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Transportation Noise Assessment

Lot 2495 (#7) Cheriton Drive, Carramar

Reference: 22047249-01

Prepared for:
FRP Capital C/- Planning Solutions

Report: 22047249-01

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1 INTRODUCTION

It is proposed to construct a double storey commercial addition adjacent to Carramar Village Shopping Centre at Lot 2495 (#7) Cheriton Drive, Carramar, as located in *Figure 1-1*. Proposed plans of the development are provided in *Appendix A*.

Figure 1-1 Subject Site Locality

As the proposed development comprises of a childcare centre,which is considered noise sensitive, and is approximately 24 metres from Joondalup Drive ('Other significant freight/traffic routes'), a noise assessment against *State Planning Policy No. 5.4 Road and Rail Noise* is required.

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

2 CRITERIA

The criteria relevant to this assessment are provided in *State Planning Policy No. 5.4 Road and Rail Noise* (hereafter referred to as SPP 5.4) produced by the Western Australian Planning Commission (WAPC). The objectives of SPP 5.4 are to:

- Protect the community from unreasonable levels of transport noise;
- Protect strategic and other significant freight transport corridors from incompatible urban encroachment;
- Ensure transport infrastructure and land-use can mutually exist within urban corridors;
- Ensure that noise impacts are addressed as early as possible in the planning process; and
- Encourage best practice noise mitigation design and construction standards

Table 2-1 sets out noise targets that are to be achieved by proposals under which SPP 5.4 applies. Where the targets are exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.

Table 2-1 Noise Targets for Noise-Sensitive Land-Use

Outdoor Noise Target		Indoor Noise Target	
55 dB $L_{Aeq(Day)}$	50 dB $L_{Aeq(Night)}$	40 dB $L_{Aeq(Day)}$ (Living and Work Areas)	35 dB $L_{Aeq(Night)}$ (Bedrooms)

Notes:

- Day period is from 6am to 10pm and night period from 10pm to 6am.
- The outdoor noise target is to be measured at 1-metre from the most exposed, habitable[1] facade of the noise sensitive building.
- For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors (as amended) for each relevant time period.
- Outdoor targets are to be met at all outdoor areas as far as is reasonable and practicable to do so using the various noise mitigation measures outlined in the Guidelines.

The application of SPP 5.4 is to consider anticipated traffic volumes for the next 20 years from when the noise assessment is undertaken.

In the application of the noise targets, the objective is to achieve:

- indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and childcare centres, the design of outdoor areas should take into consideration the noise target.

[1] A habitable room is defined in State Planning Policy 3.1 as a room used for normal domestic activities that includes a bedroom, living room, lounge room, music room, sitting room, television room, kitchen, dining room, sewing room, study, playroom, sunroom, gymnasium, fully enclosed swimming pool or patio.

3 METHODOLOGY

Noise measurements and modelling have been undertaken generally in accordance with the requirements of SPP 5.4 and associated Guidelines[2] as described in *Section 3.1* and *Section 3.2*.

3.1 Site Measurements

Noise monitoring was undertaken on site using a Rion NA-28 (S/N: 211611) sound level meter (refer *Figure 3-1*). This meter complies with the instrumentation requirements of *Australian Standard 2702-1984 Acoustics – Methods for the Measurement of Road Traffic Noise*. The meter was field calibrated before and after the measurement session and found to be accurate to within +/- 1 dB. Lloyd George Acoustics also holds current laboratory calibration certificate for the meter.

The microphone was approximately 1.4 metres above existing ground level and approximately 24 metres from edge of Joondalup Drive main carriageway. The measurements were recorded on 12 October 2021, between 2.00pm and 3.00pm.

Figure 3-1 Sound Level Meter on Site

A relationship between hourly traffic volumes and noise levels can then be derived to determine the existing $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ noise levels at the subject site.

[2] Road and Rail Noise Guidelines, September 2019

3.2 Noise Modelling

The computer programme *SoundPLAN 8.2* was utilised incorporating the *Calculation of Road Traffic Noise* (CoRTN) algorithms, modified to reflect Australian conditions. The modifications included the following:

- Vehicles were separated into heavy (Austroads Class 3 upwards) and non-heavy (Austroads Classes 1 & 2) with non-heavy vehicles having a source height of 0.5 metres above road level and heavy vehicles having two sources, at heights of 1.5 metres and 3.6 metres above road level, to represent the engine and exhaust respectively. By splitting the noise source into three, allows for less barrier attenuation for high level sources where barriers are to be considered.
- Note that a -8.0 dB correction is applied to the exhaust and -0.8 dB to the engine (based on Transportation Noise Reference Book, Paul Nelson, 1987), so as to provide consistent results with the CoRTN algorithms for the no barrier scenario;

Predictions are made at heights of 1.4 metres above floor level and at 1-metre from the window of each habitable room, resulting in a + 2.5 dB correction due to reflected noise.

Various input data are included in the modelling such as ground topography, road design, traffic volumes etc. These model inputs are discussed in the following sections.

3.2.1 Ground Topography

Topographical and road design data for this project was taken from publicly available data e.g. *Google*. This was combined with the proposed dwelling and existing neighbouring dwellings to create a 3D noise model.

3.2.2 Traffic Data

Traffic data includes:

- Road Surface – The noise relationship between different road surface types is shown in *Table 3-1*.

Table 3-1 Noise Relationship Between Different Road Surfaces

Road Surfaces							
Chip Seal				Asphalt			
14mm	10mm	5mm	Slurry	Dense Graded	Novachip	Stone Mastic	Open Graded
+3.5 dB	+2.5 dB	+1.5 dB	+1.0 dB	0.0 dB	-0.2 dB	-1.5 dB	-2.5 dB

  The existing road surface is dense graded asphalt and is expected to remain unchanged into the future.

- Vehicle Speed – The existing and future posted speed is 70km/hr.

