BEFORE THE ENVIRONMENT COURT

Decision No. [2013] NZEnvC 7

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of appeals under Clause 14 of the First Schedule to the Act

BETWEEN NEW ZEALAND WINEGROWERS

(ENV-2010-CHC-179)

HORTICULTURE NEW ZEALAND

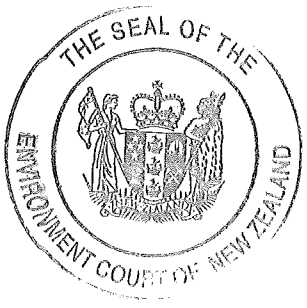
(ENV-2010-CHC-184)

Appellants

AND MARLBOROUGH DISTRICT COUNCIL

Respondent

Court:	Environment Judge J R Jackson Environment Commissioner J Mills Environment Commissioner O Borlase
Hearing:	4 and 5 December 2012 in Blenheim
Appearances:	M Batistich for NZ Winegrowers and Wither Hills Ltd (under section 274) S Quinn for Marlborough District Council G Cameron for Nelson/Marlborough Health Board (under section 274) M J Hyson for the Hyson Family (under section 274) M J Maclean for the Maclean Family (under section 274)
Date of Decision:	30 January 2013
Date of Issue:	30 January 2013



INTERIM DECISION

A: Under section 291 of the Resource Management Act 1991 ("the Act") and clause 15(2) of the First Schedule to the Act the Environment Court orders:

1. The Marlborough District Council is directed to amend the Wairau/Awatere Resource Management Plan by substituting the following rules in the Wairau/Awatere Resource Management Plan:

(1) (The noise insulation rule)

30.1.4.2.3 Noise Sensitive Activities

(a) Any new dwelling house, visitor accommodation or other habitable building located within 300 metres of any frost fan shall be designed and constructed so that within the external building envelope surrounding any bedroom (when the windows are closed), airborne sound insulation meets the following standards as determined in accordance with NZS 1276.1:1999 (Acoustics Rating of sound insulation in buildings and of building elements Part 1):

Dwellings located less than 300m and more than 200m from the nearest frost fan	$D_{nT,w} + C_{tr50\text{-}3150\ Hz}$ ~~25~~ 27
Dwellings located less than 200m and more than 100m from the nearest frost fan	$D_{nT,w} + C_{tr50\text{-}3150\ Hz}$ ~~30~~ 32
Dwellings located less than 100m from the nearest frost fan	$D_{nT,w} + C_{tr50\text{-}3150\ Hz}$ ~~35~~ 37

(b) For the purposes of this rule, "external building envelope" means an envelope defined by the outermost physical parts of the building, normally the cladding and roof.

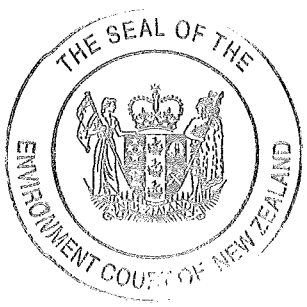
(2) (The wind speed rule)

30.2.9.1.4

When protecting crops from potential frost damage, a frost fan shall only be operated in wind speeds not greater than 8 km/hr (averaged over periods not greater than 5 minutes) and when the local air temperature is less than 1°C. For the purposes of this rule, temperature shall be measured within the property to be protected, for vineyards at the lowest fruiting wire and for other crops at the lowest point of the bud height (above ground level) of the plants being protected.

(3) (The frost fan rule in the Rural 3 (Wairau Plains) zone)

30.2.9.1.2



(1) sound levels shall be measured in accordance with the provisions of NZS 6801:2008 Acoustics – Measurement of Environmental Sound and assessed in accordance with the provisions of NZS 6802:2008 Acoustics – Environmental Noise;

(2) subject to (1) above noise from a frost fan which has special audible characteristics such as tonality or impulsiveness, shall have a 5-6 dB penalty added to the measured rating level before compliance with rule 30.2.9.1.2 is assessed;

(3) for the avoidance of doubt, NZS 6801:1991 and NZS 6802:1991 do not apply;

Note: pre-24 September 2009 Frost Fans
Note that fans in place and able to be operated for frost control as at 23 September 2009 are likely to have existing rights provided they are operated in accordance with the now replaced rule. For convenience it is quoted here:

"30.1.4.2.3 Wind machines for Frost Control

Any wind machine used for frost control shall be so constructed and operated that any noise emission measured at a distance of 300 metres shall not exceed 60 dBA L10 provided that:

(a) The wind machine will be allowed to operate during the frost danger period until the leaves of the plant are dry and the air temperature has reached 2°C;

(b) The speed of the wind machine must be governed such that the top speed of the rotor does not exceed the speed of sound; and

(c) The wind machine be located no closer than 500 metres to any residential zone, or within 100 metres of a dwelling house not located on the property."

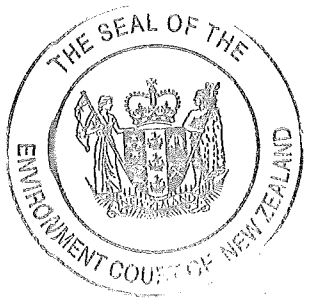
2. The signage rule 30.2.9.1.5 should be deleted.

3. The Court makes the same orders as in A1 and A2 above and B below in respect of the Marlborough Sounds District Plan with all necessary changes to policy and rule numbers.

4. Identical changes to Order A1(1) shall be made to rule 31.1.5.1 (Rural Residential Zone) and to 2.2.11.1 of Appendix K (Marlborough Ridge Zone).

5. Leave is reserved to any party to apply to the court to amend the rules stated in the orders above if there is any mistake or ambiguity in them.

6. The Marlborough District Council is directed to lodge and serve a complete copy of the amended rules by 17 April 2013 so that the Registrar can issue a final decision once Order C has been complied with provided that if leave is exercised under Order A5 this Order is suspended.



B: 1. Under section 292(1)(a) of the Act, the Marlborough District Council is directed to amend the Wairau/Awatere Resource Management Plan by adding the words "… or provided for" in policy (12.2.2)2.1 so that it reads:

"Policy 2.1 To recognise that, activities permitted or provided for in rural areas may result in effects such as noise, dust, smell and traffic generation but that these will require mitigation where they have a significant adverse effect on the rural environment."

2. For the avoidance of doubt the Environment Court directs that no further change should be made to policy (12.2.2)2.1 in the Wairau/Awatere section of the District Plan, or its equivalent in the Marlborough Sounds section.

C: Under section 293 of the Act, the Marlborough District Council is directed to prepare a change to the Wairau/Awatere Resource Management Plan in respect of the Rural Zone 4 frost fan rule in order to address the matters raised in part 6 of our Reasons.

D: Subject to the Orders above, the changes made in the council's decision on Plan Changes 23 and 58 are confirmed provided that leave is received for any party to apply to the court if any inconsistency arises as a result of the orders above, or if the court has omitted any matter.

E: Costs are reserved although applications are not encouraged since these are plan change proceedings.

REASONS

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1. Introduction

1.1 The frost fan plan changes

[1] Frost fans are commonly used in Marlborough to reduce the risk of frost damage to growing grapes. While there have been improvements to frost fan technology in the last few years, they can not only be noisy, but they may also emit special audible characteristics ("SACs") which are often even more annoying. These proceedings are principally about the appropriate rules to manage SACs in Marlborough District when operating new fans.

[2] The Marlborough District Council notified proposed Plan Changes 23 and 58 on 24 September 2009. They amend the activity status of the use of wind machines for protection of grapes against frost in respectively the Marlborough Sounds Resource Management Plan ("The Sounds Plan") and the Wairau/Awatere Resource Management Plan in the Rural Zone(s). In each plan the Marlborough District Council changes the activity status of new frost fans from permitted to controlled. Since most vineyards in the district are grown in the area covered by the Wairau/Awatere Resource Management Plan ("the WARMP") we will concentrate on that plan for most of this decision, and return to the latter at the end.

[3] In summary, plan change 58 ("PC58") seeks to change some of the performance standards in the WARMP Plan Rural 3 and 4 zones applicable to new frost fans including:

- lowering the noise level permitted from, in effect[1], L_{Aeq} 57 dB to $_{LAeq}$ 55 dB;

[1] The current standard is L_{10} 60dBAwhich is approximately equivalent to L_{Aeq} 57 dB, as we explain shortly.

- defining where noise is measured from.

A list of conditions of operation is also added in the list of Standards and Terms (not quoted here). The rule proposes to measure sound levels in accordance with NZS 6801:2008 Acoustics – Measurement of Environmental Sound. The application of that New Zealand Standard is at the heart of these proceedings.

The decision of the Hearing Commissioners on PC58 is dated 18 May 2010. On 8 July 2010 New Zealand Winegrowers ("NZW") lodged an appeal on both proposed plan changes. NZW challenges not the express words of rule 30.2.9.1.1 but the application[2] of the New Zealand Noise Standard referred to in the rule. NZW's concern is that the standard introduces a penalty of up to 5 dB, or possibly 6 dB, for "special audible characteristics".

[4] We also record that Horticulture New Zealand lodged an appeal (ENV-2010-CHC-184) against proposed PC58, but all aspects of its appeal have been resolved by agreement and it took no part in the hearing.

