

Attachment 8

Noise and Vibration
Assessment prepared by
Marshall Day Acoustics

23 May 2022

May 1 Limited
C/- TSA
Level 2, 88 Broadway
Auckland 1023

Attention: Hamish Ward

Dear Hamish

105 – 109 MAY ROAD EARTHWORKS – NOISE AND VIBRATION ASSESSMENT

SUMMARY

Marshall Day Acoustics has been engaged by TSA on behalf of May 1 Limited to assess the noise and vibration effects from the proposed earthworks at 105 – 109 May Road.

We have assessed the construction noise and vibration generated by the proposed earthworks against the relevant parts of the Auckland Unitary Plan (AUP).

In summary:

- The proposed earthworks are predicted to generate noise levels of up to 10 decibels above the 70 dB L_{Aeq} limit at the closest dwellings (33A and 35 Marion Avenue) for 1 – 2 weeks. All other dwellings are more than 25m from the works and compliance is predicted to be achieved.
- High noise levels are predicted at the commercial receivers adjacent to the demolition works for 1 – 2 weeks. This may cause disruption to noise sensitive activities in rooms facing the works (e.g. offices in the manufacturing buildings), but we expect minimal disturbance to manufacturing/repair works and similar commercial operations.
- We recommend that:
 - o Temporary noise barriers be installed to block line of sight from the earthworks to the ground floor of the dwellings at 33A and 35 Marion Avenue. These noise barriers would enable compliance with the 70 dB L_{Aeq} construction noise limit at the ground floor and provide reasonable internal noise levels for ground floor rooms facing the works.
 - o All nearby residential and commercial receivers be informed of the works prior to commencement, with times, duration and contact details for complaints and enquiries.

A glossary of acoustic terminology is included in Appendix A.

PROJECT DESCRIPTION

The project consists of demolition of the existing commercial buildings at the south-eastern end of the site, and earthworks on the north-western section which is currently a greenfield site.

The adjacent site to the north is a Central Interceptor works area, and we understand that Watercare and May Road limited are working together to use the opportunity to create improved areas for future development. The works include raising part of the site above the flood plain, through an integrated storm water and earthworks approach.

We understand that works are anticipated to take 6 months in total to complete. Construction hours are proposed to be 7:30am to 6pm Monday to Saturday.

The proposed works are summarised in Table 1.

Table 1: Summary of proposed works

Activity	Description	Methodology and equipment	Duration
Demolition	Remove existing warehouses	Excavators to demolish existing buildings	2 months
Excavation and earthworks	Remove topsoil and place material to re-contour site	Excavators, truck movements	4 months

A map of the works and closest receivers are shown on Figure 1.

Figure 1: Map of works



PERFORMANCE STANDARDS

The relevant AUP rules are summarised below.

Construction noise limits are 70 dB L_{Aeq} and 85 dB L_{AFmax}

AUP Rule E25.6.27 sets construction noise limits for construction works.

The limits vary depending on the total duration of construction for the project. We have adopted the long-term duration limits for projects with construction periods greater than 20 weeks in accordance with Rule E25.6.27(4). The relevant limits are 70 dB L_{Aeq} and 85 dB L_{AFmax} between 7:30am and 6pm Monday to Saturday.

In accordance with Rule E25.6.1(3) construction noise must be measured and assessed in accordance with the provisions of New Zealand Standard NZS 6803:1999 "Acoustics - Construction Noise".

Construction Vibration

AUP Rule E25.6.30 (1)(a) requires construction vibration to be measured and assessed in accordance with German Standard DIN 4150-3:1999 “*Structural vibration – Part 3: Effects of vibration on structures*”. The short-term (transient)¹ vibration limits in Figure 2 apply at building foundations in any axis. The vibration limits in all other cases are summarised in Table 1.

The criteria relate to the avoidance of cosmetic building damage, such as cracking in paint or plasterwork. Cosmetic building damage effects are deemed ‘minor damage’ in the Standard and can generally be easily repaired. The cosmetic building damage thresholds are much lower those that would result in structural damage. The Standard states: “*Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur.*”

Figure 2: Short-term (transient)¹ vibration at building foundations (DIN 4150-3 1999: Figure 1)