- Traffic Volumes – Existing (2016) and forecast (2041) traffic volumes were provided by Main Roads WA (Thomas Ng, Traffic Modelling Analyst, Reference: #42062). A validation plot was also provided allowing the Main Roads WA traffic volume model to be calibrated against actual counts. More recent traffic data was also obtained from the Main Roads WA Traffic Map. *Table 3-2* provides the traffic volume input data in the model.

Table 3-2 Traffic Information Used in the Modelling

Parameter	Scenario			
	Existing – 2017/18		Future - 2041	
	Eastbound	Westbound	Northbound	Southbound
24 Hour Volume	17,745	16,849	21,300	24,900
% Heavy	7.1	7.1	6	6

3.2.3 Ground Attenuation

The ground attenuation has been assumed to be 0.0 (0%) for the roads and 0.5 (50%) elsewhere. Note 0.0 represents hard reflective surfaces such as water and 1.00 represents absorptive surfaces such as grass.

4 RESULTS

4.1 Noise Monitoring

The results of the hourly noise level measurements, in free-field conditions, were:

- 12 October 2021: 2.00pm to 3.00pm – 58.5 dB $L_{Aeq,1hour}$.

Combining the measured noise levels with the hourly traffic volumes as shown in *Figure 4-1*, the $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ have been determined to be 58.0 dB $L_{Aeq(Day)}$ and 51.3 dB $L_{Aeq(Night)}$. Based on these results, the $L_{Aeq(Day)}$ is more critical than the $L_{Aeq(Night)}$ since their difference is greater than 5 dB (refer *Section 2* criteria).

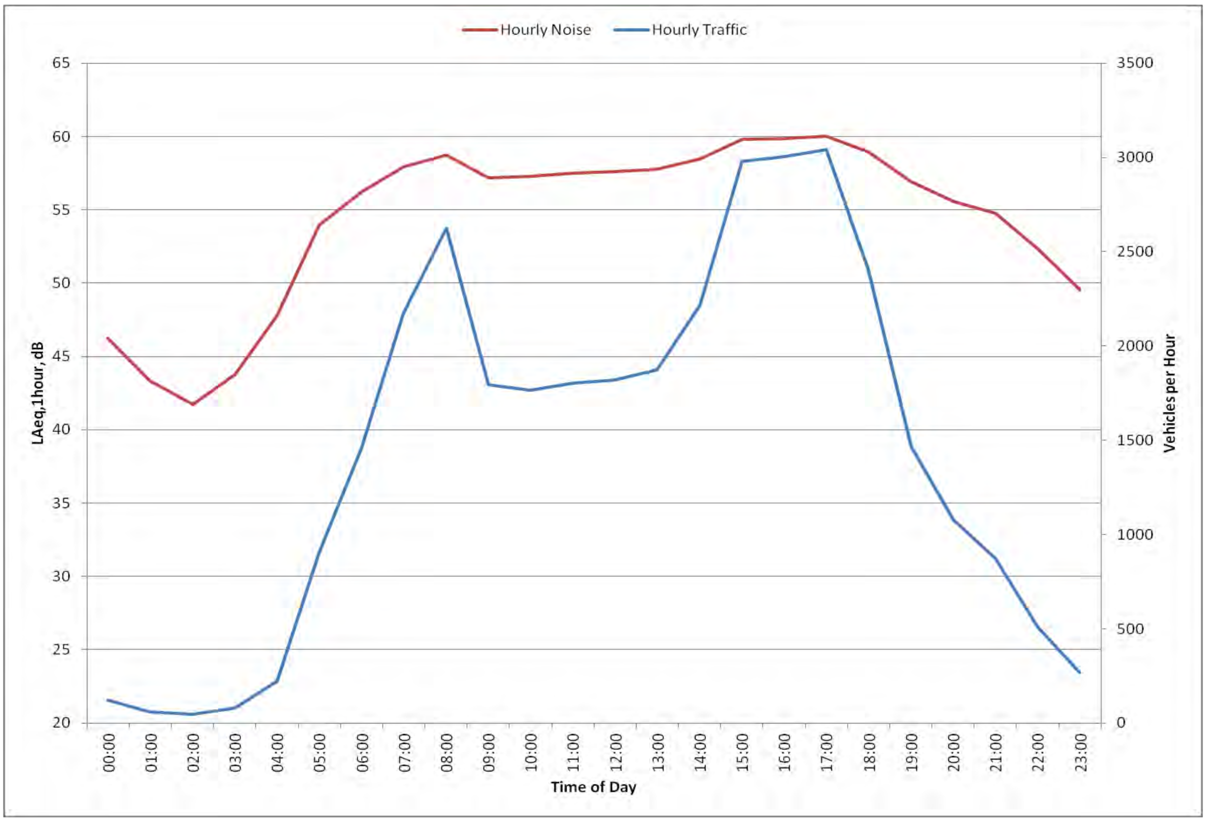


Figure 4-1 Noise Level Relationship to Hourly Traffic Volumes

4.2 Noise Modelling

The noise model was initially set-up for existing conditions and calibrated to the noise measurement location. The model is then updated to include the proposed building plans and future traffic volumes, maintaining the same model calibration. *Table 4-1* provides the predicted $L_{Aeq(Day)}$ noise levels to the glazed facade of each habitable room.

Table 4-1 Predicted Future (2041) $L_{Aeq(Day)}$ Outdoor Noise Levels

Room	$L_{Aeq(Day)}$, dB
Group Room 1	61
Group Room 2	59-63
Group Room 3	58
Group Room 4	57
Group Room 5	47-56
Nappy Change	61
Piazza/Foyer	57
Staff Room	44
Office	50

5 ASSESSMENT

The objectives of SPP 5.4 are to achieve:

- indoor noise levels specified in *Table 2-1* in noise-sensitive areas (e.g. bedrooms and living rooms of houses and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot.

Where the outdoor noise targets of *Table 2-1* are achieved, no further controls are necessary. As such, *Table 5-1* provides the minimum construction recommended.

