



7 August 2015

EMMANUEL CHRISTIAN COMMUNITY SCHOOL
C/O -
Ferguson Architects
31 Malcolm Street
West Perth 6005

Attention: **Doug Harvey** doug@fergusonarchitects.com

Re: EMMANUEL CHRISTIAN COMMUNITY SCHOOL - NEW JUNIOR SCHOOL
DEVELOPMENT APPROVAL STAGE - ACOUSTIC REPORT

Dear Doug,

As requested, this correspondence summarises acoustic design issues relevant to the Development Approval stage of proposed new Junior School to be located on Casserley Ave, Girrawheen.

At the Development Approval stage there is not adequate detail available to conduct a complete acoustic assessment, including engineering calculations for all Building Services. However, this report establishes the site specific Assigned Level criteria that must be addressed, and also includes indicative prediction of noise levels for a range of representative Car-Park noise sources, at relevant receiver positions. This is to enable the Local Authority to review the D.A submission in terms of likely compliance, and identify items that require additional assessment.

The main purpose of this Development Approval - Acoustic Report is to:

- a) Ensure that the Client and Project Team is aware of their Regulatory obligations with regards to noise emissions.
- b) Establish the project specific "Assigned Level" criteria in accordance with the Regulations.
- c) Identify the relevant Noise Sources and the Assigned Levels applicable to each, including any required adjustments for 'Intrusive or Dominant Noise Characteristics'.
- d) Identify acoustic issues that may require further detailed consideration by the Project Team and Local Authority, which may require project specific legal interpretation, or application of discretion within the framework of the regulations.
- e) Identify acoustic issues to be addressed in more detail during design and documentation stages, to ensure compliance with the Environmental Protection (Noise) Regulations, to the satisfaction of the Local Authority.

The Local Authority then generally includes a 'D.A Condition' to follow through with further detailed acoustic assessment and reporting, to demonstrate compliance with the Environmental Protection (Noise) Regulations.

1. ENVIRONMENTAL NOISE EMISSIONS

Noise emissions generated by the use of the proposed Junior School facilities must comply with the Environmental Protection (Noise) Regulations, 1997 (as amended December 2013).

The criteria for noise emissions from the school development to all neighbouring premises are called the 'Assigned Levels', and vary depending on time of day, as well as type and duration of the noise source etc. The site specific 'Assigned Level' criteria are set out below in 1.1. As identified in **Fig 1** of 1.1 below, the neighbouring receivers are all existing residential premises, and are therefore deemed to be 'noise sensitive'.

1.1 Site Specific 'Assigned Level' Criteria

The site specific 'Assigned Level' criteria relevant to the neighbouring residences take into account the land zoning and traffic flows within a 100m and 450m radius of the relevant receivers, as discussed below.

Transport Influencing Factor

In this case Beach Road is deemed to be a 'Major Road' and is located within 100 metres of the residential neighbours to the south of the proposed school building. The result is a Traffic Influencing Factor of + 6dB for the houses within 100 m of Beach Road, and + 2dB for the residences further north, but still within 450 metres of Beach Road. Refer to *Fig 1 below*.

Land Zoning Influencing Factor

There is no commercial or industrial zoned land within 100 metres of any receiver premises. Similarly, there is negligible if any commercial or industrial zoned land within 450 metres of any neighbouring premises. This results in nil 'Land Use' Influencing Factor.

However, in accordance with Schedule 3, clause 2, item (8) of the regulations, a + 2dB Influencing Factor is applied to all receiver premises located within 100m of Hainsworth Park, which is considered to be a sporting facility with associated sporting use building. As per *Fig 1* below, this +2dB allowance applies to the residences immediately north and east of the proposed school buildings, being added to the total Influencing Factor.

The combined effect of these Influencing Factors is summarised in Figure 1 below. Note also that the residences hatched 'Blue' are two storey units, so have both ground level and upper level receivers.

Fig 1 – Influencing Factors relevant to neighbouring residential premises



Based on the above, there is a total Influencing Factor of +2dB to the western residences, +4dB to the north and east residences, and +6dB to the residences to the south of the proposed school buildings. On this basis, the regulatory ‘Assigned Noise Level’ criteria to be applied to this development, which will only operate during the daytime period Monday to Saturday are tabulated below:

TABLE 1: ASSIGNED LEVELS

Type of premises receiving noise	Time of day	Assigned Noise Level (dB)			
		Location of Residence	L _{A10}	L _{A1}	L _{A max}
Noise sensitive premises; highly sensitive area (i.e. within 15metres of a residential building)	0700 to 1900 hours Monday to Saturday		(45+IF)	(55+IF)	(65+IF)
		Western	47 dB	57 dB	67 dB
		North & Eastern	49 dB	59 dB	69 dB
		Southern	51 dB	61 dB	71 dB
Further than 15m from a residential building	All hours		60 dB	75 dB	80 dB

The Assigned Level parameters used for the various environmental noise criteria are described below. The examples are based on an *Assessment Period* of 4 hours (refer to 1.1.1 below):

L_{A10} is the 'A' weighted noise level which is not to be exceeded for more than 10% of the time. i.e. Noise sources that occur for more than 24 minutes in 4 hours must not exceed this value.

