Before the Independent Hearing Panel
Appointed by the Timaru District Council

Under	Schedule 1 of the Resource Management Act 1991 (**RMA**)
In the matter of	Submissions on the Proposed Timaru District Plan
Between	**Various**
	Submitters
And	**Timaru District Council**
	Respondent

Malcolm James Hunt

Hearing B – General Rural Zone - Fixed-wing aircraft noise

28 February 2025

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Introduction

1 My name is Malcolm James Hunt. I am the principal of Malcolm Hunt Associates, an environmental noise and acoustic consultancy firm based in Wellington. I hold the degrees of Bachelor of Science from Victoria University and Master of Mechanical Engineering from the University of Canterbury specialising in environmental acoustics.

2 I hold other qualifications, including the qualification of Environmental Health Officer pursuant to the Environmental Health Officer Qualification Regulations 1975. I also hold a Royal Society of Health Diploma specialising in Noise Control Engineering.

3 I have around 35 years' experience in the field of environmental noise and building acoustics in New Zealand. I am an associate member of the New Zealand Acoustical Society and have been a member of various national and international acoustic standards committees, and expert working groups, including a number of New Zealand Standard's Committees. In particular, I was a member of the past New Zealand Standards committees reviewing the 1999 and 2008 versions of NZS6801 relating to the measurement of environmental noise and NZS6802 relating to the assessment of environmental noise. I am also a past member of international noise/acoustic committees including the International Standards Organisation technical working groups.

4 In 2011 I was awarded the Standards New Zealand 'Meritorious Service Award' by Standards New Zealand Council recognising my involvement in the development of New Zealand Acoustic Standards.

5 I have acted as a noise expert in many Resource Consent Hearings, District Plan Hearings, and proceedings in the Environment Court and High Court of New Zealand.

6 I have been involved with the measurement, prediction and assessment of environmental noise from a range of facilities such as motorways, airports, quarries, earthmoving projects and landfills. In addition, I have acted for various Councils in the development of District Plan noise provisions and have conducted numerous sound level surveys in both urban and rural areas.

7 Although this is a Council hearing, I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 and that I have complied with it when preparing this report. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that this evidence is within my area of expertise, except where I state that I am relying on the evidence of another person. Having reviewed submissions made by submitters and further submitters relevant to this topic I advise there are no conflicts of interest that would impede me from providing independent advice to the Hearings Panel.

8 I have read the submissions[1], evidence and legal submissions presented by and on behalf of some submitters[2] at Hearing B, relevant parts of the section 32 report, and the section 42A report in relation to the regulation of small, fixed-wing aircraft in the General Rural Zone of the PDP (GRUZ-R14 in the PDP).

Involvement in PDP

9 I have provided noise advice to Timaru District Council (hereafter 'the Council) since 2018 including in relation to various resource consent applications. Over recent years I have carried out research and provided advice to Council on noise matters included in the Proposed District Plan (PDP) notified on 22 September 2022.

10 To assist in development of the PDP Noise chapter, I was commissioned to prepare two background noise assessment reports, Stage One Noise Report[3] and later a Stage Two Noise Report[4]. Report Two refers to potential noise effects associated with light aircraft flight movements not undertaken at airports which may cause adverse effects in rural areas. The recommendation was that measures should be included within the PDP to adequately address these effects, noting Council's inability to rely on the district plan to control noise due to aircraft overflight, except in relation to noise arising from the use of landing areas. Section 7.1 of Report Two includes a discussion supporting NZS6802:2008 *Acoustics –Environmental Noise* be applied to address this noise, at least in some form or other. I noted assessment of noise due to these intermittent noise events was generally outside the scope of other NZ standards, such as

NZS 6805:1992 *Airport Noise Management and Land Use Planning*

NZS 6807:1994 *Noise Management and Land Use Planning for Helicopter Landing Areas*

11 I was involved with Council's "noise working group" a planning group set up in 2019 to develop the original draft district plan Noise Chapter. Working group minutes from a meeting dated 20 January 2020 recorded the need to develop a rule regarding noise from light operating from informal airstrips in the GRUZ and suggests controls based on the number of movements with a minimum separation distance of 500m *"….. or as recommended by MH* (Malcolm Hunt)". Further rule development occurred with discussions broadening to include the use of distance setbacks to sensitive receiver sites, exempting certain aircraft movements and limiting the number of days on which

[1] As listed in the Hearing B Section 42 report: Rural Zones (Maclennan) at 10.25.1.

[2] Aircraft owners and Pilots Association of New Zealand and Sid McAuley.

[3] MHA 2018 report " *District Plan Review - Topic 11: Noise and Vibration - Stage 1 Report*" Available at: https://www.timaru.govt.nz/__data/assets/pdf_file/0012/669864/Malcom-Hunt-Associates-2018-Stage-1-Report-Noise-and-Vibration.pdf

[4] MHA 2018 report "*District Plan Review, Topic 11: Noise and Vibration, Stage 2 Report Recommendations For Managing Reverse Sensitivity Effects".* Available at: https://www.timaru.govt.nz/__data/assets/pdf_file/0011/669863/Malcom-Hunt-Associates-2018-Review-Of-Timaru-District-Plan-Stage-2-Report-FINAL.pdf

movements may occur. I note the final development of these rules within permitted activity zone rules for the GRUZ is fully described within the Memorandum of counsel in response to Minute 14[5] dated 23 August 2024.

12 Following Hearing B, I provided Council with advice as to how the concerns of the submitters raised at the hearing could be addressed, while ensuring that noise from such aircraft is appropriately regulated. That advice was prepared in order to seek agreement with those submitters. That advice (dated 31 October 2024) is attached as **Attachment A** to this evidence.

13 My advice was provided to the Aircraft Owners and Pilots Association and Sid McAuley and forms the basis for the rule now proposed by those submitters. I have advised the Council that I consider the amendments proposed by those submitters are supportable from a noise perspective, and I understand that the section 42A officer has amended his recommendation to the Panel to reflect that rule.