Table 5-1 Recommended Minimum Construction

Element	Room	Construction
Glazing	Group Room 1	Assume window approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq$ 30, likely achievable using 6.5mm thick Vlam Hush glass in fixed/awning style window with acoustic seals. Glass door to be of same glass with acoustic seals.
	Group Room 2	South elevation window approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq 31$, likely achievable using 10.38mm thick glass in commercial grade fixed/awning style window with acoustic seals. Glazing to floor ratio would need to reduce to 35% for performance to be $R_w + C_{tr} \geq 30$, likely achievable using 6.5mm thick laminated VLam Hush glass in fixed/awning style window with acoustic seals. West elevation window approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq 28$, likely achievable using 6.38mm thick laminated glass in fixed/awning style window with acoustic seals. Glass door to be 6.38mm thick laminated glass with acoustic seals.
	Group Room 3	Window is approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq 28$, likely achievable using 6.38mm thick laminated glass in fixed/awning style window with acoustic seals. Glass door to be 6.38mm thick laminated glass with acoustic seals.
	Group Room 4	West elevation window approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq 27$, likely achievable using 6mm thick glass in fixed/awning style window with acoustic seals. Glass door to be 6mm thick glass with acoustic seals.
	Group Room 5	West elevation window approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq 26$, likely achievable using 6mm thick glass in fixed/awning style window with acoustic seals. Glass door to be 6mm thick glass with acoustic seals.
	Nappy Change	Assume window approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq$ 30, likely achievable using 6.5mm thick Vlam Hush glass in fixed/awning style window with acoustic seals. Glass door to be of same glass with acoustic seals.
	Piazza/Foyer	West elevation windows are approximately 40% of floor area and therefore is to achieve $R_w + C_{tr} \geq 27$, likely achievable using 6mm thick glass in fixed/awning style window with acoustic seals.

Element	Room	Construction
Walls	All	Walls to be concrete panels at least 150mm thick. Any plasterboard facing to be on furring channels or studwork with fibrous cavity insulation. Final construction should be verified at building permit stage by a suitably qualified acoustical consultant.
Roof/Ceiling	Group Room 1, Group Room 2, Nappy Change	Ceiling to be 13mm thick sound-rated plasterboard with R4 insulation above.
	All Others	Ceiling to be 13mm thick plasterboard with R4 insulation above.
Outdoor Living	Outdoor Play	At least one outdoor play area is noted to be on the opposite side and/or predicted to be below the noise target and therefore compliance with the Policy is considered achieved.
Ventilation	Rooms listed above	Fresh air requirements to be satisfied on the basis of windows closed. Any ducted fresh air intakes are to be on the side of the house opposite the corridor.
Notification	Lot	Notification to be provided on lot title advising of the potential noise impacts.

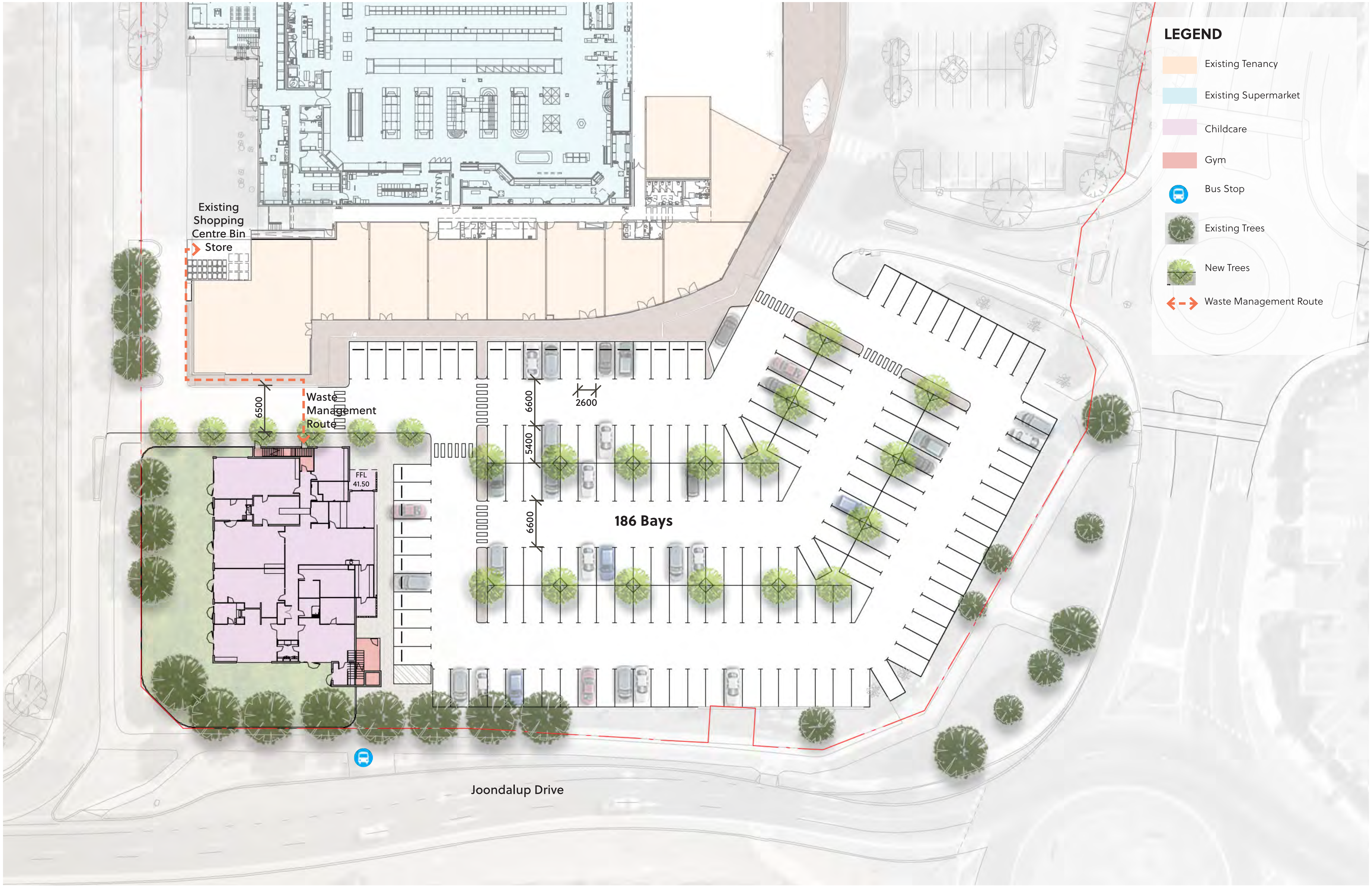
Note: Install cover mould to weep holes in above window frames where applicable