This is the parameter relevant to most HVAC equipment, and emissions from other longer term noise sources, that occur for extended duration.

However, for short duration noise events, such as car movements along a driveway, the relevant Assigned Level becomes the **L_{A1}** value, as per below

L_{A1} is the 'A' weighted noise level which is not to be exceeded for more than 1% of the time. i.e. noise sources that occur for up to but not more 24 minutes in 4 hours must not exceed this value.

This is the parameter relevant to noise sources that only occur occasionally, for short durations, (e.g. car moving along a driveway).

L_{Amax} is the 'A' weighted noise level which is not to be exceeded at any time, regardless of the Assessment Period.

1.1.1 Assessment Period

In accordance with Part 1 of the Regulations, a *Representative Assessment Period* means “a period of time of not less than 15 minutes, and not exceeding 4 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”

The determination of the *Representative Assessment Period* is therefore at the discretion of the Local Authority. This can have a significant impact on which Assigned Levels are relevant to various noise sources. For example, if the noise emission from a car park is assessed over only a 15 minute busy period, then various short term noise events may be present practically all of the time, and are not 'averaged' over a longer period of 4 hours, the majority of which will be relatively quiet.

These school facilities including car parking activities will operate weekdays, between approximately 7:30 am and 5:30 pm. The assessment of potential noise sources presented in this report have been based on a 4 hour *Assessment Period*.

1.1.2 Adjustments for Intrusive or Dominant Noise Characteristics

In accordance with Regulation 9, sounds with **tonal**, **modulating** or **impulsive** characteristics are deemed to be more intrusive. Where necessary, an adjustment of +5 dB is made to the measured level for **tonal** and **modulating** characteristics, and + 10dB for impulsive characteristics – where measurable at the point of reception.

In accordance with the noise assessment techniques described in the Regulations, noise emission from most mechanical equipment such as Condensing Units and Exhaust Fans etc are considered **tonal** and therefore a + 5dB adjustment is required to be added the measured (or predicted) level, where the tonal noise is present for more than 10% of the *Assessment Period*.

An 'Impulsive' characteristic is associated with short sharp noise sources, such as closing car doors, which attracts a +10dB adjustment.

Music noise emission must be adjusted by either + 10dB or +15dB depending on whether there is a measurable 'impulsive' character. Where impulsive bass beat is not present in music noise emission the adjustment is +10dB. However, the issue of music noise emissions in the context of an 'educational facility' is considered in more detail in section 1.3 – Exceptions for Community Noise.

1.3 Exceptions for "Community Noise"

It must be noted that that in accordance of **Regulation 16 "Community Noise"**, compliance with the Assigned Level criteria does NOT apply to a range of activities which are typically located 'within' the community.

Item 4 of Schedule 2 specifically identifies the following as "Community Noise", relevant to school facilities:

4. Noise emitted as a consequence of a recreational or educational activity from premises occupied for educational purposes if the activity -
 - (a) is conducted under the control of the occupier of the premises; and
 - (b) does not include the use of mechanical equipment, other than musical instruments.

The 'exceptions' applied to educational facilities therefore relate to noise emissions from sources such as playgrounds and classroom breakout noise, including music practice and music associated with assemblies etc.

However, it must be noted that Regulation 16 states that if the noise emission associated with a particular 'Community Noise' activity is found to be causing undue impact (of detrimental effect) on a neighbouring premises, which exceeds the benefit to the community, the Local Authority still has the power to issue a noise control notice. Consequently, the school administration / staff will have to be mindful of the potential for annoyance to neighbours, when undertaking noise generating activities. Relevant issues are discussed below.

Recreational Activities

Playground / Recreational activity is considered to be 'Community Noise'. We are aware of cases where Local Authorities have imposed restrictions on school playground activities, but this is typically only where a high noise level playground zone, such as a basketball court or designated play equipment area is located immediately adjacent to a residential boundary. The Junior School planning arrangement proposed here does not incorporate these scenarios. In fact, the location of a consolidated central Play Area bounded on all sides by the school buildings is an acoustically desirable approach. The barrier effect of the buildings will provide significant attenuation of noise emissions to neighbouring premises, superior to that achieved by many schools located in residential areas.

