

**BEFORE THE HEARINGS PANEL
FOR THE QUEENSTOWN LAKES PROPOSED DISTRICT PLAN**

IN THE MATTER of the Resource
Management Act 1991

AND

IN THE MATTER Hearing Stream 08
- Business Zones

**STATEMENT OF EVIDENCE OF DR STEPHEN GORDON CHILES
ON BEHALF OF QUEENSTOWN LAKES DISTRICT COUNCIL**

ACOUSTICS ENGINEER

2 November 2016

 **Simpson Grierson**
Barristers & Solicitors

J G A Winchester / S J Scott
Telephone: +64-3-968 4018
Facsimile: +64-3-379 5023
Email: sarah.scott@simpsongrierson.com
PO Box 874
SOLICITORS
CHRISTCHURCH 8140

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1. INTRODUCTION

- 1.1 My name is Dr Stephen Gordon Chiles.
- 1.2 I am an acoustics engineer and independent commissioner, self-employed by my company Chiles Ltd. I am a visiting academic at the University of Canterbury Acoustics Research Group.
- 1.3 I have a Doctorate of Philosophy in Acoustics from the University of Bath, and a Bachelor of Engineering in Electroacoustics from the University of Salford, UK. I am a Chartered Professional Engineer, Fellow of the UK Institute of Acoustics and Member of the Resource Management Law Association.
- 1.4 I have been practising in acoustics since 1996, as a research officer at the University of Bath, as an acoustics specialist at the NZ Transport Agency, and as a consultant for the international firms Arup, WSP, and URS and for the specialist firms Marshall Day Acoustics and Fleming & Barron. I have previously been responsible for acoustics assessments and design for numerous different activities including infrastructure, industrial, commercial, recreational and residential developments. I routinely work for central and local government, companies and individual residents.
- 1.5 I have worked extensively on acoustics issues in the Queenstown Lakes District (**District**) over many years. I have been involved with noise issues in the Queenstown and Wanaka Town Centres for over a decade, primarily with respect to disturbance or potential disturbance from various restaurants and bars at nearby residential and visitor accommodation. I provided advice to the Queenstown Lakes District Council (**QLDC**) on these issues in relation to Plan Change 42 (**PC42**) to the Operative District Plan (**ODP**), which was later withdrawn when QLDC decided to address town centre noise issues through the Proposed District Plan (**PDP**). I then provided advice to the QLDC during the preparation of the town centre noise rules for the PDP. In parallel, I also provided evidence on Plan Change 50 (**PC50**) to the ODP relating to the town centre extension.
- 1.6 I am convenor of the New Zealand industry reference group for the international standards committee ISO TC43 (acoustics), which is responsible for approximately 200 published "ISO" standards relating to acoustics. I was

Chair of the 2012 Standards New Zealand acoustics standards review group; Chair for the 2010 wind farm noise standard revision (NZS 6808); and a member for the 2008 general environmental noise standards revision (NZS 6801 and NZS 6802).

- 1.7** This is the fourth statement of evidence I have prepared on behalf of QLDC for Stage 1 of the PDP. The first was in the Rural Hearing, related specifically to informal airports, dated 6 April 2016;¹ the second was in the District Wide Hearing, primarily related to the Noise Chapter, dated 17 August 2016;² and the third was in the Residential Hearing, relating to acoustic treatment for new houses in residential zones, dated 14 September 2016.³ I have now been engaged by QLDC to provide acoustics evidence in relation to the Queenstown and Wanaka Town Centre Chapters 12 and 13 respectively, and the Local Shopping Centre Chapter 15.
- 1.8** With respect to this evidence where I discuss the Local Shopping Centre Zone in Frankton, I declare that I was an independent commissioner for the QLDC for Plan Change 35 (**PC35**) to the ODP relating to Queenstown Airport.
- 1.9** Although this is a Council hearing, I confirm that I have read the Code of Conduct for Expert Witnesses contained in Environment Court Practice Note 2014 and that I agree to comply with it. 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.
- 1.10** The key documents that I have used, or referred to, in forming my view while preparing this brief of evidence are:
- (a) QLDC Operative District Plan (**ODP**) including Plan Changes 35 and 50 (**PC35 and PC50**) to the ODP;
 - (b) QLDC Proposed District Plan (**PDP**), in particular Chapters 12, 13 and 15;

¹ <http://www.qldc.govt.nz/assets/Uploads/Planning/District-Plan/Hearings-Page/Hearing-Stream-2/Section-42-A-Reports/Expert-Evidence/QLDC-02-Rural-Stephen-Chiles-Evidence.pdf>

² <http://www.qldc.govt.nz/assets/Uploads/Planning/District-Plan/Hearings-Page/Hearing-Stream-5/Section-42A-Reports-and-Council-Expert-Evidence/QLDC-05-District-Wide-Stephen-Gordon-Chiles-Evidence-.pdf>

³ <http://www.qldc.govt.nz/assets/Uploads/Planning/District-Plan/Hearings-Page/Hearing-Stream-6/Section-42A-Reports-and-Council-Expert-Evidence/Council-Expert-Evidence/QLDC-06-Residential-Stephen-Chiles-Evidence-28356410-v-1.pdf>

- (c) URS New Zealand, Queenstown Town Centre Noise Rules Review, 29 April 2009 (**2009 Report**) at **Appendix A**;
- (d) URS New Zealand, Proposed Plan Change 42 Queenstown Town Centre, 23 July 2011 (**2011 Report**) at **Appendix B**;
- (e) an advice letter from Chiles Limited to Matthew Paetz of QLDC relating to Queenstown town centre noise contours, dated 8 July 2014 (**First 2014 Letter**) at **Appendix C**;
- (f) an advice letter from Chiles Limited to Matthew Paetz of QLDC relating to Queenstown town centre entertainment precinct, dated 26 August 2014 (**Second 2014 Letter**) at **Appendix D**;
- (g) an advice letter from Chiles Limited to Amy Bowbyes of QLDC relating to Wanaka town centre entertainment precinct, dated 26 August 2014 (**Third 2014 Letter**) at **Appendix E**; and
- (h) New Zealand Standard NZS 6802:2008 *Acoustics – Environmental noise* (**NZS 6802**).

2. EXECUTIVE SUMMARY

2.1 The key findings from my evidence are that:

- (a) the town centre noise limits in the ODP are more stringent than most other districts in New Zealand and do not allow for the degree of night entertainment enabled by policies in the PDP. The PDP sets more lenient noise limits that will enable night entertainment. This is likely to compromise residential amenity in the town centres, and to a lesser extent in nearby residential zones. I am not aware of a practicable alternative to avoid compromising either noisy or noise sensitive activities in the town centres. However, in my opinion the proposed compromise of residential amenity in the town centre and nearby residential zones is reasonable and should be acceptable in these environments;
- (b) the PDP noise limits are consistent with other districts, but have been structured with additional provisions to address specific issues that have arisen in Queenstown and Wanaka. I consider the PDP noise limits to be robust and practical. Bar and restaurant activity will be enabled to a greater extent than under the ODP, but will still need to

be subject to standard noise management practices, such as limiting sound system volumes;

- (c) an Entertainment Precinct is proposed in both Queenstown and Wanaka. The purpose of the precinct is to allow for fewer restrictions on some bar and restaurant activities in an area that has been selected to minimise effects in residential zones, and to avoid conflict with existing residential and visitor accommodation in the town centres as far as practicable. The Entertainment Precincts will serve as a guide for future developments in the town centres as to the most appropriate locations for both noisy and noise sensitive activities.
- (d) submitters have sought for the Entertainment Precinct in Queenstown to cover additional areas, but in my opinion extension to those areas would give rise to additional adverse effects. Other submissions seek to delete the Entertainment Precincts in Queenstown and Wanaka. In terms of providing for a range of activities and managing noise effects, I consider the Entertainment Precincts serve a useful function that in my experience would not be provided by assessing individual bars on a case-by-case basis as occurs under the ODP;
- (e) while the same general approach has been used for Queenstown and Wanaka, for Wanaka there is not a transition sub-zone within the town centre. To the south of Brownston Street there is a Town Centre Transition Overlay, which serves a similar function. There is no such control to the north of Ardmore Street and I therefore recommend more restrictive noise limits in that area;
- (f) the notified rules require all new buildings for noise sensitive activities in the Frankton Local Shopping Centre Zone to have a high degree of sound insulation. These requirements are significantly more stringent than sound insulation requirements for aircraft noise under PC35, and therefore I consider those do not need to be separately specified for this zone; and
- (g) various submitters have raised other issues with the PDP noise limits, and I have addressed these in my evidence.

3. QUEENSTOWN TOWN CENTRE – ODP NOISE LIMITS

- 3.1** Imperium Group, Grand Lakes Management, Peter Fleming and Others, and Friends of Wakatipu Gardens and Reserves (#151, #302, #503 and #506) sought for the noise limits in the ODP to be retained in full or in part. The PDP sets more lenient noise limits than the ODP for the Queenstown Town Centre, particularly in the new Entertainment Precinct.
- 3.2** The 2009 and 2011 Reports set out issues with the noise limits in the ODP. A key issue is that the ODP noise limits do not facilitate many restaurant and bar activities enabled in the town centre by policies in the PDP, particularly at night. In the last two years I have been engaged by QLDC to comment on ten separate resource consent applications for bars and restaurants in the town centres.⁴ Of these applications, half sought to exceed the noise limits, and although the other half sought to comply with the noise limits, they had to be subject to extensive noise assessment and controls in consent conditions.
- 3.3** To address these issues, the PDP sets more lenient noise limits that will enable noisier night entertainment activities. In my view these more lenient noise limits will result in adverse effects on residential amenity for noise sensitive activities both in the Queenstown Town Centre zone and in adjacent residential zones. These effects are discussed in the 2011 Report, and contours indicating the general extent sound levels emanating from the town centre are included in the Second 2014 Letter. In my opinion, given the nature of the existing environment (i.e. a busy town centre with significant activity at night), the adverse effects on noise sensitive activities should be acceptable for most people. With appropriate sound insulation to buildings in the Town Centre Zone, as required by notified Rules 12.5.12 and 12.5.13, sound levels could still comply with World Health Organisation guidance for avoidance of sleep disturbance. Sound levels should also be at acceptable levels in surrounding residential zones, due to the buffer provided by the Town Centre Transition Sub-zone.
- 3.4** I am not aware of a practicable technical solution that would enable noisier activities while at the same time avoiding adverse effects on existing noise sensitive activities. New acoustic treatment rules in the PDP will partly

⁴ RM140662, RM140815, RM140850, RM140901, RM150345, RM150824, RM150908, RM160107, RM160593, RM160604.

address adverse effects for new noise sensitive activities, but there remains the need to balance and prioritise acoustically mismatched activities in the town centre. In my opinion the ODP does not address this tension between activities, whereas the PDP acknowledges the issues and sets a clear prioritisation.

3.5 Notified Policies 12.2.1.3, 12.2.1.4, 12.2.3.3 and 12.2.3.4 of the PDP all seek to enable bar and restaurant activity in the town centre, at the expense of compromised residential amenity in the town centre, and also to a lesser extent in nearby residential zones. I consider the noise limits in notified Rule 12.5.11 of the PDP would give effect to these policies, whereas the noise limits in the ODP would not, as they do not enable activities as described in the policies.

3.6 For context, Section 4 of the 2009 Report includes a comparison of the noise limits in the ODP to rules in town centres in other districts. While appropriate noise limits will depend on the particular characteristics of each town centre, it is notable that the night-time noise limits in the ODP are amongst the most stringent nationally.

4. QUEENSTOWN TOWN CENTRE – PDP NOISE LIMITS

4.1 The Queenstown Chamber of Commerce (#774) submitted that it should be confirmed that the noise limits in the PDP are consistent with other resort towns. The submission also notes it is important the noise limits are sufficient to appropriately provide for night entertainment. As discussed above, noise limits from other New Zealand towns are set out in Section 4 of the 2009 Report. In this context the noise limits in the PDP as notified are consistent with other towns seeking to enable night entertainment. However, I note that in the town centre, outside the Entertainment Precinct, the PDP noise limits remain relatively stringent for some restaurants and bars and would still constrain activity at night.

4.2 Section 5 of the 2011 Report includes details of activities that could be enabled by different noise limits, including those in the PDP as notified. From Table 5-5 of that report it can be seen the PDP noise limits would enable a range of bar and restaurant activities without needing unreasonable noise mitigation measures. There would still need to be some controls and

limitations to comply with the PDP noise limits as detailed in the report, particularly for venues wishing to play loud music and for premises outside the Entertainment Precinct. As I have noted above, with the PDP noise limits, sound levels in new buildings that are subject to the insulation requirements in notified Rules 12.5.12 and 12.5.13, would comply with World Health Organisation guidance for avoidance of sleep disturbance.

- 4.3** Peter Fleming and Others (#599) submitted that notified Rule 12.5.11 of the PDP is completely unworkable. I disagree with this submission. The 2009 and 2011 Reports set out noise controls in other towns, and it can be seen that the approach in the PDP is generally consistent with those other approaches. The noise limits in the PDP are specified as being measured and assessed using the current New Zealand Standards, which I consider represents good practice.
- 4.4** Notified Rule 12.5.11 explicitly addresses several issues to make application of the noise limits more practical, in the light of experience with the ODP. For example, the outdoor loudspeaker noise limit in notified Rule 12.5.11.4 provides a simple practical control that can be readily verified by measurements on site at the same time as there being people in the vicinity. Also, the increase in noise limits allows them to be more robustly monitored in the presence of other town centre noise, such as from people and vehicles on public streets. While the PDP does introduce some complexity with separate noise limits for people and music, this allows identified issues to be specifically addressed without unnecessarily increasing noise limits for all sources, including sources such as building services equipment which can practically comply with the existing noise limits.
- 4.5** In preparing my evidence I have noticed that the drafting of notified Rule 12.5.11 does not give effect to the structure of noise limits originally intended. Notified Rules 12.5.11.1 and 12.5.11.2 correctly apply to all of the Town Centre Zone, explicitly including the Town Centre Transition Sub-zone. Notified Rules 12.5.11.3, 12.5.11.4 and 12.5.11.5 apply "within the Town Centre Zone only". From my involvement in the development of these rules, I am aware the intention was for these rules not to apply within the Town Centre Transition Sub-zone, so that a buffer was created between activities with more lenient noise limits and surrounding residential zones. However, I understand that as the Transition Sub-zone is part of the Town Centre Zone, the drafting

does not achieve that aim. I consider that to appropriately protect the residential zones, notified Rules 12.5.11.3, 12.5.11.4 and 12.5.11.5 should not apply to activities in the Town Centre Transition Sub-zone. There may need to be consequential amendments to clarify the exclusion of these sources in notified Rules 12.5.11.1 and 12.5.11.2.

- 4.6** Jay Berriman (#217) submitted that the L_{AFmax} noise limit in notified Rule 12.5.11.1.c should not have increased by 5 dB from the equivalent rule in the ODP. This noise limit applies to the loudest eighth of a second during a measurement and corresponds to events such as door slams. If this noise limit is set too low, then it becomes unrealistic for any activity to comply. Therefore, for all zones in Chapter 36 Noise (including residential zones) the value has been increased from the 70 dB L_{AFmax} in the ODP to 75 dB L_{AFmax} in the PDP, which is now consistent with the guideline value from NZS 6802. This same increase has also been made in Chapter 12. I consider this to be an appropriate noise limit and I consider any lower value to be impractical.

5. QUEENSTOWN TOWN CENTRE – PUBLIC EVENTS

- 5.1** The Council's recommendations in the section 42A report for Chapter 35 of the PDP exempts temporary events from the daytime town centre noise limits in notified Rule 12.5.11, when they fall within the Permitted Activity framework contained within Chapter 35 Temporary Activities and Relocated Buildings. The definition of "temporary events" covers numerous activities of a public nature, such as festivals and sporting events. Section 8 of the 2011 Report gives details of typical public events and discusses their associated sound sources. On account of the nature of public events, it is generally not practicable for them to comply with the noise limits in either the ODP or PDP. However, in my opinion most people would be likely to find the temporary noise disturbance of a limited number of public event occurrences each year to be acceptable. I consider the types of requirements in Chapter 35 of the PDP, relating to the timing, frequency and duration of events, to provide more efficient and practical controls than noise limits, which would be more cumbersome to assess, monitor and enforce.

6. QUEENSTOWN TOWN CENTRE – ACTIVITY STATUS

- 6.1** Imperium Group (#151) submitted that bars and restaurants seeking to exceed the ODP noise limits (or a slight increase to them) should be assessed on a case-by-case basis. This would essentially retain the status quo, with the issues set out in Section 3 of the 2009 Report unresolved. Currently, under the ODP, the same noise issues are considered through numerous resource consent applications for bars and restaurants. For most applications night-time noise limits will generally be exceeded if doors/windows are open, or if there is moderate or loud amplified music proposed, or if there are people or loudspeakers outside. There are nuances in the physical relationship between individual proposed bar/restaurant activity and their nearest residential neighbours. However, in my experience, the same noise controls are found to be appropriate for most of the town centre through the resource consent process.
- 6.2** The nature of restaurant and bar activity and the associated effects are well understood. In my opinion, the proposed noise limits in the Queenstown Town Centre Chapter have been set at a level that will avoid the need for individual noise assessments for a significant proportion of the bar and restaurant activity that exists and is anticipated in the Queenstown town centre. This permitted noise from bars and restaurants will have an adverse effect on residential amenity, which in practice I consider to be largely unavoidable. The effect on residential amenity is acknowledged in notified Policies 12.2.1.4 and 12.2.3.4 of the PDP. In my opinion, if the adverse effects of noise on residential amenity was assessed and sought to be avoided on a case by case basis (rather than to minimise or mitigate the effect in line with notified Policy 12.2.3.3) then it would inevitably result in the status quo with minimal new outdoor activity allowed at night after 2200h. This outcome would be inconsistent with notified Policies 12.2.1.3 and 12.2.3.3.

7. QUEENSTOWN TOWN CENTRE – OUTDOOR LOUDSPEAKERS

- 7.1** Evan Jenkins (#474) submitted that outdoor loudspeakers should be banned. In terms of noise effects, there is negligible difference between music heard from a loudspeaker inside a building with sound travelling through open doors/windows and music heard from a loudspeaker outside a building. The

noise effect is mainly dependent on the sound level of the music at the receiver, which is controlled for all loudspeakers by notified Rule 12.5.11.3.

7.2 Under the ODP, to maintain compliance with the relatively stringent night-time noise limit, many bars are subject to resource consent conditions requiring doors and windows to be kept closed after 2200h and for there to be no outdoor loudspeakers. To give effect to notified Policies 12.2.1.3 and 12.2.3.3 of the PDP, the noise limits in notified Rule 12.5.11.3 have been deliberately set to allow a relaxation of these controls. I expect that under the recommended Queenstown Town Centre Chapter provisions, music from bars will be clearly audible from within the town centre during the day and at night.

7.3 I note that notified Rule 12.5.11.5 sets an additional noise limit close to outdoor loudspeakers, which applies in addition to the music noise limit in notified Rule 12.5.11.3. The extra noise limit in notified Rule 12.5.11.5 restrains outdoor loudspeakers to background music only, and provides a quick and practical compliance check.

8. QUEENSTOWN TOWN CENTRE – VESSELS

8.1 Real Journeys (#621) submitted that vessels carrying out navigational procedures should be exempt from notified Rule 12.5.11 of the PDP. There are two aspects of sound associated with vessels:

- (a) the engine, exhaust and any sound from the movement of water caused by the vessel; and
- (b) sound from people and activity on the vessel such as music or commentary.

8.2 For the second of these aspects, I consider that sound from people, music and other activity on board vessels in the Town Centre Zone should be subject to the normal zone noise limits in notified Rule 12.5.11 of the PDP, including the requirement in 12.5.11.2 to comply with noise limits for other zones where the sound is received, such as residential zones around Queenstown Bay.

8.3 For sound from the engine, exhaust and water displacement by vessels, reply clause 36.3.2.10 and Rule 36.5.14 in the recommended Noise chapter of the

PDP⁵ includes a specific noise limit for commercial motorised craft on the lake and exempts them from other zone noise limits. I consider that recommended noise limit for motorised craft in Chapter 36 Noise to be appropriate. Ideally, Chapter 12 would require compliance with the Chapter 36 noise limit for commercial motorised craft operating within the Town Centre Zone, which includes Queenstown Bay. However, alternatively, sound from commercial motorised craft could simply be excluded from noise limits in Chapter 12, as commercial motorised craft operating in Queenstown Bay also operate in other parts of the lake outside the Town Centre Zone, and would therefore have to comply with the Chapter 36 noise limit regardless. If anything, vessels should be quieter when operating in Queenstown Bay due to the reduced speed of operation required in this area of the lake.

9. QUEENSTOWN TOWN CENTRE – ACOUSTIC TREATMENT

- 9.1** Grand Lakes Management (#302) submitted that it is inequitable for receivers of noise to bear the cost of acoustic treatment, required for new residential and visitor accommodation under notified Rules 12.5.12 and 12.5.13, applying outside and inside the Entertainment Precinct respectively. Imperium Group (#151) submitted that notified Rule 12.5.13 should be deleted. These rules require both mechanical ventilation/cooling and enhanced sound insulation of façades. To meet the façade sound insulation requirements both inside and outside the Entertainment Precinct, glazing generally needs to be a high performance secondary (or triple) glazed system with a large cavity of approximately 100 mm between panes of glass. This can be achieved by installing a second window inside the main window.
- 9.2** Section 5 of the 2011 Report explains the need for this sound insulation to result in internal sound levels that should provide reasonable protection from sleep disturbance. I consider the acoustic treatment requirements to be essential to give effect to notified Policies 12.2.1.3, 12.2.1.4, 12.2.3.3 and 12.2.3.4 of the PDP. Even if noise limits were not increased, it would still be appropriate to include an acoustic treatment requirement, albeit to a lesser specification.

⁵ Appendix 1 to Ruth Evan's Right of Reply.

10. QUEENSTOWN TOWN CENTRE – ENTERTAINMENT PRECINCT

- 10.1** There are numerous submissions in support of and in opposition to the proposed Entertainment Precinct. The rationale for the Entertainment Precinct is set out in the 2009 and 2011 Reports. A key factor is to allow for fewer restrictions on some bar and restaurant activity in an area selected to result in the fewest adverse effects on residential zones around the town centre. Defining an Entertainment Precinct provides guidance for where future new noisy and noise sensitive activities would be most appropriately located in the town centre, rather than the current situation with no guidance resulting in both types of activities being extensively intermingled.
- 10.2** As well as considerations with respect to residential zones, the location of the Entertainment Precinct has been selected to minimise effects on existing residential and visitor accommodation within the Town Centre Zone where practicable. However, due to the distribution of visitor accommodation throughout the zone there are some unavoidable effects. Notably, Eichardt's Private Hotel (**Eichardt's**) at 2 Marine Parade is adjacent to the proposed Entertainment Precinct. The nearest parts of Eichardt's facing the Entertainment Precinct are occupied by retail units on the ground floor, which are not considered noise sensitive and are unlikely to be occupied at night. The first floor hotel spaces appear to already have sound insulating glazing, and are currently exposed to sound from people in The Mall at night. From my past experience observing activity in this area at night, this activity would often generate sound at levels similar to or higher than those permitted by the PDP noise limits. As Eichardt's is not in the Entertainment Precinct itself, the more stringent noise limits in notified Rules 12.5.11.3.b and 12.5.11.4.b apply to any sound from within the Entertainment Precinct received at Eichardt's.
- 10.3** I consider the Entertainment Precinct has been appropriately located to minimise noise effects in residential zones. This can be seen by comparing the three sets of noise contours in the First 2014 Letter. As I have already discussed, I consider that the noise limits that apply in the Entertainment Precinct in notified Rule 12.5.11 are practical.
- 10.4** Westwood Group, Simple Simon Suck Fizzle Soup and Gourmet Pie Company, Kopuwai Investments, Pier 19, Wai Queenstown, and Future Bars (#70, #587, #714, #777, #835, and #839) propose for Steamer Wharf to be in

an Entertainment Precinct. In my opinion, providing for more lenient Entertainment Precinct noise levels at Steamer Wharf could result in unacceptable sound levels across the nearby residential zone to the south of Lake Street at night, and a noise sensitive part of the town centre on the opposite side of Beach Street.

