MARSHALL DAY Acoustics

MEMO

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Subject:	CNC 24-hour noise monitoring				

Below we discuss the measured 24-hour traffic noise levels at four locations along the Christchurch Northern Corridor (CNC).

In summary, our findings are:

1. Noise levels measured over a continuous 24-hour period show a good level of agreement to the CRTN *Shortened Measurement Procedure*[1] [CRTN] values presented at the public meeting in March 2021. Refer to Table 1 below;
2. Noise levels at the measurement locations indicate a noise environment consistent with the project criterion of 57 dB $L_{Aeq(24hr)}$, once the increase for future traffic and the reduction for the proposed low noise road surface is taken into account; and
3. Daytime traffic noise levels begin to increase from 4 am until around 7am and remain relatively steady through the day until around 8pm when levels gradually decrease. (Refer Appendix B).

Table 1 provides a comparison between the noise levels measured in March and May 2021:

Table 1: Comparison between shortened and 24-hour noise surveys

Ref	Description	Traffic noise level, dB $L_{Aeq(24hr)}$		
		CRTN shortened method (March '21)	24 hours (May '21)	Difference
1	Rear 25B Te Maru Place	59	60	1
2	Rear 14c Kruse Place	59	59	0
3	Rear 11B Mulberry Place	57	59*	2
4	Adjacent 100 Willowview Drive	54	59*	5

** Measurement adjusted for weather effects and for non-CNC noise sources as far as practicable*

The measured values show good agreement - within 2 dB – between the 24 hour and shortened measurement techniques. A noise level difference of 2dB is generally not perceptible and considered negligible. The exception is Position 4 adjacent to 100 Willowview Drive where a larger difference was noted, most likely as a result of unwanted wind noise effects adjacent to the measurement location.

In the following pages we provide further details of the noise measurements and analysis. A glossary of acoustics terminology is provided in Appendix A.

[1] CRTN 'Shortened Measurement Procedure', Section 43 of UK Dept of Transport (Welsh Office) *Calculation of Road Traffic Noise* (CRTN)

Survey details

Sound level measurement instrumentation was installed at each measurement location shown in Figure 1 for the durations described below. The noise measurements were unattended and, as such, were influenced by other non-traffic noise sources such as wind noise, birdsong and leaf rustle. Positions 3 and 4 are particularly susceptible to non-traffic noise sources and we have attempted to extract weather affected measurements as far as practical.

Survey dates and times are as follows:

Position	Locations	Time/Date
Position 1	Rear 25B Te Maru Place	1200hrs 4 May to 1200hrs 5 May 2021
Position 2	Rear 14c Kruse Place	1500hrs 5 May to 1500hrs 6 May 2021
Position 3	Rear 11B Mulberry Place	1800hrs 13 May to 1800 hrs 14 May 2021
Position 4	Adj. 100 Willowview Drive	1700hrs 12 May to 1700 hrs 13 May 2021

Measurements were conducted using a 01dB CUBE Noise Monitoring Terminal, serial 11191, (calibration due 30/07/2021). Field calibration of the equipment was carried out before measurements, and the calibration checked after measurements using a Brüel & Kjær Type 4231 calibrator, serial 3025226 (calibration due 18/08/2021).

Measured 24-hour traffic noise levels

Table 2 presents the measured 24-hour noise levels at the positions shown in Figure 1. We have provided a comparison to the measurements conducted using *CRTN Shortened Measurement Procedure* in March 2021 and, for further comparison, the May 2021 data using the CRTN calculation techniques. An example of the hourly variation in noise levels over a 24-hour period is provided in Appendix B.

Table 2: Existing measured and future estimated 24-hour surfacing.

Ref	Description	Traffic noise level, dB $L_{Aeq(24hr)}$		
		CRTN Shortened method		24 hours
		March '21	May '21	May '21
1	Rear 25B Te Maru Place	59	59	60
2	Rear 14c Kruse Place	59	58	59
3	Rear 11B Mulberry Place	57	58	59*
4	Adjacent 100 Willowview Drive	54	59	59*

** Measurement adjusted for weather effects and for non-CNC noise sources as far as practicable*

We note the following about the data in Table 2:

- The May 2021 data shows the CRTN shortened method provides good agreement to the 24-hour measurement data. The CRTN shortened method provides a robust procedure for estimating 24-hour traffic noise levels, without the need to measure for 24 hours.
- The CRTN shortened method is preferred to the unattended 24-hour measurements as unwanted noise sources can be excluded by the survey personnel, improving the accuracy of the measurement data.
- There has been negligible noise level variation – generally less than 2dB – between the March and May measurements. This is consistent with expectations.

- We anticipate the measured data at Position 4 is affected by weather and non-CNC noise sources and hence the variation between the March and May 2021 values.
- Measured noise levels are expected to decrease by a further 5 dB with the introduction of a proposed low noise surfacing from October 2021.

"Design Year" corrected noise levels

The CNC traffic noise assessment presented at the Notice of Requirement Hearing was carried out in accordance with NZS 6806:2010 *"Acoustics - Road-traffic noise - New and altered roads"*. The Standard requires traffic noise levels to be predicted for the "design year" which, for this project, is 2026 and the traffic flow at that time is 35,000 vehicles per day.

So that the measured noise levels can be compared to the project's "design year" criterion, they need to be adjusted for traffic flow and road surfacing. The relevant corrections are presented in Table 3.

