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Childcare Noise Impact Assessment

Lots 319-325 Castlemead Drive, Yanchep

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16-Dec-20	0	Issued to Client	Olivier Mallié	Terry George
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1 INTRODUCTION

It is proposed to develop the land located at Lots 319-325 Castlemead Drive in Yanchep (refer *Figure 1-1*) into a childcare centre. The site is noted to be within the Vertex Yanchep residential development. The proposed childcare centre will consist of the following:

- One childcare building capable of accommodating up to 94 children, grouped as follows:
  - Activity 1, 6-15 months, 12 children
  - Activity 2, 15-24 months, 12 children
  - Activity 3, 2 to 3 years old, 20 children
  - Activity 4, 3 to 4 years old, 20 children
  - Activity 5, 4 years or over, 30 children
- One outdoor play area extending to the west and north of the childcare building,
- Amenities and associated mechanical plant such as:
  - kitchen with range-hood and exhaust fan assumed to be located on the roof above,
  - Various exhaust fans (toilets, laundry, nappy room) assumed to be located on the roof above, and
  - AC plant located, assumed to be located on the roof of the childcare building, and
- Car parking with 33 bays on the east side of the building.

This report presents the assessment of the noise emissions from child play, car doors closing in the car park and mechanical plant associated with the childcare centre against the *Environmental Protection (Noise) Regulations 1997* (the Regulations) based on the development drawings shown in *Appendix A*.

The proposed hours of operation are 6.30am to 6.30pm Monday to Friday. Therefore, it is expected for staff and parents to arrive and park before 7.00am, which is during the night-time period of the Regulations. However, it is noted that outdoor child play would not occur prior to 7.00am.

Appendix C contains a description of some of the terminology used throughout this report.

Figure 1-1 Project Locality

2 CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

Regulation 7 defines the prescribed standard for noise emissions as follows:

"7. (1) Noise emitted from any premises or public place when received at other premises –

(a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

(b) Must be free of –

i. tonality;

ii. impulsiveness; and

iii. modulation,

when assessed under regulation 9"

A "…noise emission is taken to significantly contribute to a level of noise if the noise emission … exceeds a value which is 5 dB below the assigned level…"

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

(a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

(b) The noise emission complies with the standard prescribed under regulation 7 after the adjustments of *Table 2-1* are made to the noise emission as measured at the point of reception.

Table 2-1 Adjustments Where Characteristics Cannot Be Removed

Where Noise Emission is Not Music			Where Noise Emission is Music	
Tonality	Modulation	Impulsiveness	No Impulsiveness	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

Note: The above are cumulative to a maximum of 15dB.

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown in *Table 2-2*.

Table 2-2 Baseline Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

The influencing factor, applicable at the noise sensitive premises has been calculated as 0 dB on the basis the land within 450 metres of the adjacent residential lots is for residential use i.e. Vertex Yanchep residential development (refer *Appendix B*). The transport factor has been calculated as 2 dB, due to Yanchep Beach Road being considered a secondary road within 100 metres (reference City of Wanneroo June 2019 traffic count between Spinnaker Boulevard and Booderee Road showing 7,714 vehicles per day).

The applicable assigned noise levels, including the influencing factor and transport factor, are summarised in *Table 2-3.*

Table 2-3 Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	47	57	67
	0900 to 1900 hours Sunday and public holidays (Sunday)	42	52	67
	1900 to 2200 hours all days (Evening)	42	52	57
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	37	47	57

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

It must be noted the assigned noise levels above apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces. Where this was not possible to be achieved due to the close proximity of existing buildings and/or fences, the noise emissions were assessed at a point within 1 metre from building facades and a -2 dB adjustment was made to the predicted noise levels to account for reflected noise.

It is noted the assigned noise levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as *a period of time of not less than 15 minutes, and not exceeding 4 hours*, which is determined by an *inspector* or *authorised person* to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission. An *inspector* or *authorised person* is a person appointed under Sections 87 & 88 of the *Environmental Protection Act 1986* and include Local Government Environmental Health Officers and Officers from the Department of Environment Regulation. Acoustic consultants or other environmental consultants are not appointed as an *inspector* or *authorised person*. Therefore, whilst this assessment is based on a 4 hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

3 METHODOLOGY

Computer modelling has been used to predict noise levels at each nearby receiver. The software used was *SoundPLAN 8.2* with the ISO 9613 (ISO 17534-3 improved method) algorithms selected. These algorithms have been selected as they include the influence of wind and atmospheric stability. Input data required in the model are:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1 Meteorological Information

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

Table 3-1 Modelling Meteorological Conditions

Parameter	Night (1900-0700)	Day (0700-1900)
Temperature (^{o}C)	15	20
Humidity (%)	50	50
Wind Speed (m/s)	Up to 5	Up to 5
Wind Direction*	All	All

* Note that the modelling package used allows for all wind directions to be modelled simultaneously.

It is generally considered that compliance with the assigned noise levels needs to be demonstrated for 98% of the time, during the day and night periods, for the month of the year in which the worst-case weather conditions prevail. In most cases, the above conditions occur for more than 2% of the time and therefore must be satisfied.

3.2 Buildings, Fences and Receivers

Surrounding existing buildings were included in the noise model, as these can provide noise shielding as well as reflection paths.

The childcare centre building was modelled at 6 metres high. All future residential houses were modelled as single storey buildings 3.5 metres high, based on existing houses along Rondo Way and Spinnaker Boulevard. Receivers are then located 1.5 metres above ground level. The small outdoor storage shed was modelled as a 2.4 metre high building. Finally, a 1.8 metre high fence was assumed around the bin store.

Fencing along the boundary of the childcare centre was initially taken to be open style, therefore not providing any acoustic benefits. Sheet metal fencing was assumed between lots and on the lots boundary, which was modelled as 1.6 metres high to account for noise leakage through the fence.

3.3 Topographical Data

Topographical information was based on data provided by the project and that publicly available (e.g. *Google*) in the form of spot heights.

The topography slopes up in a westerly direction with Castlemead Drive sloping up from circa 29.1 AHD to 32.6 AHD at the west boundary of Lot 325. The childcare centre levels range between 29.5 AHD and 31.46 AHD, with the outdoor area at 31.36 AHD.

Finished levels for the surrounding existing and future lots were taken from the Vertex Yanchep development stages by LWP (refer *Appendix B*).

3.4 Ground Absorption

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. asphalt, concrete) and 1 for acoustically absorbent ground (e.g. grass/sand). In this instance, a value of 1 has been used for the outdoor play area and any grassed areas, and 0 for the surroundings including roads, pavement, driveways, etc.

3.5 Source Sound Levels

The sound power levels used in the modelling are provided in *Table 3-2*.

Table 3-2 Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Child play 0-2 Years (10 kids), L_{10}	54	60	66	72	74	71	67	64	**78**
Child play 2-3 Years (10 kids), L_{10}	61	67	73	79	81	78	74	70	**85**
Child play 3+ Years (10 kids), L_{10}	64	70	75	81	83	80	76	72	**87**
AC plant, each, L_{10}	88	85	80	76	71	68	61	56	**78**
Toilet / Laundry / Change Exhaust Fan, L_{10}	60	65	62	63	60	61	56	53	**67**
Kitchen exhaust fan, L_{10}	50	64	62	70	69	66	62	50	**73**
Closing Car Door, L_{max}	71	74	77	81	80	78	72	61	**84**

The following is noted in relation to the source levels in *Table 3-2*:

- Based on similar projects, three AC condensing units were assumed to be required for the various spaces. Each was modelled as a point source located 1.0 metre below the roof ridge height and on the south side of the roof ridge.