- 10.5** The approximate effect of increasing noise limits at Steamer Wharf can be seen by comparing the contours in the Second 2014 Letter with Scenario 2 in the First 2014 Letter. From the figure in the First 2014 letter it is evident sound levels would increase across the block between Hay, Lake, Beach and Man Streets, which contains the Crowne Plaza Hotel, and also across the adjacent residential zone on the other side of Lake Street. The block between Hay, Lake, Beach and Man Streets was rezoned to Town Centre Zone but retained residential zone noise limits under PC50 to the ODP, other than a slight change to the night hours.
- 10.6** Pog Mahones Irish Pub (#247) submitted that the Entertainment Precinct should be extended from Rees Street to Steamer Wharf. For the reasons discussed above, I consider that an Entertainment Precinct including Steamer Wharf would give rise to unacceptable noise effects. The additional area proposed in this submission would also affect existing residential and visitor accommodation fronting Beach Street including Absoloot Value (50 Beach Street), YHA (48 Shotover Street) and the apartments at 63-73 Beach Street. The increased sound levels that these buildings could be exposed to at night would be likely to give rise to unacceptable sleep disturbance effects.
- 10.7** Good Group (#544) submitted that the Entertainment Precinct should be extended to all of the Town Centre Zone excluding the Town Centre Transition Sub-Zone. The approximate effect of increasing the extent of the Entertainment Precinct can be seen by comparing the contours in the Second 2014 Letter with Scenario 2 in the First 2014 Letter. In my opinion, extending the Entertainment Precinct, as submitted by Good Group Limited, could result in unacceptable sound levels in residential zones at night. Also, the Entertainment Precinct is currently located to avoid the majority of existing visitor accommodation in the Town Centre Zone. Extending the Entertainment Precinct noise limits throughout the zone would result in numerous visitor accommodation buildings being exposed to increased sound levels that would be likely to affect a large number of people in terms of sleep disturbance.

- 10.8** Watertight Investments (#549) proposed to extend the Entertainment Precinct to include both sides of Searle Lane. Nomads visitor accommodation (5-11 Church Street) overlooks Searle Lane and if the Entertainment Precinct were extended to this area I consider that increased sound levels at Nomads would be likely to affect a large number of people in terms of sleep disturbance.
- 10.9** Ngai Tahu Property & Ngai Tahu Justice Holding (#596) proposed to extend the Entertainment Precinct to include the Pig 'n' Whistle and Historic Courthouse buildings. Queenstown Chamber of Commerce (#774) proposed to extend the Entertainment Precinct more broadly in this area around the Village Green to Stanley Street. This area was modelled as a potential entertainment precinct in the 2011 Report, although with a lower noise limit than now proposed. I understand this area was initially considered due to its reasonable separation from most existing visitor accommodation in the Town Centre Zone. However, this area is closer to the residential zone than the notified Entertainment Precinct in the PDP, and if the Entertainment Precinct were extended to include this area it would result in sound levels that would generally be unacceptable, particularly at the interface with the residential zone around Henry Street and Melbourne Street. This can be seen by comparing the contours in the Second 2014 Letter with Scenario 2 in the First 2014 Letter.
- 10.10** Shipleys AV (#53) proposed for the extents of the Entertainment Precinct to be reviewed every six months. In terms of noise effects only, the factors determining an appropriate location for the Entertainment Precinct are unlikely to change during the ten-year lifespan of the PDP. Therefore, in terms of noise effects I am not aware of any rationale for routine review of the Entertainment Precinct extents.

11. WANAKA TOWN CENTRE – ODP NOISE LIMITS

- 11.1** Like submissions on the Queenstown Town Centre, Terry Drayton, Whitney Thurlow, Wanaka on Water, and Wanaka Residents Association (#9, #196, #707 and #728) sought for the noise limits in the ODP to be retained for the Wanaka Town Centre. The PDP sets more lenient noise limits than the ODP for the Wanaka Town Centre, particularly in the new Lower Ardmore Entertainment Precinct.

- 11.2** The 2009 and 2011 Reports primarily set out issues with the noise limits in the ODP with respect to the Queenstown Town Centre. However, the same issues and analysis as I have already discussed with respect to the Queenstown Town Centre, are relevant to the Wanaka Town Centre. The Third 2014 Letter discusses application of the proposed controls specifically in relation to the Wanaka Town Centre.
- 11.3** As with Queenstown, a key issue in the Wanaka Town Centre is that the ODP noise limits do not facilitate many restaurant and bar activities sought by policies in the PDP, particularly at night. I disagree with submissions that assert that the ODP noise limits are not unduly restrictive, as in my experience many common activities, such as people talking at normal conversation levels in outdoor areas, particularly after 2200h, cannot comply.
- 11.4** Notified Policies 13.2.1.3 and 13.2.5.2 in the PDP would not be given effect to by maintaining the noise limits in the ODP, as the ODP noise limits would not enable the activities provided for by the policies. However, in my opinion the noise limits in notified Rule 13.5.10 of the PDP are consistent with the policies. As also discussed with respect to the Queenstown Town Centre, the noise limits in the PDP for the Wanaka Town Centre are consistent with those reviewed from other towns.

12. WANAKA TOWN CENTRE – NOISE MITIGATION AT SOURCE

- 12.1** Wanaka on Water (#707) submitted that any noise mitigation required should be implemented by noise producers. As a general proposition I agree that it is usually best for noise to be controlled at source. As shown in Table 5-5 of the 2011 Report, bars and restaurants will continue to have to provide a degree of noise mitigation at source in order to comply with the PDP noise limits. For example, amplified music above a background level could not be played without doors closed and attention paid to the door and window design.
- 12.2** However, it is generally not practicable to provide mitigation at source for sound from people sitting outside. I also understand that having a degree of background music audible outside bars and restaurants would be consistent with notified Policy 13.2.1.3, and therefore while notified Rule 13.5.10.5, relating to outdoor loudspeakers, will assist in keeping the noise acceptable,

attempting to "mitigate" sound from people and music outside would not be appropriate.

12.3 I note that in the PDP, noise limits generally apply relative to the zone or area where sound is received, rather than where it is produced. Therefore, sound from building services equipment in the Town Centre Zone has to comply with the residential noise limits from Chapter 36 Noise of the PDP in neighbouring residential zones. However, there is an exception to this approach. Sound from people and music in the Wanaka Town Centre is only subject to noise limits in the Wanaka Town Centre Zone and is not further subject to the noise limits within the boundary of any other zone. In most cases, compliance with the town centre noise limits at an immediately adjacent site in the town centre will also result in compliance with the residential noise limits at a site further away. However, for sites in the town centre around the periphery of the zone, sound from people and music is likely to exceed normal residential limits in residential zones.

12.4 Much of the adjacent area in the Medium Density Residential Zone is within the Town Centre Transition Overlay, and in that context I consider increased sound levels from people and music should be acceptable. For other areas by Hedditch Street, Little Street and Monley Lane potential effects might be more significant. To protect these areas, it might be appropriate to exclude sites in the Town Centre Zone to the north of Ardmore Street from notified Rules 13.5.10.3, 13.5.10.4 and 13.5.10.5.

13. WANAKA TOWN CENTRE – EXTENSION OF HOURS FOR OUTSIDE DRINKING AND DINING

13.1 Lake Bar Limited (#129) submitted that outdoor dining and drinking should be permitted until 2300h. In terms of the noise limits for people and music in notified Rule 13.5.10 of the PDP, there are no times specified. Therefore, this would allow for use of outdoor areas until 2300h and later. Notified Rule 13.4.5 makes the serving of liquor after 2300h a restricted discretionary activity and includes noise issues as a matter of discretion. I have been involved with numerous resource consent applications where, due to another rule such as this one, noise management controls have been imposed in consent conditions even when compliance with the noise rules is proposed. Regardless, these rules still allow for outdoor dining and drinking until 2300h

as sought in the submission, so I do not consider that any changes are required to the notified rules.

14. WANAKA TOWN CENTRE – ENTERTAINMENT PRECINCT

14.1 There are various submissions in support of and in opposition to the proposed Lower Ardmore Entertainment Precinct. The rationale for the Entertainment Precinct is set out in my Third 2014 Letter. In summary and as for the Queenstown Town Centre, a key factor is to allow for fewer restrictions on some bar and restaurant activity in an area that has been selected to result in the fewest adverse effects on residential zones around the town centre. The Lower Ardmore Entertainment Precinct will provide bars and restaurants fronting Ardmore Street with more lenient noise limits at adjacent buildings on Ardmore Street.

14.2 The Lower Ardmore Entertainment Precinct is slightly closer to residential zones, with fewer intervening buildings than the Queenstown Entertainment Precinct, so the adverse noise effects are not as well contained. For an individual bar in the Lower Ardmore Entertainment Precinct the 65 dB $L_{Aeq(15 \text{ min})}$ noise limit for sound from people in notified Rule 13.5.10.4 would typically apply at a distance of 10 metres at an adjacent site. As sound travels to the nearest residential zone by Lakeside Road, it will reduce as it is spreading over a wider area, and with sound at the noise limit at a distance of 10 metres, based on standard propagation calculations at a typical distance of 250 metres the levels should be less than 40 dB $L_{Aeq(15 \text{ min})}$ (which is the residential night-time noise limit). There will be a cumulative effect from multiple bars but, in the context of existing activity in this area, I consider that the resulting sound levels and noise effects in the residential zone, while clearly audible, should be acceptable.

14.3 NZIA Southern and Architecture + Women (#238) submitted that a management plan should be required for the Lower Ardmore Entertainment Precinct to ensure active control. In terms of noise effects, in my opinion notified Rule 13.5.10 in the PDP provides appropriate controls through noise limits without needing an additional management plan. If there are any specific concerns for individual premises operating after 2300h, these can be considered as assessment matters under Rule 13.4.5, and controls can be

imposed through conditions, including a requirement for a noise management plan for that site if appropriate.

15. LOCAL SHOPPING CENTRE ZONE - FRANKTON

15.1 Queenstown Airport Corporation (#433) submitted that rules for activities within the Local Shopping Centre Zone should be augmented and amended to be consistent with PC35. This issue arises as the Frankton Local Shopping Centre Zone is within the Queenstown Airport Outer Control Boundary (**OCB**). I do not consider that any of the proposed changes with respect to rules for acoustic treatment and ventilation are necessary, and I consider that the PDP as notified is already consistent with PC35. There are two key factors:

- (a) the sound insulation requirements in notified Rule 15.5.3 for other sources are significantly more stringent than sound insulation requirements under PC35 for airport noise; and
- (b) in the vast majority of the Frankton Local Shopping Centre Zone no sound insulation or ventilation is required for airport noise. This is because the zone is at the periphery of the OCB and exposed to less than 57 dB L_{dn} airport noise.

15.2 As a result of submissions on Chapter 36 Noise, there have been some changes to ventilation requirements for airport noise in other zones from PC35. However, there was not scope to make the same changes to ventilation requirements in the Town Centre and Local Shopping Centre Zones. Although it would be preferable to also update those ventilation requirements, they remain consistent with PC35.

15.3 For the reasons set out above, I consider that the amended acoustic treatment and ventilation rules proposed by Queenstown Airport Corporation will have no effect in practice and will introduce unnecessary complexity and compliance costs.

A handwritten signature in black ink, appearing to read 'Stephen Chiles', written in a cursive style.

Dr Stephen Gordon Chiles

2 November 2016

APPENDIX A
URS REPORT (29 APRIL 2009)

REPORT

Queenstown Town Centre Noise Rules Review

Prepared for

Queenstown Lakes District Council

Private Bag 50072

Queenstown 9348

29 April 2009

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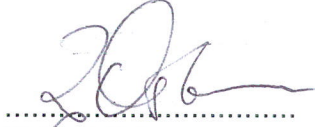
Project Manager:



Dr Stephen Chiles
Senior Associate

URS New Zealand Limited

Project Director:



Richard Osborne
Principal

Level 5, URS House
287 Durham Street, Christchurch
PO Box 4479, Christchurch
New Zealand
Tel: 64 3 374 8500
Fax: 64 3 377 0655

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Section 1

Introduction

1.1 Background

In Queenstown's town centre zone there is tension between noise sensitive activities such as residential and visitor accommodation, and noise generating activities such as bars and restaurants. The District Plan allows all these activities within the zone but existing methods to manage and control the potential noise effects appear to be struggling. Lakes Environmental has been aware for some time of difficulties with practical application of the noise rules for the town centre. This report describes problems with the existing noise provisions and proposes options to move forward with a possible plan change.

Many of the same issues discussed in this report exist to a lesser extent in Wanaka and even Arrowtown. However, as requested by the Queenstown Lakes District Council (QLDC), this report is limited to Queenstown.

1.2 URS New Zealand

QLDC has appointed URS New Zealand Limited (URS) through Lakes Environmental to prepare this scoping report to inform a possible plan change to the district plan noise provisions for the Queenstown town centre zone.

The primary author of this report, Dr Stephen Chiles, has extensive experience dealing with the acoustic issues in the Queenstown town centre, having recently worked for Lakes Environmental in connection with numerous different bars. This report has been triggered by current work on an appeal relating to a resource consent for the Guilty bar and restaurant on Ballarat Street. That appeal questions fundamental aspects of the district plan noise provisions for the town centre. Other previous work includes bars on Church Lane, in particular Montys, and also issues relating to Barmuda and Revolver.

1.3 Approach

This report is intended to provide background material to aid a possible plan change. We have started by simply documenting some of the current acoustic issues in the town centre as we understand them. We have then gone on to provide details of noise provisions from other towns in New Zealand as a benchmark, and have explored technical issues such as the existing ambient noise levels in Queenstown and the propagation of noise from the town centre. These initial sections of our report provide a basis on which we have then devised options for a plan change. The methods proposed are given in outline detail with discussion of their implications. Recommendations are made as to additional work that would assist in proceeding with a plan change.

Section 2

District Plan

2.1 Introduction

This section reviews the current noise provisions of the district plan and the implications for bars and restaurants in the town centre.

2.2 Objectives and policies

This scoping report is primarily to address technical acoustic issues and therefore we have not conducted an in depth review of the objectives and policies of the district plan relating to the town centre. However, as the objectives and policies provide the basis for noise rules, we consider it important to consider two critical issues arising from chapter 10 of the district plan:

- a) Policy 1.3 is “*To provide for and encourage the integration of a range of activities within town centres, including residential activity.*” We note that this specifically allows for residential activity in the town centre. There are also various other statements allowing for visitor activities and we take this to include visitor accommodation.
- b) There is no specific mention of bars and restaurants in the objectives and policies. Numerous statements include allowance for a ‘wide’ or ‘full’ range of activities, which could be taken to include bars and restaurants. However, it is surprising that this major activity in the town centre is not mentioned directly, given the significant potential effects. There is one mention of entertainment in an explanation, and there is discussion of vibrancy in the town centre, but this is not explicitly linked to bars and restaurants.

In summary, the important factors influencing our analysis is that currently we understand the objectives and policies to explicitly allow for residential activity in the town centre and to implicitly allow for visitor accommodation, bars, restaurants and other entertainment.

When dealing with recent issues in the town centre it has become apparent that there is a firm belief amongst some bar owners and their patrons and supporters that Queenstown is a “party town”, which requires audible night-life to be a vibrant environment. The district plan does not provide methods that would allow a party town at the same time as allowing for residential activity in the town centre. We consider that this disconnection between common perceptions of what should be allowed and the provisions of the district plan is at the root of existing problems.

2.3 Noise rules

Unless otherwise permitted by a resource consent, bars in the town centre are subject to the following rule (10.6.5.2.ii) in the district plan. The full version of the rule also includes more stringent noise limits for activities in the town centre transition sub-zone, between Man, Shotover, Brecon and Hay Streets. Activities in the town centre are also required to comply with lower noise limits in adjacent residential zones (40 dB after 2000 hrs).

Activities shall be so conducted that the following noise limits are not exceeded at any point within the boundary of any other site within this zone:

- *daytime (0800 - 2200 hrs) 60 dBA L_{10}*
- *night time (2200 - 0800 hrs) 50 dBA L_{10} and 70 dBA L_{max}*

There are no rules in the district plan relating to the design or location of residential and visitor accommodation in the town centre to control noise at the receiver.

Draft plan change 27A would update the wording and terminology used in this rule, but would not alter the fundamental requirements. One of the changes in draft plan change 27A is that noise levels would be written as 50 dB $L_{Aeq(15\ min)}$ rather than 50 dBA L_{10} . The $L_{Aeq(15\ min)}$ and L_{10} both refer to an “average” value

Section 2

District Plan

of the noise typically over 15 minutes. The slight differences between these two descriptors are discussed in the draft section 32 analysis for plan change 27A.

For clarity, throughout this report we will not specify L_{10} or $L_{Aeq(15 \text{ min})}$ but will refer to levels in the format "50 dB". This will always refer to an A-weighted level, and when written into any noise rules the full acoustic descriptor would be required. We will discuss A-weighting later in this report with respect to music noise.

As well as the "average" noise limits, the district plan includes an L_{max} noise limit at night which is for the highest level measured for a fraction of a second. Whenever we refer to an L_{max} noise level in this report it is explicitly noted with the descriptor included. In accordance with draft plan change 27A this is written as L_{AFmax} .

Daytime

The noise limit in the town centre is 60 dB during the day. Guideline values often referred to by the World Health Organisation are that at 55 dB few people are seriously annoyed by noise and at 50 dB few people are moderately annoyed. However, within the context of a town centre people are generally more tolerant of noise and we consider that the 60 dB daytime noise limit provides appropriate amenity including for town centre residences and visitor accommodation. Anybody attempting to sleep during the day would probably need to keep their windows closed and use mechanical ventilation.

We are not aware of any complaints about bars and restaurants relating to the daytime noise limit (before 2200 hrs).

A 'quiet' outdoor area of a bar or restaurant with some separation or screening from neighbours could operate within a 60 dB limit during day providing that it is well managed and there is no exuberant or boisterous activity. However, on the basis of measurements at numerous bars, we believe that noise from people talking outside most bars and restaurants in the town centre currently breaches this daytime limit on a regular basis by in the order of 5 to 10 dB.

Night-time

The night-time noise limit is 50 dB. The World Health Organisation recommends a noise limit inside bedrooms of 30 dB to prevent sleep disturbance and the corresponding noise level outside an open window is 45 dB. Again, we do not consider that the increase to 50 dB is significant in the context of a town centre, although it may require residents to keep windows closed and use mechanical ventilation.

A noise limit of 50 dB generally precludes any outside activity at bars after 2200 hrs. The noise limit may be achieved with a small group of people talking quietly if there is some separation and/or screening, but this would require intensive management. Music entertainment inside bars would exceed the 50 dB limit unless there is enhanced sound insulation including door lobbies and excluding significant areas of standard thickness glazing.

There have been numerous complaints about noise from bars in the town centre at night. In most cases, this relates to instances where the 50 dB noise limit is breached. On the basis of our measurements we believe that many bars in Queenstown town centre regularly breach this night-time limit.

At night there is also a 70 dB L_{AFmax} noise limit. Again, if people are outside a bar it is almost inevitable that this will be regularly breached.

2.4 Summary

The noise limits for the town centre do allow for residential activity in the town centre, and are therefore consistent with the objectives and policies of the district plan. However, we consider that the noise limits do not allow for outdoor areas of bars and restaurants at any time of day or night, and essentially do not allow for any activity in the town centre after 2200 hrs. The objectives and policies are not clear on this issue but potentially this might be considered inconsistent with the desire to allow for a wide range of activities and the desire for vibrancy.

Section 3

Current Issues

3.1 Introduction

In this section we simply raise our understanding of existing problems that arise in the town centre with regards to noise. Methods for addressing these issues are provided in subsequent sections of this report.

3.2 Plan compliance

As we have discussed in the previous section, on the basis of numerous noise measurements we consider that there is currently extensive non-compliance with the district plan noise limits in the town centre by bars and restaurants, both during the day and at night.

This is an issue which Lakes Environmental is responsible for enforcing, and we are aware of substantial and continuing effort made by Lakes Environmental in this regard. However, as the noise limits are so far removed from the actual established operation of bars and restaurants in the town centre this is a difficult task. We are aware that Lakes Environmental takes a pragmatic approach when enforcing noise limits. In particular we understand:

- Lakes Environmental undertake periodic monitoring of all bars in the town centre, and issue abatement notices when bars are breaching the district plan or consent conditions.
- The focus of enforcement action is with regards to night-time noise rather than daytime noise, as there are generally no noise complaints during the day.
- Enforcement is mainly focussed on physical measures such as keeping doors and windows closed and preventing use of outdoor areas and outdoor loudspeakers after 2200 hrs. Enforcement is not usually solely on the basis of measured noise levels.
- In many places there is not residential activity or visitor accommodation on neighbouring sites and noise limits are not strictly enforced on site boundaries where there would be no noise effects.

We note that we are aware of past issues with the contractor responsible for responding to noise complaints in Queenstown failing to follow the Lakes Environmental written procedures. A new contractor has since been appointed. However, as a result of the previous contractor's failings we cannot rely on Lakes Environmental's historical complaints records. Having reviewed some complaints in detail we found that seemingly justified complaints had been incorrectly dismissed.

3.3 Existing use rights

We are aware that two bars in the town centre, Pig n Whistle and Dux de Lux, have existing use rights to use their outdoor areas after 2200 hrs. We understand that the operators of these bars are of the view that in using the outdoor areas at night these two bars are also entitled to breach the district plan noise limits. However, we have not seen any evidence that the existing use rights for either of these bars extends to breaching the noise limits. We understand that both bars are still required to comply with the district plan noise limits. However, both of these bars do currently breach the noise limits on a regular basis, to a greater degree than other bars in the town centre.

3.4 Music

All noise limits discussed so far are for A-weighted sound. The A-weighting is to account for the frequency response of human hearing and combines sound levels at all different frequencies into a single value. Without this simplification noise limits could not be expressed in a succinct manner by a single number. In A-weighting low frequencies are allowed to be significantly greater than high frequencies, as the ear is generally more responsive to higher frequencies. For many environmental noise sources this simplification works well. However, an A-weighted level does not always adequately reflect annoyance from the bass of amplified music.

Section 3

Current Issues

There is a simple mechanism to account for 'special audible characteristics' of noise in the assessment standard (NZS 6802) in that a 5 dB penalty can be applied to the A-weighted level. This can partly account for annoyance from low frequency bass music noise. Another approach could be to specify additional noise limits at low frequencies for music. An interesting alternative approach in Scotland is the use of 'inaudibility' as a criterion, although this is regarded by most people as being too stringent.

Disturbance by music bass noise can be exacerbated by attempts to improve sound insulation. An example is the Spire Hotel where there is high performance sound insulating glazing. This glazing is effective at reducing general noise, but due to the characteristics of glass the high frequency performance is substantially better than the low frequency performance. Therefore bass in music becomes more prominent inside the bedrooms as other frequencies have been reduced to a greater extent by the glass. To significantly reduce low frequency noise generally requires either uneconomically thick glass or secondary glazing (e.g. 200 mm cavity) which can introduce thermal, detailing and maintenance issues.

3.5 Smokers

Since smoking has been banned inside bars and restaurants an issue has arisen as to where to allow smokers at night. By making no provision for smokers they are forced on to public streets where any noise they generate would be uncontrolled. However, as discussed above, if smokers are allowed to use the outdoor areas of bars then they will usually breach the 50 dB district plan noise limit, unless there were particularly stringent controls.

3.6 Sound insulation

There are no requirements for residential and visitor accommodation buildings in the town centre to provide themselves with enhanced sound insulation. While there is a possibility that building envelope sound insulation requirements may eventually become part of the Building Code, the revision has been ongoing for many years and we are not aware of any imminent progress.

Noise sensitive activities could currently be established in the town centre with all ventilation provided by opening windows.

3.7 Residential zones

We are not aware of any formal complaints about noise from town centre bars and restaurants affecting people in the surrounding residential zones. This may indicate tacit acceptance or resignation to the town centre activity.

Anecdotally we understand that there have been complaints about music from bars in the town centre being audible in the residential areas, to the extent that lyrics to a song could be clearly identified. This is unlikely to happen unless noise from bars and restaurants is substantially above the current noise limits.

3.8 Special events

There are various large public events held in Queenstown town centre such as the Winter Festival and New Year's Eve celebrations. Such events involve entertainment of a scale which could never comply with the town centre noise limits and therefore require resource consent. We understand that currently these events breach the noise limits but the noise effects are generally not assessed. We are not aware of noise complaints arising from these events.

There are existing provisions for temporary activities in section 19.2.2.3 of the district plan but this is limited to events with fewer than 200 people outside, and these events still have to comply with the noise limits. Larger events are discretionary activities and require resource consent.

Section 3

Current Issues

3.9 Consents and appeals

Lakes Environmental require noise assessments to be submitted with all resource consent applications for bars and restaurants. Bar owners have had to address the problems with the noise rules discussed above in their consent applications. A typical response to these difficulties is to apply for resource consent to breach the noise limits. We are aware of instances where more lenient noise limits or other controls have subsequently been granted.

We consider that the current situation of bars being granted a relaxation to the noise limits on an ad hoc basis is likely to be failing to adequately consider cumulative effects affecting residential and visitor accommodation in and around the town centre. The current appeal relating to the Guilty bar also confuses the issue by trying to justify a relaxation on the basis of the existing environment already containing noise from another bar, even though that other bar is breaching the noise limits.

We consider that the current convoluted process for noise assessment of all bar resource consents and the inconsistency of resulting decisions is inefficient and ineffective. The problems with the district plan town centre noise provisions are causing significant expense for all parties and the rules may not succeed in achieving the objectives and policies of the plan. However, this needs to be carefully considered through a section 32 assessment.

Section 4

Noise Rule Benchmarks

4.1 Introduction

As part of this review URS has collated noise limits and other provisions for a selection of urban areas throughout New Zealand. These provide a useful point of reference, even though in some instances direct comparisons of the data are not robust due to different styles of town centres not having bars and restaurants in a similar manner to Queenstown. We have separately detailed where certain towns have specific rules for building sound insulation or special events.

