

IN THE MATTER of the Resource Management Act 1991 (**RMA**)

AND

IN THE MATTER of a Board of Inquiry appointed under s149J of the Resource Management Act 1991 to consider Notice of Requirements and applications for Resource Consent made by the New Zealand Transport Agency in relation to the Northern Corridor Improvements roading proposal in Auckland.

**STATEMENT OF EVIDENCE OF RHYS LEONARD HEGLEY ON BEHALF OF
AUCKLAND COUNCIL**

NOISE AND VIBRATION

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1. INTRODUCTION AND EXPERIENCE

1.1 My name is Rhys Leonard Hegley. I have been engaged by Auckland Council (**Council**) to provide evidence in relation to the noise and vibration effects arising from the construction of, and the operation of, the proposed Northern Corridor Improvements (**Proposal**).

1.2 I hold a BE from Auckland University and have attended specialist courses in acoustics in Australia and America. I am a Chartered Acoustic Engineer and I am a member of the Institution of Professional Engineers New Zealand.

1.3 For the last 17 years I have undertaken environmental noise assessments for a wide range of activities. Included in this has been the preparation of assessments for the notice of requirement, detailed design or peer review of projects such as the Southern Corridor Improvements, the SH1 – SH20 link in Manukau and the various sections of the Waikato Expressway.

1.4 My role in the Proposal has been to undertake a peer review of the assessments of environmental effects that Marshall Day acoustics (**MDA**) undertook of the noise and vibration effects arising from the construction of (**AEE (Construction)**)¹, and the operation of (**AEE (Operation)**)², the Proposal. I have read the New Zealand Transport Agency (**NZTA**) evidence on noise and vibration from both the construction of, and the operation of, the Proposal and met to discuss each with Ms Wilkening, NZTA's noise and vibration specialist. I am generally familiar with the site but visited the area specifically in relation to the Proposal.

2. CODE OF CONDUCT

2.1 My qualifications as an expert are set out above. I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014. I have complied with the Code of Conduct in preparing this evidence. Except where I state that I am relying on the evidence of another

¹ Assessment of Construction Noise and Vibration Effects, NCI-3PRE-2ENV-RPT-0021, Revision: 2, 2 December 2016, which includes:

- Appendix E – Construction Noise Contour Markups
- Appendix F – Construction Vibration Risk Zone Maps

² Assessment of Operational Noise and Vibration Effects, NCI-3PRE-2ENV-RPT-0032, Revision: 2, 2 December 2016

person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

3. EXECUTIVE SUMMARY

3.1 My evidence is given in support of the Council's submission on the applications by the NZTA relating to the Proposal, specifically the Notice of Requirements (**NoR**) to designate land and the resource consent applications to construct, operate and maintain the Proposal.

3.2 The key conclusions of my evidence are:

- (a) I consider that the assessment of construction noise requires further information to fully understand the effects. I discussed my concerns during a meeting with Ms Wilkening where it was agreed that she would undertake further work that would be presented during expert conferencing with the intent of reaching an agreed position;
- (b) I consider that the assessment of construction vibration requires further information to fully understand the effects. Following my meeting with Ms Wilkening, this item too will be the subject of further conferencing;
- (c) The assessment of operational noise is in accordance with best practice and shows that the effects of traffic noise will be reasonable;
- (d) The assessment of operational vibration is in accordance with best practice and shows that the effects of vibration will be reasonable; and
- (e) Should the NoRs be confirmed, the noise and vibration conditions proposed by the NZTA are suitable, subject to some amendments.

4. DESCRIPTION OF PROPOSAL

4.1 The Proposal comprises works on State Highway 1 (**SH1**) extending from Oteha Valley Road in the North to Constellation Drive in the south and on State Highway 18 (**SH18**) from the Albany Highway Interchange in the west to the SH1 connection. Key elements of the Proposal include capacity and safety improvements to SH1 and SH18, including the construction of a motorway to motorway connection for northbound traffic at SH18 to SH1 interchange and additional lanes and improved connections to the local roading network. These elements of the Proposal will necessitate alterations to both the SH1 and SH18 designations to provide sufficient footprint for the proposed works.

4.2 Complementary to the above, the Proposal incorporates an extension to the Northern Busway from its current terminus at Constellation Bus Station to the Albany Bus Station. A shared pedestrian/cycleway path will also be provided along the eastern side of SH1. These elements of the Proposal will require new designations. An upgrade of the existing Constellation Bus Station is proposed which also requires an alteration to the existing bus station designation.

