ENVIRONMENTAL ASSESSMENT 2007072 (Rev. 0)

PROPOSED EARLY LEARNING CENTRE
BRIGHT BAMBINOS
LOT 99, 12 WARRADALE TERRACE, LANDSDALE WA 6064

prepared for

BRIGHT BAMBINOS
45 FLORIDA DRIVE, LANDSDALE WA 6064

PO Box 2124, Malaga WA 6944
E: ndengine@bigpond.net.au
T: (08) 9249 9619
M: 0412 679 431

ND Engineering
Consulting Engineers

nde

25 YEARS 1994 - 2019

CONTENTS:

SECTIONS:

ANNEXES:

REFERENCES:

A. Environmental Protection (Noise) Regulations 1997.

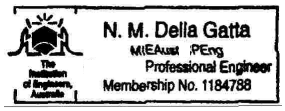
B. Drawings: 16 sheets dated 2020-07-06.

REVISIONS

Revision N°:	Date:	Issue / Comment	Status
0	28 JULY 2020	Issued for DA	Current

AUTHOR

N. M. DELLA GATTA
BE (Mech) UWA
M.IEAust



SUMMARY

0.1 ND Engineering's opinion is that the proposed Early Learning Centre (ELC) (also known as a Child Care Centre (CCC)) for the daytime periods of 0630 - 1830 hours Monday to Friday including if required Saturday 0630 - 1830 hours the assessed noise emissions will comply with the Noise Regulations (Reference A) subject to implementation of the recommendations contained in Section 5 'Recommendations'.

0.2 It should be noted that this assessment is based on the assumption that surrounding residences remain essentially unchanged at the time of writing this report.

INTRODUCTION

1.1 ND Engineering was commissioned to provide an environmental acoustic assessment of the Noise emanating from the proposed ELC with regards to the surrounding Residential premises via Reference A being the Noise Regulations.

DESCRIPTION

2.1.1 The proposed ELC site is located in Landsdale WA on Warradale Terrace with no significant traffic noise sources nearby. See ANNEX A – LOCATION.

2.1.2 The nearest noise sensitive premises, either residential or equivalent, of relevant interest are located:

a. Side adjoining on Warradale Terrace - Lot 98, No 10 & Lot 100, No 14; and

b. Rear adjoining - Lot 86, 7 Longwood Mews; and

c. Rear diagonal on Longwood Mews - Lot 87, No 5 and Lot 85 No 9; and

d. Opposite across Warradale Terrace Landsdale Primary School.

2.1.3 The assigned noise levels are contained in ANNEX C – ASSIGNED NOISE LEVELS.

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:

- Babies	0 – 2 years old	4x places	Babies Play Space
- Toddlers	2 – 3 years old	10x places	Toddlers Play space
- Kindy	3 – 5 years old	10x places	Kindy Play Space

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 Early Learning Centre (ELC) are typically expected to occur Monday to Friday between 0630 to 1830 hours and if required Saturday 0630 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 ELC at all. Anecdotal evidence indicates this is a desirable situation sought by some residences when purchasing properties adjacent to a ELC 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 ELC 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	LAmax
. . within 15 m of . .	Day	0700-1900 hrs Monday to Saturday	45	55	65
		0900-1900 hrs Sunday, Public holidays	40	50	
	Evening	1900-2200 hrs all days			55
	Night	2200-0700 hrs Monday to Saturday	35	45	
		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 ELC for the daytime periods of 0630 - 1830 hours Monday to Friday including if required Saturday 0830 - 1830 hours 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'; and

b. Non children noise emissions will comply with the Noise Regulations (Reference A) 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 ELC is to be operational for parents' usage, excluding public holidays, between 0630 - 1830 hours Monday to Friday and if required 0630 - 1830 hours Saturday; 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) There are no restrictions on the location of the children's play areas (UON) or number of children outdoors in any play area; and

(3) 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.

(6) Provide noise barriers as per FIGURE 5.1 – NOISE BARRIERS.

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 outdoors; 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) Do not locate the AC unit/s closer than 6 metres to any residential boundary UON; and

(b) 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

(c) 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

(d) Refrigerated AC units shall be inverter type with night-time 'quiet/silent' mode; and

(e) Refrigerated AC units shall have condenser fans pointing either West or East but not towards the North or South adjoining neighbours; and

(f) Refrigerated AC units shall each have a Sound Power Levels (Lw or SWL) not exceeding 70 dB(A) when operating at rated conditions; and

(g) Refrigerated AC units shall be positioned in any of the two proposed locations, but not more than two AC units in any one location, as shown in FIGURE 5.1 NOISE BARRIERS.
NB reconfirm locations once equipment details are fully documented for Building Licence/Permit purposes.

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 car 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

(4) Carpark be provided with 1800 mm high colour bond fences extended to the Western boundary on the Northern and Southern boundaries. NB the portion of the fence closest to Warradale Terrace may have truncation or tapering as per LGA requirements. See also FIGURE 5.1 – NOISE BARRIERS.