We have not made an exhaustive review of all towns in New Zealand or all zones within these towns. However, the data presented is considered to give a good representation of typical noise limits around the country. For comparison, we have simplified the noise limits, for example, by missing out different time periods for certain days of the week. The noise limits given apply within the stated zones. In many cases, including Queenstown, lower limits apply at nearby residential zones.

4.2 Noise limits

District	Zone/Area	Day	Night	L _{AFmax} (night)	Night hours
Queenstown	Town centre	60 dB	50 dB	70 dB L _{AFmax}	2200-0800 hrs
Dunedin	'Red' noise area	60 dB	60 dB	75 dB L _{AFmax}	2100-0700 hrs
Invercargill	City centre/business	65 dB	65 dB	85/80 dB L _{AFmax}	2200-0700 hrs
Christchurch	Central city	57 dB	49 dB	75 dB L _{AFmax}	2200-0700 hrs
	Entertainment precinct	60 dB		-	-
Nelson	Inner city	65 dB	55 dB	75 dB L _{AFmax}	2200-0700 hrs
Wellington	Central area	60 dB		85 dB L _{AFmax}	-
Hutt City	Central commercial	65 dB		-	-
Hastings	Commercial	55 dB	55 dB	80 dB L _{AFmax}	1900-0700 hrs
Napier	Inner city/Art deco	60 dB	50 dB	80 dB L _{AFmax}	2200-0700 hrs
Rotorua	Commercial A	60 dB	65 dB	75 dB L _{AFmax}	2200-0700 hrs
Tauranga	Business	65 dB	65 dB	85 dB L _{AFmax}	2200-0700 hrs
Hamilton	City centre	45 dB inside residences		-	-
Auckland	Central area	65 dB	60 dB 70dB @63Hz 65dB @125Hz	75 dB L _{AFmax}	2300-0700 hrs

The 50 dB night-time noise limit in Queenstown town centre is more stringent than most of these other urban areas in New Zealand. The 70 dB L_{AFmax} limit in Queenstown is the lowest of all these areas.

4.3 Sound insulation

The following table details district plans which have sound insulation requirements for residential or visitor accommodation. Again, these rules have been abbreviated for ease of comparison.

There are differences between the ways in which the sound insulation requirements are specified in this table. However, any of these requirements could generally be achieved by standard building constructions, providing windows do not need to be open for ventilation. Therefore, the main effect of these rules is usually to require mechanical ventilation.

The requirement proposed for Queenstown in proposed plan change 1 was similar to various other towns and cities. However, plan change 1 was withdrawn in 2004 due to the expectation that this issue would be addressed by a revised clause G6 of the Building Code, which has still to materialise.

Section 4

Noise Rule Benchmarks

District	Zone/Area	Requirement
Dunedin	'Red' noise area	30 dB $D_{2m,nT,w+C_{tr}}$ building envelope sound insulation
Christchurch	Central city edge zone	30 dB $D_{tr,2m,nT,w}$ building envelope sound insulation
Wellington	Central area	30 dB $D_{nT,w+C_{tr}}$ building envelope sound insulation <i>(Plan change 48: 35 dB $D_{nT,w+C_{tr}}$ for Courtenay Place precinct)</i>
Napier	Inner city/Art deco	40 dB internal level in bedrooms
Tauranga	Business	35 dB internal level in habitable rooms
Rotorua	Commercial A and B	35 dB internal level in bedrooms
Auckland	Central area	35 dB internal level in bedrooms
Queenstown	Town centre	<i>(Plan change 1 - withdrawn - 35 dB internal level)</i>

4.4 Special events

The following district plans have exemptions from the normal noise limits for special events.

District	Zone/Area	Event noise limits	Number of events	Comments
Christchurch	Hagley Park	65 dB 85 dB L_{AFmax}	20	No more than 10 events after 2230 hrs
	Cathedral Square	65 dB 85 dB L_{AFmax}	120	None after 2230 hrs
	City Mall	65 dB 85 dB L_{AFmax}	120	None after 2230 hrs
	Victoria Square	65 dB 85 dB L_{AFmax}	20	None after 2230 hrs
	New Regent Street	65 dB 85 dB L_{AFmax}	20	None after 2230 hrs
	Entertainment Precinct	65 dB 85 dB L_{AFmax}	20	No more than 10 events after 2230 hrs, but only to 2330 hrs.
Wellington	Lambton Harbour Area	none	unlimited	Applies for temporary events
Hastings	Residential (receiver)	75 dB (0900-1800) 70 dB (1800-2400)	unlimited	Applies for temporary events
Tauranga	Residential (receiver)	70 dB (1000-2300) 75 dB L_{AFmax}	6	Applies for temporary events. Includes numerous additional controls on the use of sound systems
Hamilton	Residential (receiver)	75 dB (1000-2300) 85 dB L_{AFmax}	5	Applies for special events. Includes numerous additional controls
Auckland	Wynyard Quarter	75 dB	12	Applies for special events. Includes numerous additional controls. (limits actually in terms of L_{01} rather than L_{AFmax})
		80 dB L_{AFmax}		
		85 dB 90 dB L_{AFmax}	3	

It is clear from this table that most major towns and cities which hold regular events have made allowance for them in the noise rules of the district plans. This allows for events to be held without resource consent being required every time.

Section 5

Existing Environment

5.1 Introduction

One of the comments made in the ‘Guilty’ resource consent was that bar noise levels should be viewed in the context of relatively high background/ambient noise levels, due to road traffic. While subjective responses and disturbance from different noise sources can be markedly varied, it is a valid consideration to look at the existing noise environment.

Noise measurements have been conducted in the town centre during past projects and two of these are summarised below.

5.2 Transportation study

In December 2006 Marshall Day Acoustics undertook noise monitoring at various locations around the town centre, as part of a transportation study by MWH. These measurements were beside roads along a proposed transport route and were a mix of short-term attended measurements at seven locations and twenty-four hour noise logging at three locations. As the purpose of the measurements was to determine overall traffic noise levels, they do not provide much information about ambient levels specifically in the evening and at night. However, these measurements were mainly by roads currently with light traffic and they do provide an indication of general ambient levels in the areas immediately surrounding the town centre.

The following table provides a summary of the measured levels. All levels are in terms of the $L_{Aeq(15\text{ min})}$ ‘average’ level. Times and noise levels have been rounded in this table.

Location	Distance to road	Time	Level
Melbourne Street East	6 m	1230-1500 hrs	50-53 dB
	12 m	0500-2200 hrs	42-61 dB
		2200-0500 hrs	36-51 dB
Melbourne Street West	8 m	1200-1430 hrs	52-54 dB
Between Melbourne and Henry Streets	-	1600 hrs	52 dB
Henry Street	6 m	1300-1530 hrs	55-63 dB
Memorial Street	4 m	1200-1430 hrs	62-65 dB
Man Street	7 m	1230-1500 hrs	54-58 dB
	7 m	0800-2200 hrs	55-65 dB
		2200-0800 hrs	41-59 dB
Thompson Street	6 m	1300-1530 hrs	55-59 dB
Stanley Street (Four Seasons Motel)	12 m	1700-2200 hrs	62-67 dB
		2200-0800 hrs	50-66 dB

This monitoring shows that ambient levels are relatively high but do drop at night to around 40 dB in the residential zones nearest to the town centre. The relative contribution of noise from bars and traffic to these overall levels is unknown.

Regardless of the sources of noise, given that noise levels are not continuous throughout the night it appears that there is unlikely to be justification for allowing noise from bars in the town centre to exceed the residential zone limits. On the basis of these measurements there would be frequent occasions where the existing ambient noise would not ‘mask’ noise from bars exceeding the 40 dB night-time limit in residential zones.

Section 5

Existing Environment

5.3 Church Lane

The author has previously been engaged by both the Spire Hotel and by QLDC to investigate noise from bars in Church Lane. This included Montys, Subculture, 12 Bar and the Spire Hotel bar.

In October 2006 measurements were conducted at the nearest neighbouring property to Montys. Music inside Montys and people using the outside areas of Montys caused noise levels up to 70 dB between 2200 and 0000 hrs. Following initial management controls by Montys, primarily keeping doors closed and restricting use of the outside area, the levels in January 2007 reduced to around 60 dB after 2200 hrs. More stringent controls have since been implemented but we have not returned to formally measure the noise levels.

Measurements in January 2007 opposite 12 Bar on a quiet night while a DJ was playing ranged from 55 to 58 dB from 2200 to 0200 hrs.

During the January 2007 survey at Church Lane measurements were also conducted by the green opposite the Pig n Whistle. Levels up to 73 dB were recorded primarily due to a band in the Pig n Whistle. Traffic on Ballarat Street did contribute to levels but noise from the Pig n Whistle was dominant.

5.4 Further monitoring

Ambient noise in the town centre at night is currently controlled by activity associated with bars and restaurants, together with some contribution from road traffic. As this environment is well understood we do not consider that further noise monitoring in the town centre is required to progress this plan change.

The main interest is in ambient noise levels in surrounding residential zones and how those zones are affected by noise from bars in the town centre. The transport study measurements were limited in that they only covered one night at each location, and as the night-time measurements were not attended the noise sources were not identified. We consider that additional noise monitoring in the residential zones would be of benefit in progressing a potential town centre plan change.

We recommend that additional noise monitoring should be undertaken at various locations in the residential zones around the town centre. This should occur at approximately six directions from the town centre and in each direction measurements should be at the nearest point to the town centre and also one street back from the interface. The measurements should initially be conducted on busy Friday and Saturday nights between approximately 2000 and 0000 hrs, and should be for 15 minutes in each location. All measurements should be attended so that dominant noise sources can be identified. These measurements could either be undertaken by Lakes Environmental or URS.

Section 6

Sound Propagation

6.1 Introduction

Queenstown has interesting topography in that a significant part of the residential areas such as Queenstown Hill overlook the town centre. The question has been raised as to how sound propagates from the town centre in this specific topography. To investigate this issue we have used an acoustic computer model which accounts for numerous factors influencing sound propagation including screening and reflections from terrain. At this stage the model is for noise from bars and does not include other noise sources such as road traffic.

6.2 Model

The acoustic model was constructed in CadnaA software with the following parameters:

- ISO 9613 algorithms
- Terrain modelled by 1 m contours from the QLDC GIS
- All ground assumed to be mainly reflective with an absorption coefficient of 0.1
- Building outlines taken from the QLDC GIS (some new buildings are missing, e.g. Church Street/Searle Lane development)
- Building heights taken from the QLDC GIS where available and taken as 5 m high in all other cases
- Sound power levels based on a noise source outside Guilty achieving 50, 60 and 65 dB at the apartments opposite. The levels theoretically equate to 1, 14 and 42 people outside the bar respectively. For other bars with closer neighbours the sound power levels and number of people would be lower, but for simplicity all bars have been taken with the same values. All bars have been taken as generating these noise levels simultaneously.
- The only noise sources modelled are people outside bars. i.e. music inside bars has not been included.
- Twenty bars have been included in the model in indicative locations. These locations do not precisely match current bars in the town centre and do not include all streets where there are bars.

6.3 Results

The following three figures show the noise contours for bar noise limits of 50, 60 and 65 dB. Each contour shows the level which is exceeded within that contour. e.g. all the areas within the blue contours are exposed to greater than 40 dB.

Section 6

Sound Propagation

Figure 6-1 Noise contours for twenty bars - 50 dB noise limit

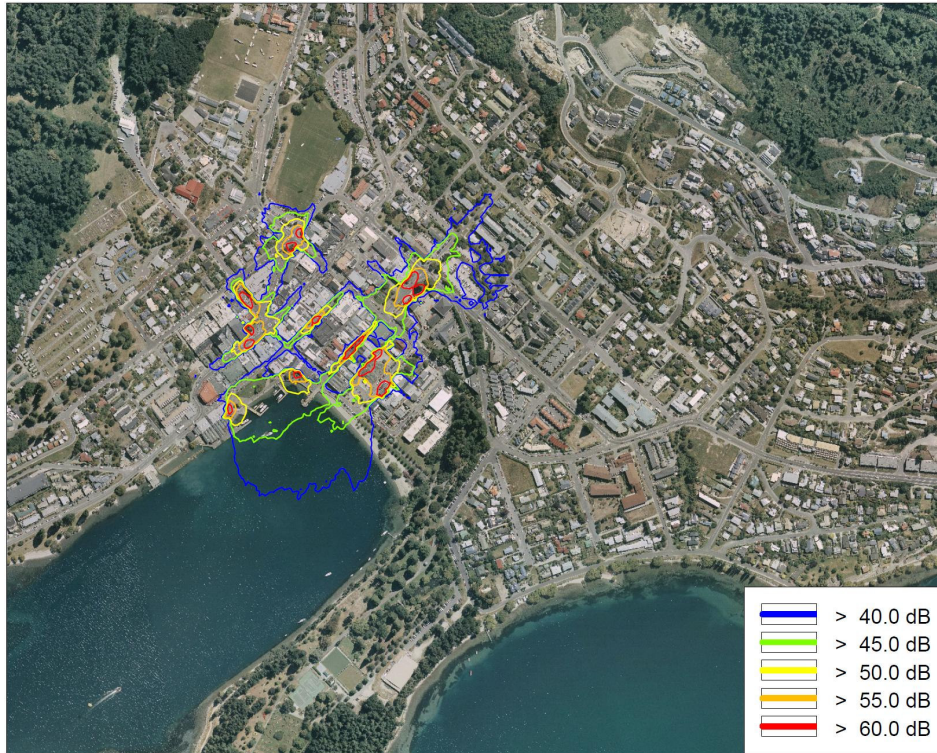
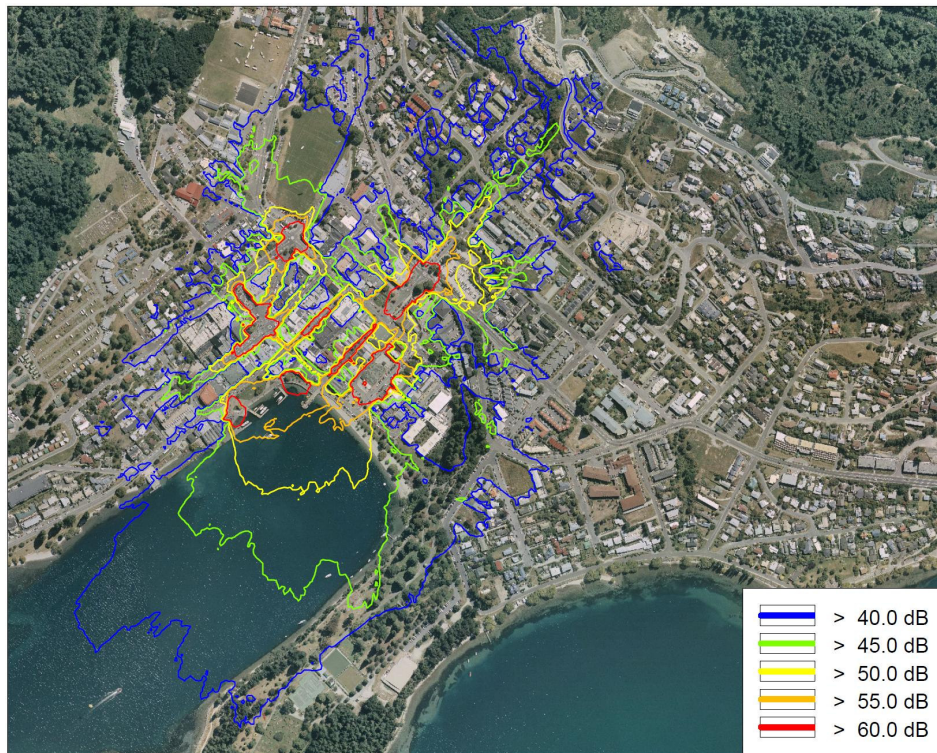


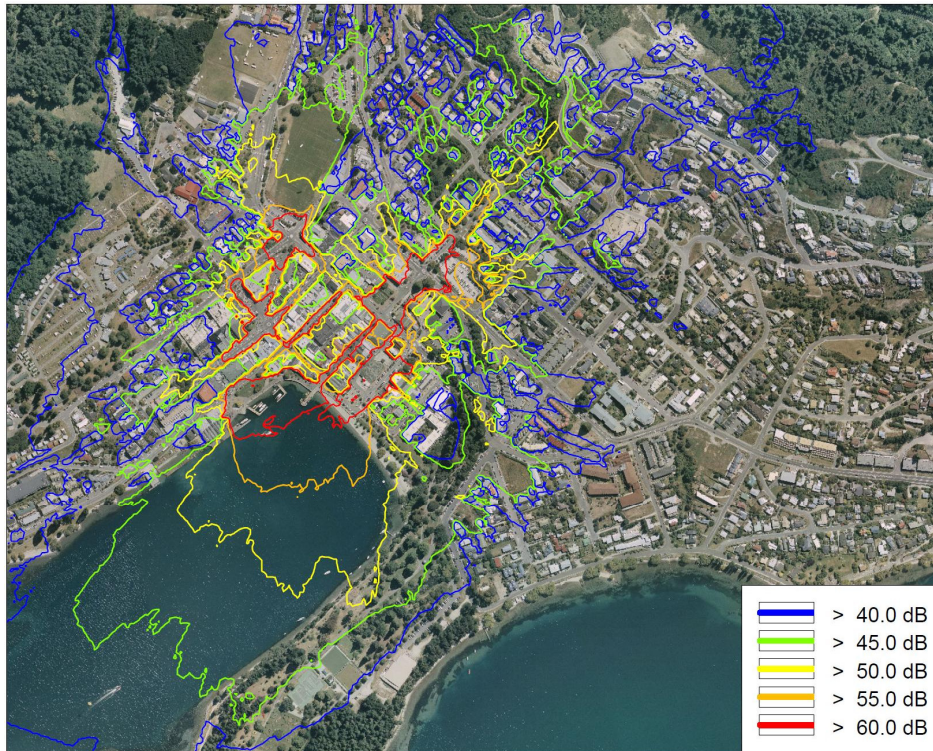
Figure 6-2 Noise contours for twenty bars - 60 dB noise limit



Section 6

Sound Propagation

Figure 6-3 Noise contours for twenty bars - 65 dB noise limit



6.4 Discussion

The night-time noise limit in residential zones is 40 dB. The World Health Organisation recommends an external limit of 45 dB to prevent sleep disturbance. It can be seen from the figures above that if the night-time noise limit for bars in the town centre was increased to 60 or 65 dB then the cumulative effect would be that large parts of the residential zones would be exposed to bar noise levels above 40 to 45 dB. This indicates that increasing the town centre noise limits could have a significant adverse effect in residential areas.

The district plan rules currently require activities in the town centre to comply with noise limits within the town centre as well as complying with the 40 dB night-time noise limit in surrounding residential zones. The implication of this modelling is that there is no benefit in significantly increasing the town centre noise limits unless there is either an exemption from the residential zone noise limits or a corresponding increase. Alternatively this may be avoided by allowing increased noise in the town centre only within a limited precinct. The issue is also complicated by the night-time period starting in the residential zone at 2000 hrs compared to 2200 hrs in the town centre.

Now that an acoustic model has been constructed for the town centre it is relatively quick to test other scenarios. Therefore, if plan change options are progressed which propose an entertainment precinct for example then we recommend that further work be conducted to test such scenarios in the acoustic model.

Section 7

Plan Change Methods

7.1 Introduction

On the basis of the summary of existing issues and background information presented in preceding sections of this report, we have identified the following methods for a possible plan change. At this stage the methods are intended to illustrate broad principles, and further refinement would be required prior to the preparation of a plan change. The issues in the town centre are complex and are unlikely to be resolved by a single control measure. Therefore, we envisage that a combination of these methods will be required. Possible combinations are discussed at the end of this section.

7.2 Status quo

Maintaining the status quo as it currently operates in practice is not considered to be a viable option as numerous bars and restaurants are routinely breaching daytime and night-time district plan noise limits. Therefore, to maintain the status quo in terms of the district plan would require substantial effort to enforce the noise limits. This would significantly curtail existing bar and restaurant activity and potentially result in loss of 'vibrancy' in the town centre. In response to this we envisage further bars and restaurants applying for resource consent to breach the noise limits, continuing the current ad hoc increase of noise levels in the town centre.

Furthermore, the status quo does not allow for smokers on site. Enforcing the noise limits would force smokers on to public streets which would result in uncontrolled noise. We consider that it is best practice for an area to be made available for smokers on site. This area should be screened from neighbours and subject to rigorous management control/supervision. However, it is still marginal whether such an area can comply with the existing district plan night-time noise limit.

We have previously discussed special events in the town centre. Under the status quo these events require resource consent.

For the reasons discussed above we do not consider that maintaining the status quo is a viable option.

7.3 Increase noise limits

If it is desired to maintain lively bars and restaurants in the town centre, we consider that this should be explicitly reflected in the objectives and policies of the district plan. The objectives and policies should indicate the extent to which Queenstown is intended to be a "party town". This is a political rather than technical decision. We recommend that there should be community consultation on this issue.

If it is decided that allowance should be made for lively bars and restaurants then noise limits should be adjusted as follows:

- Add a noise limit for building services plant at a level below the existing limits (e.g. 45 or 50 dB). There are standard methods to control building services plant and this should be maintained at a lower level so that it does not increase the overall level dominated by activity.
- Increase noise limits for general activity such as people inside and outside bars to 65 dB during the day and 60 or 65 dB at night. A limit of 65 dB would allow for people talking at normal conversational levels in an outdoor area. The proposed increase at night would only be possible for a limited area (precinct) within the middle of the town centre zone unless limits at the residential zone are also increased, to say 50 dB.
- Add specific low frequency noise limits for music. Further research would be required to determine appropriate limits.

All of these changes would require residential and visitor accommodation to either be restricted or subject to sound insulation requirements as discussed below.

Section 7

Plan Change Methods

7.4 Sound insulation

Regardless of any other option, if residential and visitor accommodation are to remain in the town centre then we recommend that a sound insulation requirement should be introduced. The examples given in section 4.3 are either in terms of the performance of the building envelope or a required internal level that should be achieved. In determining an internal level it is necessary to know the external level. We consider that it is better to specify the performance of the building envelope as then no further information is required to comply with the rule.

The building envelope sound insulation could be specified in terms of the parameter R_w+C_{tr} which avoids some complexities applying the rules in Dunedin, Wellington and Christchurch. Explanatory text would also be required to cover issues such as ventilation. The sound insulation value chosen will depend on the external noise limit for bars, but it is likely that if the bar noise is allowed up to 60 or 65 dB then the sound insulation requirement should be 35 dB R_w+C_{tr} .

We recommend that a table of constructions should be included in the plan which can be used to demonstrate compliance with the 35 dB R_w+C_{tr} limit. This would be similar to the table of constructions already included in the district plan for buildings affected by airport noise. These constructions would need to be reviewed to ensure they are consistent with the proposed town centre sound insulation standard.

The sound insulation requirements would not apply to or benefit existing residential and visitor accommodation in the town centre.

7.5 Restrict new activities

We have described how existing problems arise from a tension between noise sensitive and noise producing activities in the town centre. One option is therefore to restrict one of these sets of activities. The district plan could be revised so that the objectives and policies discourage new residential and visitor accommodation in the town centre. Alternatively the objectives and policies could discourage new bars, restaurants and other entertainment. These restrictions could be alternated in different parts of the town centre to separate incompatible activities. e.g. in part of the town centre the plan could allow residential activity but discourage bars, and in another part it could allow bars but discourage residential activity.

None of these options for restricting new activities address the existing activities and issues discussed in this report. However, in conjunction with other methods, the introduction of these restrictions may lead to a long term solution.

7.6 Entertainment precinct

We have already mentioned that raising noise limits would only be possible in a limited area before residential zones are adversely affected. This lends itself to an 'entertainment precinct' within the town centre where more lively bars and restaurants are allowed. This would need to be towards the middle of the town centre zone away from residential zones. There is no obvious place where such a precinct could be located as existing noise sensitive activities are spread throughout the town centre zone. We are aware of several apartments and also visitor accommodation in the town centre including: The Spire Hotel, Eichardt's, Sofitel, Novotel, YHA, Thomas' Hotel and Base. We recommend that further investigation should be conducted to formally locate all existing residential and visitor accommodation in the town centre.

On the basis of the noise sensitive activities we are aware of and locations of existing bars, it appears that the most likely location for an entertainment precinct would be between Cow Lane and Searle Lane to the south of Camp Street. We are aware that Eichardt's would be affected by this area and further investigation is required to establish if there are any other noise sensitive activities. The exact location of an entertainment precinct would require significant further consideration and consultation. It is likely that

Section 7

Plan Change Methods

given the existing activities, any location for an entertainment precinct would require short to medium term compromises.

If bars and restaurants are provided for in an entertainment precinct, the existing stricter noise limits should then be enforced for other bars outside this precinct. New residential and visitor accommodation should be prohibited in the entertainment precinct.

7.7 Special events

We recommend that further work should be conducted to collate full details of existing public events in the town centre. In particular the number of events, their timing and locations should be established.