1.2 The issues and the noise standard

Frost fans in the district

[5] The rapid spread of vineyards in the lower Wairau and Awatere catchments since the 1970s is well documented[3]. Many of those vineyards have had difficulties with frosts affecting leaves, buds and/or fruit, and frost fans have been installed by some owners to alleviate the problem. As at 24 September 2009 there were about 1,000 frost fans in the district. It is common ground that these frost fans have existing use rights provided they comply with the rules in force up to 23 September 2009. The operative district plan frost fan noise rules are based on limiting frost fan noise to 60 dBA at 300 metres. That is measured using the (now replaced) L_{10} metric. We note that any frost fan sound measured using L_{10} would register 2-3 dB above the sound measured using the new L_{Aeq} metric. (We attempt to explain what this is shortly). In effect noise from frost fans is currently regulated at an L_{Aeq} level of 57 dB. That is about two to three dB louder than the 55 L_{Aeq} dB limit in place since the proposed plan changes were notified[4].

[6] As the number of frost fans grew so did complaints about noise. After a series of reports on the issue (particularly an independent report by Mr John Maasen, a senior resource management counsel from Palmerston North in 2008) the council notified the plan changes in September 2009. Since then, 39 permits for frost fans have been applied for and 67 fans granted[5] on conditions by the council. We received unchallenged evidence from the council that no complaints have been received in respect of the new frost fans.

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2 By rule 30.2.9.1.2.

3 Third Joint Statement by Noise Experts: Attachment [Environment Court document 18].

4 See for example M J McLean, evidence-in-chief Figures 1 and 2 [Environment Court document 8].

5 Of course, as controlled activities, consent cannot be refused.

The issues

[7] Prior to the hearing, the parties successfully and helpfully narrowed the principal issues they thought the court needed to decide to three - the first two regarding any special audible characteristics of any new frost fan and the third regarding signage about frost fans. They are:

(a) how should the plans account for special audible characteristics ("SACs") in setting the noise limits for frost fans?
(b) depending on the outcome of that issue, what is the appropriate noise limit for frost fans?
(c) is the proposed requirement for signage about frost fans appropriate and necessary?

[8] Three other issues of (minor) jurisdiction and/or detail emerged at the hearing:

(d) can policy (12.2.2)2.1 be amended?
(e) what is the appropriate "insulation rule" for new buildings, or extensions, close to frost fans?
(f) should the wind speed rule[6] be amended to resolve any ambiguities?

The short answer to (d) is "no". Because the plan change did not seek that any objectives or policies be amended only rules, we have no jurisdiction to amend the policy: *Suburban Estates Ltd v Christchurch City Council*[7] - except in one minor way. As for (e) the parties' experts have reached agreement on the appropriate wording of an "insulation" rule and we will refer to that later. The noise experts also agreed[8] on a wording about (f) to resolve the ambiguities raised by the court in the wind speed rule (which relates to the cut-off wind speed when frost fans are to be shut down). The remaining issues are indeed (a) to (c) identified in the previous paragraph, and of those the important ones seem to be the first two.

The proposed rule for new frost fans

[9] The proposed new rule states[9]:

30.2.9	Erection and use of frost fans
	The construction use and maintenance of a frost fan is a Controlled Activity provided that the activity conforms to the following standards and terms:
30.2.9.1	Standards and Terms
30.2.9.1.1	Noise from a frost fan shall not exceed 55 dB L_{Aeq} (15 min)[10]:

6 Wairau/Awatere Resource Management Plan rule 30.2.9.14.
7 *Suburban Estates Ltd v Christchurch City Council* Decision C217/01 at [45].
8 Subject to one minor correction suggested by Mr Goodwin and accepted by Mr Quinn for the MDC.
9 Rule 30.2.9 [Wairau/Awatere District Plan]. The equivalent in the Sounds Plan is rule 36.2.7.1.1.

a) at a distance of 300 metres from the device; or

b) at any point within the notional boundary of any existing dwelling, visitor accommodation of other habitable building (other than on the property on which the frost fan is situated);

whichever is the least distance.

30.2.9.1.2 Sound levels shall be measured in accordance with the provisions of NZS 6801:2008 Acoustics – Measurement of Environmental Sound and assessed in accordance with the provisions of NZS 6802:2008 Acoustics – Environmental Noise. For the avoidance of doubt, NZS 6801:1991 and NZS 6802:1991 do not apply[11].

...

The council has chosen – and the parties accept this – to impose a general rule[12] that noise from any new frost fan shall not exceed "55 dB L_{Aeq} (15 mins)" at a distance of 300 metres from the device. The rule[13] then requires that the sound levels are measured in accordance with the relatively new (2008) New Zealand Standard on environmental noise, and it is full compliance with that which is causing concern to NZW.

1.3 The measurement of noise, the New Zealand Standard, and NZW's challenge

[10] Noise is a very complex issue. Many of the difficulties in discussing noise – often a very subjective issue on which people feel passionately, and differently – arise from the fact that measurements of sound do not readily translate into what the human ear hears. On our understanding that is why many district plans adopt the NZ Standard: it scientifically, i.e. objectively and replicably, translates measurements of sound pressure into "sound exposure levels" representing the experience of noise.

[11] The exercise starts from the fact that sound is waves of pressure (vibrations in the air). Sound pressure can be measured at any distance from the source, although it dissipates over distance. The sound pressure level at any point is measured in Pascal (Pa), but because the human ear "... detects a wide range ... of sound pressure levels (10-102 Pa) they are measured on a logarithmic scale with units of decibels (dB)"[14].

[12] Sound also varies by frequency (number of vibrations per second of the air). Because human hearing is more sensitive to some sound frequencies than others (we only hear between 20 to 20,000 Herz), the measurement of sound is weighted to give more importance to mid and higher frequencies. The "A-weighting" system is used in the New

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10 The phrase in brackets was not in the notified version of the rule, but we do not think anything turns on that point: it clears up an ambiguity.

11 This method of incorporating material by reference under Part 3 of the First Schedule of the Act is justified by section 75(5) of the RMA.

12 Rule 30.2.9.1.1.

13 Rule 30.2.9.1.2.

14 Berglund B, Lindvall T and Schwela D (Eds). *Guidelines for community noise*, para 2.1.1. (World Health Organisation April 1999).

Zealand Standard. It is intended to approximate to the human ear's response to different frequencies.

[13] The sound exposure level ("SEL") is the total (noise) energy produced by an event at a given distance from the source. For a continuous event it is the L_{eq} over one second. (The L_{eq} represents the sound exposure over a certain period of time). The SEL is normally "A-weighted" as discussed in the previous paragraph, so the L_{eq} is then denoted as "L_{Aeq}".

[14] The SEL can be added up over a time period, T, to give an average sound pressure level for that time period (called the $L_{Aeq,}T$ or "LEQ"). The New Zealand Standard 6802:2008 Acoustics – Environmental Noise moves from a rather formidable description of the $L_{Aeq,}T$ as a "Time-average A-weighted sound pressure level"[15] to, after other adjustments, a "rating level" for comparison with a noise limit in a plan. For continuous sounds which last more than 15 minutes (the standardised reference time interval[16]) the actual measurements of the LEQ can be used unless there are "special audible characteristics".

[15] We now come to the issues at the heart of these proceedings. The New Zealand Standard also makes an adjustment to the LEQ for sounds with special characteristics that are audible. It states[17]:

> 6.3 **SPECIAL AUDIBLE CHARACTERISTICS**
>
> 6.3.1 Where the sound being assessed has a distinctive character which may affect its subjective acceptability (for example, it is noticeably impulsive or tonal), the representative sound level shall be adjusted to take this into account. The adjustment shall be determined in accordance with the provisions of Appendix B.
>
> C6.3.1 *The intrusiveness of a sound is not just a function of its sound pressure level. It is also affected by its character. Sound that has special audible characteristics, such as tonality or impulsiveness, is likely to cause adverse community response at lower sound levels, than sound without such characteristics. These factors should be considered and where necessary taken into account when deriving a rating level. The methods used in this Standard are similar to those used in the 1999 edition of this Standard, but more advanced than earlier editions.*

Appendix B of the Standard then states[18] that the adjustment to the representative sound level (or LEQ) where there are special audible characteristics present, should be in normal circumstances, 5 dB. It also contains provisions as to the assessment of SACs.

The case for NZ Winegrowers

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15 NZS 6802:2008 p 14 (Definitions).
16 Para 6.1.2 NZS 6802:2008.
17 NZS 6802:2008 para 6.3.
18 NZS 6802:2008 para B4.5.

[16] NZ Winegrowers argues that the appropriate noise limit should be simply not less than L_{Aeq} 55 dB and that there should not be an additional penalty for special audible characteristics. This view is supported by its experts based on their view of the current state of frost fan technology and the desire of industry as responsible businesses to operate frost fans at the lowest practicable noise level. Mr Hay, a noise expert and Mr M L St Clair, a resource manager/planner were concerned that there is no consensus as to appropriate and objective methodologies for measuring all SACs and that there is no expert agreement as to the "inherent existence" of SACs in the models of frost fan currently available on the market. Ms Batistich submitted the evidence also shows that there is no model of frost fan currently available that is capable of consistently and effectively operating at L_{Aeq} 50 dB[19], which is in effect the noise limit proposed by the Council for frost fans displaying SACs. Therefore NZ Winegrowers say it is not appropriate for the Council to lower the noise limit and change the status to "controlled" and apply a penalty for SACs. As another method of addressing the uncertainty, NZ Winegrowers proposed that the methods by which to assess SACs could be specified in the rule.

1.4 The law governing the plan changes

[17] We have recorded that the plan changes were notified on 24 September 2009 which is immediately prior to the 2009 amendments[20] coming into force[21]. Consequently the Resource Management Act 1991 ("the Act" or "the RMA") as it stands before the 2009 amendments applies. And accordingly these appeals will be resolved under the Resource Management Act 1991 in its form prior to the Resource Management Amendment Act 2009.