Educational Activities

Noise breakout from classrooms and emissions from outdoor educational activities is also considered to be 'Community Noise'. We are aware of cases where local authorities have imposed restrictions, but this is typically where a dedicated high noise level music practice room or Covered

Assembly area is located immediately adjacent to a residential boundary. This scenario does not occur in this development.

The fact that each of the classrooms is arranged with access facing ‘inwards’ onto the central Play Area / Courtyard, with relatively limited extent of ‘outward’ facing windows is an acoustically beneficial design approach. As such standard glass for perimeter windows, together with basic management of closing windows during musical or other noise generating activity within general purpose classroom should be sufficient.

Time of Day Sirens / Signals

We are aware that sirens and other tonal ‘time of day’ signals have caused concerns at some schools in close proximity to residences, and are not necessarily considered as “Community Noise”. Consideration should therefore be given to ensuring the approach proposed for the Junior School is selected on the basis of minimising noise emission to neighbouring premises. Where an amplified signal system is the selected approach, a beneficial strategy may be to use numerous smaller ‘sounders’, only facing towards the central Play Area, rather than one larger / louder unit. Limiting the sounders to only face inwards towards the central Play Area is recommended, to minimise emission to neighbouring premises.

On-Site Parking

It should be noted that Regulation 16 does not specifically refer to any ‘exceptions’ for noise emitted from on-site parking at Community facilities. This report has therefore considered potential impact of noise emissions from the on-site car parking arrangement – refer to 1.5 and 2.1 below.

Note that potential noise emissions associated with the Casserley Ave drop-off bays (off-site) has not been considered in this report. This type of roadside drop-off / pick-up arrangement is common around suburban school sites and is typically considered as noise associated with the public ‘road’ system, hence is not assessed against the Assigned Levels.

Mechanical Plant

‘Community Noise’ exceptions are not applicable to ***Mechanical Services*** such as Air-Conditioning Exhaust fans etc. These must fully comply at all times. Refer to Section 2.2.

Fire Pumps (Future)

‘Community Noise’ exceptions are not applicable to ***Building Services*** such as Fire Pumps, which are routinely run for maintenance purposes. These must fully comply during regular maintenance operation. Refer to Section 2.3.

1.4 Waste Collection

It is noted that there is a Bin Compound to be located adjacent to the Casserley Ave crossover. With regards to servicing Bin Compounds, noise generated by this activity falls under the recently amended part of the Regulations “14A. Waste collection and other works”. This section of the Regulations states that the Assigned Levels (Regulation 7) do not apply to a range of ‘specified works’, including ‘the collection of waste’. Provided the waste collection is conducted between 7am to 7pm Monday to Saturday, (or 9am to 7pm Sunday and public holidays), then the activity is deemed to be “class 1”.

Clause 14A (2) states:

- (2) Regulation 7 does not apply to noise emitted in the course of carrying out class 1 works if —
- (a) the works are carried out in the quietest reasonable and practicable manner; and
 - (b) the equipment used to carry out the works is the quietest reasonably available; and
 - (c) in a case where a person has been required to prepare a noise management plan under subregulation (4) in relation to the works —
 - (i) the noise management plan has been prepared and submitted in accordance with the requirement, and approved in writing by the CEO; and
 - (ii) the works are carried out in accordance with the noise management plan, excluding any ancillary measure.

It is our understanding that a “14.A noise management plan” is not typically requested by the CEO (of the Local Authority) for this scale of development, which only involves very limited class 1 waste collection activities.

Based on the above the school operators should ensure waste collection complies with clause 14A(2) and only occurs between 7am and 7pm - Monday to Saturday.

1.5 On-Site Parking

Noise emission from vehicle movements in public carparks associated with retail and commercial development (being open to public access at all times) is often considered as being road traffic noise, (i.e. part of the public road system), which is not assessed against the Assigned Level criteria. This is on the basis that that noise associated with braking and propulsion of vehicles on the public road system is not addressed by the Regulations.

However, we understand that where a car park is restricted to limited access, and particularly where it incorporates gated access etc, the interpretation of the resultant noise emissions as being generated by traffic on the road system may no longer be valid. This ‘interpretation’ is not clearly defined in the Regulations, and the position of the Local Authority on this issue should be confirmed.

