

**BEFORE THE INDEPENDENT HEARING PANEL ON PROPOSED PRIVATE
PLAN CHANGE 13 TO THE OPERATIVE HAMILTON CITY DISTRICT PLAN**

UNDER the Resource Management Act 1991

IN THE MATTER of Proposed Private Plan Change 13 to the Hamilton City
District Plan

**Statement of Evidence of Alex Jacob on behalf of Chartwell Investments
Ltd, Ecostream Irrigation Ltd and Takanini Rentors Ltd**

Acoustics

Dated 9 August 2023

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INTRODUCTION

1. My full name is Alex Eli Jacob. I hold a BSc in Mechanical Engineering, and I am a current member of the New Zealand professional engineers body, Engineering New Zealand (MEngNZ).
2. I am currently employed as an Engineering Director at Earcon Acoustics Limited and have held that position since 2014. My previous work experience includes consulting to the aviation industry in the UK and the US, and to the mining industry in Australia.
3. I have over 27 years of experience in the field of Engineering, including 10 years in New Zealand specialized in Acoustics. I have advised, monitored, and prepared acoustic assessments and management plans for over 100 various industrial, commercial and residential activities and operations across New Zealand. I have provided expert evidence pertaining to acoustic matters to the Environment Court and to council hearings.
4. Earcon Acoustics were commissioned by Chartwell Investments Ltd, Ecostream Irrigation Ltd and Takanini Rentors Ltd to provide expert evidence on acoustical matters to the Independent Hearing Panel.
5. I provide this evidence pertaining to the application for the Proposed Private Plan Change 13 (**PPC13**) to the Operative Hamilton City District Plan (**HCDP**).
6. In preparing this statement of evidence I have considered the following documents:
 - (a) Plan Change 13 – including the Acoustic Assessment (**Acoustic Assessment**) by Marshall Day Acoustics (**MDA**) dated 19 July 2022 - Ref. Rp 001 r04 2016839H (Appendix G).
 - (b) Statement of Evidence (**SOE**) of James Robert Hugh Bell-Booth (**Mr Bell-Booth**) dated 26 July 2023.
 - (c) Statement of Evidence of John Blair Olliver (**Mr Olliver**) dated 26 July 2023.
 - (d) Summary of Submissions dated 13 April 2023 as they relate to acoustics.

- (e) Hamilton City Council's section 42A Hearing Report on Plan Change 13 dated 12 July 2023.
 - (f) Applicant's Updated District Plan Amendments (Appendix C).
7. My involvement in this matter to date includes:
- (a) Reviewing the PPC13 documentation, the Acoustic Assessment, the summary of submissions, and the statements of evidence pertaining to acoustic matters.
 - (b) Assessing the proposed changes to the HCDP in context of protection of amenity for the proposed residential zone, and protection of established effects-generating zones from reverse sensitivity.
8. I conducted a site visit and general survey of the subject area on the 3rd of August 2023, including observation of the general operations and layouts of the adjacent industrial facilities.

Code of Conduct for Expert Witnesses

9. I have read the Code of Conduct for expert witnesses contained in the Environment Court's Practice Note 2023 and I have complied with the Code in preparing this evidence. The evidence I am about to give is within my area of expertise and represents my best knowledge about this matter. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of this evidence

10. My evidence is limited to acoustic considerations for PPC13 in context of both construction and operation/occupation of the site subject of PPC13.
11. In the interest of brevity, I provide only for context, a summary of my understanding of the proposed changes, the proposed acoustic performance standards and the proposed mitigation measures.
12. My evidence covers:
- (a) Review of the proposed measures in context of:

- (i) Protection of amenity of dwellings in the proposed residential zone from proximity to an industrial zone.
 - (ii) Protection of the Industrial zone and the Te Rapa Racecourse from reverse sensitivity adverse effects and constraints.
- (b) Review of the Acoustic Assessment and the Statement of Evidence of Mr Bell-Booth in context of the methodology and acoustic considerations taken into account.
 - (c) Consideration of potential additional measures.
 - (d) Recommendations pertaining to proposed mitigation measures, performance standards, and potential additional measures.