[18] As these proceedings are about plan changes we must first identify the legal matters in relation to which we must consider the evidence. One of the functions of a territorial authority for the purpose of giving effect to the purpose of the Resource Management Act is "the control of the emission of noise and the mitigation of the effects of noise"[22] Further, because this proceeding concerns a method of implementation of unchallenged objectives and policies in the district plans, most of the matters in sections 74 and 75 of the Resource Management Act are largely redundant because they have been subsumed in those objectives and policies. There are no relevant Standards or other higher order documents to consider except for the regional policy statement. We must in theory give effect[23] to that but in practice the regional policy statement is so general about adverse effects of "nuisances" that it does not assist us.

[19] The relevant matters for us are therefore:

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19 She wrote 50 dBA but we think she meant L_{Aeq} 50 dB.
20 Resource Management (Simplifying and Streamlining) Amendment Act 2009.
21 On 1 October 2009.
22 Section 31(1)(d) RMA.
23 Section 75(3)(c) RMA.

(1) to have regard to the actual (and potential) effect of frost fans on the environment;
(2) whether the proposed rule or the alternatives is more appropriate for achieving the objectives and policies having regard to its efficiency and effectiveness[24]; and
(3) that we must take into account:
- the benefits and costs[25] of the proposed rule or the alternative;
- the risk of acting or not acting[26];

(4) to have regard[27] to the decision by the Council's Hearing Committee,
(5) and finally to choose the rule which better meets the purpose of the Act[28].

Because there was no detailed benefit/cost or risk analysis we consider the issues in (3) above in our discussion of (5), and we include our consideration of (4) - the Council's decision - there too.

Existing frost fans (at 24 September 2009)

[20] We have pointed out that the new rules only relate to new houses within 300 metres of existing frost fans, or to proposed new fans. The 1,000 or so frost fans in operation as at 24 September 2009 when PC58 was notified, all have existing use rights. The character, scale of, and intensity of the effects of each older frost fan must comply with the now replaced rules in the operative plan. They read:

> **30.1.4.2.3 Wind machines for Frost Control**
>
> Any wind machine used for frost control shall be so constructed and operated that any noise emission measured at a distance of 300 metres shall not exceed 60 dBA L10 provided that:
>
> (a) The wind machine will be allowed to operate during the frost danger period until the leaves of the plant are dry and the air temperature has reached 2°C;
>
> (b) The speed of the wind machine must be governed such that the top speed of the rotor does not exceed the speed of sound; and
>
> (c) The wind machine be located no closer than 500 metres to any residential zone, or within 100 metres of a dwelling house not located on the property.

We should add that in addition to the specific rule to manage noise from frost fans at a distance of 300 metres, there is a general setback for structures of 500 metres from any residential or rural-residential zone boundary.

2. What are the noise effects from frost fans?

2.1 Introducing impulsive and tonal noises of frost fans

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24 Section 32(3)(a) RMA.
25 Section 32(3)(a) RMA.
26 Section 32(4) RMA.
27 Section 290A RMA.
28 Section 5 RMA as expressly applied by sections 72 and 74 RMA.

[21] It is common ground that some frost fans have special audible characteristics such as tonal or impulsive sounds. Witnesses described a 'wop-wop-wop' sound similar to older types of helicopters. Those impulsive sounds are caused or exacerbated by how the frost fan is operated, by wind speed[29], and by local topography. Mr M J Hunt, a noise expert called by the council and author of a technical report[30] on the issue, wrote that[31]: "It is generally held that it is the blade tips which generate most of the sound as these parts of the blade are travelling the fastest through the air and induce air disturbance (which is perceived as noise)". The area over which a frost fan is effective in preventing frosts is related to airflow which is in turn affected by fan speed. The difficulty for neighbours is that the larger and faster the fan, the greater the sound output (i.e. the noise). Usually the engine which drives the fan does not control overall sound levels "unless it has a poor or faulty muffler[32]".

[22] Mr Hunt described frost fan noise and their SACs as follows[33]:

> The general character of frost fan noise (2 or 4 bladed) is a continuous sound that varies in level depending upon the orientation of the blade with respect to the observer position. This variation is caused by a change in directionality of the sound source and arises due to the face of the "swept area" of the blade rotating laterally to ensure maximum air disturbance in all directions. Apart from the level of sound emission being affected by the speed of rotation, my experience is that fan speed may also cause SACs to occur within frost fan sound at higher speeds which are not present when operated at lower speeds consistent with the manufacturer recommended operating speed. SACs are attributes of the sound emitted from frost fans that cause the sound to be additionally annoying. Commonly, for frost fans, the characteristics of the sound that may cause additional annoyance are significant tonality (higher levels sound energy concentrated within a narrow band of frequencies, compared to the sound energy present within the audible sound spectrum) and impulsiveness (peaks of sound energy repeated on a regular basis related to rotation of the fan).

[23] The existence of SACs is recognised in NZS 6802:2008. Its Appendix B states:

> B4 SPECIAL AUDIBLE CHARACTERISTICS
>
> B4.1 Introduction
> Sound that has special audible characteristics, such as tonality or impulsiveness, is likely to cause adverse community response at lower sound levels, than sound without such characteristics. Subjective assessment can be sufficient in some circumstances to assess special audible characteristics.
>
> CB4.1 Special audible characteristics may be:
> (a) Tonal, for example, a hum or a whine; examples include transformers, cyclone fans, gear box whine;
> (b) Impulsive, for example, bangs or thumps; examples include chipping hammers, panel beating, dropped timber; and

29 V C Goodwin, evidence-in-chief para 30 [Environment Court document 6].
30 *Managing Noise from Frost Protection Fans – Review of Noise and Acoustic Matters – Technical Discussion Document.* Report Date: February 21010. Report Reference: 107-74.09 (Final).
31 M J Hunt, evidence-in-chief para 21 [Environment Court document 3].
32 M J Hunt, evidence-in-chief para 21 [Environment Court document 3].
33 M J Hunt, evidence-in-chief para 22 [Environment Court document 3].

(c) Other, including but not limited to high speed cutting, grinding; examples include skillsaw, metal scraping.

Users should note that direct measurement and calculation by the reference method is a feature now available in some instrumentation systems, enabling instant results to be available in the field without complex post-measurement processing.

2.2 The effects of frost fan noise on neighbours

[24] Mr M J Hyson gave evidence for himself and his family. They have lived in the Waihopai Valley, southwest of Blenheim, for 11 years. He is a pilot, and also grows truffles on the land while his wife breeds horses[34]. The valley they live in is normally very quiet at night – they can hear the Waihopai River clearly at night even though it is over a kilometre from the house.[35] Frost fans have been operating beside his house for seven years. He wrote that[36] "this problem has come to us as we were here first'. He described[37] the experience of frost fans operating "both at a great distance and at the close distance of just 108 metres from our house" and the detrimental effects of frost fan noise on sleep. Mr Hyson said that[38]:

> ...the noise that is 'not sleepable to' has sound features that acoustic experts call special audible characteristics (SACs), which I recognize as the banging and deep humming sounds I hear and feel, that they call impulsive and tonal. Some of these have been described as being like the noise from an Iroquois helicopter in a turn, which I can confirm.

[25] Mr Hyson later described the SACs as "a form of torture"[39]:

> I have witnessed frost fans make noise that might be loud, but that is 'sleepable to', such as hay making or harvesting can be, but changes when SACs enter, into something that seems to physically enter into our bedroom, into our bed and into our sleeping heads and force us awake. As such I have experienced that SACs can be extremely, unacceptably intrusive.

He described the effects on his family[40]:

> *Irritability* affects all family members when we are kept awake all or much of a night. An abnormal continuing irritability is noticeable in them for up to a week after the kids have been woken during the night, due to frost fan noise. [Further]... irritability can also start a day or two *before* a possible frost event when stress levels noticeably rise in anticipation of what might be coming, at certain frost sensitive stages of plant development each year.
>
> Many times the frost doesn't eventuate, but just because the frost and its associated noise did not arrive, it doesn't mean our whole family didn't go through the same unnecessary anticipatory anxiety and stress as was caused when frosts did occur.

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34 M J Hyson, evidence-in-chief para 1 [Environment Court document 7A].
35 M J Hyson, evidence-in-chief para 28 [Environment Court document 7A].
36 M J Hyson, evidence-in-chief para 3 [Environment Court document 7A].
37 M J Hyson, evidence-in-chief para 2 [Environment Court document 7A].
38 M J Hyson, evidence-in-chief paras 5 and 8 [Environment Court document 7A].
39 M J Hyson, evidence-in-chief para 33 [Environment Court document 7A].
40 M J Hyson, evidence-in-chief paras 9-11 [Environment Court document 7A].

He also described how the tiredness affects his children in their school work[41] and his and his wife's work[42].

[26] Mr Hyson denied that the effects of this noise are mitigated by the infrequency of its occurrence. He wrote that[43]:

> Already this month (when I wrote this on 21 May 2012) frost fans have operated 15 times. This does not include the approximately 15 or more nights they ran last spring and who can predict future frequency with such increasingly cold winters.

Mr Hyson said[44] that he and his family have not become accustomed to the fans.

[27] Mr Hyson was critical of the concept of treating SACs as "non-solvable'. He wrote[45]:

> From my point of view, as a rural resident, the presence of SACs is clear and detrimental. The low frequency sound associated with the SACs penetrates into our bedroom, just like the low frequency bass "thump-thump-thump" noise from a boy racer's car does when it drives down a residential street. The natural, physical effects are the same. This low frequency noise penetrates the walls of our house very easily.