As public events are not currently causing disturbance we recommend that the noise limits should simply exempt these events from the noise limits in an extension of the existing rule 19.2.2.3. There would still be a requirement to adopt the best practicable option for the control of noise under section 16 of the Resource Management Act. The district plan should specify the maximum number, duration and locations of such events allowed under the exemption.

7.8 Combined methods

A political decision is required as to the relative importance of residential/visitor accommodation and entertainment in the town centre. We do not consider that these are compatible activities given the manner in which bar owners in Queenstown wish to operate as evidenced by the numerous consent applications to breach the limits. Once a political decision has been made the objective and policies of the town centre should be adjusted accordingly.

We are not prejudging the political decision, but provide the following option to illustrate a possible outcome. This is one possible combination of the methods discussed above if it were desired to maintain both entertainment and residential/visitor accommodation in the town centre:

- Increase the town centre daytime noise limit for general activity to 65 dB,
- Introduce specific noise limits for building services plant (45 dB) and music noise (TBC),
- Create an entertainment precinct,
- Increase the night-time noise limit for general activity within the precinct to 65 dB,
- Discourage new residential and visitor accommodation in the precinct,
- Restrict bars and restaurants operating after 2200 hrs outside the precinct,
- Require all new residential and visitor accommodation outside the precinct to have building envelope sound insulation of at least 35 dB R_w+C_{tr} ,
- Add exemptions for special events.

Section 8

Summary

8.1 Existing situation

We consider that the Queenstown Lakes District Plan is failing to manage noise from bars and restaurants affecting residential and visitor accommodation. While theoretically the district plan could be strictly enforced to protect residents this does not allow for the reality of existing activities. The existing rules are more stringent than most comparable areas in New Zealand.

8.2 Methods

We have detailed several methods that could be combined to address the existing noise issues in the town centre. None of these methods are perfect as there are inherent tensions in trying to allow for essentially incompatible activities in the same zone. Any plan change will need to be driven by a political decision as to the relative importance of the different activities in the town centre.

If residential/visitor accommodation in the town centre is desired then bars and restaurants need to be substantially curtailed. If bars and restaurants are considered important then the plan needs to restrict new residential/visitor accommodation and allow more lenient noise provisions for bars and restaurants. A compromise option discussed in this report is the creation of an entertainment precinct to allow a different balance of activities in different parts of the town centre. The option of an entertainment precinct rather than allowing increased noise throughout the town centre also provides protection for surrounding residential zones.

8.3 Further work

We have noted throughout this report where we consider further work may be beneficial. In summary, this is:

- Community consultation as to the preferred balance of residential/visitor accommodation and bars/restaurants in the town centre,
- Community consultation on the location of an entertainment precinct,
- Attended measurements of existing noise levels in residential zones around the town centre,
- Acoustic modelling revised for a proposed entertainment precinct,
- Investigation of appropriate noise limits for music,
- Verification of the proposed sound insulation requirement and investigation of constructions that comply with that requirement,
- Identification of all existing residential and visitor accommodation in the town centre, and
- Collation of details of existing public events in the town centre.

APPENDIX B
URS REPORT (23 JULY 2011)



Acoustics Report

Proposed Plan Change 42

Queenstown Town Centre

23 JULY 2011

Prepared for
Queenstown Lakes District Council
Private Bag 50072
Queenstown 9348
42168467

URS

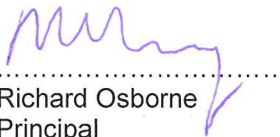
Project Manager:

pp. 
.....
James Block
Senior Associate

URS New Zealand Limited

**Level 1, 31 Orchard Road
Christchurch Airport 8053
PO Box 4479, Christchurch 8140
New Zealand
T: 64 3 374 8500
F: 64 3 377 0655**


Principal-In-Charge:

pp. 
.....
Richard Osborne
Principal

Author:

pp. 
.....
James Block
Senior Associate

Reviewer:

pp. 
.....
Dr Stephen Chiles
Principal

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Introduction

1.1 Background

In Queenstown's town centre zone there is tension between noise sensitive activities such as residential and visitor accommodation, and noise generating activities such as bars and restaurants. The District Plan allows all these activities within the zone but managing and controlling the potential noise issues is increasingly problematic. Queensland Lakes District Council (QLDC) has been aware for some time of difficulties with practical application of the noise rules for the town centre.

Earlier work by URS^[1] described issues with the existing noise provisions and proposed options to move forward with a possible plan change. This report follows on from the earlier work to provide additional information about the noise issues in the town centre in order to inform the proposed plan change. This report generally does not propose any particular measures, but is designed to provide data to inform options which might be developed.

1.2 Approach

QLDC has appointed URS to provide information on the acoustics issues in the town centre zone. The work has been lead by Dr Stephen Chiles, who has extensive experience dealing with the acoustics issues in the Queenstown town centre, having worked for Lakes Environmental Limited (LEL) and QLDC in connection with numerous different bars and carrying out the earlier work.

This report provides information regarding the acoustics issues to aid a possible plan change. It covers:

- Existing sound levels around the town centre,
- Noise limits for music in other towns/countries,
- Activity that would be allowed by different noise limits both in terms of source (i.e. bars) and receivers (i.e. residential units),
- Possible entertainment precincts,
- Rules for existing mixed use zones: Viaduct Harbour (Auckland) and Courtney Place (Wellington),
- Public events in the town centre,
- Complaint records,
- Draft Building Code G6, and
- Possible rules.

1.3 Existing situation

Unless otherwise permitted by a resource consent, activities in Queenstown town centre are currently subject to the Rule 10.6.5.2.ii of the District Plan^[2]:

Activities shall be so conducted that the following noise limits are not exceeded at any point within the boundary of any other site within this zone:

- *Daytime (0800 - 2200 hrs) 60 dBA L_{10}*
- *Night time (2200 - 0800 hrs) 50 dBA L_{10} and 70 dBA L_{max}*

The full version of the rule also includes more stringent noise limits for activities in the town centre transition sub-zone, between Man, Shotover, Brecon and Hay Streets. Activities in the town centre are also required to comply with lower noise limits in adjacent residential zones (40 dB after 2000 h).

The previous work by URS^[1] reported measured noise levels made during earlier investigations into noise from specific bars/clubs. Noise levels at the nearest neighbour were measured after 2200 h as

1 Introduction

between 55 and 73 dB, with significant contributions from music inside the bars/clubs (recorded and live) and people using outside areas. Complaints had been received due to noise at night from the bars/clubs measured, which prompted the earlier investigations. It is thought that the existing noise limits are regularly breached in the town centre, although quantification of the noise levels is not straightforward due to the similar levels of background noise (Section 3). Based on the available data for the previous work, the 70 dB L_{AFmax} night noise limit will almost inevitably be breached if people are outside a bar. Also, music entertainment inside bars will generally exceed the 50 dB limit at residential/visitor accommodation unless the bar has enhanced sound insulation, including door lobbies, and excluding significant areas of standard thickness glazing.

As there were no reported complaints about daytime noise, it was assumed that people are generally more tolerant to daytime noise in a town centre environment in addition to the higher ambient noise levels.

Plan Change 27A^[3] in 2009 included altering the existing L_{A10} metric to L_{Aeq} , whilst retaining the numerical values. The slight differences between these two metrics have been discussed previously and the change was justified by aligning the assessment process with new national standards. Plan Change 27A is currently under appeal.

The noise limits in the current District Plan are for A-weighted sound. The A-weighting accounts for the frequency response of human hearing and combines sound levels at all different frequencies into a succinct single value. The A-weighting allows the levels of low frequency sound to be significantly greater than high frequencies, as the ear is generally more responsive to higher frequencies. For many environmental noise sources this simplification works well. However, an A-weighted level does not always adequately reflect annoyance from the bass of amplified music.

Sound survey

2.1 Introduction

To provide further information about the sound levels in residential areas surrounding the town centre, attended noise measurements were taken by LEL on two separate occasions. Advice to LEL, in the form of measurement locations and requirements/instructions was provided by URS^[4].

2.2 LEL survey details

Two evening/night surveys were carried out by LEL using the same measurement locations (Table 2-1 and Figure 2-1) on:

- Saturday/Sunday 12/13 February 2011, and
- Friday/Saturday 8/9 April 2011.

Table 2-1 Measurement locations

Ref	Location	Ref	Location
1	Corner Park Street and Brisbane Street	7	5 Turner Street
2	15 Brisbane Street	8	Corner Man Street and Brecon Street
3	6 Coronation Drive	9	Corner Isle Street and Brecon Street
4	Corner Melbourne Street and Beetham Street	10	Corner Isle Street and Hay Street
5	Corner Ballarat Street and Henry Street	11	Shotover Street (by Crowne Plaza)
6	Corner Ballarat Street and Hallenstein Street	12	Corner Beech Street and Brunswick Street

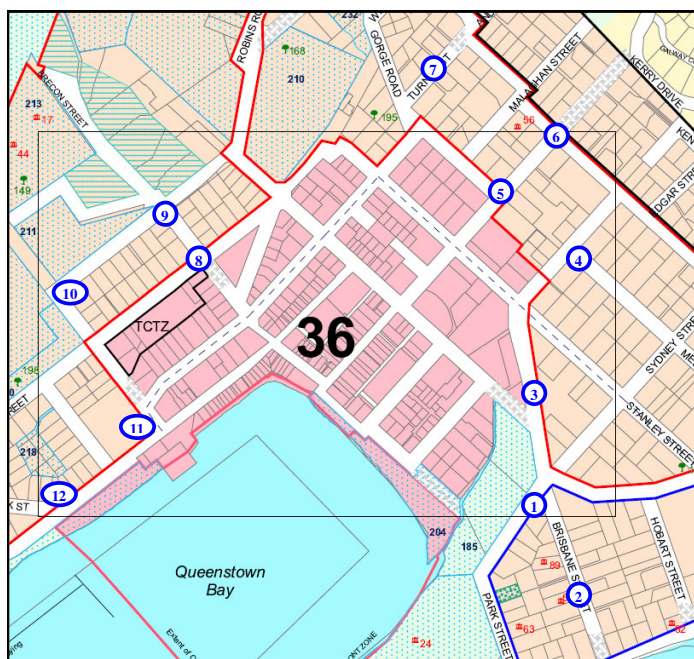


Figure 2-1 Measurement locations

2 Sound survey

At each location:

- The microphone positions were at least 3.5 m from any significant reflecting surface (other than the ground). e.g. not immediately in front of walls or buildings. If a location 3.5m from a reflecting surface could not be achieved, then the location of the microphone was moved to exactly 1 m from the reflecting surface. This was noted so that a correction could be made.
- The microphone positions were as far from road-traffic as possible. All locations were at road edges, but the microphone was kept as far from the traffic as possible, providing that the location is not within 3.5m of a reflecting surface.
- The sound level meter was mounted on a tripod with the microphone 1.2m above the ground.

Specific details of the two surveys are described in Sections 2.2.1 and 2.2.2.

2.2.1 Survey 1

Personnel:	Mary Rose Fitzgerald, LEL.
Times/dates:	2001 h Saturday 12 February to 0237 h Sunday 13 February 2011.
Instrumentation:	Brüel & Kjær 2236 SLM.
Procedure:	Each measurement was 15 minutes in duration and was made at the times shown in Table 2-2.
Weather conditions:	Wind speeds of 2 to 3 m/s, gusting to 5 m/s before 2100 h, dropping to zero later. Dry apart from intermittent light showers between 2100 h and 2200 h.

2.2.2 Survey 2

Personnel:	Mary Rose Fitzgerald, LEL.
Times/dates:	2005 h Friday 8 April to 0221 h Saturday 9 April 2011.
Instrumentation:	Brüel & Kjær 2236 SLM.
Procedure:	Each measurement was 15 minutes in duration and was made at the times shown in Table 2-3.
Weather conditions:	There was little or no wind and no precipitation during the survey.

2.3 Results and discussion

The results from the measurements are summarised in Table 2-1 and 2-2. Over all the locations, the sound levels varied from 37 to 61 dB and resulted from a wide range of sources. The sound sources frequently noted by the operator included traffic sound; wind sound from trees; conversation and music from bars and clubs. These measurements are consistent with the sound levels reported in the earlier work^[1] over the same time period.

Of the eleven measurements made during the night time period (2200 h to 0800 h) of the first survey, eight are above the 50 dB L_{Aeq}/L_{A10} specified for night time noise in the current district plan^[2]. In the second survey, measurements at the same number of locations were above the limit. However, as with the previous measurements in the town centre, the noise from the bars/club was not the dominant source (as indicated in Table 2.2 and Table 2-3). Therefore it is not possible to indicate whether these exceedances were caused by sound from bars/clubs. Section 3 discusses this issue.

2 Sound survey

Table 2-2 Noise survey results – Survey 1

Location	Time	L _{Aeq} dB	L _{A10} dB	L _{A90} dB	Wind	Precipitation	Comments/Sound sources
1	2001 h	57	58	52	Light, gusting 4 knots	None	Wind noise in trees, boats on lake, cars passing (22), car door/boot, pedestrians
2	2023 h	48	50	46	3 knots, gusting 10	None	Gusty winds for first half of measurement, car passing (1), waves on lake, motorbike on nearby street, pedestrians
3	2046 h	54	54	46	4-5 knots, gusting 10	None	Wind noise, traffic in Stanley Street (dominant), cars passing (8), people in adjacent park
4	2109 h	55	55	49	Light breeze	Light rain	Wind noise in trees, traffic in Stanley Street (dominant), 11 passing cars, some conversation audible but source unknown
5	2132 h	58	57	48	Light	Steady for 4 minutes	Traffic in Stanley Street (dominant) plus Ballarat St and Gorge Road, pedestrians
6	2156 h	60	58	45	Light breeze	Intermittent rain	Traffic in Stanley Street (dominant), in between can hear music and voices from bars, more obvious when bar door open, 15 cars passed
7	2229 h	50	51	43	Light breeze	Light rain	Traffic on Gorge Road (dominant)
8	2254 h	56	57	51	Light breeze	None	
9	2314 h	50	51	42	Light breeze	None	
10	2336 h	47	44	38	None	Light rain	People talking near by
11	2358 h	61	64	52	None	None	Music noise from Fraser's Bar
12	0019 h	56	59	45	None	None	Waterfall
1	0050 h	42	43	38	None	None	
4	0114 h	45	47	42	None	None	
5	0136 h	51	51	52	None	None	
8	0200 h	54	56	50	None	None	
11	0222 h	57	60	48	None	None	

2 Sound survey

Table 2-3 Noise survey results – Survey 2

Location	Time	L_{Aeq} dB	L_{A10} dB	L_{A90} dB	Wind	Precipitation	Comments/Sound sources
12	20:05	60.2	63.0	45.0	Slight	None	Cars passing (66), pedestrians
11	20:26	59.6	62.0	50.5	None	None	Cars passing (72), pedestrians
10	20:51	46.0	46.5	40.5	None	None	Noise from town, camp ground, cars passing (2)
9	21:09	48.6	50.5	43.5	None	None	Traffic noise from town, cars passing (5)
8	21:30	57.5	58.0	49.5	None	None	Music and speech noise from Lone Star bar, cars passing (15)
1	21:59	48.2	48.0	41.5	None	None	Traffic noise from Stanley St/Frankton Rd, cars passing (4)
2	22:20	36.7	37.5	34.0	None	None	Traffic noise from Stanley St/Frankton Rd, some conversation audible but source unknown
3	22:41	54.9	52.5	40.5	None	None	Traffic noise, cars passing (5), pedestrians
4	23:02	49.0	50.5	45.0	None	None	Traffic noise from Stanley St
5	23:25	53.4	50.0	41.5	None	None	Music noise from bar, cars passing (7)
6	23:46	54.2	54.5	41.0	None	None	Traffic noise from Ballerat/Stanley St, cars passing (10)
7	00:09	41.2	42.0	34.0	None	None	Distant traffic noise, heat pump, people passing
11	00:35	54.3	58.5	46.0	None	None	Speech noise from bars on Steamers Wharf, cars passing (31)
8	00:58	54.0	55.0	50.0	None	None	Music and speech noise from bars
5	01:23	59.5	57.5	39.0	None	None	Passing cars (12) and people, distant music and speech from bars
4	01:44	53.4	50.0	42.0	None	None	Cars passing (7), distant music and speech from bars
1	02:06	42.2	43.5	38.0	None	None	Faint music and speech from town, cars passing (2)

Compliance monitoring

3.1 Noise limits

Reference is made in this report to the fact that bars in the town centre are likely to be exceeding the current district plan noise limits. This conclusion is reached on the basis of numerous surveys and inspections in the town centre, including an extensive series of measurements opposite Guilty and Pig & Whistle bars in Ballarat Street in 2009.

A difficulty with the existing district plan noise limits is that they are defined in terms of the L_{A10} parameter. Using this statistical parameter it is not possible to accurately analyse results for individual premises by subtracting the effects of other unavoidable noise sources in the town centre such as road-traffic, other bars and pedestrians. The L_{A10} statistic cannot be deconstructed. URS considers that for most bars in the town centre it is impossible to conduct a measurement that could alone provide definitive evidence that the L_{A10} noise limit was being breached by a specific bar.

An experienced operator standing and observing bar activity while conducting measurements over a period of several hours should be able to determine compliance with the noise limits. When the noise limits are being significantly exceeded it can be evident from relatively short measurements. However, in the example of the Guilty bar, to obtain readings of bar noise to an evidential standard of proof required two acoustics experts to conduct attended monitoring for three nights.

QLDC has previously issued abatement notices for bars exceeding the noise limits. However, where an abatement notice was appealed by Montys Bar and Restaurant in 2007 it resulted in an extensive series of noise measurements by three experts and there was still debate over the actual noise levels from the bar.

QLDC (Lakes Environmental Ltd) could issue more abatement notices for bars which appear to be breaching the district plan noise limits. However, in all cases where an abatement notice is issued on the basis of a breach of the noise limits rate-payers could face significant expense for the process of obtaining and defending the required expert evidence.

Most resource consents for bars in the town centre have conditions both setting noise limits and also imposing 'physical controls' such as keeping doors closed after 2200h and not having outdoor loudspeakers. It is understood that Lakes Environmental Ltd does routinely monitor and enforce compliance with the physical controls. However, due to the problems demonstrating a breach of the noise limits to an evidential standard, such action would not be pursued unless, for example, where an actual adverse effect is demonstrated by noise complaints triggered by a subjective assessment.

3.2 Plan Change 27A

Plan Change 27A would replace the L_{A10} parameter with the L_{Aeq} parameter. This has the significant advantage that a series of measurements can be analysed to subtract other noise sources and construct a level attributed to the bar alone. This still requires observation of the activity and skilled analysis, but less extensive measurements should be required to obtain data to an evidential standard. Methods for this analysis are defined in NZS 6801 and NZS 6802 so should not be subject to debate.

There will remain difficulties with enforcement of the noise limits. This will be alleviated to some extent by the adoption of the L_{Aeq} parameter and also by raising the noise limits for bars so other noise sources are less dominant. However, opportunities to increase the use of physical controls rather than noise performance controls should be considered, as demonstrating compliance will still be an issue.

Noise limits for music

4.1 Introduction

Although the Council is considering a range of noise related issues in the town centre, the effects of amplified music has been repeatedly identified as a specific issue through consultation. This section presents the results of a literature review and discussion of limits that have been used to control music noise.

4.2 Background

There is extensive research-based literature on noise and the impact that it has on communities. Typically this involves subjective response and therefore is affected by many factors in addition to the actual sound level, including: the non-acoustical aspects of subjective response; over-simplification of the sound measurement and the physiological part of human response. An example of the former is that the response of a person to a sound is influenced by their relationship with the producer, their perception of any information it contains (e.g. speech) or by their view of its appropriateness. Hence the difficulty of establishing the acceptable levels of noise at a range of receptors must be understood. Nevertheless, criteria are essential if effective policies for noise control are to be developed.

4.3 Literature review

The literature review carried out in this work has concentrated on information available within New Zealand, Australia, UK; plus documents from the World Health Organisation (WHO). A considerable amount of information has been obtained from the UK, as a result of recent research work on this subject. The review has concentrated on music noise in the evening/night and that occurs most nights of the week (e.g. bars and clubs), as apposed to infrequent special events such as concerts or festivals.

New Zealand

Although not specifically aimed at music, New Zealand Standard NZS 6802^[5] sets out procedures for the assessment of noise for compliance with noise limits. Included is a simple mechanism to account for 'special audible characteristics' of noise, in that a 5 dB penalty can be applied to the A-weighted level. This can be used to partly account for annoyance from low frequency bass music noise. The guideline upper noise limit for residential areas in the evening is 50 dB $L_{Aeq(15\ min)}$, which is lowered to 45 dB for night time. The evening and night time periods are to be determined by the local authority. The standard establishes a guideline for the reasonable protection of health and amenity associated with the use of land for residential purposes but acknowledges that in town centres and mixed use areas it can be challenging to define noise limits that enable the fulfilment of the objectives of the areas or zones while also protecting peoples' health and amenity. The guideline limits indicate generally acceptable noise limits but recognises that communities may wish to make these more or less stringent to suite their particular circumstances.

Within other national standards and guidelines there are no specific procedures to assess and control music noise. Typical noise limits specified in district plans were presented in the previous work^[1]. These generally specified a night time noise level of between 50 and 65 dB L_{Aeq} and between 70 and 85 dB L_{AFmax} . Within Auckland's central area, there is an additional requirement of 70 dB at 63 Hz and 65 dB at 125 Hz to control low frequency noise, based on local measurement data. Queenstown town centre is more stringent than most of the other urban areas with a 50 dB L_{A10}/L_{Aeq} and 70 dB L_{AFmax} night-time noise limit (not music specific).

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Australia

In Australia, music noise is controlled at state level and the criteria are described below. The background and origin of the noise limits presented has not been established, i.e. whether the limits were the result of research work and/or measurements.

The State Government of Victoria uses a State Environment Protection Policy^[6] in which limits are placed on the music noise in comparison with the background (without music noise) measured over a period of at least 15 minutes. For the day/evening period, the L_{Aeq} music level should be no greater than 5 dB more than the L_{A90} background level. At night, the L_{oct10} (linear or C-weighted) music level should be no greater than 8 dB more than the L_{oct90} background level, where L_{octp} is the octave band noise level in the dominant octave band which is exceeded for p percent of the time. Day/evening and night periods depend on the day of the week and the number of occurrences of the music noise per week, resulting in a night periods being commencing between 2100 hrs and midnight, and finishing between 0900 hrs and 1100 hrs. Measurements are to be taken at the façade of the noise sensitive receiver, with a -2 dB correct applied to the noise level to account for reflections. When background levels are low (e.g. 32 dB for day/evening period), a fixed background level is used.

South Australia also uses a relative assessment method, with a number of differences, in a guide for new developments^[7]. The music noise ($L_{10(15\text{ min})}$) when assessed at the nearest noise sensitive location should be:

- Less than 8 dB above the level of background noise ($L_{90(15\text{ min})}$) in any octave band of the sound spectrum, and
- Less than 5 dB above the level of background noise ($L_{A90(15\text{ min})}$) for the overall (sum of all octave bands) A-weighted levels.

A conceptually simpler method is used in New South Wales^[8] by introducing subjective inaudibility criteria:

- The L_{A10} noise level emitted from the premises should not exceed the background noise level in any octave band centre frequency (31.5 Hz to 8 kHz inclusive) by more than 5 dB between 0700 h and midnight at the boundary of any affected residence.
- At other times, the L_{A10} noise level shall not exceed the background noise level and the noise from the licensed premises shall not be audible within any habitable room in any residential premises.

United Kingdom

A working group of the UK Institute of Acoustics published a Good Practice Guide on the control of noise from bars and clubs in 2003^[9] but a formal Code of Practice with criteria was not produced because of inconclusive results from trials and the inability to get agreement from all stakeholders. For music noise more than once a week or extending beyond 2300 h, the criteria being suggested by the group^[10], which would result in the music noise being 'virtually inaudible' inside a noise sensitive property, were:

- The music noise L_{Aeq} should not exceed the L_{A90} without the music noise, and
- The music noise L_{10} should not exceed the L_{90} without music noise in any 1/3 octave band between 40 and 160Hz.

Following the inconclusive work by the Institute of Acoustics, the noise from pubs (bars) and clubs in the UK was studied in government funded work^[11,12]. This study focussed on the assessment of noise

4 Noise limits for music

from infrequent and one-off entertainment activities operating between 2300 h and 0700 h, with a view towards determining which methods are best suited to gauging the impact of such noise on persons trying to sleep or trying to get to sleep. Phase 1 of the study reviewed the available data and suggested a number of assessment methods, together with a proposal for a laboratory and field validation programme. Phase 2 tested the methods. During the second phase, subjective assessment of the music noise was also collated for regular occurrences, e.g. nightly operation of a bar, but not analysed.

