise Sources