Purpose and scope of evidence

14 Against that background, the purpose of this statement is to provide the Panel with technical evidence to support the recommendation now being made. This statement therefore:

(a) provides an overview of key considerations and options for the regulation of noise from small, fixed-wing aircraft;

(b) assesses the noise likely to be expected from small, fixed-wing aircraft as proposed to be defined by the submitters; and

(c) provides comments on the proposed rule set out in the Memorandum of counsel on behalf of the Aircraft Owners and Pilots Association and Sid McAuley (dated 6 December 2024).

Key considerations and options for regulating small fixed-wing aircraft

15 At Council's request, I have investigated methods for the assessing and controlling noise due to movements of fixed-wing light aircraft operating from airstrips in the General Rural Zone (GRUZ) of the PDP. I have been guided by NOISE-O1 of the PDP which is concerned with ensuring noise effects generated are compatible with the purpose, character and qualities of the GRUZ and do not compromise the health and well-being of people and communities.

[5] Memorandum of Counsel on behalf of Timaru District Council, Response to Minute 14 – non-commercial fixed-wing aircraft 23 August 2024

16 The Noise Chapter of the PDP (Part 2, General District-Wide Matters) sets out noise performance standards and rules based on the contents of various NZ Standards, including noise from aircraft operating at Timaru/Richard Pearse Airport. The majority of noise limits specified for permitted activities in the noise chapter of PDP require noise measurement using NZS 6801:2008 *Acoustics – Measurement of environment sound* and assessment using NZS 6802:2008 *Acoustics – Environmental noise.* These two NZ Standards deal with 'general' environmental noise and are essential to the proper operation and enforcement of permitted activity noise standards set out within NOISE-S2 of the PDP[6].

17 The Timaru Richard Pearse Airport which is regulated in general accordance with the recommendations of NZS 6805:1992 *Airport noise management and land use planning*. NZS 6805:1992 is a NZ Standard which deals with the control of airport noise (measured using daily average 24 hour 'Level Day/Night' noise levels) and recommends land planning measures to address potential reverse sensitivity noise effects that may occur when sensitive land uses establish near airports.

18 While the effects of noise due to fixed wing aircraft movements from airfields and airports in New Zealand are commonly controlled via district plan provisions based on this Standard (in addition to other measures such as site-specific operational curfews), it is not considered suitable as a basis for assessing noise effects of intermittent movements of fixed-wing light aircraft operating for non-commercial purposes from airstrips in the GRUZ. That is because it adopts a noise metric based on 'whole day' noise exposure (using 24 hour average noise levels) which will significantly under estimate the likely noise effects caused by individual movements of small, fixed-wing aircraft occurring intermittently from informal landing strips in rural areas.

19 Due to the nature and character typical of rural areas, I consider the following factors important when developing district plan measures to control noise effects of individual movements of small, fixed-wing non-commercial aircraft which operate from informal landing strips in rural areas:

a) The PDP noise assessment standard for "general" environmental noise (NZS6802:2008) can be used successfully to assess aircraft noise effects associated with the intermittent use at rural airstrips. This is set out on page 3 of my advice memo on this matter (APPENDIX A) which identifies that specific mention is made of this issue at clause 1.2.2 of NZS6802:2008 which states that noise due light aircraft flight and ground movements "which are not at airports

[6] As recommendations I set out in this evidence require night time aircraft movements (between 10pm and 7am) be subject to the permitted activity nighttime noise standard NOISE-S2, NZS6801:2008 and NZS6802:2008 are considered relevant for the assessment noise effects of night time movements of fixed-wing light aircraft operating from airstrips in the GRUZ.

and which are outside the scope of other Standards" may be assessed using NZS6802:2008.

b) Due to the relative infrequency of these aircraft movements, I consider limiting the number of movements over a time period (e.g., per day) for airstrips that are within proximal distance to sensitive receivers to be more efficient and effective than controlling potential adverse noise effects based on compliance with actual noise limits. It is possible to base noise controls for movements of small fixed-wing aircraft which are not at operating at airports on compliance with NOISE Table 24 LAeq noise limits, however this could result in allowing up to 60 aircraft movements during daytime hours each day, as compliance would only need to be achieved for each 15 minute time period. This would not be a very effective control in my opinion because it would enable aircraft activity far in excess of as the level described by the submitters.

c) While the actual decibel level of aircraft noise received at sensitive receiver sites (such as rural dwellings in the GRUZ) is an important factor for the assessment of noise disturbance, received noise levels can be reasonably approximated by the setback distance between the landing strip and sensitive receiver sites. The use of setback distances in place of decibel noise limits is relatively common in district plans, as it is reasonably well understood control method and is a more user friendly approach compared with one which requires knowledge of received noise levels to assess compliance against specified decibel limits.

d) It is relatively well known that noise due to aircraft movements undertaken during 'night time' periods are more likely to generate adverse noise effects for neighbours compared to daytime movements[7]. This is due to the need to provide for sleep protection at sensitive receiver sites during night time[8]. It is widely accepted that, compared to daytime, aircraft noise is likely to be more intrusive during night time in rural areas because ambient sound levels are generally quieter than daytime periods. Thus, a noise event occurring during night time is likely to be more annoying compared to the same noise event occurring during daytime hours.

e) As a further measure to protect against adverse night time noise effects such as sleep disruption, district plan night time noise limits include a single event noise limit (specified using the LAFmax noise metric) which applies in addition to night time noise limits based on time-averaged noise levels (LAeq).

[7] PDP Table 24 (Noise performance standards) defines 'night time' as between 10pm and 7am the following day. Daytime is defined as 7am to 10pm.

[8] In order to avoid night time sleep disturbance, guidance found within relevant the NZ Standards and international guidelines generally set night time noise limits at lower decibel levels (typically 10 dB lower) than daytime noise limits.

20 In my experience, and through my working knowledge of various district plans in New Zealand, I have found no specific examples of noise rules or standards which specifically address noise effects of occasional movements of small, fixed-wing aircraft movements from rural airstrips for non-commercial purposes. In summary, my review has found;

a) Rather than requiring compliance with permitted activity noise standards to enable this activity, district plan rural zone provisions commonly classify aircraft activities as discretionary (or limited discretionary) activities, requiring some form of resource consent. For commonsense reasons, noise due to aircraft activities related to search and rescues, firefighting, civil defence, etc are commonly exempted from district plan noise performance standards.

b) If light aircraft activities in rural areas are provided for as permitted activities in district plans, this is commonly limited to commercial fixed wing or helicopter operations undertaken for primary production purposes over limited periods of time or to enable tourist or sightseeing activities, often without any specific requirement to comply with district plan permitted activity noise standards. I have not investigated noise effects due to these types of aircraft movements in the GRUZ.

