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File Ref: AC23253 – 02 – R1

16 November 2023

Cornerstone Church Rolleston
C/- Vern Marais
Macon Ltd

Email: vern@macon.net.nz

Dear Vern,

Re: Cornerstone Proposed New Church, 999 Goulds Road, Rolleston
Assessment of Environmental Noise Effects

Acoustic Engineering Services (AES) has been engaged to provide an acoustic assessment for the proposed church to be located at 999 Goulds Road, Rolleston. We understand that an Assessment of Environmental Noise Effects is required to supplement the Resource Consent application. Section 104 (1) of the Resource Management Act (RMA) requires the actual and potential effects of the activity on the environment to be considered.

Our review is based on our correspondence to date, along with the following documentation:

- Architectural drawings titled *Cornerstone – Proposed new church 999 Goulds Road, Rolleston,* Version 2, Revision A, as prepared by Whimbrel and dated the 11th of September 2023.
- Traffic report titled *Proposed Church, Rolleston: Parking and Access Assessment*, as prepared by Carriageway Consulting and dated the 11th of April 2023.

Please find our analysis below.

1.0 BACKGROUND

1.1 Site and surrounding area

The project site is located at 999 Goulds Road, Rolleston, as shown in red in figure 1.1 below. The site is located within the Medium Density Residential Zone within the Selwyn Partially Operative District Plan, as are all surrounding sites.

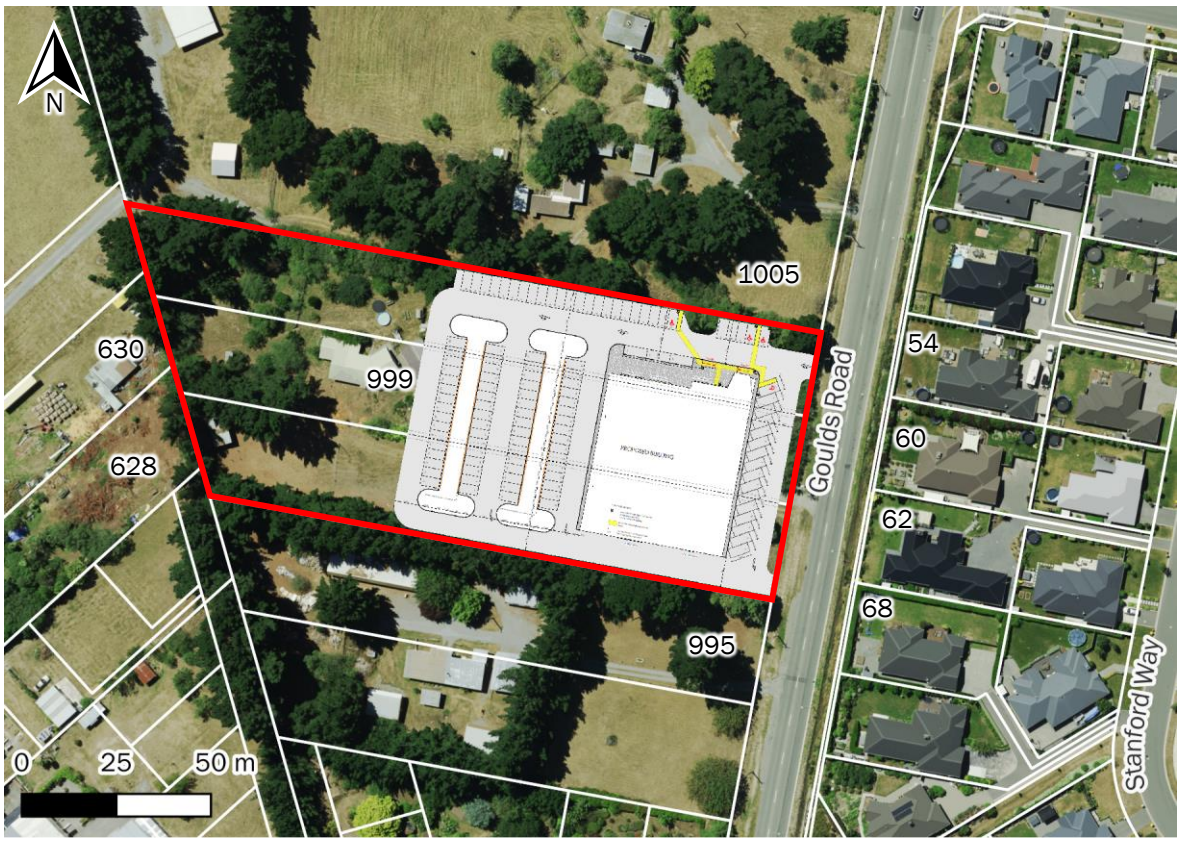

Figure 1.1 – Project site (image source: LINZ Data Service)

