

ENVIRONMENTAL ASSESSMENT 2010104 (Revision 1)

CHILDCARE CENTRE LOT 1, 2C MATHESON ROAD APPLECROSS WA 6153



prepared for

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27 YEARS 1994 - 2021



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REFERENCES:

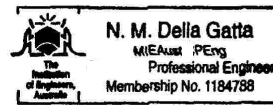
- A. Environmental Protection (Noise) Regulations 1997.
- B. Drawings: Macri Builders; Qty 7 sheets; Project 20099, Revision 007, Dated 29 JAN 21.
- C. State Planning Policy 5.4 Road and Rail Noise SEP 2019 &
 State Planning Policy 5.4 Implementation Guidelines SEP 2019

REVISIONS

| Revision N°: | Date: | Issue / Comment | Status |
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| 0 | 19 NOV 2020 | Issued for DA | Current |
| 1 | 01 FEB 2021 | Reissued for DA with updated Annex H Traffic | |

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SUMMARY

- 0.1 ND Engineering's opinion is that the proposed Child Care Centre (CCC) for the daytime periods of 0700 - 1830 hours Monday to Friday hours the assessed noise emissions will comply with the Noise Regulations (Reference A) subject to implementation of the recommendations contained in Section 5 'Recommendations'.

INTRODUCTION

- 1.1 ND Engineering was commissioned to provide an environmental acoustic assessment of the:
- a. Noise emissions from the proposed CCC with regards to the surrounding Residential premises via Reference A being the Noise Regulations.
 - b. Noise received from Canning Highway with regards to the CCC's outdoor and indoor noise via Reference C being SPP5.4 for traffic noise.



DESCRIPTION

- 2.1.1 The proposed CCC site is located in Applecross on the corner of Matheson Road, Cunningham Street and Canning Highway.
- 2.1.2 The nearest noise sensitive 'residential' premise of relevant interest is located adjacent to the North East at 2D Matheson Road Applecross.
- 2.1.3 The assigned noise levels are contained in Annex A.
- 2.1.4 Refer to the following Annexes for detailed location and site descriptions:
 - a. Annex A 'Location'.
 - b. Annex B 'Site Plans'.

2.2 The main non-equipment noise source at the site will be:

- a. Children's voices by age groups:

| | | |
|-----------------------------|------------|------------|
| - Babes 0 – 2 years old | 16x places | Activity 4 |
| - Babes 1 – 2 years old | 16x places | Activity 3 |
| - Toddlers 2 – 3 years old | 15x places | Activity 2 |
| - Pre Kindy 3 – 5 years old | 20x places | Activity 1 |
- b. Occasional music for children with the music being non-impulsive by nature. Refer Annex E 'Music'.
- c. Carpark. Refer Annex G 'Carpark'.

2.3 The main equipment noise sources at the site are expected to comprise air-conditioning systems and mechanical ventilation systems.

Please note that the mechanical services have yet to be designed at DA stage.

Refer Annex F 'Mechanical Services'.



ASSESSMENT

3.1 Noise emissions from the Child Care Centre (CCC) are typically expected to occur Monday to Friday between 0700 to 1830 hours mainly during outdoor play weather permitting.

This means that for evenings, night-time, public holidays and Sundays there is expected to be no noise emissions from the CCC at all. Anecdotal evidence indicates this is a desirable situation sought by some residences when purchasing properties adjacent to a CCC as their will be no afterhours noise thus negating a common source of complaint.

3.2 The relevant assigned noise levels at receiving premises, residential in the vicinity of the noise source, as allowed under Reference A are shown in the following Table 3.2. The assessments of the various noise sources emissions from the CCC are assessed against Table 3.2 as applicable.

| Table 3.2 – ASSIGNED NOISE LEVELS | | | | | |
|---|--------------------|---|------------------------------------|------------|-------------|
| Noise sensitive premises at locations a building directly associated with a noise sensitive use. | Time of day | Time of day | Assigned Noise Levels dB(A) | | |
| | | | LA10 | LA1 | LAmx |
| . . within 15 m of . . | Day | 0700-1900 hrs Monday to Saturday | 51 | 61 | 71 |
| | | 0900-1900 hrs Sunday, Public holidays | 46 | 56 | |
| | Evening | 1900-2200 hrs all days | | | 61 |
| | Night | 2200-0700 hrs Monday to Saturday | 41 | 51 | |
| 2200-0900 hrs Sunday, Public holidays | | | | | |
| . . greater than 15 m from . . | All hours | All hours | 60 | 75 | 80 |
| Commercial | All hours | All hours | 60 | 75 | 80 |

3.3 Refer to the following annexes for the detailed assessments:

- a. Assigned Noise Levels. Refer Annex C - Assigned Noise Levels.
- b. Children. Refer Annex D - Children.
- c. Music. Refer Annex E - Music.
- d. Mechanical Services. Refer Annex F - Mechanical Services.
- e. Carpark. Refer Annex G - Carpark.
- f. Traffic. Refer Annex H - Traffic.

3.4 Recommendations arising from the assessments are collated and presented in Section 5 'Recommendations' in the main body of the report.



CONCLUSIONS

- 4.1 ND Engineering's opinion is that for the proposed Child Care Centre (CCC) for the daytime periods of 0700 - 1830 hours Monday to Friday the:
- a. Children's' noise emissions will comply with the Noise Regulations (Reference A) subject to implementation of the recommendations contained in Section 5 'Recommendations'.
 - b. Non children noise emissions will comply with the Noise Regulations (Reference A) subject to implementation of the recommendations contained in Section 5 'Recommendations'.
 - c. Traffic noise received will meet the requirements of SPP5.4 (Reference C) subject to implementation of the recommendations contained in Section 5 'Recommendations'



RECOMMENDATIONS

- 5.1 The recommendations presented in this report are in outline format only and require:
- a. Detailed final design of components by appropriately experienced persons in accordance with the current relevant editions of Australian Standards, Regulations, Gas Installation Code/s and the BCA.
 - b. Completion of minor details, including acoustic/vibration details, on site by competent and qualified tradesmen and technicians.
 - c. New materials and equipment to be installed in accordance with the manufacturer's and/or supplier's instructions.
 - d. New materials and equipment to comply with, and be installed in accordance with, the BCA.
 - e. Installer of materials and/or equipment to comply with:
 - (1) regulatory safety requirements.
 - (2) The safety procedures on the relevant Materials Safety Data Sheets (MSDS).
 - (3) The site safety requirements.
 - f. A site inspection to fully determine the extent of the work and the nature of the site.
- 5.2 The following recommendations are made:
- a. **Operational:**
 - (1) The CCC is to be operational for parents' usage, excluding public holidays, between 0700 - 1830 hours Monday to Friday; and
 - (2) Staff will be instructed not to arrive prior to 0600 hours and to be off site by 1900 hours; and
 - (3) Children are not permitted outdoors for play purposes, carpark excluded, prior to 0700 hrs or after 1800 hrs.
 - b. **Children's play areas:**
 - (1) Children are not permitted outdoors for play purposes, carpark excluded, prior to 0700 hours or after 1800 hrs; and
 - (2) External Play Areas
 - EPA1 and EPA2 fronting onto Matheson Road can be used continuously; and
 - EPA1 and EPA3 fronting onto Canning Hwy can be used during non-peak hour traffic between 0930 to 1430 hrs.
 - (3) There are no restrictions on the location of the children's play areas (UON) or number of children outdoors in any play area; and
 - (4) Practical considerations:
 - (a) Fixed play equipment should be non-metallic. If metal fixed play equipment is used then hollow metal sections shall be filled with expanding foam or sand; and
 - (b) Concrete or brick paved areas, if any, should be minimised and where practicable covered with synthetic grass to minimise noise of play equipment on hard surfaces.
 - c. **Music:**
 - (1) Keep external windows and doors closed when playing music indoors; and



- (2) Do not play music outdoors; and
- (3) Avoid playing games requiring hand clapping; and
- (4) Where music is allowed to be played outdoors, by the Local Government Authority (LGA), the music shall be light children's type of music.

d. **Mechanical Services:**

- (1) Exhaust systems:
 - (a) No specific external acoustic requirements for small non-kitchen exhaust systems.
 - (b) No specific acoustic requirements for domestic kitchen canopy ducted to exterior when kitchen equipment inputs is less than either 8 kW electrical or 29 MJH gas.
 - (c) Specific external acoustics requirements for a commercial kitchen canopy with an external fan when the kitchen equipment input is greater than either 8 kW electrical or 29 MJH gas then the exhaust fan shall be:
 - (i) Located more than 6.0 metres from residential boundary with a vertical discharge; and
 - (ii) Operating at a speed not exceeding nominally 960 rpm with a Sound Pressure Level not exceeding 52 dB(A) @ 3.0 m at the maximum operating speed.
- (2) Air conditioning systems:
 - (a) Evaporative AC units shall be of the centrifugal fan type and shall be sized to deliver the required air quantity on the low speed setting; and
 - (b) Refrigerated AC units shall be inverter type with night-time 'quiet/silent' mode; and
 - (c) Do not locate the AC unit/s closer than 6 metres to any residential boundary; and
 - (d) AC units shall have Sound Pressure Level not exceeding 61 dB(A) @ 1.0 metre when operating at rated conditions; and
 - (e) Evaporative AC units shall have Sound Pressure Levels (Lp or SPL) not exceeding 61 dB(A) @ 1.0 metre when operating at rated conditions; and
 - (f) Refrigerated AC units shall have Sound Power Levels (Lw or SWL) not exceeding 83 dB(A) when operating at rated conditions; and
 - (g) AC enclosure - Service openings facing Canning Hwy.

e. **Carpark:**

- (1) Staff will be instructed not to arrive prior to 0600 hours and to be off site by 1900 hours and park in the designated staff parking bays; and
- (2) Signage is placed within the carpark asking parents/staff not to slam car doors/boots; and
- (3) Signage is placed within the carpark asking parents/staff not to play music; and



e. **Construction:** The following recommendations are made:

. Provide external walls as follows:

- (1) GROUND Floor external double brick cavity walls to all locations as follows:
 - External 90 brick with or without render,
 - 50 cavity with Matrix resilient ties & with 50 Roxul CWI insulation density 45 kg/m³,
 - Internal 90 brick with or without render; and
- (2) FIRST Floor external brick veneer walls to all locations UON as follows:
 - External 90 brick with or without render,
 - 50 cavity with vapour break, 90 steel studs resiliently mounted off the brick wall, with 75 Glass Wool insulation density 11 kg/m³,
 - 2x13 plasterboard to Canning Hwy façades & 1x 13 plasterboard elsewhere; and
- (3) Use of permicav or solid board insulation in lieu of GW insulation is not permitted.

. Ceilings/Roof with minimum 60mm anti-condensation GW insulation applied under roof, insulation on the ceilings minimum 50 mm density 11 kg/m³ or greater as required for energy efficiency;

- (1) Cot Rooms 1 & 2, Activity 3 & 4:
 - ceilings to have 2x 13mm plasterboard;
- (2) All other ceilings, other than the above, to be 1x 13mm plasterboard.
- (3) All eaves and gables shall be fully sealed and closed with Compressed Fibre Cement sheeting or equivalent;

. Glazing to be laminated glass with thicknesses as nominated below or greater as required for energy efficiency:

- (1) GROUND Floor – All glazing:
 - Glazing rated at Rw36 being either 6.50 laminated Viridian Hush glass or 6.76 mm laminated Cooling Brothers Whisper glass.
- (2) FIRST Floor – All glazing:
 - Glazing rated at Rw36 being either 6.50 laminated Viridian Hush glass or 6.76 mm laminated Cooling Brothers Whisper glass.
- (3) All other glazing rated at Rw33, other than the above, to be 6.38mm laminated glass.

. Mechanical ventilation, for the provision of outdoor air, shall be provided via either an evaporative or refrigerated air conditioning system.

During peak hour traffic utilise mechanical ventilation whenever possible.

Mechanical ventilation openings shall not face towards Canning Hwy.

Mechanical ventilation systems will need to comply with AS 1668.2 - *The use of mechanical ventilation and air-conditioning in buildings*.