CONTEXT

Summary of PPC13

- 13. PPC13 proposes to rezone circa 6.5Ha of land within the Te Rapa Racecourse, currently zoned Major Facilities Zone, to Medium Density Residential Zone and rezone a small portion to Industrial Zone. The area proposed to be rezoned Residential is adjacent to Industrial Zoned sites with established industrial facilities.

Summary of acoustic considerations

- 14. The main areas of concern pertaining to acoustics are:
 - (a) Sensitivity and amenity of the residential properties, these being in proximity to an industrial zone with allowance for emission of high noise, day and night, as per HCDP standards.
 - (b) Reverse sensitivity effects arising from new noise sensitive activities in proximity to lawfully established noise generating activities adjacent industrial zone.
- 15. For reference, I provide below a high-level description of what residential amenity and reverse sensitivity entail in context of acoustics:

- (a) Amenity of dwellings in context of acoustics entails the control of noise in living areas, indoor and outdoor, within limits commensurate with the sensitivity of each area to noise.
 - (i) Bedrooms for example require lower noise levels, in addition to controls on the characteristics of noise for the protection of sleep. This includes avoiding impulsive sounds (i.e., sudden-onset, short duration, loud noise as occurs for example from steel-on-steel impact) and low frequency noise (e.g., noise from static machinery such as fans and compressors)
 - (ii) Living areas other than bedrooms are generally less sensitive to noise, albeit still require controlled noise levels.
 - (iii) Amenity considerations extend to outdoor living areas, which require some controls on noise levels to allow enjoyment of the facilities.
 - (b) Reverse sensitivity in context of acoustics is an adverse effect arising from the establishment of new noise sensitive activities near lawfully established noise-generating activities or zones. In such cases, established noise-generating activities become susceptible to complaints, objections or constraints on operation or future growth. In some cases, reverse sensitivity effects can become severe enough to force lawfully established noise-generating activities to relocate.
16. The following sequence of measures would typically need to be considered to either avoid, or to mitigate issues arising from noise sensitive activities being introduced near noise-generating activities. (I note that distances referenced in the following sub-paragraphs are provided for general context only, and pertain to industrial activities in line with the area in proximity to the site subject of PPC13):
- (a) First, it should be considered whether it is possible to avoid introducing noise sensitive activities into areas with established noise generating activities. Safe distances where no special mitigation measures or controls are required would be in the order of more than 240m.

- (b) If noise sensitive activities need to be closer than circa 240m, but can be separated by circa 120m or more, it would typically be sufficient to provide basic acoustic treatment to buildings (e.g., mechanical ventilation to allow windows to be closed).
 - (c) If noise sensitive activities need to be closer than circa 120m, but can be separated by circa 60m or more, then in addition to the basic treatment of buildings, mitigation must be provided for low frequency noise. This would usually require slightly higher performance facades (e.g., upgraded internal lining, higher performance glazing, etc.).
 - (d) If noise sensitive activities need to be closer than circa 60m, then even higher performance facades are required to control the increased low frequency noise (e.g., heavy cladding, additional insulation, additional internal lining, high performance glazing, etc.) In addition, effective shielding (i.e., acoustic fencing) would also be needed closer to the noise sources to control impulsive noise.
17. As per the paragraphs above (which I note are for general context only,) the closer dwellings get to established noise-generating activities, the more mitigation measures become necessary to protect the amenity of the dwellings, and consequently, protect the noise-generating activities from reverse sensitivity issues.

Summary of Proposed Performance Standards and Mitigation Measures

18. As detailed in the Acoustic Assessment, and the Statement of Evidence of Mr Bell-Booth, it is my understanding that the following performance standards and mitigation measures are proposed to manage acoustic effects of PPC13:
- (a) Adoption of the intra-industrial noise limit of 65dB LA_{eq (15mins)} to apply as the noise limit within the boundary of the new Residential Zone for noise generated from the adjacent Industrial Zone.
 - (b) Setback of dwellings by 30m from the boundaries with the Industrial Zone.