In this report we have therefore provided predictions of the potential noise levels at representative residential receivers, due to; vehicle door closing action, engine starts and vehicle movements within the on-site carpark. In our experience, noise generated by door closing action and start-ups is often required to be assessed for carparks proposed for new developments located in close proximity to residences. (e.g. Child Care Centres).

Refer to 2.1 for discussion of results.

2 ASSESSABLE NOISE SOURCES & PREDICTED NOISE LEVELS

Assessable noise sources relevant to this development (not including “Community Noise”) are therefore :

- On Site Car Parking / Drop Off areas
- Mechanical / HVAC Plant (e.g. air conditioning condensers / evaporative coolers / exhaust fans)
- Future Fire Pump.

2.1 On-site Car Parking / Drop Off Areas

Provision of a conclusive acoustic assessment of all possible noise emissions from a dynamic and highly variable carpark is not feasible, as it is not practical to address every possible scenario. However, for the proposed carpark arrangement it is considered practical to calculate the likely noise levels generated by typical representative events, for selected ‘worst case’ source to receiver scenarios. Then the likely frequency / duration of these events can be taken into account, and the predicted results compared to the relevant Assigned Level criteria. Representative source to receiver scenarios addressed by this assessment are set out on ‘Attachment 1 – Noise Sources and Receivers’. This also takes into account that fact that some neighbouring properties are two stories.

Based on discussions with the Client and Project Team, as well as review of the “Traffic Impact Assessment” prepared by Transcore (July 2015 - revision r01c), we have applied the following approach and assumptions:

- Separate 4 hour representative *Assessment Periods* apply to:
 - Mornings; e.g. 7:30 am to 11:30 am - accommodating staff arrivals, student drop off etc
 - Afternoons; e.g. 12:30pm to 4:30pm - accommodating staff departures, student pickup etc
- Morning and afternoon peak hour vehicles movements inwards and outwards are as per the project Traffic Impact Assessment. The number of morning and afternoon movements is summarised on Attachment 1 of this Acoustic Report.
- Onsite speed limit is 5km/hr.
- Reference noise levels used in predictive calculations are based on field data from a range of standard passenger cars as discussed in 2.1.1 below.
- Noise generated by occupants / pedestrians moving between cars and school facilities is not predictable. It is assumed that noise generated by pedestrians moving within the carpark will be managed as far as is practical, and may be considered as ‘Community Noise’ associated with an educational facility. Reminders of the need to keep carpark noise levels low may be provided in the form of signage and/or regular school newsletter messages.

2.1.1 Reference Noise Levels

Reference noise levels used in predictive calculations for representative events have been based on field measured values for typical carpark noise sources. This includes recent measurements specifically conducted of mid-sized passenger cars, travelling at 5km/hr. It was determined that a ‘drive-by’ event lasts approximately 10 seconds (over 15 metres length), before the noise level fell back to ambient. Door slams and car starts are only considered to last 1 second each.

The Sound Power Levels used for predictive calculations in this assessment are based on:

- Car Door Closing action (soft to hard slam) = Lw 75 to 89 dB(A), so Lw 89 dB(A) used in predictive calculations.
- Car Starting action = Lw 82 to 84 dB(A), so Lw 84 dB(A) used in predictive calculations.
- Car drive-by at 5km/h = Lw 76 to 80 dB(A), so Lw 80 dB(A) used in predictive calculations.

2.1.2 Relevant Assigned Noise Levels

Based on a 4 hour *Assessment Period* each morning and afternoon, the Assigned Level parameters relevant to each of the carpark noise events are:

Door Slams (1 second each) = L_{Amax}

- Must not exceed L_{Amax} (where there are less than 144 events)

If more than 144 events (144 seconds total duration) contributed to any one receiver position, then LA1 may become relevant (i.e. more than 1% of 4 hours). However, this is not considered likely at any of the representative receiver positions. Even allowing for an average of 2 to 3 doors per car, there will only be limited number of bays that result in contributing noise at any one receiver position, and there will be acoustic screening of some doors due to adjacent cars etc, so the resultant noise levels from many events will be lower than the worst case predicted values.

Note however that the predicted result is adjusted by +10dB, to account for the impulsive character of the noise event, prior to comparing to the L_{Amax} Assigned Level – see 2.1.3 Results.

Car Starts (1 second each) = L_{Amax}

- Must not exceed L_{Amax} (where there are less than 144 events)

If more than 144 events (144 seconds total duration) contributed to any one receiver position, then LA1 would become relevant. However, as per the ‘door slam’ scenario, this is not considered likely at any of the representative receiver positions.

