BEFORE INDEPENDENT COMMISSIONERS WELLINGTON CITY COUNCIL

In the matter of

the Resource Management Act 1991

And

In the matter of

A Resource Consent application by **Ryman Healthcare Limited** to establish a retirement care village at 26 Donald Street and 37 Campbell Street Karori, WELLINGTON.

EVIDENCE LINDSAY JOHN HANNAH

Prepared on behalf of

Wellington City Council NOISE & ACOUSTICS

18 July 2022

Absolutely Positively **Wellington** City Council

Me Heke Ki Pōneke

Introduction

1. My full name is Lindsay John HANNAH. I am an acoustic engineer at Wellington City Council, Specialist Advice and Compliance Team.

Qualifications

- 2. My qualifications include a Master's Degree specialising in Acoustics and Environmental Health from Massey University (with distinction), a Post Graduate Diploma in Science (with distinction) specialising in Acoustics from Massey University; and a Bachelor of Building Science Degree (BBSc) from Victoria University School of Architecture.
- 3. I also hold other qualifications in acoustics including the *'Technical University of Denmark* Specialist Sound Insulation Course' and specialist full year acoustics course taught at Massey University *'Bio-physical effects of noise, vibration and electrometric radiation'*.
- 4. I have been involved with the prediction, measurement and assessment of environmental noise from a range of developments in both the New Zealand and overseas on a continuous basis over the last 20 plus years. My expertise is based around environmental and building acoustics.
- 5. I have been responsible for acoustics assessments and design for numerous different activity and project types nationwide and overseas including infrastructure, industrial, commercial, recreational and residential developments. I also have experience in noise control engineering and design works. I have worked on a number of health care and wellbeing projects such as existing and proposed medical centres, hospitals as well as rest homes facilities for example Harbour View Rest Home, Wellington; Met Life Coastal Villas, Paraparaumu and Summer Set Villas, Paremata, and Summer Set Villas, Boulcott, Hutt City
- 6. I have been employed as a specialist in environmental acoustics since 1999. I was the Lead of Acoustics Engineering at Cardno (now Stantec) a global infrastructure, environmental and social development company operating in over 100 countries. I have also worked for specialist acoustic firms such as Malcolm Hunt Associates which only specialised in acoustics and noise.
- 7. I am a full member of the New Zealand Acoustics Society¹, with a requirement of Full Membership being that I satisfy the Society's 2 yearly requirements in regard to continuing professional development (CPD) for both on-going education and development in the field of acoustics. I am an associate member of the New Zealand Planning Institute.
- 8. I am a current elected board member of the New Zealand Acoustical Society an elected position I have held several times over my career. I am the Editor in Chief of New Zealand Acoustics Journal, a position I have held for several years.

¹ NZAS Membership Number M1202HL

Experience

9. I have been involved with the prediction, measurement, assessment and reporting of environmental noise from a range of developments on a continuous basis over the past 20 years. I also have experience in noise control engineering and acoustic design works. I have worked on projects both in New Zealand and overseas.

Code of Conduct

10. The evidence I give is within my area of expertise. I am not an expert in vibration. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Scope of Evidence

- 11. My evidence will deal with:
 - Background and role;
 - Summary of site and activity;
 - Summary of assessment of environmental noise and vibration issues;
 - o Response to the Applicants expert noise and vibration reviews;
 - Response to submissions received regarding noise and vibration;
 - o Summary of proposed noise management methods; and
 - Recommended noise and vibration conditions.

Background SR462500

- 12. My involvement in this Application initially involved preparing a technical review report for Council, as Councils Acoustic Engineer, under the <u>original</u> Application reference SR471670. A new Application was then submitted under the WCC reference SR462500. I was not asked to prepare an updated noise assessment thus include my updated assessment below for SR462500 (current application and consent).
- 13. I understand the change to the application (from SR471670 to SR462500) is negligeable with respect to noise and vibration matters. My evidence is based around the Application and information provided by the Applicants noise and vibration experts, Marshall Day Acoustics (MDA). I can confirm I have visited the subject site and reviewed the surrounding area.

Development Site and Proposed Activity

- 14. The site, surrounding environs and proposed activity is well described in detail within the Application, and I provide the following summary.
- 15. Ryman Healthcare Limited (The Applicant) have applied to Wellington City Council (The Council) to construct and operate a new retirement village to be located at Donald Street, Karori, Wellington.
- 16. The development is surrounded by a host of residential properties and non-residential activities.

- 17. The non-residential sites include (but are not limited to) the Kaori Swimming Pool, Wellington RSA, Campbell Kindergarten, Karori Kids, Donald Street Pre-school and sports/open space facilities. There is also the Huntleigh Home and Retirement Village in the wider area.
- 18. As indicated in the MDA review the closest noise sensitive sites include surrounding sites in Donald Street, Campbell Street, Donald Street, Scapa Terrace and Karori Road.