Properties surrounding the site that could be most affected by noise emitted from the site are:

- 995 Goulds Road
- 1005 Goulds Road
- 54 Stanford Way
- 60 Stanford Way
- 62 Stanford Way
- 68 Stanford Way
- 628 East Maddisons Road
- 630 East Maddisons Road

1.2 Proposed activities

We understand that the proposed development consists of both a new church building and carpark. The carpark is assumed to be able to accommodate up to 111 vehicles, and has two accessways to Goulds Road. The proposed church will have a main worship space, foyer space, meeting rooms, and a kitchen space on the Ground Floor, and an office on the First floor. Currently there is a wire fence around the perimeter of the property.

We understand that the main worship services will accommodate in the order of 220 people and will be held on Sundays from 1000 hours to 1130 hours, with worship band practice starting from 0900 hours. Other events include prayer meetings on Mondays between 1830 and 2030 hours and youth group gatherings on Fridays between 1800 and 2100 hours, however these are expected to produce lower noise levels than the main worship services.

We understand that outdoor music or events are not planned to take place in the carpark.

2.0 ACOUSTIC CRITERIA

As requested, we have assessed compliance against the Selwyn Partially Operative District Plan (PODP), which has now superseded the Selwyn Operative District Plan for noise issues. We also comment on how these limits relate to wider guidance and noise effects for this site in the following sections.

2.1 Partially Operative District Plan

As outlined above, the site and all surrounding sites are located within the Medium Density Residential Zone (MRZ) in the PODP.

The PODP contains the following noise limits to residential zoned properties in Rule NOISE REQ-1:

- 0700 to 2200 hours – 50 dB $L_{Aeq(15\ min)}$
- 2200 to 0700 hours – 40 dB $L_{Aeq(15\ min)}$ and 70 dB L_{Amax}

The various sound measurement and assessment terms and parameters used in the PODP are described fully in NZS 6801:2008 *Acoustics – Measurement of Sound* and NZS 6802:2008 *Assessment of Environmental Sound*. NZS 6802:2008 is discussed below in section 2.4.

The PODP also has the following limits for construction noise to residential zoned properties for longer duration construction work in Rule NOISE REQ-2:

- 0730 to 1800 hours, weekdays and Saturdays – 70 dB L_{Aeq} / 85 dB L_{AFmax}
- 1800 to 2000 hours, weekdays – 65 dB L_{Aeq} / 80 dB L_{AFmax}
- 1800 to 2000 hours, Saturdays – 45 dB L_{Aeq} / 75 dB L_{AFmax}

The PODP noise limits for construction noise correspond to the recommended upper limits for construction noise received in residential zones and dwellings in rural areas found in Table 2 of NZS 6803:1999 *Acoustics – Construction Noise*.

2.2 Existing noise environment

On the 14th of November 2023 (Tuesday) between 1000 and 1045 hours, Jonathan Prins of AES measured ambient noise levels at the site of the proposed church on 999 Goulds Road, Rolleston. Measurements were taken in general accordance with NZS 6801:2008 Acoustics – Measurement of Environmental Sound. Cloud coverage was moderate and the wind speed was in the order of 6 m/s.

Dominant noise sources were from birdsong and traffic travelling down Goulds Road (in the order of 3 vehicles per minute). During our site visit noise sources audible in the area included:

- Birdsong and noise from other domestic animals.
- Traffic travelling down Goulds Road.
- Intermittent noise from wind in trees.
- Aircraft directly overhead.
- Intermittent noise from general residential activities.

Noise levels were measured to be 63 – 64 dB L_{Aeq} on the opposite side of Goulds Road, 52 – 54 dB L_{Aeq} at approximately 50 metres from the road, and 50 dB L_{Aeq} at the rear of the section farthest from the road.

We note that on Sundays there may be less traffic than observed during the site visit, however this is not expected to change the ambient noise levels significantly, except in locations that are in close proximity to the road.

2.3 World Health Organization

Guidelines for Community Noise[1] is produced by the World Health Organization (WHO) based on extensive international research and recommends a guideline day time limit of 55 dB $L_{Aeq(16\ h)}$ to ensure few people are seriously annoyed in residential situations. A guideline limit of 50 dB $L_{Aeq(16\ h)}$ is recommended to prevent moderate annoyance.

2.4 NZS 6802:2008

NZS 6802:2008 Acoustics – Environmental noise outlines a guideline day time limit of 55 dB $L_{Aeq(15\ min)}$ for *"the reasonable protection of health and amenity associated with the use of land for residential purposes"*.