21 Due to the lack of any suitable guidance from other district plans that could be directly applied, I developed a proposal based on a distance setback (distance being a proxy for noise levels) coupled with caps on aircraft movement numbers. This is the approach taken in Rules 21.10.2 and 21.10.3 of the Queenstown Lakes District Plan (QLDP) which controls movements of any aircraft from 'informal airports' in rural areas for noise control purposes based on:

a) Rule 21.10.2 - Not more than two landings and two take-offs take place per day; five landings and five take-offs take place per week or twelve landings and twelve take-offs take place per month.

b) Rule 21.10.3 – Aircraft 'Fly-in' Events are limited to not more than 6 events per calendar year; provided there is not more than 1 event per month; the AOPA[9] has notified the Council's Planning Department of the event; and Informal airports at which 'Fly-in' events take place are located within the Outstanding Natural Landscape Area.

22 Neither Rule 21.10.2 or 21.10.3 apply to aircraft use of informal airports used for emergency landings, rescues, fire-fighting and activities ancillary to farming activities are exempt.

[9] Aircraft Owners and Pilots Association of New Zealand

Generation of noise from small fixed-wing aircraft

23 While I consider the above QLDP provisions provide some useful guidance on methods to control noise daytime and night time effects of limited light aircraft movements, Council requested that I also take into account that distant receiver sites in the GRUZ would receive negligible or no noise effect due to the separation distances involved.

24 To determine the sort of distances beyond which light aircraft noise levels would be likely to result in *di minimis* noise effects, I have investigated noise levels from typical light aircraft movements[10]. I have based my assessment on measured single event take-off noise emission levels of a Cessna C172 light aircraft which is a small, four-seat, single-engine, high wing, fixed-wing aircraft in common use in New Zealand. An example of a Cessna C172 is depicted in Figure 1.

25 Take-off noise levels for this type of light aircraft were sourced from a published paper entitled *Measurement and Modelling of Noise-Power-Distance Curves of a Fixed-Wing UAV.* 10.2514/6.2022-3037 by Amargianitakis, Daniel & Self, Rod & Proença, Anderson & Boyd, Cameron & Westcott, Oliver & Ferraro, Mario & Erbil, Mehmet & Entwistle, Robert Published by AIAA[11] 2022-3037 and presented at the 28th AIAA Aeroacoustics 2022 Conference. June 2022.

26 This published data provides measured C172 noise levels in terms of 'noise power distance' curves which enables LAFMax and LAeq sound levels noise levels to be assessed across a range of receiver distances from the take-off location. The data for this light aircraft demonstrates a standard C172 departure would result in a significant single event LAMax noise levels in close proximity to the airstrip but would result in a single event noise level of 60 dB or less being received at sites beyond 1,000 metres. Noise received at this setback distance is considered acceptable given this would comply with the PDP's night time 70 dB LAFMax limit for the GRUZ (Table 24).

[10] Aircraft take-off movements only have been considered given that noise from light aircraft landings generate much less noise.

[11] American Institute of Aeronautics and Astronautics

Figure 1 Photograph of a Cessna C172 light aircraft.

27 This supports the recommendations I have made that night time light aircraft movements (including before 7am) be permitted where the airstrip is located >1,000m from a noise sensitive receiver site.

28 Regarding LAeq noise levels of the C172 take-off, I derived these values from the noise-power-distance curve for the C172 take-off published as 'SEL' single event noise levels. The SEL from a single take-off was converted into units LAeq(15 min) based on the procedures set out in NZS6801:2008 *Acoustics – Measurement of Environmental Sound*. The LAeq(15 min) level derived in this way enables comparisons to be made with LAeq noise limits for the GRUZ set out in Table 24 of the PDP

29 For daytime, I have found noise due to a single C172 take-off would appear to comply with the 50 dB LAeq(15 min) daytime noise limit for the GRUZ at a setback distance of 500m from the rural airstrip. This result indicates for receivers located at distances of 500 metres or more, a daytime departure once per 15 minutes would comply with the 50 dB LAeq(15 min) daytime limit. While this indicates typical light aircraft movements may be able to comply with the 50 dB LAeq(15 min) daytime noise limit for permitted activities in the GRUZ where receivers are located as close as 500 metres from the airstrip, I do not recommend daytime noise limit controls for this type of activity for the reasons set out above.

30 For night time, using the LAeq(15 min) value derived from the published SEL levels for the C172 aircraft, I have found a single take-off event would be likely to comply with the LAeq(15 min) 40 dB night time noise limit for the GRUZ for receivers located at distances up to 640 metres from the airstrip, however the PDP (and relevant NZ Standards) also require compliance with LAFMax district plan noise limits. Given the LAFMax finding above and given that aircraft larger (and noisier) than the C172 may fall within the 'light aircraft' definition under consideration, I recommend that night time controls for occasional movements of small, fixed-wing aircraft for non-commercial purposes be based on potentially unacceptable noise effects where sensitive receivers are located at 1,000 metres or less from the airstrip.

Comments on rule proposed by submitters

31 Following submitters consideration of the recommendations I put forward to Council, I understand the submitters filed a memorandum outlining a proposed activity-based rule framework.

32 This response was based on my recommended framework, but sought amendments to the frequency of permitted take-offs and landings and number of fly-in events to effectively accommodate the scale of the existing activity. As set out in paragraph 33 of the submitter's memorandum, in summary, this rule would permit the flying of small non-commercial fixed-wing aircraft as follows:

1. *Where an airstrip is located within a 500m of any Residential zone or the notional boundary of a building containing an existing noise sensitive activity, on a separate site under different ownership:*

    (a) No more than 20 take offs and 20 landings per month;

    (b) 'Fly-in' events (where multiple aircraft fly onto a property) are not included in the calculation for (1)(a) and are limited to no more than 12 events per calendar year; and

    (c) Nighttime movements (between 10pm and 7am) are subject to the permitted activity nighttime noise standard NOISE-S2.