By implementing the above construction recommendations, noise levels are calculated to comply with the targets of SPP 5.4. Alternative constructions can be accepted provided these are supported by a laboratory calibration certificate.

It should be noted that the recommendations in this report are calculated to achieve acceptable internal noise levels in accordance with *State Planning Policy No. 5.4*. Compliance with this Standard does not result in all residents considering the noise level as acceptable as this is a subjective response. Where a resident is particularly sensitive to noise, they may wish to consider upgrading all glass (thicker, laminated glass results in higher levels of attenuation) and converting sliding windows/doors to hinged versions such as awning/casement style.

Appendix A

Development Plans



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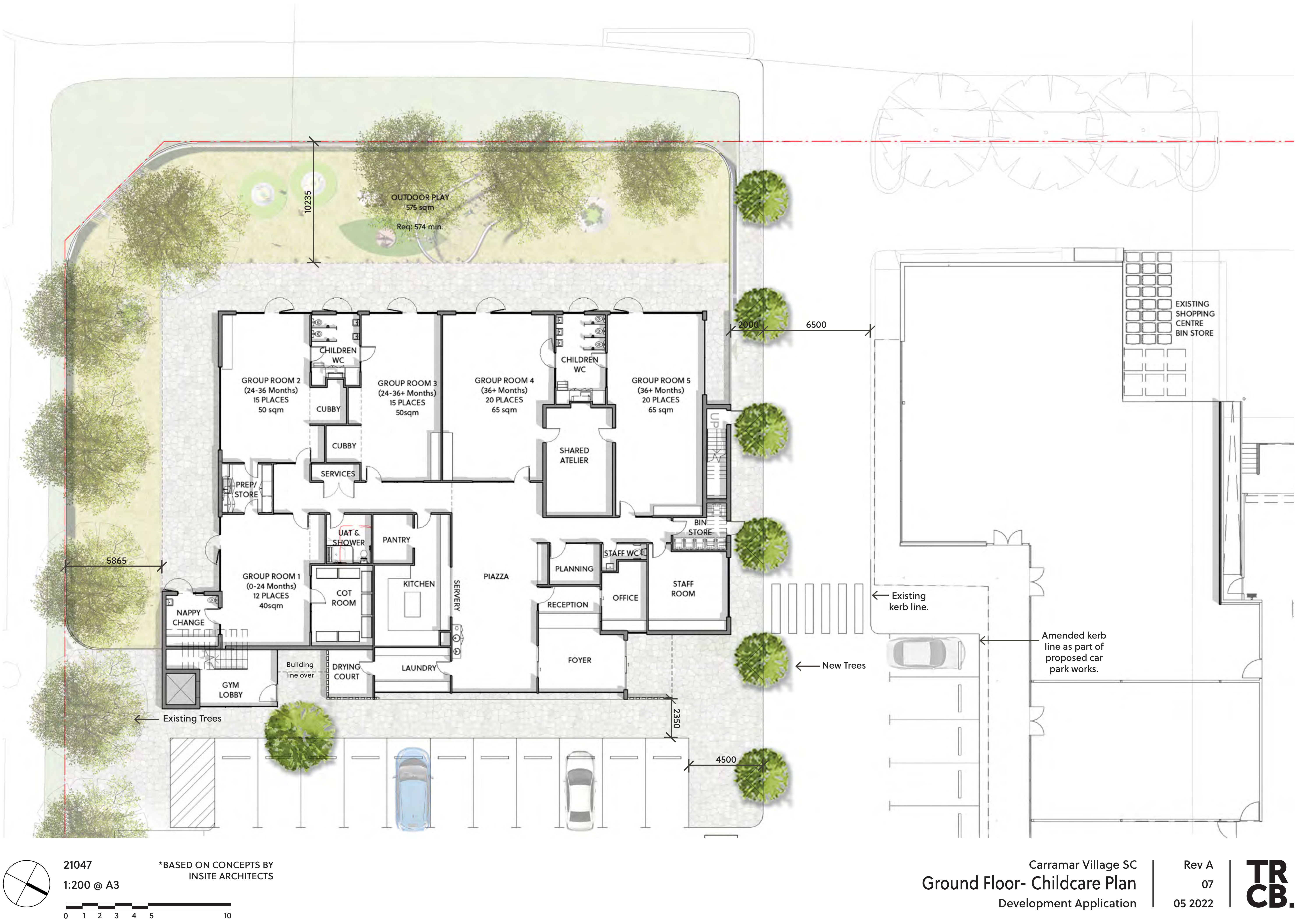
Carramar Village SC
Proposed Site Plan
Development Application

Rev A
06
05 2022

TR CB.