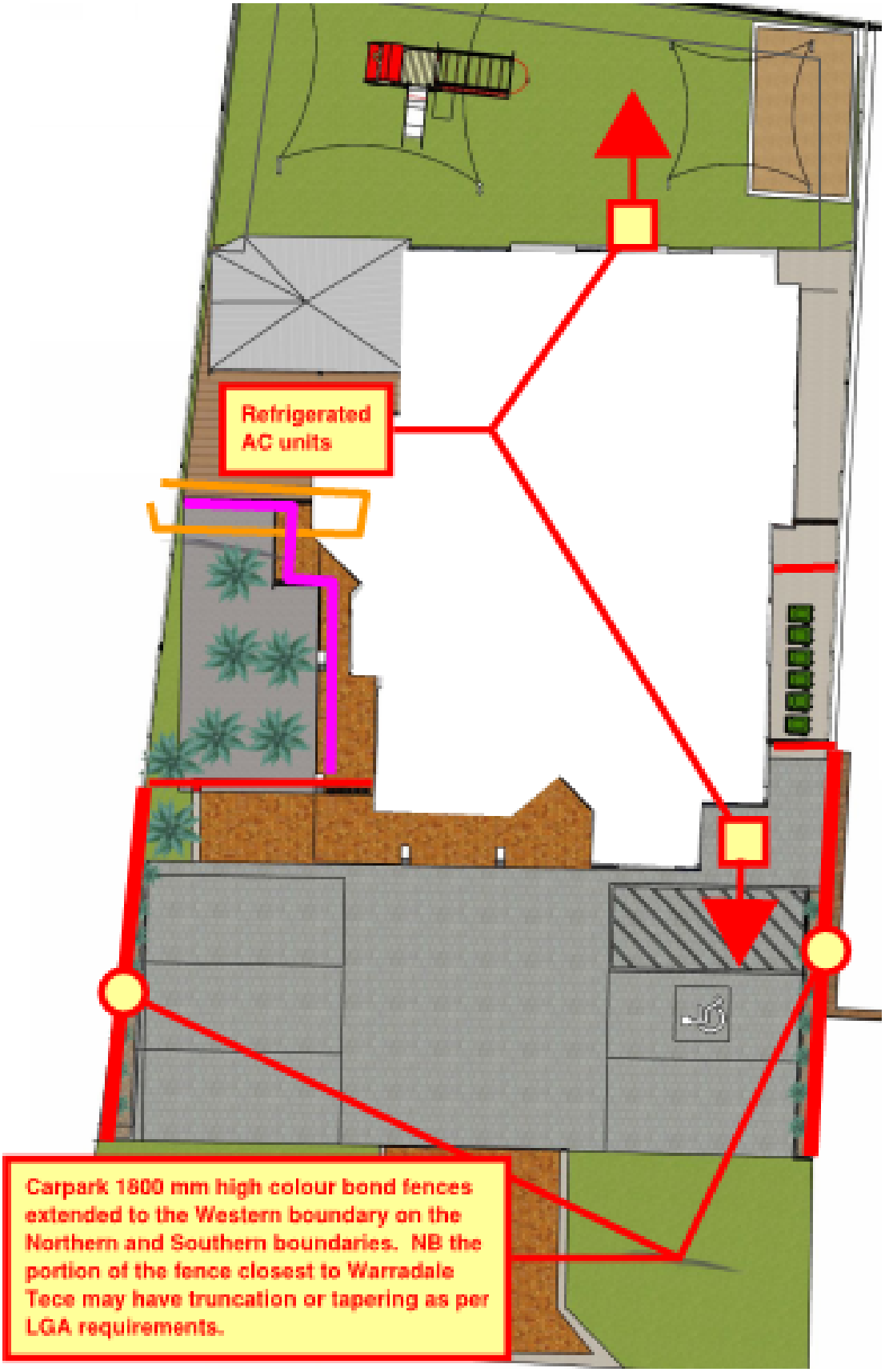


FIGURE 5.1 – NOISE BARRIERS

ANNEXES:

A. Location.

B. Site Plans.

C. Assigned Noise Levels.

D. Children.

E. Music.

F. Mechanical Services.

G. Carpark.

ANNEX A – LOCATION

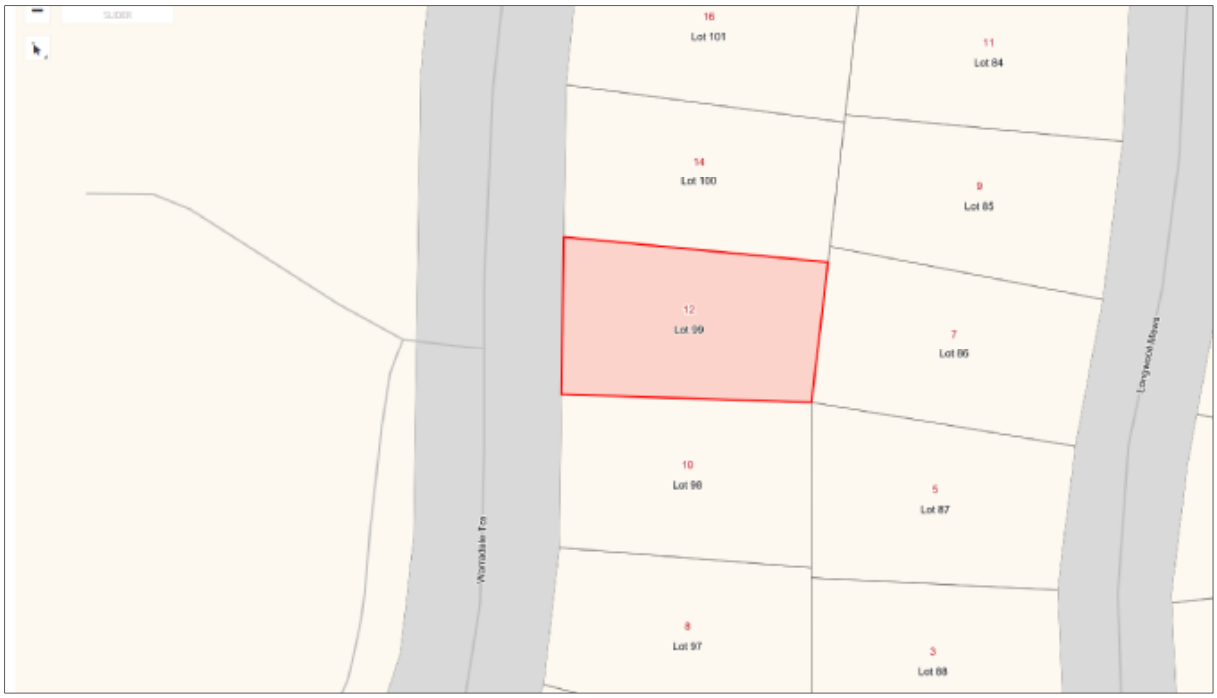


FIGURE A1 – SITE OVERVIEW 1 (North top of page)

FIGURE A2 – SITE OVERVIEW 2 (North top of page)

ANNEX B - SITE PLANS

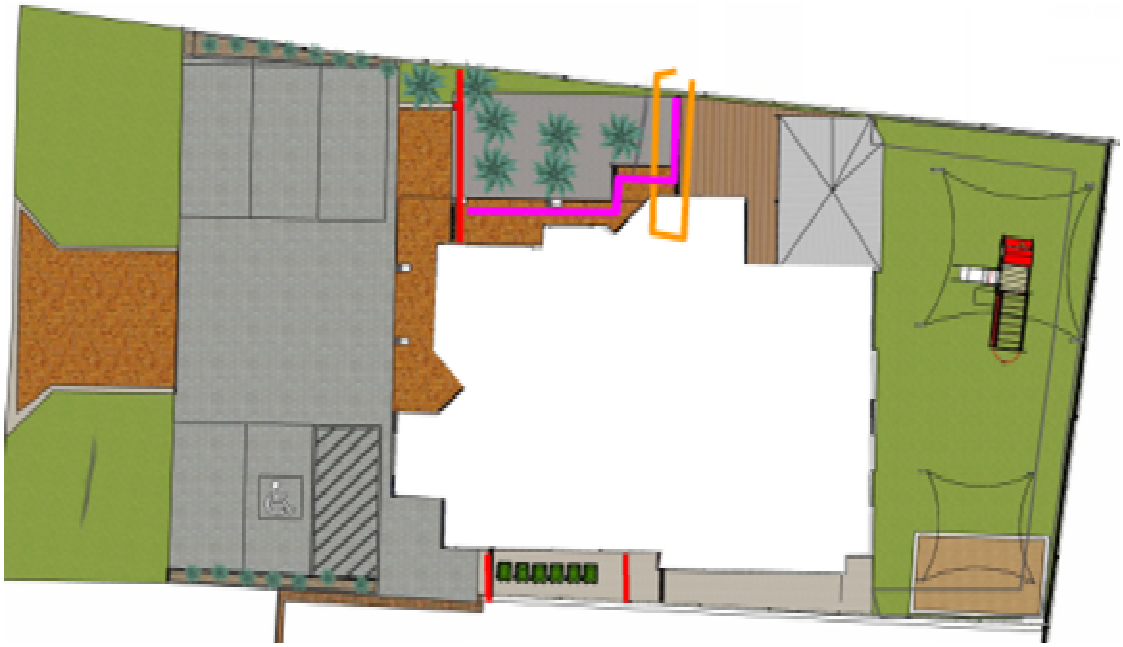


FIGURE B1 – FLOOR PLAN OVERVIEW (North top of page)

FIGURE B2 – FLOOR PLAN DETAIL (North top of page)

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 ELC would be 4 hours.

C3. Repeated attempts at obtaining statistical noise measurement data at various ELC without interference from traffic is difficult as most ELC 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 childcare centre.

