

1. INTRODUCTION

- 1.1. My full name is Jon Robert Styles. I am an acoustic consultant and director and principal of Styles Group Acoustics and Vibration Consultants. I lead a team of 8 consultants specialising in the measurement, prediction and assessment of environmental and underwater noise, building acoustics and vibration working across New Zealand and internationally.
- 1.2. I have approximately 22 years of experience in the acoustics and noise control industry. For the first four years I was the Environmental Health Specialist – Noise at the Auckland City Council, and for the latter 18 years I have been the Director and Principal of Styles Group Acoustics and Vibration Consultants. I have a Bachelor of Applied Science (EH) majoring in Environmental Health.
- 1.3. I am the past-President of the Acoustical Society of New Zealand. I completed two consecutive two-year terms as the President from 2016 to 2021. I have been on the Council of the Society for approximately 15 years. Styles Group is a member firm of the Association of Australasian Acoustical Consultants (AAAC) and I am on the Executive team of the AAAC. My role on the Executive is to oversee the development of guidelines for acoustical consultants to follow in their day-to-day work and to participate in the governance of the AAAC generally.
- 1.4. I have assisted a large number of councils to process a significant number of resource consents and notices of requirement subject to noise and vibration standards. I have extensive experience advising on the management of noise and vibration effects, including the construction, maintenance and operational noise effects of major and strategic transport infrastructure (including port, road, air and rail) and the protection of strategic industry and transport infrastructure through the effective management of reverse sensitivity effects.

- 1.5. I have given evidence before several Boards of Inquiry on road traffic noise and construction noise and vibration effects including being instructed as the Boards' expert.
- 1.6. I am providing evidence on behalf of Kāinga Ora in respect of the noise issues arising in PC14, and specifically in relation to the provisions within the Noise chapter of the ODP and the planning controls inside the 50dB L_{DN} noise contour. I was not involved with the preparation of the primary and further submissions made by Kāinga Ora in relation to this Hearing Stream.
- 1.7. In preparing this evidence I have read the Section 32 and Section 42A¹ reports together with the associated appendices prepared by Council staff and the evidence prepared by Mr Trevathan (Acoustics).
- 1.8. I have also read and considered the evidence prepared on behalf of Kāinga Ora by:
- (a) Mr. Matthew Lindenberg (Planning); and
 - (b) Mr. Jonathan Selkirk (Ventilation).

2. CODE OF CONDUCT

- 2.1. Although this is a Council hearing, I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving evidence.
- 2.2. Except where I state that I am relying on the evidence of another person, this written 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. SCOPE OF EVIDENCE

- 3.1. My evidence covers:

¹ Planning Officer's Report of Sarah-Jane Oliver Under Section 42A of the Resource Management Act 1991. Dated 11 August 2023.

- (a) A summary of the CIAL position supported by the Council;
- (b) A description and assessment of various World Health Organisation (**WHO**) guidelines about the environmental noise;
- (c) My opinion about acoustic treatment between the 50dB L_{DN} and 55dB L_{DN} contours;
- (d) Discussion of the significance of outdoor living environments and the conservatism inherent in CIAL and the Council's approach;
- (e) My conclusion that the CIAL and Council's approach is unnecessarily blunt.

4. THE CIAL AND COUNCIL APPROACH TO MANAGING DEVELOPMENT INSIDE THE 50dB L_{DN} CONTOUR

- 4.1. The Council supports the management of effects inside the 50dB L_{DN} contour. Their approach and reasoning is set out at section 12.6 of the s42A Report. A summarised version of the Council's proposal is:
 - (a) Inclusion of an 'Airport Noise Influence Area' as a qualifying matter (**QM**), and using the 50dB L_{DN} contour to define the QM;
 - (b) Adopting the Operative District Plan zone provisions that limit intensification and not providing for any greater enablement of the application of the MDRS and / or Policy 3 of the NPS-UD inside the 50dB L_{DN} noise contour.
- 4.2. The 'Airport Noise Influence Area' proposed through PC14 was based upon the 2021 Annual Average Aircraft 50dBA Noise Contour. The s42A Report recommends that the 2023 final noise contours should be used as the basis for defining the extent of the QM.
- 4.3. In paragraph 12.63 of the s42A Report, the author considers:

“...managing residential (population) density to be the most effective method to address reverse sensitivity effects on the airport, and limit the number of people exposed to airport noise (thereby potentially adversely affected by airport noise).”