2. *Where an airstrip is located between 500m and 1000m from any Residential zone or the notional boundary of a building containing an existing noise sensitive activity, on a separate site under different ownership, no maximum use limitations or noise limits apply between 7am and 10pm but the permitted activity nighttime noise standard NOISE-S2 applies outside of these hours; and*

3. *Where an airstrip is located over 1000m from any Residential zone or the notional boundary of a building containing an existing noise sensitive activity, on a separate*

site under different ownership no maximum use limitations or noise limits apply (whether day or night).

33 I have considered the potential noise effects and 'enforceability' of a permitted activity rule based on the above response from the submitters.

34 I note the provisions include a limited number of 'Fly-in' events originally found within Rule 21.10.3 of the QLDP and which I recommended also be applied within the light aircraft noise controls under consideration for the GRUZ. Whereas this rule recommended 6 fly-in's per year, my recommendation (at item C.1 page 9, APPENDIX A) is once per month. I understand submitters are accepting of the proposed frequency of 1 per month but would prefer this to be expressed as 12 events per calendar year. I agree the change to controlling the frequency of fly-in events based on annual events is an equivalent noise effect to once-per-month and is supported.

35 I further understand the submitters do not support the requirement to notify the council's planning department of each fly-in event (included in my recommendations at item C.2, page 9, APPENDIX A) . I am not supportive of removing this requirement which ensures Council is made aware of the number of fly-in events that occur in the GRUZ, this being consistent in my view with Council's duty to monitor (RMA s.35). I would support any amendment to the rule that simplified or modified the requirement to advise Council of each fly-in event however I would not support removing this general requirement.

36 I recommend the Council adopt the approach outlined above as I consider it generally acceptable for the purposes of managing noise from non-commercial, small fixed-wing aircraft in the GRUZ. I consider a district plan rule framed in this way to be relatively easy for plan users to understand and follow. Importantly, I consider such a rule to be a practical solution which would adequately protect sensitive sites in the GRUZ and would be relatively straightforward for Council to enforce, should this become necessary.

37 I have reviewed the proposed rule wording now being recommended by Mr Andrew Maclennan. I consider the amendments to GRUZ-R14 being recommended by him will be effective for the control of potentially adverse noise effects of intermittent movements of fixed-wing light aircraft operating for non-commercial purposes from airstrips in the GRUZ. As above, I consider the rule, amended as proposed, will be relatively easy for plan users to understand and comply with and relatively straightforward to enforce, should this become necessary.

Malcolm James Hunt
28 February 2025

ATTACHMENT A

"*Proposed District Plan – Recommendations For Noise Controls For Light Aircraft Movements At Informal Airstrips In General Rural Zone*" authored by Malcolm Hunt dated 31 October 2024.

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Date of Issue:	**31 October 2024**
Client:	Timaru District Council c/- Jen Vella, Legal advisor Anderson Lloyd
Project :	Noise: Informal Airstrips - Noise Controls For Non-Commercial Fixed-Wing Aircraft Movements
Prepared By :	Malcolm Hunt, Malcolm Hunt Associates

Proposed District Plan – Recommendations For Noise Controls For Light Aircraft Movements At Informal Airstrips In General Rural Zone

1. Introduction

Malcolm Hunt Associates[1] have prepared this memorandum in response to your request for advice regarding managing potential noise effects associated with a possible exemption to the permitted activity noise limits of the General Rural Zone (GRUZ) of the Proposed Timaru District Plan to enable aircraft movements by small, non-commercial fixed-wing aircraft at informal airstrips.

In response, this discussion document has been prepared aimed at enabling 'reasonable' use of these informal airstrips by promoting flexible movement limits and night time activity constraints where this can be justified based on noise effect grounds. The recommended controls seek to reasonably protect health and amenity at receiver sites having regard to the proximity of airstrips used by non-commercial fixed-wing light aircraft to sensitive receiver sites. Because noise arising from the use airstrips reduces with distance, noise-based controls are relaxed for more remote airstrips without sensitive receiver sites located in the wider area.

For the reasons set out below, I recommend aircraft movements be controlled to a reasonable degree for informal airstrips located within 500m of a sensitive receiver site. For airstrips where sensitive receivers are located between 500m and 1,000m daytime restrictions are not considered warranted or necessary for noise control reasons, however expected noise effects at these distances do justify restrictions on night time aircraft movements after 10pm and before 7am.

Potential night time sleep disturbance for distant receiver sites affected by light aircraft noise has been investigated based on a 'single event' equivalent to one take-off movement of a typical, small, low noise, light aircraft (Cessna C172). As shown below, received LAMax noise for this type of light aircraft movement may be marginally compliant at 500m however night time noise effects of movements quantified in terms of LAeq(15 min) results in apparent non-compliance at this separation distance between informal airstrips and sensitive receiver sites. As a consequence, night time movements are proposed to be permitted for noise effect reasons only for informal airstrips located greater than 1,000m to any noise sensitive receiver site.

[1] Malcolm is an environmental noise consultant and principal of Malcolm Hunt Associates, Wellington. He holds both science and engineering degrees and has over 30 years Malcolm experience with the measurement, prediction and assessment of noise from a range of activities in New Zealand including aircraft noise. Malcolm has been involved with the development of several NZ Standards dealing with environmental noise and has provided expert noise advice to various Council's, including assisting in the development of Timaru District Council's Proposed District Plan environmental noise provisions. Malcolm confirms he is familiar with and understands the Code of Conduct for Expert Witnesses as set out in the Environment Court Practice Note 2023 which has been complied with in preparing this advice.