Table C6 – INFLUENCING FACTOR ASSESSMENT for residences adjacent to ELC and closest to ELC

INFLUENCING FACTOR CRITERIA			ASSESSMENT		
Item	**Criteria**	**Value**	**Criteria**	**Value**	**Totals**
Major Road within the					0 (Transport Factor ≤ 6)
- 100 m radius inner circle	veh/day > 15000	6 dB	-	0	
- 450 m radius outer circle	veh / day > 15000	2 dB	-	0	
Minor Road within the					
- 100 m radius inner circle	15k > veh/day > 6k	2 dB	-	0	
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 %	0.0	
Type B 'Commercial premises' within the					
- 100 m radius inner circle	1/20 x Area%	≤ 5	0 %	0	
- 450 m radius outer circle	1/20 x Area%	≤ 5	0 %	0	
					INFLUENCING FACTOR = 0 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 adjacent to ELC and closest to ELC

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**	55	**65**
		0900-1900 hrs Sunday, Public holidays	40	50	
	Evening	1900-2200 hrs all days			55
	Night	2200-0700 hrs Monday to Saturday	35	45	
		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 (ELC) are expected to occur Monday to Friday between 0630 to 1830 hours and if applicable Saturday 0630 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 ELC at all.

D2. Anecdotal evidence indicates this is a desirable situation sought by some residences when purchasing properties adjacent to a ELC 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 ELC 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 ELC staff since year 2000. Their external play time is less than the Kindy but more than the Babies 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 ELC's that ND Engineering has been reporting upon.

c. **Babies 0 - 2 years old:**

This is a very low noise producing group based on observations and discussions with ELC 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 ELC'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 ELC operators since year 2005. There are some variations between ELC but it is generally consistent with ND Engineering experience with the ELC 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 10 children depending upon supervision levels, with play times being staggered with children being rotated between outdoor and indoor activities.

Children 0 to 3 years old - Assessment

D5.1 The Babies 0 - 2 years old is a very low noise producing group based on observations and discussions with ELC 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 ELC staff. Their external play time is generally less than the Kindy but more than the Babies 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 ELC'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 Babies 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:

a. Low noise output of this age group; and

b. 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

c. 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:

a. LAmax Sound Pressure Lp = 82 dB(A) @ 1.0 m for a single child shouting,

Sound Power Lw = 90 dB(A) for a single child,

Note that LAmax is time independent;

b. 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;

c. LA10 Sound Pressure Lp = 65 dB(A) @ 1.0 m for a single child,

Sound Power Lw = 74 dB(A) for a single child,

(Sound Power Lw = 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 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.

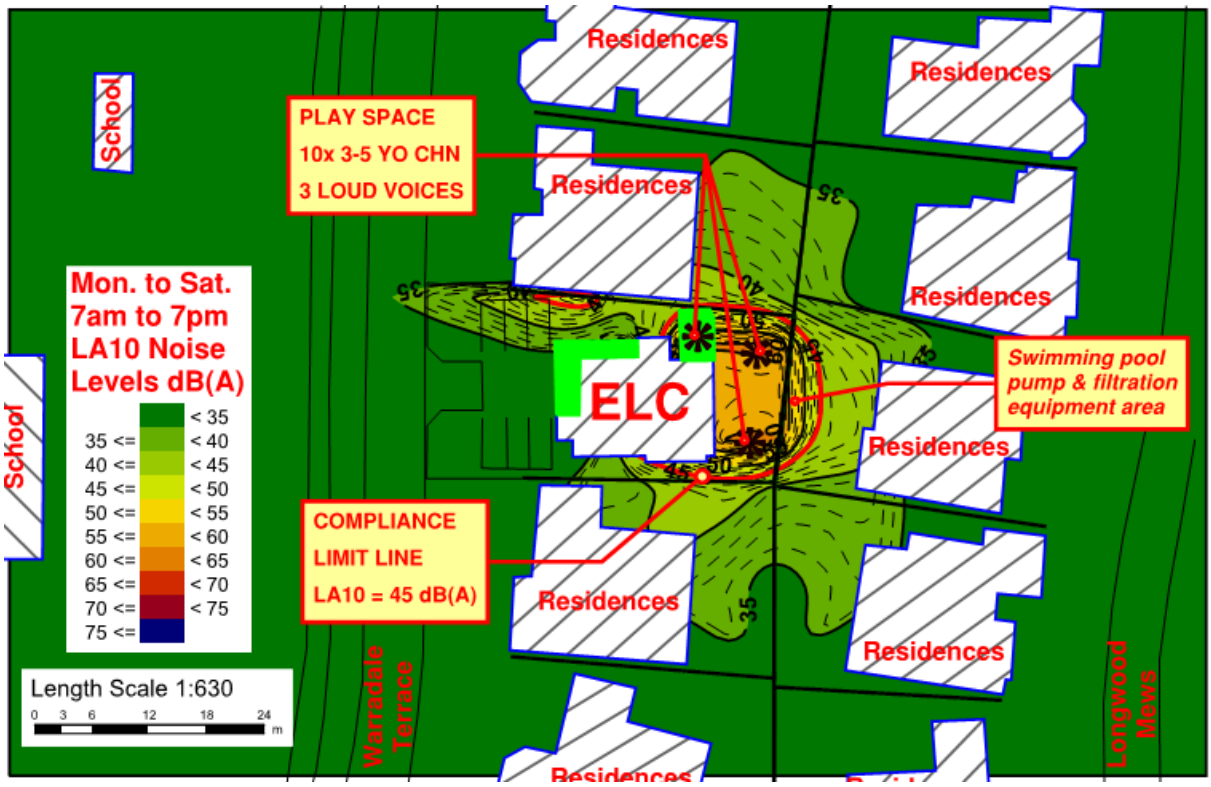


Figure D6.1 – OUTDOOR PLAY AREA LA_{10}

Notes:

0. North is top of page.

1. Absenteeism is ignored.

2. Receiver 1400mm high with Children (Chn) noise sources at 1000mm high.

3. Noise barriers, existing fences, required as shown.

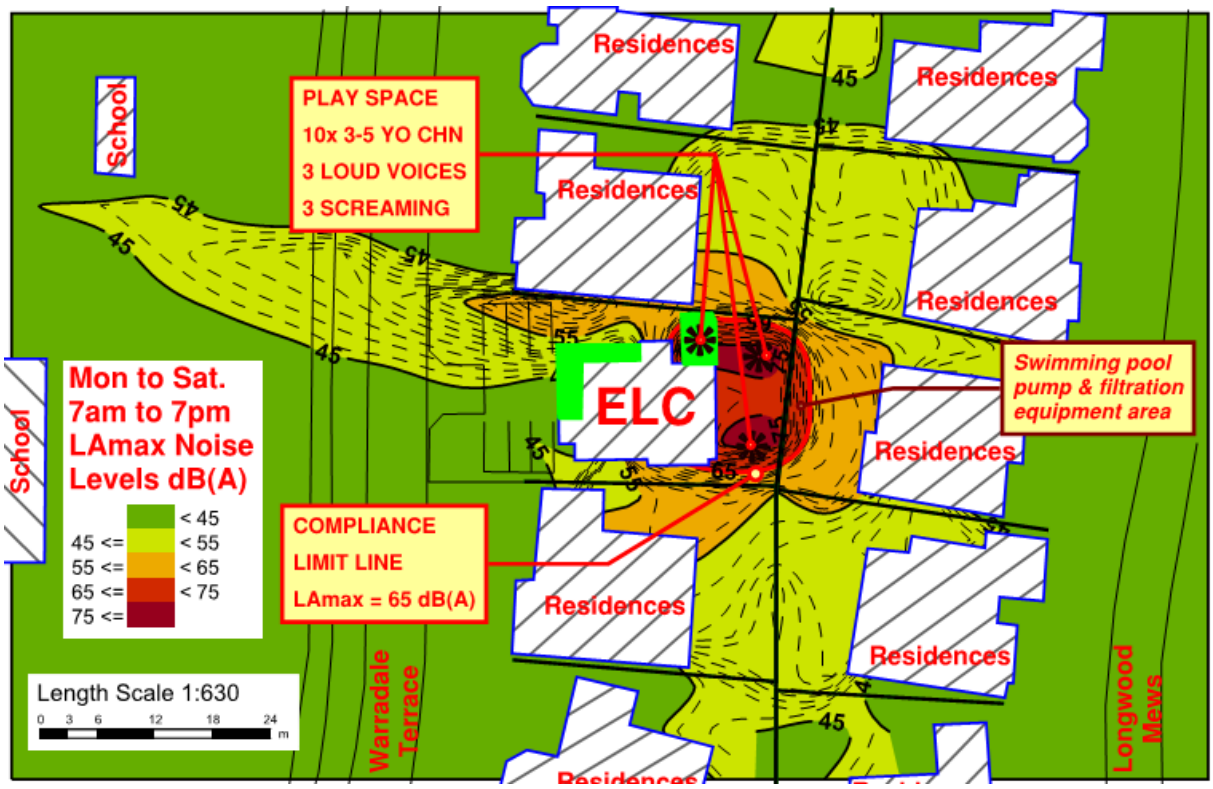


Figure D6.2 – OUTDOOR PLAY AREAS LA_{MAX}

Notes:

0. North is top of page.

1. Absenteeism is ignored.

2. Receiver 1400mm high with Children (Chn) noise sources at 1000mm high.

3. Noise barriers, existing fences, required as shown.

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 rooms;

(1) With an external non-boundary wall having either window or wall mounted exhaust fans; and

(2) 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 0630 to 1830 hours Monday to Friday and maybe including Saturday 0630 - 1830 hours.

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. Do not locate the AC unit/s closer than 6 metres to any residential boundary UON; and

b. 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

c. 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

d. Refrigerated AC units shall be inverter type with night-time 'quiet/silent' mode; and

e. Refrigerated AC units shall have condenser fans pointing ither West or East but not towards the North or South adjoining neighbours; and

f. Refrigerated AC units shall each have a Sound Power Levels (Lw or SWL) not exceeding 70 dB(A) when operating at rated conditions; and

g. Refrigerated AC units shall be positioned in any of the two proposed locations, but not more than two AC units in any one location, as shown in FIGURE 5.1 NOISE BARRIERS. NB reconfirm locations once equipment details are fully documented for Building Licence/Permit purposes.