Fresh intake and relief air paths will need to be fully ducted to allow windows to be closed when required and be located at positions furthest from the traffic noise source where practicable or located so they do not have direct line of sight to the traffic noise source.

Glazing additional requirements:

The sound reduction of windows and doors are based on the requirement that suitable acoustic seals are provided to prevent sound leakage around each building element.

All external glass windows and doors must:

- have a seal to restrict air infiltration fitted to each edge of an operable window; and
- within doors or fixed framing, glazing must be set and sealed using an airtight arrangement of non-hardening sealant, soft rubber (elastomer) gasket and / or glazing tape; and
- all external doors must have compressible silicon based rubber seals to the full perimeter and a drop seal to provide an airtight seal when closed.

In this context, a seal is foam or silicon based rubber compressible strip, fibrous seal with vinyl fin interleaf or the like. Brush / pile type seals without this seal included are not allowed.

External Play Areas

- (1) EPA1 and EPA2 fronting onto Matheson Road can be used continuously; and
- (2) EPA1 and EPA3 fronting onto Canning Hwy can be used during non-peak hour traffic between 0930 to 1430 hrs.

Fences/Walls to 1st Floor (EPA2 & EPA3) and Ground floor (EPA1 & Carpark) side:

- (1) Ground floor boundary fences/walls to the Canning Hwy, Cunningham St and Carpark minimum 1800 high solid walls/fences including gates minimum surface density 15 kg/m² (colorbond is not acceptable); and
- (2) First floor EPA2 and EPA 3 for acoustic purposes, all walls minimum 1800mm high and minimum surface density 15 kg/m² including glass/polycarbonate walls.



ANNEXES:

- A. Location.
- B. Site Plans.
- C. Assigned Noise Levels.
- D. Children.
- E. Music.
- F. Mechanical Services.
- G. Carpark.
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ANNEX A – LOCATION



FIGURE A1 – SITE OVERVIEW 1 (North top of page)



ANNEX B - SITE PLANS

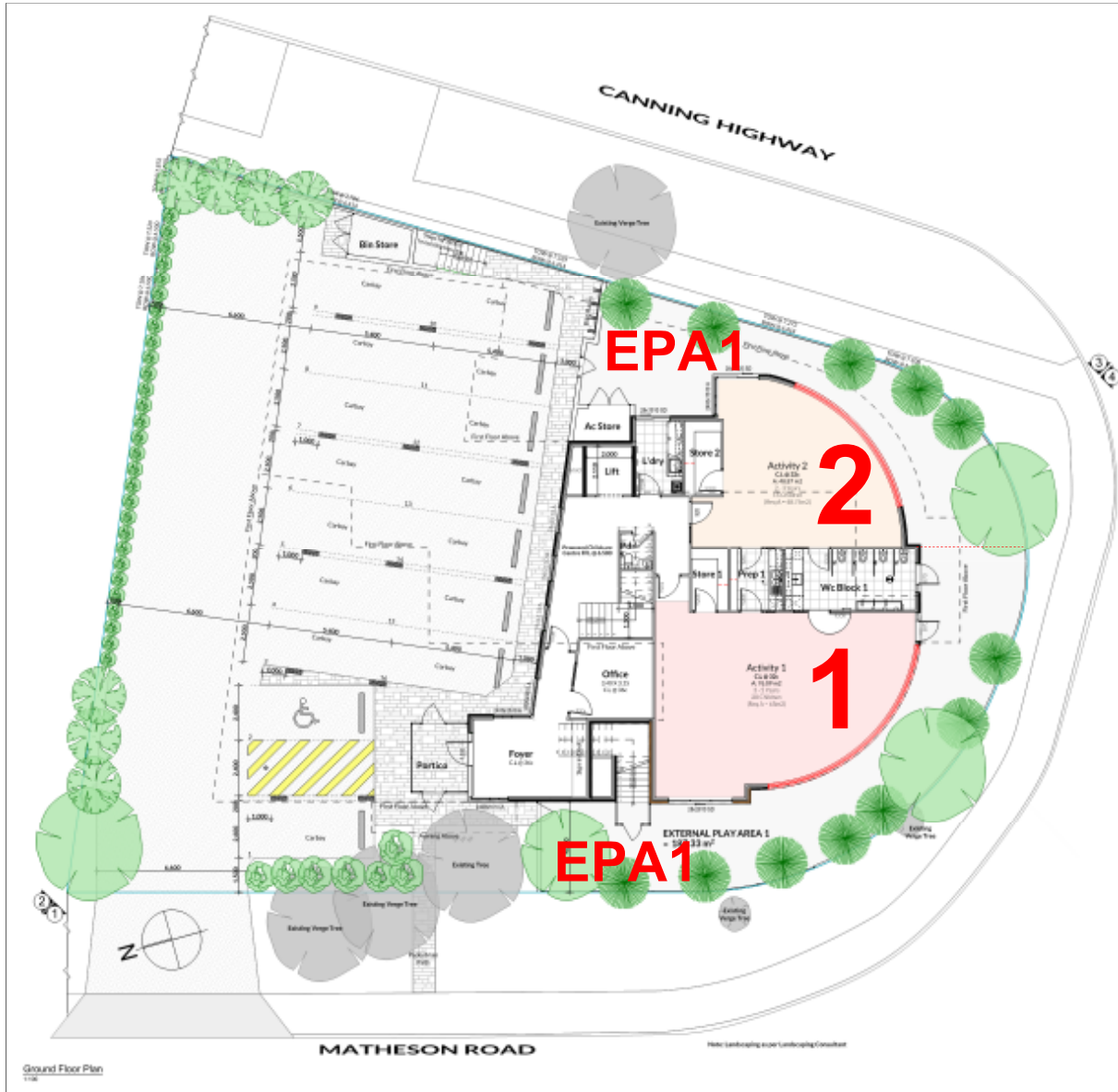


FIGURE B0 – GROUND FLOOR PLAN OVERVIEW

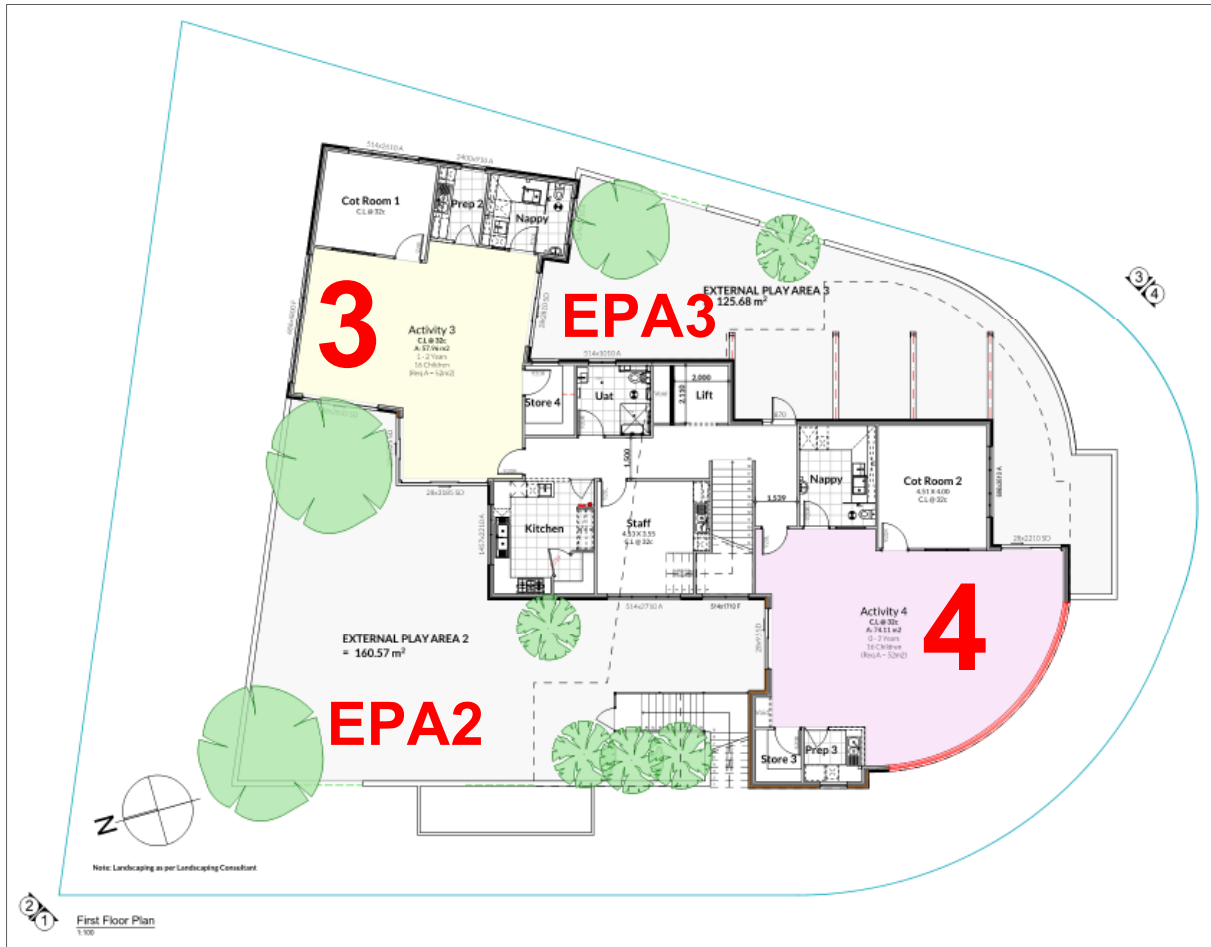


FIGURE B1 – FIRST FLOOR PLAN DETAIL



FIGURE B2 – ELEVATIONS



FIGURE B3.1 – MATHESON ROAD PERSPECTIVE (Elevation 1)



FIGURE B3.2 – MATHESON ROAD PERSPECTIVE (Elevation 1)



FIGURE B3.3 – CORNER PERSPECTIVE (Elevation 4)



FIGURE B3.4 – CANNING HWY PERSPECTIVE (Elevation 3)



ANNEX C - ASSIGNED NOISE LEVELS

- C1. The assigned noise level, as determined by Reference A, comprises a Base Noise Level and an Influencing Factor adjustment to take into consideration noise from nearby features such as major roads, industrial and commercial premises. The assigned noise level comprises three criteria being the LAmax, LA1 and LA10.
- C2. LAmax and LA1 represent respectively the single maximum noise event and the 1 percentile highest A weighted sound pressure levels over a representative measurement period.

The measurement criteria LA10 represents the 10 percentile highest A weighted sound pressure level over a representative measurement period of not less than 15 minutes and not more than 4 hours.

ND Engineering's understanding as a result of discussions with the DEP in March 2005 indicated that a representative measurement period for a CCC would be 4 hours.

- C3. Repeated attempts at obtaining statistical noise measurement data at various CCC without interference from traffic is difficult as most CCC are located on major and/or secondary roads with children playing outdoors when there is significant traffic noise in the morning and afternoon.

The LAmax is fairly easy to obtain as it represents a single noise event such as a shout or scream. The other two criteria LA1 and LA10 are statistical measurements and traffic noise creates significant problems in acquiring the measurement in particular the LA1 measurement.

The LA10 measurement criteria provides a reasonable indication of the objectionable noise as any unwanted noise events such as traffic, wind induced vegetation noise and animal noise form a smaller and less significant component which can be partially edited out.

- C4. ND Engineering's assessment is based primarily on the LAmax and LA10 criteria as obtaining a LA1 measurement that is 'legally' watertight is virtually impossible or not achievable when gathering noise data for the assessments. As a consequence, the assessments are based on the LAmax and LA10 criteria. The LAmax criteria is the most important criteria as this is the criteria associated with shouting that is most objectionable.

