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Environmental Noise Assessment

**Lots 84 & 87 (#16 & #30) Anstey Road,
Forrestdale
Proposed Childcare Centre**

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OTB Management Pty Ltd

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- A Development Plans
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1 INTRODUCTION

It is proposed to develop the northern portion of Lots 84 & 87 (#16 & #30) Anstey Road, Forrestdale (refer *Figure 1-1*) as a childcare centre (CCC). The proposed CCC development will consist of the following:

- Five internal play group spaces capable of accommodating up to 92 children, grouped as follows:
 - Activity Group 1 – 12 Places for Babies (0-24 months),
 - Activity Group 2A – 15 places for Toddlers (24-36 months),
 - Activity Group 2B – 15 places for Toddlers (24-36 months),
 - Activity Group 3A – 15 places for Kindy (36+ months),
 - Activity Group 3B – 15 places for Kindy (36+ months).
 - Activity Piazza – 20 places for 0-3+ years.
- Three outdoor play areas (shown as combined area on plans).
- Amenities and associated mechanical plant such as:
 - One kitchen with rangehood and exhaust fan assumed to be located on the roof above,
 - Various exhaust fans (toilets and kitchen) assumed to be located on the roof above, and
 - AC plant assumed to be located on ground level at the rear of the building in the nominated service yard/drying court (north facade).
- Car parking off Anstey Road.

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 CCC against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997* (the Regulations) based on the development drawings shown in *Appendix A*. Consideration is given to the noise impact to the existing residences to the north and south. Furthermore, it is understood that as part of ongoing development of the local area, part of the lot to the north east will be residential such that consideration is given to these also.

The proposed hours of operation are 6.30 am to 6.00 pm Monday to Friday. Therefore, staff and parents can arrive and park before 7.00 am, which is during the night-time period of the Regulations. It is assumed outdoor child play would not occur until after 7.00 am.

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



Figure 1-1 Project Locality (City of Armadale Maps)



Figure 1-2 Project Site Plan

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
Commercial	All hours	60	75	80

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

The total influencing factor, applicable at surrounding noise sensitive premises has been calculated as 2 to 6 dB – refer *Table 2-3*, due to the proximity of Armadale Road, which is a major road (as defined by the Regulations to have greater than 15,000 vehicles per day (vpd) – MRWA Site #0774 – 19,377 vpd 2017/2018) within 450m of the site or northern receivers, and within 100m of residences to the south. In order to be conservative, no additional influencing factor was assumed for the subject site and surrounds, which are labelled “general rural” under Town Planning Scheme No. 4.

Table 2-3 Influencing Factor Calculation

Description	Within 100 metre Radius	Within 450 metre Radius	Total
Commercial Land	0	0	0 dB
Transport Factor	Armadale Road	Armadale road	2 or 6 dB
Total			2 or 6 dB

Table 2-4 shows the assigned noise levels including the transport factor at the receiving locations.

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.

Table 2-4 Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
North Residences (including future)	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
South Residences along Armadale Road	0700 to 1900 hours Monday to Saturday (Day)	51	61	71
	0900 to 1900 hours Sunday and public holidays (Sunday)	46	56	71
	1900 to 2200 hours all days (Evening)	46	56	61
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	41	51	61
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.

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 the noise emissions from the development at all nearby receivers. The software used was *SoundPLAN 8.1* with the ISO 9613 algorithms (ISO 171534-3 improved method) selected, as they include the influence of wind and are considered appropriate given the relatively short source to receiver distances. 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	Day (0700-1900)	Night (1900-0700)
Temperature (°C)	20	15
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 Topographical Data

Topographical information was based on data publicly available (e.g. *GoogleEarth*). The levels were combined with finished floor levels provided on the development drawings.

3.3 Buildings and Receivers

Surrounding existing buildings were included in the noise model, as these can provide noise shielding as well as reflection paths. Future buildings are also assumed, for an ultimately developed subdivision. Adjacent existing and future houses are assumed single storey, being modelled as 3.5 metres high. *Figure 3-1* shows a 2D overview of the noise model with the location of all relevant receivers identified.



Figure 3-1 2D Overview of Noise Model

Receivers 1 to 7 are the future possible residences with the receiver positioned at 3 metres from a facade. Receivers 8 to 14 are existing residences with receivers positioned 15 metres from the dwelling. Receiver 15 is a residence on the subject site. Receivers 16 and 17 are on the boundary and represent future residential development.

3.4 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	
Babies Play Aged 0-2 Years (10 kids), L ₁₀	78	54	60	66	72	74	71	67	78
Toddler Play Aged 2-3 Years (10 kids), L ₁₀	61	67	73	79	81	78	74	70	85
Kindy Play Aged 3+ Years (10 kids), L ₁₀	64	70	75	81	83	80	76	72	87
Medium Condenser Unit (4 off), each, L ₁₀	62	74	68	69	63	61	53	48	70
Toilet/Laundry Exhausts, each, L ₁₀	60	65	62	63	60	61	56	53	67
Kitchen Exhaust/Supply fans, L ₁₀	50	64	61	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 above:

- Child play source levels are based on Guideline 3.0 provided by the Association of Australasian Acoustical Consultants (AAAC) published 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 Babies = 78 dB(A)
 - 40 Toddlers = 91 dB(A)
 - 40 Kindy = 93 dB(A)
- Based on the AAAC Guideline 3.0, source sound power levels for AC condensing units were assumed. The DA drawing shows 4 units, and therefore medium sized (double fan) outdoor units were deemed appropriate. Each was modelled as a point source located 1.2 metres above ground level positioned in the drying yard area at the northern facade of the building.
- Other mechanical plant includes three exhaust fans (toilets and laundry) and one kitchen exhaust fan/rangehood fan. All were modelled as point sources approximately 0.5 metres above roof level and nominally above the area serviced.
- Car doors closing were modelled as a point source 1.0 metre above ground level. Since noise from a car door closing is a short term event, only the L_{Amax} level is applicable.

3.5 Walls and Fences

Typical boundary fencing (*Colorbond* type) between residences is noted. The noise model also includes a 25-course (2.15m) high masonry wall as proposed to the drying yard. The southern play area requires a 1.8m high noise wall on the north east and south east sides, with a 1.0m high cantilever section atop along the future residential boundary (approximately 10 metres long). The vertical sections must be 8kg/m² material at minimum (such as double skinned *Colorbond*) while the cantilever section can be made from clear acrylic/Perspex material provided it has at least 8kg/m² surface mass. All barriers must be installed free of any gaps. A 1.8m high masonry wall has been assumed adjacent the car park areas along the north eastern boundary (shared with future residential).

Elsewhere, boundary fencing has been assumed as 1.8m high lightweight (eg. *Colorbond* equivalent) throughout the noise model.

Figure 3-2 shows a view of the 3D model based on the information above in relation to topography and building and fence heights. Also shown are the outdoor play areas (pink polygon) and point sources (e.g. mechanical plant, car doors) as purple dots, and nearest noise sensitive receiving premises.