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*BASED ON CONCEPTS BY INSITE ARCHITECTS

Carramar Village SC
Ground Floor- Childcare Plan
Development Application

Rev A
07
05 2022

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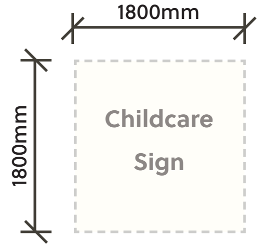
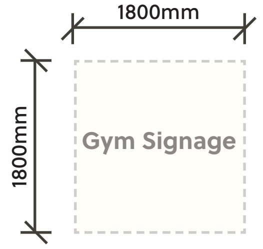
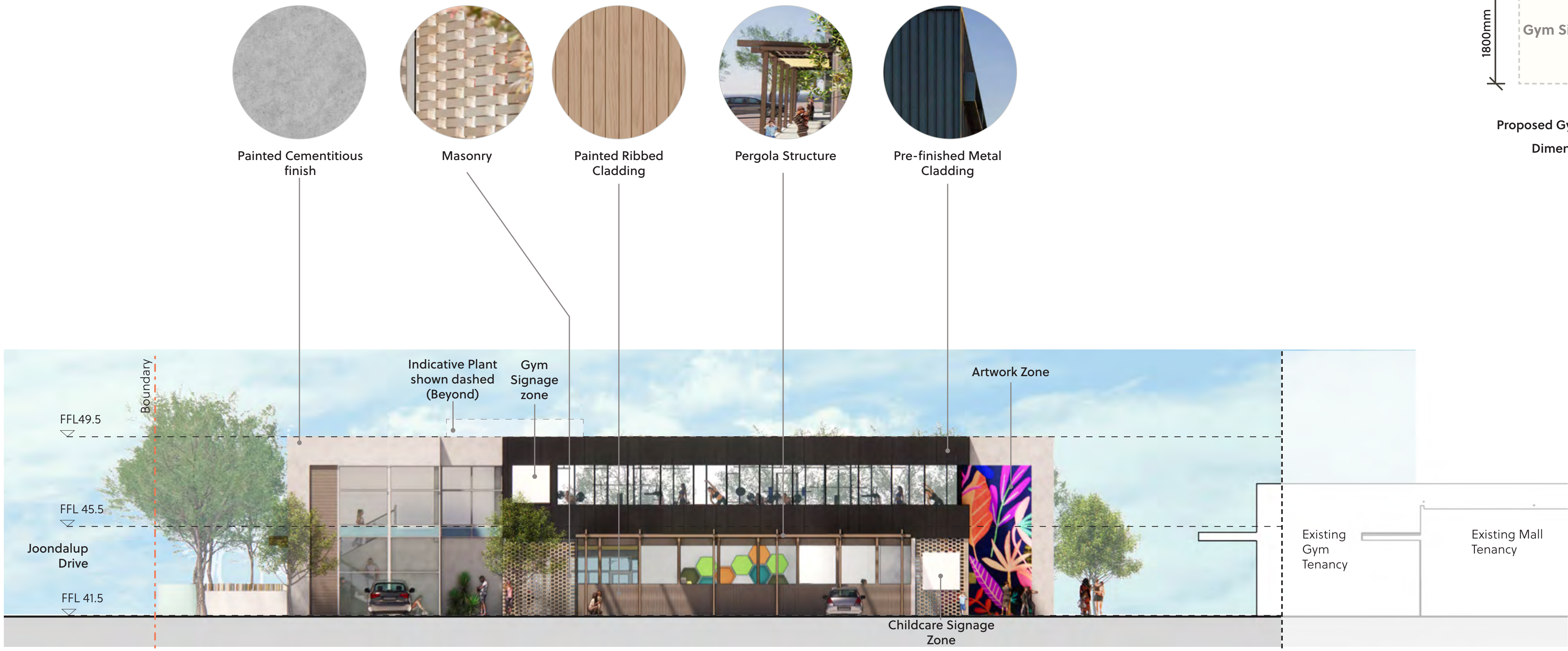