- C5. The base assigned noise levels are shown in the following table.

| Table C5 – ASSIGNED 'BASE' NOISE LEVELS | | | | | |
|---|--------------------|---|------------------------------------|--------------|--------------|
| Noise sensitive premises at locations a building directly associated with a noise sensitive use. | Time of day | Time of day | Assigned Noise Levels dB(A) | | |
| | | | LA10 | LA1 | LAmax |
| . . within 15 m of . . | Day | 0700-1900 hrs Monday to Saturday | 45+IF | 55+IF | 65+IF |
| | | 0900-1900 hrs Sunday, Public holidays | 40+IF | 50+IF | |
| | Evening | 1900-2200 hrs all days | | | 55+IF |
| | Night | 2200-0700 hrs Monday to Saturday | 35+IF | 45+IF | |
| 2200-0900 hrs Sunday, Public holidays | | | | | |
| . . greater than 15 m from . . | All hours | All hours | 60 | 75 | 80 |



C6. The following table shows the Influencing Factor calculation for the adjustments to the base noise levels for the nearest residences to the CCC.

| Table C6 – INFLUENCING FACTOR ASSESSMENT for residence adjacent to the CCC | | | | | |
|---|--------------------|--------------|--------------------|--------------|--------------------------------------|
| INFLUENCING FACTOR CRITERIA | | | ASSESSMENT | | |
| Item | Criteria | Value | Criteria | Value | Totals |
| Major Road within the | | | | | 6 (Transport Factor ≤ 6) |
| - 100 m radius inner circle | veh/day > 15000 | 6 dB | Canning Hwy | 6 | |
| - 450 m radius outer circle | veh / day > 15000 | 2 dB | - | - | |
| Minor Road within the | | | | | |
| - 100 m radius inner circle | 15k > veh/day > 6k | 2 dB | - | - | |
| Type A 'Industrial and Utility premises' within the | | | | | 0 (≤ 30) |
| - 100 m radius inner circle | 1/10 x Area% | ≤ 10 | 0 % | 0 | |
| - 450 m radius outer circle | 1/10 x Area% | ≤ 10 | 0 % | 0 | |
| Type B 'Commercial premises' within the | | | | | |
| - 100 m radius inner circle | 1/20 x Area% | ≤ 5 | 0 % | - | |
| - 450 m radius outer circle | 1/20 x Area% | ≤ 5 | 0 % | - | |
| INFLUENCING FACTOR = 6 dB(A) | | | | | |

C7. The assigned noise levels at receiving noise sensitive premises, residential in the vicinity of the noise source, as allowed under Reference A are shown in the following table.

| Table C7 – ASSIGNED NOISE LEVELS for residences | | | | | |
|---|--------------------|---|------------------------------------|------------|-------------|
| Noise sensitive premises at locations a building directly associated with a noise sensitive use. | Time of day | Time of day | Assigned Noise Levels dB(A) | | |
| | | | LA10 | LA1 | LAmx |
| . . within 15 m of . . | Day | 0700-1900 hrs Monday to Saturday | 51 | 61 | 71 |
| | | 0900-1900 hrs Sunday, Public holidays | 46 | 56 | |
| | Evening | 1900-2200 hrs all days | | | 61 |
| | Night | 2200-0700 hrs Monday to Saturday | 41 | 51 | |
| 2200-0900 hrs Sunday, Public holidays | | | | | |
| . . greater than 15 m from . . | All hours | All hours | 60 | 75 | 80 |



ANNEX D - CHILDREN

- D1. Noise emissions from the Child Care Centre (CCC) are expected to occur Monday to Friday between 0700 to 1830 hours mainly during the two hours of outdoor play per day weather permitting for the Kindy group. This means that for evenings, night-time, public holidays and Sundays there is expected to be no noise emissions from the CCC at all.
- D2. Anecdotal evidence indicates this is a desirable situation sought by some residences when purchasing properties adjacent to a CCC as their will be no afterhours noise thus negating a common source of complaint.
- D3. The Children's voices categorised by age groups:
- a. Pre Kindy / Kindy 3 – 5 years old:

Measurements, observations and discussions with CCC staff since year 2000 indicates that this is the most significant noise producing group.
 - b. Toddlers 2 – 3 years old:

This is a very low noise producing group based on observations and discussions with CCC staff since year 2000. Their external play time is less than the Kindy but more than the Babes group.

Attempts to obtain noise measurements suitable for use with Environmental Protection (Noise) Regulations 1997 "Reference A" have not been successful mainly due to traffic noise from nearby minor and/or major roads associated with the CCC's that ND Engineering has been reporting upon.
 - c. The Babes 0 - 2 years old:

This is a very low noise producing group based on observations and discussions with CCC staff.

Attempts to obtain noise measurements suitable for use with Environmental Protection (Noise) Regulations 1997 "Reference A" have not been successful mainly due to traffic noise from nearby minor and/or major roads associated with the CCC's that ND Engineering has been reporting upon.
- D4. Children, weather permitting, are allowed outside to play for about 2 hours per day being typically about 0830 to 1000 hours and 1500 to 1800 hours with play typically being broken up into about 30 minute sessions at a time. Sometimes the afternoon outdoor play time is not utilised due to higher levels of sun exposure at this time of day. This low number of outdoor play hours is:
- (1) Consistent with information obtained from CCC operators since year 2005. There are some variations between CCC but it is generally consistent with ND Engineering experience with the CCC assessments undertaken since year 2005;
 - (2) Also due to current sun exposure policies as expressed by the Cancer Council's Sun Protection Policy which does not recommend outdoor play between 1000 to 1500 hours;
 - (3) Play groups are typically up to 20 children depending upon supervision levels, with play times being staggered with children being rotated between outdoor and indoor activities.
- D5. It should be noted that this assessment is based on the assumption that all future developments to adjoining sites to remain single storey buildings and to adopt quiet house design concepts including:
- a. Only having have non habitable rooms/spaces (drying courtyards, laundry, storerooms etc) closest to the CCC; and
 - b. Not placing alfresco areas or courtyards with direct line of sight to the CCC boundary.



Children 0 to 3 years old - Assessment

- D5.1 The Babes 0 - 2 years old is a very low noise producing group based on observations and discussions with CCC staff. Their external play time is typically about 30 minute sessions. Attempts to obtain noise measurements suitable for use with Reference A have not been successful due to the typically low noise output of this age group.
- D5.2 The Toddlers 2 – 3 years old age group is again a very low noise producing group based on observations and discussions with CCC staff. Their external play time is generally less than the Kindy but more than the Babes group. Attempts to obtain noise measurements suitable for use with Reference A have not been successful mainly due to traffic noise from nearby secondary and/or major roads associated with the CCC's that ND Engineering has been reporting upon. This age group is also a low noise output age group.
- D5.3 The noise levels created by small groups of children, in the Babes 0 to 2 years old and Toddlers 2 to 3 year old age groups, is unlikely to cause a problem for any of the surrounding residences due to:
- Low noise output of this age group; and
 - These age groups engage in parallel play, rather than group play, at this stage of their social development which is a low noise activity; and
 - Short duration of outdoor play times, typically 30 minutes, especially if the weather is not mild.

Children 3 to 5 years old - Assessment

- D6.1 The data utilised for this assessment is mainly derived from '*Proceeding of ACOUSTICS 2006 of the 20-22 November 2006 at Christchurch New Zealand*' with the relevant extract on the following page.
- D6.2 The assessment is based on using sound data, consistent with WA requirements, as follows:
- L_{Amax} Sound Pressure L_p = 82 dB(A) @ 1.0 m for a single child shouting,
 Sound Power L_w = 90 dB(A) for a single child,
 Note that L_{Amax} is time independent;
 - LA₀₁ not utilised as past experience shows that this data is difficult to acquire, and substantiate, as it is easily influenced by traffic, animal and wind induced vegetation noise;
 - LA₁₀ Sound Pressure L_p = 65 dB(A) @ 1.0 m for a single child,
 Sound Power L_w = 74 dB(A) for a single child,
 (Sound Power L_w = 84 dB(A) for 10 children assuming a single point noise source),
 note LA₁₀ is time dependent and measured over a minimum of 15 minutes.
- D6.3 ND Engineering's assessment with regards to Residential Premises is that the noise emissions from the play areas as currently presented see Reference B and Annex A, complies with the assigned noise levels, see FIGURE D6.1 to D6.2, subject to implementation of the recommendations.
- D6.4 ND Engineering opinion is that the current building configuration requires existing fences to remain however the Northern 2200 mm high brick wall fence needs to be extended as per FIGURE 5.1 – NOISE BARRIERS.
- D6.5 Refer to the Section 'Recommendations' in the main body of the report including FIGURE 5.1 – NOISE BARRIERS.



OUTDOOR PLAY AREA NOISE SOURCE MODELS

The sound produced from children at play varies significantly at different times. Nevertheless a model based on the realistic worst-case (or at least an upper percentile) noise level is required to be established to assess the impact on neighbouring premises. The noise levels when the children are quiet are not relevant. Annoyance is only likely and the neighbours will only complain when the sound level from the children at play is raised. Aspects of the noise source model include, the number of children in an area, the number of children that are likely to be vocal in that area, the type of voice (i.e. casual, normal, loud, etc) and the times and distances between source and receiver.

General assumptions are that the boundaries of the proposed outdoor play area will be at least 2 metres from the neighbouring boundaries due to landscaped areas. Typical play positions are approximately 2 to 9 metres from the boundaries of the nearest affected residences with an average distance of 5 metres. The maximum numbers of children in the proposed outdoor play area(s) at any given time, not including babies or very young children (i.e. 2 years of age or under), are normally 20 to 40 and occasionally as many as 70.

Noise models have been developed for the calculation of child sound levels from children at play. This is based on sound pressure level data for one child at 1 metre as given by Kryter (1985). This model covers various types of voice shown in column 1 of Table 1 below.

The estimated time of each type of voice is used to predict a 15-minute average for one child. Attenuation is then applied for a distance of 5 metres and an adjustment is made for the amount of children vocal at any one time. This is typically 20% to 35% of the number of children at a centre. Hence, for the rear play area for, for example, 35 children (aged 2 to 5 years) and for a typical worst-case scenario, a maximum of 12 children could be expected to be vocal at any one time, in any one area. Site-specific distance attenuations are then applied as shown in Table 1 below.

Table 1. An example of the predicted noise levels for children at play

| Type of Voice | Sound Pressure Level (dBA) at 1 metre | Estimated Time Spent at each type of voice (minutes in 15) | Resultant Sound Level (dBA) 15 minute average |
|--|---------------------------------------|--|---|
| Casual | 53 | 2.8 | 46 |
| Normal | 58 | 5 | 53 |
| Raised | 65 | 5 | 60 |
| Loud | 74 | 2 | 65 |
| Shout | 82 | 0.2 | 63 |
| 15 minute Average for 1 Child at 1 metre | | | 68 |
| 15 minute Average for 12 Children at 1 metre Average Distance (From 68 + 10 log ₁₀ (12) dB) | | | 79 |
| 15 minute Average for 12 Children at 5 metres (From 79 - 20 log ₁₀ (5/1) dB) | | | 65 |

This model was tested and verified with acoustical measurements taken at the Shore Preparatory School, Northbridge, NSW, on Monday 10 November 2003. At 8

metres a sound pressure level of 60 dBA was found to be the highest 15-minute noise level when 30 children first entered the play area. After the children settled, the noise level dropped by 3 to 5 dB. It was noted that the sand pit was the area where the children played the quietest.