- Car doors closing were modelled as a point source 1.0 metre above ground level.
- Other mechanical plant includes six exhaust fans (toilets and laundry) and one kitchen exhaust/rangehood fan. All were modelled as point sources 0.5 metres above roof level and nominally above the area serviced.
- Child play source levels are based on Guideline 3.0 provided by the Association of Australasian Acoustical Consultants (AAAC) published in September 2020. Where the number of children for individual play areas is specified in the plans, these have been adjusted from the reference source levels using appropriate acoustical calculations. Outdoor child play was modelled as area sources at 1-metre heights above ground level. The sound power levels used in the model were scaled as follows:
    - 12 children aged 0-2 years (Activity and 2) = 78 dB(A)
    - 20 children aged 2-3 years (Activity 3) = 88 dB(A)
    - 20 children aged 3-4 years (Activity 4) =90 dB(A)
    - 30 children aged 4-5 years (Activity 5) = 91 dB(A)

Combining all of the above, results in the 3-dimentsional noise model shown in *Figure 3-1*.

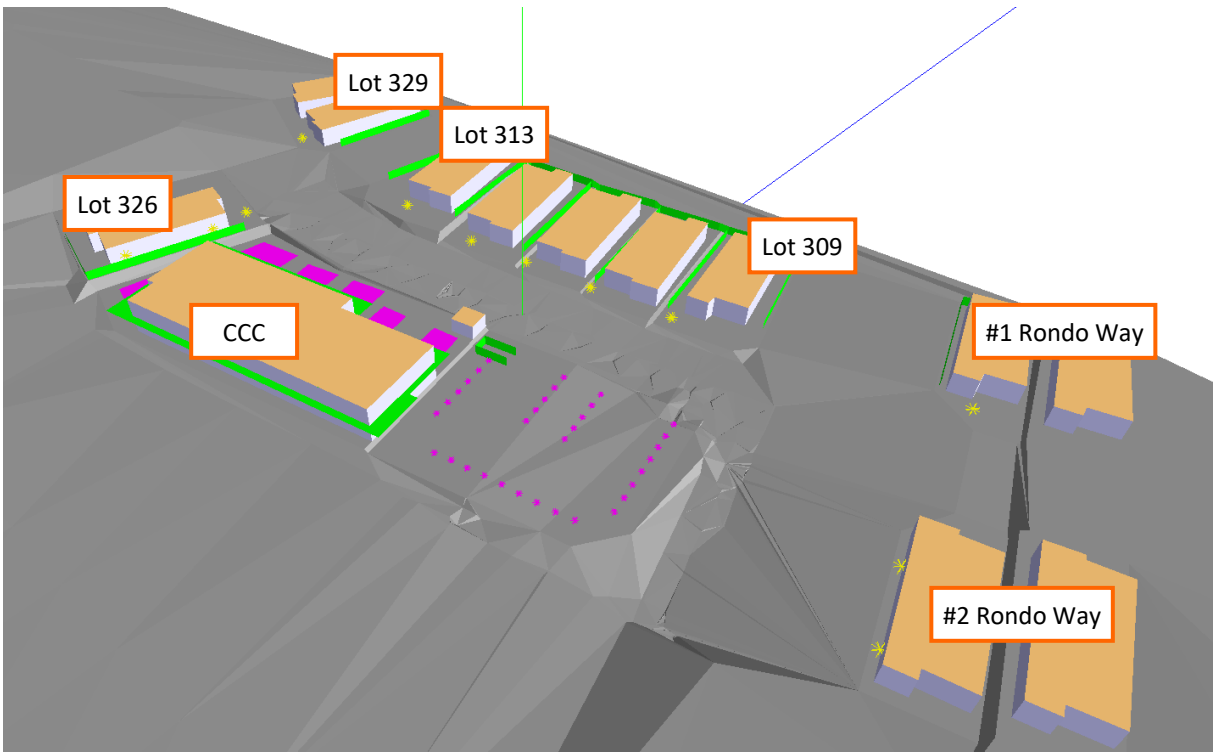


Figure 3-1 Noise Model 3D View

4 RESULTS

4.1 Outdoor Child Play

The childcare development will host up to 94 children. It is noted play time is generally staggered and therefore not all children would be playing outside at once for extended periods of time. However, to provide for maximum flexibility, noise levels were predicted for all children playing outside simultaneously for extended periods of time.

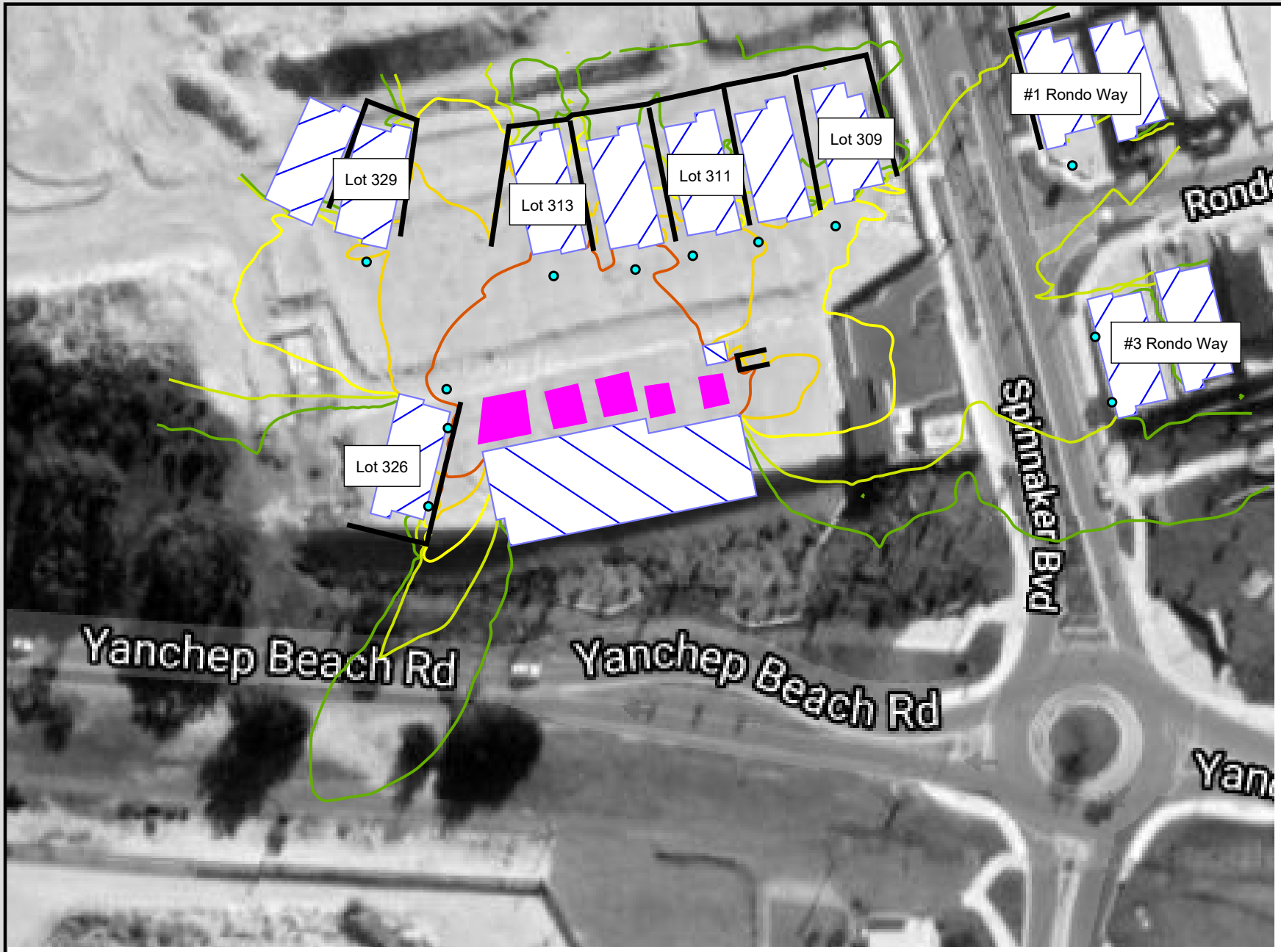
Given the layout of the childcare building and outdoor play areas, it is noted that Activity 5 children have also access to the western part of the outdoor play area. Therefore, predictions were made on the basis that all 30 children in Activity 5 either play in the northern or western part of the outdoor area, with the noise levels from both scenarios presented in *Table 4-1*.