- (c) A fence, 1.8m in height, to be established at the boundaries with the Industrial Zone. I note the acoustic performance of this proposed fence is not defined.
- (d) Overlay of a “Noise Sensitive Area” within 60m of the boundary of the subject site with Industrial Zone sites (i.e. an additional 30m beyond the setback), whereby habitable rooms in dwellings to be designed and constructed to achieve internal noise levels of 35dB $LA_{eq(24hr)}$ in bedrooms and 40dB $LA_{eq(24hr)}$ in other habitable rooms, with ancillary requirements pertaining to ventilation where windows need to be closed to achieve the internal noise limits.
- (e) Excluding the proposed Medium Density Residential Zone from the performance criteria (e.g., noise limits) associated with noise from Te Rapa Racecourse activities.

Summary of Noise Descriptors

- 19. For reference and clarity pertaining to how noise is measured and assessed, the following are the main descriptors of sound relevant to my evidence:
 - (a) A-weighting: An adjustment applied to sound levels at different frequencies across the audible spectrum, resulting in a single number reflecting how sound is generally perceived by human hearing.
 - (b) $LA_{eq(15min)}$: Time-averaged level over a 15 minute period, A-Weighted.
 - (c) $LA_{eq(24hr)}$: Time-averaged level over a 24 hour period, A-Weighted.
 - (d) LAF_{max} : Maximum level during a measurement period, A-Weighted.
 - (e) L_{eq} at Frequency (Hz): Time-averaged sound Level at a specific frequency only.

REVIEW OF PROPOSED MEASURES

Application of the Intra-Industrial Noise Limit to the subject site

- 20. Notwithstanding the wording in the latest proposed changes to the HCDP, I agree with the recommendation of Mr Bell-Booth to apply the intra-industrial

noise limit for noise from the Industrial Zone receiver within the Residential Zone, and note the following:

- (a) The current absence of noise limits received at the Major Facilities Zone from the Industrial Zone is more representative of a gap in the HCDP standards than an allowance for unfettered noise generation. In addition, as noted in the evidence of Mr Bell-Booth, this intra-Industrial limit already applies between the Industrial Zoned sites.
- (b) In theory, if the proposed plan change had required the new zoning to be Industrial, then this limit would have applied by default. As such, this proposed noise limit is in my opinion reasonable pertaining to operation of the Industrial sites, current or future.

21. With regards to the proposed wording pertaining to this noise limit, I note that the noise limit between Industrial zoned sites as per 25.8.3.7.(c) is $LA_{eq(15min)}$ 65dB (i.e. appropriately averaged over 15 minutes.) The reference in the proposed changes to the HCDP does not however align with this, as follows:

- (a) The references to this limit in both the Acoustic Assessment, the Statement of Evidence of Mr. Bell Booth, and the proposed changes to the HCDP rule 25.8.3.7.(e) refers to LA_{eq} 65dB (without reference to the time averaging period of 15min). This can be technically interpreted as substantially different from the appropriate Intra-Industrial limit.
- (b) The notation of the limit as it stands, requires compliance over a period in the order of any 1 second or less, which would be unreasonably restrictive. I assume this is a drafting error, albeit note it in my recommendations below for the avoidance of doubt in the future.

22. In addition to the incorrect notation of the limit, the proposed wording in Rule 25.8.3.7 of the HCDP (excluding the Industrial sites from the residential noise limits) may create an unintended consequence pertaining to other residentially zoned sites, as follows:

- (a) The proposed wording excludes sites in the Industrial Zone with a common boundary with the Medium Density Residential Zone from the noise limits received at residential sites.

- (b) This is reasonable in context of the proposed use of the intra-industrial limit between the proposed new Residential zone and the existing Industrial Zone.
- (c) The surrounding area, however, also includes another residential zone across Ken Browne Drive (currently Metlifecare Retirement Village).
- (d) The proposed wording would result in a gap in HCDP rules governing noise received at the retirement village, allowing unrestricted noise from the industrial operations across Ken Browne Drive (current or future) received at the retirement village.