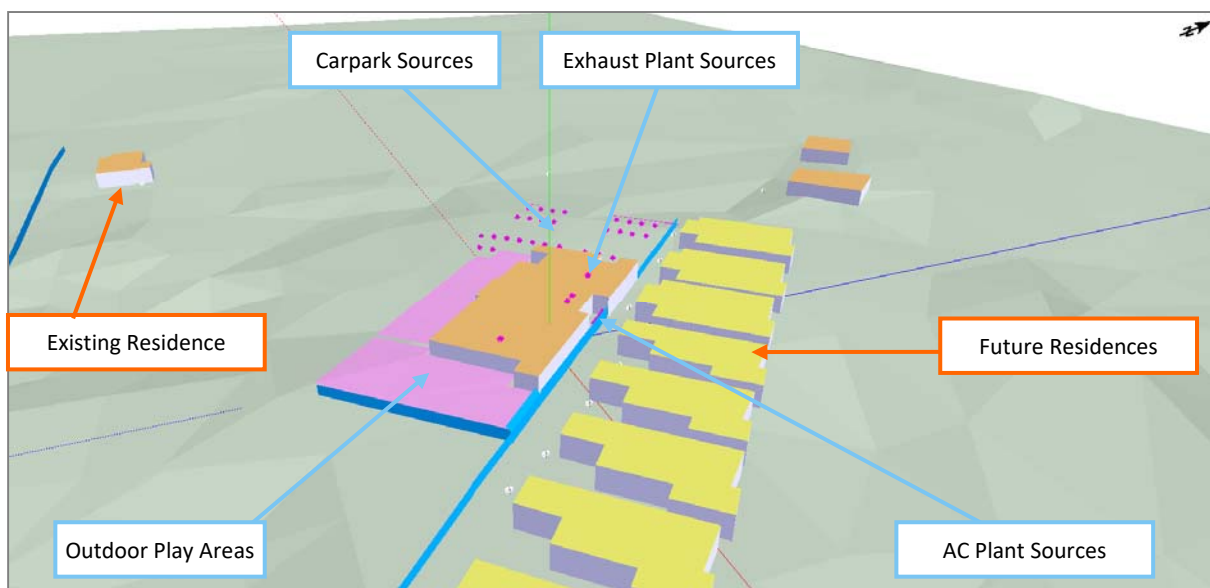


Figure 3-2 East Elevation View of 3D Noise Model

3.6 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 0 has been used for the outdoor play areas, road and the car park areas, and 0.6 for the remaining surroundings.

4 RESULTS

4.1 Outdoor Child Play

The childcare development will host up to 92 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, noise levels were conservatively predicted for this, as a worst-case scenario, as follows:

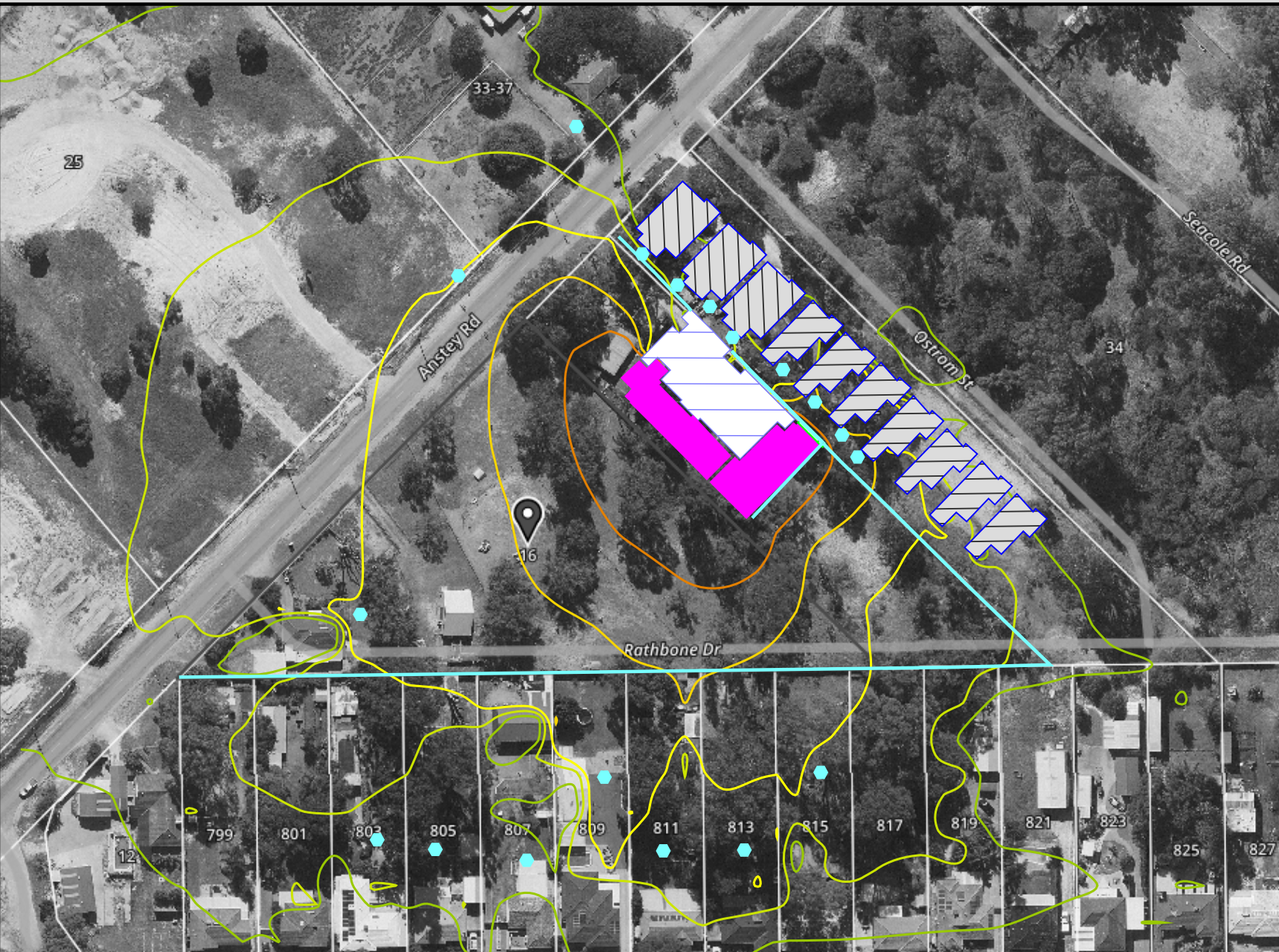
- All 5 groups, totalling 92 children are playing outside simultaneously for extended periods of time.

Table 4-1 presents the predicted noise levels at each receiver, noting the predicted noise levels are from child play only i.e. mechanical plant noise is not included. Figure 4-1 also shows the predicted noise levels as a noise contour map at ground level (1.5 metres AGL).