It is noted the predicted noise levels are from child play only i.e. mechanical plant noise is not included. *Figure 4-1* and *Figure 4-2* also show the predicted noise levels for both scenarios as noise contours maps at ground level (1.5 metres AGL).

Table 4-1 Predicted Noise Levels of Child Play, dB L_{A10}

Receiver	Floor	Façade	Child Play Noise Levels		Highest Levels
			Activity 5 North	Activity 5 West	
#1 Rondo Way	GF	-	43	41	43
#2 Rondo Way	GF	W	43	41	43
Lot 309	GF	-	49	48	49
Lot 310	GF	-	53	52	53
Lot 311	GF	-	54	53	54
Lot 312	GF	-	58	57	58
Lot 313	GF	-	60	58	60
Lot 326 front yard	GF	-	61	55	61
Lot 326 back	GF	E	47	54	54
Lot 326 front	GF	E	54	53	54
Lot 329	GF	-	51	49	51

Figure 4-1



Predicted Noise level L_{A10} dB

- = 37
- = 42
- = 47
- = 52
- = 57

N

Signs and symbols

- Proposed building
- Point source
- Receiver
- Fence
- Outdoor Childplay

Lots 319-325 Childcare Centre - Child Play (Activity 5 North) Predicted Noise Levels

L_{A10} Ground Level Noise Level Contours

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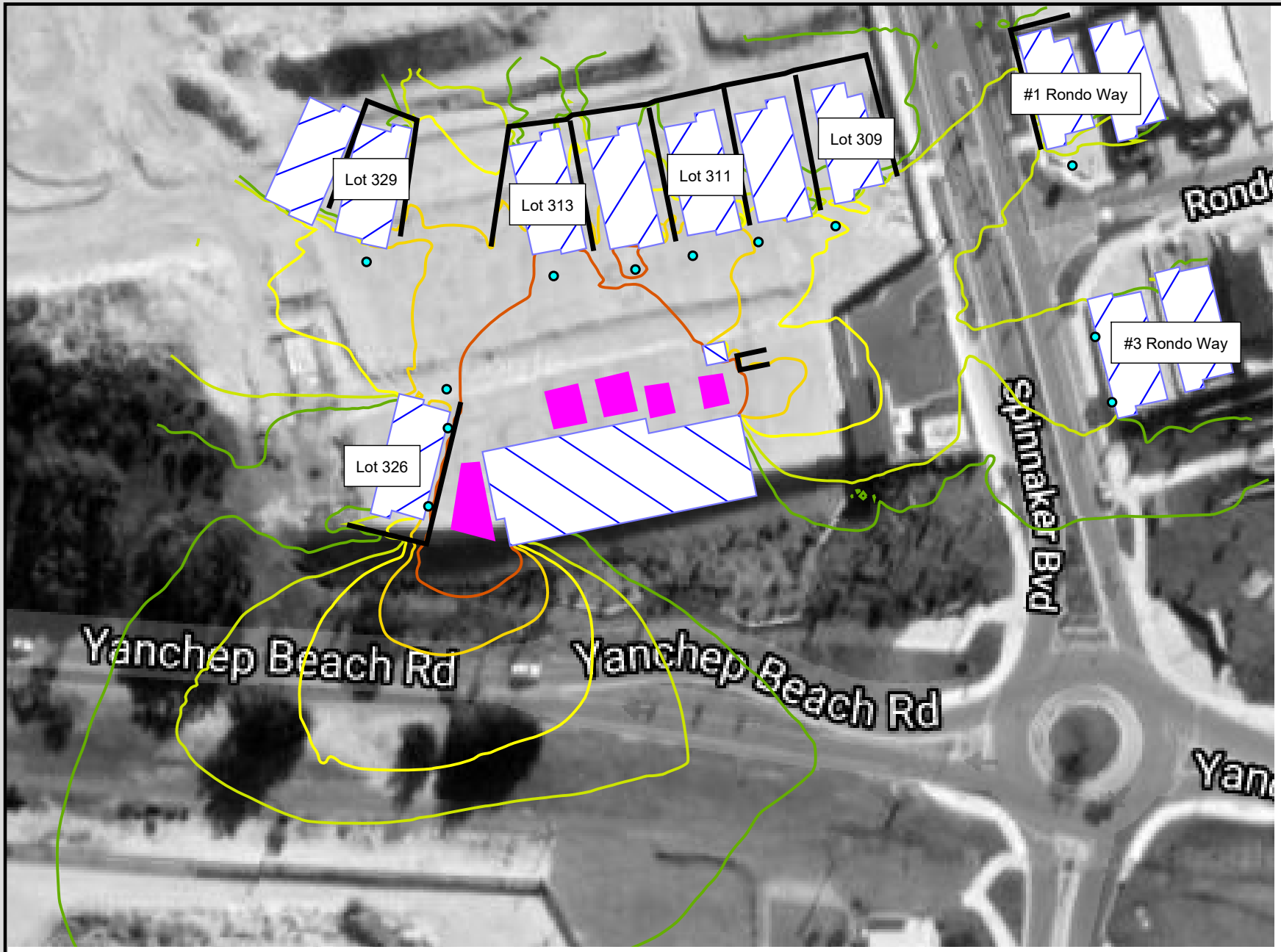

Figure 4-2

Predicted Noise level
L_{A10} dB

	= 37
	= 42
	= 47
	= 52
	= 57

N

Signs and symbols

- Proposed building
- Point source
- Receiver
- Fence
- Outdoor Childplay

Lots 319-325 Childcare Centre - Child Play (Activity 5 West) Predicted Noise Levels
L_{A10} Ground Level Noise Level Contours

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4.2 Mechanical Plant

Mechanical plant consists of AC plant and extraction fans for the kitchen, toilets and laundry. All plant were assumed to be located on the roof as shown on *Figure 4-3*.

Since the childcare centre opens from 6.30 am it was considered that all plant can be operating simultaneously at night-time (i.e. before 7.00 am). The predicted mechanical plant noise levels are presented in *Table 4-2*, including the contribution for each source group i.e. extraction fans or AC plant. *Figure 4-2* also shows the predicted noise levels as a noise contour map at ground level (1.5 metres AGL).