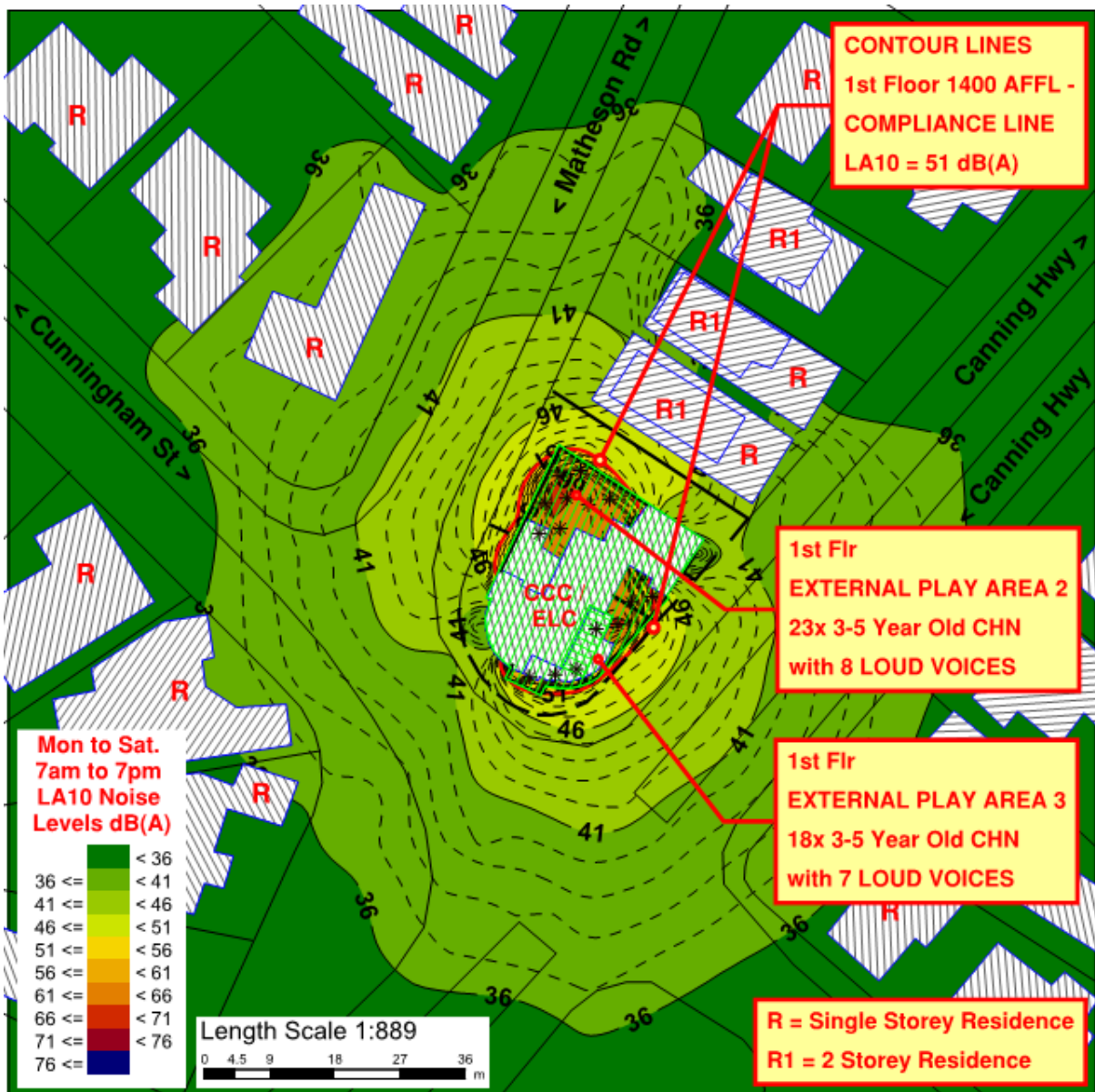


Figure D6.1a – OUTDOOR PLAY AREAS 2 & 3 FIRST FLOOR LA₁₀

Notes:

0. North is top of page.
1. Absenteeism is ignored.
2. Receiver 1400mm high with Children (Chn) noise sources at 1000mm high.
3. Contour lines: AGFL = Above GROUND Floor Level; AFFL = Above FIRST Floor Level.

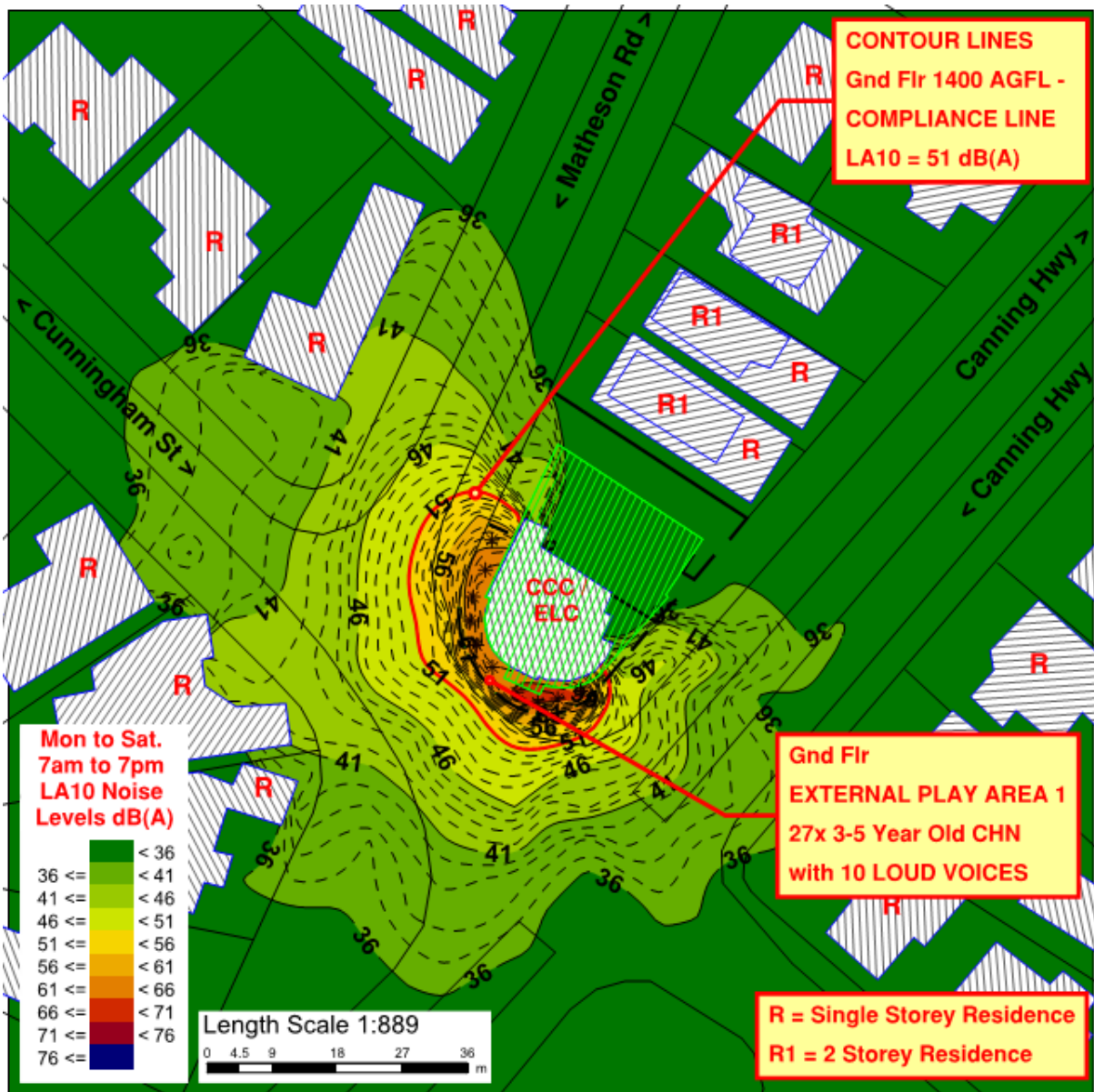


Figure D6.1b – OUTDOOR PLAY AREA 1 GROUND FLOOR LA₁₀

Notes:

0. North is top of page.
1. Absenteeism is ignored.
2. Receiver 1400mm high with Children (Chn) noise sources at 1000mm high.
3. Contour lines: AGFL = Above GROUND Floor Level; AFFL = Above FIRST Floor Level.

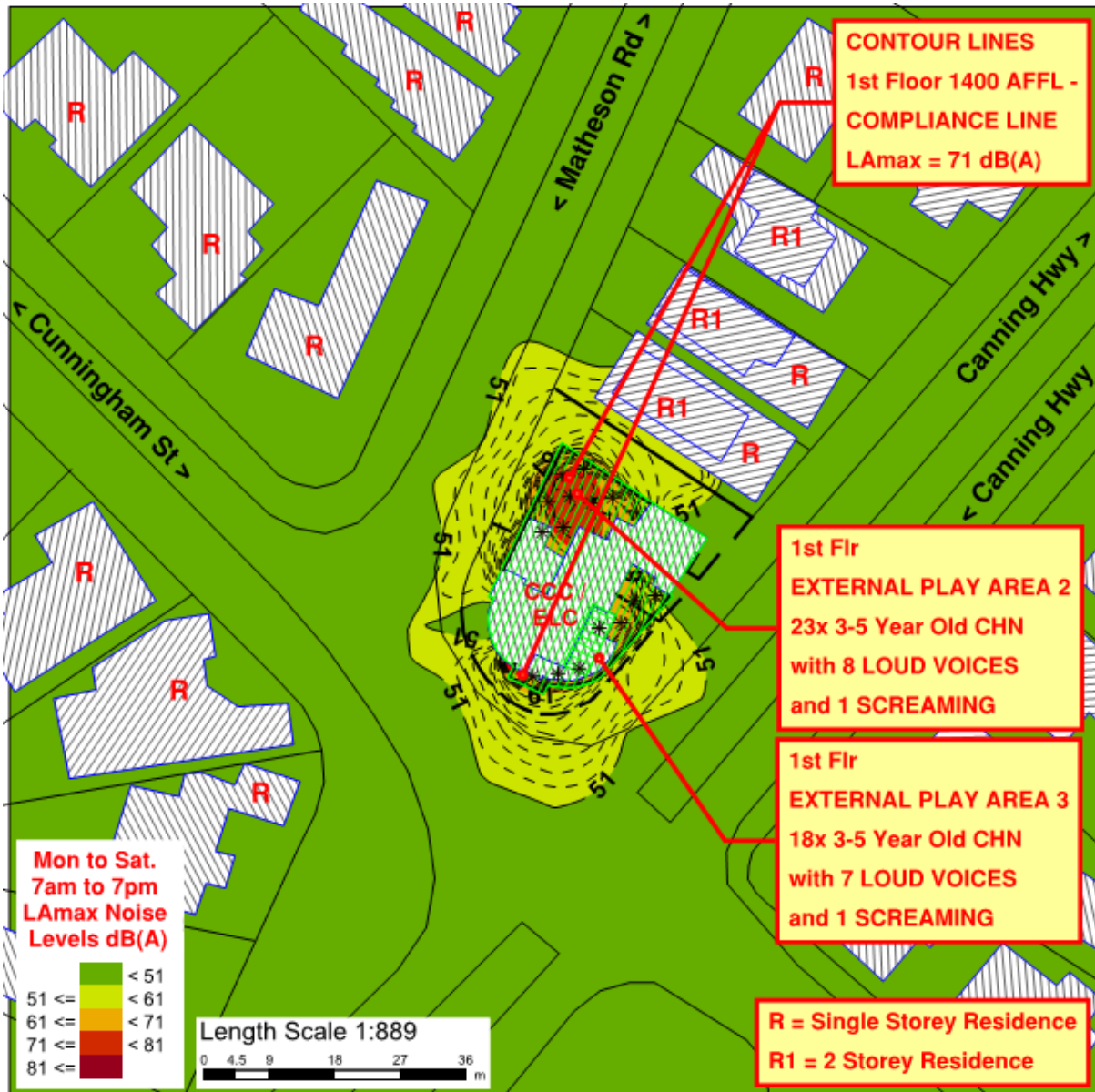


Figure D6.2a – OUTDOOR PLAY AREAS 2 & 3 FIRST FLOOR L_AMAX

Notes:

0. North is top of page.
1. Absenteeism is ignored.
2. Receiver 1400mm high with Children (Chn) noise sources at 1000mm high.
3. Contour lines: AGFL = Above GROUND Floor Level; AFFL = Above FIRST Floor Level.