Introduction of a 30m exclusion zone and a 60m “Noise Sensitive Area”

- 23. With regards to the adoption of a hybrid buffer area (30m exclusion, 60m Noise Sensitive overlay) rather than a typical circa 60m “Amenity Protection Area,” I make no comment on the commercial considerations associated with the developable area and whether or not a 60m Amenity Protection Area is commercially feasible.
- 24. I consider the proposed approach of establishing a hybrid buffer area of a 30m setback and a further 30m noise sensitive area has merit, in combination with the other proposed mitigation measures, to address the balance of commercial, amenity, and reverse sensitivity requirements of PPC13, albeit only pertaining to daytime noise.
- 25. I consider this hybrid buffer area, and the proposed additional mitigation measures (i.e., 1.8m fence and internal noise performance standards) only sufficient for noise effects during daytime hours.
- 26. The proposed measures are not, in my opinion, sufficient to address the amenity or reverse sensitivity issues arising from proximity of night-time industrial operations (which the lawfully established industrial activities are entitled to undertake, and likely need to undertake) to dwellings requiring protection from sleep disturbance.
- 27. Night-time noise considerations for the protection of sleep include low frequency noise (e.g., extractor fans, or compressors) and impulsive noise (e.g., unloading containers, or opening/closing steel roller doors).

28. As such, I recommend further additional measures, specific to protection of dwellings from sleep disturbance, and these are considered further in this Statement of Evidence.

Internal noise performance standard for the “Noise Sensitive Area”

29. With the exceptions noted in the following point pertaining to night-time noise, I agree with the recommendation of Mr Bell-Booth to introduce internal noise performance standards for the Noise Sensitive Area, generally in-line with the standards in rule 25.8.3.10 of the HCDP for noise sensitive activities in proximity to noise generating activities. I note however the absence of controls for low frequency noise, considering the proximity of dwellings to industrial operations.
30. A number of acoustic considerations pertaining to industrial operations during night-time are under-emphasized or not considered in the Acoustic Assessment or in the Statement of Evidence of Mr Bell-Booth, including:
- (a) Maximum Noise levels (i.e. impulsive noise) inherent in industrial operations. Industrial facilities can (and at times need to) operate during any hours of day and night, and can generate impulsive noise from basic activities (e.g. loading or unloading of solid materials, opening or closing of roller doors, opening or closing of containers, etc.) or from use of commonly used tools (e.g. use of a pneumatic wrench on wheel nuts).
 - (b) Low frequency noise usually associated with fixed plant (e.g. ventilation fans, extraction fans, roof mounted mechanical plant, pumps, etc.) equipment required to operate overnight (e.g. refrigeration units).
 - (c) Other characteristics of industrial night-time noise sources, including elevation of sources (e.g. extraction fans, roller doors, etc.).
31. I address the above night time considerations in my evidence below, including recommended additional or alternative measures.

Construction Noise

32. With regards to potential construction noise, I agree with the evidence of Mr Bell-Booth (paragraphs 81-83) that the potential noise effects from the types of construction works associated with the proposed zoning would generally be in

line with effects anticipated by the applicable standard NZS6803:1999 and can be managed within acceptable limits.

REQUIRED NIGHT TIME ACOUSTIC CONSIDERATIONS

Maximum Noise Levels – Night-time

33. Limits on night-time noise levels are usually represented by the LAF_{max} noise descriptor, which pertains to maximum noise levels associated with sudden-onset, short-duration noises typically prominent well above the ambient noise environment. For industrial operations at night, this can be associated with a range of activities, many of which are independent of the production process itself, and include, inter alia:
- (a) Deliveries requiring loading or unloading of steel or other solid materials
 - (b) Loading, unloading, stacking, opening or closing of containers
 - (c) Steel on steel impact from securing or releasing of loading chains
 - (d) Opening or closing of steel roller doors
 - (e) General industrial activities (e.g. pneumatic Impact driver/wrench).
34. I note that while industrial facilities are not subject to explicit limits of maximum noise levels (LAF_{max}) between them, the emission of such noise is implicitly limited by the time averaged noise limit ($LA_{eq(15min)}$ 65dB.) Instances of impulsive noise affect the time averaged noise level, whereby generating too many impulsive noise events, or just a few events with excessive impulsive noise may result in reaching or exceeding the time averaged limit.
35. While this implicit limitation to impulsive noise is an effective control during daytime, further mitigation is required during night time when exposure to any impulsive noise can cause disturbance of sleep for the majority of people.
36. I provide the following example to demonstrate that impulsive noise requires more attenuation for the protection of sleep than is currently proposed through the internal noise performance standards:

- (a) In accordance with NZS6802:2008 – Environmental Noise, a typically acceptable night-time maximum noise level received in residential areas without special building envelope requirements is LAF_{max} 75dB, which is in-line with HCDP rules pertaining to residential zones.
 - (b) For typical dwellings where this limit would apply, this would result in internal noise levels in the order of LAF_{max} 60-65dB with windows open for ventilation (as would be expected in dwellings without specific acoustic treatments achieving circa 10-15dBA noise reduction with windows open).
 - (c) Industrial activities involving steel (e.g., use of an impact driver as is typical in garages or panel-beaters) can reach in the order of circa LAF_{max} 100-105dB at 10m, which if occurring near the boundary would result in external noise levels at 30m (at the proposed building facades) in the order of circa LAF_{max} 90-95dB.
 - (d) I note for reference that 1 incidence of this impulsive noise in every 15-minute period may not result in exceedance of the time averaged limit of $LA_{eq(15min)}$ 65dB but would be cause for significant sleep disturbance and is highly likely to generate complaints.
 - (e) To achieve LAF_{max} 60-65dB internally, the external LAF_{max} 90-95dB noise level requires significantly more attenuation (in the order of up to 30-35dBA) compared to the attenuation required for the time-averaged noise limit received at the dwellings (requiring attenuation in the order of circa 20-25dBA).
37. Control of internal noise levels in the proposed dwellings from impulsive sources, for the protection of sleep, can be achieved by one of the following measures, notwithstanding other non-acoustical considerations:
- (a) Increasing the offset from the boundary to circa 60m, with façade acoustic performance of dwellings similar to what is currently proposed (i.e., noise attenuation in the order of 20-25dBA.)

- (b) Maintaining the current offset of 30m and significantly increasing façade acoustic performance of any proposed dwellings (i.e., to achieve attenuation in the order of 30-35dBA.)
 - (c) Increasing shielding height at the boundary to elevations in-line with potential impulsive noise sources (e.g., top of a container on a truck).
38. I note here that increasing the offset of dwellings from the boundary reduces the shielding and/or façade insulation requirements, and conversely the closer the dwellings get to the industrial zone, the more shielding and façade noise insulation are required.
39. I am of the opinion that the best practicable options to address amenity concerns and reverse sensitivity issues from impulsive noise would be to either:
- (a) Increase the offset of the dwellings from the industrial boundary to the typical Amenity Protection Area distance of 60m, with the closest dwellings to the boundary treated acoustically as per the current proposal (i.e., attenuation in the order of 20-25dBA), or
 - (b) Establish more substantial acoustic shielding at the boundaries with the industrial sites, as detailed further in my evidence.

Low-Frequency Noise – Night-time

40. Industrial activities and facilities regularly generate noise with prominent low frequency components, typically from static mechanical plant (e.g. extraction or ventilation fans, HVAC plant, pumps, etc.) or from machinery required to run overnight (e.g. refrigerated containers/reefers, compressors, overnight activities, etc.).
41. Low frequency noise at night can cause sleep disturbance and a myriad of adverse health effects to residents in dwellings exposed to it.^[1] As such, low frequency noise warrants specific consideration.
42. It may not be practicable for established industrial facilities to limit low frequency noise to within levels commensurate with dwellings at the distances proposed in

¹ Leventhall H G. Low frequency noise and annoyance. Noise Health 2004;6:59-72

PPC13. An example of this would be extraction fans required on facades facing dwellings, or an air compressor required to be located near the boundary (as is currently the case at 89 Garnett Ave).