Table 4-2 Predicted Noise Levels of Mechanical Plant, dB L_{A10}

Receiver	Floor	Façade	Mechanical Plant		Overall
			Fans	ACs	
#1 Rondo Way	GF	-	23	29	30
#2 Rondo Way	GF	W	25	33	33
Lot 309	GF	-	24	29	30
Lot 310	GF	-	25	30	31
Lot 311	GF	-	27	30	32
Lot 312	GF	-	31	32	35
Lot 313	GF	-	32	33	35
Lot 326 front yard	GF	-	31	33	35
Lot 326 back	GF	E	32	39	40
Lot 326 front	GF	E	31	34	36
Lot 329	GF	-	27	29	31

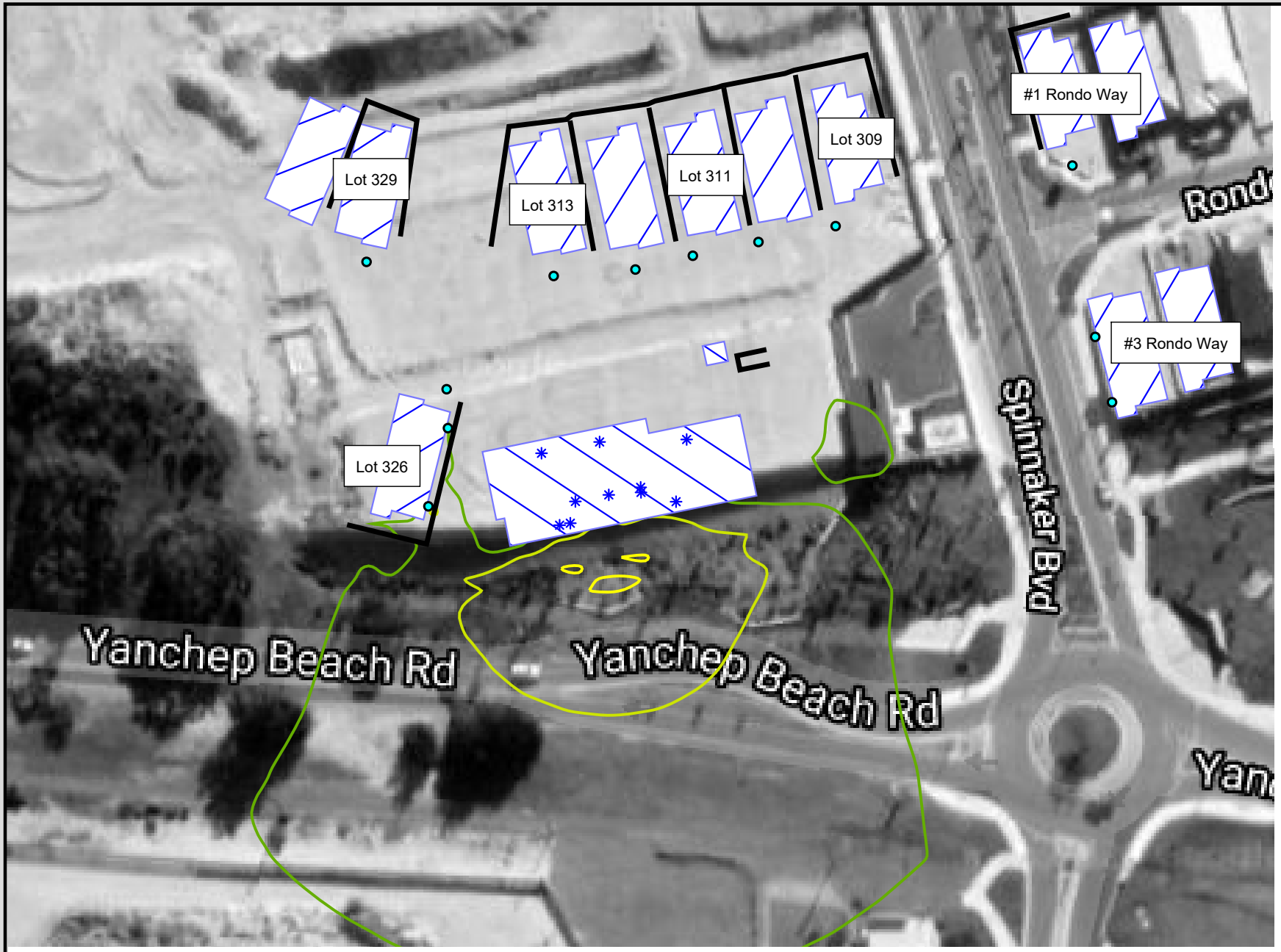

Figure 4-3

Predicted Noise level
L_{A10} dB

= 37
= 42
= 47
= 52
= 57

N

Signs and symbols

- Proposed building
- Point source
- Receiver
- Fence

Lots 319-325 Childcare Centre - Mechanical Plant Predicted Noise Levels
L_{A10} Ground Level Noise Level Contours

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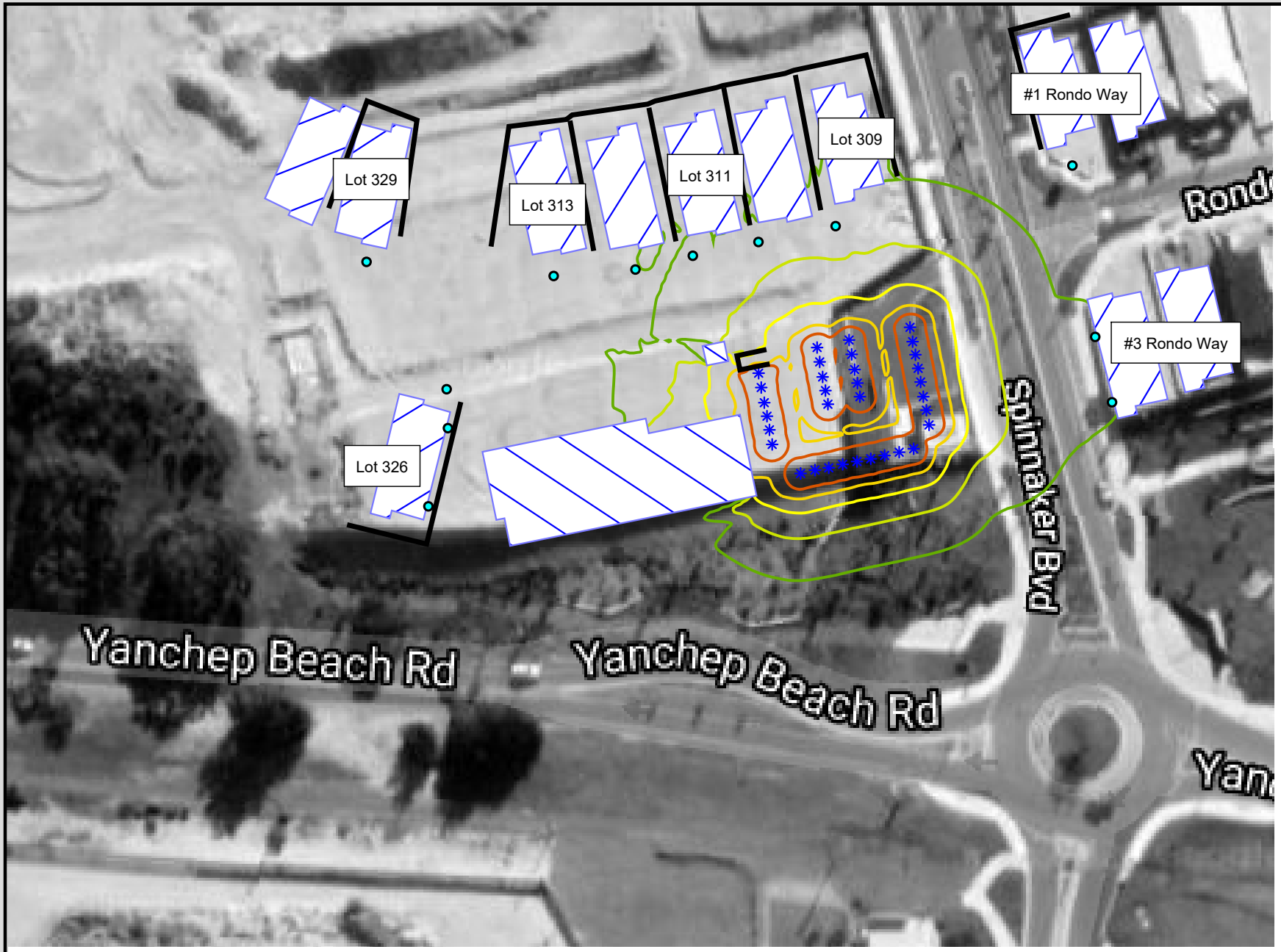
4.3 Car Doors

The predicted noise levels from car doors closing in any parking bays are presented in *Table 4-3*. *Figure 4-4* also shows the predicted noise levels as a noise contour map at ground level (1.5 metres AGL).