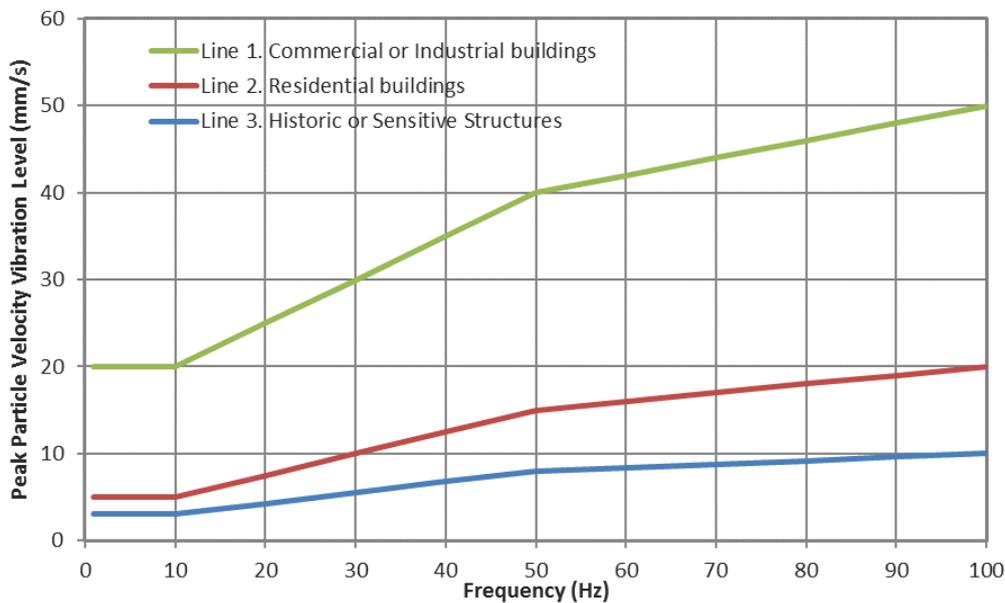


Table 1: Vibration at horizontal plane of highest floor (DIN 4150-3 1999: Tables 1 and 3)

Structure Type	Peak Particle Velocity Vibration Level (mm/s)	
	Short-term (transient) ¹	Long-term (continuous) ^{2, 3}
Line 1. Commercial or Industrial buildings	40	10
Line 2. Residential buildings	15	5

AUP Rule E25.6.30 (1)(b) requires construction vibration to comply with 2 mm/s PPV in any axis on the floor of interest of any occupied building. This limit is an amenity limit and should be used to identify receivers that need to be engaged with. Where construction vibration is predicted to exceed this threshold for more than three days, the occupants of buildings within 50 m must be advised of the works no less than three days prior to the works commencing and the vibration level must not exceed 5 mm/s PPV whilst occupied.

¹ Short-term (transient) vibration is “vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure being evaluated”

² Long-term (continuous) vibration is types not covered by the short-term vibration definition

³ The long-term (continuous) criteria can apply at all floor levels, but levels are normally highest at the top floor

PREDICTED NOISE LEVELS

Our noise assessment has assumed that a 2m high temporary noise barrier will be installed along the site boundary between the cut area and closest Marion Avenue dwellings (see Figure 1). This barrier will mitigate noise levels received at the ground floor level of these dwellings.

The recommended location of the temporary noise barrier is shown in Appendix B. Suitable barrier materials are also provided in the appendix.

Table 2 presents the identified high noise equipment and the setback distance to achieve compliance with 70 dB L_{Aeq}. We have provided setback distances for with and without noise barrier. This is because some adjacent buildings are multi-level, and a 2m high noise barrier will not provide shielding to these locations.

Table 2: High Noise Equipment Setbacks

Equipment	Sound Power Level (dB L _{WA})	Setback Distance for Compliance	
		No Noise Barrier	With Noise Barrier
Excavator pulveriser	104	28m	9m
20 – 30T Excavator	103	25m	8m
Road truck	103	25m	8m

Table 3 presents the highest predicted noise levels for the identified potentially affected receivers.

Table 3: Maximum Predicted Noise Levels

Address	Occupancy	Distance from works	Highest Construction Noise Level (dB L _{Aeq})	Potential noise effects
Residential Receivers				
35 and 33A Marion Avenue	2 storey dwellings	8m from earthworks	80 first floor 70 ground floor	Disruption on residential activities like WFH only on first floor (1 – 2 weeks), reasonable levels on ground floor
1/31, 35A, 37, 39 and 41 Marion Avenue	2 storey dwellings	>25m from earthworks	70 first floor 60 ground floor	Noticeable but limited disruption. Noise levels are compliant
Other dwellings on Marion Avenue	Mix of 1 and 2 storey dwellings	>50m from earthworks	63 first floor 53 ground floor	Generally no disruption to normal residential daytime activities
Commercial receivers				
101-103 May Road	Commercial – Gilmores	20m from demolition	73	Slightly exceeds noise limits for short periods (2 – 3 weeks). Effects expected to be negligible as receiving area is a loading dock.
		20m from earthworks	72	
111 May Road	Commercial – SY Auto Service	8m from demolition	85	High noise levels for short periods (1 – 2 weeks). Potential disturbance to office work but minimal disturbance to manufacturing/repair
		15m from earthworks	74	

Address	Occupancy	Distance from works	Highest Construction Noise Level (dB LAeq)	Potential noise effects
Residential Receivers				
	Central City Cutting	10m from demolition	79	High noise levels for short periods (1 – 2 weeks). Potential disturbance to office work but minimal disturbance to manufacturing/repair

In summary:

- We recommend temporary noise barriers are installed prior to works commencing to block line of sight from the earthworks area to all dwellings on Marion Avenue within 25m of the works. This will enable compliance at the ground floor
- High noise levels are predicted at the upper floors of the closest dwellings (35 and 33A Marion Avenue). This would be only for a limited period (1 – 2 weeks).
- High noise levels are predicted at the commercial receivers at 111 May Road during demolition of the existing buildings on the project site (1 – 2 weeks).