The outcomes of the studies applicable to this review were:

- The majority of the members of the public and Environmental Health Officers (EHO) reported that the onset of audibility of the entertainment noise did not equate to a threshold of acceptability.
- The results of the laboratory testing identified several methodologies and criteria, which gave reasonably good correlation with subjective response. However, during the field testing it was apparent that the 'highest performers' from the laboratory testing all had clear disadvantages in use practice. Hence there was no clear best option which combined optimum correlation between subjective response and easy, rapid use.
- The following options were considered the best of the available options for assessing noise from one-off events after 2300 h, in descending order of correlation with subjective response:

— **$L_{Aeq(5\text{ min})}$ noise level value set at a single action level**

However, an intrusive music noise criteria based on an absolute L_{Aeq} would be difficult to use where the existing ambient noise level without the music noise was close to, equal to or above the action level. Recommended, therefore, was an action level (L_{Aeq}), with an additional subjective requirement that the music noise itself has a clearly audible (to an ontologically normal listener) contribution to the overall noise e.g. the songs/tracks would be recognisable to a listener familiar with the music and any words intelligible. The noise levels at which the test subjects felt the noise was 'just unacceptable' for a one-off event within a habitable room with windows closed was at 34 dB $L_{Aeq(5\text{ min})}$. The range for the next two scores of unacceptability (on a 10 point scale) was a $L_{Aeq(5\text{ min})}$ of between 34 and 37 dB. The study assumed a 25 dB reduction from external to internal noise levels, with a closed window, hence these values correlate with external noise levels of 59 and 62 dB respectively. For an open window, with a reduction of 15 dB, the resulting external noise levels are 49 and 52 dB respectively.

— **$L_{A90(5\text{ min})} - L_{A90(5\text{ min}),\text{no music}}$**

This option allows consideration of the background level, but requires a measurement without intrusive entertainment noise that may not be possible on the night of a complaint. This in itself may be problem enough to make the metric unusable for one-off events or as a quick response to a problem.

— **$L_{Aeq} - L_{A99.95}$ or $L_{Aeq} - L_{A99.8}$ ^[13]**

These metrics include some consideration of the underlying noise level at the same time as any offending noise level is measured, without requiring a separate 'no music' measurement to be made. The former was slightly more effective in prediction of subjective response than the latter, but not substantially so, and using the latter has logistical advantages. The performance of both these noise metrics was worse than the previous two options, but they also avoid the practical disadvantages of the previous two options.

Those metrics which were also tested but performed worse in terms of correlation with subjective response than the three listed above comprised:

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- $\Delta L_{Aeq} - L_{A90, no\ music}$ where ΔL is the logarithmic subtraction of the levels with and without music^[14].
- $\Delta L_{A10} - L_{A90, no\ music}$ in the one-third bands between 40 and 160 Hz. The maximum value in any of these bands was then used for the analysis^[14].
- The maximum values of the previous two options^[14].
- $L_{Aeq} - L_{A90, no\ music}$ ^[15].
- Noise Rating (NR) curves based on octave band L_{eq} , L_{10} , L_{90} and L_{max} measurements.
- Maximum exceedance of one-third octave band L_{eq} measurements over reference curve in the frequency range from 12.5 to 160 Hz^[16].
- Absolute and relative C-weighted noise levels.
- Relative L_{90} (A- and C-weighted).
- Subjective inaudibility.

Interestingly, although three out of the four music samples used in the testing of the options included significant low frequency elements, the methods designed to assess these features specifically did not compare well with the subjective response.

The study recommended that the three best performing options should be trialled to select the most practical option. The field trials assisted in the selection of the optimum criterion but further tests were proposed in normal working conditions to establish the practicality of each option. Additional laboratory testing was also recommended to establish further methods for assessing noise from regular events.

The use of 'audibility/inaudibility' with the absolute level L_{Aeq} in the first of the best performing options is an interesting approach and has been used in Scotland. Due to the complex nature of audibility, this subject has been debated by professionals for several decades, with no clear answers. Its use also partly conflicts with the first outcome of this study and therefore may be too stringent.

The Clean Neighbourhoods and Environment Act 2005^[17] amended the English Noise Act 1996^[13] to cover general noise emissions from licensed premises in addition to noise from dwellings. The permitted internal level is set at 34 dB $L_{Aeq(5\ min)}$ if the 'underlying level' of noise is no more than 24 dB L_{Aeq} or L_{A99} (or a similar statistical level), or 10 dB above the underlying level where this exceeds 24 dB.

Within the rest of Europe, absolute L_{Aeq} and L_{AFmax} limits are typically used^[11] to control music noise. L_{Aeq} limits varied between 34 to 45 dB, L_{Amax} between 25 and 60 dB.

The Association of Australian Acoustical Consultants^[18] produced guidelines on internal noise levels for residences in 2010, although these are not specifically aimed at music noise. A number of levels were proposed depending on the star rating (i.e. the quality) of the internal noise environment and varied between 27 and 36 L_{Aeq} . Levels of 30 to 35 dB are also proposed in AS/NZS 2107^[19].

The World Health Organisation (WHO) recommended in 1999^[20] a noise limit inside bedrooms of 30 dB to prevent sleep disturbance and the corresponding noise level outside an open window of 45 dB (L_{Aeq} , continuous noise, not specifically music). Additionally, for non-continuous noise, the recommended levels were 15 dB higher (e.g. 45 dB inside and 60 dB outside), using L_{Amax} . Following the availability of additional research, these levels were updated in 2009^[21] and a night noise guidance level was recommended of 40 dB ($L_{night, outside}$) for the avoidance of sleep disturbance and other biological effects. The L_{night} is A-weighted long-term average sound level as defined in ISO 1996-2:1987, determined over all the night periods of a year. An interim target value of 55 dB was also recommended where the lower limit cannot be achieved in the short term and where policy-makers

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choose to adopt a stepwise approach. In practice these noise levels are very low and will be exceeded in the majority of urban locations, therefore they may be considered as aspirational.

4.4 Summary of approaches

The majority of the noise limits are specified outside the affected property: Table 4-1 summarises the absolute noise level criteria in terms of L_{Aeq} , and Table 4-2 in terms of L_{Amax} . Table 4-3 summarises the relative criteria. In each case, the noise level criteria presented are the façade noise levels outside the worst affected room with an open window during the evening/night. Where criteria are specified as only internal noise levels, these have been converted to external levels using a 15 dB correction (open window). The majority of the limits presented are specifically targeting music/entertainment noise. A number of non-specific limits have also been presented, including for example, those concerning sleep disturbance.

Those criteria that are explicitly specified for room inside a building in the evening/night are summarised in Table 4-4.

Table 4-1 Comparison of absolute external noise limits, L_{Aeq}

Source	Music specific?	Time period	Outside noise limit, dB
New Zealand Standard NZS 6802	No	15 minutes	50 (evening) 45 (night) 60 (new mixed use zone night)
New Zealand District Plans – centre/business/commercial areas in major towns and cities	Yes	15 minutes	50 – 65
			70 dB at 63 Hz 65 dB at 125 Hz
Queenstown – town centre	No	15 minutes	50 (L_{10})
UK noise from pubs (bars) and clubs research	Yes	5 minutes	49 – 52
UK Clean Neighbourhoods and Environment Act 2005	No	5 minutes	34 (if background less than 24 dB)
Germany VDI 2058B11	Yes	-	40 – 45
France Recommendation CNB (1993)	Yes	-	37 ^(a) (22 inside, closed window)
Sweden SOSFS 1996:7	Yes	-	40 ^(a) (25 inside, closed window)
Netherlands Catering order (1998)	Yes	-	40

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Italy DPCM 14/11/97 No280	Yes	1 minute	40 (open window)
Switzerland DEP	Yes	10 seconds	34
WHO night noise guidance level	No	-	40 ($L_{\text{night}}^{(b)}$)

Notes: (a) Outside noise level based on 15 dB difference between inside and outside.

(b) L_{night} is A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the night periods of a year.

Table 4-2 Comparison of absolute external noise limits, $L_{A\text{max}}$

Source	Music specific?	Time weighting	Outside noise limit, dB
NZS 6802	No	Fast	75
New Zealand – centre/business/commercial areas in major towns and cities	Yes	Fast	75 – 85
Queenstown – town centre	No	Fast	70
Norway NS 8175-1997	Yes	Fast	25-45
Netherlands Catering order (1998)	Yes	Fast	60

Table 4-3 Comparison of relative external noise limits

Noise metric	Source	Outside noise limit, dB	Music specific?
$L_{A\text{eq}}$	Victoria EPA SEPP No. N-2 (day/eve)	$L_{A90,\text{no music}} + 7^{(a)}$	Yes
	UK Clean Neighbourhoods and Environment Act 2005	$L_{A\text{eq}} + 10$ or $L_{A99} + 10$ (if background greater than 24 dB)	No
	Draft UK Institute of Acoustics Working Group	$L_{A90,\text{no music}}$	Yes
L_{A10}	New South Wales Noise Guide (07:00 to midnight)	$L_{A10,\text{no music}} + 5$	Yes
	New South Wales Noise Guide (midnight to 07:00)	$L_{A10,\text{no music}}$	Yes

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	South Australia EPA Guidelines	$L_{A90, \text{no music}} + 5$	Yes
	Draft UK Institute of Acoustics Working Group	$L_{A90, \text{no music}}$ in any one-third octave band from 40 to 160 Hz	Yes
L_{Oct10}	South Australia EPA Guidelines	$L_{\text{Oct90, no music}} + 8$	Yes
	Victoria EPA SEPP No. N-2 (night)	$L_{\text{Oct90, no music}} + 10^{(a)}$	Yes

Notes: (a) Includes -2 dB correction for reflective façade.

Table 4-4 Comparison of absolute internal noise limits

Source	Internal noise limit		Music specific?
	dB L_{Aeq}	dB L_{AFmax}	
Tauranga, Business Zone, habitable rooms	35	-	No
Rotorua, Commercial A and B, bedrooms	35	-	No
Auckland, Central area, bedrooms	35	-	No
Queenstown, Town centre, Plan Change 1 – withdrawn	35	-	Yes
AS/NZS 2107	30-35	-	No
AAAC Guideline	36 (2 star) 35 (3 star) 32 (4 star) 30 (5 star) 27 (6 star)	50 (2 star) 50 (3 star) 45 (4 star) 40 (5 star) 35 (6 star)	No
Switzerland DEP	24	-	Yes
Sweden SOSFS 1996:7	25	-	Yes
France Recommendation CNB (1993)	22	-	Yes
Italy DPCM 14/11/97 No280	25	-	Yes
Germany VDI 2058B11	25	35	Yes
Netherlands Catering order (1998)	25	45	Yes
Norway NS 8175-1997	-	22-37	Yes
World Health Organisation (1999)	30		No

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4.5 Discussion

The literature review has shown the wide range of limits and assessment techniques that have been applied to music noise and this illustrates that the subjective response is affected by many factors in addition to the actual sound level.

The majority of criteria found in the review favour an absolute L_{Aeq} limit, with a range of limits between 34 and 85 dB. With a current limit level of 50 dB L_{A10} (or 50 dB L_{Aeq} in Plan Change 27A), the current Queenstown District Plan falls in the lower half of this range. In a number of cases the L_{Aeq} limit is combined with an absolute L_{AFmax} limit, typically between 45 and 75 dB. The current limit in Queenstown is 70 dB. Therefore there is precedent for both the L_{Aeq} and L_{Amax} limits to be revised higher or lower than the existing. To determine new limits, a compromise will be required which balances the operation of the bars/clubs; the acceptable noise inside and outside affected residential buildings and visitor accommodation; and the acoustic insulation of both the source and receiver buildings.

Assessment of music noise using relative levels is predominantly favoured in Australia and is also used in the UK, all with slightly different approaches. These typically compare the noise level with music measured using a L_{Aeq} or L_{A10} against the noise level without the music using a L_{A10} or L_{A90} . The noise level with music is limited to between 5 and 10 dB more than the level without (up to midnight). On a practical note, arranging for a measurement without the music noise, to obtain the relative level, may prove difficult to obtain simply.

There is also an additional difference between noise assessments in Australia and New Zealand^[22]. Generally within New Zealand, the zoning of the receiver defines the noise criteria, whereas in Australia the criteria can depend on the current use of the area. Therefore in New Zealand the noise criteria for a residential property adjacent to a commercial area would be for a 'residential zone', but under most Australian policies the criteria would be relaxed to reflect the adjacent non-residential use.

Three methods of assessing the contribution of low frequency noise (e.g. bass-dominated music) have been found in this review. In Australia, the music noise level in the dominant octave band is used in relative level assessment, whereas in Auckland, absolute levels are prescribed at two octave band frequencies (63 and 125 Hz). In the UK, draft guidelines suggested a relative assessment in any one-third octave band from 40 to 160 Hz. Research in the UK however, has shown that A-weighted metrics have a better correlation with subjective response than those metrics tested which incorporate a low frequency element. Whether this is due to the fact that the research was aimed at infrequent events is not currently clear.

Lowering the noise limit would have significant effects on the bars/clubs, including not only the volume of music within the establishment but also the access (opening doors), ventilation (opening windows), sound insulation of the building structure and use of outdoor areas. Disregarding the use of outdoor areas at the receiver, a lower noise limit may not be required if affected receivers have adequate sound insulation and alternative ventilation systems (as apposed to opening windows). Given the variety of building constructions in and around the town centre, it would be difficult to generalise on the level of sound insulation at the receivers. For future residential and visitor accommodation buildings in the town centre, a minimum sound insulation should be considered.

The ability to determine the activity noise level from the ambient noise should also be considered within a potential change in noise limit. Unless the music noise is significantly higher than the ambient noise, it may not be possible to determine it precisely at the receiver (Section 3). In the case where the

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music noise is of a similar or lower level compared to the ambient, the music noise may still be perceptible due to the characteristics of the music, e.g. low frequency content or temporal patterns (beats).

Tolerance to music noise is not widely discussed in the literature reviewed but it will depend on other factors in addition to the actual sound level, including the relationship with the producer; the perception of any information it contains (e.g. speech or lyrics) or by the view of its appropriateness. Residents in town centres may well accept higher noise levels due to the location and music noise may be tolerated at certain times of the day and evening but potentially not at night if it causes sleep disturbance. Occupants in visitor accommodation may be more or less tolerant than residents.

4.6 Summary

Numerous noise limits have been proposed for music. In many cases it is unclear whether these limits have been founded on research. Where there has been research in the UK, it has shown that commonly held views about the benefit of noise limits at specific low frequencies are not supported, and the use of an A-weighted limit is sufficient.

Where music noise is specifically addressed within New Zealand district plans, it is controlled using low frequency limits, e.g. 70 dB at 63 Hz and 65 dB at 125 Hz (Auckland). Otherwise NZS 6802 specifies a +5 dB penalty for 'special audible characteristics' which can be used to address annoyance from low frequency bass music noise. These methods are not supported by the findings of the recent research mentioned above.

Most noise limits are either relative to the ambient noise or audibility of the music. Both systems are difficult in that it might not be practical to obtain a measurement without the music playing, or otherwise reliance is placed on a subjective judgement that will be open to challenge. There does not appear to be a robust technical solution to this issue but the best interim approach might be the use of an absolute L_{Aeq} limit when the music is audible. This demonstrates the inherent difficulty of a mixed-use zone where factors at both the source and the receiver need to be included, e.g. ambient noise, sound insulation, opening windows/doors and the use of outdoor areas.

Enabled activity

5.1 Introduction

Any change in the noise limits by a plan change will have effects on both bars/clubs and the visitor accommodation/residential properties. This section quantifies the likely implications of different noise limits on both accommodation and entertainment areas. This has been done using calculations based on assumptions of external noise limits; internal levels and façade constructions. This analysis is only intended to provide an indication of effects on activities and the actual effect on a particular activity in a particular location will depend on site specific factors.

5.2 Effects on accommodation

The relevant internal noise criteria are discussed in Sections 4 and 10. For this exercise, the following internal noise limits have been considered:

- 30 dB (WHO recommendation); and
- 35 dB (proposed PC1 / G6 building code).

The required façade constructions have been predicted to achieve the above criteria for external noise levels of between 40 to 60 dB L_{Aeq} . The music noise spectrum as shown in Table 5-1 has been used in the calculations, which includes a significant low-frequency component. The example shown is for 60 dB L_{Aeq} .

Table 5-1 Music noise spectrum, dB L_{Aeq}

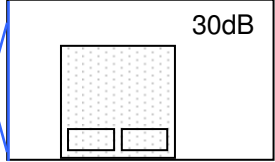
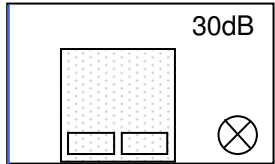
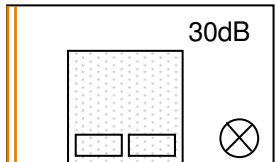
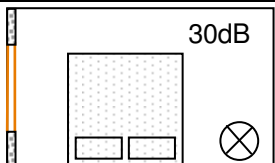
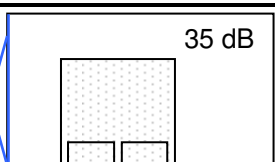
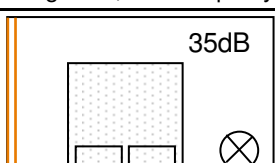
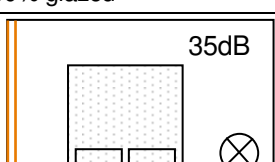
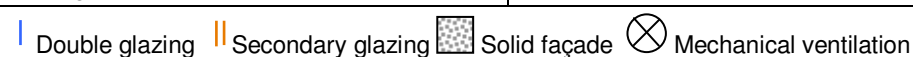
	Octave band centre frequency, Hz							A-weighted total
	63	125	250	500	1k	2k	4k	
External music noise	71	69	59	58	53	46	43	60

Noise calculations have been made assuming a 3×4×2.4 metre bedroom with typical furnishings and no significant sound transmission path through the roof / ceiling. The latter assumption is valid for most high-density buildings typical of the town centre but would not apply to smaller or standalone buildings. The façade on which the external noise is assumed to be incident is 3 metres wide and 2.4 metres high.

Predictions of the dimensions and construction of the glazing plus the open/closed status have been made which provide the required acoustic insulation to meet the internal noise level for various external noise levels. The results of the calculations are presented in Table 5-2. The glazing type is specified in terms of the total width, glass thickness and cavity thickness. For example, '14mm, 4/6/4' is a double glazed unit with a total width of 14mm, composed of two panes of 4mm thick glass, with a 6mm air cavity between them. The quoted acoustic insulation of the façade, in terms of the R_w+C_{tr} , applies to the façade with all windows closed. R_w describes the airborne sound insulating power of a building element and can apply to walls, ceiling/floors, doors or windows. It is a laboratory measured value and the higher the number, the greater the sound insulating power of the building element. C_{tr} is a low frequency sound correction used for sources with low frequency components, e.g. surround sound systems, traffic and aircraft noise, drums and bass guitars. Two walls can have the same R_w rating but have different resistance to low frequency sound, thus a different R_w+C_{tr} .

5 Enabled activity

Table 5-2 Predicted façade constructions

External noise level	Façade configuration and bedroom internal criteria	Glazing type and façade performance
40 dB	 <p>100% glazed, window partly open</p>	14mm double glazed (4/6/4) R_w+C_{tr} 27
50 dB	 <p>100% glazed, window closed</p>	24mm double glazed (6/12/6) R_w+C_{tr} 29
60 dB	 <p>100% glazed</p>	116mm secondary glazed (10.76/100/6) R_w+C_{tr} 42
65 dB	 <p>Maximum 50% glazed</p>	116mm secondary glazed (10.76/100/6) R_w+C_{tr} 44
50 dB	 <p>100% glazed, window partly open</p>	24mm double glazing (6/12/6) R_w+C_{tr} 29
60 dB	 <p>100% glazed</p>	67mm secondary glazed (10.76/50/6) R_w+C_{tr} 38
65 dB	 <p>100% glazed</p>	116mm secondary glazed (10.76/100/6) R_w+C_{tr} 42
Legend:		

5 Enabled activity

To achieve the internal noise levels when external levels of 60 dB or above are allowed requires fully sealed secondary glazed windows, with considerable air gaps (50 or 100 mm). This is shown diagrammatically in Figure 5-1. In addition, mechanical ventilation would be required. These are not standard constructions and preclude the use of opening windows. This is not compatible with the current regular use of opening glazed doors onto balconies for example.

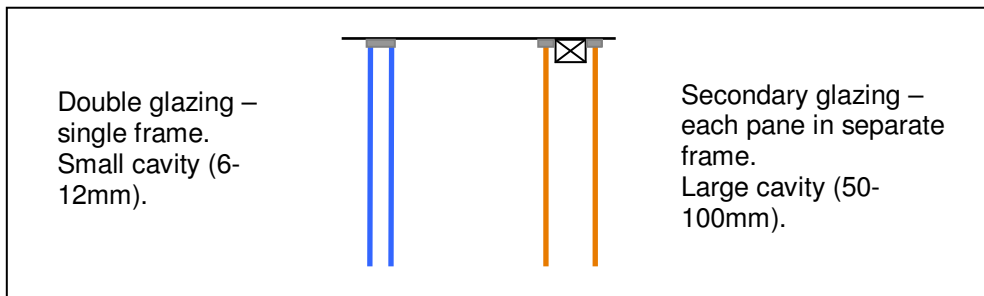


Figure 5-1 Glazing comparison

There are other methods to control internal noise levels such as screening or orientation of the building and/or windows. Such measures could potentially reduce the sound insulation requirements shown above but may only be possible in certain circumstances.

5.3 Effects on bars and clubs

The above analysis considered what façade construction would be required for residential / visitor accommodation given a range of potential limits for bar noise outside. Similarly, setting an external noise limit at the receiver determines the activities that can occur at a bar/club.

An associated scenario where there is vertical separation between the source and receiver, e.g. a residence above a bar, has not been studied in this work. Unlike activities in separate buildings, when a bar and apartment are in the same building the situation is entirely under the control of the developer in the first instance, and subsequently the Body Corporate.

Predictions have been made of the level of noise inside the bar/club that would lead to typical external noise levels at a receiver. A separation distance of 20 metres has been assumed between the bar/club and the noise receiver, taken to be on the other side of a street.

Three levels of music noise inside (Table 5-3) have been used in the calculations. Note that 'background' music levels may vary significantly between venues. In this instance, conversation between patrons is not significantly impeded by music noise.

Table 5-3 Assumed internal music levels, L_{Aeq}

Example music type	Internal reverberant noise level, dB
Background music	75
Amplified music	95
Live band / dance club	105

5 Enabled activity

The major factor in achieving noise levels is the amount of openings in both the doors and windows. Three different door configurations have been modelled, which are shown in Figure 5-2. The calculations have assumed that the doors will be opened for access and egress, however will remain closed at all other times.

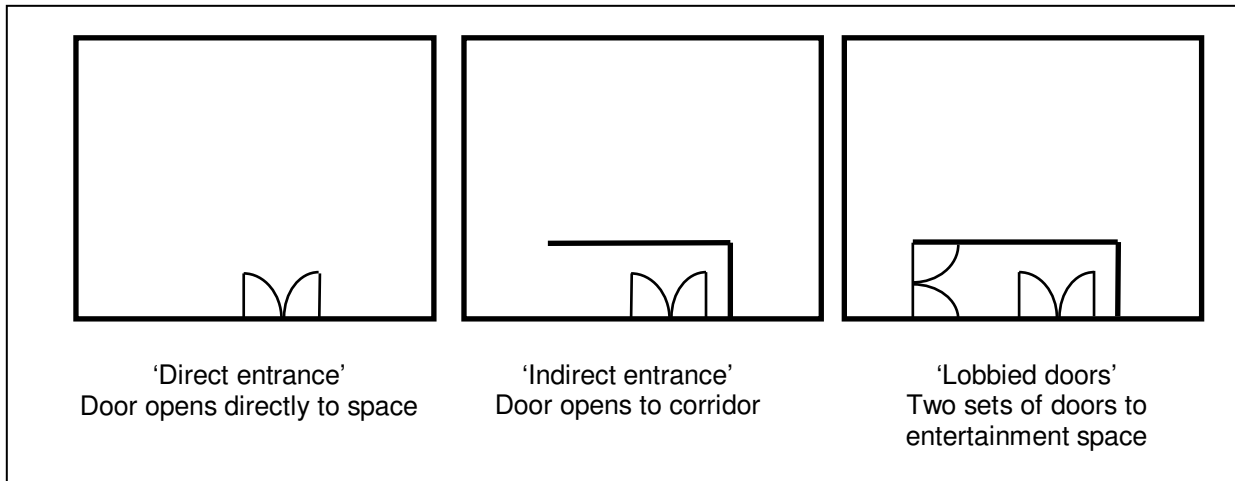


Figure 5-2 Door configurations

Based on a series of measurements opposite the Guilty and Pig & Whistle bars on Ballarat Street in 2009 a 'quiet' outdoor area of a bar or restaurant with some separation or screening from neighbours could operate within a 60 dB limit providing that it is well managed and there is no exuberant or boisterous activity^[1]. These measurements and others at Montys bar indicate that this limit is often exceeded. On the basis of such measurements, the levels detailed in Table 5-4 have been assumed for the current assessment. Screening would typically consist of a minimum 2.5 metre high barrier which blocks line-of-sight between the patron area and the receivers. While the 'noisy group' makes allowance for some degree of exuberance, patrons in external areas are required to be well managed in order to maintain these noise levels.

Table 5-4 Assumed external patron levels at 20 metres

Patron group type	External noise level, L_{Aeq} dB
Quiet group with screening	50
Quiet group	60
Noisy group	65

The results of the predictions are shown in Table 5-5, showing the permitted internal and external activities for potential noise limits ranging from 40 to 65 dB.