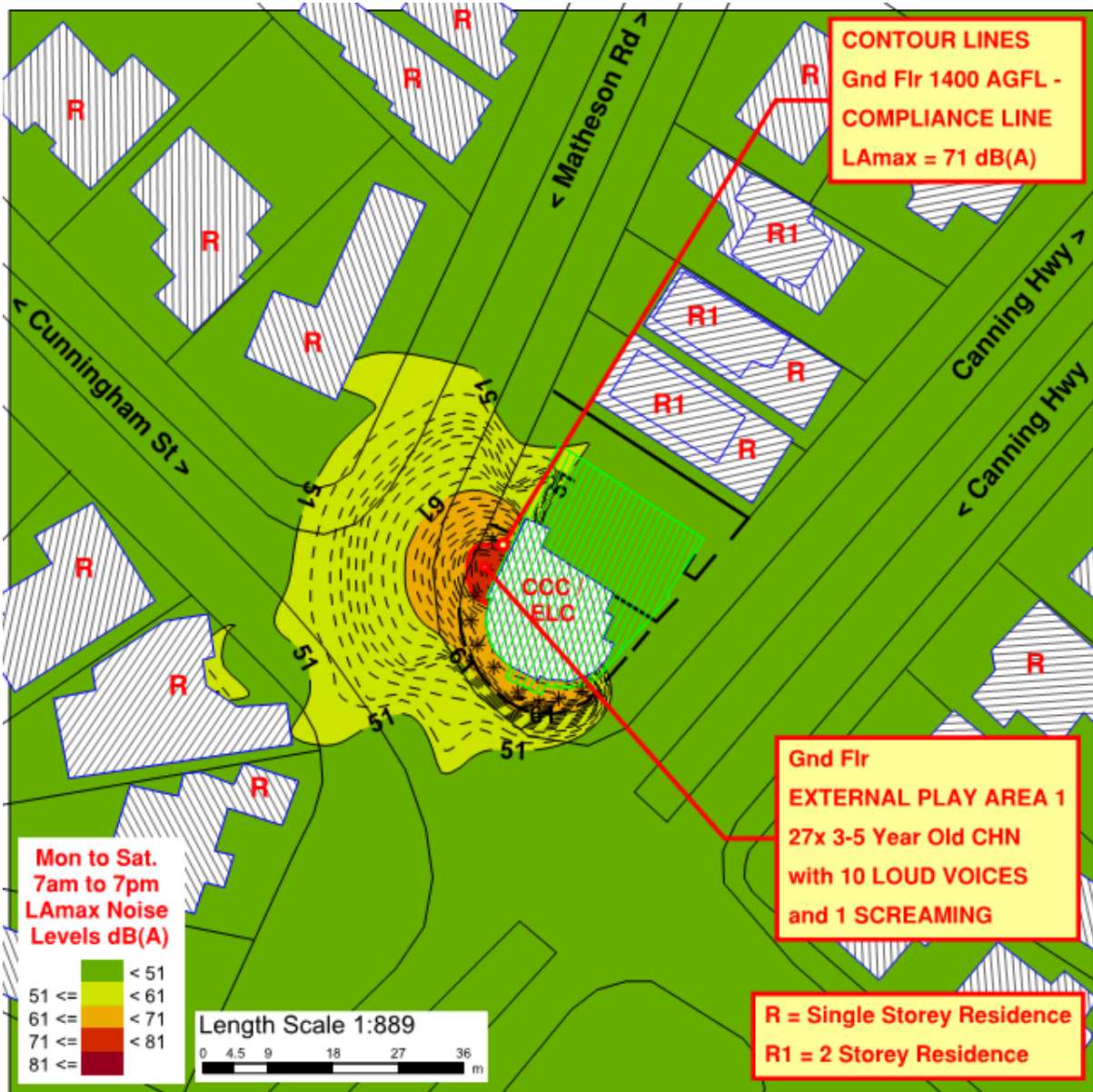


Figure D6.2b – OUTDOOR PLAY AREA 1 GROUND FLOOR L_{Amax}

Notes:

0. North is top of page.
1. Absenteeism is ignored.
2. Receiver 1400mm high with Children (Chn) noise sources at 1000mm high.
3. Contour lines: AGFL = Above GROUND Floor Level; AFFL = Above FIRST Floor Level.



Annex E - Music

- E1. Typically, music produced within Child Care Centres is for short durations as part of an activity and is played at a low volume as small children will typically not be able to follow instructions in rooms with a high noise background.

Basically, music levels will need to be kept at about 60 dB(A) or lower within the room which is equivalent to the noise level produced by a conversational adult male voice at 1 metre.

The music is typically non-impulsive, minimal bass, thus minimizing the main source of complaint typically associated with music.

- E2. The reduction in noise levels to the nearest residential boundary has been calculated to be at least 20 dB(A) as a result of attenuation due to the transmission loss of the glass.

Essentially with all external doors and windows closed the noise level due to music at the nearest residential boundary will be about 35 dB(A) which with all adjustments included is well below the daytime LA10 assigned noise levels.

- E3. Reductions due to distance and boundary fence reductions have not been included in the preceding calculation and are expected to be about 3 to 8 dB(A) with an average of 5 dB(A) therefore making the assessment fairly conservative.

- E4. Refer to the Section 'Recommendations' in the main body of the report.



Annex F – Mechanical Services

- F1. The main equipment noise sources at the site are expected to comprise:
- a. Air-conditioning being either:
 - (1) Evaporative ducted; or
 - (2) Refrigerated reverse cycle air conditioning systems configured possibly as a mixture of ducted and wall mounted systems;
 - b. Mechanical ventilation exhaust systems (for Bath, Kitchen, Laundry, WC's) being typically of two types for;
 - (1) Rooms with an external non-boundary wall having either window or wall mounted exhaust fans; and
 - (2) Rooms without an external non-boundary wall having either:
 - (i) Ceiling mounted exhaust fan ducted vertically to the exterior through the roof; or
 - (ii) Bulkhead/ceiling ducted exhaust system to a non-boundary external wall; and
- F2. The Child Care Centre is expected to be operational, excluding public holidays, between 0700 to 1830 hours Monday to Friday.
- F3.1 The main potential noise source is the air-conditioning condenser units and the detailed requirements for these AC condenser units are contained in the recommendations section of this report and also as follows:
- a. Evaporative AC units shall be of the centrifugal fan type and shall be sized to deliver the required air quantity on the low speed setting; and
 - b. Refrigerated AC units shall be inverter type with night-time 'quiet/silent' mode; and
 - c. Do not locate the AC unit/s closer than 6 metres to any residential boundary; and
 - d. Evaporative AC units shall have Sound Pressure Levels (Lp or SPL) not exceeding 61 dB(A) @ 1.0 metre when operating at rated conditions.
 - e. Refrigerated AC units shall have Sound Power Levels (Lw or SWL) not exceeding 83 dB(A) when operating at rated conditions.
 - f. Position refrigerated AC units in the AC enclosure as shown in FIGURE 5.1 NOISE BARRIERS.
- F3.2 The toilet exhaust fans are unlikely to pose a problem and are not assessed in detail. In the unlikely event that these exhaust discharges through the roof do present some objectionable noise this can be easily overcome by the insertion of some additional acoustic flexible duct into the discharge line.
- F3.3 The kitchen exhaust fans will either be of a domestic kitchen canopy type or commercial kitchen canopy type depending upon the size of the kitchen equipment. If the kitchen equipment has inputs:
- a. Less than either 8 kW electrical or 29 MJH gas then a commercial kitchen canopy is not required, and a domestic kitchen canopy ducted to the exterior will suffice. In this situation, the exhaust system is unlikely to pose a problem and therefore is not assessed in detail.
 - b. Greater than either 8 kW electrical or 29 MJH gas then a commercial kitchen canopy is required with an external roof mounted fan. Essentially the exhaust fan will need to be located further than 6.0 metres from a residential boundary with a maximum speed of 960 rpm. Detailed requirements for the kitchen exhaust fan are contained in the recommendations section of this report.
- F4. Refer to the Section 'Recommendations' in the main body of the report.

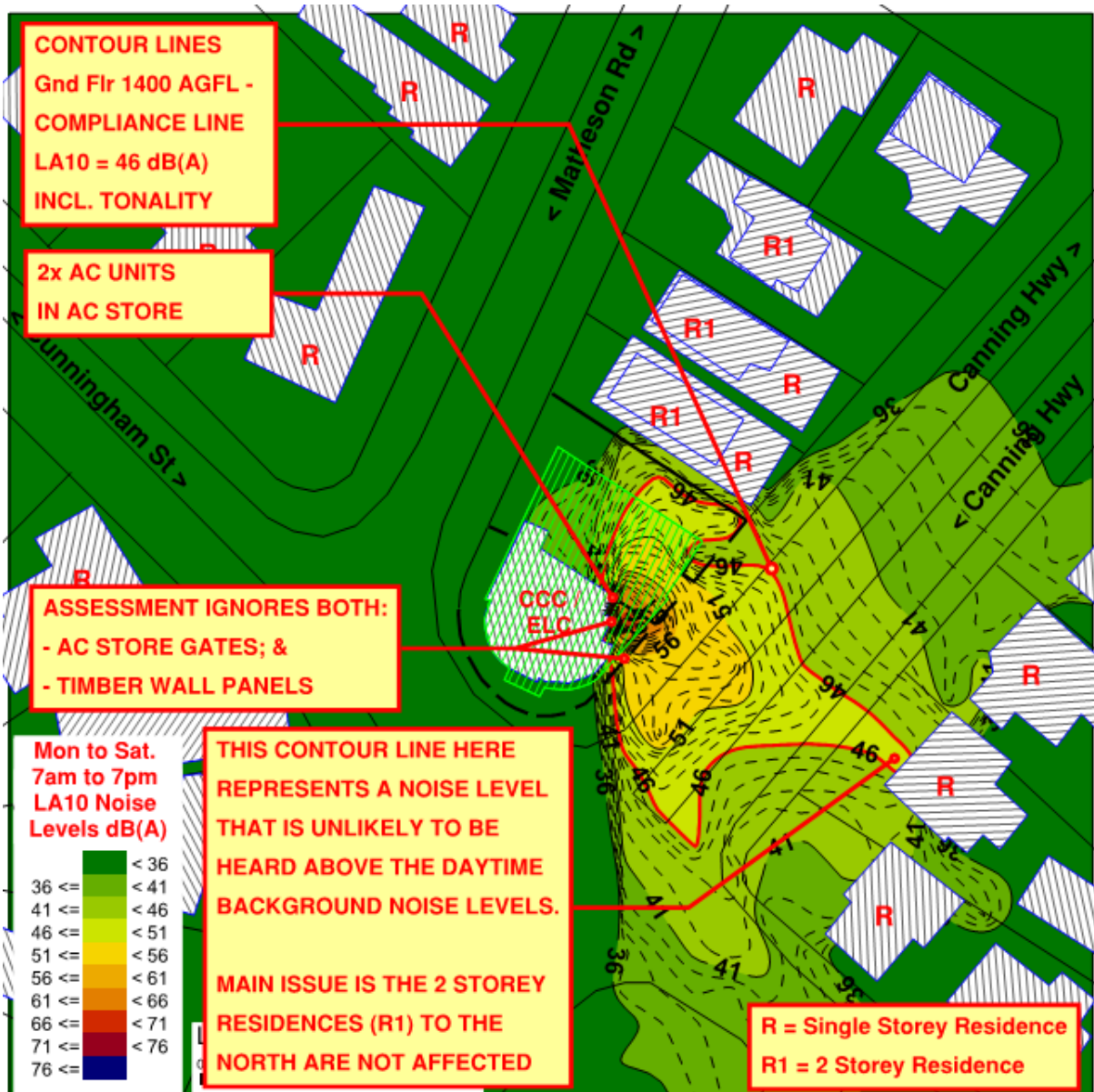


FIGURE F.1a – AC UNITS GROUND FLOOR LA10 With Tonality

Notes:

0. North is top of page.
1. AC Condenser Units noise source 1500 mm high (assume worst case vertical discharge type AC CU so 1500mm is location of condenser fans which are 300mm below wall height of 1800mm).
2. Contour lines: AGFL = Above GROUND Floor Level; AFFL = Above FIRST Floor Level.
3. Tonality limit line contour adjustment is to get compliant you have to predict 46 + tonality 5 = compliant 51 dB(A).