43. For the protection of amenity of dwellings in the proposed residential zone, I recommend:
- (a) Inclusion of internal noise performance standards (preferably as rules) pertaining to low frequency noise as follows:
 - (i) Internal, frequency-specific noise limits, recommended to be L_{eq} 45dB at 63Hz and L_{eq} 40dB at 125Hz. These levels are referenced in other district plans in New Zealand, where exposure to low frequency noise is anticipated.²
 - (ii) Based on long term noise measurements at similar industrial facilities, I would recommend that façade design performance is calculated based on external noise levels at the boundary reaching L_{eq} 75dB at 63Hz and L_{eq} 70dB at 125Hz., and
 - (b) Either:
 - (i) Increasing the offset of the dwellings from the Industrial boundary to circa 60m, or alternatively
 - (ii) Establishing more substantial acoustic shielding at the boundaries with the industrial sites, as detailed further in my evidence.

Acoustic Fencing / Shielding

44. The proposed 1.8m boundary fence is only required to be solid. This may not be acoustically suitable, and if constructed from materials with low surface density (e.g., corrugated iron) may have little or no effect on noise propagation, even independent of height.
45. Furthermore, PPC13 in proposed changes to HCDP rule 4.6.7.(c) adopts a height limit of 15m applicable to dwellings. At the proposed 30m offset, the upper

² For example, the Auckland Unitary Plan – Operative Version Rule E25.6.10 – Noise levels for noise sensitive spaces in Business zones.

floors of dwellings would have line of sight directly over the fence resulting in minimal, if any, shielding of noise sources.

46. While the proposed 1.8m high fence, if acoustically suitable, would have some attenuation effect on noise propagation during daytime (albeit in my opinion minimal), the elevation of some noise sources typical of night-time activities and equipment, and the elevation of upper floor receivers from ground level noise sources, would render it of little if any effect on noise propagation at night.
47. As noted above pertaining to shielding of impulsive noise, and with the added benefit of reducing low frequency noise propagation from some noise sources, I would recommend consideration of more substantial acoustic shielding at the boundary to elevations in the order of 4m or more from the ground level elevation of adjacent industrial facilities (i.e., depending on the topography at the boundary relative to adjacent facilities.) This can be achieved with commercially available acoustic fencing products designed specifically for industrial operations.
48. Some industrial building facades are founded at or adjacent the boundary (e.g., 423-429 Te Rapa Road.) Nevertheless, acoustic shielding would still be recommended at the boundary with these facades to protect dwellings from noise sources within the facilities during night-time operation. In addition, shielding of these facades would protect dwellings from low frequency noise from some mechanical services that can be (and may need to be) established on these facades.

ADDITIONAL MEASURES TO CONSIDER

No-Complaints Covenants

49. In his Statement of Evidence, Mr Bell-Booth does not recommend the provision of no-complaints covenants, indicating that these are not 100% effective and may not be easy to enforce, and notes the best practical option is adopting a rule framework enabling consideration by council of reverse sensitivity effects.
50. While I agree that the best approach is avoiding conflicting land-uses and controlling noise levels received by residents, either through land use planning, mitigation measures (e.g., shielding) or through regulatory controls, I note this

does not preclude the additional protection from reverse sensitivity afforded through no-complaints covenants. In that context I note the following:

- (a) The fact these covenants may not be 100% effective, does not necessarily mean they are ineffective, and as such cannot be dismissed on this basis.
- (b) In the Acoustic Assessment Section 4.2.4, pertaining to dwellings adjacent the racecourse, the Assessment indicates that it is reasonable to expect that most potential residents will have realistic expectations of racecourse noise. I do not agree with this assumption pertaining to the racecourse or the industrial zone.
- (c) As an example, I note for reference the highly publicised case of a developer purchasing land next to the Royal NZ Airforce Base Whenuapai, rezoning the land for residential use, then complaining about aircraft noise from the Airforce base. While it would have been reasonable to assume that proximity to an operational Airforce base implies an expectation of aircraft noise at night, this was not the case.
- (d) Realistic expectations are a subjective matter that may differ from person to person, and from time to time for the same person, and may at times be unreasonable.
- (e) As such, I am of the opinion that an unambiguous legal instrument, such as a no-complaints covenant, is required to more formally establish realistic expectations rather than assume them.
- (f) In context of precedent, as per Section 4.3 of the MDA Acoustic Assessment, it is noted that the Waikato Racing Club Incorporated (WRCI) as the operator of the Te Rapa Racecourse, included an agreement/no-complaints covenant as part of the sale and purchase agreement of the sites referenced in HCDP rule 25.8.3.9.(d).(ii).
- (g) Based on the above, I am of the opinion that no-complaints covenants registered against the titles of the PPC13 Medium Density Residential Zone are warranted and recommended. Furthermore, I recommend the