Proposed Childcare Signage Dimensions



Proposed Gym Signage Dimensions



East Elevation

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Carramar Village SC

Building Elevations

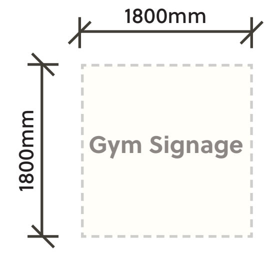
Development Application

Rev A

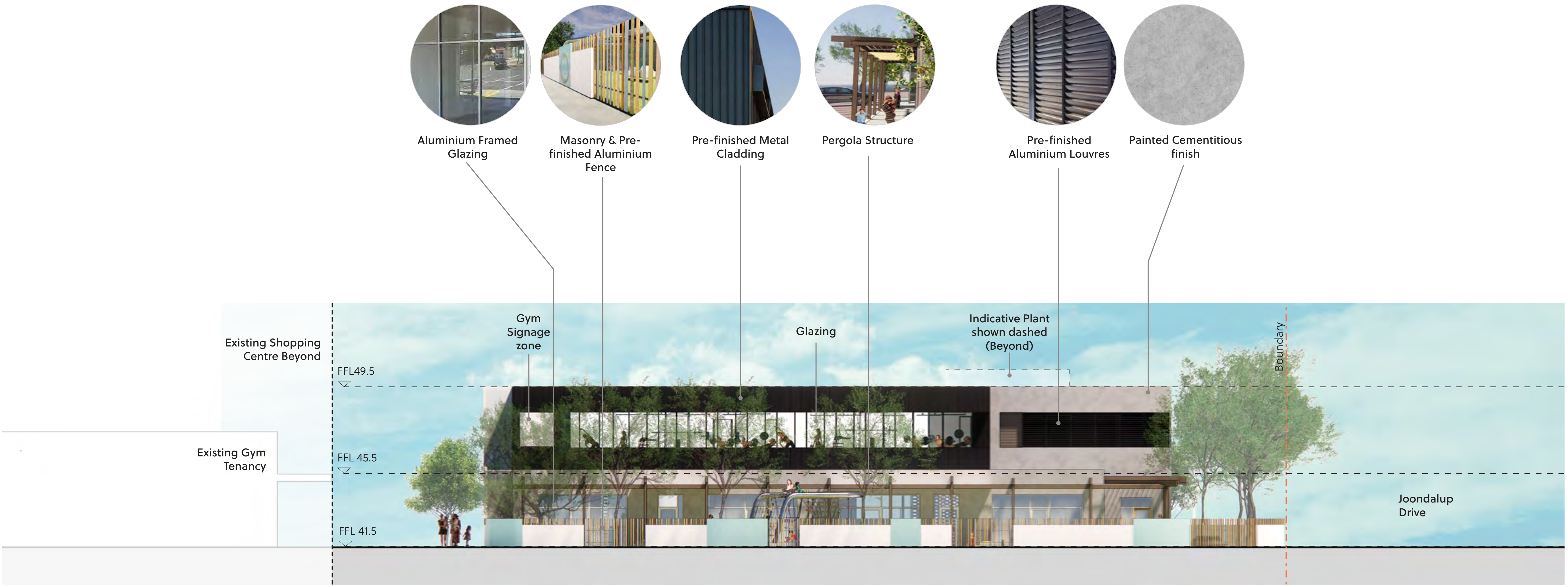
09

05 2022

TR CB.



Proposed Gym Signage Dimensions



West Elevation

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0 1 2 3 4 5 10

Carramar Village SC

Building Elevations

Development Application

Rev A

10

05 2022

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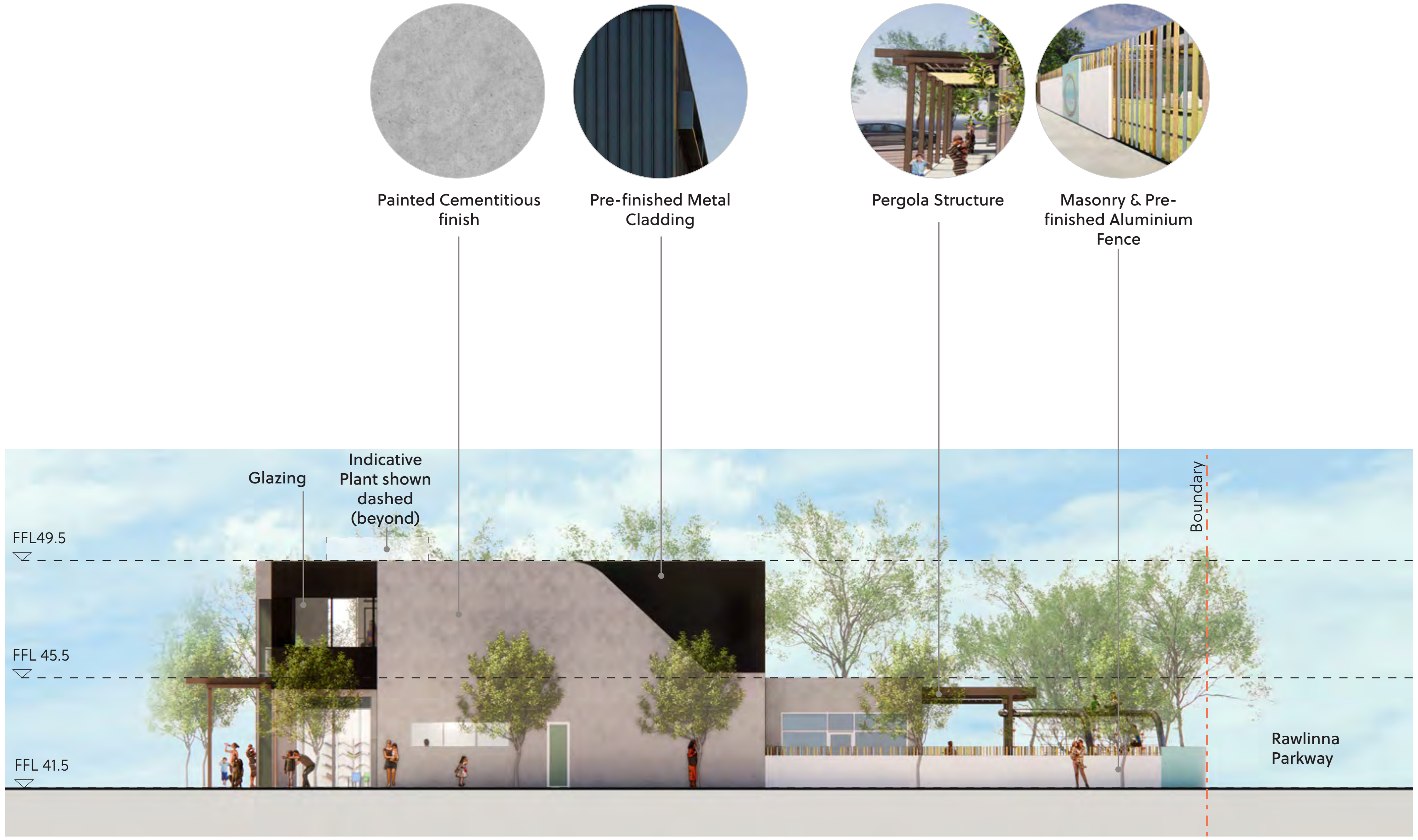