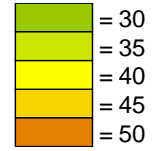
Table 4-1 Predicted Noise Levels of Outdoor Child Play, dB LA10

Receiver	Group 1 12 Babies	Group 2A & 2B 40 Toddler	Group 3A & 3B 40 Kindy	Combined (92 children)
1. Future Residence 1	30	32	28	35
2. Future Residence 2	26	31	30	34
3. Future Residence 3	21	31	33	35
4. Future Residence 4	15	28	36	36
5. Future Residence 5	16	30	46	46
6. Future Residence 6	17	30	46	46
7. Future Residence 7	15	32	46	46
8. 815 Armadale Road	23	35	37	39
9. 813 Armadale Road	25	37	38	41
10. 811 Armadale Road	24	36	36	39
11. 809 Armadale Road	25	37	38	41
12. 807 Armadale Road	21	30	29	33
13. 805 Armadale Road	21	31	33	35
14. 803 Armadale Road	22	33	32	36
15. 16 Anstey Road (retained)	28	40	41	44
16. 25 Anstey Road (vacant)	29	38	36	40
17. 37 Anstey Road	26	31	24	33






Figure 4-1



**Predicted Noise level
L_{A10} dB**



Signs and symbols

-  CCC building
-  Indicative building
-  Wall/fence
-  Sloped wall areas
-  Area source

Lots 84, 86, 87 Anstey Road, Forrestdale - Childcare Centre - Predicted Noise Levels
L_{A10} Ground Floor Noise Level Contours - Child Play Noise



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4.2 Mechanical Plant

Mechanical plant consists of AC plant and extraction fans for the kitchen, toilets and laundry. The exhaust fans were assumed to be located on the roof and above the room being serviced. The AC plant were modelled within the area labelled service yard on the DA plans, at ground level on the north side of the building.

Since the childcare centre opens from 6.30 am, the conservative case was considered that all plant could be operating simultaneously at night-time (i.e. before 7.00 am). The predicted mechanical plant noise levels are presented in *Table 4-2*.

The overall plant noise levels at ground level (1.5m AGL) are also shown on *Figure 4-2*.

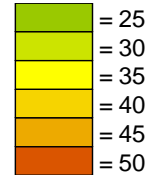
Table 4-2 Predicted Noise Levels of Mechanical Plant, dB LA10

Receiver	Mechanical Plant
1. Future Residence 1	26
2. Future Residence 2	32
3. Future Residence 3	43
4. Future Residence 4	38
5. Future Residence 5	33
6. Future Residence 6	32
7. Future Residence 7	30
8. 815 Armadale Road	18
9. 813 Armadale Road	18
10. 811 Armadale Road	18
11. 809 Armadale Road	18
12. 807 Armadale Road	15
13. 805 Armadale Road	16
14. 803 Armadale Road	16
15. 16 Anstey Road (retained)	17
16. 25 Anstey Road (vacant)	21
17. 37 Anstey Road	18

Figure 4-2



**Predicted Noise level
L_{A10} dB**



Signs and symbols

- CCC building
- Indicative building
- Wall/fence
- Sloped wall areas
- Mech Plant source
- Receiver

Lots 84, 86, 87 Anstey Road, Forrestdale - Childcare Centre - Predicted Noise Levels
 L_{A10} Ground Floor Noise Level Contours - Mechanical Plant Noise



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4.3 Car Park

The model includes noise from car doors closing in all parking bays and *Table 4-3* presents the highest predicted noise levels applicable to each receiver. *Figure 4-3* also presents the maximum noise levels at ground level (1.5 m AGL) for car doors as a contour map. Note that this contour is not a cumulative level, but a composite contour of each individual maximum noise event.

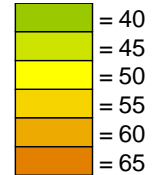
Table 4-3 Predicted Car Doors Closing Noise Levels, dB L_{Amax}

Receiver	Car Doors
1. Future Residence 1	50
2. Future Residence 2	47
3. Future Residence 3	37
4. Future Residence 4	29
5. Future Residence 5	23
6. Future Residence 6	24
7. Future Residence 7	22
8. 815 Armadale Road	29
9. 813 Armadale Road	31
10. 811 Armadale Road	31
11. 809 Armadale Road	31
12. 807 Armadale Road	28
13. 805 Armadale Road	28
14. 803 Armadale Road	29
15. 16 Anstey Road (retained)	34
16. 25 Anstey Road (vacant)	43
17. 37 Anstey Road	40

Figure 4-3



Predicted Noise level
L_{Amax} dB



Signs and symbols

- CCC building
- Indicative building
- Wall/fence
- Sloped wall areas
- * Car door source
- Receiver

Lots 84, 86, 87 Anstey Road, Forrestdale - Childcare Centre - Predicted Noise Levels

L_{Amax} Ground Floor Noise Level Contours - Car Park Noise



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5 ASSESSMENT

5.1 Outdoor Child Play

Although the childcare centre may be open from 6.30 am, outdoor child play will only occur after 7.00 am, when the assigned noise levels increase by 10 dB. Noise from child play is not considered to contain characteristics within the definition of the Regulations to attract adjustments to the predicted noise levels. *Table 5-1* presents the assessment of the highest predicted noise levels from 92 children playing outside against the L_{A10} assigned noise level at each receiver.

Table 5-1 Assessment of Outdoor Child Play Noise Levels, dB L_{A10}

Receiver	Day Assigned Noise Level	Predicted Level	Exceedance*
1. Future Residence 1	47	35	Complies
2. Future Residence 2	47	34	Complies
3. Future Residence 3	47	35	Complies
4. Future Residence 4	47	36	Complies
5. Future Residence 5	47	46	Complies
6. Future Residence 6	47	46	Complies
7. Future Residence 7	47	46	Complies
8. 815 Armadale Road	51	39	Complies
9. 813 Armadale Road	51	41	Complies
10. 811 Armadale Road	51	39	Complies
11. 809 Armadale Road	51	41	Complies
12. 807 Armadale Road	51	33	Complies
13. 805 Armadale Road	51	35	Complies
14. 803 Armadale Road	51	36	Complies
15. 16 Anstey Road (retained)	51	44	Complies
16. 25 Anstey Road (vacant)	60	40	Complies
17. 37 Anstey Road	47	33	Complies

From *Table 5-1* it can be seen that noise levels are highest at future residential dwellings in close proximity to the north east. Note that in reality, play times of each group will be staggered so the assessment is conservative. The proposed solid barriers are demonstrated to be effective in mitigating child play noise to future residences. All existing residences are compliant with their respective assigned levels.

5.2 Mechanical Plant

Given the proposed opening hours of the childcare centre, the night-time period (i.e. before 7.00am) is most critical. Mechanical plant noise may be considered tonal, and a +5 dB adjustment (refer *Table 5-2*) applies to predictions.