Overview of Acoustic Reporting and Review Documents

- 20 In addition to the Resource Consent and Application, a host of documents (the MDA review's) have been submitted by MDA in support of the Resource Consent Application, these documents are summarised as follows:
 - *i.* **Operational Noise** Assessment prepared by Bill Wood. Report reference Rp 001 R05 20200396 dated 27th August 2020. This document was attached as **Appendix K** to the Resource Consent AEE Application.
 - *ii.* **Noise Assessment Report** prepared by Bill Wood. Report reference Mm 001 R03 dated 14th October 2020. The memo (Mm 001 R03) was prepared in response to WCC's FiR and should be read in conjunction with the MDA operational noise assessment and WCC FiR.
 - *iii.* **Construction Noise and Vibration Assessment** Report prepared by Bill Wood. Report reference Rp 002 R04 20200396 dated 14th November 2020. This document was attached as Appendix A to the Applicants Further Information Request to address construction noise.

Overview of Environmental Noise (Operational Noise, Construction Noise and Vibration)

(a) Noise Sources

- 21 The proposal is to construct and operate a new retirement village. The development will have two key noise sources being
 - a. Operational noise, described as noise from 'day to day' operations such as plant, services, people, recreational and traffic for example. The operational noise sources will occur on site once the development is completed, and residences occupy the site; and
 - b. Temporary **construction noise and vibration** which will only be present for a set period of time while the facility is constructed. This noise source is temporary in nature and are the related noise and vibration effects.

(b) **Operational Noise**

- 22 The MDA Operational Noise Assessment reports have provided a detailed review of the dayto-day operational noise. This includes (but is not limited to) service noise (rubbish trucks etc), fixed plant (emergency generator, transformer, waste compactor etc).
- 23 Operational noise has been predicted by MDA in accordance with ISO 9613-2:1996 Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation (ISO 9613-2:1996) as implemented in SoundPLAN® environmental noise modelling software. ISO 9613-2:1996 considers a range of frequency dependent attenuation factors, including screening, spherical spreading, atmospheric absorption and ground effects for example.
- 24 The MDA acoustic assessment has also adopted New Zealand environmental standards for the assessment of environmental noise, New Zealand Standard **NZS 6802:2008 Acoustics Environmental Noise** (NZS6802:2008). A number of reasonable assumptions are also relied on throughout the reporting, for example appropriate sound insulation being adopted as well as the final site design and layout being the same as indicated in the plans provided.
- 25 In my experience **operational noise** from a retirement village site, when compliant with the District Plan would be a 'genuine' low-level activity (when suitable managed) as being proposed by the Applicant. In this case, the noise levels are predicted to meet the level of noise specified by the District Plan for permitted activities. Based on this I am of the view operational noise effects would be similar in nature and scale to existing residential activities (when suitable managed by the operator of the site).

(c) Construction Noise and Vibration

- 26 The MDA construction assessment has adopted **NZS6803:1999** Acoustic Construction Noise. The MDA construction assessment report has provided an assessment of temporary construction and vibration effects. The MDA report states that with respect to construction noise sources the closest receiver distances to the site boundary are between 1 metre to 12 metre, however as noted in the MDA report distances to actual working areas are still to be confirmed as part of the final construction methodology and thus may change. Table 3 of the MDA construction review sets out sound power levels and set back distances.
- 27 Construction noise has been predicted in accordance with ISO 9613-2:1996 as implemented in SoundPLAN[®] environmental noise modelling software with the adoption of 2.4m high acoustic noise barrier around the full perimeter of the site. A number of detailed construction stages have been assessed from slab preparation and construction through to internal building works.
- 28 The MDA review concludes with respect to construction noise that "for the vast majority of construction works, compliance with occasional marginal exceedances of the 70 dB *L*_{Aeq} noise limit can be achieved".

- 30 Notably the MDA review states, "any one receiver will not be exposed to high noise activities for the entire construction period, but only during the construction activities closest to them, and for intermittent and limited durations". I further agree.
- 31 With respect to the above conclusions the MDA report also notes that "at this stage, a complete construction methodology is not available". The MDA review goes onto state that "when predicting noise from construction activities there is always a level of uncertainty'. The review also states that 'there are numerous variables and factors affecting the accuracy of the noise predicted. Factors include the variations in the specific models and individual items of equipment, the exact location of each item, the operator idiosyncrasies and the exact location of the various receivers". As with the operational noise review several reasonable assumptions are also relied for the construction modelling importantly however, the MDA review states that with respect to the assessment and assumptions "the predicted noise levels are based on a conservative worst-case scenario of the noisiest equipment being operated 100% of t time and only the 2.4m perimeter fencing as mitigation". These noise predictions are based on a 2.4m high perimeter solid noise barrier fence, making installation of this fence essential to achieve the levels presented in the Application.
- 32 The MDA construction noise and vibration review states that with respect to vibration "the majority of construction activities will not generate high levels of vibration at most assessment locations". The MDA report states however that some dwellings closest to the construction activities may be exposed to construction vibration levels from vibratory compaction, that may approach and at times exceed the vibration limit. For vibratory works near these dwellings the MDA review states an alternative compaction measures should be investigated and/or building condition surveys offered.
- 33 The MDA review concludes that "some dwellings closest to the construction activities may be exposed to construction vibration levels from vibratory compaction, that may approach and at times exceed the vibration limit. For vibratory works near these dwellings, alternative compaction measures should be investigated and/or building condition surveys offered". The MDA report also states that an exceedance of up to 7 dB is predicted at Karori Normal School and Karori Pool in relation to noise emanating from the piling works that will occur for a limited duration. Accordingly, MDA have recommended the CNVMP consider additional localised mitigation measures for these works near the school to ensure the noise does not exceed a reasonable level. I support this approach and note localised and mitigation measures are essential to ensure noise is reduced as far as practical at all neighbouring sites.