Specifically, in response to your request I have undertaken the following tasks;

- Review of acoustic matters referred to within letter from Wynn Williams dated 19th September 2024 & provide advice on the appropriate to use of NZ Standards to measure noise from movements by non-commercial fixed-wing light aircraft (as proposed to be defined by submitters).
- Review and comment on Queenstown Lakes District Plan rules relating to use of informal airstrips in rural areas (Rules 21.10.2 and 21.10.3)
- Researched recommendations for a 'reasonable use' compliance regime which recognises available buffer distance to sensitive receiver sites and is based on available information and documents provided. I set out a combination of fairly straightforward recommended movement limits combined with a 'relaxation' in requirements where the airstrip is located at a significant buffer distance to sensitive receiver sites. For situations with the highest potential for noise effects (informal rural airstrips located less than 500m to sensitive receiver sites) the proposed controls provide flexibility in the way 'reasonable' use of the airstrip is determined with separate daily, weekly, monthly limits on aircraft movement, coupled with controls applying during night time (10pm to 7am) to address potential night time noise effects where there are existing sensitive receivers located up to 1,000m from the airstrip.

As noted in our discussions, there appears no standardised method for managing noise from movements of non-commercial, small, fixed wing aircraft at informal rural airstrips in district plans in New Zealand. The recommendations below are considered an effective, effects-based approach to managing non-commercial small, fixed wing light aircraft noise received within areas surrounding informal rural airstrips. Overall, I consider the recommended controls enable reasonable use of informal rural airstrips whilst protecting health and amenity in the GRUZ zone consistent with general noise guidance of NZS6802:2008 *Acoustics – Environmental Noise* and with many aspects of the Table 24 (NOISE-S2) of the Proposed District Plan.

2. Review of Wynn Williams Letter

Regarding the existing situation, Wynn Williams (WW) letter dated 19 September 2024 proposes that either there are no existing controls in the Operative District Plan (ODP) limiting noise from non-commercial small, fixed-wing aircraft movements at informal airstrips in Rural Zone or (alternatively) that this activity is subject to the widely applied L10 noise limits applying to permitted activities in the Rural Zone (with an argument put forward that due to technical vagaries of the L10 unit, the ODP does not limit noise from short-duration noise events such as light aircraft departures or landings).

I have no fixed view on how the existing ODP noise provisions apply to noise from small, non-commercial fixed-wing aircraft movements at informal airstrips in Rural Zone. I consider this has no direct bearing on Council's deliberations aimed at providing a reasonable and workable exemption to enable limited noise effects of movements by small, non-commercial fixed-wing aircraft at informal airstrips in GRUZ. I do not consider that setting new noise standards in the Proposed District Plan (PDP) is informed by, or needs to remain consistent with, status quo controls of the ODP however they be construed. My understanding is that existing use rights remain unaffected by any new provisions introduced into the PDP to control noise from non-commercial small, fixed-wing aircraft movements at informal airstrips in GRUZ.

I do not agree with the quasi-technical advice provided in the WW Letter on the difference between the L10 noise unit of the ODP and the LAeq unit adopted within the PDP. I agree there are differences between these two types of noise metrics however the differences are not as described in paras 15 to 20 of the WW letter. There is an incorrect assumption that the L10 unit would normally be assessed over a time-base of 15 minutes. It is incorrect for the WW Letter to state (as it does at para 17) that under the ODP "*….in practice, an assessment period of 15 minutes is/was typically used for consistency*". This is incorrect as it ignores the recommendations of 1991 noise measurement standard referred to in the ODP (NZS6801:1991) which states at clause 5.4.5.3 that the L10 sample time interval "*must be long enough to capture a representative sample*". This is evidenced by the microlight noise measurements reported in 2014 (attached to the Memorandum of Counsel dated 23 August 2024) which adopted a time-base for measurements of 1-2 minutes for each measurement which, while uncommon, does not contravene the recommendations of NZS6801:1991.

In reality, careful reading of NZS6801:1991 clearly indicates the unfounded basis of the argument set out in the WW Letter that, because the ODP noise rules are based on the L10 noise unit this provides a 10% "window" within which short duration aircraft events are essentially uncontrolled (and therefore there is no noise limit applying to aircraft noise events such as take-offs or landings by non-commercial, small, fixed wing aircraft at informal rural airstrips). In reality, the 1991 measurement standard enables the user to determine an appropriate measurement period which, as was adopted for the 2014 microlight noise measurements, may be as short as a few minutes to ensure noise effects are appropriately quantified.

The WW Letter also incorrectly asserts at paras 19, 23, and 24 that the noise assessment standard adopted by within PDP noise provisions (NZS6802:2008) cannot be applied to assess aircraft noise. In fact, clause 1.2.2 of NZS6802:2008 states that noise due to *"..... flight and ground movements which are not at airports and which are outside the scope of other Standards, may be assessed using this Standard".* As noise due to non-commercial fixed-wing aircraft at informal airstrips in rural areas are not covered by any other NZ Standard (including NZS6807:1994 'helicopter noise' and NZS6805:1992 'airport noise') it is considered entirely appropriate to assess noise due to non-commercial fixed-wing aircraft at informal airstrips in rural areas using NZS6802:2008.

I therefore consider it illogical to conclude at para 25 of the WW Letter that *"….undertaking any further assessment of how NZS 6801:2008 and NZS 6802:2008 would apply to the noise produced by small, non-commercial, fixed wing aircraft is outside of the scope of the plan change"*[Sic].

I make recommendations below which seek to manage noise generated when non-commercial fixed-wing light aircraft operate at informal airstrips in the GRUZ. No controls are proposed where the airstrip is remote from any noise sensitive receiver sites. The recommendations focus on controlling noise effects where receiver sites are located in proximal distance to informal airstrip sites. In those cases, the recommendations for the control of noise effects are based on compliance with allowable numbers of movements of small, non-commercial fixed wing aircraft consistent with movement limits adopted elsewhere in NZ[2]. In order to protect sleep at affected sensitive sites during night time hours I have additionally recommended controls for sleep protection reasons on movements taking place during 'night time' (defined in the PDP as 10pm to 7am the next day) where existing sensitive receiver sites are located within 1,000m of the airstrip.

[2] As below, Queenstown Lakes District Plan (QLDP) rules relating to use of informal airports (Rules 21.10.2 and 21.10.3 in particular).

In reality, I do not expect compliance with noise limits during night time to be a frequently applied noise control because, as mentioned in the footnote on page 1 of the WW Letter, *"….the vast majority, if not all, of the activity we are concerned about would occur between 7am and 10pm*".