This Standard recommends a 15 minute measurement interval for fluctuating continuous sound.

The Standard describes how a -5 dB adjustment may be applied to sound received for less than 30 % of the day time period. It goes on to describe how up to a -5 dB adjustment of the representative sound level may also be applied when the level of sound reduces significantly for large periods of time but does not switch off completely. In these cases, the energy average of the sound being investigated should be calculated over the entire time frame to determine the magnitude of the adjustment. No such adjustment is permitted for the night time period.

The Standard describes the application of a penalty for noise containing Special Audible Characteristics (SAC). In cases where SAC are confirmed to be present, the adjustment is + 5 dB.

2.5 Discussion of acceptable noise levels

We observe that the limits in the Selwyn PODP for residential zones are generally consistent with the levels recommended by WHO and NZS 6802:2008 for the protection of residential amenity. They are also consistent with the level of ambient noise at locations removed from Goulds Road. We therefore consider it conservative to conclude that where predicted noise levels comply with the District Plan limits at the boundaries of residential properties, noise effects will be minimal. For areas that are not occupied or noise sensitive we consider that an exceedance of the District Plan noise limits will be acceptable from time to time.

[1] Edited by Berglund, B et al. *Guidelines for Community Noise*. World Health Organization 1999.

As the church is not expected to operate outside of day time hours it is not necessary to assess the site with regard to night time noise limits.

3.0 NOISE GENERATED BY THE ACTIVITY

The main noise sources associated with the operation of the church are expected to be:

- Break-out noise from the congregation and music within the building.
- Noise generated by vehicles travelling about on the site (engine noise, exhaust noise, road/tire noise and door slams).
- Noise from external mechanical plant associated with the church.

3.1 Noise from the auditorium

We have considered break-out noise from the auditorium during peak internal activity. We have based our calculations on a 15 minute average reverberant level of 90 dB L_{Aeq} within the space, with a spectrum typical of amplified music. Based on our experience with similar projects, this is likely to be the worst case and we would not expect the internal noise levels to exceed 90 dB L_{Aeq} due to typical weekly activity such as from the congregation, amplified sermon, or music played within the building space. We have assumed that doors to the auditorium will be closed during high noise events.

The facade of the Auditorium space consists of 0.55 mm BMT steel on timber battens, 140 mm timber framing, and 10 mm plasterboard internal linings. Walls have been modelled without fibrous insulation.

In accordance with NZS 6802:2008 we have added a +5 dB penalty for SAC, as drum beats and bass music may be audible, but have also added a -5 dB correction for duration, as the combined duration of the service and cars parking (assumed 4 hours) is less than 30 % of the day time hours defined in the PODP (15 hours).

Predicted rating noise levels are shown in table 3.1 below.

Table 3.1 – Expected rating noise levels at boundaries from break-out noise from the auditorium

Location	Expected rating noise levels L_{Aeq} (dB)
995 Goulds Road	55
1005 Goulds Road	51
Stanford Way properties	Less than 44
East Maddisons Road properties	Less than 41

The predicted rating noise levels exceed the District Plan noise limits at the neighbouring properties at 995 and 1005 Goulds Road. These exceedances could be mitigated with a 1.8 metre high acoustic fence extending 10 metres beyond the carpark (total 110 metres) along the boundary to each property.

With an acoustic fence the expected rating noise levels would be as follows in table 3.2.

Table 3.2 – Expected rating noise levels at boundaries from break-out noise from the auditorium with a 1.8 m high acoustic fence

Location	Expected rating noise levels L_{Aeq} (dB)
995 Goulds Road	50
1005 Goulds Road	47
Stanford Way properties	Less than 44
East Maddisons Road properties	Less than 41

The acoustic fence should be constructed as follows:

- Minimum height 1.8 metres.
- Surface mass – at least 10 kg/m^2 (such as plywood, 25 mm timber palings).
- The fence must be continuous and maintained with no gaps or cracks. For timber fences this will require palings to be well overlapped (25 mm minimum) or a "board and batten" system, and a sleeper rail connecting the base of the palings to the ground. We also recommend a paling thickness of at least 25 mm to help resist warping.
- Extending 10 metres beyond the end of the carpark (total 110 metres).

3.2 Noise from vehicles

Noise emissions for vehicles travelling in the carpark have been calculated based on a sound power of 90 dB L_{wA} for a passenger vehicle travelling at 20 km/hr. Maximum noise levels due to car door slams and engine starts have been based on a noise level of 95 dB L_{AFmax}. Noise emissions for light vehicles manoeuvring in the carparking spaces have been calculated using the LFU Bayern 2007 algorithm.