- 34 With respect to temporary construction noise and vibration, projects of this nature and scale cannot at all times comply with the day-to-day permitted construction or vibration limits. This fact is clearly acknowledged within the Applicants Resource Consent, Application and supporting documents.
- 35 I note construction noise will be noticeable at times throughout the project during the various stages and in my opinion adopting best practice in line with s.16 duties, as proposed by the Application, to management construction noise is a key requirement to ensure noise remains reasonable.
- 36 Noise will be noticeable at times for varying activities, and in some cases non complaint (as noted by MDA), this may also mean at times, the noise produced may also at times be undesirable to some residents. There are measures that can be adopted to reduce noise this includes but is not limited to limited duration of activities, time of operation and most importantly a detailed Construction Noise Management and Vibration Management Plan (CNVMP) to set out a suit of mitigation measures, community engagement and monitoring, all of which should be adopted in line with the Best Practical Option (BPO) requirements of the Resource Management Act to mitigate noise.

(d) Summary Noise and Vibration

- 37 I provide the following overview summary with respect to my review for both operational noise and construction noise and vibration reports prepared by MDA:
 - a. In my opinion the MDA review is in accordance with the required Wellington City District Plan noise rules and related New Zealand environmental acoustic standards for the assessment of environmental sound, construction and vibration standard DIN 4150-3:2016 'Vibrations in buildings – Part 3: Effects on structures.
 - b. In my opinion the assessment methods and supporting information provided in the MDA review such as the adopted sound power levels for operational noise and construction are in the authors experience fit for purpose and the the acoustic modelling software in line with industry standards and best practice.

In my opinion the MDA assessment makes it very clear that the operational noise assessment, construction noise and vibration assessment is indicative and could be subject to change based on limited methodology and detailed design at the time of preparing their assessments. **Based on this a detailed construction noise management and vibration plan is essential**.

- c. MDA note that **operational** noise-based activity is '*capable of complying*' with the relevant Wellington City District Plan noise rules when suitable managed.
 - i. There is an exemption to operational compliance; being the dwelling at <u>29</u> <u>Campbell Street (Early Learning Centre)</u> where the MDA assessment concludes at this location, a 3 dB exceedance has been assessed (limited to twice a week from rubbish collection).

- ii. I note, a change in sound level of 3 dB is generally typically imperceptible (unnoticeable) to the average listener i.e the degree of the change would be negligeable.
- d. For this project the construction standard referenced in the District Plan, *NZS6803:1999 Acoustic Construction Noise* sets a level of 70 dB L_{Aeq} and 85 dB L_{AFmax} at 1m from the worse affected building façade (not the site boundary) between the construction hours of 7.30am to 6.00hrs Monday to Saturday.
- e. I note based on the MDA construction reporting; MDA conclude the 85 dB $L_{AFmax}\,can$ be complied with.
- f. I further note based on the MDA construction reporting construction noise is predicted as being *'capable of complying for the majority of time'* with the relevant acoustic construction standards however, as noted by MDA there may be times when the limits are exceeded for limited periods of time, MDA note these as:
 - i. Exceedances for noise sensitive residential sites will generally be up to 2 dB; however in the specific case of concrete cutting for Allen Ward Hall exceedance levels may be as high as 11 dB above permitted;
 - ii. In the case of Karori Normal School (a noise sensitive site) exceeded during piling may be up to 6 dB above permitted;
 - iii. During piling exceedances of up to 7 dB at Karori Pool are predicted (which is not a noise sensitive site); and
 - iv. In some cases, for temporary areas and activities, such as concrete cutting, levels may result in levels between 72 dB L_{Aeq} to 81 dB L_{Aeq}.
 - v. The Application at *Section 5.3.6 Construction Effects* notes any potential construction effects are considered <u>'to be less than minor'</u>. I am of the view with respect to noise levels ranging between 7 dB to 11 dB <u>above</u> permitted, such effects would range from moderate to high (albeit for limited times).
 - vi. With respect to non-compliance, the Applicant notes neighbors will not be exposed to ongoing high noise activities for the <u>entire</u> construction period, but some will experience at times, high exposure during the construction activities when these are conducted close to them, thus why a detailed CNVMP is essential in my opinion.

- g. In the cases where potential non-compliance levels may result; MDA note with additional measures in place such levels may be able to be reduced further. I agree. MDA further note in there reporting such measures include (but not limited to) localized screening and barriers (this is in addition to the 2.4m perimeter acoustic barrier), surveys of building conditions, non-vibratory rollers, community engagement and a detailed construction noise and vibration management plan recommend by MDA (among other things). Such measures would be looked at in detailed through the drafting and finalising of the CNVMP.
- h. The MDA vibration review notes the 'majority of vibration activities will not generate high levels of vibration' there may be times when the limits are exceeded for limited periods of time (from rollers or piling activity for example). The MDA assessment recommend as part of the CNVMP vibration monitoring. I support this as part of the detailed construction noise management suite.
- i. Overall based on the nature and scale of the proposed development I recommend the suite of draft noise and vibration conditions (as set out in Appendix A attached). In my experience adopting the detailed suite of conditions and related noise management method through the CNVMP, this can give the community a certain level of certainty that the final design, specifications and noise management methods (once put in place) can ensure noise effects will be managed in line with the s.16 duties of the Resource Management Act.
- j. I recommend the draft CNVMP is reviewed and certified by Council.