Note that the predicted noise level need not be adjusted for potential ‘tonality’, as the total duration of noise will not exceed 10% of the assessment period.

Note that for many cars the predicted result may be adjusted by +10dB, to account for an impulsive character of the noise event. Occasionally a car start may also be deemed tonal (due to the ‘8 dB’ frequency rule), so +5dB may also apply, prior to comparing the adjusted result to the L_{Amax} Assigned Level. To be conservative we have therefore adjusted the calculated results by +15 dB, to represent potential worst case – See 2.1.3 Results.

Car Drive-by (at 10 seconds) = L_{A1} where < 144 cars pass by, and L_{A10} where > 144 cars pass by

- Must not exceed L_{A1} , where combined duration does not exceed 1440 second (24 minutes)

The L_{A1} criteria is therefore relevant to the Salcott Street Drop-off route, which has up to 74 Outward movements (i.e. total 740 seconds)

The L_{A1} criteria is also relevant the Staff Carpark scenario of up to 88 vehicles passing through (i.e. total 880 seconds in 4 hours is < 10% of the time).

- Must not exceed L_{A10} criteria, where the combined duration of the noise source is greater than 1440 seconds.

The more stringent L_{A10} criteria is relevant to the Casserley Ave Crossover, which has 162 Inwards and 88 Outwards movements per *Assessment Period* (i.e. total 250 movements x 10 seconds each)

Note that the predicted noise level for vehicle movements may not need be adjusted for potential ‘tonality’, as the total duration of noise with tonal character at the same frequency is unlikely to exceed 10% of the assessment period, due to significant variation in vehicle noise. Also, tonality may not be measurable above other ambient noise, including that generated by off-site traffic noise, considering that sample on-site noise levels were measured in the order of 50 dB(A), from Beach Road etc. To determine if tonality may be measurable above background noise would require long term monitoring at relevant receiver positions, to determine the masking effect of ambient. Consequently, to be conservative we have included a +5dB adjustment to the predicted results set out in 2.1.3 below.

2.1.3 Results of Predictive Calculations

Predictive calculations have been undertaken for the range of source and receiver scenarios set out on Attachment 1. These calculations have taken into account:

- the reference Sound Power Levels of each source / event (Octave band reference data),
- the source to receiver distance attenuation,
- the ‘barrier effect’ of intervening barriers to ground level receivers (i.e. 1.8m high solid fence),
- the influence of reflective ground and adjacent surfaces.

Car Door Slams

The predicted results set out below indicate that typical car door slamming noise events should marginally comply with the L_{Amax} criteria at each receiver location. This is based on reference L_{Amax} value of $Lw89$ dB(A) for “Hard Slam” action, from closest car bay. Softer closing action will obviously result in lower noise levels. This includes +10dB adjustment for ‘impulsive’ noise character.

CALCULATION RESULTS SUMMARY				Assessment Period = 4 hours		Relevant Criteria = L_{Amax} unless more than 144 seconds / events, then must meet LA1			
Car Doors Closing				Reference Source Level = Lw 89 dB(A)		Assigned Level Criteria dB(A)			
Receiver position	Barrier	Calculated Result dB(A)	Adjustment +10 Impulsive	Adjusted Level dB(A)	L_{Amax} dB(A)	LA1	LA10	OUTCOME	
A Lower	Y	57.1	10	67.1	< 69	59	49	OK	
A Upper	N	57.5	10	67.5	< 69	59	49	OK	
B Lower	Y	56.8	10	66.8	< 69	59	49	OK	
B Upper	N	57.8	10	67.8	< 69	59	49	OK	
C1 Lower	Y	57.6	10	67.6	< 69	59	49	OK	
C2/ C3 Lower	Y	57.6	10	67.6	< 71	61	51	OK	
D Lower	Y	47	10	57	< 71	61	51	OK	
D Upper	N	53.7	10	63.7	< 71	61	51	OK	
E Lower	Y	NA							
F Lower	Y	57.4	10	67.4	< 69	59	49	OK	

Car Starts

The predicted results set out below indicate that typical car start noise events should comply with the LAmax criteria at each receiver location. This is based on reference LAmax value of Lw 84 dB(A) for car start in the closest car bay. This includes +10dB adjustment for ‘impulsive’ noise character and a +5dB adjustment for potential tonality that ‘may’ occur, although this would likely be very difficult to ‘measure’ at point of reception.