Encouragingly, both Mr Hyson[46] and the other section 274 party Mr Maclean[47] confirmed that none of the frost fans which have been causing them problems are new fans. It is the older fans, operating at distances of one kilometre or more which are the principal problem, especially cumulatively.

2.3 Are there health impacts?

[28] Mr V C Goodwin, an expert in environmental acoustics gave evidence on the health effects of noise fans. Setting the context for that he identified the non-auditory health effects of noise as being[48] physiological and chronic health effect, annoyance, interference with speech communications, interference with the learning process and education, interference with mental activity, and interference with rest and sleep. He wrote that[49]:

> Descriptions of adverse night-time noise effects I have investigated in Marlborough are consistent with moderate to severe disturbance.

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41 M J Hyson, evidence-in-chief para 15 [Environment Court document 7A].
42 M J Hyson, evidence-in-chief paras 16 and 17 [Environment Court document 7A].
43 M J Hyson, evidence-in-chief para 24 [Environment Court document 7A].
44 M J Hyson, evidence-in-chief para 28 [Environment Court document 7A].
45 M J Hyson, evidence-in-chief para 39 [Environment Court document 7A].
46 Transcript p 192.
47 Transcript p 192.
48 V C Goodwin, evidence-in-chief para 59 [Environment Court document 6].
49 V C Goodwin, evidence-in-chief para 64 [Environment Court document 6].

He quoted what he described as "key findings"[50] from the World Health Organisation's *Night Noise Guidelines for Europe* as follows[51]:

> Below the level of 30 dB $L_{night,outside}$, no effects on sleep are observed except for a slight increase in the frequency of body movements during sleep due to night noise. There is no sufficient evidence that the biological effects observed at the level below 40 dB $L_{night,outside}$, are harmful to health. However, adverse health effects are observed at the level above 40 dB $_{night,outside}$, such as self-reported sleep disturbance, environmental insomnia, and increased use of somnifacient drugs and sedatives.

[29] Mr Goodwin qualified that by referring to a UK review which distinguishes between effects on annoyance and sleep disturbance and effects on physical and psychological health:

> That sleep can be affected by noise is common knowledge. Defining an exposure-response curve that describes the relationship between exposure to noise and sleep disturbance has, however, proved surprisingly difficult. Laboratory studies and field studies have generated different results. In part this is due to habituation to noise which, in the field, is common in many people.

In his opinion "the Proposed Plan Change is a reasoned, proportionate, and justified response to the adverse effects of noise experienced by people in Marlborough's urban and rural areas near horticultural land uses where frost fans are in use."[52]

3. Which frost fan rule better achieves the policies of the plan(s)?

3.1 What is the plan(s)' scheme for avoiding unreasonable noise?

[30] The two most relevant chapters in the Wairau/Awatere Plan are Chapters 22 (Noise) and 12 (Rural Environments). The conflicts between noisy activities and people's health and amenities are recognised in a general way in Chapter 22 of the Wairau/Awatere Resource Management Plan. It also points out[53] that occupiers of land have obligations under section 16 of the RMA. The methods of implementation for the noise chapter identifies in particular the setting of "... noise performance standards for different areas to reflect the existing amenity values"[54]. The implications of this last sentence are important because the resource management witnesses in the proceedings (Mr P J Hawes for the MDC, and Mr St Clair for NZW) have ignored the different policy approaches about amenities for different areas.

[31] The significance of the omission is that Chapter 12 (Rural Environment) divides the Wairau/Awatere area into "management areas" including[55]:

- Lower Wairau Plain (Rural 3 Zone)

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50 V C Goodwin, evidence-in-chief para 67 [Environment Court document 6].
51 WHO *Night Noise Guidelines for Europe*, p xvi.
52 V C Goodwin, evidence-in-chief para 70 [Environment Court document 6].
53 Wairau/Awatere Resource Management Plan p 22-2.
54 Wairau/Awatere Resource Management Plan p 22-3.
55 Wairau/Awatere Resource Management Plan p 12-1.

- The balance area of rural land ... including the lower Awatere (Rural 4 Zone)
- Rural lifestyle localities[56]

The two management areas that concern us are separately zoned as Rural 3 and Rural 4 respectively. They also have their own sets of objectives and policies even if some are in common.

[32] The Wairau Plans (Rural 3 zone) has four objectives. The first[57] is to sustain the life supporting capacity of the versatile soils of the plain. The second - and most relevant to this case - is "to protect rural amenities"[58]. The third and fourth relate to soil and water and are not particularly relevant here[59].

[33] The policies for Objective 2 relating to rural amenities include[60]:

> Policy 2.1 To recognise that activities permitted in rural areas may result in effects such as noise, dust, smell, and traffic generation but that these will require mitigation where they have a significant adverse effect on the rural environment.
>
> Policy 2.2 to ensure that a wide range of rural land uses and land management practices can be undertaken in the rural areas without increased potential for the loss of rural amenity values or for conflict.

These two policies are unique in the WARMP to the Rural 3 zone.

[34] Other policies are to limit the scale of rural subdivision and dwellings[61] in order (amongst other reasons) to reduce conflicts between residential and neighbouring rural activities; to avoid, remedy or mitigate the effects of activities that can cause unpleasant living[62] or working conditions for the rural community. The final policy is particularly relevant[63]. We will call this the "no significant compromise" policy. It is:

> Policy 2.8 to enable rural activities which might generate adverse effects such as noise or smell, to operate in rural areas in accordance with accepted practices, without being significantly compromised by other activities demanding higher levels of amenity.

The "no significant compromise" policy must of course be read and applied with policies 2.1 and 2.2 set out above.

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56 The Final two management areas are the Rainbow Skifield (in the St Arnaud Range) and the Salt Works Zone (at Grassmere). The catch-all area is the "Rural Uplands".
57 Objective (12.2.2) 1 [Wairau/Awatere Resource Management Plan p 12-5].
58 Objective (12.2.2) 2 [Wairau/Awatere Resource Management Plan p 12-6].
59 Objectives (12.2.2) 3 and 4 [Wairau/Awatere Resource Management Plan pp12-7 and 12-8].
60 Policies (12.2.2) 2.1 to 2.8 [Wairau/Awatere Resource Management Plan p 12-6].
61 Policy (12.2.2)2.3 [Wairau/Awatere Resource Management Plan p 12-6].
62 Policy (12.2.2)2.4 [Wairau/Awatere Resource Management Plan p 12-6].
63 Policy (12.2.2)2.8 [Wairau/Awatere Resource Management Plan p 12-6].

[35] The explanation for the policies recognises[64] that the "... nature of land based activities... means that intermittently high noise levels will be produced when ... crop protection mechanisms are activated". It continues[65]:

> The policies seek generally to enable established rural land uses ... to operate sustainably in rural areas, so long as the effects for those uses do not constitute a general nuisance or health risk.

[36] In contrast the "General Rural" management area in Zone 4 - which includes the Awatere Valley - is described by the plan as being[66] "... distinguished by its vastness and relative isolation from major centres of population". Its second objective[67] does not refer to amenities or to living conditions, but only to not creating "... an unacceptable working environment". It is implemented by five policies of which four[68] are either identical to or similar to the policies for the Rural 3 (Wairau Plain) zone. However, it does not include the first two policies from the Rural 3 zone.

[37] Clearly the plan contemplates different management regimes for the two zones (Rural 3 and Rural 4), and yet the plan change proposes to treat the two zones in the same way in respect of noise. The key difference is that the "no significant compromise" to normal rural activities policy which is common to both the Rural 3 and 4 zones, is qualified in the Rural 3 zone by policies which require first that where noise has a "significant adverse effect" it will require mitigation[69]; and secondly that a land management practice (e.g. use of a frost fan)[70] should not be undertaken if it increases the potential for the loss of (rural) amenity.

Is there jurisdiction to change policy 2.1?

[38] We should deal with one minor jurisdictional issue here. It arises out of the agreement between the parties to change this policy to read[71]:

> Policy 2.1 To recognise that, even with a reasonable level of mitigation to avoid significant adverse effects, activities permitted or provided for in rural areas may result in effects arising from the activity itself or from management practices, including ~~such as~~ noise, dust, smell and traffic generation ~~but that these will require mitigation where they have a significant adverse effect on the rural environment~~ and other activities located in the Rural Zone need to accept these effects.

This was explained by Mr Quinn in his closing submissions as an elaboration of the policy to show that controlled activities were expressly contemplated by the policy. We accept the concept but only three words – "or provided for" – are necessary to achieve

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64 Explanation to objective (12.2.2)2 [Wairau/Awatere Resource Management Plan p 12-6].
65 Explanation to objective (12.2.2)2 [Wairau/Awatere Resource Management Plan p 12-7].
66 Issue 12.4.1 [Wairau/Awatere Resource Management Plan p 12-14].
67 Objective (12.4.2)2 [Wairau/Awatere Resource Management Plan p 12-15].
68 Policies (12.4.2)2.1 and 2.2, 2.4 and 2.5 [Wairau/Awatere Resource Management Plan p 12-15].
69 Policy (12.2.2)2.1 [Wairau/Awatere Resource Management Plan p 12-6].
70 Policy (12.2.2)2.2 [Wairau/Awatere Resource Management Plan p 12-6].
71 Proposed additions to the operative district plans are underlined, deletions are struck through.

that. There is no jurisdiction for the parties to agree to most of the changes, because the plan change as notified proposed no changes to objectives or policies. However, we are satisfied that the addition of the words "or provided for" may be made under section 292 of the Act in order to remedy any uncertainty.