Noise Management and Mitigation Methods

38 The Resource Management Act (RMA) Section 16 (s.16) requires occupiers to adopt the best practicable option (BPO) to ensure noise emissions do not exceed a reasonable level. The definition of best practicable option is set out in Section 2 (s.2) of the Act and is summarized as follow:

"Best Practicable Option", in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to –

- (a) The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and
- (b) The financial implications, and the effects on the environment, of that option when compared with other options; and
- (c) The current state of technical knowledge and the likelihood that the option can be successfully applied

- 39 In my view adopting BPO measures through the adoption of a detailed CNVMP is a **critical** requirement to ensure construction noise is reasonable at all times. The MDA review provides in my opinion a host of reasonable recommendations with respect to noise management. However, as noted in the MDA review additional noise management and mitigation measures will need to be finalised and given further consideration as part of the final mitigation measures once final methods are known. I support this method, as a reasonable approach, and note such measures can be worked through during the draft construction noise and vibration management plan preparation.
- 40 With respect to construction and vibration a host of measures are recommended under *Section 5.0* of the MDA construction noise assessment. There are a host of noise management methods (including but not limited to) the erection of a temporary noise barrier (minimum height 2.4 metres) to be installed to extend around the site perimeter as well as the preparation of a CNVMP is included as a condition of consent on the project. Importantly the MDA review also recommends that "where high noise equipment is used close to a sensitive boundary or where receivers are not easily shielded, localised barriers should be used where they would be effective and practicable.". I agree.
- 41 With respect to operational noise the MDA review concludes "that with the use of conventional noise control treatments (if required), the operation of the Proposed Village would comply with the relevant Permitted Activity noise criteria at all assessment locations, with the exception of the occasional brief exceedance at 29 Campbell Street. The MDA review also concludes compliance of fixed plant is dependent on the review of fixed mechanical plant items, and any required noise mitigation, following completion of design".
- 42 Overall, I am in support of the recommended methods proposed by the Applicant, and I agree that these methods are inline with the s.16 duties under the Resource Management Act. I stress the certification of a detailed CNVMP, 2.4m high perimeter barrier and localized mitigation (among other noise mitigation measures) are essential to ensure noise can be managed.

Submissions (Noise and Vibration)

- 43 I have read the submissions where noise and vibration are highlighted as a concern by the community. I have given consideration to noise matters raised in those submissions.
- 44 I am of the view that the submissions raise valid concerns including potential noise matters.
- 45 These issues raised can in my view be addressed through the final design, specifications and operation for operational noise and the CNVMP for construction and vibration measures.
- 46 The following is a subject site map and adjacent sites (from the MDA assessment for construction noise *Appendix A*).



- (a) **Operational Noise Submissions**
- Submission 17 Mary-Anne Healy (42 Donald Street): Noise impacts from the pocket park (picnic area) and fencing and rubbish noise.
- Submission 41 Nikki Fraser (19^A Campbell Street): "Noisylessly" no fans air conditioning laundry.
- 3. Submission 46 Jennifer Mattlin (36 Cooper Street): Noise impacts (no further specific comments made).
- 4. **Submission 49 Bonita Gestro (6 Scapa Terrace)**: Noise impacts from tyre squealing from the undercroft carparking, noise from construction and excavation and piling. Requests pre and post survey of their home.
- 5. **Submission 56 Andrew and Julie Cooper (49 Campbell Street)**: Car movement noise and tyre squeal from undercroft car parking, car parking audible warning alarm for garage door.
- 6. Submission 60 Jeremy and Debbie Sprott (32 Campbell Street): Car movement noise from tyre squeal from undercroft car parking.
- 7. Submission 65 Responsible Development Karori (49 Campbell Street): Car movement noise from tyre squeal from undercroft car parking.

- 8. **Submission 70 Mark Moore (17 Paddington Grove)**: Car movement noise from tyre squeal from undercroft car parking.
- 9. Submission 72 Bernadette and Tristram Ingham (22 Scapa Terrace): Car movement noise from tyre squeal from undercroft car parking.
- 47 In summary the following subject matters are raised in the submissions pertaining to operational ('day to day') noise:
 - General concerns with respect to day to day noise emissions including service and plant noise;
 - Noise from tyre squealing from the under croft carparking;
 - Car movement noise; and
 - Noise from audible warning devices associated with the car parking garage door.
- 48 I address each of the specific matters separately as follows:
- 49 **General concerns with respect to noise emissions including plant and service noise.** The Applicant has provided a detailed assessment of operation noise effects. I have discussed such in my evidence above.
- 50 Noise from tyre squealing from the undercroft carparking. Noise from tyre squealing could be a potential noise source that is detectable off site. This issue appears in a host of submissions. The Applicant has not addressed this matter and may wish to consider providing further review. I note that with suitable design and specification, such as the selection of car parking floor surface (for example a rough as opposed to smooth surface (where required)), I see no practical reason why this noise source cannot be suitable mitigated to comply with the operative noise limits.
- 51 **Car movement noise.** Car movement noise relates to engine sounds, door opening and closing and the movement of the vehicles themselves. The MDA review did not specifically address vehicle noise and referred in their s.92 response (Appendix C) referred the matter back to the Applicants Planner. The Applicant wish to comment further however, in my experience when vehicles are driven sensibly (as would be fair to expect when in the precinct for an aged care facility for our elderly citizens) vehicle noise would be expected to be similar in nature and scale to noise from adjacent residential sites. There are measures that can be adopted such as speed humps and/or signs that will ensure vehicles move at safe and slow speeds on site. I note that heavy vehicle noise will also be present such as collection of waste.
- 52 The MDA review notes that when assessed in accordance with NZS 6802:2008, the noise from rubbish trucks is predicted to comply with the 50 dB L_{Aeq 15 minutes} District Plan daytime limit for non-residential activities at all assessment locations, with the exception of the 29 Campbell Street (Early Childhood Education (ECE) facility) where the MDA assessment concludes at this location, a 3 dB exceedance has been predicted twice a week. I have discussed this issue above in my evidence.