5. ASPECTS OF THE PROPOSAL ADDRESSED IN MY EVIDENCE

5.1 My evidence will address the following aspects of the Proposal:

- (a) Construction noise;
- (b) Construction vibration;
- (c) Operational noise;
- (d) Operational vibration; and
- (e) Suggested conditions.

6. METHODOLOGY OF ASSESSMENT

6.1 My role in the Proposal was that of a technical peer reviewer. To complete this, the process I followed can be summarised as:

- (a) Review the methods adopted for the assessment of noise and vibration and the resulting criteria against current best practice;

- (b) Determine whether the assessment procedure followed the adopted assessment methods;
- (c) Review the results of the technical analysis to determine whether it was consistent with the base information provided. My review did not include any detailed calculations of either noise or vibration as this would essentially require a full redesign of the Proposal, which is outside the scope of a peer review;
- (d) Consider whether the conclusions reached within the assessments of noise and vibration are consistent with the reported levels of noise and vibration; and
- (e) Consider whether the proposed conditions accurately portray the conclusions of the assessments and represent best practice.

7. RELEVANT EFFECTS OF THE PROPOSAL

7.1 My assessment has identified the following key relevant effects arising from the Proposal:

Construction Noise

7.2 In paragraph 9.4 of her construction evidence, Ms Wilkening notes that there is the potential for a number of houses and businesses to receive noise from construction activities that are well in excess of the adopted limits during both the day and night time. The evidence does not however go on to predict the magnitude of this exceedance or provide an indication of its duration. The AEE (Construction) provides further information as to the effects of construction noise but limits itself to indicating that the effects could be significant³ rather than providing detail.

³ See Appendix E "Construction Noise Contour Mark-ups" of the AEE (Construction). The green shading shows areas that can expect construction noise levels above the 70dB L_{Aeq} day time limit while the blue shading shows areas that can expect to receive levels above the 45dB L_{Aeq} night time limit.

Construction Vibration

- 7.3 In paragraph 9.9 of her construction evidence, Ms Wilkening notes that “there is a risk of vibration creating both annoyance and building damage where buildings are located very close to the works (i.e. less than 20 metres from retaining wall construction or potential vibro-compaction)” but again there is no information. The AEE (Construction) infers⁴ vibration magnitudes through the use of zone risk maps but neither it nor the evidence offers a substantive assessment of the effects and therefore do not demonstrate that it is technically feasible to complete the Proposal without undue damage to the surrounding buildings and infrastructure.

Operational Noise

- 7.4 Ms Wilkening’s conclusion is that with the proposed mitigation, the increase in operational noise as a result of the Proposal will be up to 4dB, which she describes in paragraph 14.3 of her evidence as ranging from unnoticeable to just perceptible. In paragraph 14.6 of her evidence she concludes that “people and amenity values of residential zones will be protected from unreasonable noise arising from the Project”. I agree with these conclusions. I note however that neither the evidence nor the AEE (Operation) consider what the Proposal could include to improve the amenity of those close to the carriageways in accordance with s16 of the RMA and whether the Best Practicable Option (**BPO**) has been addressed in all instances;

Operational Vibration

- 7.5 I agree with Ms Wilkening where, in paragraph 14.7 of her evidence on operational noise and vibration, she concludes that traffic vibration will have no adverse effects on nearby residents.
- 7.6 Each of the above four issues is elaborated on below.

⁴ See Appendix F “Construction Vibration Risk Zone Maps” of the AEE (Construction). The orange/ brown shading shows areas where there is the potential for a high risk of damage from vibration.

Construction Noise

- 7.7** Within the AEE (Construction), MDA go to considerable lengths to describe the method by which noise levels from the various construction activities have been predicted to the surrounding environment. However, from that point, the AEE (Construction) and the subsequent construction noise evidence provide no actual noise levels or a substantive assessment of the effects of the construction activities on the surrounding buildings. In paragraph 9.4 of her evidence, Ms Wilkening notes that construction levels may exceed the adopted day time limit of 70dB L_{Aeq} but provides no indication as to by how much. The same situation arises with the night time limit of 45dB L_{Aeq} , which has been adopted for the protection of sleep. Appendix E of the AEE (Construction) uses noise contours to show the area over which the 70dB L_{Aeq} day time and 45dB L_{Aeq} night time construction noise limits could potentially be exceeded. The areas enclosed by the contours include a large number of buildings and while they contain no actual levels, they indicate that for the most exposed sites the exceedances could be significant based on the distance that the contours extend beyond the Proposal.
- 7.8** My concern is that the properties receiving in excess of 70dB L_{Aeq} during the day time and/ or 45dB L_{Aeq} during the night time will potentially experience significant adverse effects. The magnitude of these effects will be related to the level, which is unknown, and the duration of that level, which is also unknown. In severe cases, one potential remedy⁵ identified by the AEE (Construction) would be to relocate any adversely affected occupants for the duration of the work. However, without knowledge of how long the work will take and how many people are involved, there is no way of knowing whether this approach is practicable.
- 7.9** I discussed these issues with Ms Wilkening during our meeting where she explained the difficulty of predicting construction noise and vibration levels due to the absence of a contractor at this early stage of the Proposal. We discussed the type of information that could be provided, which I believe will be helpful to the assessment. Ms Wilkening agreed to provide this information