covenants cover noise from both the industrial zone and from the racecourse.

REVIEW OF ACOUSTIC ASSESSMENT METHODOLOGY

51. I reviewed the methodology adopted in the Acoustic Assessment, and note the following points that, in my opinion, warrant more consideration:

- (a) The Acoustic Assessment is notably absent discussion and consideration of noise characteristics of night-time activities and operations in the industrial zone, as these relate to heightened night-time residential sensitivities.
 - (i) PPC13 proposes the establishment of a residential zone in close proximity to an industrial zone at distances closer than would be anticipated with a typical Amenity Protection Area (i.e., in the order of 60m).
 - (ii) The adjacent industrial zone is lawfully established with an appropriate provision to operate at all hours of day or night.
 - (iii) Residential occupancies typical of residential zones are particularly sensitive to noise during night time, especially with regards to sleep disturbance.

52. A number of acoustic considerations are over-emphasised and should, in my opinion, be given minimal if any weight pertaining to the scope and context of PPC13. For the avoidance of doubt, while these considerations were over-emphasised in the Acoustic Assessment, I am of the opinion that these did not materially affect the measures or performance standards proposed by Mr Bell-Booth in his Statement of Evidence or in the Acoustic Assessment. The same conclusions reached by Mr Bell-Booth would in my opinion be reasonably reached without these considerations taken into account. As such, I recommend the following considerations are given minimal if any weight in decisions pertaining to PPC13:

- (a) There is a significant emphasis made on the noise levels measured in 2017 and 2018 associated with the established industrial operations in the industrial zone.

- (i) While these measurements are likely out of date, more importantly these are, in my opinion, out of context. Emphasis should be placed on allowed noise levels from the Industrial Zone rather than noise levels measured during a certain period.
 - (ii) Industrial and commercial activities are highly dynamic both in terms of specific operations over time, and in terms of changes to operations. Industrial Activities, and by extension noise levels and characteristics can change rapidly in response to market conditions and demand.
 - (iii) Noise levels measured at a point in time can within a short period become outdated by simple changes to the existing operation (e.g. relocating a loading bay) or by changes in the operations (e.g. upgrade of facility, increased production, additional shifts, etc.).
 - (iv) While reference to existing noise levels is critical when considering introduction of noise generating activities to a noise sensitive environment (e.g. introducing a commercial facility to a residential area), the inverse does not apply.
 - (v) As such, I recommend that decisions pertaining to PPC13 should be based on the allowed noise limits from lawfully established and permitted activities.
- (b) The same points pertaining to measured noise levels applies to the characterisation of the occupancies in the adjacent industrial zone as light industry or small scale³
- (i) This characterisation is not relevant to the consideration of the Proposed Plan Change. The nature, intensity and scale of the current operations is a coincidental matter relevant only to the point in time the occupancies were observed.

³ As referenced in the Acoustic Assessment Sections 2.1, 3.4, and the Statement of Evidence of Mr Bell-Booth paragraph 22 and the Statement of Evidence of Mr Olliver paragraph 107.

- (II) Assessments and decisions should, in my opinion, be made based on both the existing environment and what is allowed/permitted in the zone when considering this Proposed Plan Change.