3.2 The changes in PC58 and the alternatives

[39] The plan change also defined "frost fan" to Ch. 26 (Definitions) to mean:

> ... a land based device, including both permanent and mobile, designed or adapted to ~~control frost~~ mitigate frost damage by fanning warmer air over potentially frost-affected surfaces, and includes ~~the~~ any motive source, the support structure, and power source.

[40] The parties to the PC58 appeals also proposed to add to Chapter 26 (Definitions) two further definitions relating to noise as follows:

1. "Noise Measurements"[72] is to read:
   To avoid the necessity of duplicating technical acoustical information, New Zealand Standards relating to acoustics are cited where appropriate within this plan. Except where expressly provided elsewhere in this Plan, sound levels shall be measured in accordance with the provisions NZS 6801:1991 and assessed in accordance with the provisions NZS 6802:1991 (unless stated otherwise);

2. by amending the definition of 'Noise Limit'[73] to read as follows:

   Noise Limit means an Leq L10 or Lmax numerical sound level in A-frequency-weighted decibels that is not to be exceeded.

[41] PC58 also recognises that people coming to the frost fan nuisance should bear some responsibility for their own comfort. It provides[74]:

> ... that any new dwellinghouse or other habitable building located within 300 metres of any frost fan must be constructed so that within the external building envelope surrounding any bedroom (when the windows are closed) airborne sound insulation the New Zealand standards[75]:
>
> | | |
> |---|---|
> | Dwellings located less than 300 m and more than 200 m from the nearest frost fan | $D_{nT.w} + C_{tr} > 25$ |
> | Dwellings located less than 200 m and more than 100 m from the nearest frost fan | $D_{nT.w} + C_{tr} > 30$ |
> | Dwellings located less than 100 m from the nearest frost fan | $D_{nT.w} + C_{tr} > 35$ |

72 PC58 [amending WARMP p 26-19].
73 PC58 [amending WARMP p 26-11].
74 Section 30.1.4.2.3 Noise Sensitive Activities.
75 As determined in accordance with AS/NZS ISO 717.1:2004 Acoustics – Rating of sound insulation in buildings and of building elements.

[42] The plan changes do not amend the interpretations of noise measurements in the two plans. The Definitions section of the Wairau/Awatere Plan (Chapter 26) states that:

> ... except where expressly stated elsewhere in the Plan, sound levels shall be measured in accordance with 6801:1991 and assessed in accordance with NZS 6802:1991.

That section refers to the 1991 standard not to the more up-to-date NZS 6801:2008 or NZS 6802:2008 (which are referred to in the current plan changes). We assume the old definitions are retained for noise rules which do not relate to frost fans.

[43] Chapter 26 of the Wairau/Awatere Plan also provides additional guidance on noise measurement as follows:

> Adjustments for special audible characteristics, if present, as provided for in clause 4.3 and 4.4, shall apply and will have the effect of imposing a numerical noise limit 5 dB more stringent than those L10 numerical limits stated in the Plan (pages 26-29).

No similar definition or explanatory text is included in the Marlborough Sounds Plan.

3.3 Is the New Zealand Standard about special audible characteristics too uncertain?

[44] The preliminary matter for us to consider is whether the NZ Standard on SACs is so uncertain that any rule relying on it is invalid. The leading authority on vagueness leading to invalidity is the decision of McGeehan J in *A R and M C McLeod Holdings v Countdown Properties Limited*[76]. There the High Court described the level of certainty required of rules establishing predominant uses (the equivalent of permitted activities) under the Town and Country Planning Act 1977:

> ... Predominant use rights must not be described, even in objective fashion, in terms so nebulous that the reader is unable to determine whether or not a use may be carried on in the zone. This second aspect does not involve any express subjective formula. It involves, simply, invalidity through inherent vagueness.
>
> ... A description of, and condition attached to, a predominant use is not to be condemned simply because there is some element of degree, judgement, or 'value judgement, involved in its ascertainment. There will usually be some element of judgement involved in application of descriptions to factual situations. There will usually be some element of degree. Some matters can be ascertained without undue difficulty and debate. There is a difference, after all, between 'substantial' and 'beautiful'. The law does not require predominant uses to be defined ('specified') with scientific or mathematical certainty. Some degree of flexibility is permissible.

That approach has been applied under the RMA: *Foodstuffs (Otago Southland) Properties Limited v The Dunedin City Council*[77] - and we will respectfully follow it here.

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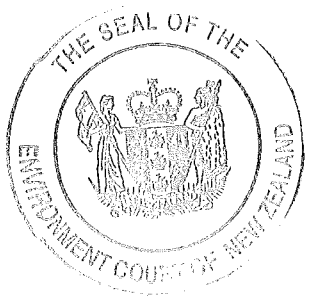
76 *A R and M C McLeod Holdings Ltd v Countdown Properties Ltd* (1990) 14 NZTPA 362 at pp 373-375.

77 *Foodstuffs (Otago Southland) Properties Limited v The Dunedin City Council* (1993) 2 NZRMA 497 (PT) at pp 5339-540.



[45] Turning to the challenged part of NZS 6802:2008: Appendix B to the Standard deals with "Rating Level and Adjustments". A rating level is "[a] derived level used for comparison with a noise limit"[78]. That derived level is adjusted for the factors identified in Appendix B of NZS 6801:2008 being[79]:

> (a) reflections from nearby structures affecting free-field conditions at the microphone;
> (b) the contribution to the measured level of the sound from sources other than the sound under investigation;
> (c) standardisation to a 15-minute reference time interval;
> (d) the presence of significant special audible characteristics in the sound; and
> (e) duration of the sound.

It is (d) which is relevant here.

[46] The relevant part of Appendix B then contains this passage:

> B4.2 Objective test methods
> Where there is doubt about the presence of tonality, the following two methods provide an objective measure for tonality. The simplified test method may be carried out using one-third octave band measurement equipment. The reference test method requires the use of narrow band analysis. If the simplified method does not indicate tonality, it may still be necessary to use the reference method to confirm the presence or absence of tonality. In addition, the reference method can properly assess modulated tones or complex tones.

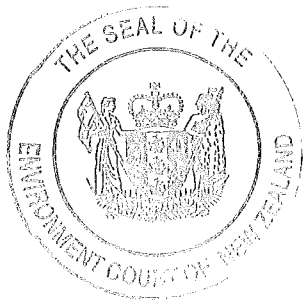
That applies to tonality, but the standard does not[80] provide an objective test for impulsive or "other" SACs. That is important because the most relevant SACs emitted by frost fans appear to be impulsive noises.

[47] Descriptions of a "simplified test"[81] and a "reference test"[82] for tonal SACs then follow. The Appendix continues[83]:

> B4.5 Adjustment k_2
> Where special audible characteristics are confirmed, the value of the adjustment (k_2) shall be 5 dB for that sample, provided that where the reference method is used, the value of the adjustment (k_2) may be 6 dB where justified. The adjustment k_2 shall only be applied to measurement time intervals in which special audible characteristics are present. Only one adjustment value (k_2) shall be applied to each measurement, even if more than one type of special audible characteristic is present.

The wording of this appendix leaves a little to be desired since it names a constant (k_2) which is not, so far as we can see, actually used in any formula for converting a measured

78 NZS 6802:2008 (3. Definitions) (p 12).
79 NZS 6802:2008 Appendix B1 General (p 43).
80 Transcript p 16 (Cross-examination of M J Hunt).
81 Appendix B4.3 [NZS 6802:2008 p 47].
82 Appendix B4.4 [NZS 6802:2008 p 47].
83 Appendix B4.4 [NZS 6802:2008 p 47].



"derived level" into an adjusted "rating level". Still the intention is clear: for any measured derived level, if there are SACs (as determined by the earlier rules) then the derived level should be adjusted by 5 or 6 dB. So how is the presence of SACs determined?

[48] Discussions among the three noise expects resulted in the joint statement by noise witnesses M J Hunt, R L Hay and V C Goodwin dated 25 October 2011. They disagreed[84] over:

- whether SAC are inherent in existing fan designs;
- whether a noise limit should be set to include a penalty for SAC, or should be subject to an adjustment which assesses any penalty for SAC; and
- whether a de facto reduction in noise limit by up to 5 dB (i.e. 55 dB L_{Aeq} (15 min) at 300m plus penalty for SAC, assuming most if not all frost fans possess SAC), is achievable by the industry; and whether the impact on the industry is reasonable;
- in general, the level of certainty provided by the NZ Standard.

[49] Ms Batistich cross-examined Mr Hunt on how it is possible to obtain different results for tonal sounds depending on which test is being used. The exchange went[85]:

> Q. But it is possible because as you say the reference method is more narrow and more detailed that they may have a different result?
>
> A. It's possible but, ...for example, ... the result under the third octave test is really a straight situation where the five dB penalty applies or doesn't apply, whereas the narrow band method has a correction that ranges from zero to in fact six dB although the correction at that high level of six dB would most likely not be applied because such a strong tone would have been clearly evident in the subjective initial test and would have qualified for the initial 5 dB without having to run it through the narrow band method to find that it was such a strong tone that it warranted a 6 dB penalty.
>
> Q. Sure but the point though, Mr Hunt, is that there are two methods in B4.2 and either of those could validly be used under the standard to assess tonality?
>
> A. Yes. I guess what I am more interested in is what I see as common in practice and perhaps under the heading of best practice.

[50] As for tests for impulsive SACs, for the council Mr Hunt wrote[86]:

> **Impulsiveness of Sound [Impulse Sound]**
>
> The rapid-fluctuating sound characteristic of frost fan sound, if present, can be classified as "impulsive sound" if the fluctuations are large enough and have a sufficiently short rise time.