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.

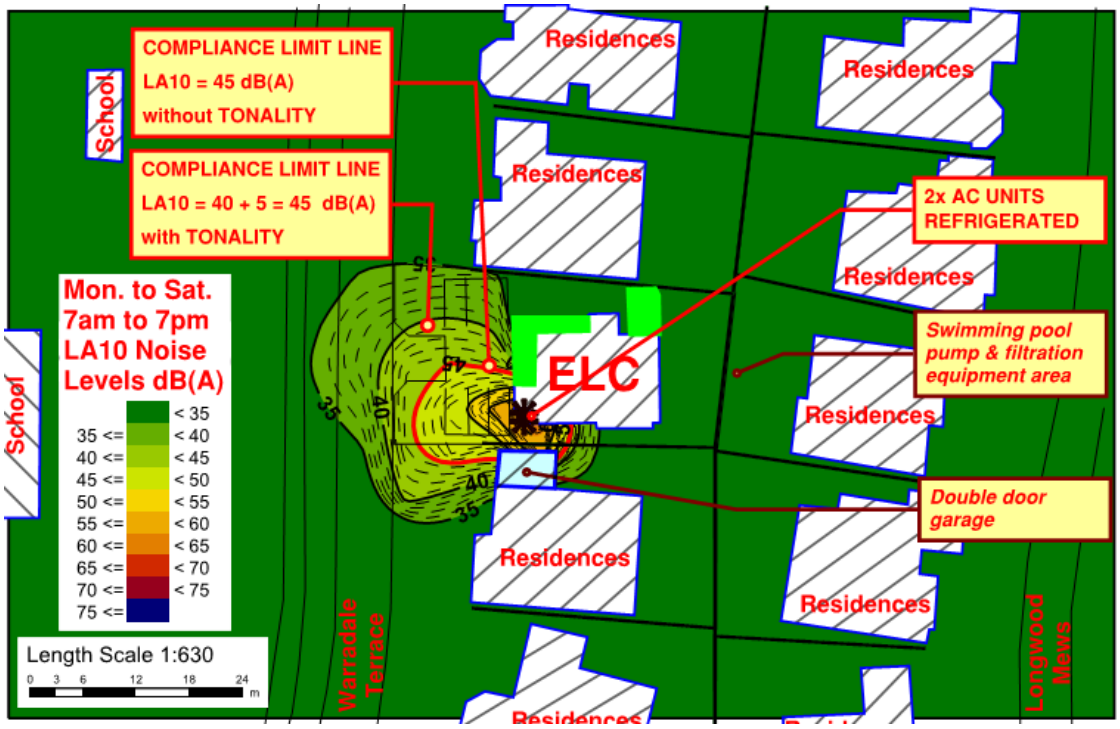


FIGURE F.1 – FRONT OPTION AC UNITS LA10 Without & With Tonality

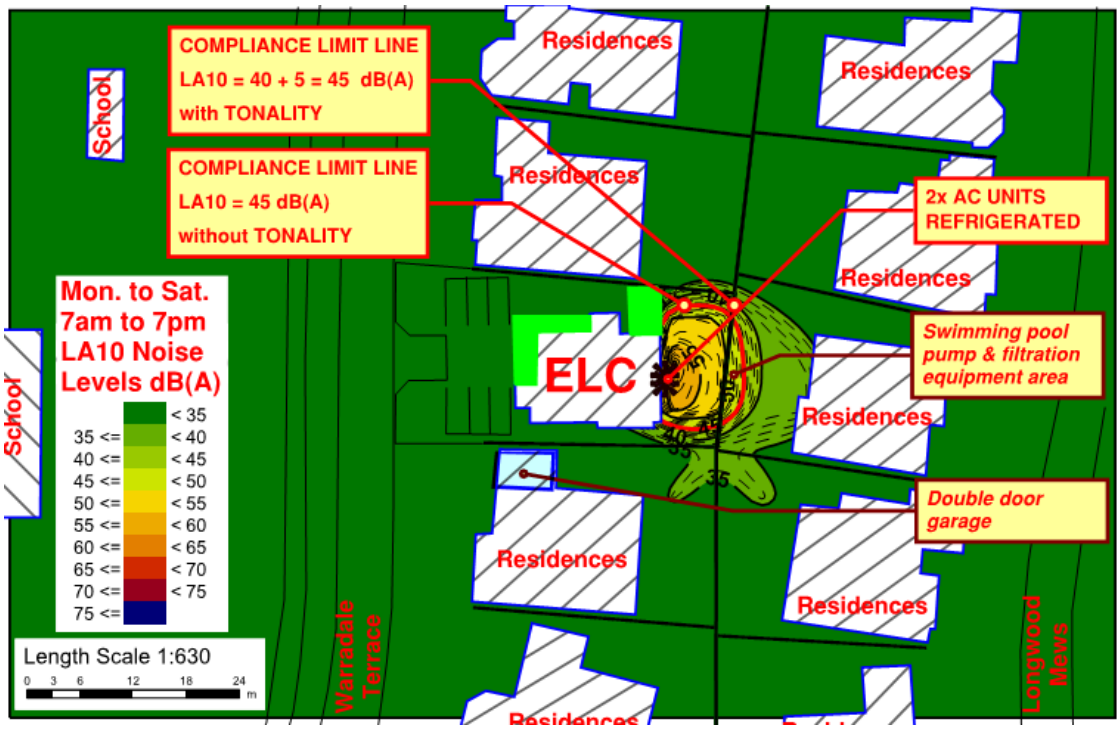


FIGURE F.1 – REAR OPTION AC UNITS LA10 Without & With Tonality

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 ELC staff. The ELC 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 ELC doors.

