



MARSHALL DAY
Acoustics 

**SOUTHERN CROSS HOSPITAL WELLINGTON
NOISE ASSESSMENT FIXED PLANT**

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Project: SOUTHERN CROSS HOSPITAL WELLINGTON

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1.0 INTRODUCTION

Marshall Day Acoustics has been engaged by Warren and Mahoney and Southern Cross Hospital to carry out an assessment of the noise resulting from the fixed plant of the proposed Southern Cross Hospital consulting building, in terms of the relevant noise requirements of the Wellington City District Plan.

The consulting building is proposed to be built as an extension to the existing Southern Cross Hospital in Hanson Street, Wellington.

A glossary of acoustic terminology used in this report can be found in Appendix A.

2.0 PROPOSED FACILITY

2.1 Subject site

The subject site is bordered by Hanson Street to the east and Hall Street to the south. The subject site is zoned Inner Residential. The adjacent sites are zoned Open Space B to the west and Inner Residential area to the north, east and south.

Figure 1 is an aerial view showing the subject site in context of the Wellington City District Plan.

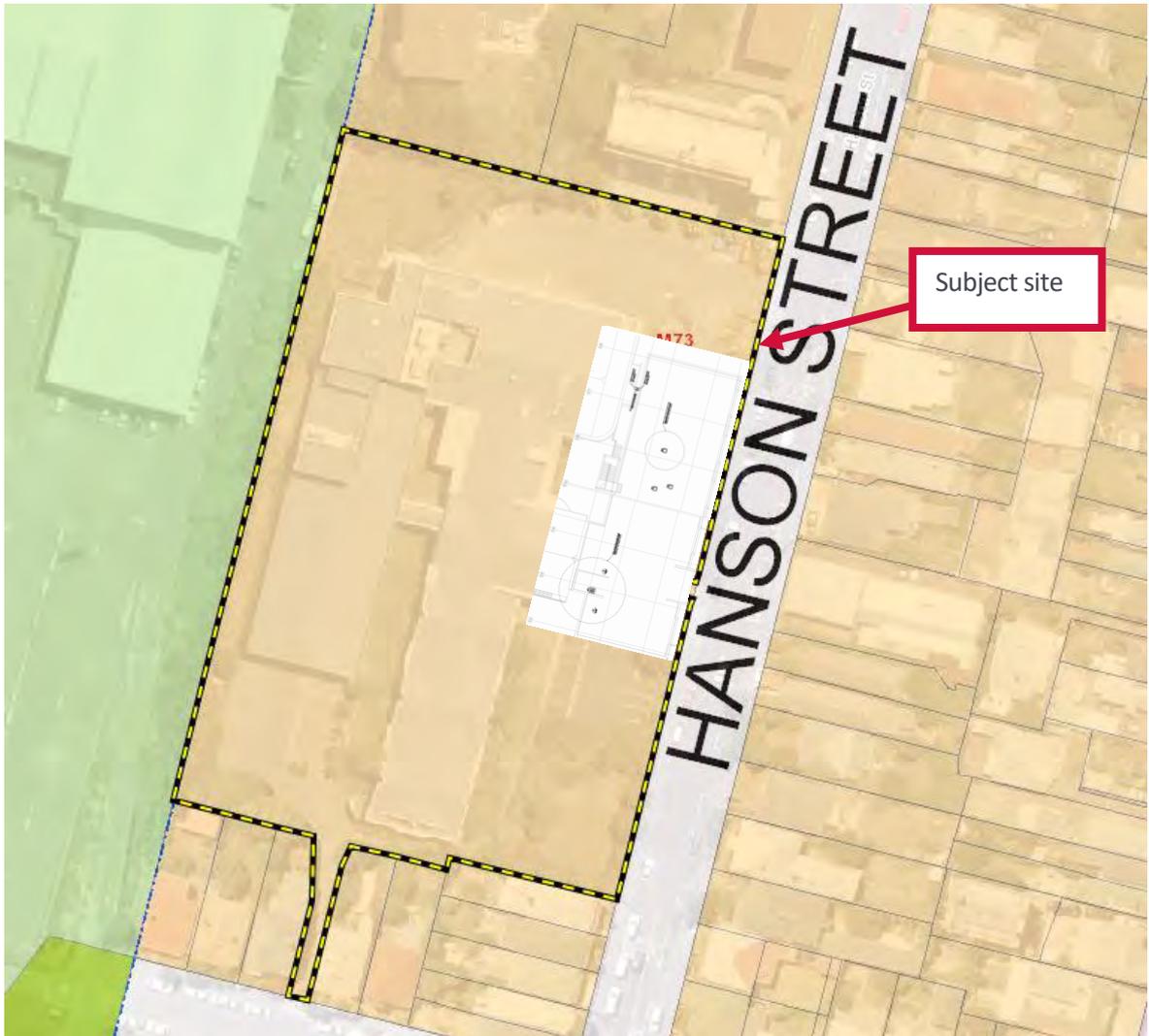


Figure 1: Subject site shown in context of the Wellington City District Plan [Base image: ePlan – Wellington City District Plan]