- 53 Council's Trade Waste bylaw (Controls for the Solid Waste Management and Minimisation Bylaw 2020) permits collection of waste in residential areas only between 7.00am to 9.00pm Monday to Saturday thus the collection of waste by heavy vehicles could only be during daytime hours.
- 54 Noise from audible warning devices such as associated with the car parking garage door. I see no practical reason why noise from the garage door and related warning devices cannot in my experience be suitably designed, specified and operated so that these noise source can comply with the operative noise limits. Such measures could include the audible component of noise is only present during day and at night the flashing light operates but not the warning beeper noise. Other options may include adopting broad band noise emitters as opposed to beepers. The Applicant may wish to provide further comment.
- 55 Noise from outdoor areas such as the pocket park (picnic area). Noise from persons outside would be expected to be normal vocal effort meaning persons talking and normal levels and would be expected to be similar in nature and scale to surrounding residential activity. With respect to the pocket park (picnic area) the boundary fence between the site and neighbour will have a fence shown as "Type C" which is a timber board fence.
- 56 The "Type C" fence is shown as running along the entire common boundary of Donald Street. The site also has a host of other outdoors areas, for example the bowling green. This area is set back from the common site boundary, regardless as noted above I see no reason why when suitable managed the outdoor areas would not produce reasonable levels of noise that comply with the permitted district plan noise limits.

(b) Construction Noise Submissions

- 10. Submission 1 Heng Hu (26 Donald Street): General noise impacts during construction.
- 11. Submission 38 Barbara Carruthers (14 Scapa Terrace): Construction noise impacts (during construction).
- 12. Submission 41 Nikki Fraser (19^A Campbell Street): Construction noise impacts, during demolition as well as use of radios and builders talking during construction, builders working outside permitted hours. WCC 'promptly attend to issues' for residents including noise'.
- 13. Submission 43 Jude Wallace (13 Scapa Terrace): Level of construction noise and how this will continue for 'years of construction activity'. Concern of construction noise from persons working from home; confine excessively noise activity to certain period of the day and none at the weekend. Construction vibration. Ryman prepare a construction check (survey) prior to any construction work.
- 14. Submission 49 Bonita Gestro (6 Scapa Terrace): Noise impacts from construction and excavation and piling.

- 15. Submission 50 Joost and Kerri van Amelsfort (12 Scapa Terrace): Construction noise, construction noise exposure and hours of work. Ground movement and vibration. No construction on Sundays and limited time on Saturdays.
- 16. **Submission 54 Richard Brandon (23 Scapa Terrace)**: Construction noise impact, construction noise exposure when working from home. Ground movement and vibration from piling.
- 17. Submission 56 Andrew and Julie Cooper (49 Campbell Street): Construction noise impact on property.
- 18. Submission 57 Richard Leikis and Vanessa Porter (20 Scapa Terrace): Construction noise impacts. Control of ground impacts and movement (geotechnical).
- 19. Submission 58 Clinton Moran (16 Scapa Terrace): Construction noise impacts. Construction impacts from work from home.
- 20. Submission 62 B Dustan (11 Scapa Terrace): Construction noise impacts. Limit construction working hours.
- 21. **Submission 70 Mark Moore (17 Paddington Grove)**: Construction noise is not suitable to have 6 days a week. Construction noise and work from home impacts.
- 22. Submission 72 Bernadette and Tristram Ingham (22 Scapa Terrace): Construction noise is not suitable to have 6 days a week. Construction noise and work from home impacts.
- 23. Submission 74 Mr and Mrs Major (37 Donald Street): Construction impacts and ground movements.
- 24. Submission 75 David King and Anna Reese McKinnon-King (24 Scapa Terrace): Construction impacts. Concerns that no evidence is provided or given to whether the adverse noise effects are minor (as stated by Ryman). Submitters assessment is 'noise and vibration from construction are at least moderate'.
- 57 In summary the following subject matters are raised in the submissions pertaining to construction noise and vibration:
 - General noise impacts from construction noise including plant noise;
 - Construction noise impacts from demolition, excavation and piling works;
 - Construction noise impacts from demolition works;
 - Noise from builders talking (vocal) and use of radios;
 - Duration of noise, operating hours and noise impacts (including high impact activity) occurring on weekends or public holidays;
 - Construction noise impacts when working from home;
 - WCC enforcement and attendance of complaints;