Table 4-3 Predicted Noise Levels of Car Door, dB L_{Amax}

Receiver	Floor	Facade	Car Doors
#1 Rondo Way	GF	-	44
#2 Rondo Way	GF	W	46
Lot 309	GF	-	50
Lot 310	GF	-	50
Lot 311	GF	-	49
Lot 312	GF	-	47
Lot 313	GF	-	44
Lot 326 front yard	GF	-	39
Lot 326 back	GF	E	25
Lot 326 front	GF	E	35
Lot 329	GF	-	39

Figure 4-4



Predicted Noise level
L_{Amax} dB

- = 47
- = 52
- = 57
- = 62
- = 67

N

Signs and symbols

- Proposed building
- Point source
- Receiver
- Fence

Lots 319-325 Childcare Centre - Car Doors Closing Predicted Noise Levels

L_{Amax} Ground Level Noise Level Contours

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5 ASSESSMENT

5.1 Outdoor Child Play

Outdoor child play is considered to only occur during the daytime, that is from 7.00am only. Noise from child play is not considered to contain annoying characteristics within the definition of the Regulations, therefore no adjustments are made to the predicted noise levels.

If considering the worst-case scenario where all children are allowed to play outside simultaneously for extended periods of time, the L_{A10} assigned noise level is applicable. *Table 5-1* presents the assessment of the highest child play noise against the daytime assigned noise level.

Table 5-1 Assessment of Highest Predicted Child Play Noise, dB L_{A10}

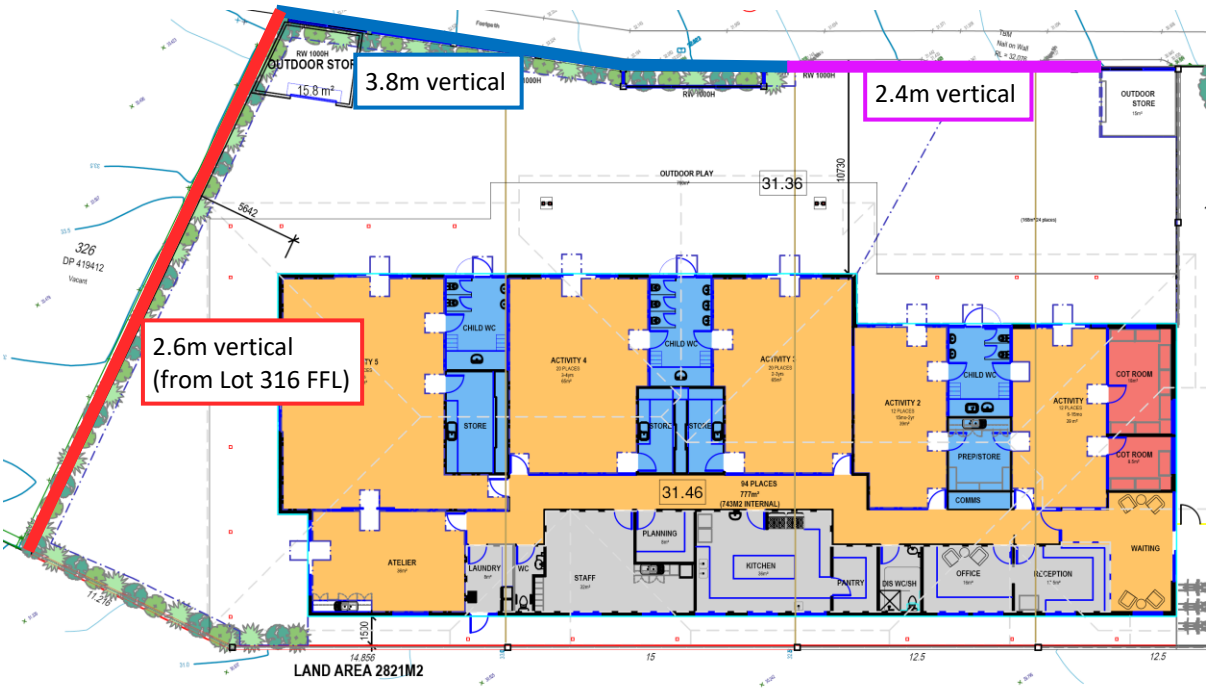
Receiver	Floor	Façade	Childplay	Assigned Noise Level	Exceedence
#1 Rondo Way	GF	-	43	**47**	*Complies*
#2 Rondo Way	GF	W	43	**47**	*Complies*
Lot 309	GF	-	49	**47**	2
Lot 310	GF	-	53	**47**	6
Lot 311	GF	-	54	**47**	7
Lot 312	GF	-	58	**47**	11
Lot 313	GF	-	60	**47**	13
Lot 326 front yard	GF	-	61	**47**	14
Lot 326 back	GF	E	54	**47**	7
Lot 326 front	GF	E	54	**47**	7
Lot 329	GF	-	51	**47**	4

From *Table 5-1* it can be seen that exceedences of up to 14 dB are predicted at the receivers to the west and north. It is further noted that exceedences of the L_{A1} assigned noise level up to 4 dB are also predicted.

Given the level of exceedences and the fact that the L_{A1} assigned noise level would also be exceeded, restricting the number of children playing outside for extended periods of time by staggering play times alone is not considered a practicable noise control option. For instance, compliance would only be achieved if only the 24 children aged 6-24 months play outside. Acoustic fencing was investigated to allow for all children to play outside for extended periods of time.

Based on the modelling assumptions and results, the following acoustic fencing is predicted to achieve compliance:

- 2.6 metres high along the west boundary with Lot 326, noting the fence height is taken to be from Lot 326 finished lot level of 33.4 AHD.
- 3.8 metres (from outdoor play area level of 31.36 AHD) from the north west corner and along the north planter.
- 2.4 metres (from outdoor play area level of 31.36 AHD) along the north boundary from the planter to the outdoor store.
- All acoustic fencing is to be solid, free of gaps and built from material achieving at least 8 kg/m2 surface mass. To maintain sight lines and/or natural light ingress the acoustic fence can incorporate Perspex panels at least 8 mm thick. All gaps around the inserts are to be caulked/sealed.



5.2 Mechanical Plant

At this stage, mechanical plant has not been designed in detail, but rather the assessment uses typical plant distributed on the roof. Given the proposed hours of operations, the AC plant and all extractions fans were assumed to be operating simultaneously before 7.00am as a worst-case scenario.

Table 5-2 presents the assessment of the noise emissions from mechanical plant against the night-time assigned noise level. It is noted that before 7.00am noise was considered to be tonal at the closest receivers, therefore the predicted noise levels were adjusted by +5 dB (refer *Table 2-1*).

Table 5-2 Assessment of Predicted Noise Mech. Plant Noise, dB L_{A10}

Receiver	Floor	Façade	Adjusted Level	Night-time Assigned Noise Level	Exceedence
#1 Rondo Way	GF	-	35	**37**	*Complies*
#2 Rondo Way	GF	W	38	**37**	1
Lot 309	GF	-	35	**37**	*Complies*
Lot 310	GF	-	36	**37**	*Complies*
Lot 311	GF	-	37	**37**	*Complies*
Lot 312	GF	-	40	**37**	3
Lot 313	GF	-	40	**37**	3
Lot 326 front yard	GF	-	40	**37**	3
Lot 326 back	GF	E	45	**37**	8
Lot 326 front	GF	E	41	**37**	4
Lot 329	GF	-	36	**37**	*Complies*

Based on the assessment in *Table 5-2*, it can be seen exceedences up to 8 dB are predicted at the receivers on the adjacent Lot 326, assuming the noise emissions are tonal.