3. Guidance From Queenstown Lakes District Plan

As requested, I have reviewed Queenstown Lakes District Plan (QLDP) rules regulating the use of informal airports (Rules 21.10.2 and 21.10.3). I note the term "informal airport" is defined in the QLDP as any defined area of land or water intended or designed to be used for the landing, departure movement of aircraft but specifically excludes the designated aerodromes or airports. I consider this adequately encapsulates the rural sites that could be used for non-commercial small, fixed-wing aircraft movements in the Timaru district, for which noise controls are currently being considered.

I also note QLDP Policy 21.2.11.1 which seeks to provide for informal airports as an appropriate activity within the Rural Zone "*provided the informal airport is located, operated and managed to maintain the surrounding rural amenity*" which I also consider has similarities in approach to policies of the Proposed Timaru District Plan applying to the GRUZ.

I summarise QLDP Rules 21.10.2 and 21.10.3 which provide for movements of small, non-commercial light aircraft at 'informal airports' as permitted activities in the Rural Zone provided their use complies with;

- Rule 21.10.2 - Not more than two landings and two take-offs take place per day; five landings and five take-offs take place per week or twelve landings and twelve take-offs take place per month.
- Rule 21.10.3 – Aircraft 'Fly-in' Events are limited to not more than 6 events per calendar year; there is not more than 1 event per month; the AOPA[3] has notified the Council's Planning Department of the event; and Informal airports at which 'Fly-in' events take place are located within the Outstanding Natural Landscape Area.
- Neither 21.10.2 or 21.10.3 apply to Informal airports used for emergency landings, rescues, and fire-fighting activities.

I consider these provisions to be a reasonable basis for the Proposed Timaru District Plan (PDP) to enable limited movements of non-commercial fixed-wing light aircraft at informal rural airstrips in the Timaru district. However I have the following concerns with the above QLDP provisions which I describe beknow and address within the recommended wording set out in Section 4;

1. There is no limitation on the <u>size of aircraft</u> to which the rule applies nor is an exclusion applied for aircraft movements undertaken for commercial purposes. It is recommended below that the following definition be included (either within the new proposed rule or within the definitions section):

   Non-commercial small fixed-wing aircraft is an aeroplane that is not being flown for a commercial purpose and has a certified take-off weight for the aeroplane and its contents of 5,700kg or less.

2. There seems to be no recognition that noise from aircraft movements taking place during

[3] Aircraft Owners and Pilots Association of New Zealand

night time hours (especially prior to 7am) could generate increased adverse effects at sensitive receiver sites, compared to daytime aircraft movements which occur during a less noise-sensitive time of day[4]. World Health Organisation (WHO) guidelines on environmental noise (e.g. WHO Night Noise Guidelines For Europe (2009) and EU Noise Directive (2002/49/EC)) recognise noise limits need to be set at lower limits during night time hours to adequately protect sleep and human health. This concept is applied within the PDP permitted noise standards in NOISE-S2 (Table 24 – Noise Performance Standards) and within the generic recommendations for noise rules contained within NZS6802:2008. My recommendations below are based on allowing night time movements within the proposed rule, but only where noise emissions from night time landings or take-offs comply with the permitted activity night time noise standard Noise-S2 Table – 24 (45 dB LAeq (15 min) and 70 dB LAFmax). Aircraft noise events complying with these limits would adequately protect against adverse night time noise effects in my opinion.

My recommendations below for limited numbers of non-commercial fixed-wing aircraft movements at informal airstrips in rural areas of the Timaru district are based on a similar provisions in the Queenstown Lakes Proposed District Plan (QLDP) which I consider suitably balances benefits of enabling non-commercial fixed-wing aircraft movements at informal airstrips in GRUZ while controlling noise effects of these movements in a manner that accords, in my opinion, with the duty Council has to manage the effects of noise and the mitigation of its effects in the Timaru district under RMA s.31(1)(d).

4. Remote Informal Airstrips

As requested, I have specifically examined whether it is reasonable control aircraft movement for noise effects reasons for situations where an informal airstrip is located at sites remote from any neighbours or sensitive receiver sites.

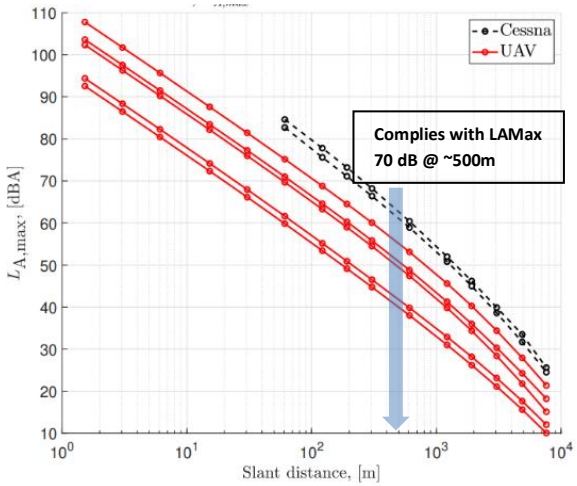
To assess noise effects for receivers located within a conceptual 'perimeter' of noise effects surrounding remote informal airstrips, it is necessary to consider compliance with the more stringent night time noise controls for the zone set out in NOISE-S2 which is a relevant consideration, specifically the single event LMax noise limit of 70 dB applying at sensitive receiver sites as set out in Table 24 of the PDP. For night time noise assessment the relevant assessment standard (NZS6802:2008 *Acoustics – Environmental Noise*) recommends potential night time sleep disturbance be assessed on a LMax 'single event' basis in addition to the night time LAeq noise limit.

The assessment of 'reasonable noise' from a light aircraft movement has been based on the single event noise emission levels of a Cessna C172 which is a small, light aircraft with a take-off weight of (MTOW) 1,200 kg[5]. Specifically, this data describes C172 take-off noise levels in terms of 'noise power

[4] I understand most pilots are authorised to fly during 'daytime' hours which, according to CAA rules, is defined as the time between the beginning of morning civil twilight and the end of evening civil twilight. At almost all times of the year (except around the shortest day in winter) the beginning of morning civil twilight occurs prior to 7am. This is within night time as defined under the PDP. There is a likelihood movements of non-commercial fixed-wing aircraft at informal airstrips in GRUZ in the Timaru District may not consider aircraft take-offs after morning civil twilight but prior to 7am as a night time movement. This indicates clear communication is needed in defining time-of day controls for aircraft movements.