⁵ The Mitigation paragraph in the Executive summary of the AEE (Construction)

for our intended conferencing from which we will produce a joint statement of evidence outlining our areas of agreement and any areas of disagreement.

Construction Vibration

- 7.10** My concerns with the assessment of construction vibration are similar to those of construction noise. In her construction evidence, Ms Wilkening notes that “there is a risk of vibration creating both annoyance and building damage where buildings are located very close to the works”⁶. Table 13 of the AEE (Construction) identifies 67 buildings as being within the ‘High Risk’ category as defined by the assessment criteria. From the adopted criteria of the NZTA, “High Risk” is where the potential for building damage begins to become of concern. Indeed, the adopted assessment criteria state that “... construction activity shall only proceed if there is appropriate monitoring of vibration levels and effects on those buildings at risk of exceed of exceeding the Category B criteria, by suitably qualified experts”. In paragraph 9.11 of her evidence Ms Wilkening recommends communication with potentially affect residents prior to any high vibration work commencing, which I agree is appropriate although would extend to include commercial neighbors. Such consultation could be managed through the preparation of a Construction Noise and Vibration Management Plan (CNVMP), which is the subject of CNV.1, and which I support.
- 7.11** While I consider that the MDA approach satisfies the method developed by the NZTA, I am left unclear as to whether the Proposal is technically feasible. No anticipated vibration levels are provided so it is not known whether those properties classified as being at high risk would experience vibration just above the threshold where damage may begin to occur, or significantly above. If the predicted vibration from an activity is at or about the building damage threshold, then I consider the suggested approach to ‘monitor as they go’ would be appropriate. However, should vibration levels significantly exceed the building damage threshold, there must be doubts as to whether that activity can be completed and therefore, whether consent should be granted.

⁶ Paragraph 9.9 of Ms Wilkening’s construction evidence

- 7.12** While the AEE (Construction) limited its assessment of vibration to the effects on buildings, Watercare has underground services near to the Proposal as does the nearby Rosedale closed landfill. This issue was raised in Council's submission on the Proposal and Ms Wilkening subsequently responded in paragraph 12.50 of her construction evidence. The response however is limited to providing criteria for the assessment of vibration on buried pipes and does not provide anticipated levels of vibration to demonstrate that the Proposal is feasible.
- 7.13** These issues were discussed with Ms Wilkening during our meeting. As with construction noise effects, Ms Wilkening noted that the ability to predict and assess vibration effects this early stage of the Proposal is limited due to the absence of a contractor and therefore detailed knowledge on construction activities and plant. We discussed approaches to this issue and I understand that she will provide further information for our intended conferencing.

Operational Noise

- 7.14** The assessment of operational noise has been undertaken in accordance with NZS 6806⁷ and proposes a solution this is in accordance with the criteria set out by that standard. I generally consider that the approach taken provides a robust assessment of operational noise and agree that the mitigation proposed will result in reasonable levels to the surrounding environment. I believe that the AEE (Operation) and evidence demonstrate that it will be practicable to manage adverse effects from road traffic noise.
- 7.15** The proposed solution includes a number of mitigation measures, which typically take the form of barriers but with façade mitigation in some instances. While the barriers have been designed to address the objective noise limits of NZS6806, there is no specific discussion of Section 16 of the Resource Management Act, which requires that:

Every occupier of land ... shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level.

⁷ NZS 6806: 2010 Acoustics – Road-traffic noise – New and altered roads

- 7.16** In places where the criteria of NZS 6806 are being met without noise walls, no assessment has been provided as to whether noise walls would be practicable and could be used to improve the noise environment of either the existing or the proposed situation. Taking Barbados Drive (the road itself rather than Area 5 as described by the AEE (Operation)) as an example, the adjacent dwellings are partly screened from the carriageway by a small earth bund with open boarded timber fences on top, the effects of which the AEE (Operation) correctly states were disregarded from the analysis. It would appear from a site visit that upgrading to, or replacing the existing fence with, a properly constructed noise wall would be of benefit to the adjacent dwellings and would likely reduce traffic noise from the Proposal to below the existing levels. However, no such assessment of s16 is included.