Table 5-2 Assessment of Mechanical Plant Noise Levels, dB L_{A10}

Receiver	Night Assigned Noise Level	Predicted Level	Exceedance*
1. Future Residence 1	37	26 + 5 = 31	Complies
2. Future Residence 2	37	32 + 5 = 37	Complies
3. Future Residence 3	37	43 + 5 = 48	+11
4. Future Residence 4	37	38 + 5 = 43	+6
5. Future Residence 5	37	33 + 5 = 38	Complies
6. Future Residence 6	37	32 + 5 = 37	Complies
7. Future Residence 7	37	30 + 5 = 35	Complies
8. 815 Armadale Road	41	18 + 5 = 23	Complies
9. 813 Armadale Road	41	18 + 5 = 23	Complies
10. 811 Armadale Road	41	18 + 5 = 23	Complies
11. 809 Armadale Road	41	18 + 5 = 23	Complies
12. 807 Armadale Road	41	15 + 5 = 20	Complies
13. 805 Armadale Road	41	16 + 5 = 21	Complies
14. 803 Armadale Road	41	16 + 5 = 21	Complies
15. 16 Anstey Road (retained)	41	17 + 5 = 22	Complies
16. 25 Anstey Road (vacant)	60	21 + 5 = 26	Complies
17. 37 Anstey Road	37	18 + 5 = 23	Complies

Based on the predicted noise levels in *Table 5-2*, the most critical mechanical plant noise levels are at future residential premises #3, which is nearest to the plant area, with an assessable level of 48 dB L_{A10} (inclusive of tonality adjustment). This exceeds the night-time assigned level by a factor of 11 dB, resulting mainly from the AC condenser units.

Mitigation should be applied, however it must be noted that this is based on assumptions in relation to the size and type of AC plant and exhaust/supply fans. Therefore, mechanical plant noise and the effectiveness of any mitigation measures applied, are to be reviewed by a qualified acoustical consultant during detailed design, when plant selections, locations and detailed designs are progressed.

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 and visitors can arrive before 7.00 am when the critical night-time assigned noise level is applicable. Car door noise was considered impulsive within the definition of the Regulations. Therefore, an adjustment of +10 dB (refer *Table 5-3*) is to be applied to the predicted noise levels.

Table 5-3 Assessment of Car Doors Closing Noise Levels, dB L_{Amax}

Receiver	Night Assigned Noise Level	Predicted Level	Exceedance
1. Future Residence 1	57	$50 + 10 = 60$	+3
2. Future Residence 2	57	$47 + 10 = 57$	Complies
3. Future Residence 3	57	$37 + 10 = 47$	Complies
4. Future Residence 4	57	$29 + 10 = 39$	Complies
5. Future Residence 5	57	$23 + 10 = 33$	Complies
6. Future Residence 6	57	$24 + 10 = 34$	Complies
7. Future Residence 7	57	$22 + 10 = 32$	Complies
8. 815 Armadale Road	61	$29 + 10 = 39$	Complies
9. 813 Armadale Road	61	$31 + 10 = 41$	Complies
10. 811 Armadale Road	61	$31 + 10 = 41$	Complies
11. 809 Armadale Road	61	$31 + 10 = 41$	Complies
12. 807 Armadale Road	61	$28 + 10 = 38$	Complies
13. 805 Armadale Road	61	$28 + 10 = 38$	Complies
14. 803 Armadale Road	61	$29 + 10 = 39$	Complies
15. 16 Anstey Road (retained)	61	$34 + 10 = 44$	Complies
16. 25 Anstey Road (vacant)	80	$43 + 10 = 53$	Complies
17. 37 Anstey Road	57	$40 + 10 = 50$	Complies

The highest (worst-case) assessable noise levels (including the adjustment for impulsiveness) is 60 dB L_{Amax} being at the nearest future residence, to the north. The noise level is resultant from car doors closing in the nearest two car parking bays to the boundary.

Noise levels are predicted to exceed the night-time assigned noise level by 3 dB. All other premises comply with their respective assigned levels.

6 RECOMMENDATIONS

Car park noise is predicted to exceed the most critical assigned noise level at the nearest future residence and mitigation measures are required. The model has already assumed a 1.8m masonry wall exists however this does not achieve compliance. It is recommended therefore that car parking in the two proposed bays nearest to the boundary (Bays 10 & 14) are reserved for Staff only, and specifically those staff arriving after 7.00 am. All other bays can be used at any time.

Mechanical plant noise is predicted to exceed at future residences based on generic source file data. All external mechanical plant designs are to be reviewed by a qualified acoustical consultant during detailed design, when plant selections and locations become known. Notwithstanding, the following mitigation measures should be considered:

- Kitchen exhaust/supply fans recommended that these be designed as inline type fans, which could be installed with attenuators or diverted ducting, rather than externally mounted plant. If possible exhausts/openings should be positioned on the side of the roof ridge that faces away from residences.
- Selection of external plant (condenser units) to be programmed in such a way that sound power levels of units are no more than 60 dB(A). Alternatively, the condensers are not to operate until after 7.00 am by way of a timer system.
- Condenser units are to be floor mounted with anti-vibration mounts and with no rigid anchors or connections to the proposed masonry noise wall behind.
- The 25-course wall may need be increased to 28c (approximate 2.4m) based on assumed sound power levels, and as this is a relatively enclosed area, absorptive materials will need to be utilised in this drying yard (eg. absorptive panels on walls, artificial turf/tiles on floor) to reduce reflected noise.

Regarding noise from child play, the proposed solid barriers (including sloped cantilever sections) are demonstrated to be effective in mitigating child play noise to future residences. All existing residences are compliant with their respective assigned levels.

Finally, the following best practices are not mandatory but should be implemented where practicable:

- 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.

It is understood that future development is planned for the parcels of land surrounding the subject site. Based on the predictive model, all existing noise sensitive premises are demonstrated to achieve compliant outcomes.

The recommendations herein apply to the proposed operation of the CCC and assumptions outlined in this report regarding the nature of future residential development. Any changes that arise may require a follow up acoustical assessment.

7 CONCLUSIONS

The noise impacts from the proposed childcare centre to be located at Lots 84 & 87 (#16 & #30) Anstey Road, Forrestdale 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 the centre, it is concluded that compliance can be achieved for all premises (existing and future) provided that the recommendations in *Section 6* are implemented. It is recommended that a detailed review of mechanical plant selections be undertaken during detailed design to ensure compliance.

Appendix A

Development Plans

NOTE:
 CEILING 31c + WALL PLATE
 UNLESS NOTED OTHERWISE.
METAL DECK ROOF
 AT 5 & 20 °, EAVE 500MM
 ACRYLIC TEXTURE ON RENDER FINISH TO
 EXTERNAL BWK UNLESS NOTED
 OTHERWISE.