- Ground movement and vibration; and
- Construction assessment effects not being minor;
- Noise from outside recreational areas including specific areas such as the pocket park picnic area adjacent Donald Street in the south-east corner of site;
- 58 I address each of the above matters separately as follows:
- 59 General noise impacts from construction noise. The Applicant has provided a detailed construction noise and assessment of construction noise effects which has been discussed above in detail my evidence. The Applicant recommends a CNVMP be prepared. I support this approach and recommend it is reviewed and certified by Council, where any deficiencies arise the Plan should be amended at the request of Council in consultation with the Applicant.
- 60 Noise from builders talking (vocal) and use of radios. Noise from typical vocal effort would be expected to be similar in nature and scale to surrounding residential activity. With respect to the use of a radio on site, in my experience I see no practical reason why amplified sound, or the use of a radio could not comply with the operative noise limits when suitable volume is set. In cases where a (noise) complaint were to be received by Council from the community, such as a 'loud radio' Councils Compliance Officers would investigate and undertake the suitable measures to ensure compliance with the operative District Plan noise levels or Resource Consent conditions. The CNVMP can also address such matters.
- 61 Duration of noise, operating hours and noise impacts (including work from home) occurring on weekends or public holidays. Concern of resident and the community with respect to the length of the project, operating days and hours are raised and are an important matter to address with respect to the health and amenity of adjacent residents. I understand the projects construction is expected to be approx 3-4 years and thus the concerns of residents and the community around this specific matter.
- 62 Noise from construction projects during certain stages of work (namely outdoors) generally cannot comply with the day-to-day permitted operational noise limits set out within the District Plans or those recommended in standards such as NZS 6802, thus why NZS6803:1999 was developed to address noise levels and related management methods.
- 63 **NZS6803:1999** Acoustics Construction Noise specifically states that this standard should be used for the setting of noise limits to *"reduce the likelihood of annoyance, nuisance and adverse health effects to people in the vicinity of construction work"*. The standard recommended limits based on duration of works, time of day and if the activity occurs on a weekday or public holiday.
- 64 The standard provides two key tables; the first one is for noise sensitive residential areas (table 2) and the second for industrial or commercial areas. The three categories are described for work duration as "short", "typical" and "long".

65 The New Zealand Acoustic Standard *NZS6803:1999 Acoustics Construction Noise* set limits in Table 2 and Table 3 of that standard. The limits are summarised below:

Time of	Time period	Duration of work					
week		Typical duration (dBA)		Short-term duration (dBA)		Long-term duration (dBA)	
		L _{eq}	L _{max}	L _{eq}	L _{max}	Leq	L _{max}
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85
	1800-2000	70	85	75	90	65	80
	2000-0630	45	75	45	75	45	75
Saturdays	0630-0730	45	75	45	75	45	75
	0730-1800	75	90	80	95	70	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75
Sundays and	0630-0730	45	75	45	75	45	75
public holidays	0730-1800	55	85	55	85	55	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75

Table 2 – Recommended upper limits for construction noise received in residential zones and dwellings in rural areas

(a) "Short-term" means construction work at any one location for up to 14 calendar days;

(b) "Typical duration" means construction work at any one location for more than 14 calendar days but less than 20 weeks; and

(c) "Long-term" means construction work at any one location with a duration exceeding 20 weeks.

- 66 As indicated in **Table 2** above (from NZS6803) the standard sets varying limits based on a number of factors including the length of the project, time of week and time of day. As the project is long duration the limits at adjacent sites are 5 dB more stringent for typical duration projects and 10 dB more restrictive for short term projects. Limits are also more restrictive during evening and night time periods, Sundays and Public Holidays.
- 67 NZS6803:1999 sets very restrictive limits for Sundays and Public Holidays permitting levels up to 55 dB L_{Aeq} and 85 dB L_{AFmax} between 7.30am to 6.00pm. The Applicant may wish to comment further with respect to any planned works on Public Holidays occurring.
- 68 I am of the view that in accordance with s.16 duties to manage noise, any high noise impact activity that cannot comply with the permitted limits set out in NZS6803, such activities could for example be limited, for example between 9.00am and 4.00pm Monday to Friday only.
- 69 It is understandable that there is concern around the community **working from home** and the noise effects. As above I support the use of a CNVMP to ensure noise is suitable managed inline with BPO s.16 so as to ensure noise remains reasonable at all times.

- 70 WCC enforcement and attendance of complaints. When a project is granted Resource Consent a Compliance Monitoring Officer (CMO) is assigned the project. The CMO role is to ensure all the conditions are complied with, conduct site visits, and also ensure that if any complaints are received to investigate. This may mean for example if a noise complaint is received the CMO and acoustic team will investigate the complaint and act according.
- 71 **Construction noise surveys (pre and post construction works).** The MDA assessment has noted they recommend such surveys be undertaken. I support this.
- 72 Construction noise impacts from demolition, excavation, vibration, ground movement and piling works. Section 1.4 of NZS 6803 specifically states that the standard "does not cover vibration". Generally, this is because although vibration is a common by–product of construction work, vibration itself is separate expert field for both assessment and measurement. The effects of vibration may relate to potential damage to buildings (structural damage) and human response (annoyance and subjective response).
- 73 The MDA assessment and application has addressed these matters in some detail. I have made comment above in my evidence but have noted I am not an expert in vibration. I understand ENGEO are reviewing ground movement matters and thus refer to their expertise to provide further comment and insight with respect to ground movement, as this is outside my area of expertise.
- 74 **Construction assessment effects not being minor and at least moderate.** The MDA assessment and application has addressed this matter. I have commented in my evidence above also.