Regular Sunday services occur between 1000 and 1130 hours on Sunday each week, and the majority of vehicle noise is expected to occur within a narrow time frame before and after the services.

We have assumed that all 111 of the carparks will be filled before the service and vacated after the service. This would result in a total of 222 car movements per Sunday. This would be a worst-case scenario.

From our experience with projects of a similar nature and scale, we expect that the peak hour will be before or after the service, where up to 111 vehicle movements could be expected. The peak 15 minute period could be half of that number – 56 movements in or out of the carpark.

In accordance with NZS 6802:2008, a -5 dB correction may also be applied, as the combined time that noise is produced from vehicles and from use of the auditorium on a Sunday – up to 4 hours – is less than 30 % of the day time period (15 hours) defined in the PODP. The energy average of the total noise emissions is also expected to be very low.

It is expected that peak parking and peak noise from the auditorium will not coincide with each other.

Noise levels from vehicles at surrounding properties are presented in table 3.3 below.

Table 3.3 – Expected rating noise levels at boundaries from noise generated in the carpark

Location	Expected rating noise levels L_{Aeq} (dB)
995 Goulds Road	55
1005 Goulds Road	55
Stanford Way properties	Less than 44
East Maddisons Road properties	Less than 41

Noise from the carpark results in rating noise levels that exceed the District Plan noise limits at the properties at 995 and 1005 Goulds Road. Noise from the carpark could be mitigated with a 110 metre long acoustic fence on both sides of the carpark with the same construction as described above in section 3.1.

With an acoustic fence the expected rating noise levels would be as follows in table 3.4:

Table 3.4 – Expected rating noise levels at boundaries from noise generated in the carpark with a 1.8 m high acoustic fence

Location	Expected rating noise levels L_{Aeq} (dB)
995 Goulds Road	47
1005 Goulds Road	46
Stanford Way properties	Less than 45
East Maddisons Road properties	Less than 41

With an acoustic fence the noise from the carpark will comply with the day time District Plan noise limits.

3.3 Noise from external plant

At the time of issue, the current design of the building has not progressed enough for specific mechanical systems to be selected, and so we have considered the maximum cumulative sound power level of the mechanical plant that would result in noise levels of less than 50 dB L_{Aeq} at the closest property boundaries, to ensure that noise effects are minimal.

The current design indicates three outdoor units mounted on the roof of the church. We have assumed that there are no acoustic barriers around the plant.

We expect that any plant will largely operate during the daytime period when the church is being used. Based on the distances from the indicated locations of mechanical plant units to the surrounding properties, if the sound power of each unit is no more than 73 dB L_{wA} then noise levels of less than 40 dB L_{Aeq} would be received at surrounding property boundaries. This would ensure that mechanical plant would not significantly contribute to overall noise levels during a Sunday Service. If louder plant models are selected, additional screening will be required. We recommend that the design of the mechanical plant is reviewed in due course to ensure compliance is achieved.

4.0 CONSTRUCTION NOISE

Noise generated by construction activities associated with the establishment of the Cornerstone Church, Rolleston has the potential to adversely affect nearby properties, especially if carried out during the early morning or evening hours.

We recommend that the applicant adopts best practice procedures to reduce the likelihood of annoyance, nuisance, and adverse health effects to people in the vicinity of construction work, and that these activities are planned and managed in accordance with NZS 6803:1999 *Acoustics Construction Noise*, and that construction is undertaken to ensure as far as practical that noise does not exceed the sound levels specified in Rule NOISE REQ-2 of the PODP and in Table 2 of the Standard.

Given the setbacks to the closest dwellings this is likely to be achievable.

5.0 CONCLUSIONS

Noise from all sources expected to be associated with the proposed Cornerstone Church in Rolleston have been considered.

The church is expected to be used between 0700 and 2200 hours only. Noise levels due to the operation of the church, including break-out from the main worship space, noise from vehicles in the carpark, and mechanical plant noise have been considered.

Provided that a 110 metre long 1.8 metre high acoustic fence is built on the northern and southern boundaries, and that noise levels within the church are kept below 90 dB L_{Aeq}, noise from the church is expected to comply with District Plan noise limits, and adverse noise effects are expected to be minimal.

The external mechanical plant is expected to only be operated between 0700 and 2200 hours. Provided that the sound power of each unit is less than 73 dB L_{wA}, noise levels of less than 40 dB L_{Aeq} would be expected at the nearest boundaries, and the associated noise effects would be minimal. We recommend that the design of the mechanical plant is reviewed in due course, to ensure compliance is achieved.

We trust this is of assistance. If you have any questions, please don't hesitate to contact me.

Kind regards,

Jonathan Prins
BE Hons, ME
Acoustic Engineer
Acoustic Engineering Services