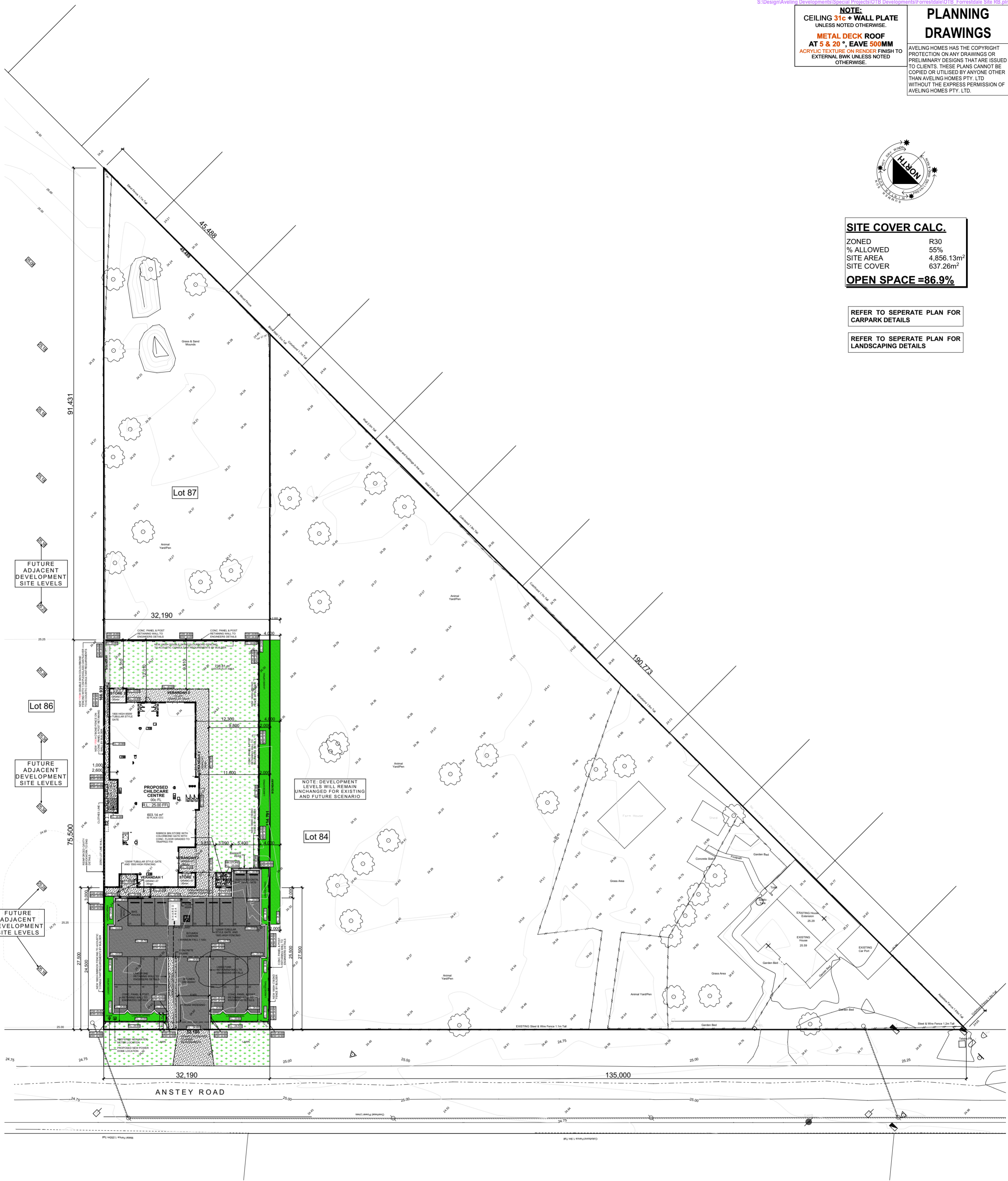
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SITE COVER CALC.

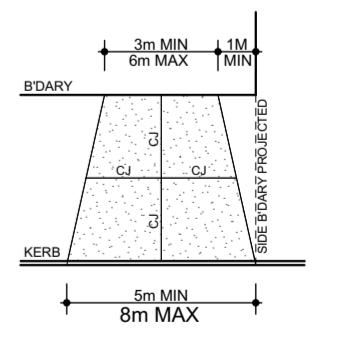
ZONED	R30
% ALLOWED	55%
SITE AREA	4,856.13m ²
SITE COVER	637.26m ²
OPEN SPACE = 86.9%	

REFER TO SEPERATE PLAN FOR CARPARK DETAILS
 REFER TO SEPERATE PLAN FOR LANDSCAPING DETAILS



NOTE: DEVELOPMENT LEVELS WILL REMAIN UNCHANGED FOR EXISTING AND FUTURE SCENARIO

SITE PLAN 1:500
 1:500



TYPICAL ARMADALE SHIRE GRANO CROSSOVER DETAIL

PAVING & GRANO AREA

BITUMEN - DRIVEWAY	875.63
BITUMEN - PARKING	378.60
FLUSH KERB	138.08
GRANO - BIN STORE	8.05
GRANO - DRY. / SERV.	31.18
GRANO - PATH	29.63
GRANO - VERANDAH 1	71.87
GRANO - VERANDAH 2	479.28
TOTAL	2,012.32 m²

0 15 30
 ALL DISTANCES ARE IN METRES
 For a true to scale reproduction of this plan, plot it to A3 with the Paving Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should verify themselves of this plan's currency by contacting the MNG Survey Group.

Surveyor: ATH
 Survey Date: 13/10/2020
 Precal/Cad: 19/10/2020

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

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 ABN 90 009 363 311

FORRESDALE LOTS 84, 86 & 87 ANSTEY ROAD DETAIL SURVEY

CLIENT: **OTB MANAGEMENT PTY LTD**

Project Mgr: Mark Dobson
 Datum: PEGDA / AHD

103473 - DE - 001 - A
 Number Type Plan Revision

REFER TO SEPERATE PLAN FOR CARPARK DETAILS
 REFER TO SEPERATE PLAN FOR LANDSCAPING DETAILS

ENERGY EFFICIENCY 6 STAR REQUIREMENTS
 CAVITY WALL INSULATION: **NIL**
 (Extent between markers X-X)
 LIVING CEILING INSULATION: **R3.0**
 GARAGE CEILING INSULATION: **NIL**
 ROOF INSULATION: **NIL or BAL SPEC.**
 DESIGN CHANGES: **NIL**
 WINDOW GLAZING: **SINGLE CLEAR**
 ENERGY RATING COMPLETE: **YES/NO**

AVELING DEVELOPMENTS
 STRATA, DUPLEX, TRIPLEX, MULTI-UNITS
 BUILDING CONTRACTOR N° 12788
 Level 1, 42 Cedric Street, Stirling WA 6021
 Phone (08) 6144 1000 Fax (08) 6144 1004
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Drwg: **SITE PLAN (1:500)**
 Client: **OTB DEVELOPMENTS PTY LTD**
 Site: **LOT 84 & 87 #16 & 30 ANSTEY ROAD FORRESDALE**
 Map Ref: StreetSmart® - 494/E5

CONTRACTS

OWNER..... DATE.....
 OWNER..... DATE.....
 BUILDER..... DATE.....