84 M J Hunt, evidence-in-chief para 54 [Environment Court document 3].
85 Transcript p 12.
86 M J Hunt, evidence-in-chief paras 31 to 33 [Environment Court 3].

> Impulsive sound is sometimes referred to as the presence of a rapidly fluctuating "choppy" sound that makes the sound additionally annoying. This impulsiveness is commonly classified as a "special audible characteristic" as defined by NZ Standard NZS 6802.
>
> NZS 6802:2008 does not make any specific recommendations for methods to assess impulsive sound. Various published methods may be employed to assist the assessment of impulsiveness, if needed. The most useful reference document I have found for assessing the presence of impulsive characteristics in frost fan sound is the document *"Delta AV 1794/00 Objective Method for the Measurement of Prominence of Impulsive Sounds and for Adjustment of L_{Aeq}"*, commonly referred to as the "Delta Method".
>
> The Delta method predicts the prominence of impulsive sounds in correspondence with average subjective judgements based on an examination of the "Onset Rate" and "Level Difference". The method outputs a correction value between zero and 5 dB to adjust the measured L_{Aeq} sound level with the amount of adjustment reflecting the likely degree of additional annoyance reaction to the impulsive sound.

Mr Hunt did not mention the third category of SACs, and no other witness identified them as relevant.

Conclusions on certainty

[51] In our view Appendix B4 suggests as a general sequence:

(1) SACs should first be subjectively[87] assessed: the particular tone or impulse is often so obvious that its presence does not have to be scientifically assessed;
(2) if that subjective assessment is unclear then the simplified method is applied[88], and only then,
(3) if necessary is the reference test applied.

However, that sequence only works beyond the first, subjective, step for noises with a tonal character. Impulsiveness and "other" SACs cannot be assessed even with the simplified test.

[52] We judge that the proposed rule incorporating the NZ Standard is sufficiently certain to be legal. Scientific certainty is not required. However, we accept that the rule could be made easier for lay-readers of the district plan to understand. If we consider the rule is justified, we will amend it to achieve that.

3.4 Is the rule appropriate?

[53] Mr M L St Clair, a planner called by NZ Winegrowers told us that the proposed rule did not comply with the guidelines in the "Quality Planning" website[89] in that the

87 B4.1 [NZS 6802:2008].
88 B4.2 and B4.3 [NZS 6802:2008 p 47].
89 He told us that the website had been prepared by the NZPI, RMCA, LGNZ, NZIS and the MFE "... to provide best practice in planning": M L St Clair, evidence-in-chief para 3.8 [Environment Court document 14].

rules raises doubts about its certainty, and whether it can be applied consistently[90]. His criticism relied[91] on the evidence of Mr Hay, an acoustic consultant called by NZW. We have already considered whether the proposed rule is sufficiently certain and held it is. The next question is whether it is better to have the rule or not. We consider Mr St Clair's criticism was overstated. Indeed given the standard open-endedness of much language in district plans (for example any rule with the word "significant" in it), we consider Mr St Clair's criticisms were rather harsh.

[54] As for Mr Hay's criticisms of the standard, he was concerned that "... the very definition of SAC requires some subjective value judgment"[92]. Further his evidence then suggests that noise assessment, to be certain, should be "... by predetermined objective measures alone"[93]. But as we have stated that is not the scheme of the standard. Its tests for SACs start with a subjective test: that is, we infer, because SACs may be so obvious that there is no need for measurements. It is only when the alleged SACs are difficult to discern – and a question arises as to when a complainant is being unreasonably sensitive – that it may be necessary to apply any objective tests known to experts.

[55] We pointed out earlier that the NZS 6802:2008 changes from using the L10 metric to the LEQ form of measurement. Consequently the appellant's relief would be more permissive that the current regime under the operative plan. That is because proposed 55 dB LEQ is the equivalent of 57/58 dB L10. The effect, as Mr Hay accepted in cross examination[94] of what NZW is seeking is actually 2/3 dB more permissive than the current plan. That would defeat the whole purpose of the plan change.

4. Does the proposed rule better achieve the purpose of the Act?

4.1 Avoiding unreasonable noise

[56] Noise is recognised as a particular environmental problem by the Act. Section 16 of the Act states (relevantly):

> **16 Duty to avoid unreasonable noise**
>
> (1) Every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or ... the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level.
>
> (2) ...

On the subject of the best practicable option Mr Hyson wrote[95]:

> Frost fan manufacturers have carried out significant research and development work into the SAC problem and have made good progress to date. It is important that this aspect of the fan noise

90 M L St Clair, evidence-in-chief para 3.8 [Environment Court document 14].
91 M L St Clair, evidence-in-chief para 3.7 [Environment Court document 14].
92 R L Hay, evidence-in-chief para 4.3 [Environment Court document 13].
93 R L Hay, evidence-in-chief para 4.3 [Environment Court document 13].
94 Transcript page 152.
95 M J Hyson, evidence-in-chief para 42 [Environment Court document 7A].

> remains in their focus, as it is this aspect of the fan noise that is most annoying to human beings trying to sleep.

[57] In fact, it emerged at the hearing that most of the frost fans which have been installed (under consents) since the plan change(s) were notified are complying with the standard and that none[96] have SACs. In fact the two new models of frost fan on the market in recent times have been the Frost Boss C49 and the Defender Mark II. Each of those two models has been tested for SACs by Mr N Hegley, a very experienced acoustic expert. In his report "Frost Boss C49 Frost Fan Field Testing Noise Report" he stated[97]:

> ... the noise from the frost fan was not impulsive and this confirmed the subjective effect of these frost fans although as already noted, if the fans operate with a wind blowing there is the potential for there to be impulsive noise to the sound. However, operating the frost fans in windy conditions can damage the machines so they have automatic shut offs to ensure this does not occur during normal operation.

He concluded[98] that there were "no special audible characteristics" to that frost fan. We were advised at the hearing that the Defender Mark II is no longer being manufactured so we do not consider it further apart from recording that another expert, Mr Halstead – reported it did "... exhibit helicopter-like chop... "[99].

[58] Mr Hegley's opinion was corroborated by Mr Hunt when he wrote[100]:

> It is my view that SACs can be avoided. There is at least one model I am aware of (Frost Boss C49 model) which does not emit SACs when operated under calm conditions and within the manufacturer's recommended range of operating speeds.
>
> Some operators appear to operate their frost fans above recommended speeds in order to gain an extra amount of frost protection. Higher fan operating speeds causes greater noise output and increases the probability of producing SACs within the frost fan sound emissions. Through field testing undertaken in frost-like conditions, I have found some frost fan models operated at set speeds recommended by the manufacturer under calm conditions do not produce SAC however these same fans run at certain higher speeds and/or under certain wind flow conditions do cause the fan to produce tones or excessive clatter or slap that represent significant SACs. Thus, proper control over fan speed will avoid SACs. Furthermore, I understand some parties have developed quieter four-bladed fan blades which could be retro-fitted to frost fans (where necessary) to remove the present of SACs.

[59] For NZW Mr Hay had a different opinion. He confirmed[101] that the scenario postulated by Mr Halstead was as likely as not: "... even competent acoustic consultants, experienced in the use of frost fans, can use objective methods that achieve different

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96 Transcript p 25 (M J Hunt to the Court).

97 N Hegley September 2010 Appendix A to R L Hay evidence-in-chief [Environment Court document 13].

98 N Hegley September 2010 Appendix A to R L Hay evidence-in-chief [Environment Court document 13].

99 M Halstead Appendix B to R L Hay evidence-in-chief [Environment Court document 13].

100 M J Hunt, evidence-in-chief paras 23-24 [Environment Court document 3].

results sometimes contrary to the consultant[']s own subjective perception". He was also critical of the use of the "Delta" method for measuring impulsivity.

[60] We consider that Mr Hay is being too theoretically vigorous on the one hand, and insufficiently practical on the other. Translating the scientific measurement of "impulsive" sounds compared with listener's subjective assessment of the prominence of sudden onset sounds (and vice versa) is clearly an ongoing issue. But in our view this problem only occurs at the margins. Most people know a helicopter when they hear one, and the same goes for noisy frost fans.

[61] As it happens the Frost Boss C49 shows no SACs when operated under the plan change conditions and so people can rely on the Hegley reports[102]. We have already recorded that both Mr Hyson and Mr Maclean confirmed that none of the frost fans which have been causing them problems are new fans. Their difficulties are with the older fans and with cumulative noise. The latter is a problem depending on the number of fans in the vicinity: Mr Maclean produced figures[103] showing the huge increase in vineyards around his property (and neighbouring rural residential owners) since his family purchased their land. However, rules governing the operation of older (pre 24 September 2009) frost fans and any replacements, nor the rules about cumulative effects are before us in these appeals. Further, older frost fans are covered by existing use rights provided they comply with the now revoked (for other purposes) rule.

4.2 Part 2 of the Act and section 32

[62] We accept immediately that there are trade-offs involved in making a decision on the frost fan rule. In the general terms of section 5(2) RMA, the case is a conflict between the economic well-being of the grape-growing industry and the health and welfare of residents in or near rural areas.

[63] An example of the conflicts arising over frost fans is *Maclean v Marlborough District Council*[104] which related to an application for two frost fans for a vineyard at Fairhall near Blenheim. The appellant in that case, Mr Maclean, is a section 274 party to this proceeding. The court wrote[105]:

> ... the applicant argues that frost fans are a crop protection mechanism that intermittently produces high noise levels, and this is a part of the inherent nature of land based production activities. However they will operate only for a very small percentage of the time, probably on less than 5% of the available days in a year. Such fluctuations in amenity should be accepted as anticipated components of rural amenity values, particularly by those choosing to live in rural areas such as this Rural Residential zone.