Conclusion

75. If consent is granted, I recommend the draft conditions attached in *Appendix A* be adopted.

and say Manuch.

M.A.S.N.Z (M1202HL). Assoc NZPI MPhil- Acoustics (Sc) (Dist.). Post Graduate Diploma Science (Dist.). Bachelor Building Science

18th July 2022

Glossary of Acoustic Terminology

Decibel. A bel is defined as the logarithm to base ten of the ratio of two acoustical powers, or intensities. One tenth of a bel, the decibel, is the generally used unit. The dB primary unit of sound measurement; used to quantify both sound pressure level and sound power level. Used for measuring the relative magnitude based on a logarithmic scale. A weighted Sound Level. A measurement of sound 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 measure of sound pressure level designed to reflect the acuity of the human ear, which does not respond equally to all frequencies. The ear is less efficient at low and high frequencies than at medium or dB(A) speech-range frequencies. Therefore, to describe a sound containing a wide range of frequencies in a manner representative of the ear's response, it is necessary to reduce the effects of the low and high frequencies with respect to the medium frequencies. The resultant sound level is said to be A-weighted, and the units are dBA. The single highest sampled level of sound. Used in night time emission limits as a LAmax dB means of ensuring sleep protection. A-weighted. Equivalent Continuous Sound Pressure Level. The A-weighted time-averaged sound level (or equivalent sound level) that has the same mean square sound pressure level L_{Aeq} dB as the time-varying sound level under consideration. Commonly referred to as an "energy average" measure of sound exposure. The A-weighted level of sound exceeded for 90% of the monitoring period. This level of sound equates to an average background sound level, and is influenced by constant LA90 or LA90 dB sources. Noise emission limits are not generally specified in terms of an L₉₀ level, but it is used as a guide to the general background sound level. The LA90 is widely accepted as reflecting human perception of ambient background noise and generally reflects the noise level in the lulls between individual noise events, for example noise present during car by pass or someone yelling. Noise Level (dBA) LN as function of Time Time NZS 6801:2008 NZS 6801:2008 Acoustics - Measurement of Environmental Sound NZS 6802:2008 Acoustics - Environmental Noise NZS 6802:2008 Sound Power Level. The 'energy' created by a sound is defined as its sound power. Sound Power The ear cannot hear sound power nor can it be measured directly. Sound power is not dependent upon its surrounding environment.

Sound Pressure Sound Pressure Level is defined as varying pressure fluctuations caused by sound waves. The ear converts these fluctuations into what we call audible sound, which is the sensation (as detected by the ear) of very small rapid changes in the air pressure above and below a static value. This "static" value is atmospheric pressure.

Appendix A – Recommended Draft Noise Conditions

(....) Fixed Plant Noise

All fixed plant must be specified, located, designed and operated so that noise emission levels when measured at or within the boundary of any site, other than the site from which the noise is generated do not exceed the following limits:

Monday to Sunday 7am to 10pm	45 dB L _{Aeq (15 min)}
Monday to Sunday 10pm to 7am	40 dB LAeq (15 min)
Monday to Sunday 10pm to 7am	65 dB L _{AFmax}

Fixed plant noise shall be measured in accordance with 'NZS 6801:2008 Acoustics - Measurement of Environmental Sound' and assessed in accordance with 'NZS 6802:2008 Acoustics - Environmental Noise'.

Advice Note: Fixed Plant means plant that is permanently or temporarily located and operated at any location and includes mechanical and building services equipment such as equipment that is required for ventilating, extracting, heating, cooling, conditioning, and exhaust either of buildings or commercial activities; associated with boilers or plant equipment, furnaces, incinerators or refuse equipment; electrical equipment, plumbing (including pumps), lift or escalator equipment; or similar plant, equipment, items, rooms or services

(....) Construction Noise Hours

The Consent Holder must ensure that construction activities shall operate between the hours of 7.30am and 6.00pm Monday to Saturday only.

Advice Note: The intent of the above condition is to restrict operating days and hours so as to ensure respite periods for the community for example not allowing construction work during early morning, evenings or Sundays.

(....) Construction Noise Limits and Management

The Consent Holder must ensure that construction activities, <u>except</u> were identified in the construction noise and vibration management plan (CNVMP) as predicted to exceed the levels in the NZS Acoustic standard "NZS6803:1999 Acoustics Construction Noise', shall be managed and controlled so that the noise received at any residential or commercial site does not exceed the limits set out in Table 2 and Table 3 of 'NZS6803:1999 Acoustics – Construction' Noise' when measured and assessed in accordance with that Standard.

Where a specific construction activity (stage) cannot comply with the noise limits set out in 'NZS6803:1999 Acoustics – Construction' the Consent Holder must provide to Wellington City Councils Compliance Monitoring Officer (CMO) a written assessment of physical and managerial noise control methods that must be adopted. The assessment shall be in line with s.16 Best Practical Option (BPO) and included in the draft Construction Noise and Vibration Management Plan submitted to Council for approval.