At all receivers, the AC plant generally dominates the overall noise levels, with the toilet exhaust fans the second most significant noise contributor.

To achieve compliance at all times, a minimum 8 dB overall noise reduction is required. This level of reduction could be achieved with either, or a combination of, the following noise controls:

- All plant to be the quietest available, and
- Locate AC plant at ground level against the south wall of the childcare building, and
- Select AC units which can operate on a 'low noise mode' prior to 7am, or potentially not operate before 7am. Data obtained from manufacturers such as Daikin (RXYQ range) or Fujitsu (AJY range) indicate that overall 4-7 dB reduction maybe be achieved by setting the

unit on 'Level 2' quiet mode. When on such mode, it is also assumed that tonality would no longer be present in the noise emissions, and

- Consider providing acoustic louvres or solid barriers around the AC plant e.g. 6 mm solid fibre sheeting behind architectural louvres. The height and extent of the louvres/barriers will need to be determined based on final plant selection and location, and
- Kitchen exhaust fan could be located within the ceiling space and ducted to the roof, with the roof cowl then to be located furthest away from sensitive receivers, and
- Allow for silencers or acoustic flexible ducts on the outside air side of all exhaust fans, and
- All plant to be mounted on suitable anti-vibration mounts.

The above is to be reviewed during detailed design/building permit stage when mechanical plant selection and layout is known.

5.3 Car Doors

Car doors closing noise are short duration events and were therefore assessed against the L_{Amax} assigned noise level. Given the proposed hours of operation, staff members and parents can arrive before 7.00am, when the night-time assigned noise level is 57 dB L_{Amax}.

Given the relative short source to receiver distances, car doors closing noise may be impulsive within the definition of the Regulations. Therefore, an adjustment of +10 dB (refer *Table 2-1*) is to be applied to the predicted noise levels.

Based on the predicted noise levels in *Table 4-3*, the highest assessable noise levels are:

- 60 dB L_{Amax} (50+10) at Lot 309 and Lot 310, and
- 59 dB L_{Amax} (49+10) at Lot 311.

Based on the above, the night-time L_{Amax} assigned noise level of 57 dB is exceeded by up to 3 dB at Lots 309 to 311, while compliance is predicted to be achieved at all other receivers. Furthermore, compliance with the daytime L_{Amax} assigned noise level of 67 dB is predicted to be achieved at all receivers.

Therefore, to achieve night-time compliance at all receivers i.e. staff arrivals and/or children drop-offs before 7.00am, parking management will be required, as shown on *Figure 5-1*.

Figure 5-1 Parking Management Requirements Before 7.00am

It is noted that adding solid noise barriers between the landscaped area and the adjacent parking bays would result in those bays closest to the noise barriers being compliant at night-time. However, given the layout of the site, most parking bays will always be within line of sight of a receiver, at some distance away from the noise barrier, such that parking management will still be required.

6 CONCLUSIONS

The noise impacts from the proposed childcare centre to be located at Lots 319-325 Castlemead Drive in Yanchep, have been assessed against the relevant criteria of the *Environmental Protection (Noise) Regulations 1997*.

Based on the modelling and assessments in relation to the noise emissions from child play and car doors closing, it is concluded that compliance can be achieved by implementing the noise controls as described in *Section 5.1* and *Section 5.3*.

It must be noted all acoustic fencing / noise walls are to be free of gaps and built to achieve a surface mass of at least 8 kg/m^2 but can incorporate translucent sections (e.g. *Perspex)* to preserve sight-lines or natural light ingress.

With regard to mechanical plant noise, potential exceedences were identified however, mechanical plant has not been designed in detail and therefore the following is to be considered, and reviewed, during detailed design:

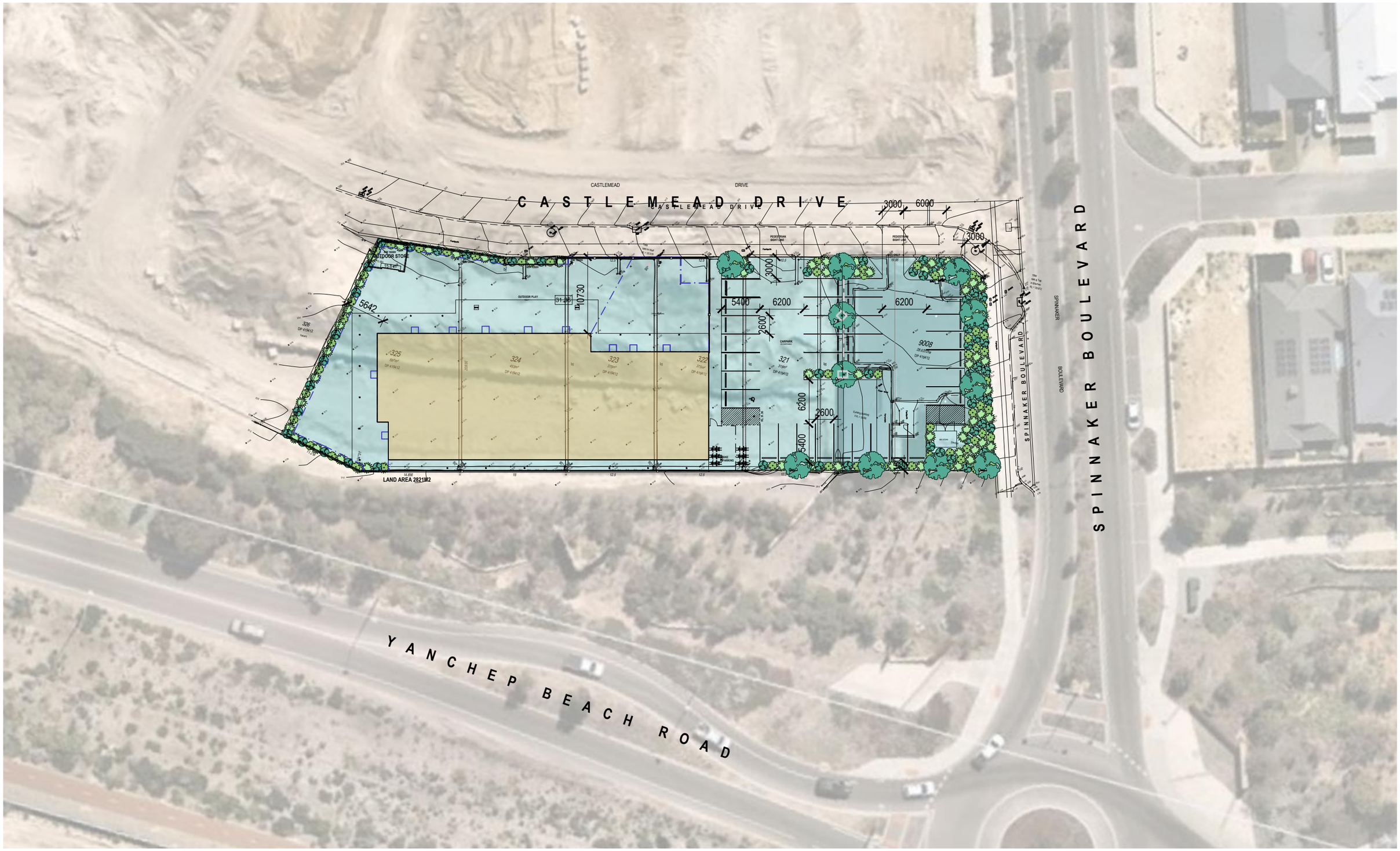
- All plant to be the quietest available, and
- Locate AC plant at ground level against the south wall of the childcare building, and
- Select AC units which can operate on a 'low noise mode' prior to 7am, or potentially not operate before 7am. When on such mode, it is also assumed that tonality would no longer be present in the noise emissions, and
- Consider providing acoustic louvres or solid barriers around the AC plant e.g. 6 mm solid fibre sheeting behind architectural louvres. The height and extent of the louvres/barriers will need to be determined based on final plant selection and location, and
- Kitchen exhaust fan could be located within the ceiling space and ducted to the roof, with the roof cowl then to be located furthest away from sensitive receivers, and
- Allow for silencers or acoustic flexible ducts on the outside air side of all exhaust fans, and
- All plant to be mounted on suitable anti-vibration mounts.