5 Enabled activity

Table 5-5 Activity permitted for different noise limits

Noise limit at receiver dB	Allowable activity at bar/club		Required glazing and door arrangement	
	Level of music inside	External activity	Glazing	Doors
40	Background music	None	50% double glazing, closed	Indirect door
	Amplified music	None	50% secondary glazing, closed	Lobbied door
	Live band / dance club	None	25% secondary glazing, closed	Lobbied door
50	Background music	Quiet group with screening	50% double glazing, partially open	Direct door
	Amplified music	Quiet group with screening	50% double glazing, closed	Indirect door
	Live band / dance club	Quiet group with screening	50% secondary glazing, closed	Lobbied door
60	Background music	Quiet group	50% double glazing, fully open	Direct door
	Amplified music	Quiet group	50% double glazing, partially open	Direct door
	Live band / dance club	Quiet group	50% double glazed, closed	Lobbied door
65	Background music	Noisy group	50% double glazing, fully open	Direct door
	Amplified music	Noisy group	50% double glazing, partially open	Direct door
	Live band / dance club	Noisy group	50% double glazed, closed	Indirect

To achieve the current noise limit of 50 dB at the receiver, the activity outside the bar/club is limited to a quiet group with screening or no activity at all. As expected, for higher levels of music inside the bar/club, better performing glazing is required and windows need to be kept shut.

Entertainment precinct

6.1 Introduction

The noise issues in the town centre may be partially relieved by the instigation of an entertainment 'precinct' by which provision is made for bars and clubs to operate with more lenient noise limits in a defined area. This would encourage the separation of noise from residential and visitor accommodation.

6.2 Methodology

To investigate the distribution of noise sources and receivers in the town centre, information regarding building usage was obtained from QLDC and presented graphically in Figure 6-1. The location of the bars and clubs are shown, together with the number of beds within the visitor accommodation, where the data was available. The markers are generally located in the centre of the buildings and not necessarily in the exact part of the building where the bar is located. Information was available regarding the number of private residential properties within the town centre but at 'meshblock' level (a collection of buildings bounded by streets). This level of detail was not fine enough to be of use in this current work, and there are various apartments in the town centre which may require further consideration.

For the purpose of this report, bars have been considered as premises where the sale of food (if any) is secondary to the sale of alcohol as it is activities of this nature that have generally been the source of most of the noise problems. To some extent this is an arbitrary distinction but further distinctions are difficult as most cafes and restaurants have liquor licences and most bars sell food.

The data only shows markers on buildings in the town centre zone, so excludes some relevant buildings in adjacent zones such as the Crowne Plaza on Shotover Street.

6.3 Discussion

There is an area centred around the Village Green where there is no visitor accommodation shown. This area without visitor accommodation extends down several of the adjoining streets, such as The Mall, where there are existing bars. There are some apartments in this area, which have been the source of complaints about bar noise. However, of all the areas in the town centre for a potential entertainment precinct this would appear to have the least impact at least on existing visitor accommodation.

There are numerous areas where there are concentrations of existing bars, but there is also existing visitor accommodation in the vicinity.

There does not appear to be any other locations where an entertainment precinct would be viable due to the distribution of visitor accommodation in particular. Around the general area of the Village Green there could be several variations as to the extents of a precinct.

Figure 6-2 and Figure 6-3 show updated noise contours from the previous report^[1]. The model parameters are as detailed in the previous report, apart from the bar locations and noise levels.

Figure 6-2 shows bar noise on the basis of the existing night-time noise limit of 50 dB. The number of bars is now 45 in accordance with the actual locations, which is more than the 20 used for illustrative purposes in the previous report. In Figure 6-3 the noise limit has increased to 60 dB for 5 bars in the vicinity of the Village Green and a further 5 indicative bars have been added around the Green,

6 Entertainment precinct

subject to the same limit. Comparison of these two figures provides an indication of the effect of more lenient noise limits in an entertainment precinct.

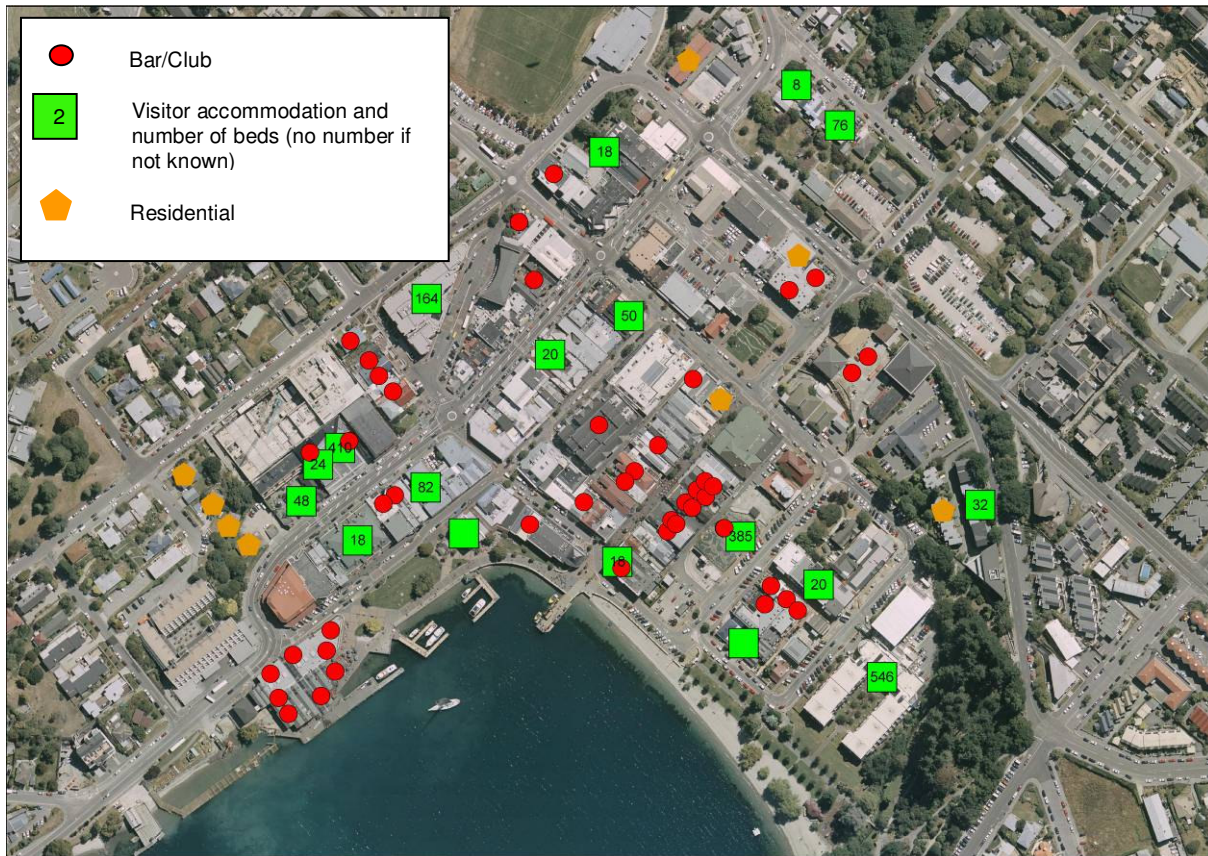


Figure 6-1 Location of bars/clubs and visitor accommodation

6 Entertainment precinct

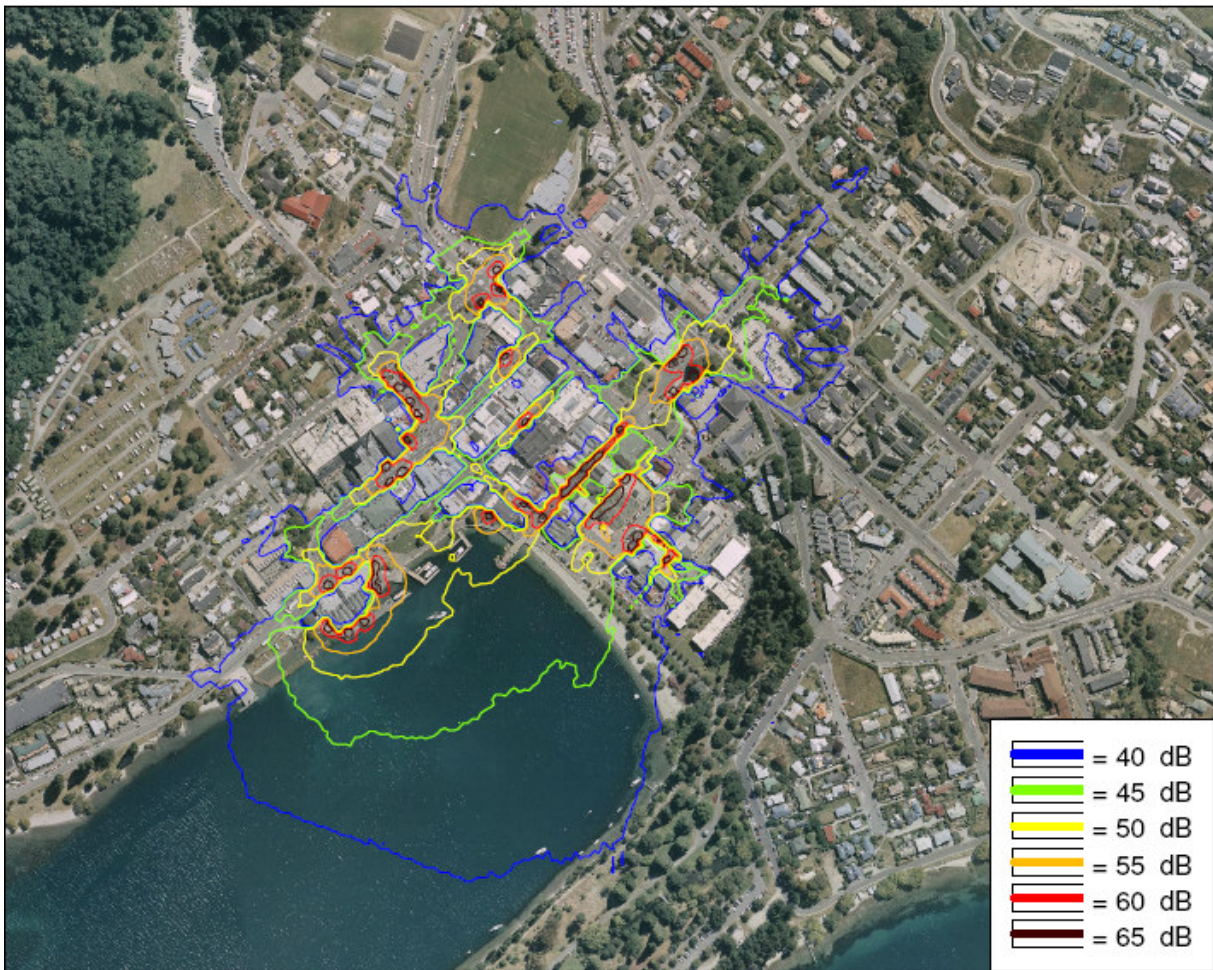


Figure 6-2 All bars at 50 dB

6 Entertainment precinct

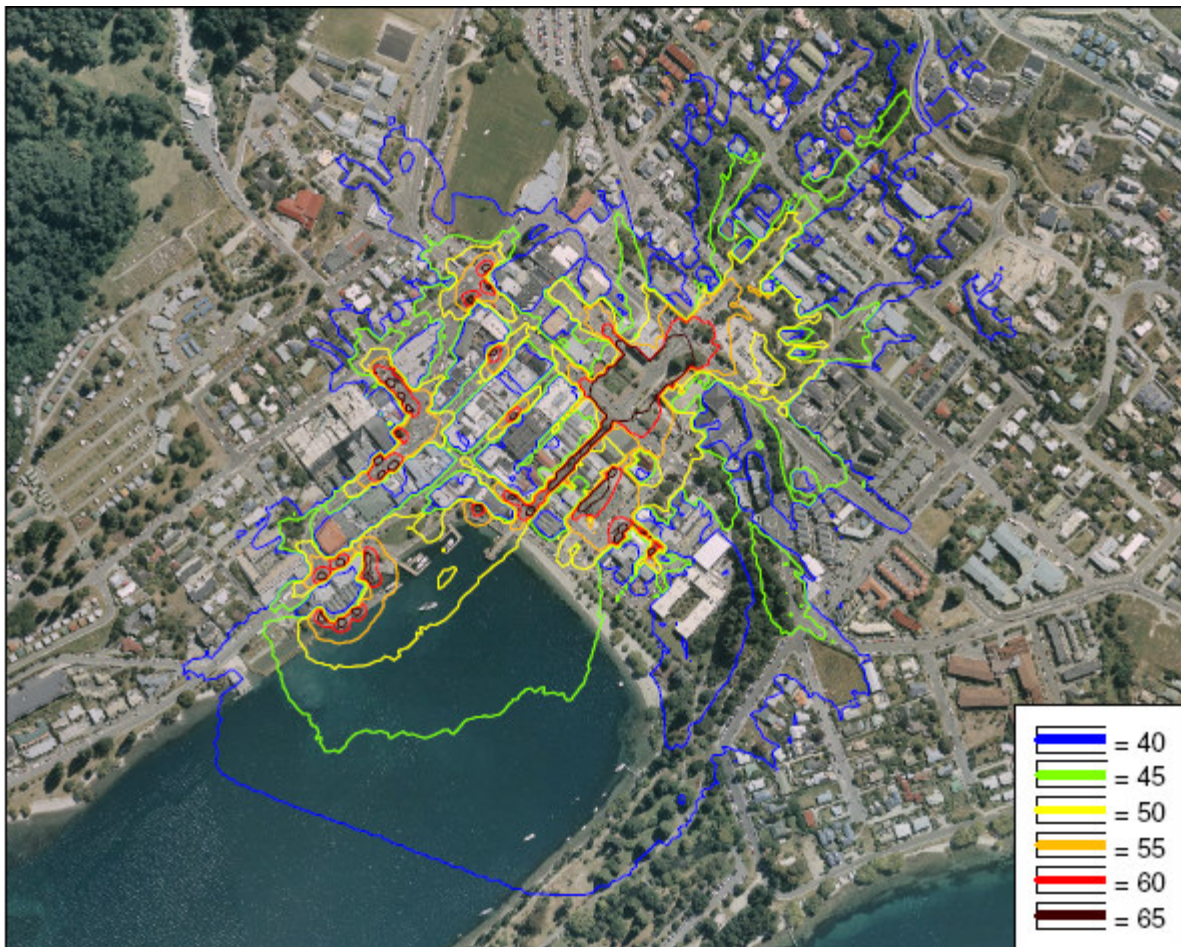


Figure 6-3 Village Green bars at 60 dB

Comparing Figure 6-2 and Figure 6-3 shows the extension of the 65 dB contours from very localised effects when all the bars are limited to 50 dB, to include the majority of the Village Green area when the bars in the potential precinct have a more relaxed limit. The 50 dB contour extends across Stanley Street and into the areas to the north east.

Mixed-use zones

7.1 Introduction

Information has been gathered from the local council staff on the control of noise from two other mixed-use environments:

- Courtney Place, Wellington and
- Viaduct Harbour, Auckland.

7.2 Wellington

In the inner business area of Wellington, which includes Courtney Place, the noise impact on another building, including residential, is controlled by a combination of methods^[23]:

- Noise limits outside the receiver building:
 - 60 dB L_{Aeq} at all times
 - 85 dB L_{Amax} at all times
- Noise limits on fixed plant (e.g. air conditioning equipment) at the receiver building:
 - 55dB $L_{Aeq(15\ min)}$ at all times
 - 80dB L_{AFmax} Monday to Sunday 10pm to 7am
- A limit on the noise from a loudspeaker:
 - 75dB $L_{Aeq(2\ min)}$ measured at least 0.6 m from the speaker.
- A noise insulation construction requirement:
 - An external sound insulation level of $D_{nT,w} + C_{tr} > 30\ dB$

Historically, the 60 dB noise limit outside a building was used to control the noise impact in adjacent buildings, including both visitor accommodation and residential properties. The limit on fixed plant was introduced later to prevent background noise levels increasing.

With the use of large opening doors and windows on bars plus outdoor loudspeakers, music noise levels often reached very high levels with adjacent bars competing for their music to be heard. In such instances, identification of the offending premises was difficult. A consultation process involving all stakeholders resulted in the addition of a limit on the noise from individual loudspeakers, thus preventing these issues.

The acoustic insulation performance has been included recently as a condition for new buildings and when combined with the external noise limits should result in acceptable noise levels inside the building.

After the introduction of the further noise controls in addition to the noise limit outside a receiver building, the number of noise complaints in the Courtney Place area have decreased. This is an interesting situation, as the external L_{Aeq} noise limits are generally higher than those found in the literature review (Section 4). The insulation requirements (resulting in low internal noise levels) or the expectations of the residents in the zone may be factors in this.

7.3 Auckland

Noise from licensed premises is a major issue in many areas of Auckland's CBD, including the mixed-use area of Viaduct Harbour, resulting in approximately 10% of all noise complaints received by the

7 Mixed-use zones

local council. The majority of the buildings used as bars and clubs in the CBD were not generally designed to accommodate such uses and therefore are not adequately designed and insulated.

The City of Auckland District Plan sets external noise levels at the receiver, including elements to control low-frequency noise. Part 14.7 of the plan deals specifically with Viaduct Harbour with additional limits on the internal noise (35 dB L_{A10} in bedrooms and 45 dB in other habitable rooms) thus implying a certain level of acoustic insulation. To avoid the need to open windows, alternative ventilation systems are specified. These are required to operate with low noise levels to maintain the internal noise limits.

In comparison to Wellington, external loudspeakers are not permitted outside bars/clubs without an additional licence and are therefore not typically used. Lobbied doors are recommended by the council for licensed premises as a means of noise control.

While areas such as the Viaduct Harbour are sometimes heralded as examples of successful mixed-use zones, the same noise complaints and issues appear to exist as are being experienced in Queenstown, even with some additional controls such as internal noise criteria.

7.4 Summary

The examples in Auckland and Wellington show approaches to mixed-use zones similar to those being considered for Queenstown. Both allow higher night-time noise limits and require sound insulation for new residential buildings. However, there are still noise complaints. Where higher noise limits are allowed, there is generally a compromise of the standards discussed in Section 4, to achieve a more 'lively' town centre. Finding the appropriate balance for a particular location is primarily a political decision rather than a technical acoustics issue.

Public events

8.1 Introduction

The noise from outdoor public events is likely to exceed the noise limits within the District Plan and therefore either rules should be devised to accommodate these events, or they should remain subject to resource consent. Currently, rule 19.2.2.3(d) of the District Plan permits temporary activities only if they comply with the normal zone noise standards, although larger events with more than 200 people outdoors are discretionary activities.

8.2 Outdoor events

The outdoor events in the town centre scheduled for twelve months from April 2011 are listed in Table 8-1. We understand this is a typical year in terms of the general number of events held. These events will include:

- Outdoor music, both live and recorded,
- Public address systems,
- Fireworks, and
- Crowds of people.

A number of these events will predominantly take place during the day but some will also extend into the night and early morning. For most of these events the existing noise limits in the District Plan are likely to be exceeded.

Table 8-1 Outdoor town centre events in the next 12 months

Date	Event
25 April 2011	ANZAC Day
24 June – 3 July 2011	Winter Festival
23 – 31 July 2011	Gay Ski Week
11 – 28 August 2011	New Zealand Winter Games
1 September 2011	Rugby World Cup – Ireland Arrives
18 September 2011	Classic All Blacks Game
23 – 30 October 2011	ASB Jazz Festival
December 2011	Community Carol Services
31 December – 1 January 2012	Summerdaze New Year Festival

8.3 Previous consent conditions

A number of consent conditions for outdoor events have been reviewed during this work to determine what noise conditions have been used previously (Table 8-2). Consents acknowledge that noise from the events will exceed the limits in the District Plan but allowance has been made due to the 'one-off' nature of the events and that they would occur within prescribed times of the day and/or night.

8 Public events

Table 8-2 Previous consent conditions relating to noise

Event	Location	Date and times	Summary of contents relating to noise
Summerdaze New Year Festival	Various locations	Yearly (consented Aug 2009)	Short-term noise effects for a few hours only in the morning, afternoon or evening.
Concert	Village Green	9 Dec 2009 1200 h to 2000 h	Mitigation of the effects of noise by having lower volume acoustic music during afternoon office hours. Significant effects not anticipated.
Winter Festival	Various events and locations	25 Jun to 4 Jul 2004	'Less than minor effects' anticipated due to short duration and town centre location. Latest event runs to 2200 h. Seven events listed that will use amplified music, with specified times. Music stated to be non-continuous.

8.4 Discussion

Previously issued resource consent conditions generally acknowledge that the noise from the events will exceed the limits in the District Plan. Consent has been granted due to the 'one-off' nature of the events and that they would occur within prescribed times of the day and/or night.

Rules in the plan could possibly exempt a set number of events from the noise limits or provide a higher noise limit for those events. However, there have been four noise complaints about music at two public events over the last year (Table 9-1), indicating that it may be appropriate to set a noise limit for these events. The events were located on the lake front and in Village Green.

Further investigation of the resource consent conditions that have been issued for these events in the past is recommended.

Complaint records

9.1 Introduction

This section reviews the complaint records supplied by LEL, covering the period between 1 January 2010 and 17 December 2010. These complaints were typically investigated using an assessment of whether the noise was 'excessive' under Section 326 of the RMA. Therefore measurements of the noise levels were not carried out (a) as activities operating within the noise limits may well be considered 'excessive' and (b) due the difficulties in measuring the actual noise level from the activity (Section 3).

The complaint records were supplied in spreadsheet form, with details of the complaint and a series of yes/no columns to describe the situation. For example, these columns were entitled 'Recorded music', 'Live music', 'Sound system'. A comment column was used to provide additional information. Some of the yes/no columns gave conflicting information on the complaint and the comment column was used to clarify the nature of the complaint.

During this time there had been ongoing proceedings over noise issues in the Church Street/Church Lane area and this is reflected in the complaint records.

9.2 Analysis of complaint records

9.2.1 All noise sources

There are 60 recorded noise complaints in the immediate vicinity of the Queenstown town centre, covering almost a full calendar year between 1 January 2010 and 17 December 2010. Other noise complaints originated outside the town centre and have not been included in this analysis. All of the 60 entries were attended in person by a Noise Control Officer (NCO) contracted to LEL. In 30 of these entries the source of the noise had ceased before the arrival of the NCO (Figure 9-1). Of the remaining 28 entries, 12 of these resulted in the issue of a 72 hour Excessive Noise Direction (END), the remainder being resolved without this formal process.

9 Complaint records

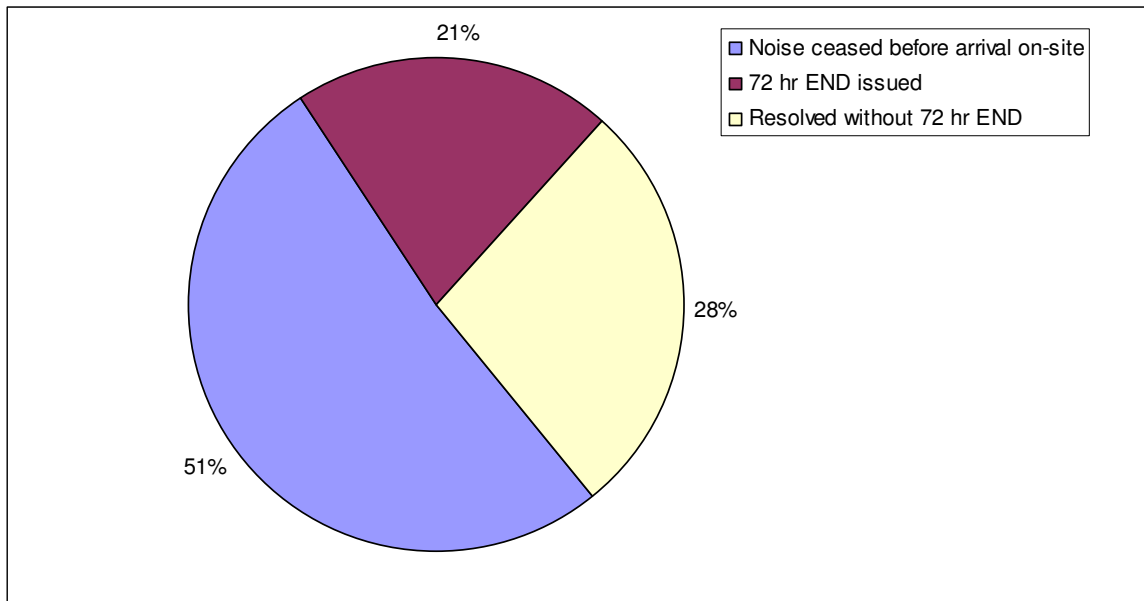


Figure 9-1 Noise complaint resolution

A breakdown of all the entries in terms of the noise source and the type of noise causing the complaint is presented in Table 9-1. Music noise accounted for the majority (82%) of the complaints (Figure 9-2), with 43 (72%) originating from bars/clubs (Figure 9-3).