CALCULATION RESULTS SUMMARY			Assessment Period = 4 hours		Relevant Criteria = LAmax unless more than 144 seconds / events, then must meet LA1			
Car Starting			Reference Source Level = Lw 84 dB(A)		Assigned Level Criteria dB(A)			
Receiver position	Barrier	Calculated Result dB(A)	Adjustment (dB) Impulsive +10 & Tonal +5	Adjusted Level dB(A)	LAmax dB(A)	LA1	LA10	OUTCOME
A Lower	Y	48.8	15	63.8	< 69	59	49	OK
A Upper	N	52.2	15	67.2	< 69	59	49	OK
B Lower	Y	42.4	15	57.4	< 69	59	49	OK
B Upper	N	52.5	15	67.5	< 69	59	49	OK
C1 Lower	Y	48.8	15	63.8	< 69	59	49	OK
C2 / C3 Lower	Y	48.8	15	63.8	< 71	61	51	OK
D Lower	Y	38.4	15	53.4	< 71	61	51	OK
D Upper	N	48.4	15	63.4	< 71	61	51	OK
E Lower	Y	NA						
F Lower	Y	48.6	15	63.6	< 69	59	49	OK

Car Movements

Note that as discussed in 2.1.2, due to the relative number of car movement and therefore the total duration of noise, the Assigned Levels are LA1 for some receiver locations, and LA10 for others as summarised below

- The LA1 criteria is relevant to the Salcott Street Drop-off route and the Staff Carpark drive through route, so applies to Receiver Positions; A, B, C and F
- The more stringent LA10 criteria is relevant to the Casserley Ave crossover, which has a greater total number of vehicle movements, so applies to Receiver Position D.

CALCULATION RESULTS SUMMARY			Assessment Period = 4 hours		Relevant Criteria = LA1 for Positions A, B, C, and F due to less than 10% total duration of noise		LA10 for Position D, due to greater than 10% total duration of noise source	
Car Drive By at 5km/hr			Reference Source Level = Lw 80 dB(A)		Assigned Level Criteria dB(A)		OUTCOME	
Receiver position	Barrier	Calculated Result dB(A)	Adjustment +5 Tonal	Adjusted Level dB(A)	LAmax	LA1 dB(A)	LA10 dB(A)	OUTCOME
A Lower	Y	48.0	5	53	< 69	59	49	OK
A Upper	N	49.2	5	54.2	< 69	59	49	OK
B Lower	Y	39.1	5	44.1	< 69	59	49	OK
B Upper	N	45.5	5	50.5	< 69	59	49	OK
C1 Lower	Y	47.9	5	52.9	< 69	59	49	OK
C2 / C3 Lower	Y	42.9	5	47.9	< 71	61	51	OK
D Lower	Y	38.4	5	43.4	< 71	61	51	OK
D Upper	N	43.3	5	48.3	< 71	61	51	OK
E Lower	Y	NA						
F Lower	Y	50.1	5	55.1	< 69	59	49	OK

As can be seen above, the calculation results indicate that typical car movements at 5km/hr should comply with the relevant Assigned Level criteria. This include a conservative adjustment for potential 'tonality', which may not be 'measurable' on site.

2.2 Mechanical Plant

The proposed location of Air-conditioning (A/C) equipment compounds is indicated on the Attachment 1 marked-up plan. The relevant receivers are residences to the north (Position E), adjacent the site boundary (with solid boundary fence), and residences to the west across Casserley Ave. Noise emissions from all HVAC equipment including these air-conditioning condensers and any other ventilation / exhaust fans etc must comply with the relevant Assigned Level criteria.

Relevant Assigned Noise Levels

Since mechanical plant can run for extended periods, the relevant Assigned Level that must be achieved is the LA10 criteria relevant to operation between 7am and 7pm, as follows:

- North residences = LA10 49 dB(A)
- West residences = LA10 47 dB(A)

Detailed assessment of all Air-conditioning and other HVAC equipment noise emissions will be conducted during Design Development and Documentation stages, to ensure compliance. If it is found that the current locations and proposed equipment selections may not achieve compliance, even with proposed screening / barriers, then alternative complying locations will be investigated and incorporated into the project design and documentation.

Since most air-conditioning condensers and other fan based mechanical equipment is deemed to generate 'tonal' noise emissions, the 5dB tonal adjustment will be taken into account in the acoustic assessment.

2.3 Future Fire Pumps (if required)

We are advised that Fire Pumps and Tanks may be required, pending further review of street main water pressure, which may in fact decrease over time as further development occurs in nearby areas. The designated location for the Fire Pump is immediately south of the Casserley Ave crossover – Refer to Attachment 1.

If Fire Pumps are to be installed as part of this development, these are to be assessed for compliance, as regular operation is required for maintenance purposes. If the installation is not adequately attenuated, these maintenance runs can generate significant noise emissions.