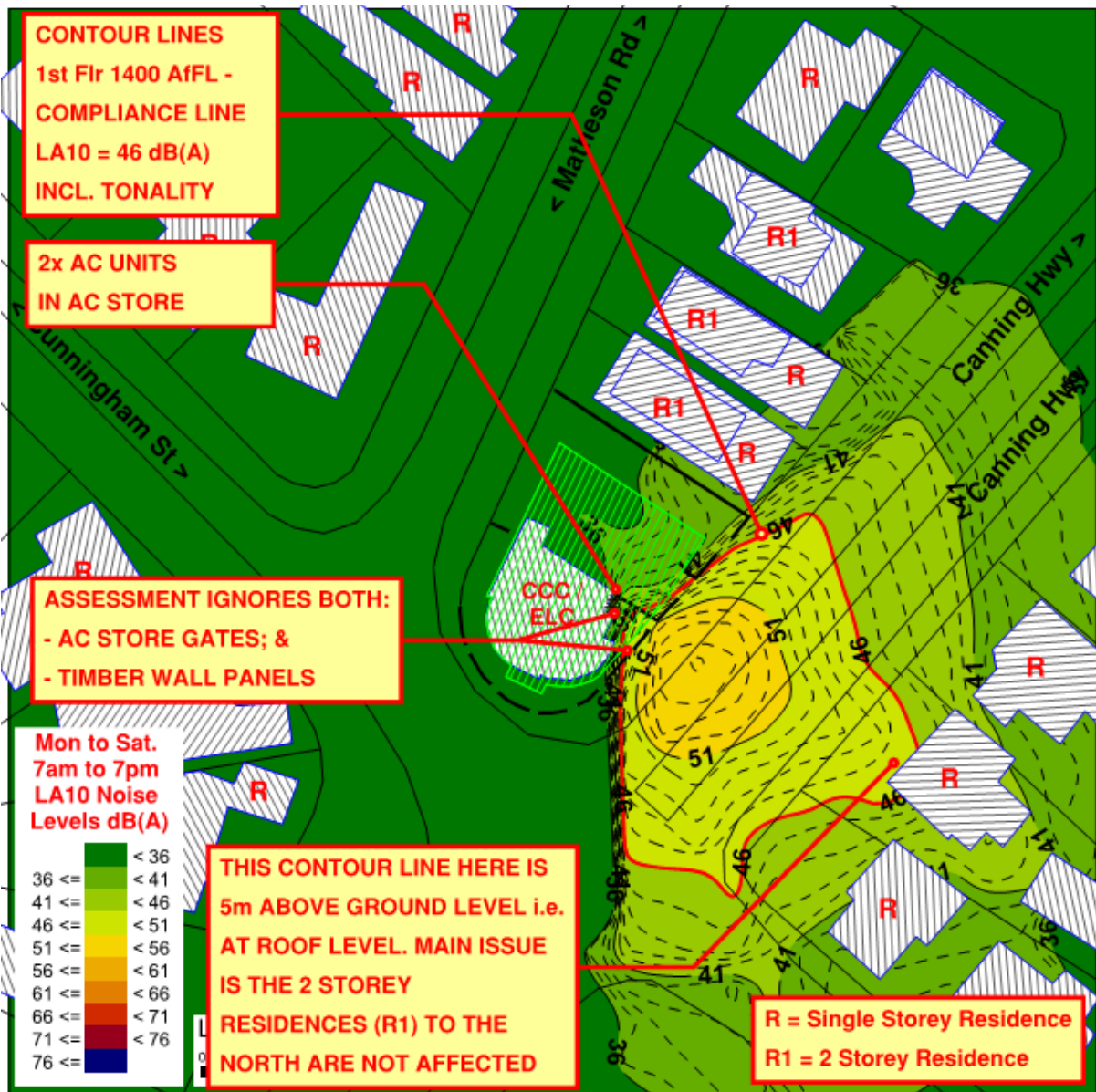


FIGURE F.1b – AC UNITS FIRST FLOOR LA10 With Tonality

Notes:

0. North is top of page.
1. AC Condenser Units noise source 1500 mm high (assume worst case vertical discharge type AC CU so 1500mm is location of condenser fans which are 300mm below wall height of 1800mm).
2. Contour lines: AGFL = Above GROUND Floor Level; AFFL = Above FIRST Floor Level.
3. Tonality limit line contour adjustment is to get compliant you have to predict 46 + tonality 5 = compliant 51 dB(A).



Annex G - Carpark

- G1. Carpark noises typically may comprise adults talking and children's voices, car radios and car doors.
- G2. Essentially the first and last persons on site are the CCC staff. The CCC staff parking should be away from car bays outside of the drop off zone in order to reduce parental stress by allowing them to park closer to the CCC doors.
- G3 Observations on various CCC site shows that pickup and drop offs are generally fairly quick especially in the morning. The morning drop offs tend to occur in several distinct groups being the trades/building/construction workers drop off at or prior to 0730 hours, the first school morning drop off at about 0815 hours (prior to older siblings being taken to school) and the other school morning drop off at about 0915 hours (when older siblings have been dropped off at school in the morning).
- G4.1 Measurements and observations were conducted at the Kids Campus CCC on 103 Canning Road Kalamunda on the morning of Wednesday 14 SEP 05 between 0730 to 0830 hours in order to obtain carpark noise data and discuss operational matters with the manager. This carpark contains about 21 car bays with about 15 on the residential side of the carpark and 6 on the CCC building side.
- G4.2 A series of three noise measurements on site at the Kids Campus CCC side of the residential boundary showed noise levels as follows: Cars doors closing $L_{Amax} = 54$ to 58 dB(A) at approximately 10 metres; and Children talking about $L_{Amax} = 50$ dB(A) at approximately 10 metres.
- ND Engineering measurement point near the residential boundary was located about 10 metres from the CCC entry doors. Parents were not made aware of ND Engineering's presence so that the behaviour was allowed to be as normal as possible. The entire carpark location was fairly reverberant. Parents were parking fairly close to either side of or in front of the CCC entry doors.
- The LA10 and LA1 measurements were meaningless as the noise from the nearby road heavily contaminated these two measurements however it would be safe to say that the LA1 and LA10 would be lower than the L_{Amax} measured values.
- G4.3 These L_{Amax} noise levels are not significant and given the short duration of the drop off the application of tonality and modulation penalties could not be applied to the measurements as the duration of the event was less than 10% of any representative measurement period. The only penalty that could be applied is if car doors are slammed resulting in the application of an impulsive penalty of +10 dB(A). The following figures show that for normal car door action the situation is one of compliance with the assigned noise levels however slamming of car doors would not be compliant prior to 0700 hrs and thus a Noise Management Plan is required via signage.
- G5.1 ND Engineering's assessment is that the noise emissions within the carpark as currently presented, see Reference B and Annex A, complies with the assigned noise levels subject to implementation of the recommendations. Refer to FIGURES G.1 to G.4.
- G5.2 ND Engineering's carpark recommendations are:
- Staff will be instructed not to arrive prior to 0600 hours and to be off site by 1900 hours and park in the Northern car bays 1, 2, 3, 23, 24 & 25; and
 - Signage is placed within the carpark asking parents/staff not to slam car doors/boots; and
 - Signage is placed within the carpark asking parents/staff not to play music; and
 - Existing brick fence on the carpark Northern boundary to be retained. See also FIGURE 5.1 – NOISE BARRIERS.
- G6. Refer to the Section 'Recommendations' in the main body of the report including FIGURE 5.1 – NOISE BARRIERS.



LIST OF FIGURES

| | |
|-----------------------------|---------------------------------|
| FIGURE G.1 – CARPARK BAY 01 | LA _{MAX} NON-IMPULSIVE |
| FIGURE G.2 – CARPARK BAY 11 | LA _{MAX} NON-IMPULSIVE |
| FIGURE G.3 – CARPARK BAY 14 | LA _{MAX} NON-IMPULSIVE |
| FIGURE G.4 – CARPARK BAY 18 | LA _{MAX} NON-IMPULSIVE |

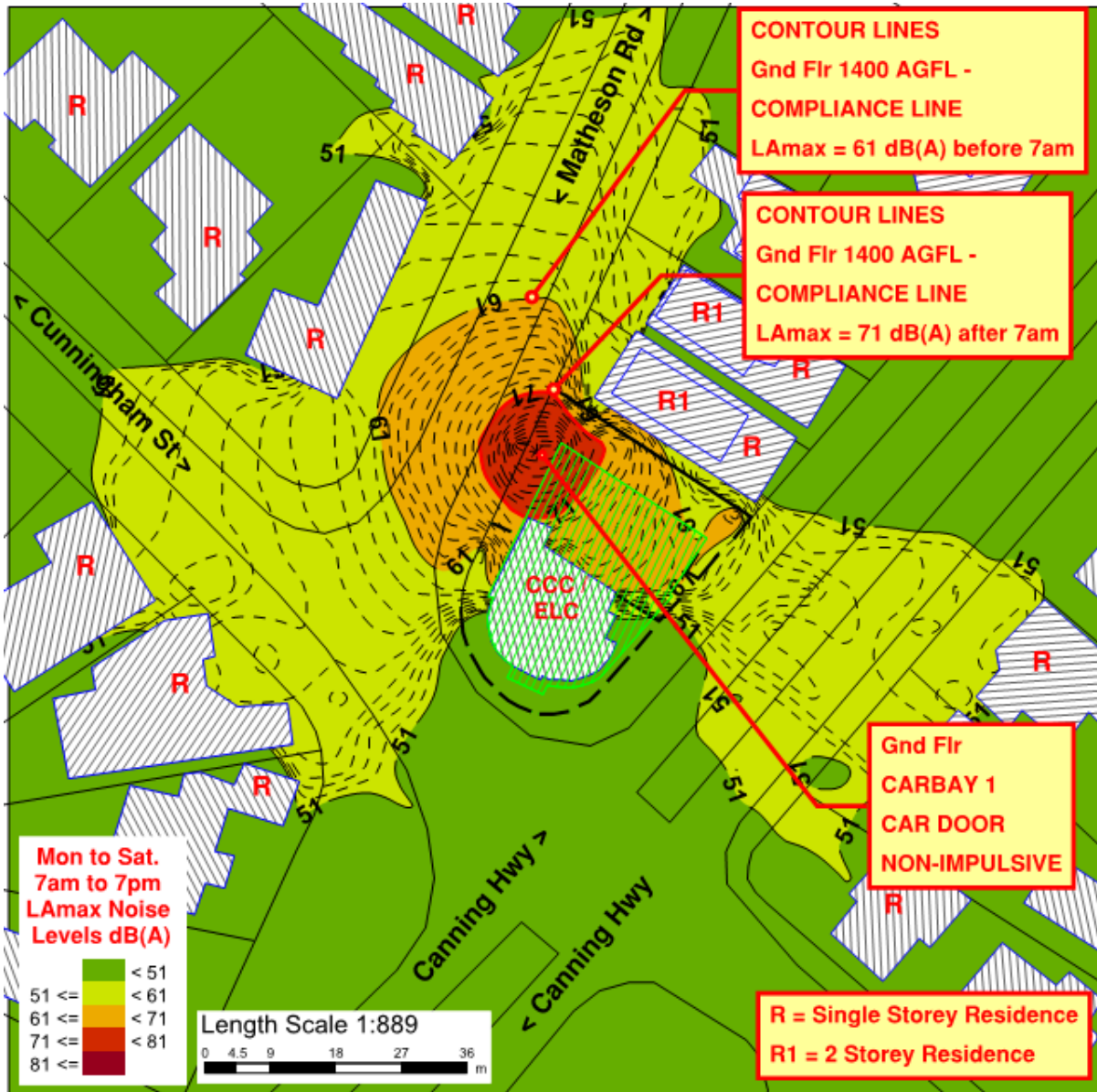


FIGURE G.1 – CARPARK BAY 01 - L_{MAX} NON-IMPULSIVE

Notes:

0. North is top of page.
1. Compliance limit line is L_{Amax} 71 dB(A) after 0700 hrs, and L_{Amax} 61 dB(A) before 0700 hrs which are all reasonably away from anticipated residential facades.
2. Receiver 1400mm high with Car Door closing noise sources at 1000mm high.
3. Contour lines: AGFL = Above GROUND Floor Level; AFFL Above FIRST Floor Level.