PREDICTED VIBRATION LEVELS

Vibration from excavation and demolition works is predicted to readily comply with both the amenity and cosmetic building damage limits.

Vibration from excavation may be perceptible at times but at a reasonable level with prior communications to the closest receivers.

ASSESSMENT OF EFFECTS

Dwellings

The noise effects at the dwellings that are predicted to receive noise levels that exceed the noise limits are considered acceptable based on the short duration (1 – 2 weeks) and provided communication is undertaken prior to the works commencing. The highest noise levels are received at the first floors which would be annoying for some occupants and conversations may require a raised voice. However, the recommended noise barriers would control noise at the ground floor to a reasonable level, and occupants may choose to stay on the ground floor during the closest works.

Receivers on Marion Avenue within 50m of the works should be informed of the times and durations, and provided with a phone number/email to direct complaints.

Commercial Receivers

The predicted noise levels at the closest commercial receivers may cause disruption to noise sensitive activities in rooms facing the works (e.g. offices in the manufacturing buildings). We expect minimal disturbance to manufacturing/repair works and similar commercial operations.

These receivers should be informed of the times and duration of the demolition works so sensitive activities can be planned to avoid these periods. They should be provided with a phone number/email to direct complaints.

CONDITIONS OF CONSENT

We recommend that the following conditions be included in any consent granted:

1. Construction noise shall be measured and assessed in accordance with New Zealand Standard NZS 6803:1999 “Acoustics - Construction Noise” and, as far as practicable, comply with the following Project Standards.

Day	Period	dB LAeq	dB LAFmax
Dwellings			
Weekdays	0630 – 0730	55	75
	0730 – 1800	70	85
	1800 – 2000	65	80
	2000 – 0630	45	75
Saturdays	0730 – 1800	70	85
	1800 – 0630	45	75
Sundays and public holidays	0730 – 1800	55	85
	1800 – 0630	45	75
Commercial receivers			
Any day	0730 – 1800	70	n/a
Any day	1800 – 0730	75	n/a

2. Construction vibration shall be measured and assessed in accordance with German Standard DIN 4150-3:2016 “Vibrations in buildings – Part 3: Effects of vibration on structures” and comply with AUP Standard E25.6.30(1).
3. Temporary noise barriers shall be installed along the site boundary between the Marion Avenue dwellings and nearby earthworks. The barriers shall be 2m high and block line of sight from the ground floor of the dwellings to excavation works (refer to MDA assessment dated 23 December 2021). Noise barrier panels should be constructed from materials with a minimum surface mass of 6.5 kg/m².
4. All occupied receivers within 50m of the proposed works shall be informed of the works at least 1 week prior to commencing. This shall include details of the overall works, timing, duration and contact details where complaints and enquiries should be directed.