Relevant Assigned Noise Levels

We understand that regular Fire Pump maintenance runs are generally conducted on a weekly or fortnightly basis, but only occur for approximately 10 to 20 minutes duration. The relevant Assigned Level criteria that must be achieved is therefore the LA1 criteria relevant to operation between 7am and 7pm, as follows:

- West residences = LA1 57 dB(A)
- South residences = LA1 61 dB(A)

Considering the proximity to the southern residences (two storey), this is likely to require a solid / roofed pump-house enclosure, with attenuated louvres facing north and an appropriate acoustic performance specification for the engine exhaust noise level.

Detailed assessment of the Fire Pump installation (if required) will be conducted during Design Development and Documentation stages, to ensure compliance.

3. ENVIRONMENTAL NOISE INTRUSION

The southern façade of the proposed school building is located just over 110 meters north of Beach Road. The land immediately between the development site and Beach Road is Public Open Space / Reserve. Beach Road has a speed limit of 70 km/hr and accommodates approximately 17,000 vehicle movements per day, with < 5% heavy vehicles. In accordance with the *Screening Assessment* method set out in State Planning Policy 5.4 “*Road and Rail Transport Noise and Freight Considerations in Land Use Planning*”, the estimated external noise level including allowance for façade correction (+2.5 dB) and traffic growth (+2dB) is 54 dB(A). Since the result is less than $L_{Aeq,Day}$ 55 dB(A), no further design measures are required for this development. In addition to the SPP 5.4 screening assessment, short term noise levels were also measured on site, with results of approximately 50dB(A). This supports the conclusion that the school site is not considered to be exposed to problematic levels of traffic noise, and no upgrade to building fabric is warranted with regards to controlling traffic noise intrusion.

4. CONCLUSION

This report summarises the project requirements in terms of compliance with the Environmental Protection (Noise) Regulations, 1997. This includes determination of the relevant site specific ‘Assigned Level’ criteria.

A description of relevant noise sources and applicable Assigned Level criteria has been provided, including acknowledgment of relevant ‘adjustments’ required for noise sources with particular characteristics.

Discussion regarding the application of Regulation 16 “Community Noise” has also been provided. It must be recognised that application of the relevant ‘exceptions’ for Recreational and Educational related noise emissions will apply to this development site. However, as also discussed, the school administration / staff must be aware that the Local Authority still has the power to issue a ‘noise control notice’ that may restrict certain activities, where it is found that particular noise source is causing a detrimental effect on the neighbours. Staff will therefore have to be mindful of the type and duration of noise generating activities that may cause neighbourhood annoyance, particularly those including musical or impulsive noise emissions.

As far as is practical, preliminary acoustic assessment and design advice has been conducted, based on review of the architectural Development Approval drawings. In particular, results of predictive calculations have been presented for representative on-site carpark noise events at selected receiver locations, for comparison to the Assigned Level criteria. Taking into account the fact that the assessment is based on reference data for ‘typical’ cars, and the potential for some variation around the predicted levels, it appears as though noise emissions from the proposed carpark arrangement should ‘marginally’ comply in its current configuration. However, it is still likely that

parents and other users of the carpark may have to be reminded of the need to keep noise levels down in close proximity to neighbouring residences, particular from boisterous children. Also, if particular noisy cars are identified, then a management strategy of directing these to use the available road-side parking, rather than the on-site parking may also be required.

As acknowledged in this report, further detailed acoustical analysis is still to be undertaken to ensure the Mechanical & Building Services noise sources will comply with the relevant Assigned Level criteria. This assessment is typically conducted during Design Development, once the HVAC system configuration and equipment selections are progressed to a suitable stage.

Please call the undersigned if you have any queries regarding this correspondence.

Regards



Kingsley Hearne B.Arch M.A.A.S
Associate Director
for

GABRIELS ENVIRONMENTAL DESIGN Pty Ltd
Member Firm – Association of Australian Acoustical Consultants

APPENDIX:

- ATTACHMENT1 – Noise Sources and Receivers

DEVELOPMENT APPROVAL STAGE - ACOUSTIC REPORT ATTACHMENT 1 - Noise Sources and Receivers