2.2 Noise generating items

The key noise generating activity associated with this proposal is fixed plant noise. The proposed new plant consists of:

- Extract fan CEF-01
- Toilet exhaust fans
- Chiller

An HVAC specification has been provided by the mechanical services engineer which details the type of plant to be used for the new building only and the corresponding sound power levels¹. This includes one extract fan (Fan Model GUD636D). See also

Figure 2 and Figure 3 for proposed location of the equipment.



Figure 2: Proposed location of rooftop equipment on the new building [Base image: drawings M130 DD R0 and M131 DD R0 by McAlpine Hussmann, dated 20-02-2019]

¹ Document CEF-1 Alt.pdf.

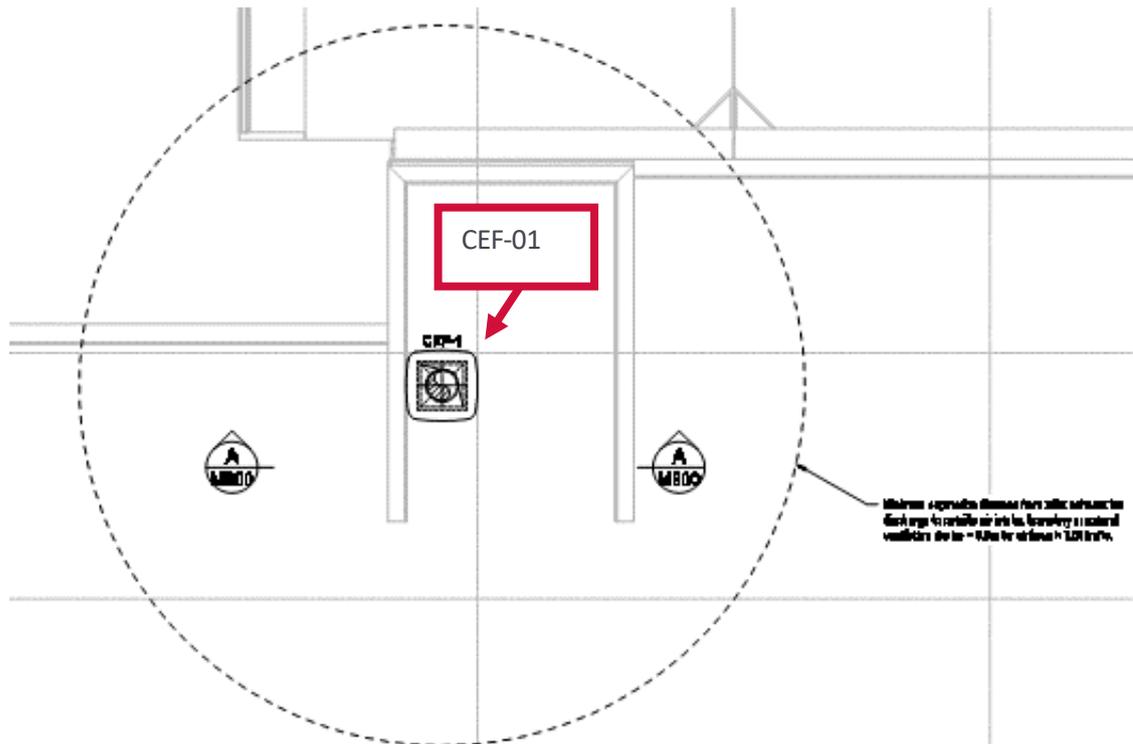


Figure 3: Proposed location of CEF-01 [Base image: drawing M130 DD R0 by McAlpine Hussmann, dated 20-02-2019]

We understand that this equipment will run 24 hours a day, 7 days per week.

We understand also that the new building will be serviced by chillers located in the existing Hospital building. We have not assessed existing plant as part of this proposal, but we understand that a new chiller is being selected and installed to also service the new building. This new chiller will be selected, installed and operated so as to comply with District Plan noise rules.