RECOMMENDATIONS

53. The wording of the noise limit in rule 25.8.3.7.(e) of the HCDP should be updated to $LA_{eq(15min)} 65dB$ (instead of simply $LA_{eq} 65dB$) to reflect the intended intra-industrial site noise limit in rule 25.8.3.7.(c) of the HCDP.
54. I recommend qualifying the proposed exclusion in HCDP rule 25.8.3.7 such that it only applies to the Medium Density Residential Zone established by PPC13. Other residential zones (i.e. the current retirement village) should not be part of this exclusion.
55. I recommend the inclusion of internal noise performance standards (preferably as rules) pertaining to low frequency noise for protection of residential occupants from sleep disturbance, as follows:
- (a) Internal frequency specific noise limits, recommended to be 45dB at 63Hz L_{eq} and 40dB at 125Hz L_{eq} ,
 - (b) Façade design performance to be calculated based on external noise levels at the boundary reaching 75dB at 63 Hz L_{eq} and 70dB at 125 Hz L_{eq} , whereby noise levels incident on façades would need to be calculated in-line with proposed rule 1.3.3.(P)(c)(ii)
56. I recommend that either:
- (a) The offset between dwellings and the boundary with industrial sites is increased to 60m, with the closest dwellings to the boundary treated acoustically as per the current proposal (i.e., attenuation in the order of 20-25dBA), or
 - (b) Acoustic fencing at boundaries adjacent industrial sites is established to elevations in the order of 4m or more from the ground level elevation of adjacent industrial facilities, for the protection of residential occupants from sleep disturbance associated with low frequency noise and impulsive noise during night-time.

57. I recommend no-complaints covenants are registered against the titles of the PPC13 Medium Density Residential Zone covering noise from both the Industrial Zone and from the Racecourse.
58. I recommend that decisions pertaining to PPC13 are made without regard to point-in-time measured noise levels, or characterisations of operations. Reference should be made to lawfully allowed noise levels and operations.

CONCLUSION

59. PPC13 proposes the introduction of a Residential Zone in proximity to an established Industrial Zone, requiring consideration of amenity of residents in the proposed Residential zone, and protection of lawfully established industrial activities from reverse sensitivity complaints.
60. I consider the proposed approach of establishing a hybrid buffer area between the zones (a 30m setback and a further 30m noise sensitive area) a generally reasonable approach provided sufficient additional mitigation measures are included for night-time protection from sleep disturbance.
61. I do not consider the proposed mitigation measures associated with the 30m offset sufficient, especially in context of protection from sleep disturbance.
62. Night-time noise effects are under-emphasised or overlooked in the Acoustic Assessment and the proposed changes. The proposed changes do not, in my opinion, sufficiently protect dwellings from night-time sleep disturbance or sufficiently protect the industrial facilities from reverse sensitivity effects.
63. The vulnerability of residents in dwellings close to industrial activities to sleep disturbance requires additional mitigation for both impulsive noise and low frequency noise. I make a number of recommendations to address this:
 - (a) Addition of low frequency noise components to the proposed internal noise performance standard, potentially requiring increased façade noise insulation, and
 - (b) Either:
 - (i) Increasing the offset between the dwellings and industrial boundaries to distances in the order of 60m, with the closest

dwellings to the boundary treated acoustically as per the current proposal (i.e., attenuation in the order of 20-25dBA), or

- (ii) Increasing the shielding heights at the boundaries with the industrial zone to an elevation that would materially reduce noise propagation (in the order of 4m or more from the ground level elevation of adjacent industrial facilities.)

64. For the protection of both the Industrial activities and the Racecourse from reverse sensitivity complaints, and for the reasons detailed in my evidence, I recommend:

- (a) Registering no-complaints covenants against the titles of the PPC13 Medium Density Residential Zone for noise from both Industrial and Racecourse activities.

65. In summary, I am of the opinion that unless PPC13 addresses my above recommendations including accounting for and mitigating night-time noise, and introducing a no-complaints covenant mechanism, then the introduction of a Medium Density Residential Zone does not appropriately protect dwellings and facilities from sensitivity and reverse sensitivity effects respectively.

A Jacob

Alex Jacob

Dated this 9th day of August 2023