Operational Vibration

- 7.17** I agree with Ms Wilkening's conclusion that traffic vibration will have no adverse effects on nearby residents⁸.

8. MANAGEMENT OF EFFECTS

- 8.1** In my opinion amendments to the Proposal and/or the NoR/ resource consent conditions are required to ensure effects are appropriately managed as follows:

- (a) Proposed conditions CNV.1 to CNV.8 describe the preparation of a Construction Noise and Vibration Management Plan (**CNVMP**) which I consider to be the most practicable method for managing the adverse construction effects should the Proposal be designated. I believe that the suggested conditions are reasonable, provided NZTA is able to provide satisfactory evidence that the effects resulting from the construction of the Proposal are expected to be reasonable. My concerns expressed in 7.7 – 7.13 above are that the assessment does not clearly demonstrate that these effects will be reasonable. The adoption of a CNVMP will ensure that the best practice is used to

⁸ Paragraph 4.7 of Ms Wilkening's evidence on operational noise and vibration.

manage the adverse effects but will provide no assurance that the effects of noise and vibration are reasonable. It is my understanding that Ms Wilkening will prepare additional information for our intended conferencing where we intend to produce further evidence outlining our areas of agreement and any of disagreement.

- (b) In the advice note to CNV.5, there appears to be an incorrect reference. I have underlined and struck out my suggested changes below:

Advice Note:

... mitigation that is consistent with the best practicable option shall be adopted in accordance with ~~CNV.6~~ CNV.7.

- (c) ON.1 – ON.14 address operational noise, which I consider generally represent best practice and therefore support, subject to the following comments.

ON. 4 states that if it is not practicable to implement particular structural mitigation (a noise wall) included in the noise assessment (AEE (Operation)), a changed design can be included in the detailed mitigation options if: (a) the change would result in no change in the noise Category⁹ to all receivers considered in the assessment or (b) would result in a less stringent Category to the receivers. In both cases, the Team Leader confirms that the changed Structural Mitigation would be consistent with adopting the BPO in accordance with NZS 6806. In discussions with Ms Wilkening, I understand that less stringent means less stringent to the NZTA. In other words, the NZTA can implement a solution that results in higher noise levels to the neighboring sites than are presented within AEE (Operation), and which would have been consented by the Board of Inquiry, if the Team Leader confirms the changes to be acceptable.

⁹ The proposed conditions define the Noise Criteria Categories as “means the groups of preference for sound levels established in accordance with NZS 6806 when determining the BPO for noise mitigation (i.e. Categories A, B and C)”

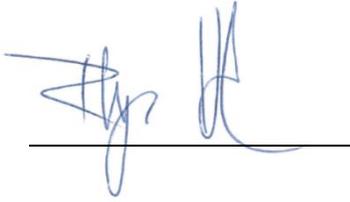
Taking Barbados Drive as an example, the AEE (Operation) states¹⁰ that the existing noise level at the three most exposed properties are currently within Category B (greater than 64dB but not exceeding 67dB). A 3.0m high noise wall is proposed meaning that traffic noise levels as a result of the Proposal would fall to Category A to two of these properties (64dB or less) while the third property would remain in Category B. Should it subsequently be found that the structural mitigation cannot be installed (the subject of condition ON.4), the AEE (Operation) reports levels above 67dB to all three properties placing them in Category C. If such a situation was to arise, an assessment under NZS 6806 would require façade mitigation to the Category C dwellings. Such changes in noise level, and the change from structural to façade mitigation, could potentially be significant to the occupants of those dwellings. Under ON.4, I am unclear as to how the Team Leader would assess the proposed changes and whether that assessment would be as rigorous as the current NoR process.

9. CONCLUSION

- 9.1** I consider that the assessment undertaken by MDA demonstrates that the effects of operational noise and vibration will be reasonable noting that I believe that there is the potential to reduce the effects of traffic noise still further through addressing s16. I also consider that the proposed conditions are appropriate when considered in conjunction with the changes I proposed above.
- 9.2** I have concerns over the lack of assessment of construction noise and vibration as I consider that the AEE (Construction) and subsequent evidence does provide enough information on the noise and vibration levels expected, their duration, and their extent across the neighbors to the Proposal. I have discussed these issues with NZTA's noise and vibration specialist. The agreed outcome was for expert conferencing at which she will present further technical information. I consider that the proposed construction noise and vibration conditions represent best practice when considered in conjunction

¹⁰ Section 5.6.1 of the AEE(Operation)

with my proposed amendments and, should consent the notices of requirement be confirmed, would be suitable for the Proposal.



Rhys Leonard Hegley

25 May 2017