[5] C172 aircraft noise levels extracted from Figure 18 (Comparison to Cessna 172 departure NPD curves) in *Measurement and Modelling of Noise-Power-Distance Curves of a Fixed-Wing* UAV. 10.2514/6.2022-3037 by Amargianitakis, Daniel & Self, Rod & Proença, Anderson & Boyd, Cameron & Westcott, Oliver & Ferraro, Mario & Erbil, Mehmet & Entwistle, Robert. (2022).

distance' curves which enables LMax and LAeq sound levels noise levels to be assessed across a range of receiver distances from the informal rural airstrip.

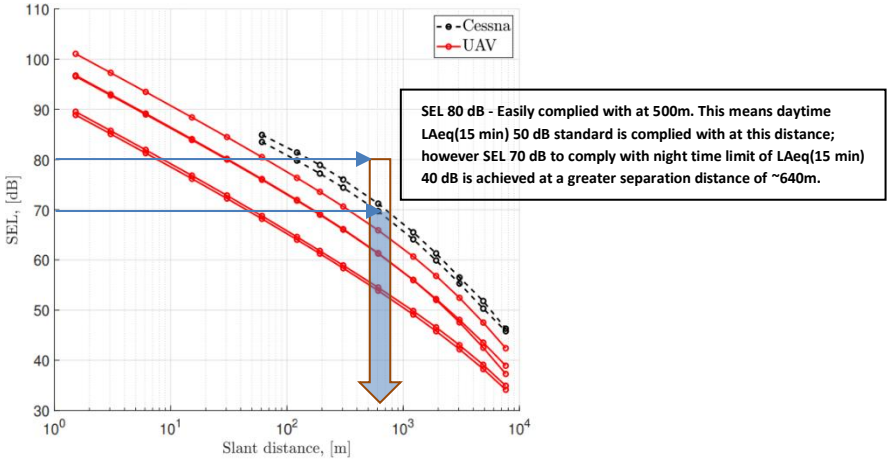


(a) $L_{A,max}$

Figure 1 Noise-Power Distance LAMax Curve for Cessna C172 light aircraft.
Ref. Figure 18 of *Measurement and Modelling of Noise-Power-Distance Curves of a Fixed-Wing* UAV. 10.2514/6.2022-3037 by Amargianitakis, *et al*.

Using LAMax levels for one C172 departure, as shown in Figure 1, it appears this would comply with a noise limit of 70 dB LAMax at 500m but would result in higher levels for this noise event received at closer distances. LAMax noise levels for the C172 received beyond 1,000m appear acceptable (60 dB). This supports the recommendations below which recommends night time light aircraft movements (including before 7am) be permitted where the airstrip is located >1,000m from a noise sensitive receiver site.

Regarding LAeq noise levels derived from the noise-power-distance curve for the C172 take-off, it is necessary to convert the published 'SEL' single event noise level into units LAeq(15 min) which enables comparisons can be made with Table 24 LAeq noise limits. The Cessna noise-power curve for the measured SEL of one take-off is shown in Figure 2.



(b) SEL

Figure 2 Noise-Power Distance SEL Curve for Cessna C172 light aircraft.
Ref. Figure 18 of *Measurement and Modelling of Noise-Power-Distance Curves of a Fixed-Wing* UAV. 10.2514/6.2022-3037 by Amargianitakis, *et al*.

The appropriate and accepted logarithmic conversion essentially takes the 1 second 'sound energy' of

the SEL reading and calculates the result as if this energy were spread over 15 minutes of time. Based on this conversion, one C172 take-off 'event' per 15 minutes received at levels up to SEL 70 dB would comply with LAeq(15 min) 40 dB during night time. In fact, Figure 2 shows SEL 70 dB is achieved at a distance of around 640m from the airstrip, meaning noise due to a single C172 aircraft take-off received at 500m would not be able to comply with 40 dB LAeq(15 min). This noise limit is able to be achieved at a distance of 640m from the informal rural airstrip.

For daytime, compliance with the 50 dB LAeq(15 min) daytime noise limit is achieved at 500m from the informal rural airstrip for a single take-off event per-15 minutes, provided the noise event level received at the sensitive receiver does not exceed SEL 80 dB. Figure 2 shows a C172 take-off would generate SEL 80 dB at around 200m and thus confirms, at distances 500m or more, daytime departure once per 15 minutes would comply with the 50 dB LAeq(15 min) daytime limit[6].

For night time, Figure 2 shows compliance with the 40 dB LAeq(15 min) night time limit is achieved for one Cessna C172 take-off received at a distance greater than 500m from the airstrip (actually around 640m from the airstrip. Figure 1 shows the received LAMax noise level measured at a distance of 500m would likely just comply with LAMax 70 dB. Having regard to this finding, plus the 640m distance at which the night time 40 dB LAeq(15 min) limit is complied with, coupled with potentially higher LAMax and LAeq(15 min) noise emissions associated with larger, noisier aircraft up to 5,700 MTOW, the above findings support avoiding night time aircraft movements by small, non-commercial light aircraft at informal airstrips in the GRUZ where sensitive receiver sites are located within 1,000m of the airstrip.

The noise-power-distance graphs shown in Figure 1 and Figure 2 above indicate there should be no concerns regarding noise effects (including night time effects) associated with take-off of small, typical non-commercial light aircraft received at sensitive receiver sites located at distances of >1,000m from the airstrip.

5. Recommended wording

Having reviewed the recommendations of the relevant NZ Standards, considered similar existing provisions of the QLDP and examined noise levels associated with take-off of a common type of a small light aircraft, I have come to the conclusion that movements of small, non-commercial fixed-wing aircraft at informal airstrips in the General Rural Zone (GRUZ) can be exempted from the permitted noise performance standards provided some basic controls are put in place. For remote rural airstrips, no controls are considered necessary where sensitive receivers are located >1,000m from the airstrip. Noise effects generated by aircraft using informal airstrips located closer to noise sensitive receivers would generally be acceptable provided they are limited in number per day / week / month and further limited in terms of restricting use during night time.