9 Complaint records

Table 9-1 Number of complaints against type of noise

Noise source	Type of noise causing the complaint						Total
	Music	Voices	Alarm	Generator	Vibration	Not known	
Bar/Club	38	2				3	43
Busker	4	1					5
Circus				1	1		2
Gym	1					1	2
Not known	2						2
Public event	4						4
Road vehicle	1						1
Commercial property			1				1
Total	50	3	1	1	1	4	60

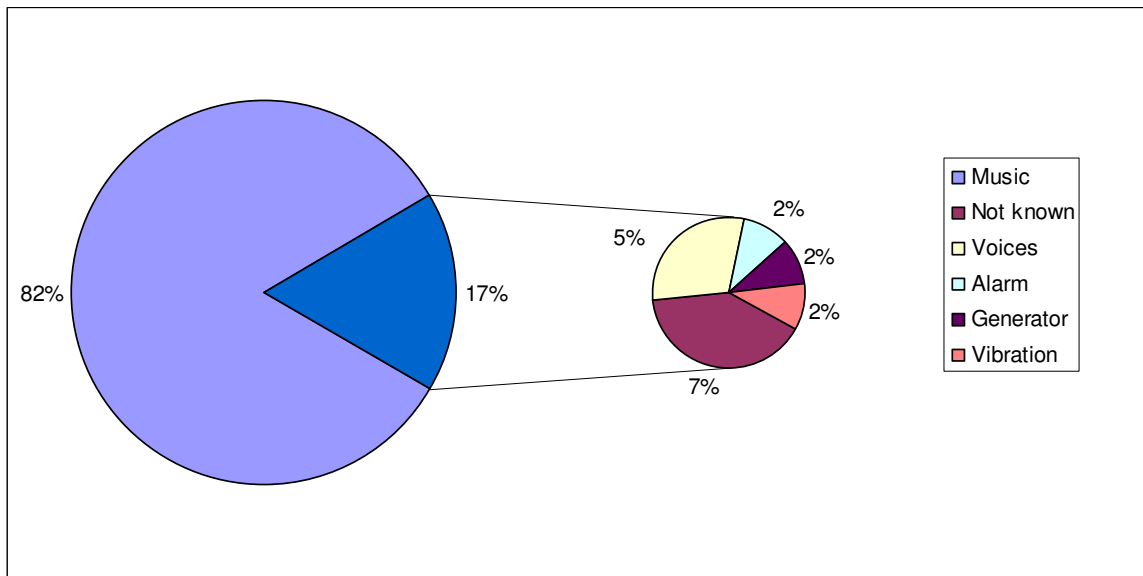


Figure 9-2 Type of noise causing complaint

9 Complaint records

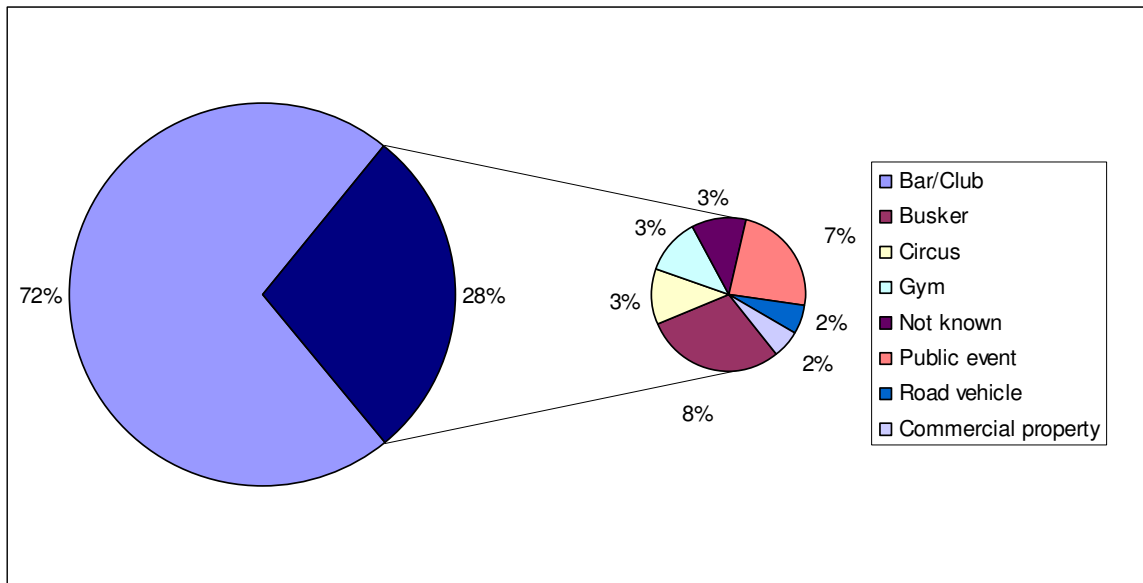


Figure 9-3 Source of noise causing complaint

9.2.2 Noise from bars and clubs

Of the 43 complaints arising from noise originating in bars and clubs, 39 cases (90%) were due to music, 2 (5%) were due to patron’s voices and for 2 cases (5%) the type of noise was not recorded .

Of the 39 cases of music noise from bars and clubs, the music had stopped in 19 cases (49%) by the time the NCO arrived on site and no further action was taken. Where the music noise was ongoing (19 cases, 49%), almost one third resulted in the issue of a 72 hour END. The remainder were resolved by other means, including:

- Closing the entrance doors and/or windows,
- Using a side entrance for patron arrival/departure,
- Turning down the bass level on the PA system
- Altering the direction that the PA speakers were facing
- Reducing the volume of the PA system

From Table 9-2 it can be seen that 22 out of the 43 (51%) complaints regarding noise from bars/clubs were a result of noise from a bar/club located in the Earl Street/Church Street/Church Lane area with the remainder spread around the town centre.

This is also reflected in the location of the complainants, with 58% located in the Earl Street/Church Street/Lane area (Table 9-3). Of these 25 complaints, 15 were from the an address in Church Lane and 8 from an address in Earl Street. These two complainants generated 38% of the total number of complaints in the town centre and 53% of the complaints about bars/clubs. Shotover Street is the next concentration of source and complaint location.

9 Complaint records

Table 9-2 Noise complaints from bars and clubs – source location

Location of bar/club	Number of complaints
Ballarat Street	3
Brecon Street	1
CBD	1
Cow Lane	1
Duke Street	1
Earl St/Church St/Church Lane	22
Rees Street	1
Searle Lane	3
Shotover Street	9
Stanley Street	1
Total	43

Table 9-3 Noise complaints about bars and clubs – complainant location

Location of complainant	Number of complaints
Ballarat Street	1
Cow Lane	1
Duke Street	2
Earl St/Church St/Church Lane	25
Malaghan Street	1
Not known	1
Shotover Street	8
Stanley Street	2
Suburb Street	1
Von Place	1
Total	43

9.3 Summary

This analysis has indicated that music noise from bars and clubs is the dominant reason for the noise complaints received in Queenstown town centre. Approximately one-half of these complaints required further action, either by issuing a 72 hour Excessive Noise Direction, or were resolved by other means, including simple good-practice noise control (closing windows and doors, reducing the volume of PA equipment). The bars and clubs located in the Earl Street Church Street and Church Lane area caused approximately one-half of the complaints, with the complainants located in the same area.

Building Code

10.1 Introduction

In September 2010, the Department of Building and Housing (DBH) released a consultation draft of proposed changes to G6 of the Building Code for the protection from noise. This proposed revision includes internal noise criteria for external noise sources and requires the building envelope to be designed to achieve these levels. URS has since been involved as part of a DBH working group to review public comments.

The discussion document accompanying the consultation advised that decisions about changing the Building Code would be made by the end of May 2011 and that any changes would take effect from 1 December 2011. These timeframes have not been achieved.

Imposing requirements on buildings was considered previously by QLDC in proposed Plan Change 1, but that was withdrawn in 2004 as it was thought that the current G6 revision was imminent.

10.2 Proposed G6 amendment

Table 10-1 details the proposed internal noise levels which apply to buildings containing household units and to detached dwellings, from Section G6.3.4 of the proposed G6 revision.

Table 10-1 Proposed internal noise levels

Receiving space	Source	Maximum internal noise level L_{Aeq} dB
Habitable spaces of household units	Day-time external noise level specified in the District Plan	45
Habitable spaces of household units	Night-time external noise level specified in the District Plan	35

If the proposed revision to G6 were implemented, it is likely that this approach would first require some refinement to better define the external noise, and also to differentiate between different types of habitable spaces. The effect of these proposed noise levels on the building design and amount of noise a bar/club could emit are investigated in Section 5.

Comparing these levels with others specified (Section 4.3) it can be seen that the proposed night-time level of 35 dB is the maximum or 'satisfactory' value of the AS/NZS 2107 range; rated '3 star' under the AAC Guideline; 5 dB higher than the 1999 WHO document and generally noisier than the other cases found during the literature survey. It therefore represents a compromised standard, as could be reasonably expected in a mixed-use zone.

10.3 Summary

The internal noise levels proposed in the draft revision of G6 would require new residential and visitor accommodation buildings in the town centre to be designed and constructed to result in reasonable internal noise levels. However, this revision has been awaited for in the order of 10 years, and it appears that it may stall again. It therefore would seem prudent for the Queenstown Lakes District Plan to include internal noise/sound insulation requirements in the interim in the same manner as several other districts.

Rules

11.1 Introduction

No recommendations are made here as to the appropriate protection of amenity for residential / visitor accommodation, or appropriate noise limits for bars/clubs. The following draft rules are provided simply to illustrate how options discussed in this report might be implemented.

11.2 Noise limits

General noise rules

Plan Change 27A introduced rules to all zones relating to: noise limits applying from the zone in which noise is received; and standards for assessing construction, airport, helicopter and wind farm noise. These general provisions should remain unchanged, by proposed Plan Change 42, other than updated numbering/referencing.

Cumulative effects

District plan noise limits in New Zealand usually apply to each site generating noise individually. Therefore, if a receiving site was equal distance from two neighbouring bars each generating noise at exactly the district plan limit, the total noise received would be 3 dB ($=10 \times \log(2)$) above the district plan noise limit. This potential cumulative effect needs to be considered when setting noise limits.

General sound sources

The issues in the town centre relate primarily to noise from music and people. There has been no reason raised to alter the noise limits for other sources such as building services plant. It is therefore recommended that the existing noise limits be retained for those noise sources. On the basis of the proposed rules for the town centre from PC27A, the noise limits for general sound sources could be written as:

- (a) *Sound from activities, other than music and voices, measured in accordance with NZS 6801:2008 and assessed in accordance with NZS 6802:2008 shall not exceed the following noise limits at any point within any other site in this zone:*
 - (i) *daytime (0800 to 2200 hrs) 60 dB $L_{Aeq(15 min)}$*
 - (ii) *night-time (2200 to 0800 hrs) 50 dB $L_{Aeq(15 min)}$*
 - (iii) *night-time (2200 to 0800 hrs) 70 dB L_{AFmax}*

Music

From Section 4 an appropriate noise limit for music could be written in the form:

- (X) *Sound from audible music, measured in accordance with NZS 6801:2008 and assessed in accordance with NZS 6802:2008, excluding any special audible characteristics and duration adjustments, shall not exceed XX dB $L_{Aeq(5 min)}$ at any point within any other site in this zone.*

The term 'audible music' does introduce potential ambiguity and would preferably be avoided. However, as discussed in Section 4 there isn't a robust objective alternative at this time. The exclusions for special audible characteristics and duration adjustments are made as the criteria for

11 Rules

music has been developed for this specific source already accounting for any such factors. On the basis of the discussion in Section 5 the value of the noise limit XX in this rule might either be 50 dB $L_{Aeq(5 \text{ min})}$ if it is assumed that windows of neighbouring residential / visitor accommodation are ajar for ventilation or 60 dB $L_{Aeq(5 \text{ min})}$ if the windows are closed and the spaces mechanically ventilated.

A rule has not been drafted here, but the provision in Wellington for a limit applied close to individual loudspeakers could provide a useful monitoring method, which should be considered further.

Currently it is difficult to measure the actual level of music using the L_{A10} parameter, if there is noise from other activity contaminating readings. Using the L_{Aeq} parameter as proposed here would allow analysis of results to determine the music noise level. However, this would still generally not be possible with a single short measurement.

Voices

The main reason to adjust noise limits would be to make more allowance for people in outdoor areas of bars at night and to some extent during the day. A rule could be written in the form:

- (X) *Sound from voices measured in accordance with NZS 6801:2008 and assessed in accordance with NZS 6802:2008 shall not exceed XX dB $L_{Aeq(15 \text{ min})}$ at any point within any other site in this zone.*

The value of XX would need to be 65 dB or more to allow current usage patterns of outdoor areas. This is a rule that could potentially be applied just within an entertainment precinct, with the standard limits in Rule (a) applying elsewhere.

Public events

In Section 8 there was insufficient detail of noise from current events to determine an appropriate rule for public events. It is likely that an exemption or relaxation of the noise limits for a set number of events would be appropriate.

11.3 Bar management measures

Most recent resource consents issued for bars in the town centre have similar consent conditions for noise management measures. While some are site specific, it might be more efficient and consistent for others to be added as rules in the plan. These provisions could include the following, although some may become redundant if it is decided to facilitate greater use of outdoor areas:

- Doors to be lobbied,
- Doors and windows kept closed after 2200 h,
- No outdoor loudspeakers,
- External rubbish bins not to be filled or emptied between 2200 h and 0800 h,
- No occupation of outdoor areas, other than for smoking, after 2200 h,
- Installation of an automatic music noise limiter,
- Implementation of a noise management plan, and
- Annual monitoring where there is music entertainment (above a background level).

11 Rules

11.4 Sound insulation

As the revision to G6 might not eventuate in the near future, a rule for sound insulation may be appropriate. A rule applicable to critical listening environments in the town centre could be written in the form:

- (X1) *A mechanical ventilation system shall be installed for all critical listening environments in accordance with Table 2 in Appendix 13.*
- (X2) *All elements of the façade of any critical listening environment shall have an airborne sound insulation of at least XX dB R_w+C_{tr} determined in accordance with ISO 140-3 and ISO 717-1.*

The ventilation specification in Appendix 13 was written for airport noise and the title would need to be adjusted to include the town centre application.

In the example rule above, the sound insulation requirement (R_w+C_{tr} , described in Section 5) has been suggested here to avoid the need for acoustics calculations or field testing as it is measured in a laboratory. As shown in Section 5, the value of XX would need to approximately 35 to 40 dB to allow for an increase in noise limits for music and voices whilst maintaining the internal noise levels. This would require relatively costly and non-conventional secondary glazing. This rule could potentially be limited to within or adjacent to an entertainment precinct.

Other approaches to the sound insulation rule could be to specify constructions or an internal noise criterion. Specification of constructions that meet the sound insulation requirement should be included in an appendix regardless (possibly in Appendix 13), to provide an efficient option for demonstrating compliance. An internal noise criterion has the disadvantage of requiring specialist acoustics input to calculate, but does allow for consideration of site specific factors. Given that the external noise is variable in level and source location, the exact calculation of an internal level is considered unwarranted.

11.5 Entertainment Precinct

If an Entertainment Precinct were implemented then a rule could be added to prohibit new residential activity and visitor accommodation in that area. Where possible, the boundaries of the precinct would need to avoid creating situations where residential activity could exist in an adjacent area immediately opposite a bar in the precinct.

In the town centre zone outside the Entertainment Precinct, rules could be added to limit operating hours for new bars to within daytime hours (up to 2200h).

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Limitations

URS New Zealand Limited (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Queenstown Lakes District Council and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 1 December 2010.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between December 2010 and July 2011 and is based on the information available at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.



URS New Zealand Limited
Level 1, 31 Orchard Road
PO Box 4479, Christchurch 8140
New Zealand
T: 64 3 374 8500
F: 64 3 377 0655
www.urscorp.co.nz

APPENDIX C
CHILES LIMITED FIRST LETTER (8 JULY 2014)

Chiles Ltd

Private Bag 55037, Christchurch 8154

8 July 2014

Ref: 140101

Queenstown Lakes District Council
Private Bag 50072
Queenstown 9348

Attention: Matthew Paetz

Dear Matthew

Subject: Queenstown town centre noise contours

Introduction

Chiles Ltd has been engaged by the Queenstown Lakes District Council (QLDC), to provide noise contours for different scenarios of bar noise in Queenstown town centre. Dr Chiles was previously responsible for providing acoustics advice related to the town centre as set out in URS reports 42168467/R001/B dated July 2011 and 421768107/R002 dated April 2009. This letter provides variations to the noise contours in those previous reports. It is based on the same URS noise model documented in report 42168467/R001/B.

Scenarios modelled

Three new scenarios have been modelled and results are attached to this letter. The scenarios are:

Scenario	Number of bars	Noise limit (people talking)
1	45	60 dB $L_{Aeq(15 \text{ min})}$
2	45	65 dB $L_{Aeq(15 \text{ min})}$
3	35	60 dB $L_{Aeq(15 \text{ min})}$
	10	65 dB $L_{Aeq(15 \text{ min})}$

For the third scenario a precinct has been created where some bars (10) have a higher noise limit of 65 dB $L_{Aeq(15 \text{ min})}$ as opposed to a general noise limit of 60 dB $L_{Aeq(15 \text{ min})}$ for most bars. This precinct has been defined as bars fronting on to the Mall, which was selected to:

- minimise noise from a precinct affecting residential areas surrounding the town centre,
- coincide with an area containing existing bars, and
- avoid areas containing existing residential and visitor accommodation as far as practicable.