- 4.4. The CIAL submission seeks that density inside the 50dB L_{DN} contour is restricted in a way that is consistent with the Council recommendations, including adopting the 2023 contours.

5. NOISE EFFECTS INSIDE THE 50dB L_{DN} CONTOUR

- 5.1. It is well accepted and globally recognised that exposure to noise from road, rail and air transport infrastructure, industry, ports commercial activities and a variety of other sources has the potential to generate high levels of annoyance and adverse health effects if it is not managed carefully.
- 5.2. In 2018, WHO published the Environmental Noise Guidelines for the European Region² (**the 2018 Guidelines**). The 2018 Guidelines provide strong recommendations to implement measures to reduce noise exposure from road, rail and air traffic in the population exposed to levels above the guideline values for average and night noise exposure.
- 5.3. There are many studies and assessments of the same or similar issues that are available. However, I consider that the 2018 Guidelines are suitable to rely on for an evaluation of the effects and options in this case.
- 5.4. The 2018 Guidelines have been developed based on systematic reviews of many different studies that have been conducted differently and with different objectives and outcomes. These studies have been integrated and synthesised into the relatively concise recommendations given in the 2018 Guidelines.
- 5.5. The 2018 Guidelines are based on many of the individual studies and reviews that are often cited and relied in their own right.

² https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

- 5.6. I am not aware of any accepted criticisms of the 2018 Guidelines other than the fact that the targets are often regarded as optimistically low, or 'ideal'. There is a general consensus that they are mostly impracticable to achieve when taking into account the real pressures and challenges of reducing existing exposure and managing population growth.
- 5.7. The 2018 Guidelines recommend that aircraft noise is managed to be low 45dB L_{DEN} and 40dB L_{night} . These are outdoor noise levels. There are no indoor noise level targets specified in the 2018 Guidelines.
- 5.8. The 50dB L_{DN} contour around CIAL is slightly above the L_{DEN} target and is likely to result in night time noise levels a few dB above the 40dB L_{night} target. The differences are small.
- 5.9. The 2018 Guidelines are strictly health-based targets and do not take into account any other factors that may arise from achieving them, such as the costs and social and environmental benefits and disbenefits. I consider that they comprise 'purely' health-based targets. I consider that achieving these targets would be likely to deliver the best possible outcome only when considered from from a health-based perspective.
- 5.10. Achieving the 2018 Guideline targets for aircraft noise would deliver a noise environment and outcome that is significantly better than would arise from the Operative District Plan methods of managing other adverse noise effects, such as from road, rail industry and commercial activities generally.

6. CONFOUNDING FACTORS

- 6.1. Importantly, there is no robust guidance in the 2018 Guidelines or any other well-regarded guidance that helps to differentiate between the exposure to aircraft noise inside a house and outside a house and how that is likely to influence the adverse effects on people.

- 6.2. Put simply, there is no reliable evidence to help differentiate between the following scenarios and how they might influence the health outcomes:
- (a) Living in a noisy area, where outdoor living is common and with no specific acoustic treatment to dwellings (perhaps the worst case);
 - (b) Living in a noisy area, where outdoor living is common but with a well-treated dwelling where indoor noise levels are below the health-based target noise levels;
 - (c) Living in a noisy area, where outdoor living is limited and dwellings are acoustically treated and the noise levels are below the health-based target noise levels.
- 6.3. I consider that these are important distinctions that comprise gaps in the research and that must be taken into account when applying the recommendations.
- 6.4. It is my experience that the degree and importance of the outdoor living options and the indoor noise levels are two important variables that will have a considerable influence on the annoyance and health outcomes.
- 6.5. I consider that these issues confound the statistics presented in the s42A Report. I consider that the statistics related to existing and future noise exposure and the consequences of change should be treated with caution, as they do not account for these factors, the gaps in knowledge and the potential for other, more refined options for managing the potential issues.