North Elevation

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Carramar Village SC

Building Elevations

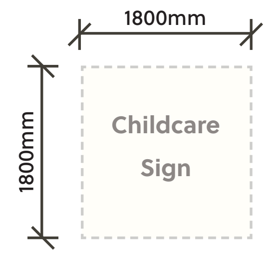
Development Application

Rev A

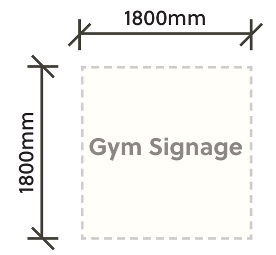
11

05 2022

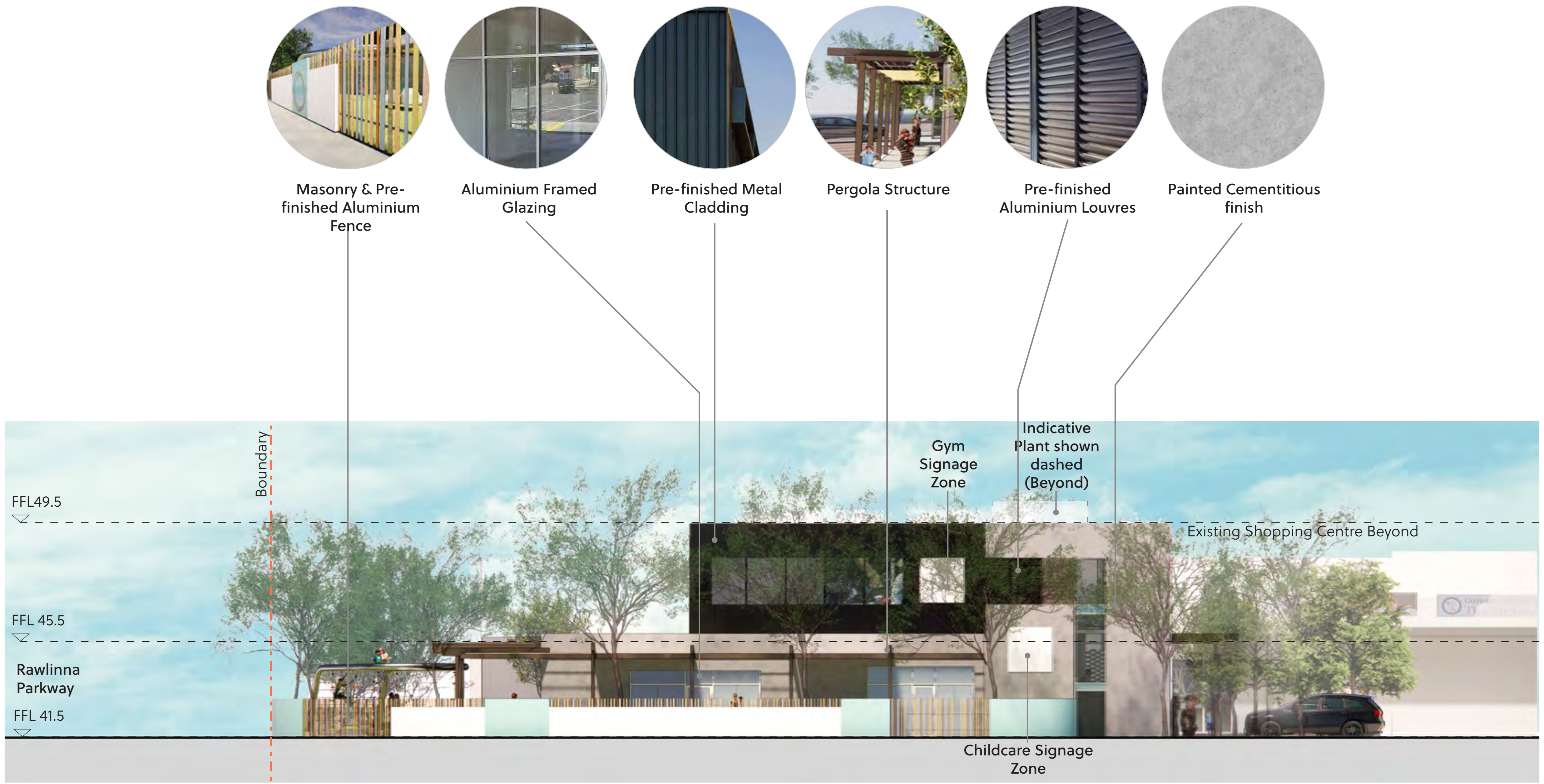
TR CB.



Proposed Childcare Signage Dimensions



Proposed Gym Signage Dimensions



South Elevation

21047

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0 1 2 3 4 5 10

Carramar Village SC
Building Elevations
Development Application

Rev A
12
05 2022

TR CB.

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.

L_1
An L_1 level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{10}
An L_{10} level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{90}
An L_{90} level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the "*background*" noise level.

L_{eq}
The L_{eq} level represents the average noise energy during a measurement period.

$L_{A10,18hour}$
The $L_{A10,18\,hour}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00 am and midnight. The *CoRTN* algorithms were developed to calculate this parameter.

$L_{Aeq,24hour}$
The $L_{Aeq,24\,hour}$ level is the logarithmic average of the hourly L_{Aeq} levels for a full day (from midnight to midnight).

$L_{Aeq,8hour}$ / $L_{Aeq\,(Night)}$
The $L_{Aeq\,(Night)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 10.00 pm to 6.00 am on the same day.

$L_{Aeq,16hour}$ / $L_{Aeq\,(Day)}$
The $L_{Aeq\,(Day)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the $L_{A10,18hour}$.

Noise-sensitive land use and/or development
Land-uses or development occupied or designed for occupation or use for residential purposes (including dwellings, residential buildings or short-stay accommodation), caravan park, camping ground, educational establishment, child care premises, hospital, nursing home, corrective institution or place of worship.

About the Term 'Reasonable'

An assessment of reasonableness should demonstrate that efforts have been made to resolve conflicts without comprising on the need to protect noise-sensitive land-use activities. For example, have reasonable efforts been made to design, relocate or vegetate a proposed noise barrier to address community concerns about the noise barrier height? Whether a noise mitigation measure is reasonable might include consideration of:

- The noise reduction benefit provided;
- The number of people protected;
- The relative cost vs benefit of mitigation;
- Road conditions (speed and road surface) significantly differ from noise forecast table assumptions;
- Existing and future noise levels, including changes in noise levels;
- Aesthetic amenity and visual impacts;
- Compatibility with other planning policies;
- Differences between metropolitan and regional situations and whether noise modelling requirements reflect the true nature of transport movements;
- Ability and cost for mobilisation and retrieval of noise monitoring equipment in regional areas;
- Differences between Greenfield and infill development;
- Differences between freight routes and public transport routes and urban corridors;
- The impact on the operational capacity of freight routes;
- The benefits arising from the proposed development;
- Existing or planned strategies to mitigate the noise at source.