In addition, the following best practices in relation to child play should be implemented:

- The behaviour and 'style of play' of children should be monitored to prevent particularly loud activity e.g. loud banging/crashing of objects, 'group' shouts/yelling,
- Favour soft finishes in the outdoor play area to minimise impact noise (e.g. soft grass, sand pit(s), rubber mats) over timber or plastic,
- Favour soft balls and rubber wheeled toys,
- Crying children should be taken inside to be comforted,
- No amplified music to be played outside,
- External doors and windows to be closed during indoor activity / play, and
- Any music played within the internal activity areas to be 'light' music with no significant bass content and played at a relatively low level.

Appendix A

Development Plans



Location Plan

Scale: **1:500 @ A3**

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Leyton Property

94 PLACE CHILDCARE
LOT 319-325 CASTLEMEAD DRV YANCHEP WA

Job No: **S193**
Dwg No: **SK01.1**
Date: **October 2020**

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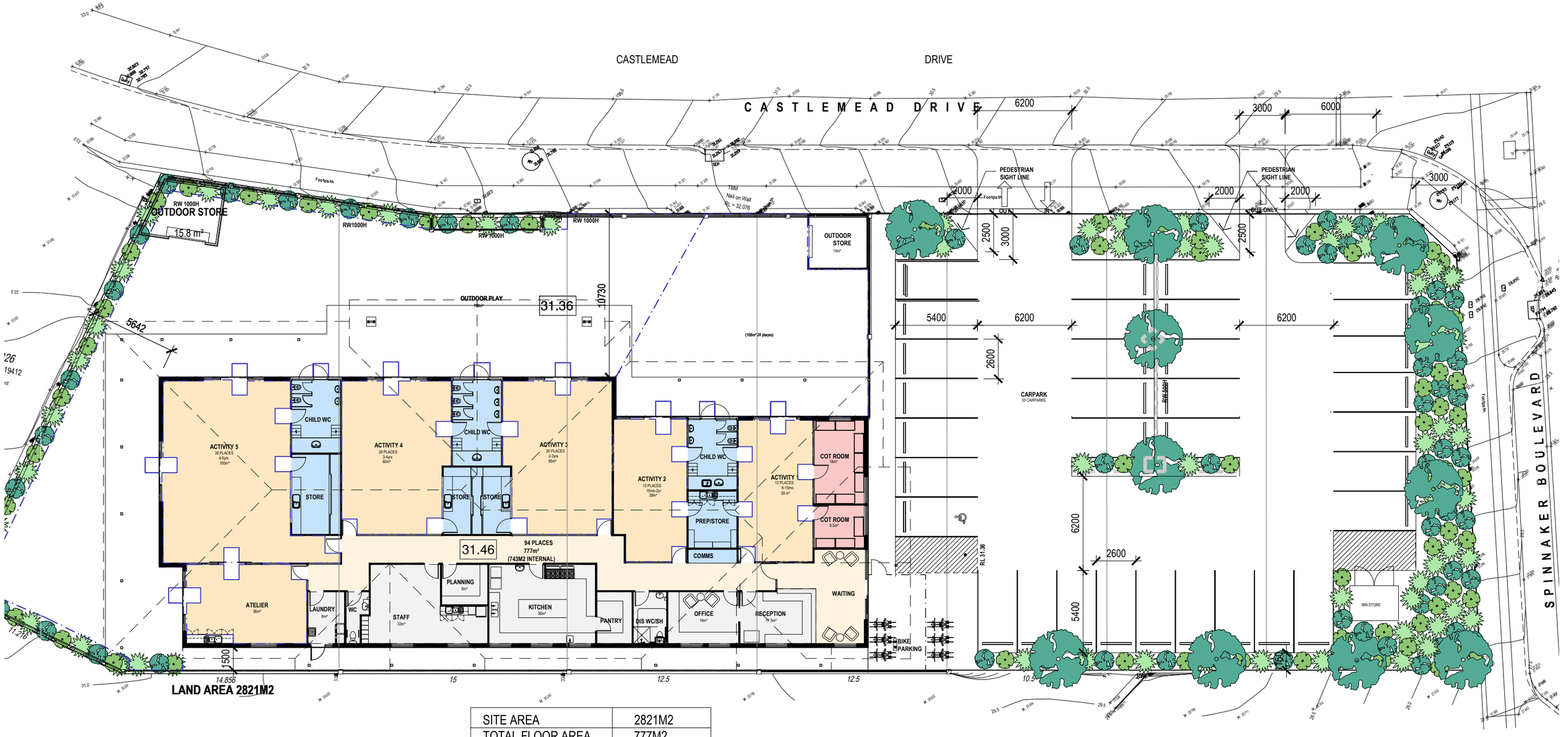

SITE AREA	2821M2
TOTAL FLOOR AREA	777M2
TOTAL CARPARKING	33 PARKS
LANDSCAPED AREAS	310M2
OUTDOOR PLAY	700M2
CENTRE CAPACITY	94 PLACES
NO. OF STAFF	17 STAFF

ON ARCHITECTURE
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Leyton Property

Site Plan/Floor Plan

Scale: **1:250 @ A3**

94 PLACE CHILDCARE
LOT 319-325 CASTLEMEAD DRV YANCHEP WA

Job No: **S193**
Dwg No: **SK01.2**
Date: **October 2020**

N

East Elevation

West Elevation

North Elevation

South Elevation

ELEVATION LEGEND

1. PAINTED SCYON WEATHERBOARD CLADDING
2. PAINTED TIMBER POSTS AND FASCIAS
3. PAINTED CFC WITH TIIMBER BATTENS
4. POWDERCOATED ALUMINIUM WINDOW FRAMES
5. COLORBOND STEEL ROOF CLADDING 20° PITCH
6. TUBULAR STEEL FENCING
7. ACOUSTIC FENCING, REFER ACOUSTIC REPORT
8. PAINTED BRICK WORK
9. PAINTED BRICK WORK