7. WHO NIGHT NOISE GUIDELINES

- 7.1. The WHO published the Night Noise Guidelines in 2009 (the **Night Noise Guidelines**). The Night Noise Guidelines were designed to address the specific effects of a variety of environmental noise sources on sleep and the adverse health effects that arise from sleep disturbance.

- 7.2. The 2018 Guidelines state that they complement the specific recommendations in the Night Noise Guidelines. The 2018 Guidelines do not supersede the Night Noise Guidelines.
- 7.3. The Night Noise Guidelines make recommendations on the outdoor noise level, just like the 2018 Guidelines. The Night Noise Guidelines are based on a dwelling achieving a noise level reduction (NR) of 21dB. This means that the recommendation for inside bedrooms can be determined by subtracting 21dB from the recommendation for outdoors.
- 7.4. The Night Noise Guidelines recommend that the L_{night} level outside dwellings should be no greater than 40dB.
- 7.5. After subtracting the 21dB NR that is assumed in the Night Noise Guidelines, the indoor target noise level becomes 19dB $L_{\text{night,indoor}}$. Again, this is purely a health-based and ideal target indoor noise level.
- 7.6. I consider that adding in the specific recommendations of the Night Noise Guidelines helps to provide more context for the options to manage the adverse effects on the population inside the 50dB L_{DN} contour, especially when considering more refined options beyond a simple limitation on density.
- 8. ACOUSTIC TREATMENT OF DWELLINGS BETWEEN THE 50dB L_{DN} AND 55dB L_{DN} CONTOURS**
- 8.1. The s42A Report and the CIAL submission do not evaluate the outcomes that might arise if dwellings inside the 50dB L_{DN} contour are acoustically treated.
- 8.2. The acoustic treatment of dwellings has an obvious effect on the indoor noise levels. If the indoor noise levels are managed to be low, then sleep disturbance and general indoor amenity effects can be properly managed and the adverse health outcomes that the 2018 Guidelines and Night Noise Guidelines seek to manage are avoided.

- 8.3. A typical house might achieve an outside-to-inside NR of around 15dB with windows slightly ajar for ventilation and cooling. Some older houses with little thermal insulation might achieve less and some newer houses might achieve more. An estimate for 15dB for a slightly open window is consistent with the 2018 Guidelines³.
- 8.4. The most-commonly adopted internal noise level for managing aircraft noise is 40dB L_{DN} . When allowing for a nominal 15dB NR with windows slightly ajar, the indoor aircraft noise level in most bedrooms will be in the order of 35dB L_{DN} to 40dB L_{DN} for houses exposed to outdoor noise levels between 50dB L_{DN} and 55dB L_{DN} .
- 8.5. These indoor levels are higher than the Night Noise Guidelines recommendation of 29dB $L_{night,indoor}$ ⁴.
- 8.6. If the windows of a bedroom are able to be closed at night while the occupants remain cool and comfortable, the NR will be greater than 15dB and could easily be 20-25dB for a typical dwelling. Higher NR values would be likely for many new homes.
- 8.7. This may require a ventilation and cooling system as set out in the evidence of Mr Selkirk. I refer to a dwelling with such a system as being '**acoustically treated**'.
- 8.8. I consider that the noise level inside an acoustically treated dwelling within the 50-55dB L_{DN} contours would be likely to be no greater (and probably less) than the recommendations set out in the Night Noise Guidelines.
- 8.9. This would achieve an ideal indoor noise environment that would likely be free of sleep disturbance effects arising from aircraft noise.
- 9. SIGNIFICANCE OF OUTDOOR LIVING ENVIRONMENTS**
- 9.1. As I have set out earlier, the 2018 Guidelines do not provide guidance on the significance of outdoor noise exposure when evaluating the overall adverse effects of noise exposure.