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101 R L Hay, evidence-in-chief para 4.26 [Environment Court document 13].
102 Exhibits 13.1 and 13.2.
103 M Maclean, evidence-in-chief Figures 1 and 2.
104 Decision C81/08 (8 July 2008).
105 *Maclean v Marlborough District Council* Decision C81/08 paras 44 and 45.

> In short the applicant's argument, which we endorse, is that the changes made to the plan by the consent order emphasise the importance of protecting the primary productive capacity of the land. As a result the pressure that might be present to accommodate "lifestyle" interests is required to yield to the normal activities of farming, including viticulture. Given the substantial contribution made by Marlborough to New Zealand's wine production and exports, this is clearly understandable at a local level, and indeed could be argued to be a matter also of national importance.

[64] Later, the court summarised its understanding of the policies and rules in Chapter 12 of the WARMP as meaning[106]:

> ... the expectations of production from the land should not be compromised to any significant degree by the expectations of the nearby "lifestyle" blocks where certain activities are required to realize the productive potential from the land, and those activities are reasonable and in this case are of limited duration.

The court concluded that[107]:

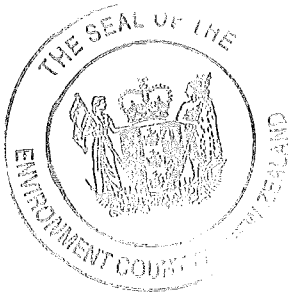
> ... the proposal will promote the efficient use and development of natural and physical resources without damaging the quality of the environment, except insofar as the fans will, for a very small proportion of the year, create a slight increase in noise levels generally during night-time hours. The effect on amenity values is therefore extremely small and, if detectable, is a price properly to be paid in the interests of increased grape production in the area.

Consequently the court granted consent with the requirement of a 55 dBA L10 noise limit measured at 300 metres for fans with SACs. Condition 5 of the consent makes it clear that the fans considered by the court had SACs and, importantly, it held "the penalty for special audible characteristics has already been applied to this limit". We are unclear as to what "applied" means in that context. We also note that this case was decided before notification of the plan change.

[65] We too recognise that the wine industry is a key part of the Marlborough economy and this should not be dis-enabled under section 5 of the RMA. However, the particular issue here needs to be kept in proportion. It is simply not supported by the evidence to suggest as Ms Batistich did in her submissions that grape growers generally are in an untenable position. As Mr Quinn submitted in reply, frost fans have been consented in the last two years under the new frost fan rule and the industry has not collapsed; and one model of fan – the Frost Boss C49 – has been accepted by the MDC as having no SACs at the 300 metre measuring point.

Health and welfare

[66] There are both direct and indirect effects on people's health from noise at night. The direct effects are of course annoyance and sleeplessness. The indirect effects are in many ways more important because persons affected may not even be consciously aware



106 *Maclean v Marlborough District Council* at [57].
107 *Maclean v Marlborough District Council* at [66].

that they are being affected. We have already referred to Mr Goodwin's evidence on this issue.

[67] Ms Batistich referred to *Maclean v Marlborough District Council*[108] on this issue. The court found[109]:

> Even if the sleep patterns of some residents were disturbed for a few nights per year by the cumulative effect of existing and proposed frost fans, there was no medical evidence that established this would be likely to have adverse effects on health, and we would be surprised if that were so. To the contrary, the acoustic consultant Mr Lloyd gave evidence that the noise levels inside bedrooms in the rural residential zone should be within World Health Organisation guidelines, or only marginally exceed them, in the case of soundly constructed, modern dwellings with windows closed – as they are likely to be during frosty, night-time conditions. Further, residents who might be unusually susceptible could take sound-reduction measures such [as] double glazing of windows on bedrooms facing the subject site.

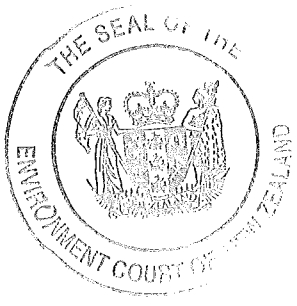
[68] Unfortunately which WHO guidelines were referred to was not identified. Here in contrast, we have two references – by Mr Goodwin and by Mr Hyson. The latter wrote[110]:

> The WHO gives a *day-time* guideline maximum noise value of 55 dB, for outdoor living areas and a *night-time* guideline value of 45 Leq dBA *outside bedrooms*.
>
> - Source: Table 4.1, Guidelines for Community Noise edited by Birgitta Berglund, Thomas Lindvall, Dietrich H Schwela © World Health Organisation 1999.
>
> The appellants have a 10 decibel benefit on this *'outside bedroom' 'night-time'* guideline, to the detriment of Marlborough's rural residents. I do not believe it should be 10 decibels greater in the Marlborough District Plan Rules than the WHO night-time guideline and have the situation further worsened by not taking into account the SAC penalty the NZ noise standards state should apply.

We agree, subject to consideration of the benefits and costs, to which we now turn.

Benefits and costs

[69] NZ Winegrowers referred to the costs of compliance. But it is important to recognise that the costs of an application for a controlled activity are not an issue before us. The application fee would be incurred anyway. The extra cost concerned is in respect of any reports required by the council to show compliance with the standard. But the evidence before us is that realistically only <u>one</u> model of frost fan – the Frost Boss C49 - achieves the standard in the rule (which has been in effect, practically, since 24 September 2009). The reports on that[111] show that at least in the tested conditions the C49 complies. We consider that it is unlikely that many more reports will be required. No other costs were identified.



108 *Maclean v Marlborough District Council* Decision C81/2008.
109 *Maclean v Marlborough District Council* Decision C81/2008 at para [62] (f).
110 M J Hyson, evidence-in-chief paras 56 and 57 [Environment Court document 7A].
111 Exhibit 13.1 and Exhibit 13.2.

[70] As for benefits of the rule – apart from the health benefits described above – Mr Quinn and council witnesses pointed to the incentives created by the rule.

> A targeted penalty will not only address adverse effects where they occur. It will also help drive improvements in the design and operation of frost fans, by incentivising[112] both manufacturers of frost fans, and users, to avoid or minimise SACs.
>
> Already, two manufacturers[113] have made significant efforts to produce quieter blades since the notification of the plan changes (although it is understood that one of them, FMC Group, has since sold its intellectual property to the other).
>
> The council's evidence was that some existing frost fan models do not have SACs sufficient to attract a penalty. Further SACs can[114] be avoided in some cases by ensuring that they are only operated under calm weather conditions and within the manufacturer's recommended range of operating speeds.

We consider that at least in more populated areas, the benefits outweigh the costs.

The risks of acting (to change the rule) or not

[71] The risks of not acting are shown in the scenario put forward by Mr S T Smith, a grape grower, vineyard owner and chair of the appellant association[115]:

> (a) a grower could obtain consent under the Plan on the basis of an acoustic report which establishes that the fan meets the noise limit and does not exhibit SACs;
>
> (b) once the fan is installed, a later assessment by the Council compliance offer could reach a different conclusion;
>
> (c) if the council officer concludes that SACs are in fact present, the penalty will be applied, in which case the fan could be in contravention of the noise limit.

Mr Smith added[116]:

> To further complicate matters, it appears from the evidence of the council's acoustic expert (Malcolm Hunt) that in specific wind velocity conditions and at certain operational speeds, fans which were assessed as not exhibiting SACs, may in fact be found to do so subsequently.

[72] Mr Smith's concerns were elaborated on by Mr D A Whyte, owner of a vineyard at Fairhall growing exclusively sauvignon blanc vines[117]. However, it was unclear in his evidence whether he was writing about existing or new fans. In cross-examination about what he was concerned about, he answered[118]:

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112 Evidence of P Hawes at para 45 [Environment Court document 4].
113 Evidence of P Hawes at para 45 [Environment Court document 4].
114 Evidence of M Hunt at para 23 [Environment Court document 3].
115 S T Smith, evidence-in-chief para 7.3 [Environment Court document 11].
116 S T Smith, evidence-in-chief para 7.3 [Environment Court document 11].
117 D A Whyte, evidence-in-chief para 1.1 [Environment Court document 12].
118 Transcript p 118.

> I am concerned that the new plan change may be subject to, down the line, public pressure to impose the new plan changes on existing frost fans…

He could not answer[119] a question from Mr Quinn suggesting there was no evidence that the conditions of operation of the 67 frost fans which have been given consent are "more onerous or expensive" than previously.

[73] On the other hand Mr Hunt's summary was that[120]:

> … It is my firm opinion that the assessment of SACs using methods set out with NZS 6802:2008 should be adopted. This includes reference to objective test methods and tools referred to within NZS 6802:2008 as well as reliable published reports such as the "Delta" document referred to above. In time, further technical assistance may eventuate such as through published scientific research or new international standards. In my view, such an approach will not give rise to uncertain or inconsistent results.
>
> It is not recommended to apply a noise limit as if SACs are present within the sound emitted by all frost fan models. This would have the perverse effect of stifling the environmental advantages likely to accrue to the noise-affected community, wine growers, and manufacturers and retailers of frost fan machines which do not exhibit SACs.
>
> In my experience, SACs can be avoided. Fan speed is a critical factor in my view. Operators need to ensure the fans are run at speeds which avoid SACs where this is an issue. Operating frost fans in the presence of wind is likely to increase the probability of SACs. Technical innovations such as replacement four-bladed fan blades may also be used to address SACs.
>
> My experience is that SACs can be avoided for frost fans operating in the absence of significant wind and at fan speeds within manufacturer recommended limits for fan speeds …

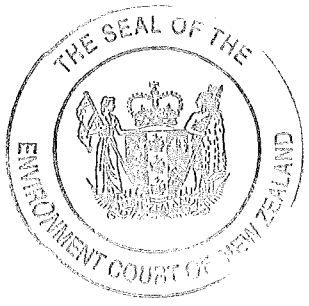
We prefer that evidence.