In considering noise control options, I have not recommended reliance on compliance with the permitted activity NOISE-S2 daytime noise standard (50 dB LAeq(15 min)) as a means of managing daytime noise for movements by non-commercial fixed wing light aircraft at informal airstrips in the GRUZ. This is because, should one aircraft movement comply with the 50 dB LAeq 15 minute noise

[6] While movements of a typical light aircraft may be shown to be able to comply with the 50 dB LAeq(15 min) permitted activity noise limit at distances of less than 500m, see Section 5 discusses possible worst case adverse noise effects that could arise should light aircraft activity be regulated simply based on meeting the district plan permitted activity daytime noise standard.

limit at a relevant receiver location, this would automatically mean compliance could be achieved for each 15 minute daytime period meaning potential compliance would be achieved for up to 60 aircraft movements during daytime hours each day (4 per hour, for each hour between 7am and 10pm) with each single event being received at a compliant noise level of up to 65 to 70 dB for short periods of time during each landing or take-off event. I consider this noise effect for receivers exposed up to 60 such events each and every day to be unreasonable and a potential noise nuisance within rural areas. Although sensitive receiver sites may receive noise up to LAeq(15 min) 50 dB during daytime from permitted activities in the GRUZ, I consider noise from private, informal airstrips differs is a special case as this noise is concentrated within the vicinity of the airstrip in a certain way which I consider differs significantly from typical noise-making rural activities (such as farm machinery or on-site vehicle movements) which operate at different areas of a farm at different times and does not generally result in the concentration of noise effects within a confined area, such as in the vicinity of informal rural airstrips.

Further to this point, I do not accept that allowing up to 60 movements per day is reasonably necessary as this level of use does not accord with my understanding of the likely level of use (and therefore noise effects) typical of informal airstrips in rural areas as described by submitters. I therefore recommend controls based on a reasonably flexible but limited number of movements per day / week / month consistent with that adopted for informal airstrips in rural areas in other districts.

I have determined, as a starting point, it is reasonable to base recommended noise controls on restricting the number of movements as per QLDP Rules 21.10.2 and 21.10.3 (as described above in Section 3, page 3 above) where the airstrip lies within proximal distance to informal airstrips. I have identified some concerns with this approach which are addressed in the recommendations below. My concerns relate to;

a) I consider a special case needs to be made to deal with noise due to night time aircraft movements on informal airstrips (10pm to 7am) which I understand is not usual practice and thus would occur only occasionally. Noise from these movements taking place during the noise-sensitive night time period should, in my view, not be exempted. Rather I consider 'night time' movements need to be explicitly controlled given that early morning departures (prior to 7am) are sometimes undertaken by pilots licensed to undertake flying during what the aviation community may consider 'normal' daytime hours.

b) Noise effects of the exemption would, in my view, remain acceptable during 'Fly-in' type activities provided these are limited in number and subject to the same limitations set out in QLDP Rule 21.10.3.

c) I consider that, for noise control reasons, the proposed exemption or performance standard for informal rural airstrips needs to be clear about the size and nature of the aircraft movements to be enabled at these airstrips. The wording of the exemption should, in my view, be informed by the definition set out above at item (1) on page 4 above regarding the maximum size of aircraft and the non-commercial purpose of flight (which I understand has been proposed by submitters).

Based on the above (and without limiting possible amendments to my recommendations which may have the same or similar effect) I recommend PDP provisions to enable movements of small, non-commercial fixed-wing aircraft at informal airstrips in the GRUZ as a permitted activity providing specific controls apply within the PDP to manage potential noise effects, including

during night time.

I recommend the PDP provisions follow the concepts and principles set out below in order to manage potential noise effects:

Noise from movements of fixed-winged light aircraft movements for non-commercial purposes at informal airstrips in the General Rural Zone (GRUZ) are exempted from the permitted activity noise performance standards of NOISE-S2 provided the following are complied with;

A. *Number of Aircraft Movements*
   1) *Subject to clauses B, C and D, where an informal airstrip is located in the GRUZ within 500m of any existing sensitive receiver site (such as rural dwellings) or sites zoned for residential use, movements of fixed-winged light aircraft taking place for non-commercial purposes shall be managed to comply with each of the following limits;*
      i. *Not more than two landings and two take-offs at the informal airstrip per calendar day;*
      ii. *Not more than five landings and five take-offs at the informal airstrip per calendar week;*
      iii. *Not more than twelve landings and twelve take-offs at the informal airstrip per calendar month.*
   2) *None of the above movement limitations apply for aircraft movements at informal airstrips located in the GRUZ at locations 500m or more from any existing sensitive receiver site (such as a rural dwelling) or sites zoned for residential use.*

B. *Night Time Aircraft Movements*
   1) *Where informal airstrips in the GRUZ are located within 1,000m of any existing sensitive receiver site (such as a rural dwelling) or a site zoned for residential purposes, use of the airstrip by non-commercial fixed-wing light aircraft between the hours of 10pm and 7am is not a permitted activity.*
   2) *Night time movement restrictions between 10pm and 7am do not apply where an informal airstrips is located 1,000m or more from any existing sensitive receiver site in the GRUZ (such as rural dwellings) or sites zoned for residential use.*

C. *Aircraft 'Fly-in' Events*
   Aircraft 'Fly-in' events are limited to not more than 6 events per calendar year per informal airstrip providing;
   1) *No more than 1 event per month; and*
   2) *The AOPA has notified the council's planning department of the event.*

D. *Application*
   1) *These provisions apply to the use of informal airstrips in the GRUZ for the landing and taking off of fixed-wing light aircraft for a non-commercial purpose and which has a certified take-off weight for the aeroplane and its contents of 5,700kg or less.*
   2) *None of the above restrictions apply to aircraft movements at informal airstrips used for emergency landings, rescues and fire-fighting.*

Please advise if you have any queries or further questions in relation to the above.

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