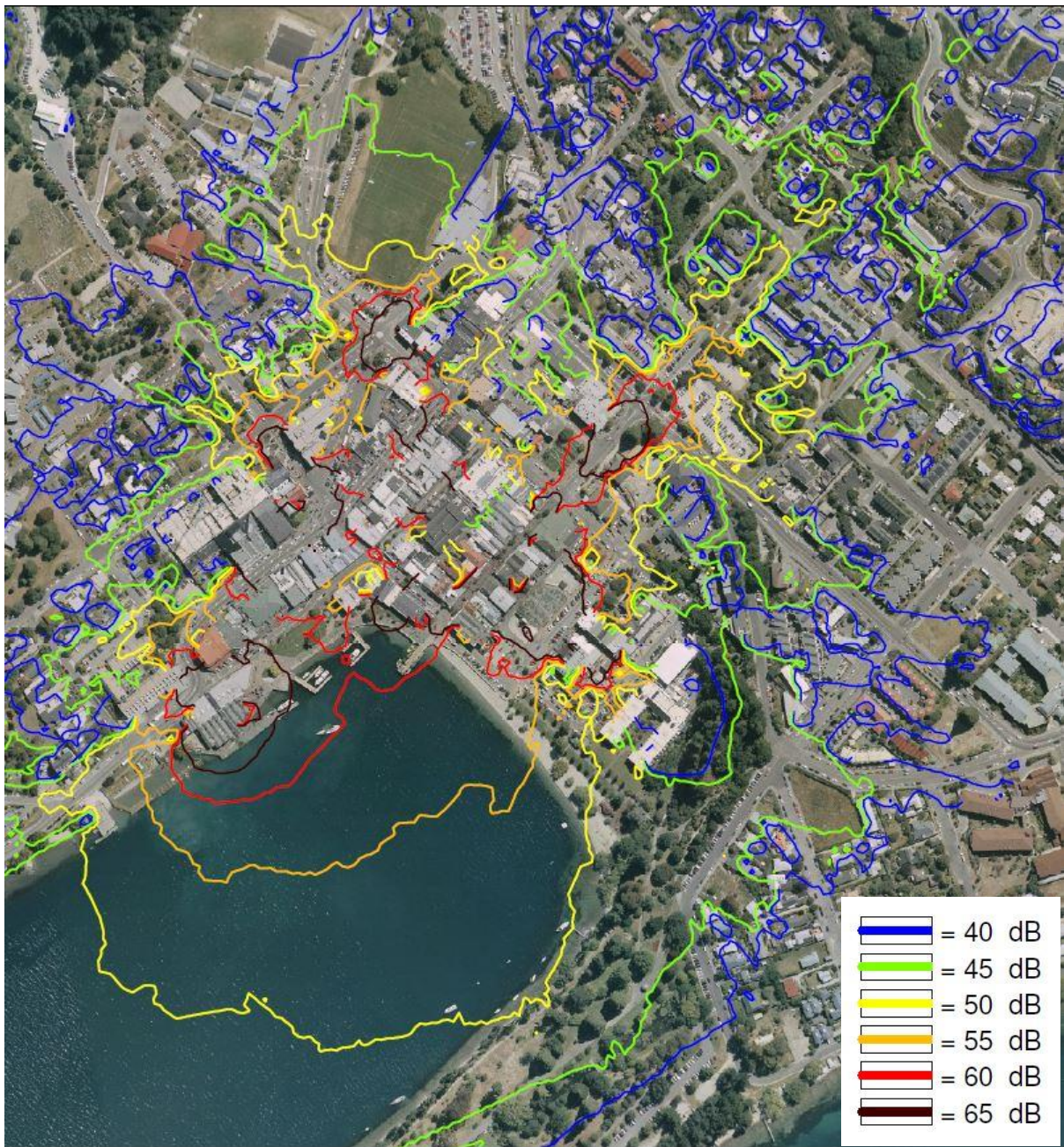
Yours sincerely

Chiles Ltd

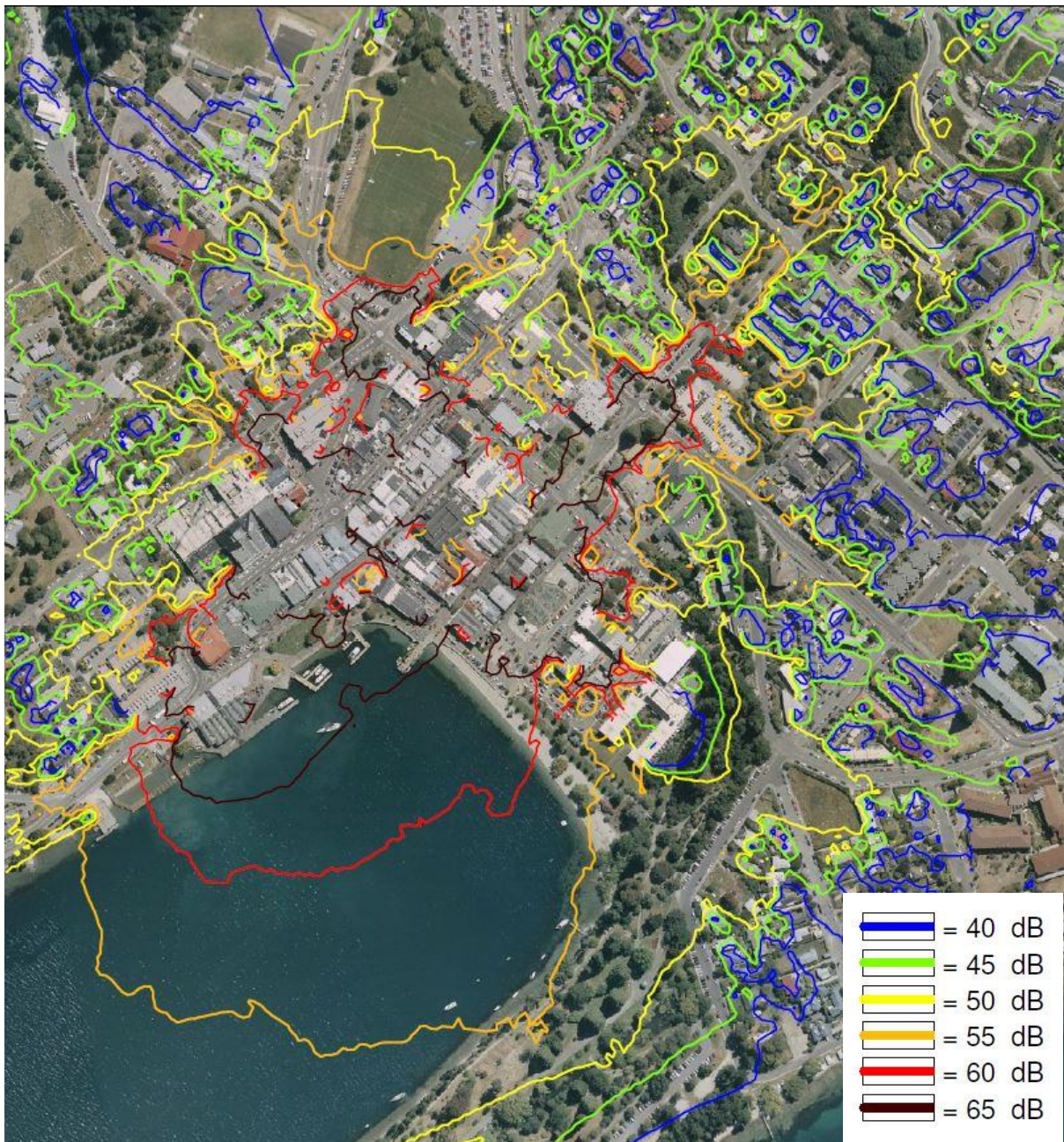


Dr Stephen Chiles
stephen@chiles.co.nz
03 318 8854

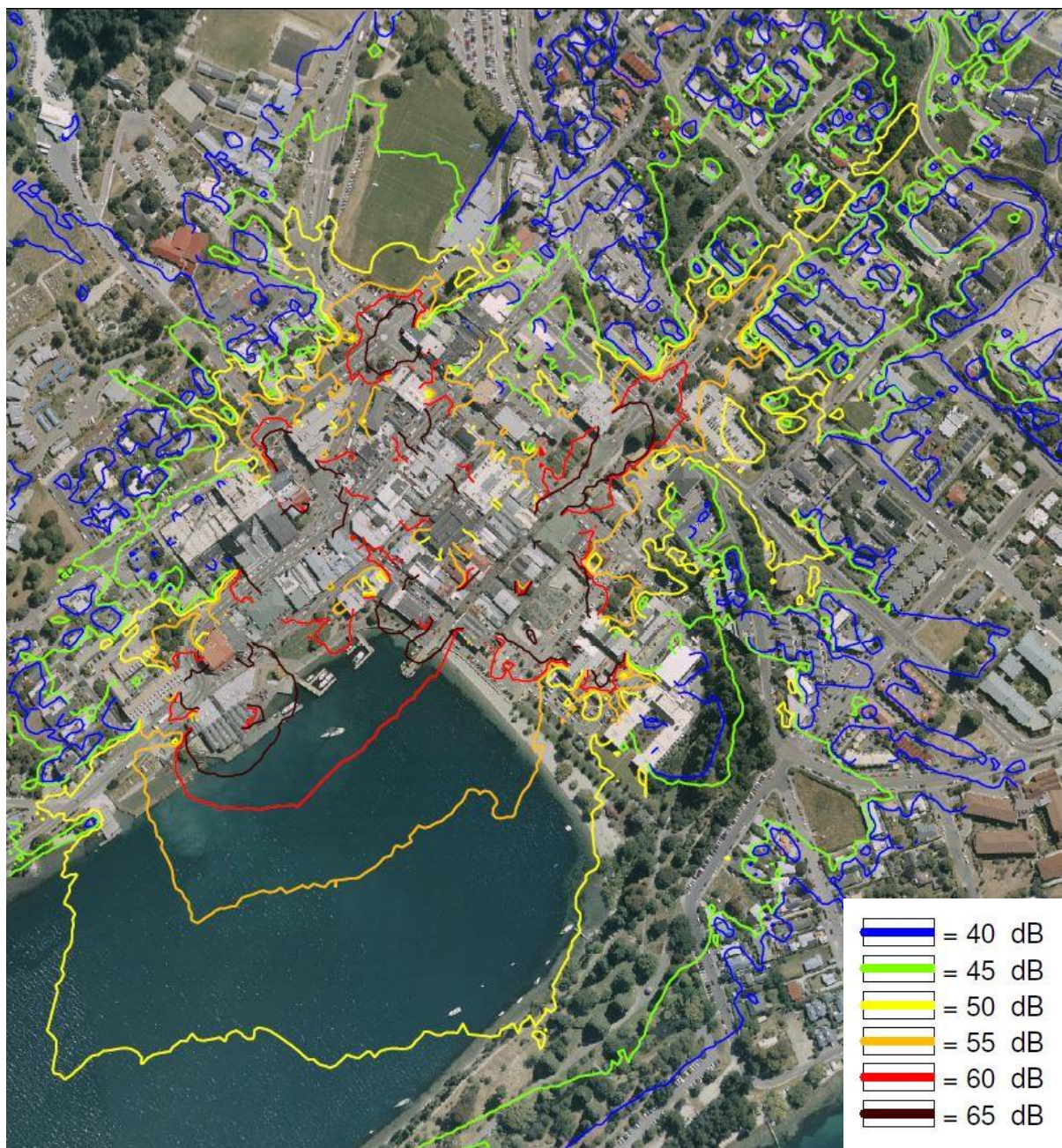
Scenario 1: All bars 60 dB $L_{Aeq}(15min)$



Scenario 2: All bars 65 dB $L_{Aeq}(15min)$



Scenario 3: All bars 60 dB $L_{Aeq}(15min)$ other than precinct on the Mall (65 dB $L_{Aeq}(15 min)$)



APPENDIX D
CHILES LIMITED SECOND LETTER (26 AUGUST 2014)

Chiles Ltd

Private Bag 55037, Christchurch 8154

26 August 2014

Ref: 140104

Queenstown Lakes District Council
Private Bag 50072
Queenstown 9348

Attention: Matthew Paetz

Dear Matthew

Subject: Queenstown town centre entertainment precinct

Introduction

Chiles Ltd has been engaged by the Queenstown Lakes District Council (QLDC), to provide advice on noise rules for the Queenstown town centre. Noise contours were presented in a previous letter (ref 140101 dated 8 July 2014) for various scenarios of noise limits for bars/restaurants. One of the scenarios was for an entertainment precinct centred on The Mall with more lenient noise limits to allow for night-life. This letter discusses the extents of that precinct and provides further noise contours for an additional scenario.

As before, the noise contours provide an aid to decision making, but they represent simplified noise sources and do not include other sources such as road-traffic. Therefore, the contours provide a guide to the likely extent of noise effects but should not be interpreted as giving exact future sound levels at specific locations. This is discussed further below.

Entertainment precinct

For the previous noise contours an entertainment precinct was modelled with ten bars in The Mall subject to more lenient noise limits (65 dB). To give effect to this scenario, rules have been drafted to apply the more lenient noise limits to sound received at any site in the precinct (as opposed to applying limits to sound emitted). This approach is consistent with New Zealand Standards and the District Plan. To fully utilise the more lenient noise limits a site must be surrounded by other sites also within the precinct, as the noise limits are defined by the receivers and not the source. A site on the edge of the precinct would remain constrained by more stringent noise limits (60 dB) applying to sound received in the neighbouring part of the town centre.

Given that the modelling was for ten bars facing into The Mall, the precinct was originally drawn as shown by the black outline in the following figure to only include sites adjoining The Mall. In this way, those bars facing The Mall would be able to utilise the more lenient noise limits as all adjacent and facing buildings are within the precinct. However, at the rear of the sites, noise limits on the opposite sides of Searle Lane and Cow Lane would constrain activity.



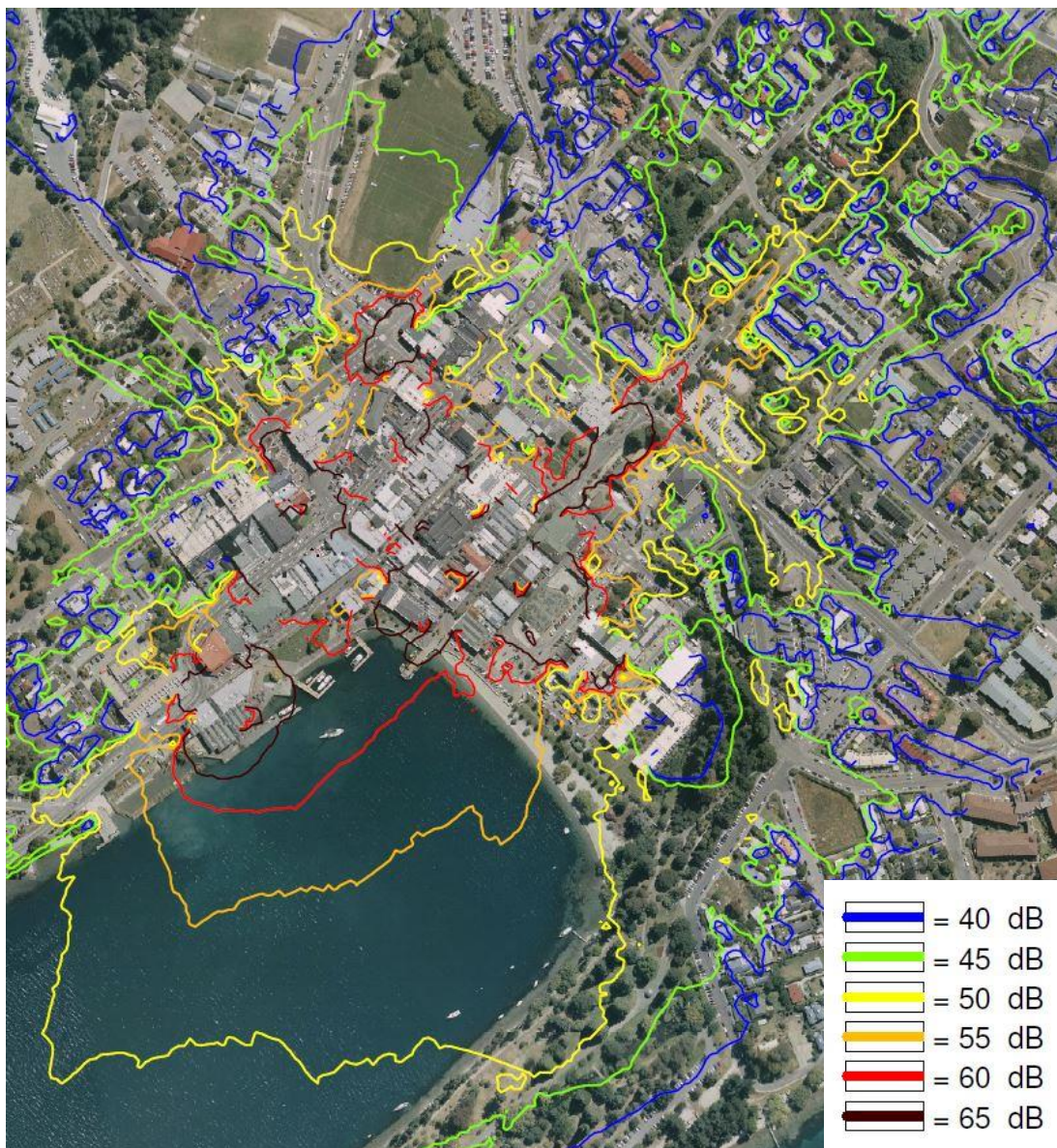
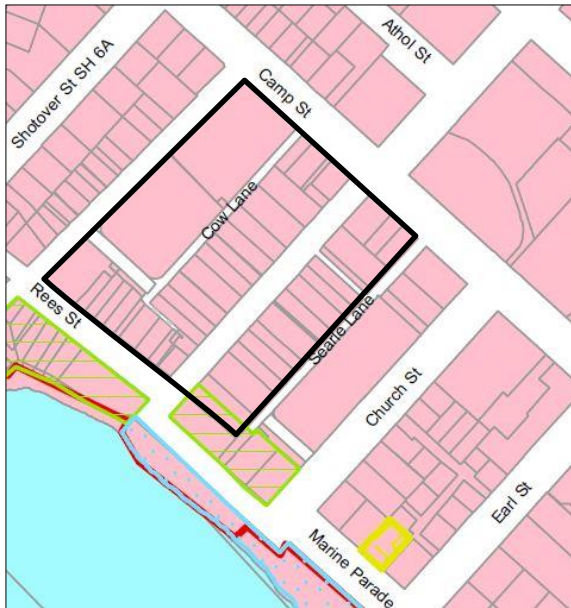
The resulting precinct shown above, with only sites adjoining The Mall included, is a rectangular shape with three corners missing (two on Camp Street and one on Rees Street). The corners could be included in the precinct as shown below. However, the corner sites remain constrained by noise limits applying on the opposite sides of Camp and Rees Streets. Whether the three corners are included in the precinct or not should therefore make minimal difference to noise effects.



Enlarged precinct

The noise modelling has been updated to investigate an enlarged precinct extending to Beach Street, as shown in the following figure. Under this scenario the only additional bars able to fully utilise the more lenient noise limits would be those facing Cow Lane. Other sites in the enlarged area on Rees Street and Beach Street are still constrained by noise limits applying at the opposite sides of those streets. There were no existing bars in the noise model that could be used to demonstrate this change. Therefore, three additional bars were added to Cow Lane and noise has been increased for a bar on each of Rees Street and Beach Street (although in reality they remain constrained by sites opposite). In

total, the new scenario has 15 bars subject to a noise limit of 65 dB (including ten in The Mall), and another 33 bars throughout the town centre subject to a noise limit of 60 dB. The noise contours for this scenario are shown below.



Ambient sound levels

As discussed above, the noise contours are based on simplified sound sources representing the noise from people outside bars/restaurants (or inside with windows/doors open). This assumes constant sound from all bars/restaurants simultaneously. The contours do not include other anthropogenic sound sources such as heat pumps or people/vehicles on roads, and do not include natural sound generated by wind, water or wildlife. There is no standard modelling technique for bar noise or standard method for comparing or combining bar noise with other ambient sound.

To aid decision making the following approach has been taken:

- Systematic sound level measurements and observations have been made to provide a context of the existing environment; and
- Noise contours have been produced to illustrate the differences between possible bar/restaurant noise limits, and provide an indication of the spread of this sound.

Section 2 of the URS report 42168467/R001B dated 23 July 2011, provides results of the ambient sound level measurements conducted around the town centre. At night the sound levels exceed 50 dB at most locations near the town centre, primarily from sources other than bars/restaurants.

The noise contours for different bar/restaurant noise limits (URS report and Chiles Ltd letter dated 8 July 2014) show sound levels generally less than 50 dB in the residential zone, or 55 dB if the noise limit is raised to 65 dB for all bars. Sound from bars in the residential zone at a similar level to the existing environment is likely to be noticeable, but may be considered acceptable in this context. For external levels above 45 dB at night residential and visitor accommodation would need closed bedroom windows to avoid sleep disturbance, although in most places this probably occurs anyway for the ambient sound regardless of future bar sound.

Conclusions

As the entertainment precinct would define limits for noise received, only a site surrounded by other sites in the precinct would be able to utilise more lenient noise limits. Initially, it was proposed to include all sites on either side of The Mall in an entertainment precinct so that activity facing The Mall would be subject to more lenient noise limits. Expanding this precinct to form a rectangular area would not significantly change the activity enabled. Expanding the entertainment precinct to Beach Street would mean that sites facing Cow Lane would then be surrounded by receiving sites all with the more lenient noise limits. The noise contours for a scenario with the enlarged precinct shows there would be minimal changes to noise received in the residential zone, compared to the scenario with the precinct covering just The Mall.

There is no standardised method for modelling bar/restaurant noise or assessing the resulting effects. A portfolio of information has been produced to allow a broad consideration of the issues.

Yours sincerely

Chiles Ltd



Dr Stephen Chiles
stephen@chiles.co.nz
03 318 8854

APPENDIX E
CHILES LIMITED THIRD LETTER (26 AUGUST 2014)

Chiles Ltd

Private Bag 55037, Christchurch 8154

26 August 2014

Ref: 140105

Queenstown Lakes District Council
Private Bag 50072
Queenstown 9348

Attention: Amy Bowbyes

Dear Amy

Subject: Wanaka town centre entertainment precinct

Introduction

Chiles Ltd has been engaged by the Queenstown Lakes District Council (QLDC), to provide advice on noise rules for the town centre zone. The work has been focussed on the Queenstown town centre, and this letter assesses how elements of the proposed rules could also apply to the Wanaka town centre. Specifically, this letter discusses extents for an entertainment precinct in Wanaka.

Proposed rules

For the Queenstown town centre a rule structure is proposed that would establish a concentric system of noise rules within the town centre zone:

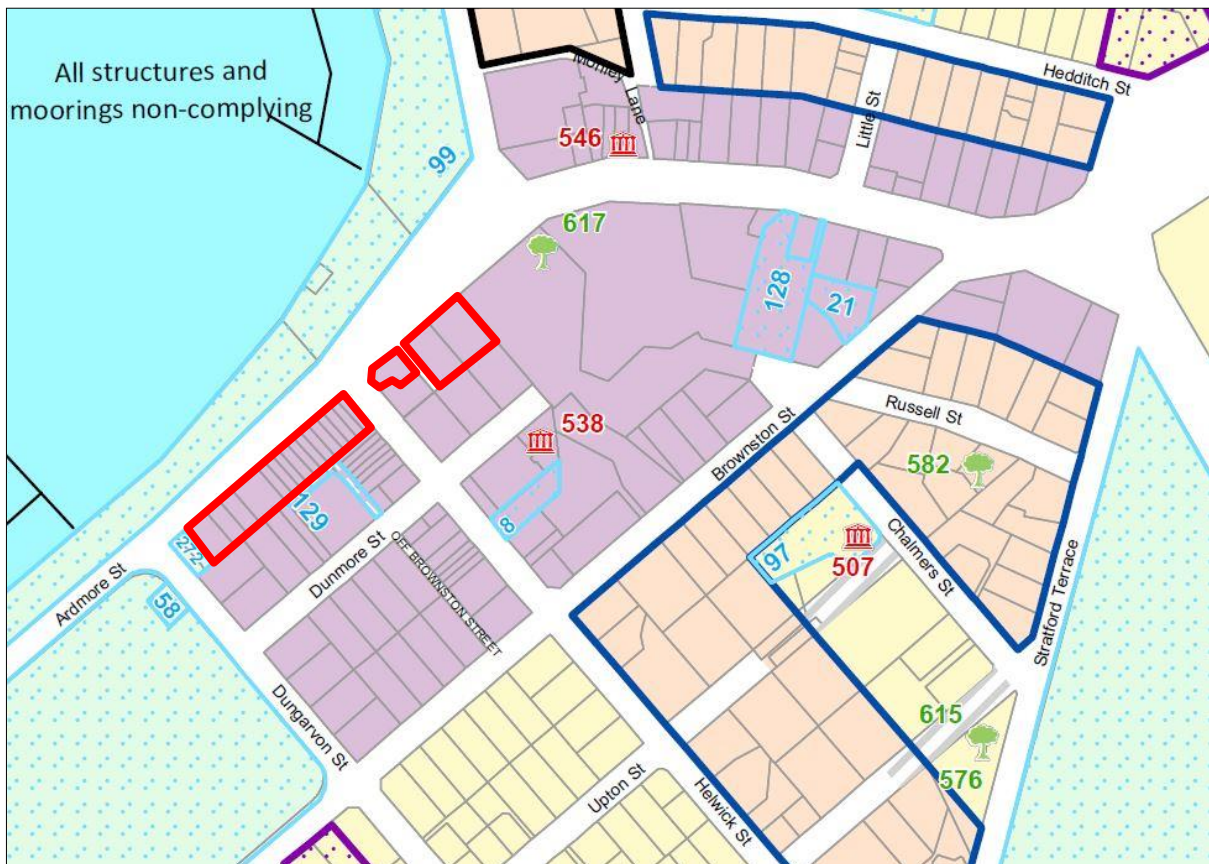
- In the centre an entertainment precinct would have permissive noise limits (65 dB for people outside bars) to enable night-life;
- In the surrounding part of the town centre the noise limits would still be increased from the existing district plan to allow restrained use of outdoor areas of bars and restaurants at night (60 dB for people outside bars); and
- At the edge of the town centre zone a transition sub-zone would have noise limits that preclude late night bars and restaurants, providing a buffer from the surrounding residential zone.

Parts of the same rule framework for Queenstown are proposed to be applied to the Wanaka town centre. The main difference is that rather than creating a transition sub-zone within the town centre zone, in Wanaka a transition will be achieved through an overlay in the residential zone to the south of Brownston Street, but this will not be continued on the north of the town centre.

Entertainment precinct

An entertainment precinct is proposed in Wanaka as shown outlined in red in the following figure. The proposed 65 dB noise limit applies to sound received in the entertainment precinct. Therefore, a site has to be surrounded only by other sites in the entertainment precinct to fully utilise the more lenient noise limit, which is generally not achieved by sites only on one side of a road. However, in this instance, the existing bars and restaurants on Ardmore Street facing Lake Wanaka do not have to

comply with any noise limits at the lake front land on the opposite side of Ardmore Street. The lake front land is designated but has an underlying rural zoning that only has noise limits at notional boundaries of residential units (there are no residential units here).

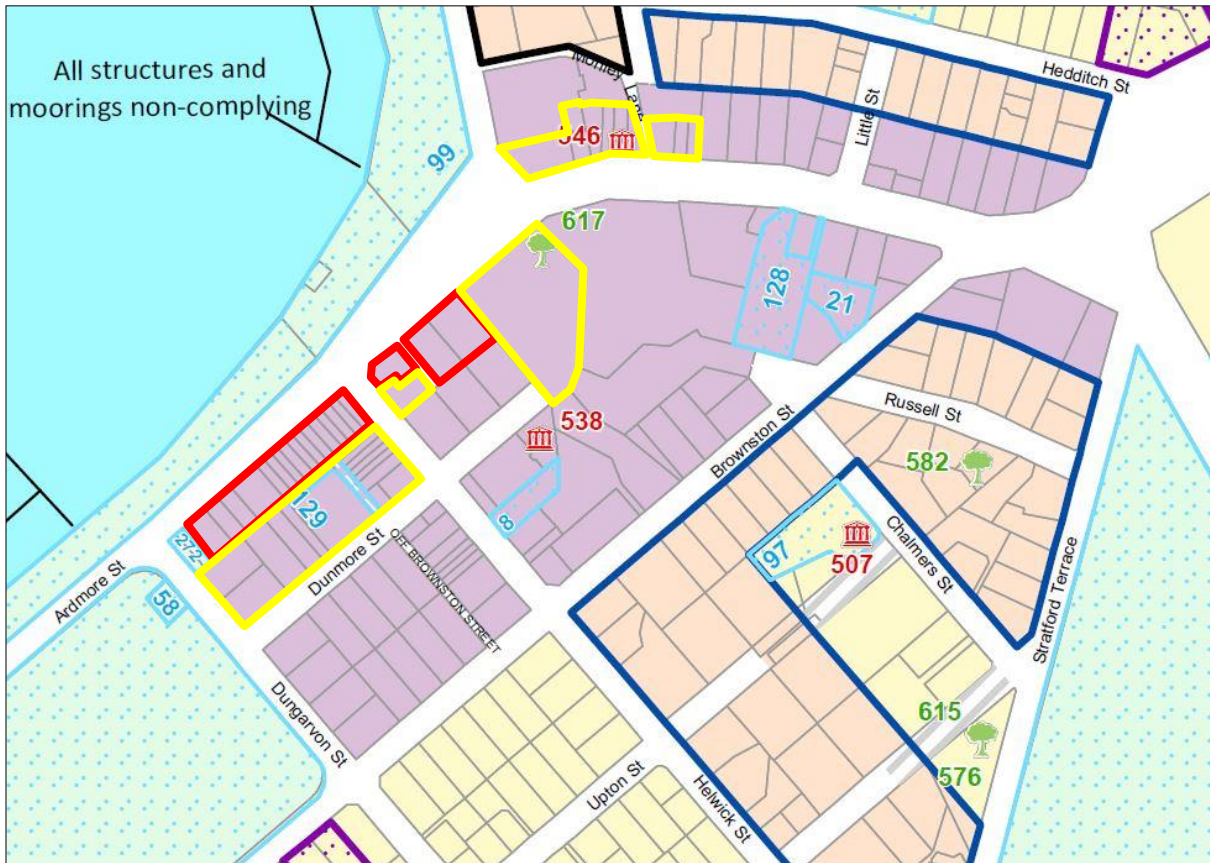


Sound from bars on Ardmore Street has in the past caused complaints from residential areas around Lake Wanaka. While this proposed entertainment precinct establishes activity as far from residential areas as practicable within the town centre, there are still likely to be residual adverse effects due to the clear sound propagation paths across the lake. Due to the relatively small size of the town centre, there are no alternative areas for an entertainment precinct that would be likely to avoid effects on residential zones.

Extended precinct

The areas shown outlined in yellow in the following figure have been identified as possible extensions to the entertainment precinct. None of these extensions cover both sides of any streets. The block facing Dunmore Street would not benefit from the extension of the precinct as any bars would still be subject to standard noise limits applying on the south side of Dunmore Street. Likewise the site on Helwick Street and the Lake Wanaka Centre site do not benefit as standard noise limits still apply at some adjacent sites. Finally, the block on Ardmore Street by Monley Lane is both constrained by adjacent sites and is also close to the residential zone (there have been recurrent noise complaints to the QLDC about existing bar noise in this area).

In summary, none of the proposed extensions enable significant additional activity as potential bars/restaurants would still be close to other parts of the town centre where the standard noise limits apply. In the case of the area near Monley Lane there is also no separation from the residential zone.



Conclusions

The Wanaka town centre is smaller than the Queenstown town centre, which constrains options for an entertainment precinct, with graduated controls to the residential zone. The area of Ardmore Street facing Lake Wanaka is an appropriate location for an entertainment precinct as lenient noise limits in the precinct are supported by there being no noise limits (and no noise-sensitive activities at night) at the lake front land opposite, although some adverse effects would be expected. All extensions proposed to the precinct are of limited effectiveness as activity would remain constrained by noise limits applying at adjacent sites. To extend the precinct it would need to be on both sides of any selected streets. An area where this could occur, while maintaining some separation from the residential zone, is if both sides of Dunmore Street were included in the precinct.

Yours sincerely

Chiles Ltd



Dr Stephen Chiles

stephen@chiles.co.nz

03 318 8854