G3 Observations on various ELC 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 ELC 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 ELC building side.

G4.2 A series of three noise measurements on site at the Kids Campus ELC side of the residential boundary showed noise levels as follows: Cars doors closing LAmax = 54 to 58 dB(A) at approximately 10 metres; and Children talking about LAmax = 50 dB(A) at approximately 10 metres.

ND Engineering measurement point near the residential boundary was located about 10 metres from the ELC 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 ELC 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 LAmax measured values.

G4.3 These LAmax 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:

a. Staff will be instructed not to arrive prior to 0600 hours and to be off site by 1900 hours and park in the designated car bays; and

b. Signage is placed within the carpark asking parents/staff not to slam car doors/boots; and

c. Signage is placed within the carpark asking parents/staff not to play music; and

d. Noise wall required to south and East extent of the carpark , 1800 mm high and the use of colour bond is acceptable. See FIGURES G1 & G2 and 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 BAYS NE & NW LA_{MAX} NON-IMPULSIVE

FIGURE G.2 – CARPARK BAYS SE & SW LA_{MAX} NON-IMPULSIVE

NOTES:

0. North is top of page.

1. Compliance limit line is LAmax 65 dB(A) after 0700 hrs, and LAmax 55 dB(A) before 0700 hrs.

2. Receiver 1400mm AFGL with Car Door closing noise sources at 1000mm AFGL.

3. Noise barriers required as shown

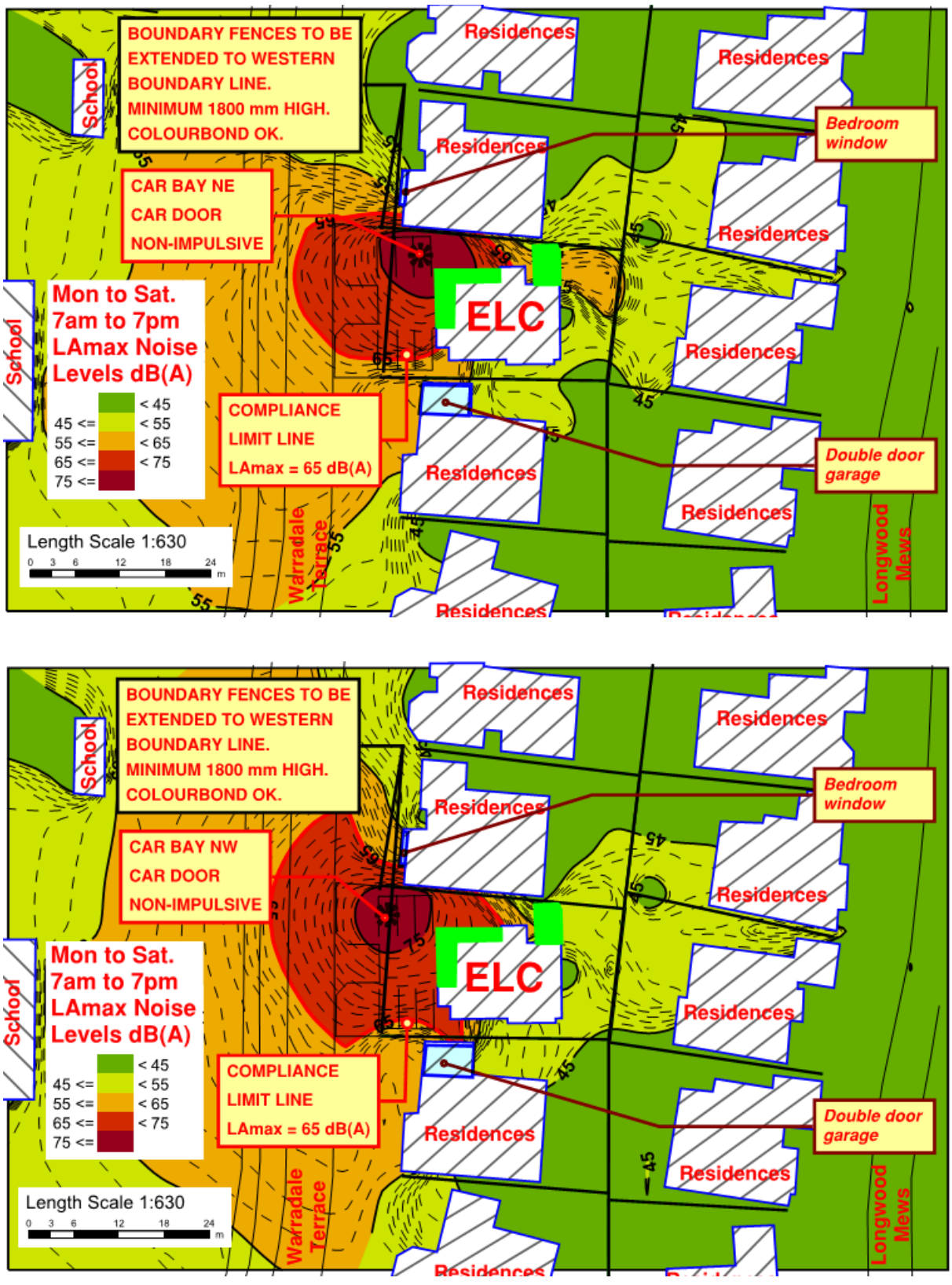


FIGURE G.1 – CARPARK BAYS NE & NW - LA_{MAX} NON-IMPULSIVE

.

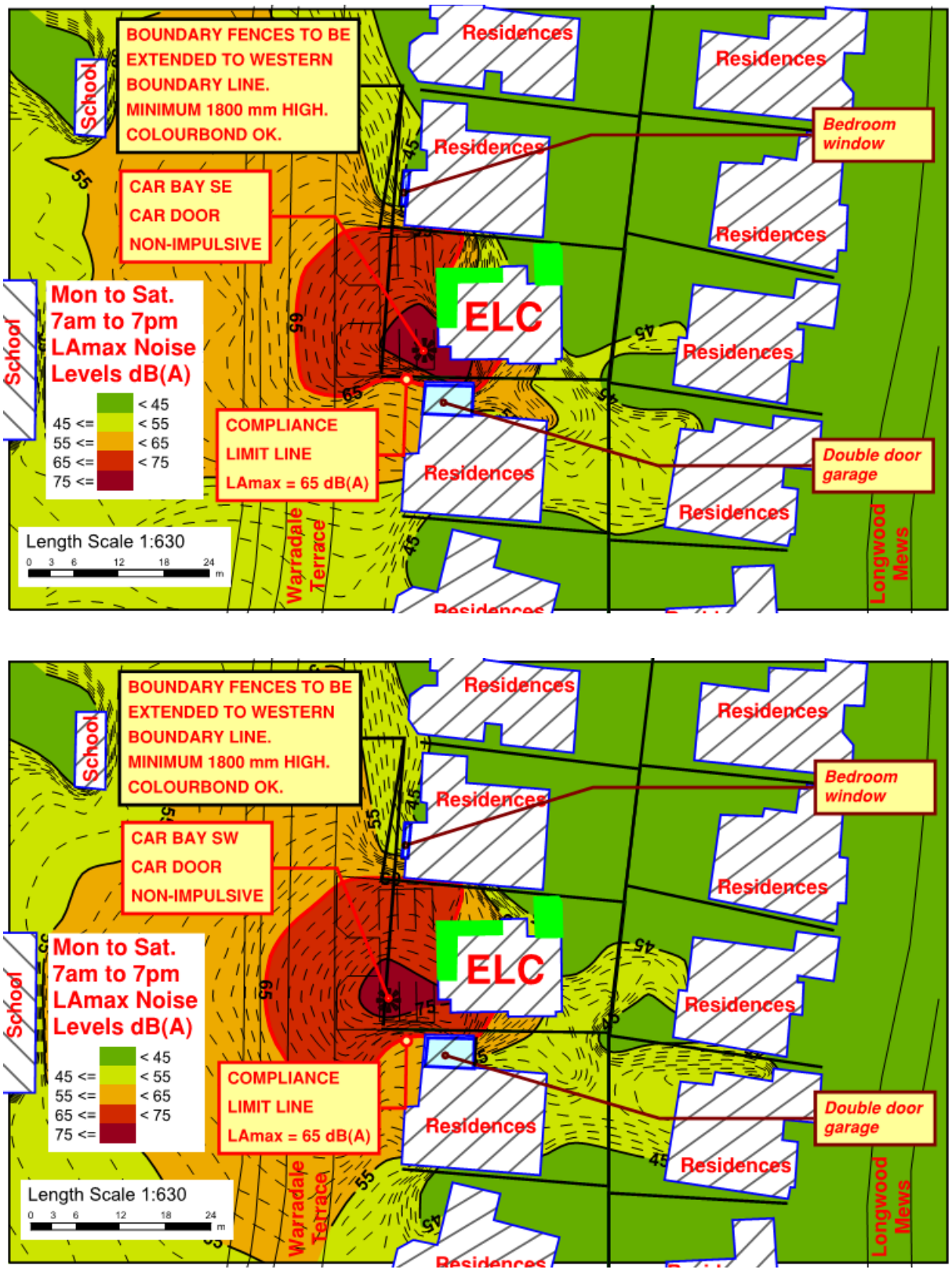


FIGURE G.3 – CARPARK BAYS SE & SW - LA_{MAX} NON-IMPULSIVE