³ Section 2.2.2 of the 2018 Guidelines

⁴ Based on the overall recommendation of 40dB $L_{night,outdoor}$ minus a 21dB NR

- 9.2. It is my experience that the size and nature of the outdoor area associated with dwellings can influence the occupants' expectations for its amenity value and the general way it is used and the length of time that people might spend in their outdoor environment.
- 9.3. For example, it is my experience that an outdoor living environment for a typical single detached house might comprise one or two lawn areas, trampolines, play equipment, areas for socialising and sometimes large gardens that people can spend considerable time in.
- 9.4. By contrast, and at the other end of the spectrum, apartment-style living can involve little or no outdoor living.
- 9.5. In a very generalised way, my experience is that the more intense the development is, the outdoor areas of dwellings become less significant in terms of size, length of occupancy and expectations of amenity. As the significance of outdoor areas reduces, it is logical that the adverse noise effects arising from exposure to aircraft noise will likely reduce as well.
- 9.6. Allowing intensification will probably mean that more people will end up living inside the 50dB L_{DN} contour. However, intensification may also provide an opportunity to better manage the outdoor noise exposure and associated effects by reducing the significance of the outdoor exposure per-person.

10. THE EXISTING ISSUE

- 10.1. The s42A Report makes it clear that there are a significant number of homes inside the 50dB L_{DN} contour already. I understand that the level of existing development is not as intense as the MDRS would allow.
- 10.2. I understand that there have been no previous acoustic treatment controls inside the 50-55dB L_{DN} contours. It is likely that the majority of the existing housing is not acoustically treated, and many houses may have outdoor living areas that are significant in terms of the way they are used.

- 10.3. Limiting the density of development will do nothing to help manage or reduce the potential exposure of the existing population to aircraft noise.
- 10.4. I understand that CIAL are not proposing to offer acoustic treatment to existing dwellings inside the 50-55dB L_{DN} contours.
- 10.5. I understand from my experience in other processes that limiting the intensity of development to be less than what is permitted in other parts of the district is likely to deter redevelopment investment in the area and would be likely to result in a slower turnover of housing stock and a greater likelihood of large and significant outdoor living areas being retained.
- 10.6. I consider it probable that the provisions proposed by the Council and CIAL will do nothing to manage any problem that might currently exist.

11. CONSERVATISM OF THE 50dB L_{DN} CONTOUR

- 11.1. The evidence of Mr Lindenberg and parts of the s42A Report acknowledge that managing development inside the 50-55dB L_{DN} contours is a very conservative approach. I agree.
- 11.2. I am not aware of any other district in New Zealand where noise from an airport down to 50dB L_{DN} is being managed by land use controls.
- 11.3. The proposed controls in the 50-55dB L_{DN} contours covers a significant land area that is considerably larger than the area between the 55-60dB L_{DN} contours.
- 11.4. The proposed controls in the 50-55dB L_{DN} contours manage noise to levels 5dB lower than what is recommended in NZS6805:1992. NZS6805:1992 recommends that land use controls apply only as far as the 55dB L_{DN} contour.
- 11.5. I consider that the proposal to manage land use inside the 50-55dB L_{DN} contour in this case is an outlier for New Zealand.

- 11.6. I note that other major airports in New Zealand have all adopted land use controls from a level of 55dB L_{DN} or greater. Based on my direct involvement with many of these and knowledge of others, their controls and adoption of the 55dB L_{DN} contour are a result of balancing the importance of managing adverse effects with the realities of dealing with existing exposure and managing future growth, as well as following the guidance in NZS6805:1992.

12. THE ISSUES WITH THE COUNCIL'S APPROACH

- 12.1. I consider that the Council's approach to limiting density is a relatively blunt way of managing the potential effects. It does not deal with any existing issue and it does not encourage the uptake of any opportunities to improve the existing situation.
- 12.2. I consider that the knowledge gaps in the research on noise effects, (and in particular the differentiation between outdoor and indoor effects) confounds the many of the statistics presented in and relied on by the s42A Report.
- 12.3. I consider that it is worth investigating a more refined approach that investigates any opportunities to encourage an improvement of the existing situation and to allow some degree of intensification while managing the effects on future development.
- 12.4. Many of the issues arising from different options will involve the expertise of other disciplines.