ON ARCHITECTURE

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Leyton Property

94 PLACE CHILDCARE
LOT 319-325 CASTLEMEAD DRV YANCHEP WA

Elevations
Scale: **1:200 @ A3**

Job No: **S193**
Dwg No: **SK01.3**
Date: **October 2020**

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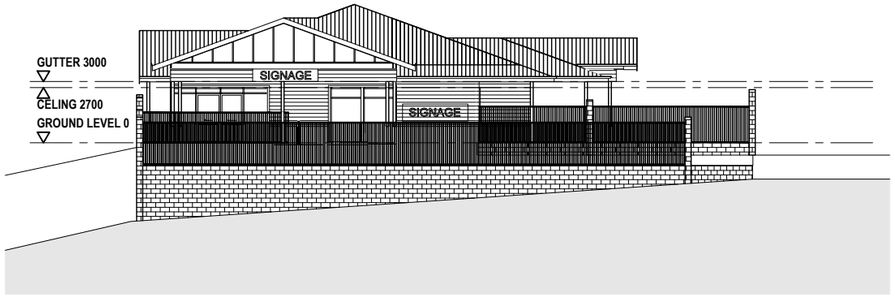
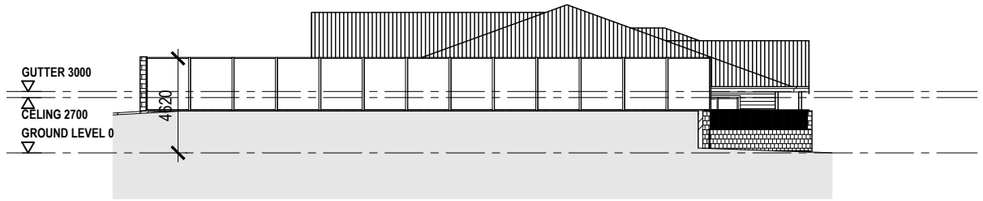
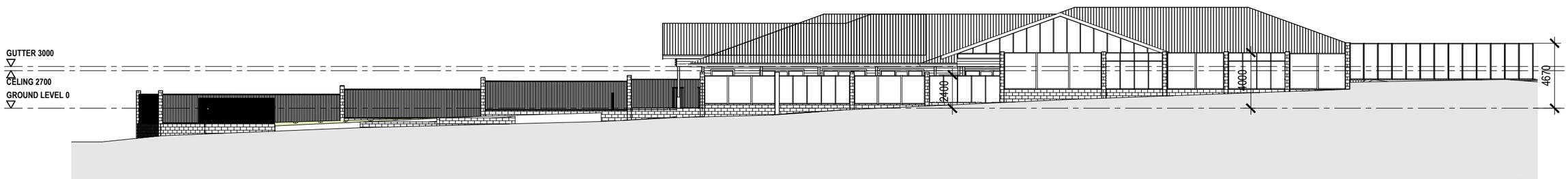


East Elevation



West Elevation

South Elevation



North Elevation

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Leyton Property

Fence Elevations

Scale: **1:300 @ A3**

94 PLACE CHILDCARE
LOT 319-325 CASTLEMEAD DRV YANCHEP WA

Job No: **S193**
Dwg No: **SK01.4**
Date: **October 2020**

N

Appendix B

Vertex Yanchep Estate Plan

Preliminary

Existing Residential

Existing Residential

Existing Residential

Public Open Space

Public Open Space

Public Open Space

ARIANE VIEW

AVENUE

CAPILANO

MOORPARK AVENUE

OBEL CLOSE

SPINNAKER BOULEVARD

BEWICK AVENUE

BEWICK WAY

RONDO

BEWICK AVENUE

AVENUE

AVENUE

BEWICK AVENUE

YANCHEP BEACH ROAD

N

Release Lots R30	Group Housing Site R50	Existing Development	Future Residential

LEGEND

Brick Paving	Drainage Manhole	Western Power Mini Pillar & Housing Connection	NBN Housing Connections
Footpath	Side Entry Pit	Western Power Uni Pillar & Housing Connection	NBN Network Pit
Planning Investigation Area	Drainage Grate		NBN Fibre Distrubution Hub
Non-Operational Waste Water Treatment Plant Site	Sewer Housing Connection / Manhole	Street Light	Limestone Retaining Wall
Lot Level	Sewer Easement	Water Connection	Garage Location
Road level	Water Valve & Hydrant	Access Restriction	Quiet House Design
		BAL - Fire Attack Level	

STAGE 1
YANCHEP

vertex-yanchep.com.au

All Dimensions and Areas are subject to survey. The particulars of this plan are supplied for identification purposes only and shall not be taken as a representation in any aspect on the part of the vendor or its agents. Authorities should be consulted when services are contained within lot boundaries as building restrictions may apply. All retaining walls, services and associated easements are shown exaggerated for legibility. Trees are indicative only. Engineering and Cadastral design sitll to be finalised and is subject to change. MNG. REF:- 98894sa-014d DATE: 09/11/2015

All Dimensions and Areas are subject to survey. The particulars of this plan are supplied for identification purposes only and shall not be taken as a representation in any aspect on the part of the vendor or its agents. Authorities should be consulted when services are contained within lot boundaries as building restrictions may apply. All retaining walls, services and associated easements are shown exaggerated for legibility. Trees are indicative only. Engineering and Cadastral design sitll to be finalised and is subject to change. MNG. REF:- 98894sa-074b DATE: 18/06/2020

Appendix C

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)
The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting
An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

Sound Power Level (L_w)
Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

Sound Pressure Level (L_p)
The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}
This is the noise level in decibels, obtained using the A frequency weighting and the S (Slow) time weighting as specified in IEC 61672-1:2002. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}
This is the noise level in decibels, obtained using the A frequency weighting and the F (Fast) time weighting as specified in IEC 61672-1:2002. This is used when assessing the presence of modulation only.

L_{APeak}
This is the greatest absolute instantaneous sound pressure in decibels using the A frequency weighting as specified in IEC 61672-1:2002.

L_{Amax}
An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

L_{A1}
An L_{A1} level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{A10}
An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{Aeq}
The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

L_{A90}
An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "*background*" noise level.

One-Third-Octave Band
Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

L_{Amax} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time.

L_{A1} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.

L_{A10} assigned level
Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period.

Tonal Noise
A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

Modulating Noise
A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;

(b) is present for at least 10% of the representative.

Impulsive Noise
An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness is:

a variation in the emission of a noise where the difference between $L_{A\ peak}$ and $L_{A\ Max\ slow}$ is more than 15 dB when determined for a single representative event;

Major Road
Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

Secondary / Minor Road
Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

Influencing Factor (IF)

$$= \frac{1}{10}(\%\ \text{Type A}_{100} + \%\ \text{Type A}_{450}) + \frac{1}{20}(\%\ \text{Type B}_{100} + \%\ \text{Type B}_{450})$$

where:

$\%\ \text{Type A}_{100}$ = the percentage of industrial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type A}_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\ \text{Type B}_{100}$ = the percentage of commercial land within a 100m radius of the premises receiving the noise

$\%\ \text{Type B}_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

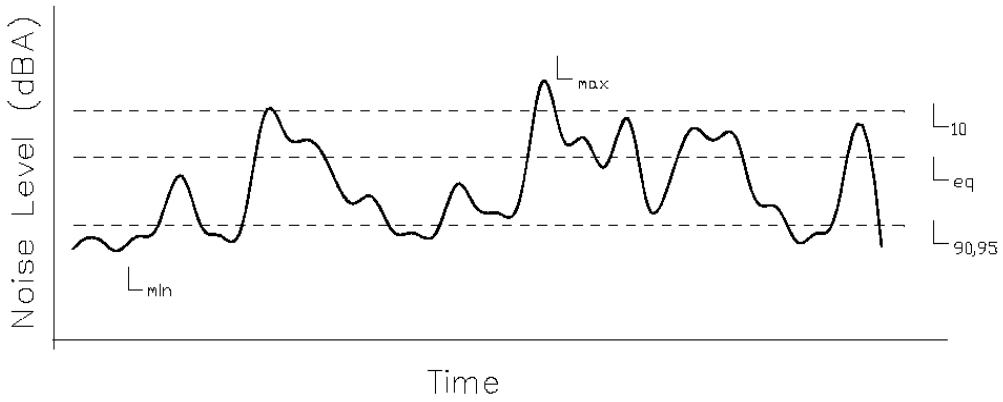
Representative Assessment Period
Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

Background Noise
Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

Ambient Noise
Means the level of noise from all sources, including background noise from near and far and the source of interest.

Specific Noise
Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

Chart of Noise Level Descriptors



Typical Noise Levels