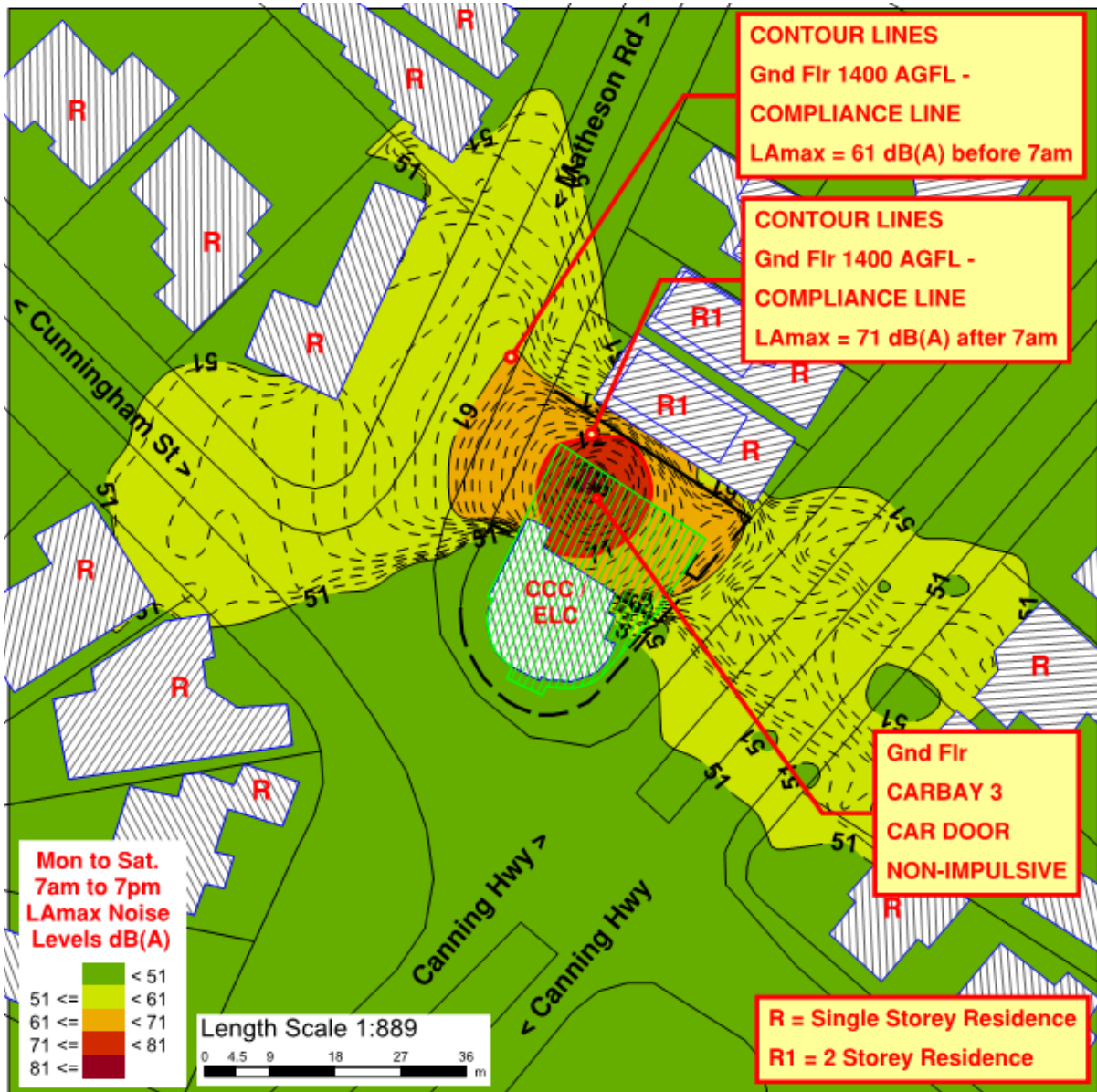


FIGURE G.2 – CARPARK BAY 03 - LA_{MAX} NON-IMPULSIVE

Notes:

0. North is top of page.
1. Compliance limit line is LA_{max} 71 dB(A) after 0700 hrs, and LA_{max} 61 dB(A) before 0700 hrs which are all reasonably away from anticipated residential facades.
2. Receiver 1400mm AFGL with Car Door closing noise sources at 1000mm AFGL.
3. Contour lines: AGFL = Above GROUND Floor Level; AFFL Above FIRST Floor Level.

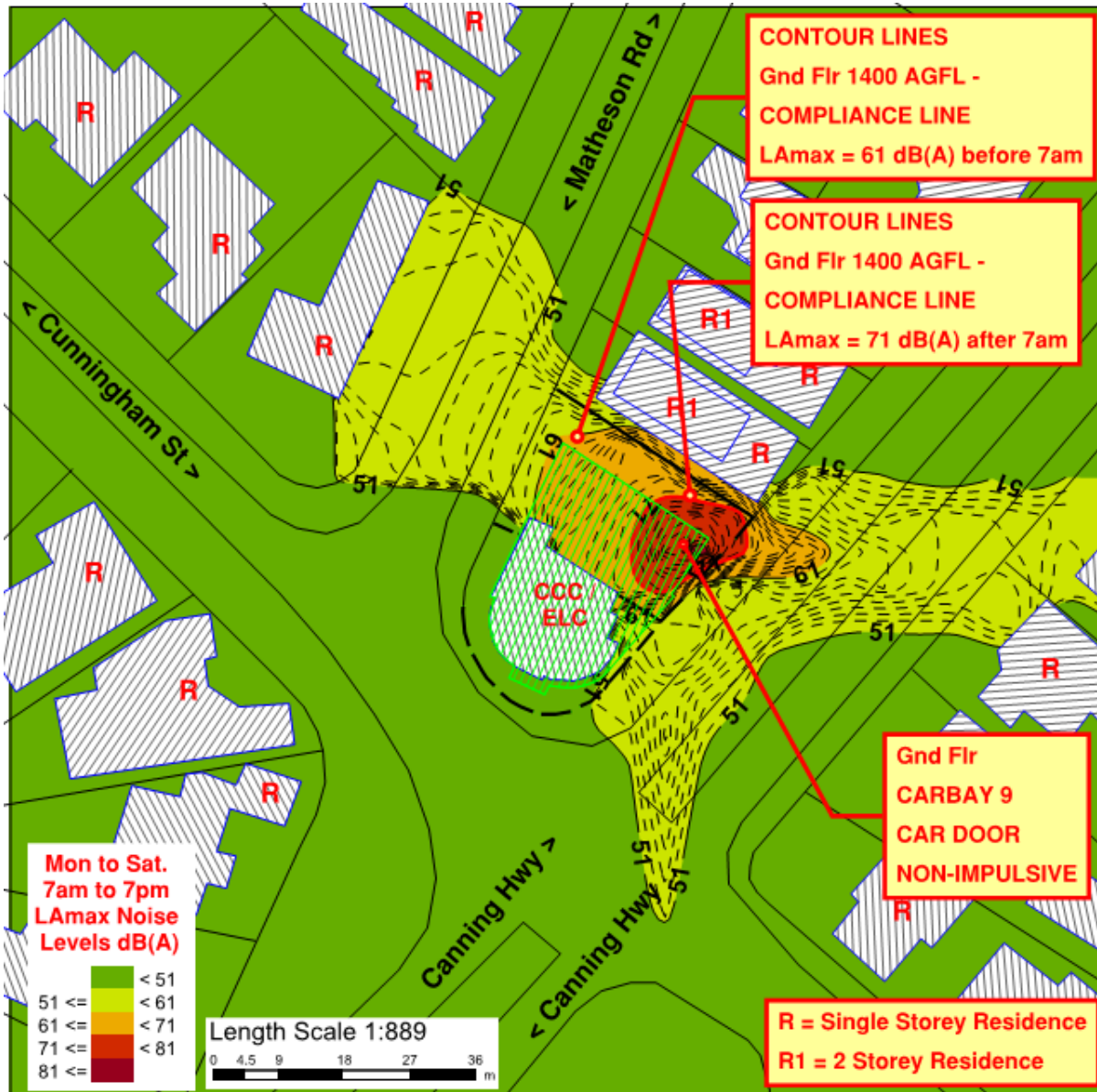


FIGURE G.3 – CARPARK BAY 09 - L_{MAX} NON-IMPULSIVE

Notes:

0. North is top of page.
1. Compliance limit line is L_{max} 71 dB(A) after 0700 hrs, and L_{max} 61 dB(A) before 0700 hrs which are all reasonably away from anticipated from residential facades.
2. Receiver 1400mm high with Car Door closing noise sources at 1000mm high.
3. Contour lines: AGFL = Above GROUND Floor Level; AFFL Above FIRST Floor Level.




Annex H - Traffic

- H0.0 The H0.n paragraphs provide some background information on the SPP5.4 traffic noise assessment for the Child Care Centre (CCC).
- H0.1 The SPP5.4 traffic noise assessment in this report for a commercial (non-residential) development and is to determine the external noise levels for:
- a. Design of the building facades for the purposes of achieving recommended internal noise levels during trading hours 0700 to 1830 hrs (7.00am to 6.30pm):
 - (1) As per *AS2107-2016 Acoustics - Recommended design sound levels and reverberation times for building interiors*
 - (2) With calculation by *EN 12354-3:2000 "Building Acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 3: Airborne sound insulation against outdoor sound; and*
 - b. Allocation of play areas that would meet the LAeq,Day 55 dB(A) between 0700 to 1830 hrs.
- H0.2 There are differences between a SPP5.4 assessment for residential and non-residential developments essentially being:
- a. The Quiet House packages are not applicable to non-residential developments; and
 - b. The daytime LAeq for this CCC is from 0700 to 1830 hrs (7.00am to 6.30pm) rather than from 0600 to 2200 hrs (6.00am to 10pm).
 - c. The night time LAeq is not applicable as the CCC is unoccupied being a non-residential use.
- H0.3 Attended noise measurements, for this small scale development, were taken during the AM and PM peak traffic times consistent with the trading hours of the CCC and comprised 30 minute samples. The samples were further developed into LAeq,Day (7am to 6.30pm) using the traffic profiles from MRWA's Trafficmap.
- H0.4 Traffic noise modelling was undertaken with:
- a. SoundPlan V8 noise modelling software utilising COCAWE daytime conditions with a wind blowing from source to receiver noting that the modelling is done well below a 100m size for which the CONCAWE inputs have no effect given the small distance between Canning Highway and Matheson Road (approx. 50m at most).; and
 - b. Traffic modelling inputs were obtained from MRWA #41661 on 27 OCT 20 for the 2016 / 2041 traffic models;
 - c. Traffic speed current is 60 kph and remains at this speed noting that traffic flow past this site is close to the speed limit with the predominant noise being tyre noise at the 1000 Hertz octave band and minimal acceleration noise;
 - d. The road surface is open graded asphalt and remains so.
 - e. Topography is essentially flat and of minimal significance given the small distances involved. This is based on a site inspection, review of Intramap contours and Nearmap elevation profiles.