13. SUMMARY AND CONCLUSION

- 13.1. In summary:
- (a) The Council supports the management of effects inside the 50dB L_{DN} contour. A summarised version of the Council's proposal is:
 - (i) Inclusion of an 'Airport Noise Influence Area' as a qualifying matter (**QM**), and using the 50dB L_{DN} contour to define the QM;

- (ii) Adopting the Operative District Plan zone provisions that limit intensification and not providing for any greater enablement of the application of the MDRS and / or Policy 3 of the NPS-UD inside the 50dB L_{DN} noise contour.
- (b) The CIAL submission essentially agrees with the Council position.
- (c) The proposed controls in the 50-55dB L_{DN} contours manage noise to levels 5dB lower than what is recommended in NZS6805:1992. NZS6805:1992 recommends that land use controls apply only as far as the 55dB L_{DN} contour. I am not aware of any other district in New Zealand where noise from an airport down to 50dB L_{DN} is being managed by land use controls.
- (d) The 2018 Guidelines recommend that aircraft noise is managed to be low 45dB L_{DEN} and 40dB L_{night} . These are outdoor noise levels. There are no indoor noise level targets specified in the 2018 Guidelines. The 50dB L_{DN} contour around CIAL is slightly above the L_{DEN} target and is likely to result in night time noise levels a few dB above the 40dB L_{night} target. The differences are small.
- (e) The 2018 Guidelines are strictly health-based targets and do not take into account any other factors that may arise from achieving them, such as the costs and social and environmental benefits and disbenefits. I consider that they comprise 'purely' health-based targets. I consider that achieving these targets would be likely to deliver the best possible outcome only when considered from a health-based perspective.
- (f) Importantly, there is no robust guidance in the 2018 Guidelines or any other well-regarded guidance that helps to differentiate between the exposure to aircraft noise inside a house and outside a house and how that is likely to influence the adverse effects on people. I consider that these are important

distinctions that comprise gaps in the research and that must be taken into account when applying the recommendations. I consider that these issues confound the statistics presented in the s42A Report.

- (g) The WHO published the Night Noise Guidelines in 2009. I consider that adding in the specific recommendations of the Night Noise Guidelines helps to provide more context for the options to manage the adverse effects on the population inside the 50dB L_{DN} contour, especially when considering more refined options beyond a simple limitation on density.
- (h) In a very generalised way, my experience is that the more intense the development is, the outdoor areas of dwellings become less significant in terms of size, length of occupancy and expectations of amenity. As the significance of outdoor areas reduces, it is logical that the adverse noise effects arising from exposure to aircraft noise will likely reduce as well.
- (i) Allowing intensification will probably mean that more people will end up living inside the 50dB L_{DN} contour. However, intensification may also provide an opportunity to better-manage the outdoor noise exposure and associated effects by reducing the significance of the outdoor exposure per-person.
- (j) Limiting the density of development will do nothing to help manage or reduce the potential exposure of the existing population to aircraft noise. I understand that CIAL are not proposing to offer acoustic treatment to existing dwellings inside the 50-55dB L_{DN} contours. Or, if acoustic treatment is not deemed sufficient or appropriate, there is no other action proposed to reduce any potential existing problem. I consider it probable that the provisions proposed by the Council and CIAL will do nothing to manage any problem that might currently exist.
- (k) I consider that the Council's approach to limiting density is a relatively blunt way of managing the potential effects. It does not deal with any existing issue and it does not encourage the

uptake of any opportunities to improve the existing situation. I consider that it is worth investigating a more refined approach that investigates any opportunities to encourage an improvement of the existing situation and to allow some degree of intensification while managing the effects on future development.

21 September 2023

Jon Robert Styles