CHILD CARE CENTRE
 Local Authority: **ARMADALE**

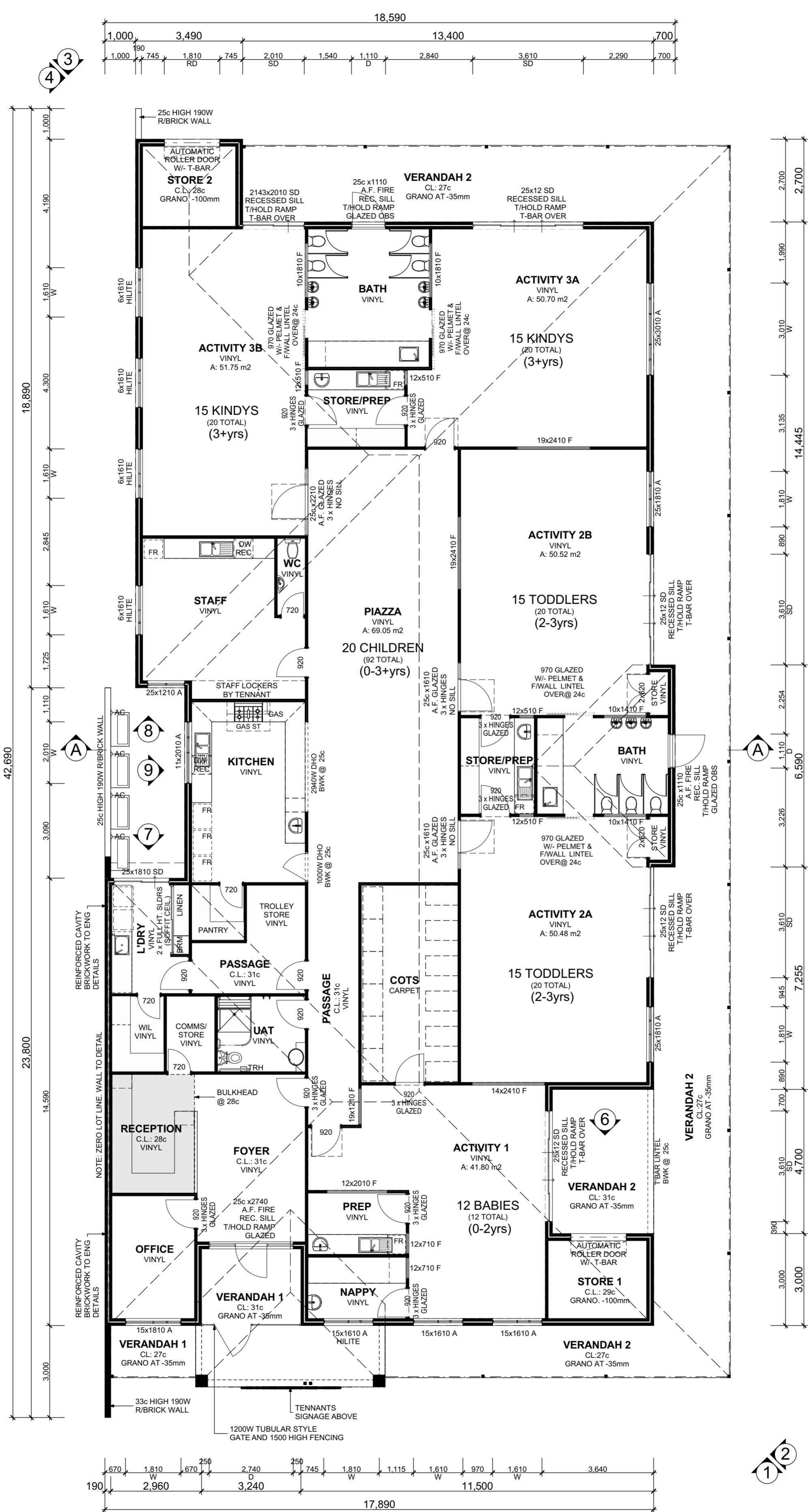
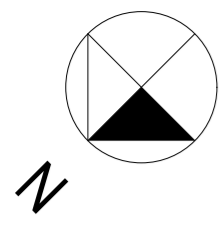
Rev	Date	Amendment
01	14/12/20	UPDATE CARPARKING LAYOUT
02		
03		
04		
05		
06		
07		

Local Authority: **ARMADALE**
 Job No: **TBC**
 Date Dm: **26/10/20**
 Dm By: **ZH**
 Check: **TIM**
 Sales: **LA**
 Scale: **1:500, 1:200, 1:100**
 Sheet # **03** Rev: **01**

NOTE: TO SCALE ON A2 SHEET

NOTE:
CEILING 31c + WALL PLATE
 UNLESS NOTED OTHERWISE.
METAL DECK ROOF
AT 5 & 20 °, EAVE 500MM
ACRYLIC TEXTURE ON RENDER FINISH TO
EXTERNAL BWK UNLESS NOTED
OTHERWISE.

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(U.N.O.) UNLESS NOTED OTHERWISE ON PLAN THE FOLLOWING SHALL APPLY.

BRICKLAYER NOTE
 6mm RODS & 3" OF LONG REACH BRICK TO TOP OF INTERNAL WALLS BETWEEN Z,Z.

EXTENT OF RENDER BETWEEN R-R.

REFER TO CONSTRUCTION DETAIL SHEET & ENGINEER CERTIFIED DETAILS.

REFER TO ENGINEERS TIE DOWN DETAILS.

ROOF CARPENTER NOTE
 REFER TO ENGINEERS TIE DOWN DETAILS.

REFER TO BUILDERS ROOF CARPENTER SPECIFICATION.

FIXING CARPENTER NOTE
 PROVIDE GALLOW'S BRACKET SUPPORT TO SHELVES OVER 1800mm LONG (MAX. 1800mm).

ALL SHELVES 450 DEEP (U.N.O.)

HANG RAIL CENTRE TO BE 250mm OFF WALL BACK OF SHELF.

WIRROBE: SHELF & RAIL AT 1800mm A.F.L.

PANTRY: 4 SHELVES TOP SHELF AT 1800mm A.F.L. BOTTOM SHELF AT 600mm A.F.L. EQ. SPACE SHELVES BETWEEN

LINEN: 4 SHELVES TOP SHELF AT 1800mm A.F.L. EQ. SPACE ALL SHELVES TO F.F.L.

BROOM: 1x SHELF AT 1800mm A.F.L.

PROVIDE DRAFTPROOF SEAL TO ENTRY, GARAGE ENTRY & LAUNDRY EXTERNAL DOORS WHERE APPLICABLE.

TOWEL RAILS FIXED AT 1100mm A.F.L.

CLIENT NOTE
 NOTED DIMENSIONS WILL TAKE PREFERENCE TO SCALE.

DIMENSIONS SHOWN ON PLANS ARE TO BRICKWORK. INTERNAL SPACES WILL ALTER IN SIZE TO ACCOMMODATE WALL FINISHES.

H/FLEX TO ALL EXTERNAL CEILINGS & EAVES UNLESS NOTED.

NUMBER AND SPACING OF RAIN WATER PIPES IS APPROXIMATE & GOVERNED BY ROOF STRUCTURE & AT THE PLUMBERS DISCRETION.

ALL STRUCTURAL BEAMS IN ACCORDANCE WITH THE ENGINEERS SIGNED DETAILS AND SPECIFICATIONS.