H1.1 Traffic noise is a significant component to this site with Canning Highway having an annual average weekday traffic count of about 41,147 vehicles, including 2676 Heavy Vehicle (HV) 6.5%, based on 2018/19 MRWA Trafficmap data (MRWA Site 0092 East of North Lake Road). Measurement details are contained in Table H1 below.

| Table H1 – MEASUREMENT DETAILS | | |
|---------------------------------------|---|--|
| Day and Date | Thursday 05 NOV 2020 | Friday 06 NOV 2020 |
| Time | 1530 to 1600 hrs (PM peak) | 0700 to 0730 hrs (AM peak) |
| Duration | ~30 minutes | ~30 minutes |
| Weather | Sunny cloudy, No wind 31 °C & 37% RH | Sunny cloudy, No wind 18 °C & 90% RH |
| Location of Microphone |  | |
| Raw Results | LAeq 69.7 dB(A) Attended measurement Traffic flow West to Fremantle | LAeq 72.8 dB(A) Attended measurement Traffic East to Perth |
| Traffic profile adjusted | LAeq,day 67.7 dB(A) NB: day 0700 to 1830 hrs for CCC | LAeq,day 70.8 dB(A) NB: day 0700 to 1830 hrs for CCC |
| Traffic volume adjusted 2041 | LAeq,day 69.0 dB(A) MRWA #41661 data 27 OCT 20: - 45,200 vpd HV 7% @ 2016 - 80,600 vpd & HV 6% @ 2041 | LAeq,day 72.1 dB(A) MRWA #41661 data 27 OCT 20: - 45,200 vpd HV 7% @ 2016 - 80,600 vpd & HV 6% @ 2041 |
| Measurement Equipment | B&K 2270 Type 1 SLM, Sn 3006288, NVMS calibrated 10-12-18. ACO 511E calibrator, Sn 021572, NVMS calibrated 19-10-20. Calibration certificates can be provided on request. | |
| Comment | Peak hour attended traffic measurements with the AM East bound traffic heading towards Perth dominating the assessment with rolling tyre noise predominated noise source. | |



- H1.2 The MRWA Transport Modelling #41414 was provided on 27 OCT 20 by Mr Thomas NG. The results of the 2016 to 2041 MRWA modelling showed an increase in the daytime noise level LAeq,day of 1.3 dB(A) for the dominant traffic volume on Canning Highway.
 See Table H2 below.
 Noise modelling is contained in Figures H.1 & H.2

| Table H2 – TRAFFIC DETAILS | |
|---|---------------------------------------|
| Item | Canning Hwy |
| Speed Limit | 60 kph |
| 2016 - Average vehicles per weekday | 45,200 VPD & 7.0% Heavy Vehicles (HV) |
| 2041 - Average vehicles per weekday | 80,600 VPD & 6.0% HV |
| Increase in 25 years from 2016 | 35,400 vpd |
| Increase in LAeq,day = 10 log (vpd 2041/2016) | +1.3 dB(A) |

- H2. The indoor design criteria, for the purposes of traffic noise intrusion, for this noise sensitive non-residential building is as per AS2107-2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors*. The recommended design sound level (LAeq,t) range for traffic noise intrusion purposes:

| Description | AS 2107 -2016 Recommendations | <i>Predicted when utilising this report's recommendations based on the calculation method in 'BS EN ISO 12354-3:2017 Airborne sound insulation against outdoor sound'</i> |
|---|--------------------------------------|---|
| - Cot Rooms (Nursery) | 35 to 45 dB(A) | <i>Within AS 2107 recommended ranges</i> |
| - Activity | 40 to 45 dB(A) | |
| - Staff | | |
| - Office | | |
| - Reception | 40 to 50 dB(A) | |
| - Parent Waiting Room | < 50 dB(A) | |
| - Foyer (Lobby) | | |
| - Lift Lobby | | |
| - Corridors | 50 to 60 dB(A) | |
| - Stores, Prep, WC's, Nappy, Laundry, Kitchen | | |



- H3. The following recommendations are made:
- a. Provide external walls as follows:
- (1) GROUND Floor external double brick cavity walls to all locations as follows:
 - External 90 brick with or without render,
 - 50 cavity with Matrix resilient ties & with 50 Roxul CWI insulation density 45 kg/m³;
 - Internal 90 brick with or without render; and
 - (2) FIRST Floor external brick veneer walls to all locations UON as follows:
 - External 90 brick with or without render,
 - 50 cavity with vapour break, 90 steel studs resiliently mounted off the brick wall, with 75 Glass Wool insulation density 11 kg/m³,
 - 2x13 plasterboard to Canning Hwy façades & 1x 13 plasterboard elsewhere; and
 - (3) Use of permicav or solid board insulation in lieu of GW insulation is not permitted.
- b. Ceilings/Roof with minimum 60mm anti-condensation GW insulation applied under roof, insulation on the ceilings minimum 50 mm density 11 kg/m³ or greater as required for energy efficiency;
- (1) Cot Rooms 1 & 2, Activity 3 & 4:
 - ceilings to have 2x 13mm plasterboard;
 - (2) All other ceilings, other than the above, to be 1x 13mm plasterboard.
 - (3) All eaves and gables shall be fully sealed and closed with Compressed Fibre Cement sheeting or equivalent;
- c. Glazing to be laminated glass with thicknesses as nominated below or greater as required for energy efficiency:
- (1) GROUND Floor – All glazing:
 - Glazing rated at Rw36 being either 6.50 laminated Viridian Hush glass or 6.76 mm laminated Cooling Brothers Whisper glass.
 - (2) FIRST Floor – All glazing:
 - Glazing rated at Rw36 being either 6.50 laminated Viridian Hush glass or 6.76 mm laminated Cooling Brothers Whisper glass.
 - (3) All other glazing rated at Rw33, other than the above, to be 6.38mm laminated glass.
- d. Mechanical ventilation, for the provision of outdoor air, shall be provided via either an evaporative or refrigerated air conditioning system.
- During peak hour traffic utilise mechanical ventilation whenever possible.
- Mechanical ventilation openings shall not face towards Canning Hwy.
- Mechanical ventilation systems will need to comply with AS 1668.2 - *The use of mechanical ventilation and air-conditioning in buildings*.



Fresh intake and relief air paths will need to be fully ducted to allow windows to be closed when required and be located at positions furthest from the traffic noise source where practicable or located so they do not have direct line of sight to the traffic noise source.

e. Glazing additional requirements:

The sound reduction of windows and doors are based on the requirement that suitable acoustic seals are provided to prevent sound leakage around each building element.

All external glass windows and doors must:

- have a seal to restrict air infiltration fitted to each edge of an operable window; and
- within doors or fixed framing, glazing must be set and sealed using an airtight arrangement of non-hardening sealant, soft rubber (elastomer) gasket and / or or glazing tape; and
- all external doors must have compressible silicon based rubber seals to the full perimeter and a drop seal to provide an airtight seal when closed.

In this context, a seal is foam or silicon based rubber compressible strip, fibrous seal with vinyl fin interleaf or the like. Brush / pile type seals without this seal included are not allowed.

f. External Play Areas

- (1) EPA1 and EPA2 fronting onto Matheson Road can be used continuously; and
- (2) EPA1 and EPA3 fronting onto Canning Hwy can be used during non-peak hour traffic between 0930 to 1430 hrs.

g. Fences/Walls to 1st Floor (EPA2 & EPA3) and Ground floor (EPA1 & Carpark) side:

- (1) Ground floor boundary fences/walls to the Canning Hwy, Cunningham St and Carpark minimum 1800 high solid walls/fences including gates minimum surface density 15 kg/m² (colorbond is not acceptable); and
- (2) First floor EPA2 and EPA 3 for acoustic purposes, all walls minimum 1800mm high and minimum surface density 15 kg/m² including glass/polycarbonate walls.

H4. Refer to the Section 'Recommendations' in the main body of the report.

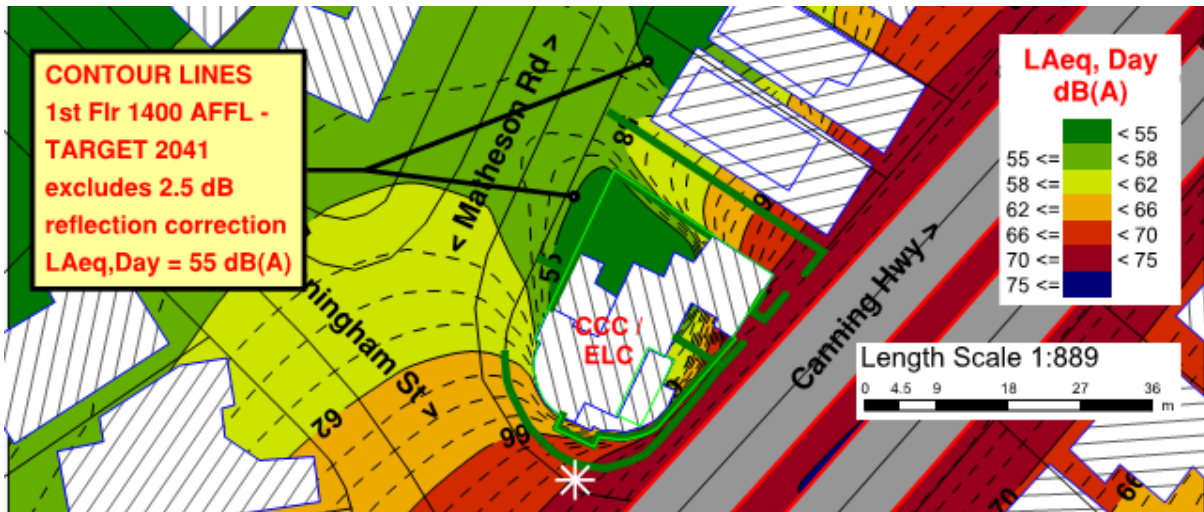


FIGURE H.0 – FIRST FLOOR OUTDOOR PLAY AREAS LAeq,Day

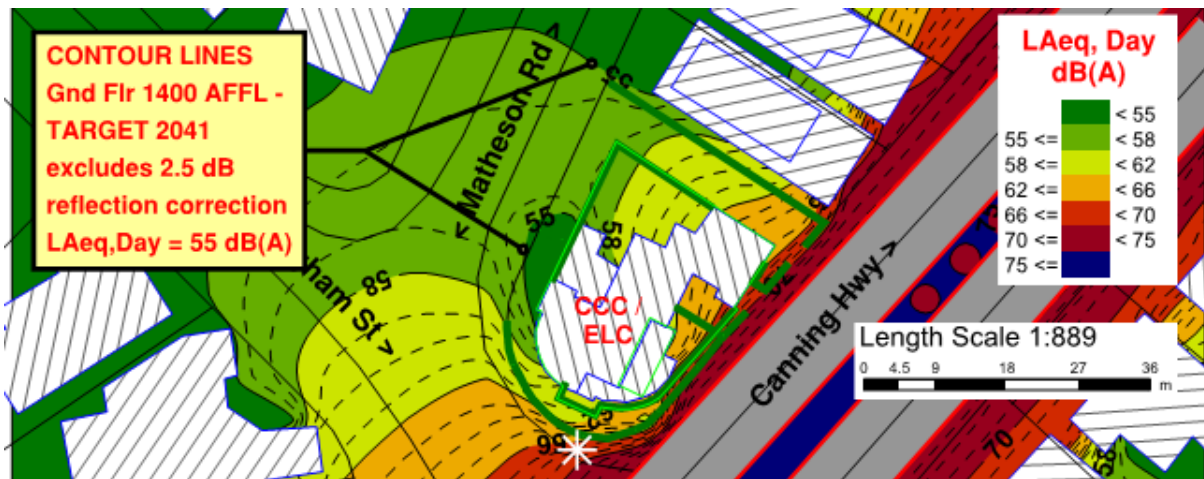


FIGURE H.1 – GROUND FLOOR OUTDOOR PLAY AREAS LAeq,Day

Notes:

0. North is top of page.
1. Façade reflection is not included.
2. Contour lines: AGFL = Above GROUND Floor Level; AFFL Above FIRST Floor Level; Topography in the small area of study, from Canning Hwy to Matheson Rd at most 50m, is essentially flat.
3. Traffic noise sources modeled using **SoundPlan 8** software with CoRTN algorithms with the traffic broken down into:
 - Light vehicle Austroads Classes 1 & 2 with the noise source modelled at 0.5m;
 - heavy vehicles Austroads Class 3 upwards with, the appropriate corrections made and,
 - the noise source modelled at 1.5m for engine noise and 3.6m for exhaust noise.
4. TABLE H.1 measurement location is shown as a white asterisk the above FIGURES H.0 and H.1.
5. NB - LAeq,Day for this CCC is 0700 to 1830 hrs (7am to 6.30pm).