(....) Construction Vibration and Management

The Consent Holder must ensure that construction activities, <u>except</u> were identified in the construction noise and vibration management plan (CNVMP) as predicted to <u>exceed</u> the levels in 'DIN 4150-3:1999 "Structural Vibration – Part 3: Effects of vibration on structures' shall be managed and controlled so that the vibration levels received at any site does not exceed the limits in 'DIN 4150-3:1999 "Structural Vibration – Part 3: Effects of vibration on structures'.

Where a specific construction activity cannot comply with the vibration limits set out in 'DIN 4150-3:1999 "Structural Vibration – Part 3: Effects of vibration on structures' the Consent Holder must provide Wellington City Councils Compliance Monitoring Officer (CMO) an assessment of vibration control methods that must be adopted. The assessment shall be in line with s.16 Best Practical Option (BPO) and included in the draft Construction Noise and Vibration Management Plan submitted to Council for approval.

(....) Construction Noise and Vibration Management Plan (CNVMP)

The Consent Holder must submit to Wellington City Councils Compliance Monitoring Officer (CMO) a Construction Noise and Vibration Management Plan (CNVMP) for review and approval. The Construction Noise and Vibration Management Plan must be prepared by a suitably qualified and experienced acoustic expert acceptable to Council. The Construction Noise and Vibration Management Plan shall be drafted in accordance with Appendix E2 of NZS6803:1999 Acoustics – Construction'. The Plan must also:

- Identify and describe all specific activities that cannot comply with the upper recommended noise levels set in Table 2 of 6803:1999;
- Identify and describe all specific activities that cannot comply with vibration limits in 'DIN 4150-3:1999 'Structural Vibration Part 3: Effects of vibration on structures';
- Specify the predicted noise and vibration limits, and identify each separate affected properties, for each activity (Stage) that exceeds the recommended levels;
- Specify the duration of the works exceeding the recommended noise and vibration levels;
- Specify the physical and managerial noise mitigation methods that must be adopted to reduce noise to a reasonable level of noise and vibration in accordance with Section 16 Best Practical Option (BPO) of the Resource Management Act 1991;

The CNVMP must be amended, where directed by the CMO to address proven deficiencies in its operation.

(....) Construction Noise and Vibration Management Plan

The Consent Holder must not undertake any activities authorised by this consent until the Construction Noise Management Plan (CNVMP) has been signed off by Councils Compliance Monitoring Officer as final and is denoted by Council as being 'certified approved for use' as the final Construction Noise and Vibration Management Plan (CNVMP). The mitigation and vibration measures detailed in the certified CNVMP must be adopted at all times by the Consent Holder for the duration of construction works.

(....) Acoustic Design Certificate District Plan Compliance (Fixed Plant Noise)

The Consent Holder must ensure that prior to residential occupation authorised by this consent that the Consent Holder submit to Wellington City Councils Compliance Monitoring Officer an Acoustic Design Certificate (ADC) for Fixed Plant. This certificate must certify that suitable acoustic mitigation measures have been incorporated into the final design are sufficient to ensure noise emitted from all Fixed Plant on the site authorised by this consent comply in all respects of the permitted noise standards set out under the Condition (...) above. The Acoustic Design Certificate must be prepared by a suitably qualified and experienced acoustic expert acceptable to Council.

Advice Note: The intent of this condition is to ensure final design and specifications of fixed plant is suitable designed, specified, located and operated to ensure noise emissions comply with the fixed plant operational noise limits.

Supporting Background Information





Outer Residential Zone



Chaper 5 Residential Rules

Standard 5.6.1.1.1 of the District Plan states:

"Noise emission levels from any non-residential activity occurring within a Residential Area, when measured at or within the boundary of any site, other than the site from which the noise is emitted in Residential and Rural Areas, must not exceed the following noise limits:

Outer Residential Area	
Monday to Sunday 7am to 7pm	50 dB LAeq (15 min)
Monday to Sunday 7pm to 10pm	45 dB LAeq (15 min)
Monday to Sunday 10pm to 7am	40 dB LAeq (15 min)
Monday to Sunday 10pm to 7am	70 dB LAFmax

Fixed Plant Noise

Standard 5.6.1.2.1 of the District Plan applies to residential activities that are permitted under Rule 5.1.1. It states:

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

••••

....

Outer Residential Area		
Monday to Sunday 7am to 10pm	45 dB LAeq (15 min)	
Monday to Sunday 10pm to 7am	40 dB LAeq (15 min)	
Monday to Sunday 10pm to 7am	65 dB L _{AFmax}	

Site Layout and Ground Floor Plans



Predicted Construction Noise Levels from MDA construction assessment (sources shown in key)

Construction Work: Excavator and truck and vibratory roller

APPENDIX C PREDICTED CONSTRUCTION NOISE LEVELS



Construction Work: Concrete truck and vibrators plus plate compactors



Construction Work: Drilling Rig Adjacent Scrap Terrace

Construction Work: Drilling Rig North and Central (1-off)





Construction Work: Drilling Rig Adjacent Donald Street (1-off)

Construction Work: Drilling Rig Adjacent Donald Street (1-off) 🛹