LEGEND:

RL	REDUCED LEVEL
FFL	FINISHED FLOOR LEVEL
NGL	NATURAL GROUND LEVEL
GF	GROUND FLOOR
FF	FIRST FLOOR
SF	SECOND FLOOR
FL	FLOOR LEVEL
CL	CEILING LEVEL
PD	PLUMBING DUCT
WP	WALL PLATE
AF	ALUMINIUM FRAME
MF	METAL FRAME
TF	TIMBER FRAME
CSD	CAVITY SLIDING DOOR
PL	PRIVACY LOCK
OBS	OBSCURE GLASS
DG	DOUBLE GLAZING
DR	DOUBLE REBATE
GB	GLAZING BARS
PB	PLASTERBOARD
FC	FIBRE CEMENT
SC	SKIM COAT (PLASTER)
PF	PAINT FINISH
PFR	PAINT FINISH RENDER
AT	ACRYLIC TEXTURE
EPS	EXPANDED POLYSTYRENE
DP	DOWNSPIPE
SPDR	SPREADER
RWH	RAIN WATER HEAD
NTB	NOT TO BOND
FW	FLOOR WASTE

ENERGY EFFICIENCY 6 STAR REQUIREMENTS
 CAVITY WALL INSULATION: **NIL**
 (Extent between markers X-X)
 LIVING CEILING INSULATION: **R3.0**
 GARAGE CEILING INSULATION: **NIL**
 ROOF INSULATION: **NIL or BAL SPEC.**
 DESIGN CHANGES: **NIL**
 WINDOW GLAZING: **SINGLE CLEAR**
 ENERGY RATING COMPLETE: **YES/NO**

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 Phone (08) 6144 1000 Fax (08) 6144 1004
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Drwg: **FLOOR PLAN**
 Client: **OTB DEVELOPMENTS PTY LTD**
 Site: **LOT 84 & 87 #16 & 30 ANSTEY ROAD FORRESDALE**
 Map Ref: StreetSmart® - 494/E5

CONTRACTS
 OWNER: DATE:
 OWNER: DATE:
 BUILDER: DATE:

CHILDCARE CENTRE ARMADALE
 Local Authority: **ARMADALE**
 Job No: **TBC**
 Date Dm: **26/10/20**
 Dm By: **ZH**
 Check: **TIM**
 Sales: **LA**
 Scale: **1:100, 1:1**
 Sheet # **06** Rev: **01**

ID	FLOOR PLAN	M ²	PERIM.
01	PROPOSED CHILDCARE CENTRE	583.42	124.76
02	VERANDAH 1	23.31	26.29
03	VERANDAH 2	159.76	137.69
04	STORE 1	10.32	12.88
05	STORE 2	10.10	14.66
	TOTAL	786.91 m²	316.28 m
	PERIM.	786.91 m²	PERIM.
01	ROOF AREA GF	787.35	125.12

NOTE:
 TO SCALE ON A2 SHEET

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NOTE:
LIGHT GREY SHADING TO RENDER INDICATES PRIMARY COLOUR

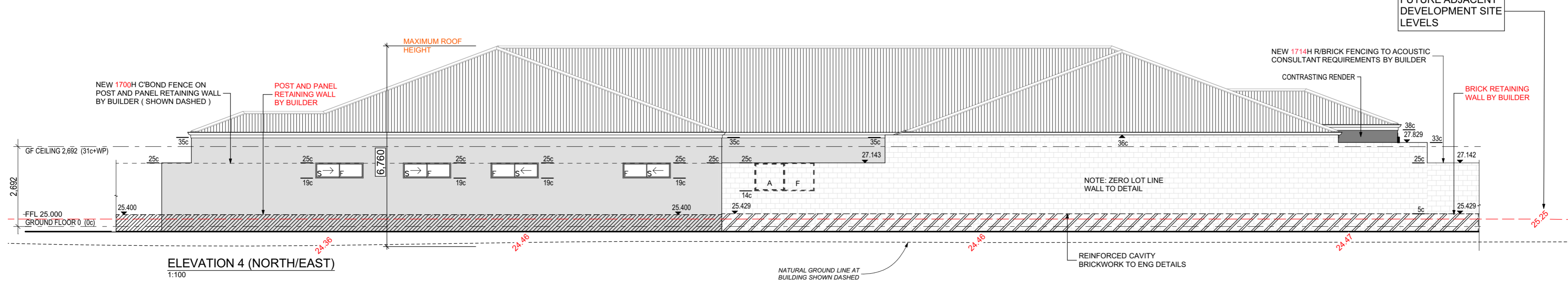
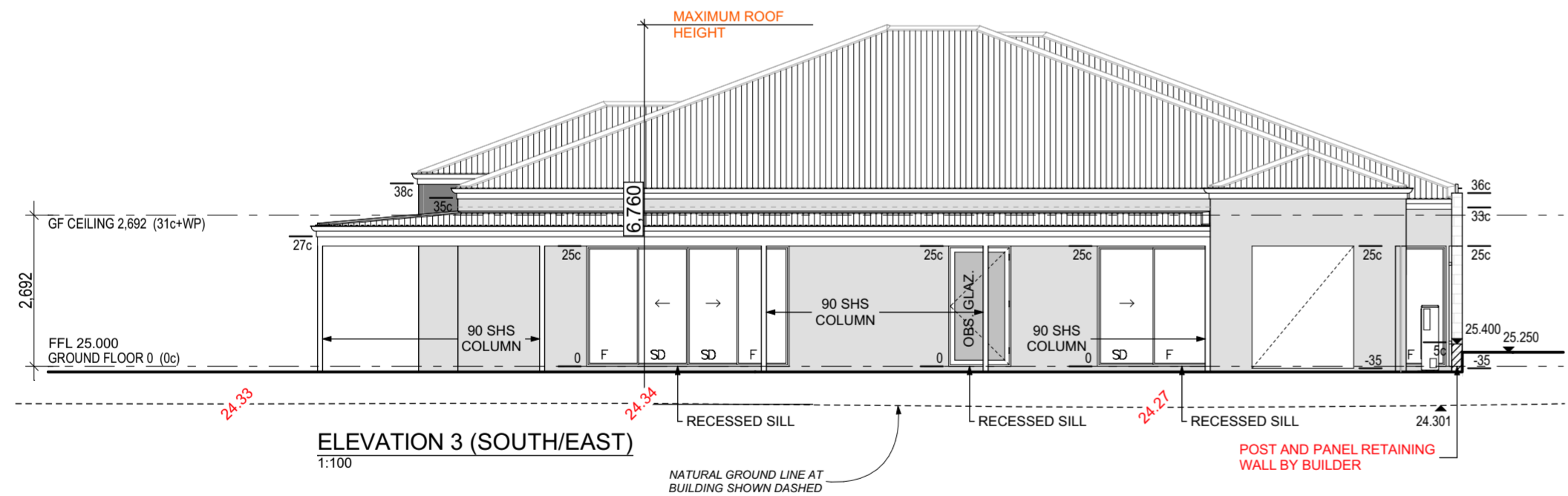
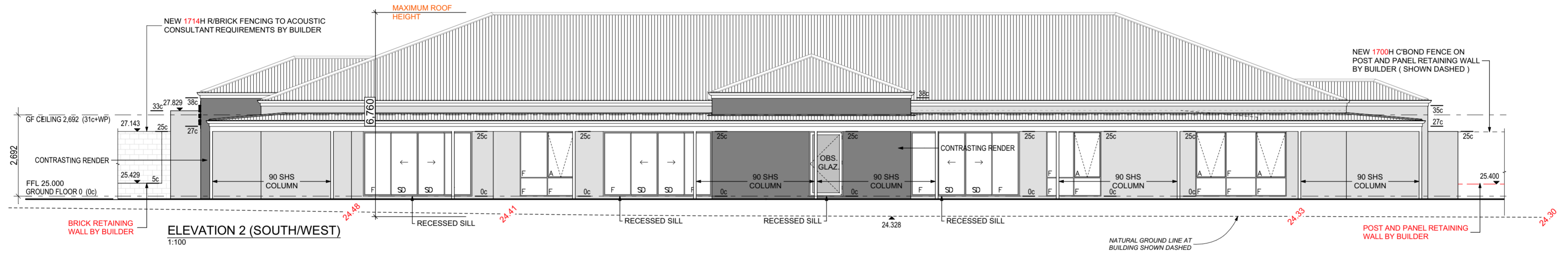
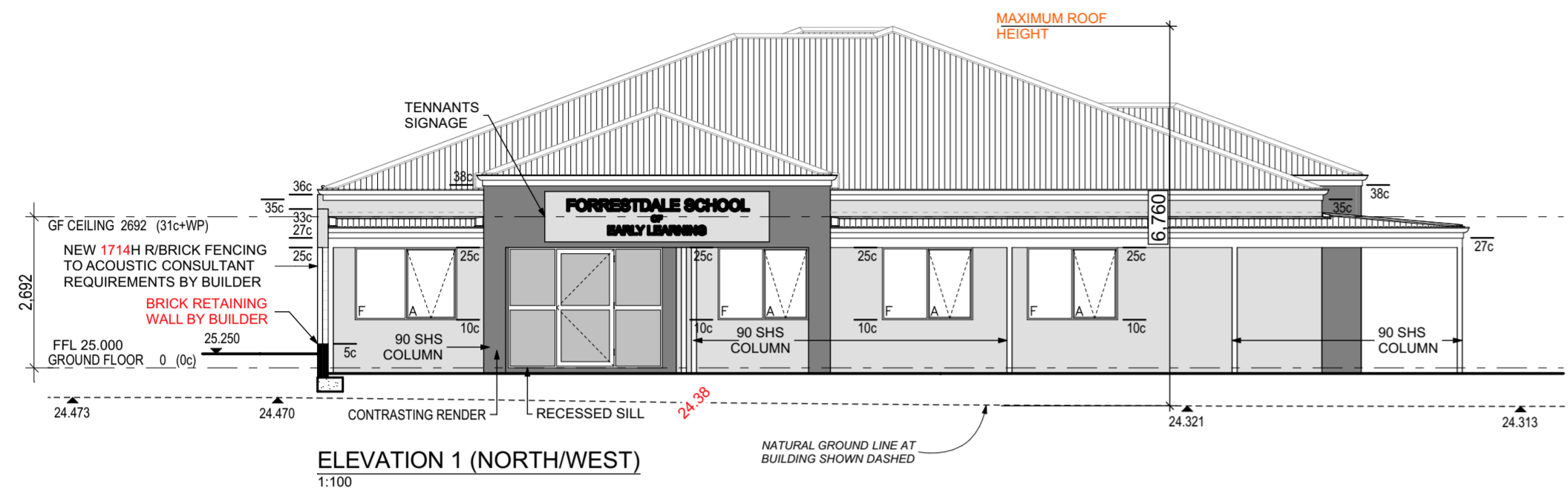
NOTE:
DARK GREY SHADING TO RENDER INDICATES SECONDARY COLOUR