Yours faithfully

MARSHALL DAY ACOUSTICS LTD

Ben Lawrence

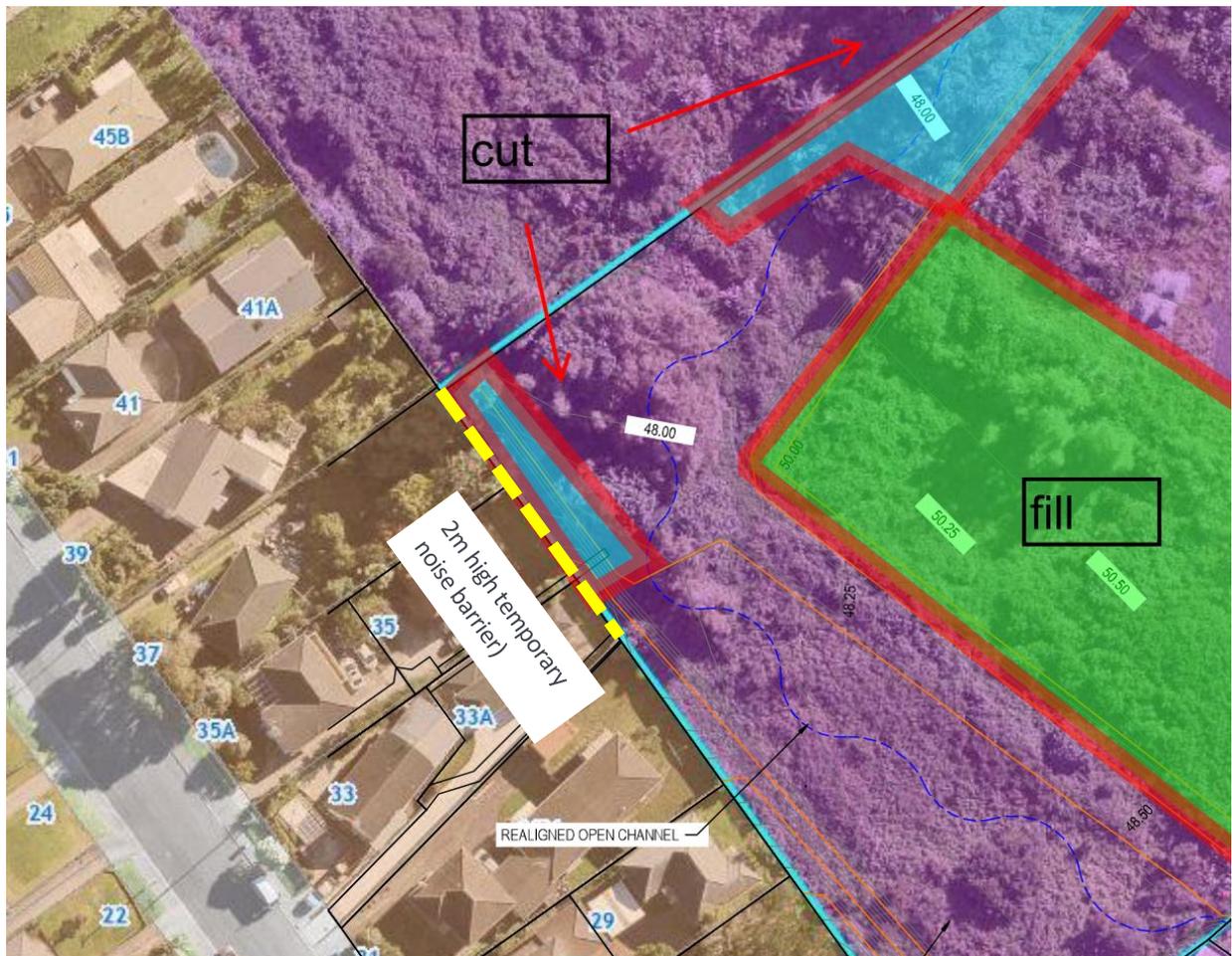
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APPENDIX A GLOSSARY OF ACOUSTIC TERMINOLOGY

dB	<p><u>Decibel</u> The unit of sound level.</p> <p>Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$</p>
dB(A)	<p>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.</p>
A-weighting	<p>The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.</p>
$L_{Aeq}(t)$	<p>The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.</p> <p>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.</p>
L_{Amax}	<p>The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.</p>
Vibration	<p>When an object vibrates, it moves rapidly up and down or from side to side. The magnitude of the sensation when feeling a vibrating object is related to the vibration velocity.</p> <p>Vibration can occur in any direction. When vibration velocities are described, it can be either the total vibration velocity, which includes all directions, or it can be separated into the vertical direction (up and down vibration), the horizontal transverse direction (side to side) and the horizontal longitudinal direction (front to back).</p>
PPV	<p><u>Peak Particle Velocity</u> For Peak Particle Velocity (PPV) is the measure of the vibration aptitude, zero to maximum. Used for building structural damage assessment.</p>

APPENDIX B TEMPORARY NOISE BARRIERS

The recommended barrier location is shown on the figure below.



Effective noise barriers typically reduce the received noise level by 10 decibels.

Where practicable, the following guidelines will be used in designing and installing temporary noise barriers:

- The panels will have a minimum surface mass of 6.5 kg/m². Suitable panels include 12mm plywood or the following proprietary 'noise curtains':
 - SealedAir 'WhisperFence 24dB' (www.sealedair.com)
 - Hushtec 'Premium Series Noise Barrier' (www.duraflex.co.nz)
 - Soundbuffer 'Performance Acoustic Curtain' (soundbuffer.co.nz)
 - Hoardfast 'Fast Wall Premium PVC partition panels' (www.ultimate-solutions.co.nz)
 - Safesmart 'Acoustic Curtain 6.5kg/m²' (www.safesmartaccess.co.nz)
 - Alternatives will be approved by a suitably qualified and experienced acoustic specialist
- The panels will be a minimum height of 2m, and higher if practicable to block line-of-sight.
- The panels will be abutted, battened or overlapped to provide a continuous screen without gaps at the bottom or between panels.