DRAWING No: 14033-01 DATE: JULY 2015

Stationary Vehicle - Door Closing & Engine Starts

Moving Vehicle Noise Source
No. of vehicle movements

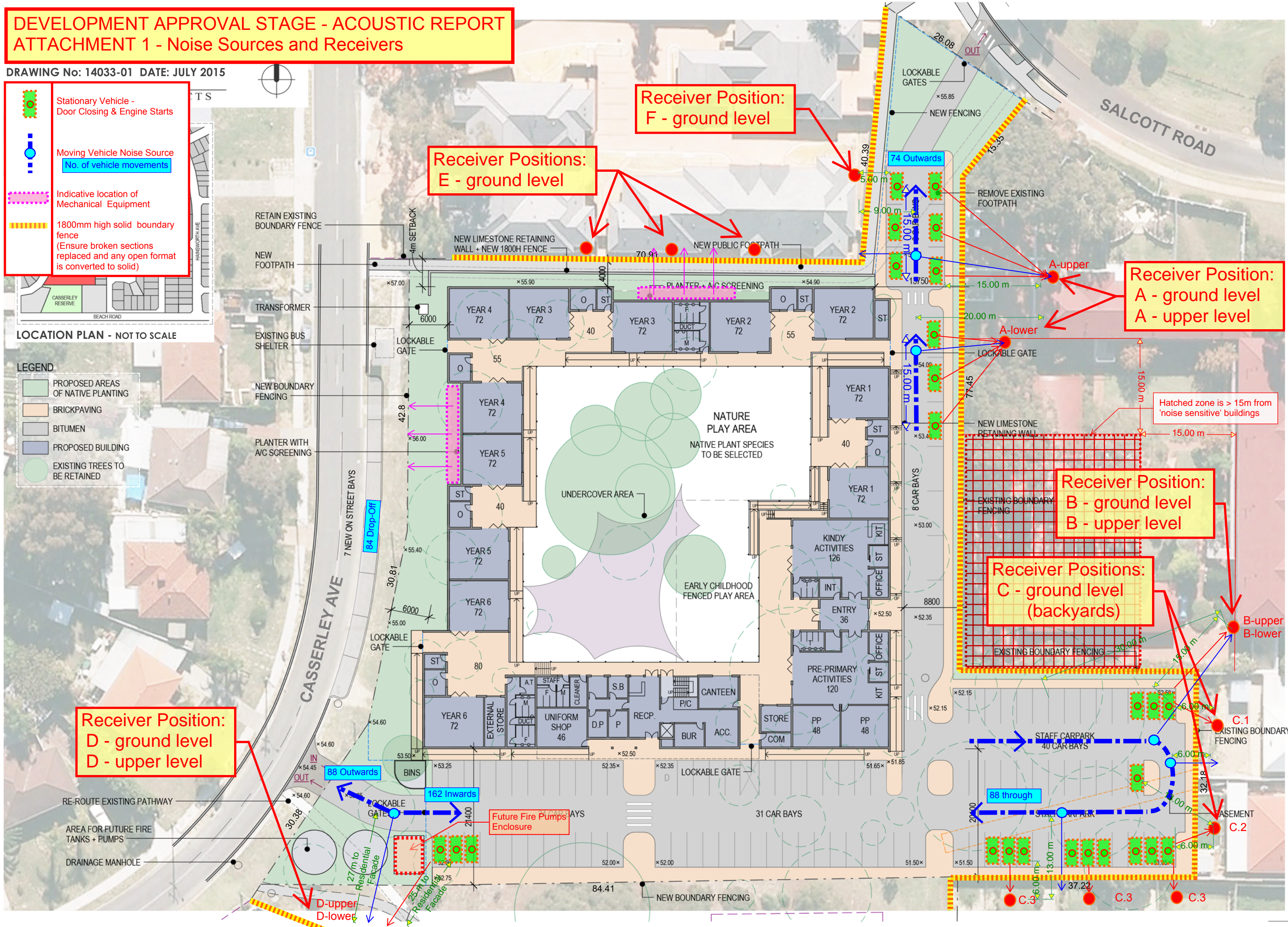
Indicative location of Mechanical Equipment

1800mm high solid boundary fence
(Ensure broken sections replaced and any open format is converted to solid)

LOCATION PLAN - NOT TO SCALE

LEGEND

- PROPOSED AREAS OF NATIVE PLANTING
- BRICKPAVING
- BITUMEN
- PROPOSED BUILDING
- EXISTING TREES TO BE RETAINED



Receiver Position:
F - ground level

Receiver Positions:
E - ground level

Receiver Position:
A - ground level
A - upper level

Receiver Position:
B - ground level
B - upper level

Receiver Positions:
C - ground level
(backyards)

Receiver Position:
D - ground level
D - upper level

Hatched zone is > 15m from
'noise sensitive' buildings

Future Fire Pumps
Enclosure