4.3 <u>The Council's decision and other matters</u>

[74] Our conclusions are generally consistent with the Council's decision.

[75] Ms Batistich mentioned different approaches elsewhere in New Zealand. We would have needed much more details to be persuaded other models should be followed. Further, as Mr Quinn pointed out, other districts have only relatively recently faced this issue for the first time, whereas in Marlborough this is a "second generation"[121] of frost fan rules.

[76] Having said that we record that the new frost fan rule and its complete application of the NZS is consistent with the rules in Tasman District. Further the use of the New Zealand Standard in full received some endorsement from the Environment Court in *New Zealand Winegrowers and Waipara Valley Winegrowers Incorporated v Hurunui District*



119 Transcript pp 120-121.
120 M J Hunt, evidence-in-chief paras 43-46 [Environment Court document 3].
121 Mr Quinn's closing submissions para 20.

Council[122]. There, as in Marlborough, the proposed plan change was prepared as a response to complaints from residents regarding the noise from frost fans. However, that decision is not much help to us on what might be an appropriate rule for two reasons: first the Hurunui rule was a cumulative rule – it took into account the noise from all fans in a vicinity[123]; secondly the court held it had no jurisdiction to amend the rule, even if it wished to.

[77] The frost rule which resulted from the Hurunui District Council's decision was[124]:

> Sound levels shall be measured in accordance with the provisions of NZS 6801:2008 Acoustics – Measurement of environmental sound and assessed in accordance with the provisions of NZS 6802:2008 Acoustics – Environmental noise, except that the noise limit includes a correction for the special audible characteristics of frost control fans and no further penalty shall be applied to measured or calculated noise levels.

In effect, that is what NZW wants in the Marlborough District Plans. The court stated[125] that it preferred the NZ Standard but held it did not have jurisdiction[126] to amend the rule as sought by a section 274 party (which wanted the rule to apply the NZ Standard 6802:2008 in its entirety), and wished the exception to be deleted.

5. Outcome (Wairau Plain)

5.1 The new frost fan rule

[78] After weighing all relevant matters we judge that the most appropriate rule on the reasonably heavily populated Wairau Plain is that which applies the NZ Standard NZS 6802:2008 fully. The standard is useful and should be applied. As the Planning Tribunal stated in *McIntyre v Christchurch City Council*[127]:

> In practice, New Zealand Standards are prepared by committees of people well-qualified in the subject, and with consultation with interested sections of the community. The standards are generally accorded respect.

We agree. In particular the NZS 6802:2008 Acoustics – Environmental Noise appears to us to be constructed with considerable care to allow objective measurements of Sound Energy Levels to be translated into relevant LEQs that describe what people experience. If the experts who prepared it consider that there should be penalties for SACs then we regard that as strongly supporting the other evidence for the Council.

5.2 The noise insulation rule for rural houses

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122 [2012] NZRMA 152.
123 *NZ Winegrowers v Hurunui District Council* [2012] NZRMA 152 at [4].
124 *NZ Winegrowers v Hurunui District Council* [2012] NZRMA 152 at [12].
125 *NZ Winegrowers v Hurunui District Council* [2012] NZRMA at [61].
126 *NZ Winegrowers v Hurunui District Council* [2012] NZRMA 152 at [23].
127 [1996] NZRMA 289 (at para 15).

[79] The noise experts at our direction, went away from the hearing to resolve issues about noise sensitive activities establishing near vineyards. The experts have complied expeditiously and agreed that the rule should be amended to read as follows:

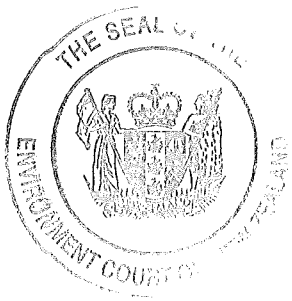
> 30.1.4.2.3 Noise Sensitive Activities
>
> (a) Any new dwelling house, visitor accommodation or other habitable building located within 300 metres of any frost fan **not within the same site** shall be designed and constructed so that within the external building envelope surrounding any bedroom (when the windows are closed), airborne sound insulation meets the following ~~standards as~~ **single-number rating for airborne sound insulation**, determined in accordance with AS/NZS ISO 717.1:2004 Acoustics – Rating of sound insulation in buildings and of building elements **Part 1 – Airborne sound insulation** ~~NZS 1276.1:1999 Acoustics Rating of sound insulation in buildings and of building elements Part 1~~):
>
> | | |
> |---|---|
> | Dwellings located less than 300m and more than 200m from the nearest frost fan | $D_{nT,w} + C_{tr50\text{-}3150\ Hz}$ ~~25~~ 27 |
> | Dwellings located less than 200m and more than 100m from the nearest frost fan | $D_{nT,w} + C_{tr50\text{-}3150\ Hz}$ ~~30~~ 32 |
> | Dwellings located less than 100m from the nearest frost fan | $D_{nT,w} + C_{tr50\text{-}3150\ Hz}$ ~~35~~ 37 |
>
> (b) For the purposes of this rule, "external building envelope" means an envelope defined by the outermost physical parts of the building, normally the cladding and roof.

The mysterious terms are all defined in the New Zealand Standard.

[80] As the noise experts explained[128]:

> ... the basis for determination of compliance with the rule shall be another NZ Standard: "AS/NZS ISO 717.1:2004 Acoustics – Rating of sound insulation in buildings and of building elements – Part 2 Airborne sound insulation.

Because there are a number of different measurement formulae in that standard, the experts have now agreed that the appropriate "metric" is the "Weighted Standardised Level Difference" with the addition of one of its standardised spectrum adaptation terms[129]. They explained that the metric is a single value used to describe the acoustic performance of the external building envelope. More precisely, the Weighted Standardised Level Difference is established using a term $D_{nT,w}$ plus a correction term $C_{tr\ 50\text{-}3150\ Hz}$ (as defined in AS/NZ 717.2:2004 using spectrum number 2 with the enlarged frequency range). This ensures the method adequately considers low frequency sounds associated with frost fan operation. They then agreed to the amended single values used to describe the acoustic performance of the external building envelope shown for the three distance ranges described in the rule.



128 Third Joint Statement paras 3.4 [Environment Court document 18].

129 As we understand it this deals with pure tones which (like SACs) cause particular problems.

5.3 The wind speed rule

[81] The noise experts agreed with the court that wind speed needs to be determined over an interval, and so they have agreed that the relevant rule should read as follows:

> 30.2.9.1.4
> When protecting crops from potential frost damage, a frost fan shall only be operated in wind speeds not **greater than 8 km/h averaged over periods not greater than 5 minutes** and when the local air temperature is less than 1°C. For the purposes of this rule, temperature shall be measured within the property to be protected, for vineyards at the lowest fruiting wire and for other crops at the lowest point of the bud height (above ground level) of the plants being protected.

[82] We mentioned at the beginning of this decision that it will be fairly limited in application for some time, because most existing frost fans and their replacements are likely to be protected by existing use rights[130]. We consider that the frost fan rule should have a note explaining that and will suggest amended wording accordingly.

5.4 The signage rule

[83] The council's decision on the proposed plan changes required the vineyard manager or a person appropriately trained to manage frost risk by the use of frost fans shall always be present on any vineyard whilst a frost fan is operating on that vineyard. The council has not defended that before us but proposed a compromise that requires the name and contact details of the owner of the vineyard and the vineyard manager to be displayed at the entrance to the vineyard.

[84] As we understood Mr Hawes' evidence the explanation for this is that when someone complains about the noise from frost fans, council staff or more likely its contractors would have the ability to contact somebody directly responsible for the frost fan on arrival at the vineyard. Alternatively the complainant might be requested to go to the site and read the sign and advise the council of the details.

[85] However, it was clear from the evidence that most complaints arise at night, that very often it is unclear what fan is emitting the noise complained of, and that council staff or contractors are unlikely to visit the area complained of until the following day. We accept the evidence for NZW that this rule is not appropriate.

6. Outcome (Awatere and elsewhere)

6.1 The Rural 4 Zone in the Wairau/Awatere Resource Management Plan

[86] We are concerned that the different policies for the Awatere Valley – which recognise a relatively sparse population - suggest a different outcome there. We consider the frost fan rule that is suitable on the Wairau Plain is too restrictive in the Awatere Valley.

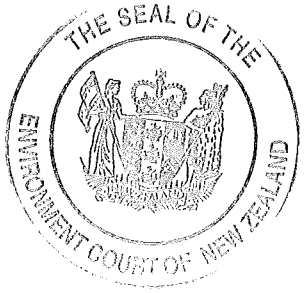
130 Under section 10 of the RMA.

[87] Specifically if an application contains a map or aerial photograph showing that there is no house within (say) 1 kilometre of the frost fan site, then we consider it might be appropriate for the SAC penalty in the NZ Standard not to be applicable. We will direct that the MDC consult briefly with Awatere rural community and of course NZ Winegrowers Inc about that, and then lodge and serve an amended rule for the Rural 4 Zone.

6.2 The Marlborough Sounds Resource Management Plan

[88] We consider the same rules should apply in this area as for the Wairau Plain and will make orders accordingly.

For the court



J R Jackson
Environment Judge

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