About the Term 'Practicable'

'Practicable' considerations for the purposes of the policy normally relate to the engineering aspects of the noise mitigation measures under evaluation. It is defined as "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge" (*Environmental Protection Act 1986*). These may include:

- Limitations of the different mitigation measures to reduce transport noise;
- Competing planning policies and strategies;
- Safety issues (such as impact on crash zones or restrictions on road vision);
- Topography and site constraints (such as space limitations);
- Engineering and drainage requirements;
- Access requirements (for driveways, pedestrian access and the like);
- Maintenance requirements;
- Bushfire resistance or BAL ratings;
- Suitability of the building for acoustic treatments.

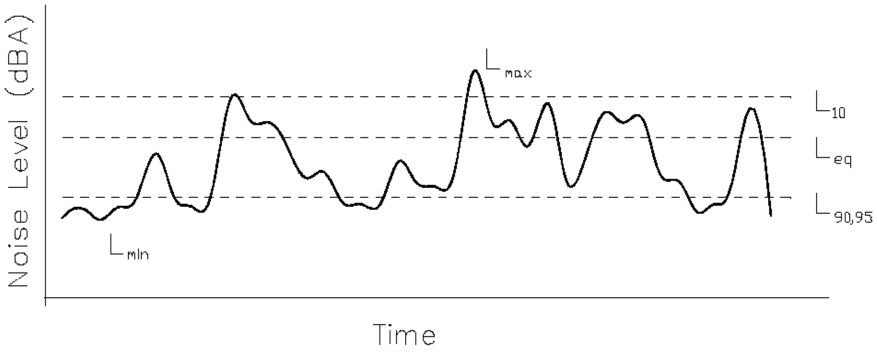
R_w

This is the weighted sound reduction index and is similar to the previously used STC (Sound Transmission Class) value. It is a single number rating determined by moving a grading curve in integral steps against the laboratory measured transmission loss until the sum of the deficiencies at each one-third-octave band, between 100 Hz and 3.15 kHz, does not exceed 32 dB. The higher the R_w value, the better the acoustic performance.

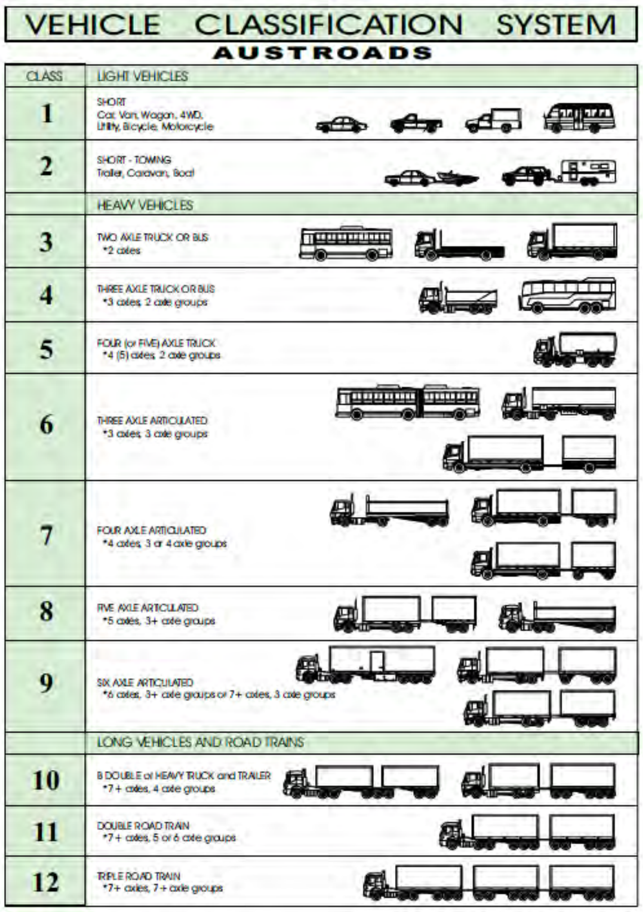
C_{tr}

This is a spectrum adaptation term for airborne noise and provides a correction to the R_w value to suit source sounds with significant low frequency content such as road traffic or home theatre systems. A wall that provides a relatively high level of low frequency attenuation (i.e. masonry) may have a value in the order of –4 dB, whilst a wall with relatively poor attenuation at low frequencies (i.e. stud wall) may have a value in the order of -14 dB.

Chart of Noise Level Descriptors



Austroads Vehicle Class



CLASS	LIGHT VEHICLES
1	SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle
2	SHORT - TOWING Trailer, Caravan, Boat
	HEAVY VEHICLES
3	TWO AXLE TRUCK OR BUS *2 axles
4	THREE AXLE TRUCK OR BUS *3 axles, 2 axle groups
5	FOUR (or FIVE) AXLE TRUCK *4 (5) axles, 2 axle groups
6	THREE AXLE ARTICULATED *3 axles, 3 axle groups
7	FOUR AXLE ARTICULATED *4 axles, 3 or 4 axle groups
8	FIVE AXLE ARTICULATED *5 axles, 3+ axle groups
9	SIX AXLE ARTICULATED *6 axles, 3+ axle groups or 7+ axles, 3 axle groups
	LONG VEHICLES AND ROAD TRAINS
10	B DOUBLE or HEAVY TRUCK and TRAILER *7+ axles, 4 axle groups
11	DOUBLE ROAD TRAIN *7+ axles, 5 or 6 axle groups
12	TRIPLE ROAD TRAIN *7+ axles, 7+ axle groups

Typical Noise Levels