Table 3: Details of applied noise level adjustment

Parameter	CNC Design Year Conditions	Existing Conditions	Adjustment Applied, dB
Traffic Volume	35,000	24,500	+1.5
Road Surfacing	OGPA (or equivalent)	2 Coat Grade 3 & 5 chip seal	- 5.0
		TOTAL	**- 3.5**

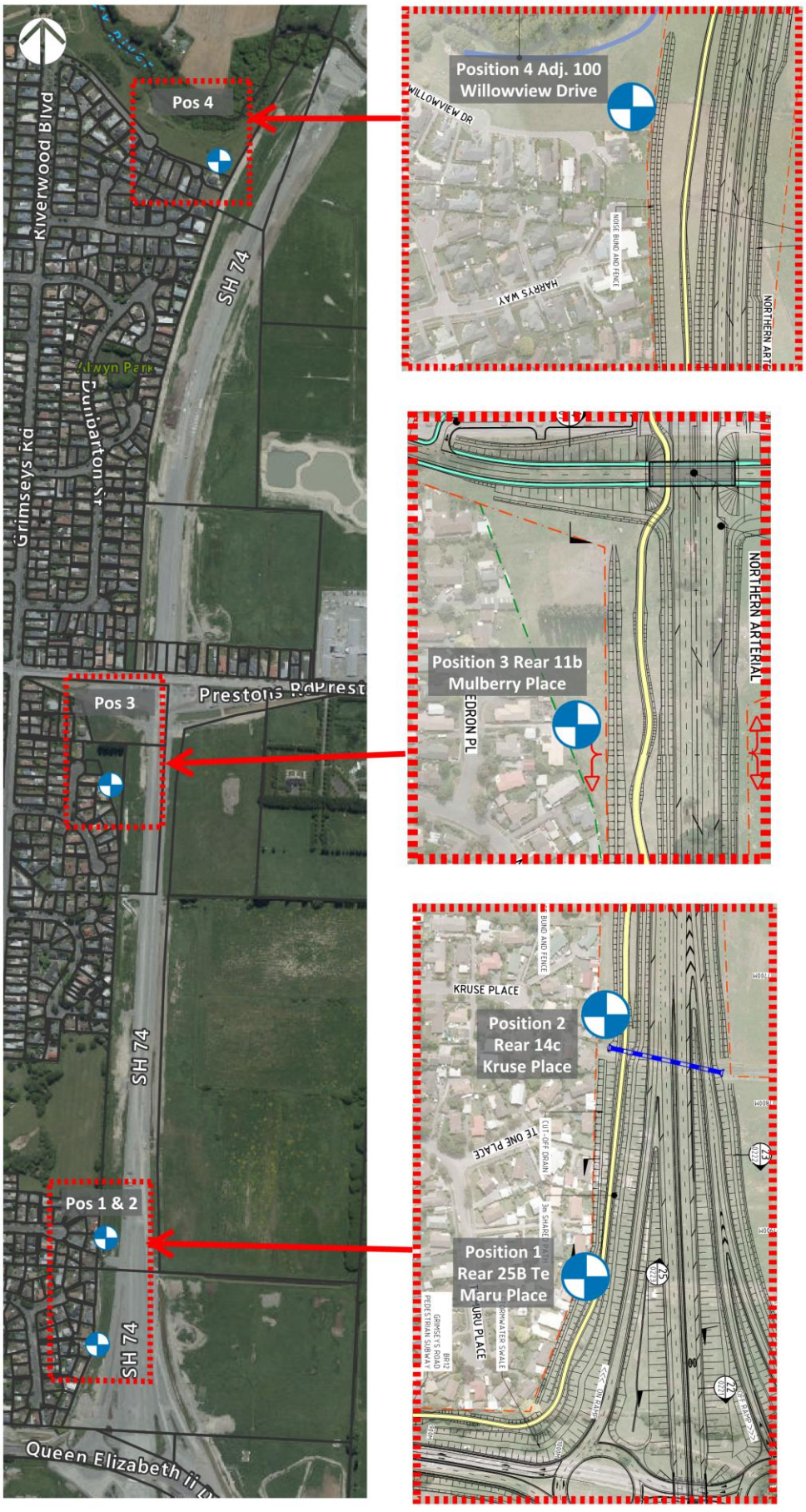
An overall correction of -3.5 dB has been applied to the measured noise levels to derive the "design year" noise levels as shown in Table 4.

Table 4: "Design Year" traffic noise levels (Brackets show workings to one decimal place)

Ref	Description	Traffic noise level, dB $L_{Aeq(24hr)}$	
		Existing Measured	Corrected to Design Year
1	Rear 25B Te Maru Place	60 (60.5)	57 (57.0)
2	Rear 14c Kruse Place	59 (58.8)	55 (55.3)
3	Rear 11B Mulberry Place	59 (59.4)*	56 (55.9)
4	Adjacent 100 Willowview Drive	59 (58.7)*	55 (55.2)

The analysis in Table 5 shows that traffic noise levels, when corrected to the Design Year, are consistent with the traffic noise environment described during the Notice of Requirement and the project noise criterion of 57 dB $L_{Aeq(24\,hr)}$.

Figure 1: Plan of CNC with enlarged areas showing measurement positions



APPENDIX A GLOSSARY OF TERMINOLOGY

dB	Decibel 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 x 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.
Design Year	A point in time that is not less that 10 years but not more than 20 years after the opening of the new road, or the opening of alterations to an altered road, to the public.
$L_{Aeq\,(t)}$	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.
SPL or L_P	Sound Pressure Level A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μPa RMS) and expressed in decibels.

APPENDIX B HOURLY TRAFFIC NOISE LEVEL VARIATION AT POSITION 1 REAR 25B TE MARU PLACE