3.0 NOISE PERFORMANCE STANDARDS

The Wellington City District Plan sets out the Objectives and Policies for the activities within the Wellington area.

Noise emissions from fixed plant from land zoned Inner Residential in the Wellington City District Plan are governed by rule 5.6.1. The sections of this rule applicable to the project are reproduced as follows.

5.6.1.2 **Fixed Plant Noise**

5.6.1.2.1 *Noise emission levels from any residential or non-residential activities occurring within a Residential Area resulting from noise associated with power generation, heating, ventilation or air conditioning systems, or water or sewage pumping/treatment systems or other similar domestic installations when measured at or within the boundary of any site, other than the site from which the noise is generated, in a Residential and Rural Areas shall not exceed the following limits:*

Inner Residential Area and Medium Density Residential Areas	
Monday to Sunday 7 am to 10 pm	45dB $L_{Aeq} (15 \text{ min})$
Monday to Sunday 10pm to 7am	40dB $L_{Aeq} (15 \text{ min})$
Monday to Sunday 10pm to 7am	65dB L_{AFmax}
Outer Residential Area	
Monday to Sunday 7am to 10pm	45dB $L_{Aeq} (15 \text{ min})$
Monday to Sunday 10pm to 7am	40dB $L_{Aeq} (15 \text{ min})$
Monday to Sunday 10pm to 7am	65dB L_{AFmax}

[...]

Where it is impractical to measure outside a dwelling, then measurements shall be made inside (with windows closed). Where indoor measurements are made the noise limits stated above shall be reduced by 15dB $L_{Aeq} (15 \text{ min})$.

4.0 NOISE LEVEL ASSESSMENT

The predictions of the noise levels have been carried out in accordance with New Zealand Standard NZS 6802:2008 “Acoustics - Environmental Noise” as required by the Wellington City District Plan.

This assessment is focused on the zone boundary of the sites zoned Inner Residential Area. These are closest to the subject site and those most likely to house noise sensitive activities.

Figure 3 shows the location of these zone boundaries. There is no requirement for noise levels received in the Open Space B zone.