NOTE:
CEILING 31c + WALL PLATE UNLESS NOTED OTHERWISE.
METAL DECK ROOF
AT 5 & 20 °, EAVE 500MM
ACRYLIC TEXTURE ON RENDER FINISH TO EXTERNAL BWK UNLESS NOTED OTHERWISE.

NOTE:
TO SCALE ON A2 SHEET

ACRYLIC TEXTURE COAT (MAIN COLOUR)	KITTY GREY (SOLVER)
ACRYLIC TEXTURE COAT (FEATURE COLOUR)	SHASHIMI (SOLVER)
GABLES, SCREENS AND DOWNPIPES	COLORBOND DUNE
ROOF COVER	COLORBOND SURFMIST
INFILL PANELS & TUBULAR FENCING	COLORBOND DUNE
WINDOW FRAMES	COLORBOND EVENING HAZE
COLORBOND BOUNDARY FENCE	COLORBOND DUNE

INDICATIVE COLOUR SCHEME



Job No	TBC
Date Dim	26/10/20
Drawn By	ZH
Checked	TIM
Sales	LA
Scale	1:100, 1:20
Sheet #/of	01
Rev	

Local Authority	ARMADALE
Project Name	CHILD CARE CENTRE
Assessment	UPGRADE CARPARKING LAYOUT
Rev	01
Date	
Owner	
Builder	

Contracts	
Owner	
Owner	
Builder	

ELEVATIONS

Client: OTB DEVELOPMENTS PTY LTD

Site: LOT 84 & 87 #16 & 30 ANSTEY ROAD FORRESTDALE

Map Ref: StreetSmart@ -491E5

AVELING DEVELOPMENTS

STRATA DUBULA TRIPLEX MULTI-UNITS
BUILDING CONTRACTOR N° 12788
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Appendix B

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 :

% Type A₁₀₀ = the percentage of industrial land within
a 100m radius of the premises receiving the noise

% Type A₄₅₀ = the percentage of industrial land within
a 450m radius of the premises receiving the noise

% Type B₁₀₀ = the percentage of commercial land within
a 100m radius of the premises receiving the noise

% Type B₄₅₀ = 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.

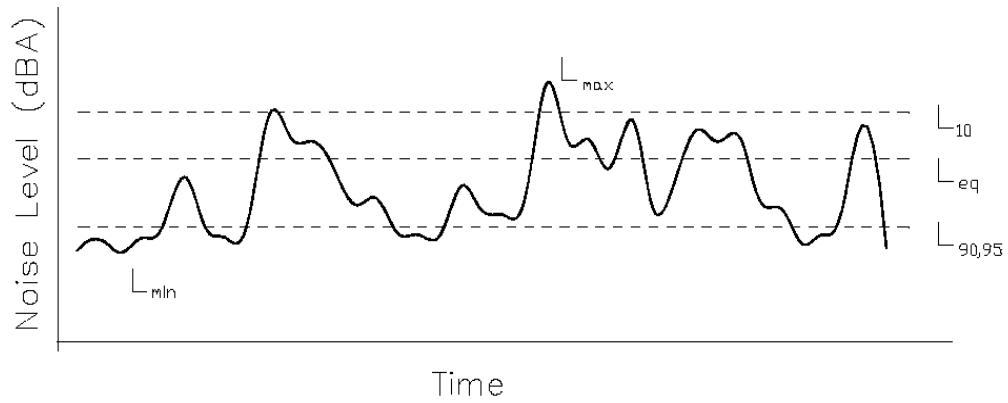
Ambient Noise

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