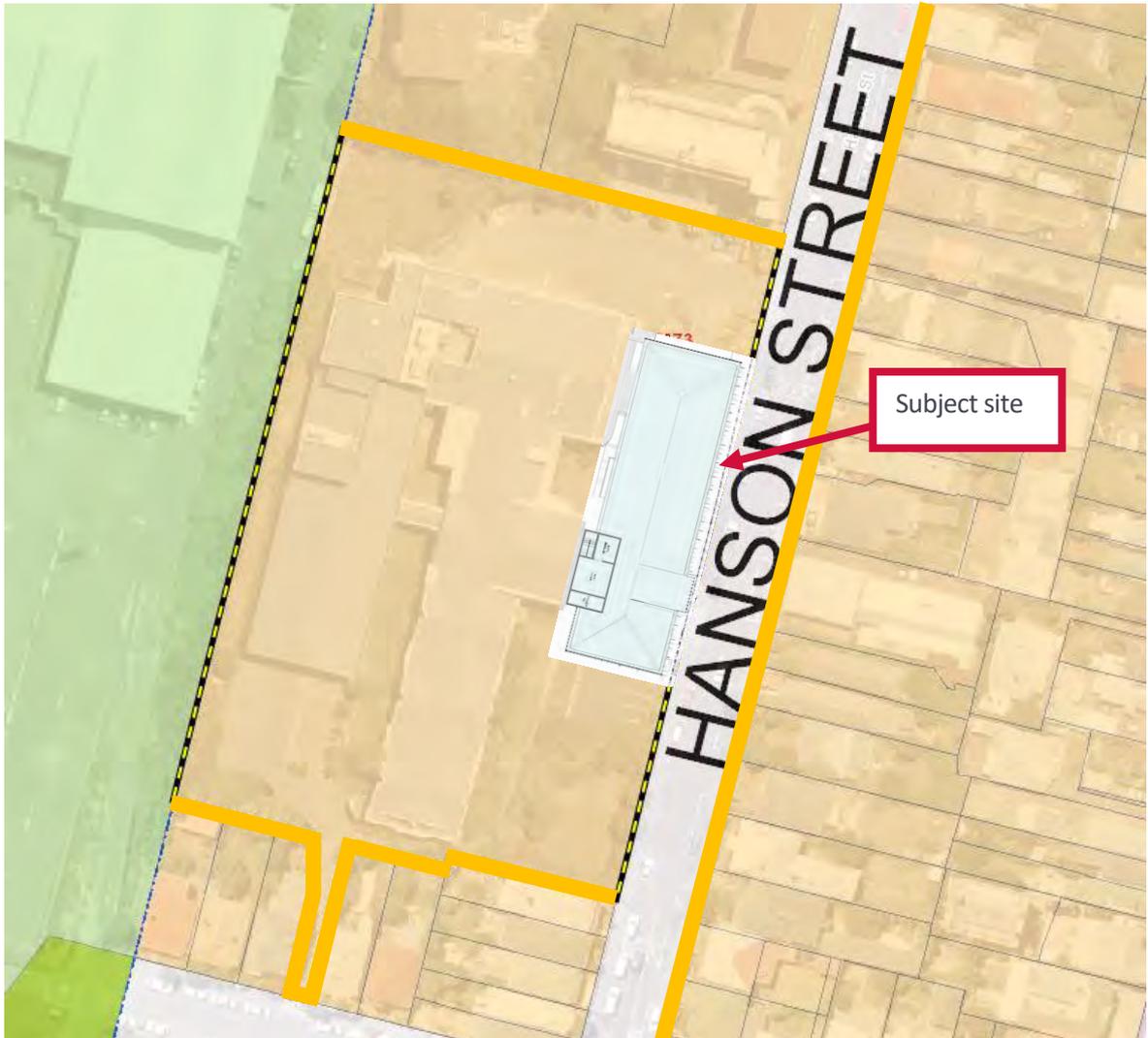


Figure 3: Assessment boundaries (dark yellow lines) [Base image: ePlan - Wellington City Council District Plan]

We have assessed the plant and building features as drawn in the McAlpine Hussmann drawing M130 DD R0, and with supplied noise data for the extract fan CEF-01. The relevant design features are as follows:

1. We have assumed a 4-sided noise barrier, extending at least 0.5m above the extract fan. This barrier should be constructed with a minimum mass of 10 kg/m² with no gaps or perforations and have sound absorbing treatment to the inside, facing the fan. Examples of sound absorbing treatment are: Autex Acoustic Blanket 20/100, 50mm thick Stratocell Whisper, 63mm thick Reapor etc.
2. We note that the rooftop toilet exhaust fans and the chiller have not yet been selected and will need to be reviewed at a later date. However, we note that these units can achieve

compliance with noise to boundary limits, provided that appropriate consideration of equipment noise levels and attenuator requirements is given at final selection.

On the basis of the provided design and the design advice referred to above, we predict that the noise emissions from the extract fan CEF-1 at the nearest Inner Residential boundary will be **27 dB** $L_{Aeq(15min)}$.

The remaining noise budget for other items of fixed plant (including the selection of a new chiller at the existing hospital building) is effectively 40 dB $L_{Aeq(15min)}$ for the night-time and 45 dB $L_{Aeq(15min)}$ for the daytime. The new plant items will be selected, installed and operated to comply with these limits.

5.0 ASSESSMENT OF NOISE EFFECTS

The fixed plant noise which is expected to occur on the rooftop of the proposed consulting building is predicted to comply with the relevant noise limit.

Similarly, the new chiller at the main Hospital building will also be selected, installed and operated to comply with the permitted noise limits.

6.0 CONCLUSIONS

We have assessed noise levels and noise effects from the new fixed plant at the proposed Southern Cross Hospital consulting building expansion, as received at the Inner Residential Boundary to the east – the nearest affected property to the proposed noise activities.

Based on the proposed design (including the construction of the recommended noise barrier), noise levels from proposed new plant items are predicted to comply with the relevant noise limits of the Wellington City District Plan. As such, we consider the noise effects of this proposal to be reasonable.

APPENDIX A GLOSSARY OF TERMINOLOGY

Noise	A sound that is unwanted by, or distracting to, the receiver.
Special Audible Characteristics	Distinctive characteristics of a sound which are likely to subjectively cause adverse community response at lower levels than a sound without such characteristics. Examples are tonality (e.g. a hum or a whine) and impulsiveness (e.g. bangs or thumps).
SPL or L_p	<u>Sound Pressure Level</u> A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
SWL or L_w	<u>Sound Power Level</u> A logarithmic ratio of the acoustic power output of a source relative to 10 ⁻¹² watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
dB	<u>Decibel</u> The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 µPa i.e. $dB = 20 \times \log(P/Pr)$
dba	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
L_{Aeq} (t)	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
NZS 6802:2008	New Zealand Standard NZS 6802:2008 <i>"Acoustics – Environmental Noise"</i>